



FEASIBILITY + IMPLEMENTATION STUDY





ACKNOWLEDGMENTS

Thank you to the thousands of local residents, community leaders, and government staff that participated in the development of this study through meetings, events, comment forms, and plan review. Special thanks to those who participated as project working group members and advisors.

TRIANGLE BIKEWAY WORKING GROUP

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 Blue Ridge Corridor Alliance
 CAMPO
 Chapel Hill Transit
 Chapel Hill Transportation & Connectivity Advisory Board
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 City of Durham - Transportation
 City of Raleigh - Parks & Recreation
 City of Raleigh - Planning & Development
 City of Raleigh - Transportation
 DCHC MPO
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 Durham City-County Planning
 Durham County - Board of Commissioners
 Durham County - Open Space & Real Estate
 Durham County - Transportation
 East Coast Greenway
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 GoRaleigh
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 Town of Chapel Hill - Planning
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We are pleased to present the Triangle Bikeway Study. Through the diligent and committed leadership of the Capital Area and Durham Chapel Hill Carrboro MPOs, this study has taken a back of the napkin idea and developed it into a viable, community-supported project that will change our region for the better in the following ways:

Model for Regional Transportation Projects – The Triangle has sometimes struggled to act as one region when advancing transportation projects. The evolution of the Triangle Bikeway is deeply rooted in each community that it touches. This deliberate, distributed model of planning yielded energetic consensus and clear next steps.

Bold Step to Future Proof our Region – With the advent of electric assist bikes, bicycling for transportation is no longer limited to experienced cyclists. People of all ages and abilities are finding the freedom and satisfaction that comes with making trips under their own power. The study also maximizes locations where the Triangle Bikeway route connects to existing and future transit to further expand commuting options.

Low Cost / No Emissions Connections to Job-Rich Corridor – The I-40 corridor is the gateway for thousands of jobs in both professional and service industries. The Triangle Bikeway will provide low-cost access to employment opportunities without increasing traffic congestion on our highways.

Powerful Partnership Model with NCDOT – NCDOT has been engaged and supportive throughout the entire study process. The agency's growing commitment to multi-modal transportation is an essential element to the success of this and other projects seeking to leverage state resources to create safe and vibrant transportation corridors.

The Triangle Bikeway vision is the result of the collective work of citizens, elected officials, staff and advocates across two counties and five municipalities. Over roughly 18 months, nine working group meetings, two extensive public engagement campaigns, over 30 meetings with individual stakeholders and countless work hours have resulted in a vibrant common vision.

As County Commissioners, our charge is to position our communities to thrive, adapt and evolve to maintain our position as one of the best places in the country to live and work. Our challenge to you is to join us in the hard work ahead to make the Bikeway part of our everyday lives in the Triangle. Funding design and construction will require creativity, perseverance, and teamwork across jurisdictions. We look forward to standing with you on Triangle Bikeway ribbon cutting day!



Wendy Jacobs

Commissioner Wendy Jacobs
Vice Chair
Durham County
Board of Commissioners
Chair, DCHC MPO Board



Sig Hutchinson

Commissioner Sig Hutchinson
Chair
Wake County
Board of Commissioners
Chair, CAMPO Executive Board



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EXECUTIVE SUMMARY

The recommendations outlined in the Triangle Bikeway Study represent a significant investment in active transportation (*a means of getting around that is powered by human energy, primarily by walking and biking*) that will transform the way residents, employees, and visitors travel throughout the Triangle Region. This study draws upon previous planning efforts and community guidance to identify a multimodal corridor connecting Raleigh, Cary, Morrisville, Research Triangle Park (RTP), Durham, and Chapel Hill.

The Capital Area Metropolitan Planning Organization (CAMPO) and Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) are partnering with the City of Raleigh, Town of Cary, Town of Morrisville, Research Triangle Park, City of Durham, Town of Chapel Hill, Durham County, and Wake County to build a 23-mile shared use path through the Triangle Region along I-40 and NC-54. When complete, the Triangle Bikeway will provide seamless connections to major employment centers, local neighborhoods, recreational areas, commercial centers, transit networks, and existing bicycle and pedestrian facilities.

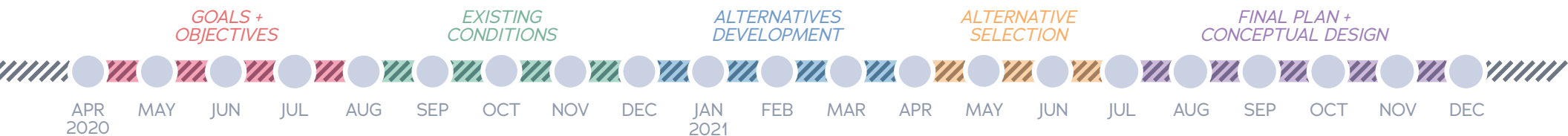
With approximately 186,000 jobs and 61,000 households in the study area, the Triangle Bikeway will provide a direct and accessible route separated from traffic to meet growing demands for multimodal travel choices as the region continues to rapidly develop.

The Triangle Bikeway Study includes design and construction recommendations between Raleigh and Research Triangle Park and a corridor assessment for the connection west between Research Triangle Park and Chapel Hill. The study also includes recommendations for connections to transit along the corridor, existing and proposed bicycle and pedestrian facilities, neighborhoods and other destinations.

The Research Triangle Park to Chapel Hill Feasibility Study includes an analysis of the segment from Park Point in Research Triangle Park to the US-15/501 and NC-54 interchange in Chapel Hill. The analysis provides the typical section of the bikeway, at-grade and grade-separated crossing layouts, conceptual structure type recommendations, conceptual right-of-way requirements, and rough impacts to streams, wetlands, and floodplains.

The Raleigh to Research Triangle Park Implementation Study includes a preliminary functional design for the segment from Trenton Rd in Raleigh to Park Point in Research Triangle Park. The functional design provides the typical section for the bikeway, at-grade and grade-separated crossing layouts, structure type recommendations, right-of-way requirements, and impacts to streams, wetlands, and floodplains.

PLANNING PROCESS



PROJECT GOALS



EQUITY



REGIONAL COLLABORATION



FEASIBILITY



CONNECT TO JOBS



TRANSPORTATION CHOICE



IDENTITY



SAFETY



PUBLIC BENEFIT + SUPPORT



RESILIENCY



COMMUNITY + STAKEHOLDER ENGAGEMENT

The Triangle Bikeway Study's engagement strategy focused on effective multi-jurisdictional coordination, broad stakeholder involvement, meaningful engagement with under-represented groups, and adaptive outreach during the COVID-19 pandemic. Key engagement techniques included establishing the Triangle Bikeway Working Group (TBWG) to guide project development, building consensus among jurisdictional partners and stakeholders, and hosting virtual and socially distant engagement opportunities throughout each phase of public input. The community engagement plan consisted of virtual public meetings, focus group meetings, working group meetings, surveys, online engagement, and several collaborative meetings with interjurisdictional stakeholders, as well as meetings with neighboring agencies and employers.

40+ Bi-weekly Project Meetings **20+ Key Stakeholder Meetings**
9 Working Group Meetings **4 Virtual Public Meetings**
7 Regional Planning Meetings **8 Pop-Up Events**
3 Focus Group Meetings **11 Jurisdictional Meetings**
10 Elected Officials Meetings **4,025 User Surveys Completed**



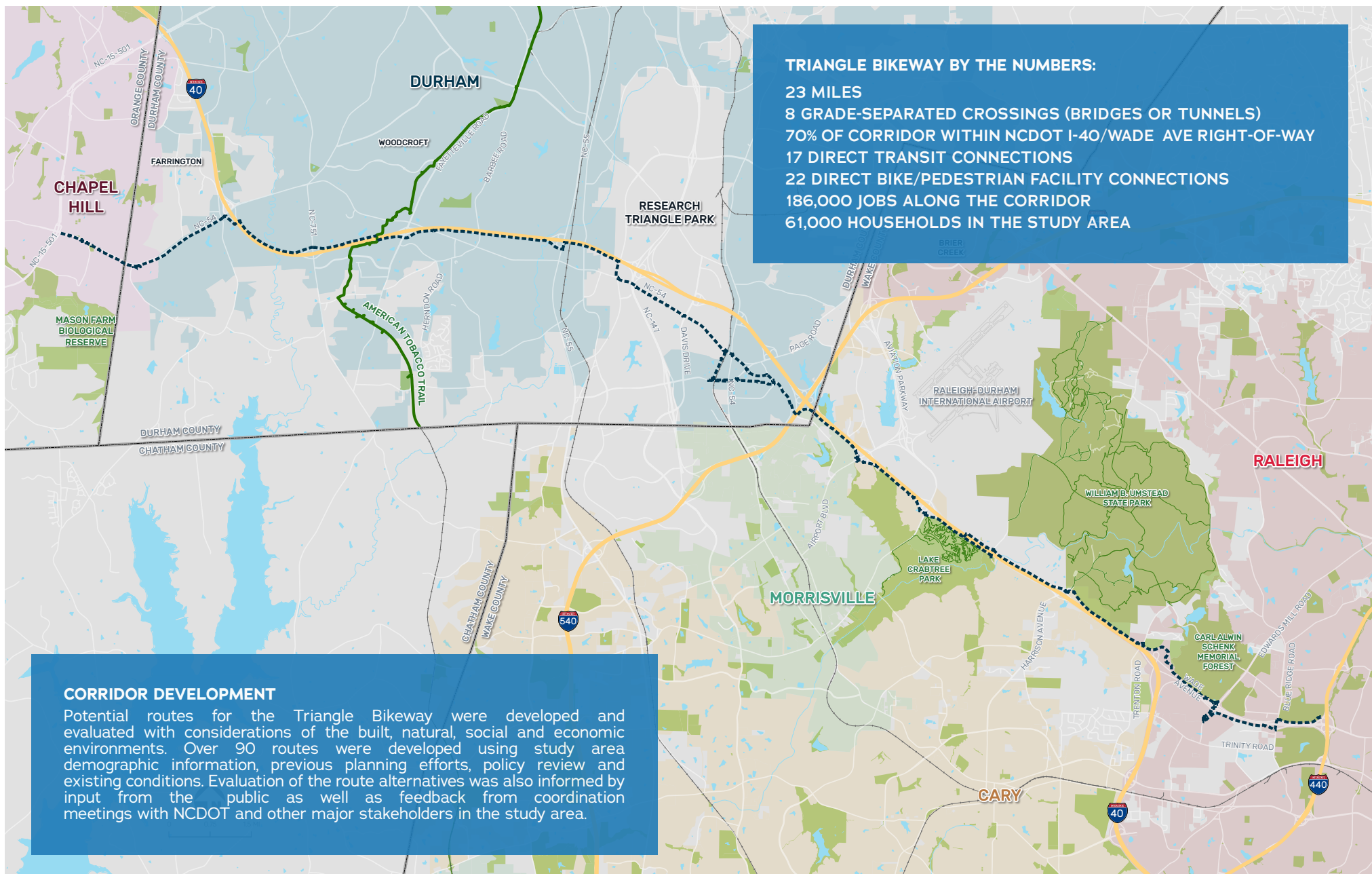
2,116
PEOPLE
RESPONDED
- to the -
PHASE I
SURVEY



5,508
POINTS
- added to the -
DESTINATION
SURVEY MAPS



2,009
PEOPLE
RESPONDED
- to the -
PHASE II
SURVEY



TRIANGLE BIKEWAY CORRIDOR

NC-15/501 TO I-440



BIKEWAY DESIGN

A 16-foot wide separated use facility type with delineation between areas for bicycling and areas for walking is proposed as the default typical section for the Triangle Bikeway. The selection of this facility type reflects input received from the public, working group members and other stakeholders.

Providing adequate width and separating use types supports the vision for the bikeway to serve not only as a commuter facility but to also meet the recreational use demand identified during community engagement. As the rise in popularity of bicycling and use of e-bikes generates greater interest in multi-modal commuting, the proposed user type separation will increase safety by reducing conflicts between those walking and those traveling at higher speeds by bike.



Preferred Bikeway Section - 16' Separated Use Path (10' Bike Path w/ 6' Pedestrian Path)

IMPLEMENTATION HIGHLIGHTS

Successful implementation of the Triangle Bikeway will require a coordinated and consistent effort with a wide range of community partners. Key agencies and partners include the Capital Area MPO, Durham-Chapel Hill-Carrboro MPO, NCDOT, municipalities and counties along the corridor, transit agencies, advocacy organizations, private partners, and members of the community.

- › Action steps prioritize implementation strategies over a 10-year period.
- › Cut sheets present design considerations of each corridor segment, defining crossings, multimodal connections, right-of-way needs, and estimated costs.
- › Implementation scenarios outline potential paths to develop the Triangle Bikeway based on accelerated, incremental, and gradual time frames.



Pedestrian Bridge Over I-40 (By Others) & Proposed At-Grade Crossing at Blue Ridge Road



Proposed Separated Use Bridge Over I-40 Near Exit 273 at NC 54

" *The Bikeway is much needed and will be instrumental in improving sustainable transportation options in the Triangle.* **"**

**- Community Survey
Respondent**





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INTRODUCTION

STUDY AREA

The Triangle Bikeway study area is in North Carolina's Research Triangle Region along the I-40 and NC-54 corridors between Raleigh and Chapel Hill, spanning approximately 23 miles. Jurisdictions in the study area include Wake, Durham, Orange, and Chatham counties and the municipalities of Raleigh, Durham, Chapel Hill, Cary, and Morrisville.

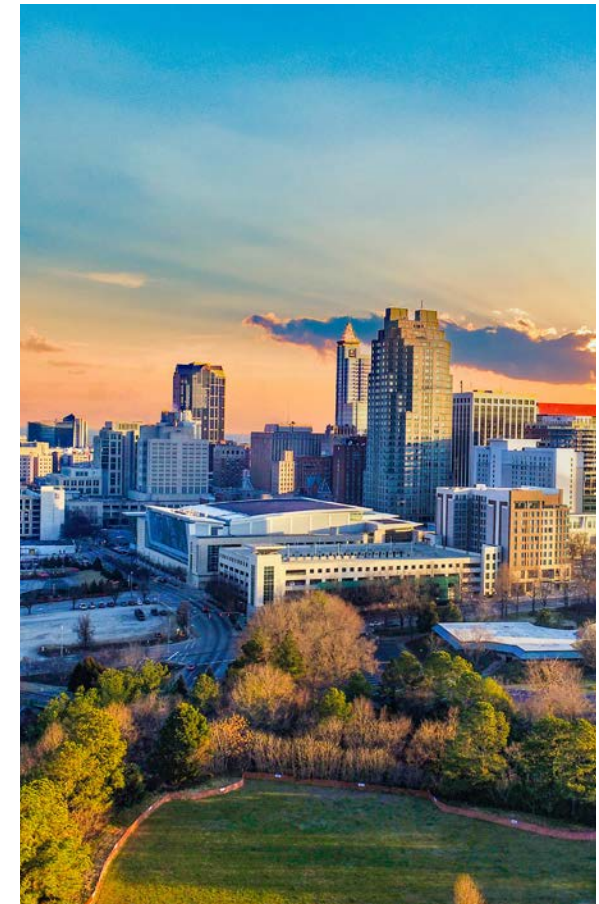
The Triangle is one the fastest growing regions in the nation and has emerged as a research and technology hub anchored by Research Triangle Park (RTP). The region has experienced rapid growth and development which combined with sparse bicycle and pedestrian infrastructure makes commuting by bike or on foot challenging for most Triangle residents. While the region has a robust greenway network, the active transportation network lacks connectivity and adequate biking, walking and transit infrastructure for users of all ages and abilities. As the region continues to rapidly develop, the Triangle Bikeway provides an opportunity to introduce more commuting choice along this job-rich corridor by creating a bicycle and pedestrian spine connected to our growing trail and transit networks.



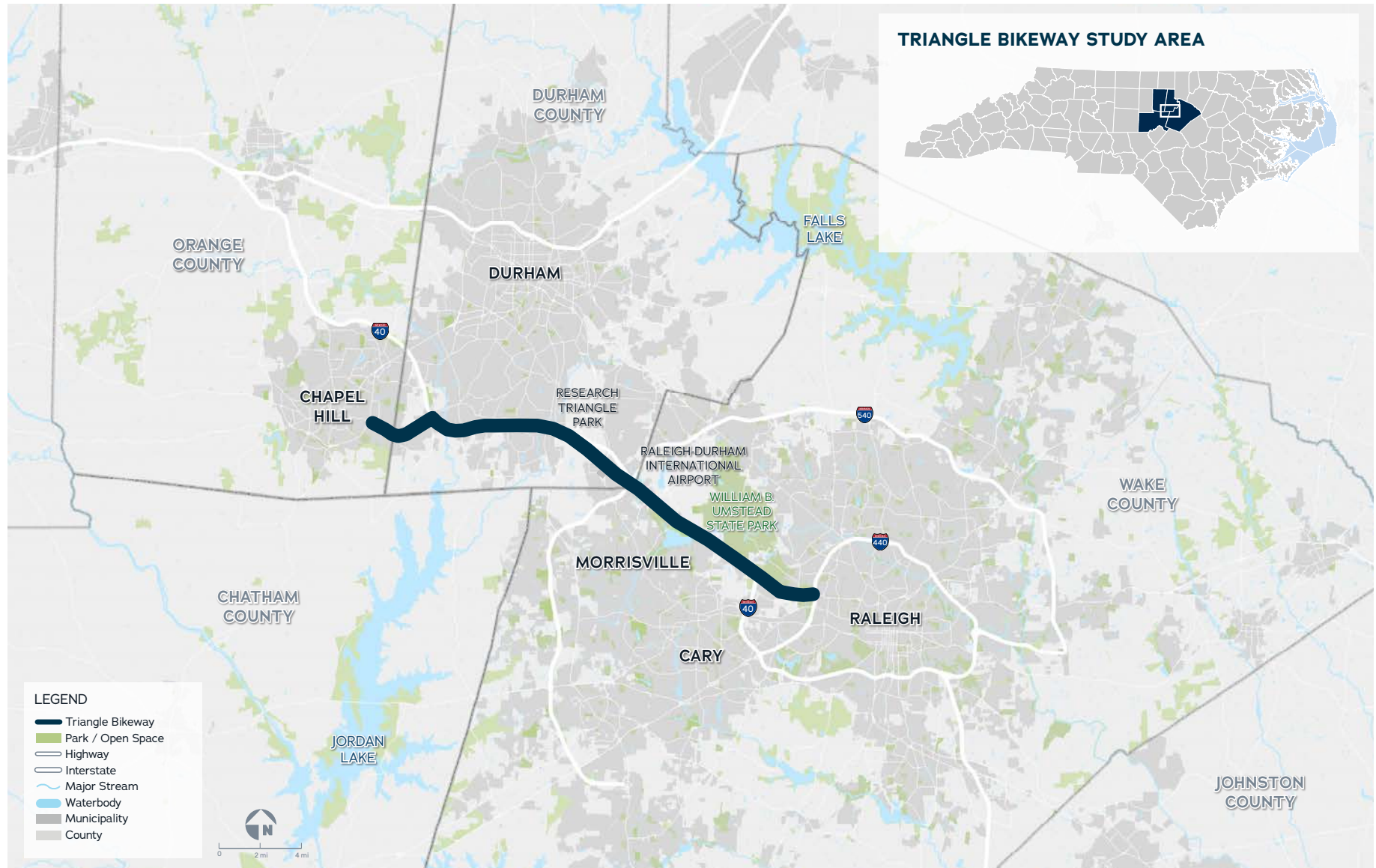
Chapel Hill, home of the University of North Carolina, anchors the western segment of the corridor.



Durham, a growing tech and innovation hub of the region, connects Chapel Hill, Research Triangle Park, and Raleigh along the corridor.



Raleigh, North Carolina's capital and second largest city, anchors the eastern segment of the corridor.





STUDY OVERVIEW

This study explores the opportunity to create an 23 mile bicycle corridor connecting Raleigh, Cary, Morrisville, Research Triangle Park (RTP), Durham and Chapel Hill generally parallel to I-40 and NC-54. The bikeway will connect Triangle communities and allow residents to make both short and long bike trips for work, play and daily errands.

The current planning effort for the bikeway includes design and construction recommendations between Raleigh and RTP, and a corridor assessment for the connection west to Durham and Chapel Hill.

Research Triangle Park to Chapel Hill Feasibility Study

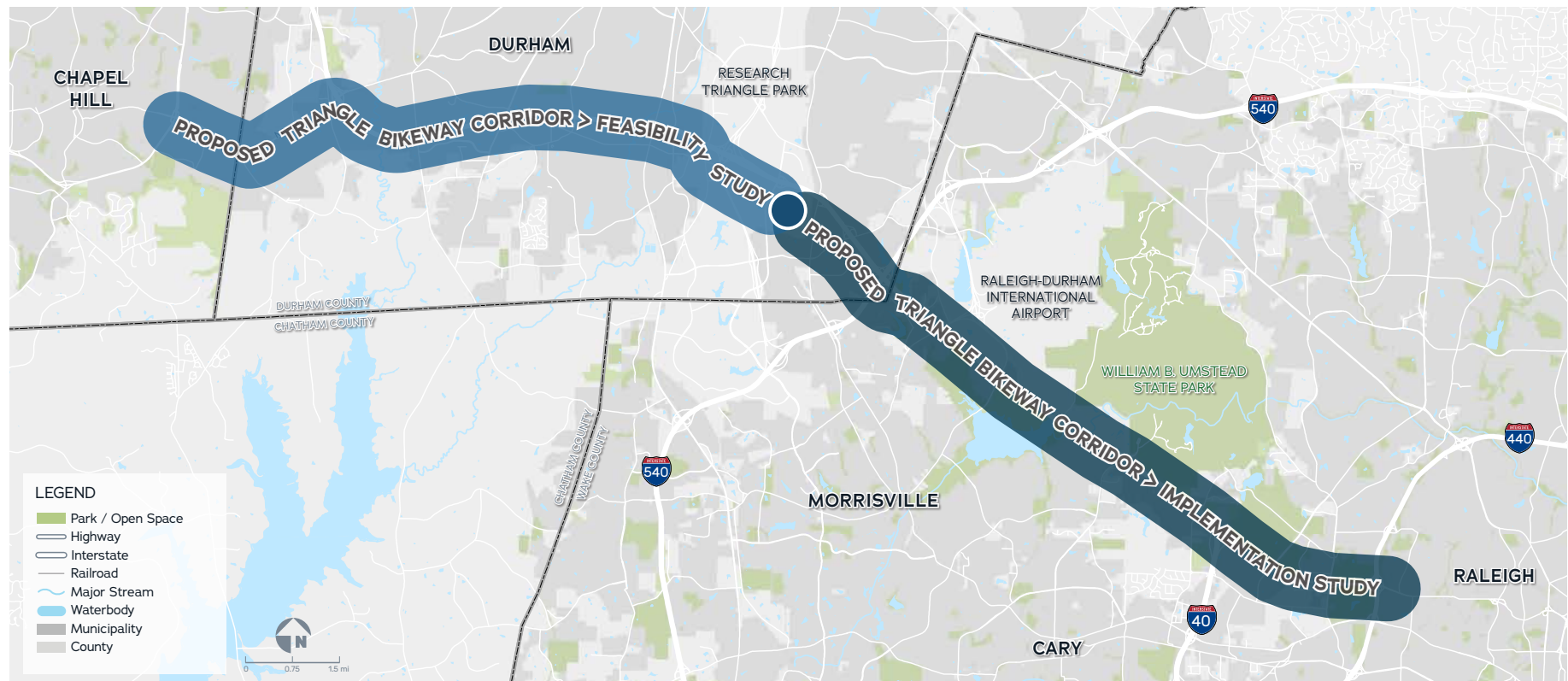
The feasibility study includes an analysis of the segment from the Hub in Research Triangle Park to the US-15/501 and NC-54 interchange in Chapel Hill. The analysis provides the typical section of the bikeway, at-grade and grade-separated crossing layouts, conceptual structure type recommendations, conceptual right-of-way requirements, and rough impacts to streams, wetlands, and floodplains.

The study also includes design recommendations for the NC-54 multi-use path proposed as part of the NCDOT STIP U-5774 project and recommendations for connections to transit, existing and proposed bicycle and pedestrian facilities, neighborhoods and other destinations.

Raleigh to Research Triangle Park Implementation Study

The implementation study includes a preliminary functional design for the segment from I-440 in Raleigh to the Hub in Research Triangle Park. The functional design provides the typical section for the bikeway, at-grade and grade-separated crossing layouts, structure type recommendations, right-of-way requirements, and impacts to streams, wetlands, and floodplains.

The study also includes recommendations for connections to transit, existing and proposed bicycle and pedestrian facilities, neighborhoods, schools, civic destinations, retail and recreation.





GOALS FOR THE BIKEWAY



EQUITY

Prioritize equal access to benefits of the Triangle Bikeway for all, through public engagement, project delivery and investment.



CONNECT TO JOBS

Provide seamless connections between the Triangle Bikeway, the regional transportation network, employment centers and local neighborhoods.



SAFETY

Address the safety needs of users of all ages and abilities in the design and development of the Triangle Bikeway.



REGIONAL COLLABORATION

Collaborate with government entities and other regional stakeholders to understand priorities and concerns. Build support of jurisdictional partners for future funding, design, construction and maintenance.



TRANSPORTATION CHOICE

Provide a direct and accessible route separated from traffic as a bicycling and walking option for commuters and recreational users. Make meaningful connections to transit and active transportation networks.



PUBLIC BENEFIT + SUPPORT

Listen to the community to help identify opportunities and challenges. Recommend an alignment that will generate public support and build momentum for future funding efforts.



FEASIBILITY

Utilize locations for the bikeway alignment that can be permitted and reduce the time required for implementation. Minimize the impact of the bikeway on environmental features and the natural habitat.



IDENTITY

Create a unique identity for the bikeway that will be instantly recognizable and highlight the regional commitment to both recreational and commuter bicycling to residents and visitors alike.



RESILIENCY

Support mode shift goals and reduce emissions / other transportation-related environmental impacts while expanding access to active living and positively impacting community health.



PROJECT BACKGROUND + STUDY TIMELINE

2003

The concept of a bike path along I-40 is first envisioned during the planning process of the Capital Area Metropolitan Planning Organization (CAMPO) Bicycle and Pedestrian Plan.

While stakeholders supported the idea, it is not included in final plan recommendations.

2016

A proposal for an I-40 bikeway resurfaces again during the late-stages of plan development for the Wake County Greenways Plan when stakeholders expressed a need for improving regional greenway connectivity.

The Triangle Bikeway project is proposed at a Triangle J Council of Governments board meeting and presented to bicycle and pedestrian advocates and practitioners for input at the annual NC Bike Walk Summit.

With support from elected officials, local governments, and advocates, CAMPO and Wake County fund an extension of the Wake County Greenways Master Plan to study the feasibility of the Triangle Bikeway.

2017

A study of the proposed corridor from the North Carolina Museum of Art (NCMA) to Research Triangle Park is completed. Wake County Greenways Plan is subsequently amended to incorporate the Triangle Bikeway into the County's greenway network.

The Triangle Bikeway Preliminary Feasibility Study evaluates the proposed bike path along I-40, connecting Research Triangle Park and Raleigh from the Hub to the NCMA. The proposed corridor is established to provide a direct connection between the existing bike and greenway systems in Durham, Cary, and Raleigh and to provide a more direct route for the East Coast Greenway through the Triangle.

The study outlines the following alignments along the corridor: connections to Cornwallis Rd bike lanes in Durham, Davis Dr shared use path, the existing and proposed shared use paths along NC-54 from Davis Dr to Miami Blvd, the proposed bike lanes along Slater Rd, shared use paths proposed along Emperor Blvd and Slater Rd, routing alternatives north and south of I-40 from I-540 to Harrison Ave, and a proposed shared use path north of I-40 from Harrison Ave to Trenton Rd, connecting to the Reedy Creek Trail in Raleigh. The study also proposes intersection improvements for roadways along the corridor, I-40 trail crossings, and opportunities to connect to existing bicycle and pedestrian facilities along the corridor.

2017

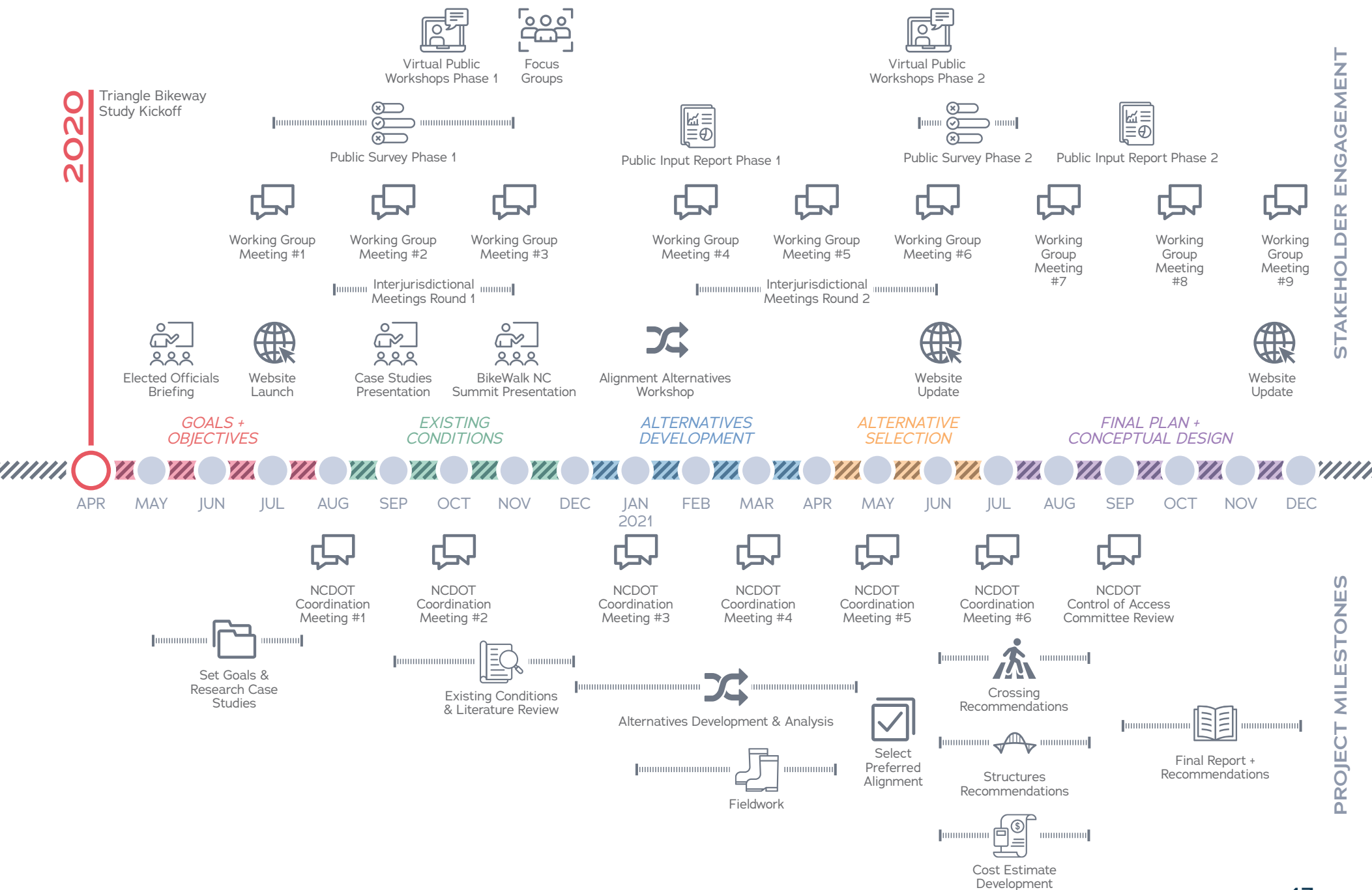
Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) also begins to evaluate opportunities to improve bicycle and pedestrian connections between Chapel Hill, Durham, and Research Triangle Park.

As in Wake County, previous initiatives in the last two decades propose commuter alternatives to I-40 between Chapel Hill, South Durham, and RTP. However, it is not until May 2017 that DCHC MPO is able to include a proposed shared-used path along I-40 in the MPO's Comprehensive Transportation Plan (CTP).

In August 2017, the NCDOT Board of Transportation approve the CTP with the proposed I-40 bike path. At this time, Wake County officials invite the DCHC MPO Board to participate in a study to expand the Triangle Bikeway into a regional project that would include a bike path between Chapel Hill and Raleigh along NC-54 and I-40. The DCHC MPO Board includes the project in the MPO's 2018-2019 Work Plan.

2019

CAMPO and DCHC MPO jointly fund the feasibility study of the Triangle Bikeway from Chapel Hill to RTP and to advance the Wake County bikeway segment to 30% design.





CASE STUDIES

The Triangle Bikeway will transform the region by providing active transportation opportunities connecting neighborhoods and employment centers in Raleigh, Cary, Morrisville, Research Triangle Park, Durham, and Chapel Hill. Several innovative shared-use path projects that parallel highway corridors serve as precedents and provide valuable lessons learned for the development of the Triangle Bikeway.

Ideas from these projects that influence the bikeway's design and project development include:

- › Aligning trails within state DOT right-of-way
- › Strong connections to transit
- › Design elements to support effective commuting (lighting, separate walking and bicycling zones)
- › Establishing strong partnerships
- › Prioritizing large-scale transportation investments





1. I-90 TRAIL

Location: King County, WA
Trail length: 10 miles
Construction: 1990's
Lead Agency: Washington State Department of Transportation (WSDOT)
Key Partners: King County, City of Seattle, City of Bellevue, Mountains to Sound Greenway Trust
Right-of-way: All within WSDOT right-of-way
Total cost: Undetermined, constructed as part of an I-90 improvement project
Funding: Federal and state funding

The I-90 Trail is a 10-mile share-use path that follows the highway corridor across Lake Washington from Seattle to Bellevue. The trail was completed as part of an I-90 improvement project in the 1990's and is located entirely in WSDOT right of way. The trail is major transportation facility for the region that connects some of the state's largest employment and residential areas. The trail is also a part of the Mountains to Sound Greenway (MTSG), which is a 100-mile corridor stretching from Seattle to Central Washington. In 2019, the MTSG was designated as a National Heritage Area and is managed by the Mountains to Sound Greenway Trust.

Key Takeaways: The I-90 Trail demonstrates the value of establishing strong partnerships between project stakeholders. WSDOT and local trail advocates developed a partnership early in the project's development because of a shared commitment to improving active transportation facilities in the region. WSDOT, King County, City of Seattle, City of Bellevue, Mountains to Sound Greenway Trust, and local businesses such as Microsoft were involved throughout the project, which helped to secure community support. The I-90 Trail also serves as another example of utilizing a complete streets approach to reduce land acquisition needs and construction costs.

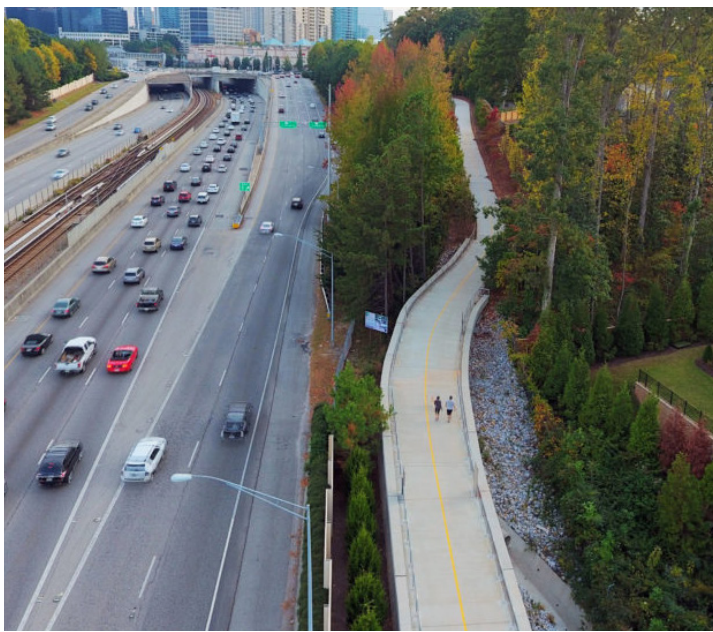


2. US 36 BIKEWAY

Location: Boulder and Westminster, CO
Trail length: 18 miles
Construction: 2015-2016
Lead Agency: Colorado Department of Transportation (CDOT)
Key Partners: City of Boulder, Boulder County, City of Westminster, Regional Transportation District (RTD)
Right-of-way: All within CDOT right-of-way
Total cost: \$16.6 million
Funding: Sales tax funding, federal funding, state funding (funded through a \$497 million U.S. 36 corridor improvement project)

US 36 Bikeway is an 18-mile multi-purpose trail that connects Boulder and Westminster along US 36 in Colorado. The trail is a major active commuter corridor in the region and connects to activity centers, major employers, and six RTD transit stations. The entirety of the trail falls within CDOT right-of-way, and CDOT led the project's development, which was part of a larger, \$497 million transportation project to create 18 miles of bus rapid transit, new toll express lanes, and the Bikeway along the US 36 corridor. These investments were part of FasTracks, a multibillion-dollar public transportation expansion throughout the Denver Metro.

Key Takeaways: This project demonstrates the importance of prioritizing large-scale transportation investments to transform a region by expanding travel choices. FasTracks is RTD's voter-approved sales tax increase to fund transit and active transportation facilities. This funding is leveraged with state and federal dollars to expand multi-modal infrastructure into more neighborhoods across the Denver region. These investments have spurred transit- and trail-oriented development and led to job creation and increased revenues for local businesses along the corridor.



3. PATH 400

Location: Atlanta, GA
Trail length: 5.2 miles
Construction: 2014-2020, remaining trail segments in development
Lead Agency: Livable Buckhead
Key Partners: Georgia Department of Transportation (GDOT), City of Atlanta, PATH Foundation, Buckhead Community Improvement District, MARTA
Right-of-way: 2/3 within GDOT right-of-way
Total cost: \$28 million
Funding: Transportation Special Local Option Sales Tax (TSPLOST) funding, state funding, Buckhead Community Improvement District funding, PATH Foundation funding, federal funding

PATH 400 is a 5.2 mile shared-use path that restores multimodal connections to neighborhoods and commercial districts along GA-400 in Buckhead. Once completed it will connect to the Atlanta BeltLine at its south end and to a two-mile trail extension in Sandy Springs at the north end. The project is being implemented through a public-private partnership. Livable Buckhead is facilitating stakeholder and public engagement through direct coordination with GDOT and the City of Atlanta, and the PATH Foundation is leading the trail's construction.

Key Takeaways: Path 400 demonstrates the effectiveness of public-private partnerships to garner public support, secure funding, and coordinate between governmental agencies and stakeholders. Appointing one organization, Livable Buckhead, to act as project manager through the life of the project has helped to maintain consistency for successful public engagement and coordination efforts. Project leaders have also emphasized the importance of completing right-of-way due diligence early in the project development process to prepare for negotiations between stakeholders on land acquisition, easements, and maintenance responsibilities.



4. BUSINESS 40 SIDE PATH

Location: Winston-Salem, NC
Trail length: 1.2 miles
Construction: 2018-2021
Lead Agency: North Carolina Department of Transportation (NCDOT)
Key Partners: City of Winston-Salem, Creative Corridors Coalition, Downtown Winston-Salem Partnership
Right-of-way: All within NCDOT right-of-way
Total cost: \$8-10 million
Funding: Federal funding, state funding, local bonds, private funding

The Business 40 Side Path spans 1.2 miles from Wake Forest Baptist Medical Center to Downtown Winston-Salem along I-40 Business. The trail connects neighborhoods, the minor league baseball stadium, the hospital, and several commercial areas in the city center. The trail falls entirely within NCDOT right-of-way and is included in the NCDOT Business 40 improvement project, which also incorporates several improvements to existing bridges along the corridor to accommodate bicycle and pedestrian facilities. Once complete, the trail will connect to a growing network of on-street bicycle facilities and 25 miles of greenways throughout the region.

Key Takeaways: The Business 40 Multi-Use Path has relied on a successful public-private partnership to advance the project. Key funding partners include NCDOT, City of Winston-Salem, Downtown Winston-Salem Partnership, and Creative Corridors Coalition. The City of Winston-Salem allocated federal CMAQ and STBG funding as well as funds generated from local bonds to construct the trail as part of the roadway improvement project. The Creative Corridors Coalition and Downtown Winston-Salem Partnership also raised private funds to enhance street lighting, landscaping, and placemaking amenities along the Business 40 corridor. Local project leaders have emphasized the importance of coordinating with NCDOT early on to incorporate critical active transportation elements that may go beyond a project's scope.



5. CUSTIS TRAIL

Location: Arlington County, VA
Trail length: 4.5 miles
Construction: 1978-1982, trail expansion into Fairfax and Prince William Counties in development
Lead Agency: Virginia Department of Transportation (VDOT)
Key Partners: Arlington County
Right-of-way: All within VDOT right-of-way
Total cost: \$2.5 million
Funding: Federal and state funding

The Custis Trail is a 4.5 mile shared-use path along I-66 that serves as a commuter route for Arlington County residents and workers. The trail was completed as part of the I-66 highway construction project in 1982. The trail is located entirely in VDOT right-of-way, and as a result VDOT maintains the trail with Arlington County contributing 50% of maintenance costs. Today, the trail is heavily used as an active transportation corridor with an average of 3,000 daily users and will soon be extended 11 miles into Fairfax and Prince William Counties as part of "Transform I-66 Outside the Beltway" project.

Key Takeaways: The Custis Trail provides a successful example of utilizing a complete streets approach to project development. Incorporating trail construction into the highway project minimized land acquisition needs and construction costs. Routing the trail entirely in VDOT right-of-way also reduced trail alignment challenges that frequently occur within constrained corridors. However, there are some trail segments on the highway side of the sound wall that pose access problems for trail users.

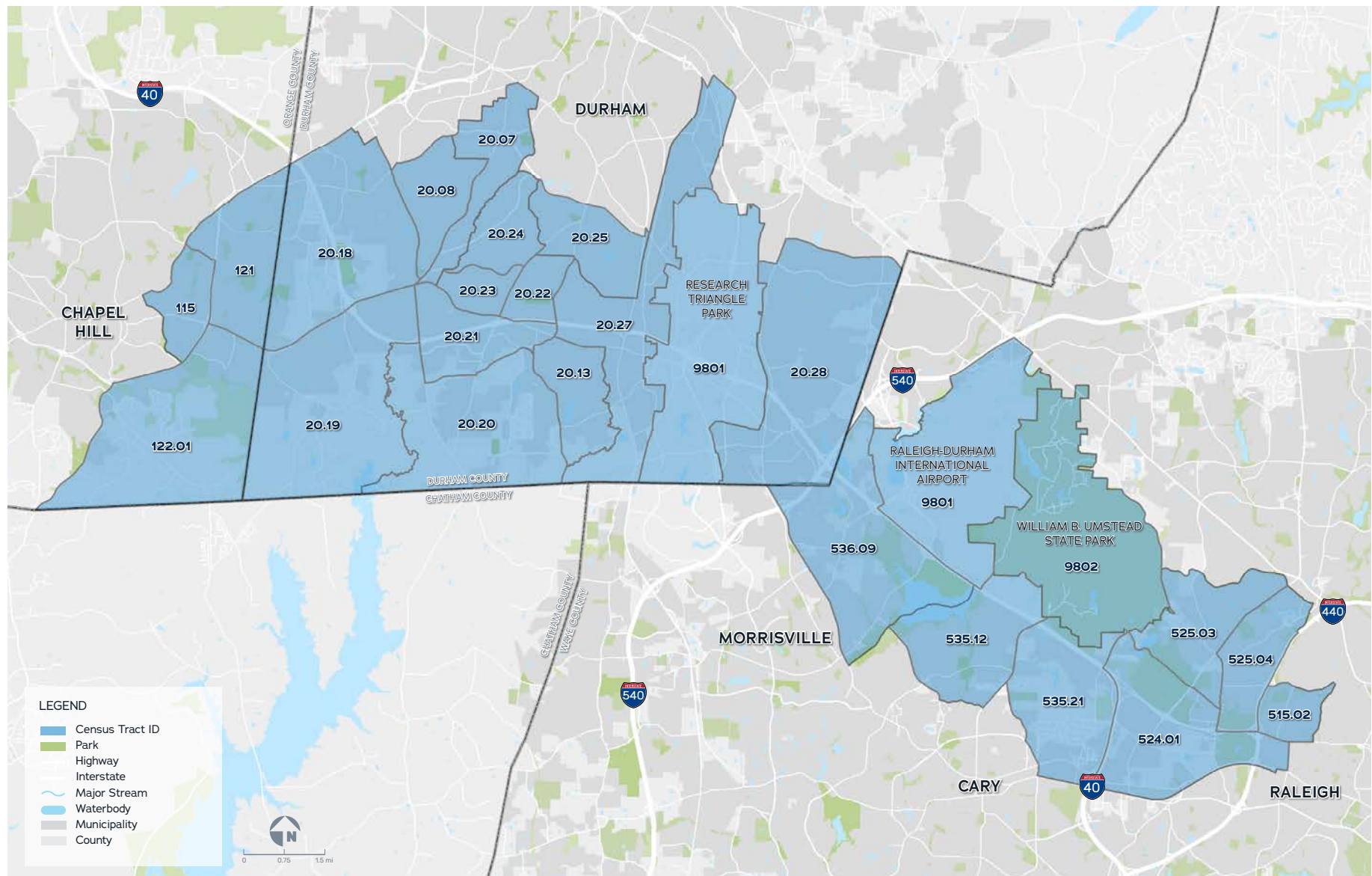


6. CHARTER OAK GREENWAY

Location: East Hartford, Manchester, and Bolton, CT
Trail length: 16 miles
Construction: 1988-2023
Lead Agency: Connecticut Department of Transportation (CTDOT)
Key Partners: Towns of East Hartford, Manchester, and Bolton, East Coast Greenway Alliance, Bike Walk Bolton, and Pratt & Whitney
Right-of-way: 2/3 within CTDOT right-of-way
Total cost: \$29 million
Funding: Federal TAP grants, state bonds

The Charter Oak Greenway offers more than 16 miles of paved pathway through Hartford and its eastern suburbs. Paralleling Route 384 in East Hartford, Manchester and Bolton, the Charter Oak Greenway was constructed by CTDOT and is the primary active transportation corridor for those commuting to Hartford. Plans call for the extension of this trail to Riverfront Recapture in Hartford and to the Hop River State Park Trail in Bolton, helping to create a corridor which will eventually stretch to Providence, RI and beyond via the East Coast Greenway. Trail funding sources have included a combination of federal TAP grants and local state bonds. The last mile of the trail in East Hartford will be completed as part of a roadway improvement project in 2023.

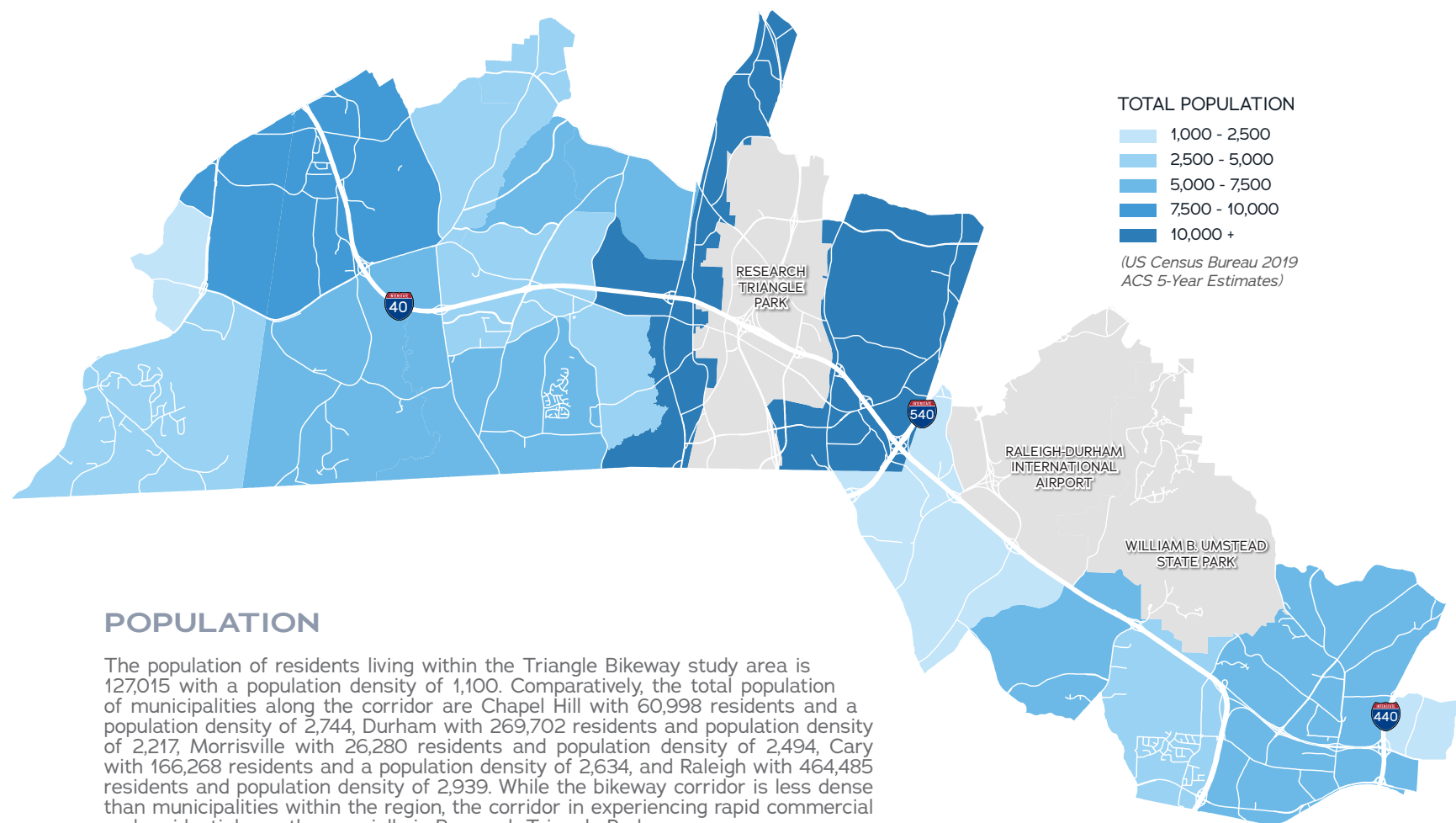
Key Takeaways: The trail's success is largely due to the advocacy efforts of local non-profits, support from local town councils, and public-private partnerships. Bike Walk Bolton, East Coast Greenway Alliance, and town councils of East Hartford and Manchester heavily advocated and prioritized funding for the Charter Oak Greenway. Pratt & Whitney, one of the area's largest employers also provided support for the trail's development. Additionally, former Connecticut Governor Dannel Malloy convened the State Bond Commission to invest \$7 million in grants to expand the state's recreational trails and establish a Recreational Trails and Greenways Program in 2016. This investment provided funds to complete remaining segments of the greenway.



The map above illustrates the census tracts that comprise the Triangle Bikeway study area. The data included in the demographic analysis is drawn from the 2019 ACS 5-Year estimates from the US Census Bureau.

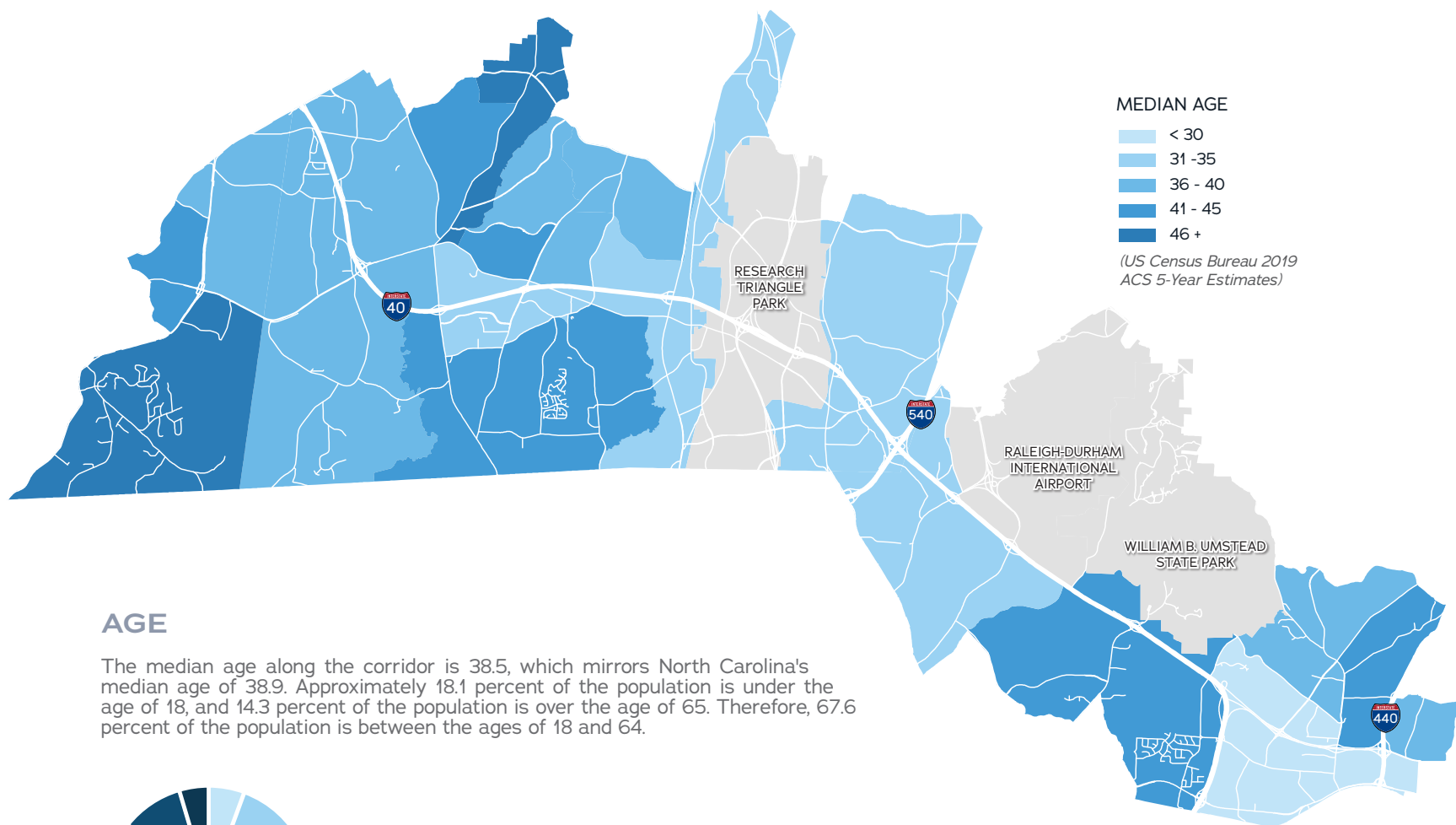
DEMOGRAPHICS

The project team created a demographic summary of the Triangle Bikeway corridor using census tracts along and adjacent to potential bikeway alignments. The data is pulled from the US Census Bureau 2019 American Community Survey (ACS) 5-year estimates and was mapped using Esri ArcGIS. This demographic analysis helps to inform the public engagement approach and to ensure proposed recommendations meet the diverse needs of people residing along the corridor.



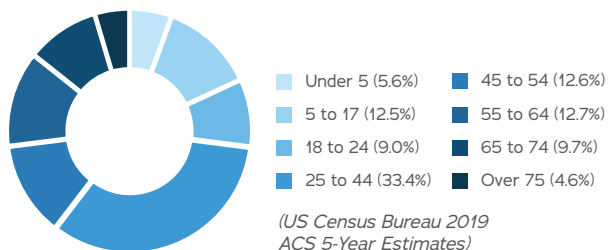
POPULATION

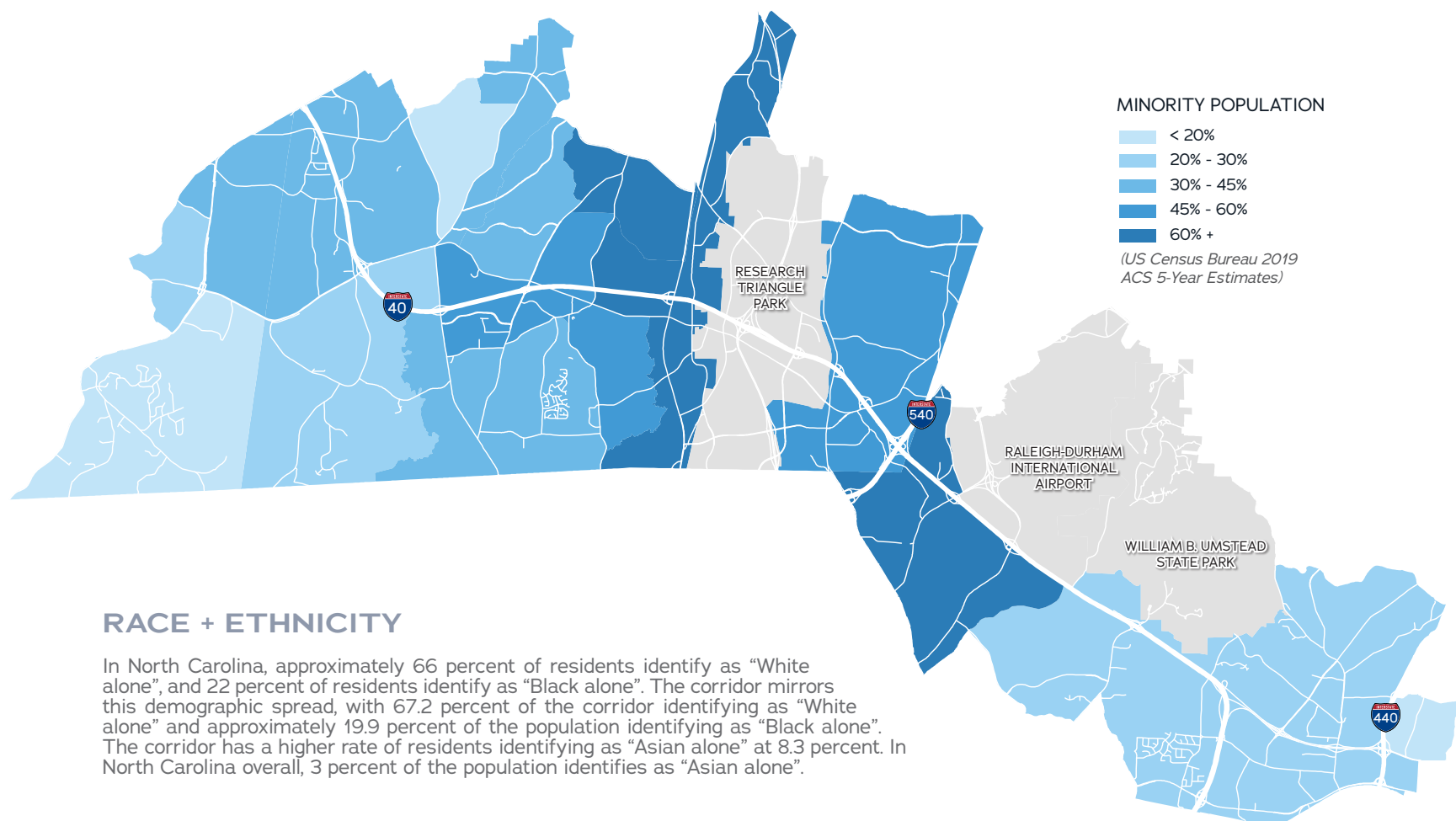
The population of residents living within the Triangle Bikeway study area is 127,015 with a population density of 1,100. Comparatively, the total population of municipalities along the corridor are Chapel Hill with 60,998 residents and a population density of 2,744, Durham with 269,702 residents and population density of 2,217, Morrisville with 26,280 residents and population density of 2,494, Cary with 166,268 residents and a population density of 2,634, and Raleigh with 464,485 residents and population density of 2,939. While the bikeway corridor is less dense than municipalities within the region, the corridor is experiencing rapid commercial and residential growth, especially in Research Triangle Park.



AGE

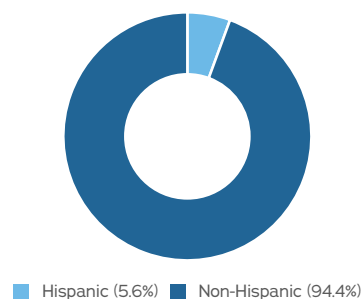
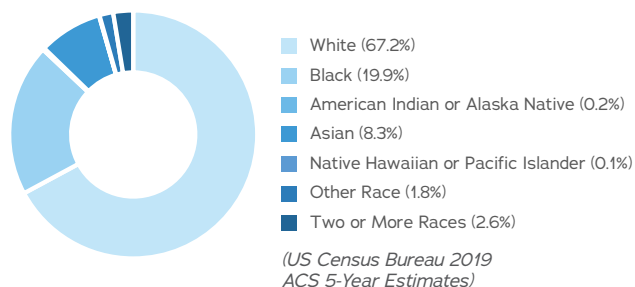
The median age along the corridor is 38.5, which mirrors North Carolina's median age of 38.9. Approximately 18.1 percent of the population is under the age of 18, and 14.3 percent of the population is over the age of 65. Therefore, 67.6 percent of the population is between the ages of 18 and 64.



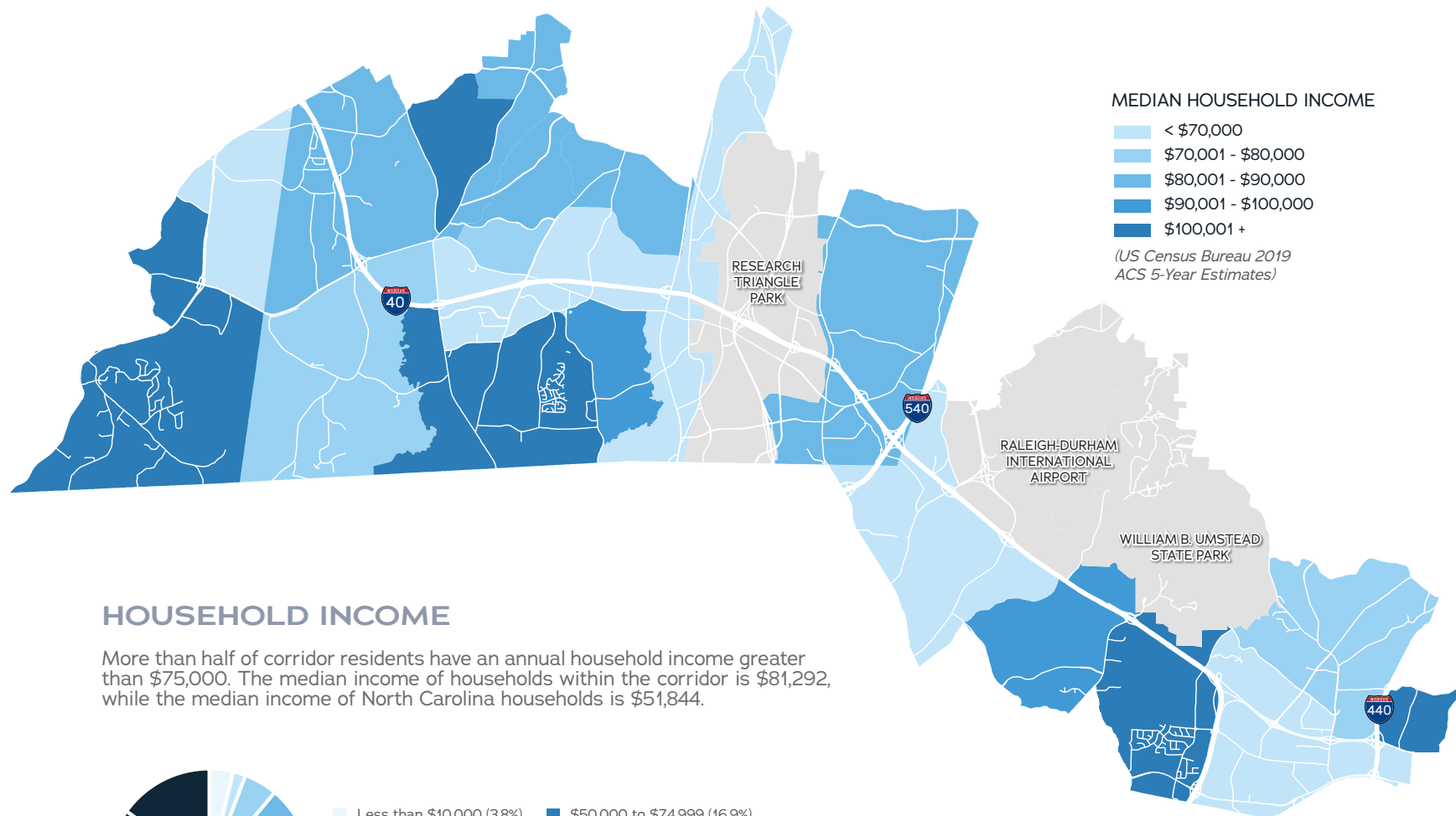


RACE + ETHNICITY

In North Carolina, approximately 66 percent of residents identify as “White alone”, and 22 percent of residents identify as “Black alone”. The corridor mirrors this demographic spread, with 67.2 percent of the corridor identifying as “White alone” and approximately 19.9 percent of the population identifying as “Black alone”. The corridor has a higher rate of residents identifying as “Asian alone” at 8.3 percent. In North Carolina overall, 3 percent of the population identifies as “Asian alone”.

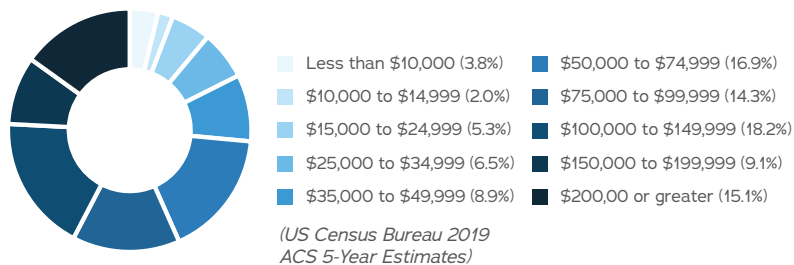


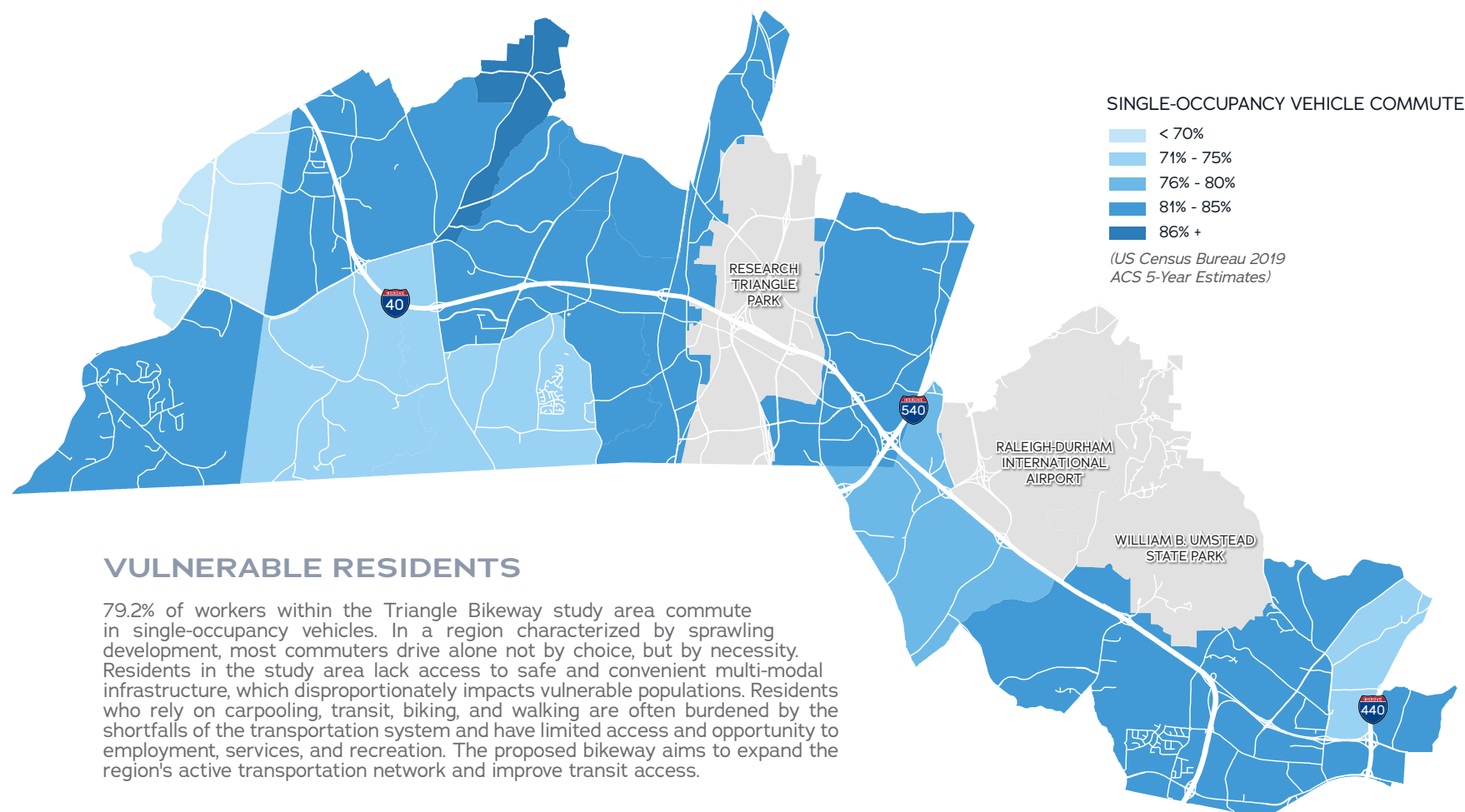
5.6 percent of corridor residents identify as “Hispanic or Latinx of any race.” The corridor’s proportion of the population identifying as “Hispanic or Latinx of any race” is lower than in North Carolina, in which 10 percent of the population identifies as “Hispanic or Latinx of any race”.



HOUSEHOLD INCOME

More than half of corridor residents have an annual household income greater than \$75,000. The median income of households within the corridor is \$81,292, while the median income of North Carolina households is \$51,844.



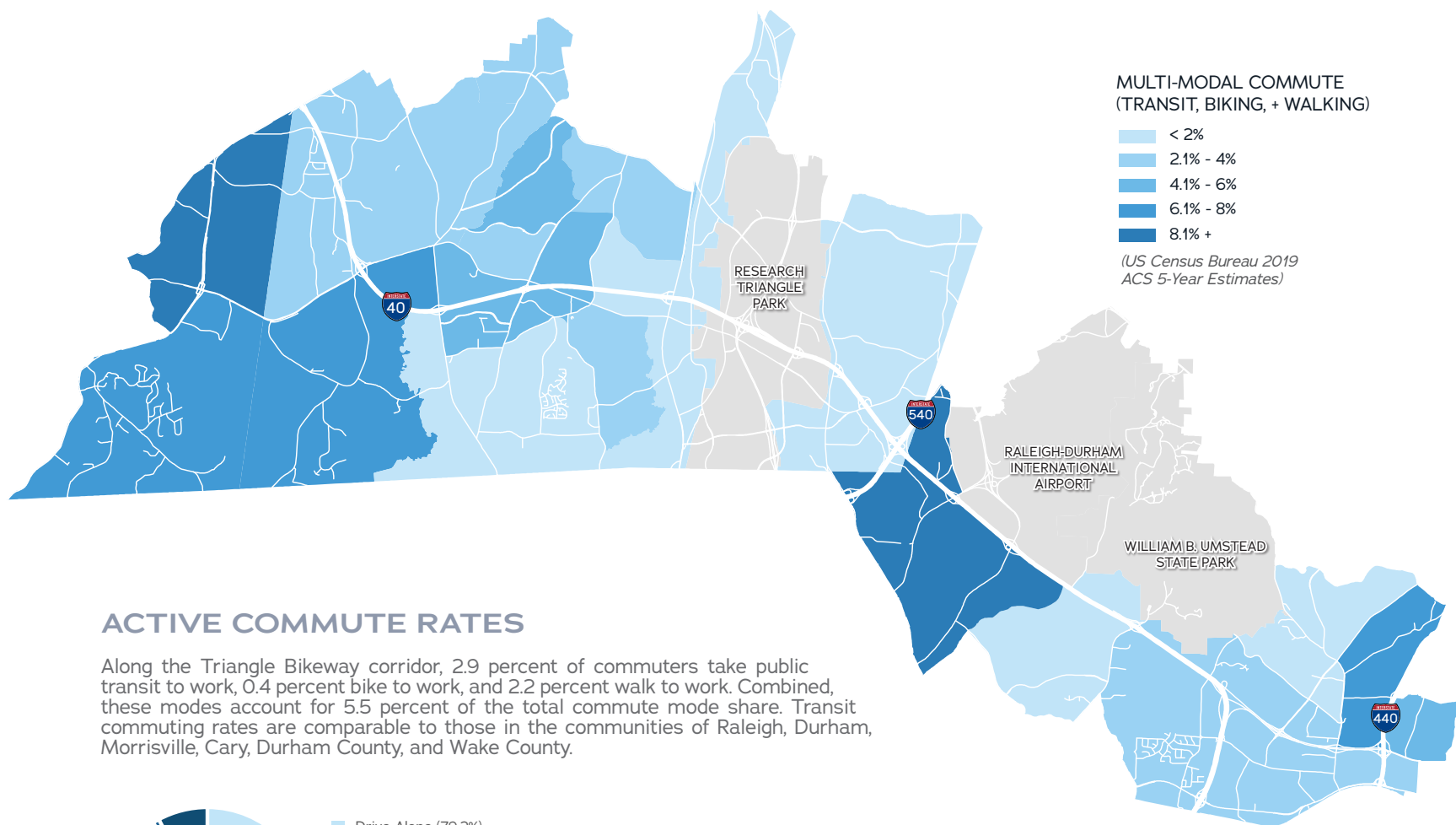


VULNERABLE RESIDENTS

79.2% of workers within the Triangle Bikeway study area commute in single-occupancy vehicles. In a region characterized by sprawling development, most commuters drive alone not by choice, but by necessity. Residents in the study area lack access to safe and convenient multi-modal infrastructure, which disproportionately impacts vulnerable populations. Residents who rely on carpooling, transit, biking, and walking are often burdened by the shortfalls of the transportation system and have limited access and opportunity to employment, services, and recreation. The proposed bikeway aims to expand the region's active transportation network and improve transit access.

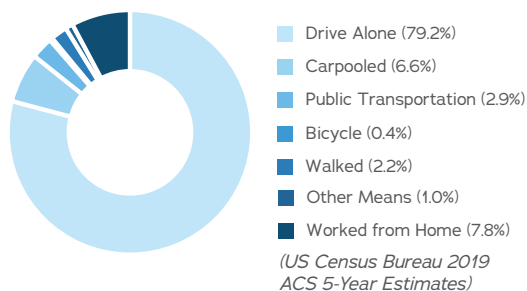
<i>Vulnerable Residents</i>	<i>% of Corridor Population</i>
Zero-Vehicle Households	0.6%
Households with Disabled Person(s)	12.4%
Households Below Poverty Level	8.9%
Minority Populations	38.4%
Unemployed Workers	9.3%
Seniors 75 and Older	4.6%
Residents with Limited English Proficiency	1.2%

(US Census Bureau 2019
ACS 5-Year Estimates)



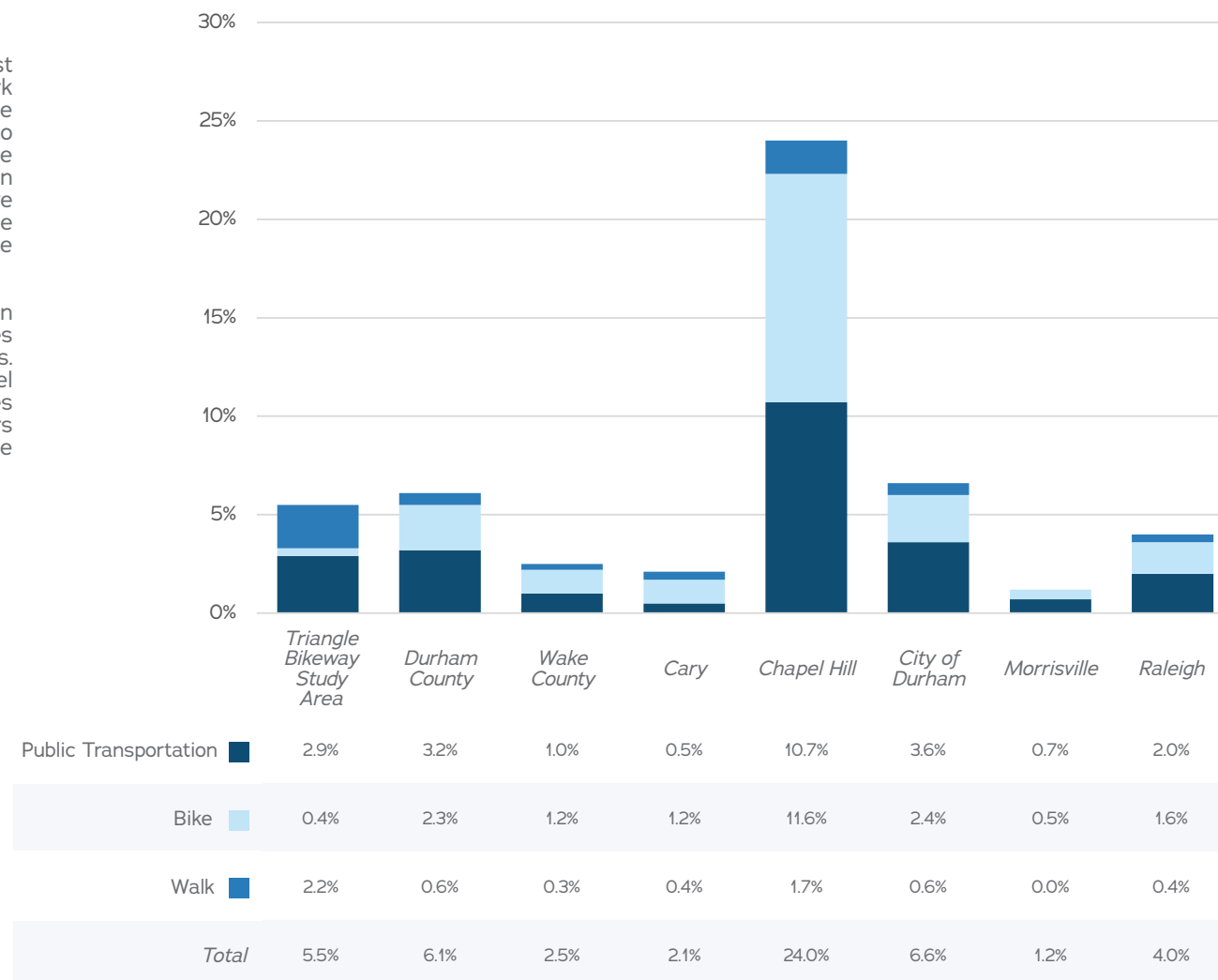
ACTIVE COMMUTE RATES

Along the Triangle Bikeway corridor, 2.9 percent of commuters take public transit to work, 0.4 percent bike to work, and 2.2 percent walk to work. Combined, these modes account for 5.5 percent of the total commute mode share. Transit commuting rates are comparable to those in the communities of Raleigh, Durham, Morrisville, Cary, Durham County, and Wake County.



The Triangle Bikeway study area has the highest commuting rates of those who *walk* to work in the region. However, the study area has the lowest commuting rates of those who *bike* to work in the region. As research suggests there is a strong correlation between investments in multi-modal transportation and higher active commute mode shares, development of the Triangle Bikeway may increase bike commute rates within the study area.¹

As a college town, Chapel Hill is the outlier in the region. Transit and bike commute rates far exceed those of neighboring communities. Connecting the Triangle Bikeway to Chapel Hill's bicycle and pedestrian network improves accessibility to the region's employment centers and may also increase the Town's walk and bike commute rates.

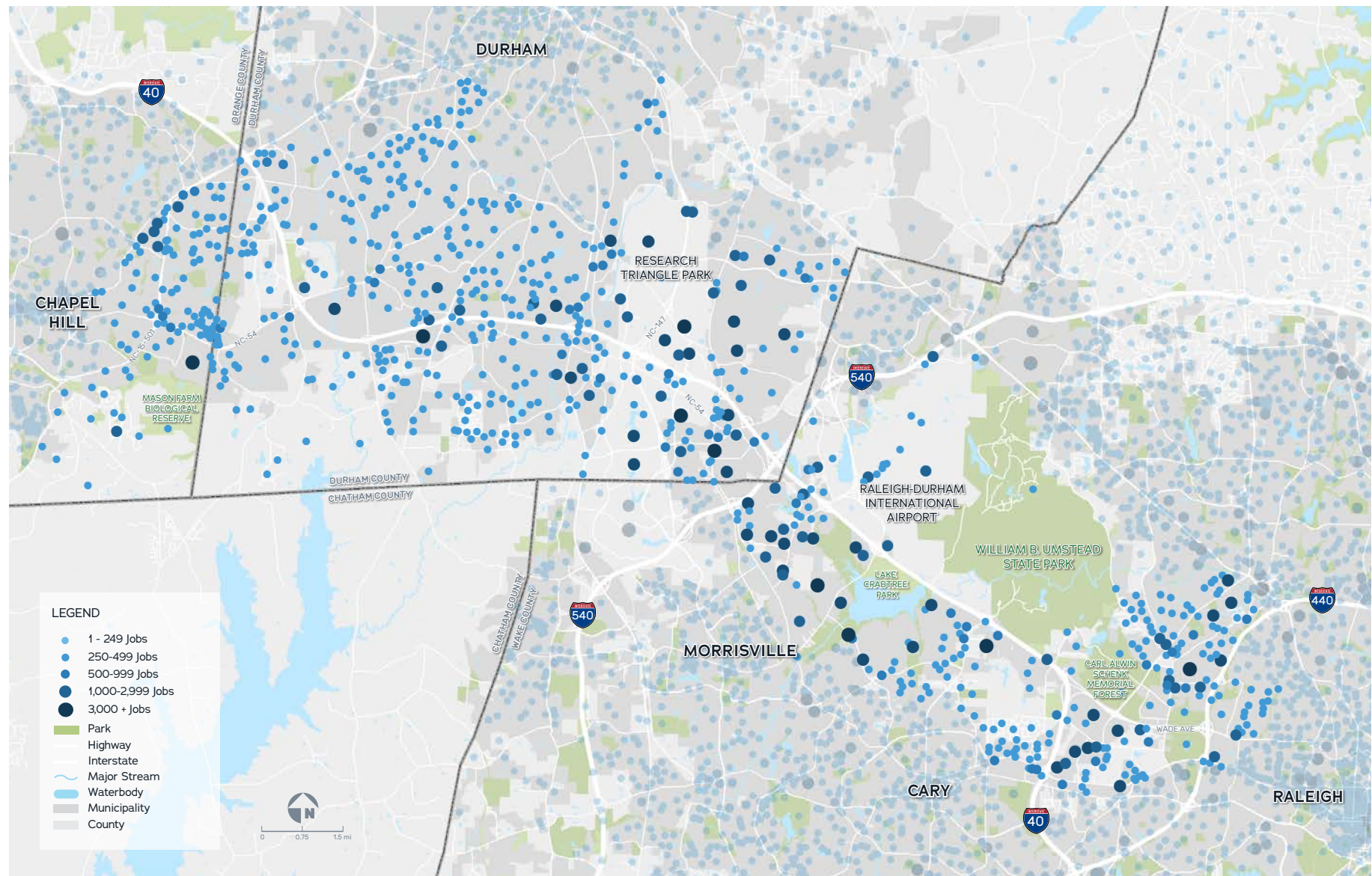


(US Census Bureau 2019
ACS 5-Year Estimates)

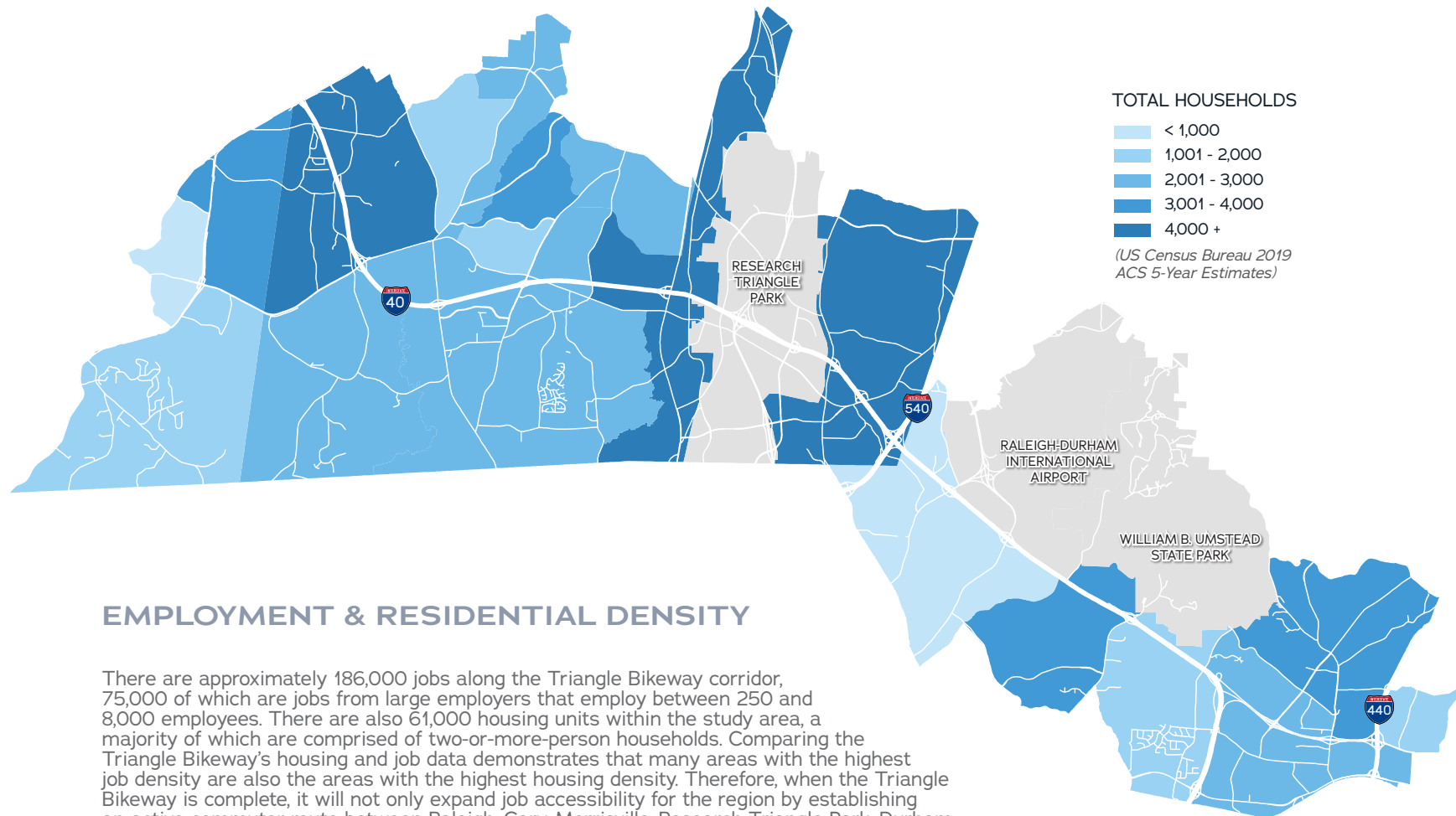
¹ *Bicycling and Walking in the US Benchmarking Report, Alliance for Biking and Walking*



INTRODUCTION



The map above illustrates employment density in the Triangle Bikeway study area. The data included in the demographic analysis is drawn from the 2019 ACS 5-Year estimates from the US Census Bureau.

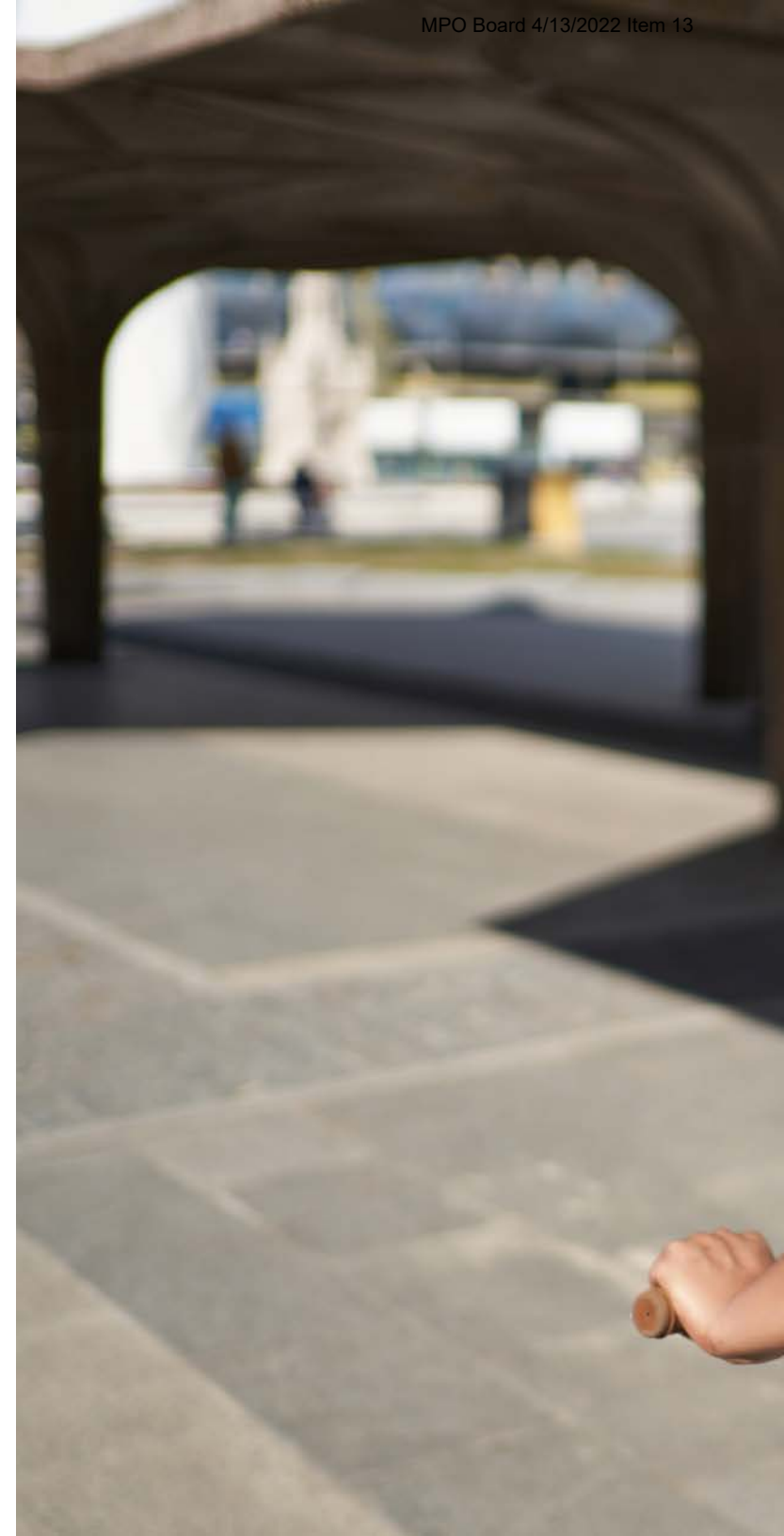


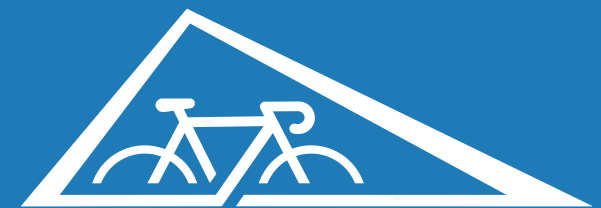
EMPLOYMENT & RESIDENTIAL DENSITY

There are approximately 186,000 jobs along the Triangle Bikeway corridor, 75,000 of which are jobs from large employers that employ between 250 and 8,000 employees. There are also 61,000 housing units within the study area, a majority of which are comprised of two-or-more-person households. Comparing the Triangle Bikeway's housing and job data demonstrates that many areas with the highest job density are also the areas with the highest housing density. Therefore, when the Triangle Bikeway is complete, it will not only expand job accessibility for the region by establishing an active commuter route between Raleigh, Cary, Morrisville, Research Triangle Park, Durham, and Chapel Hill, but it will also provide critical multimodal connections for those working and living within the study area. This investment will transform the region by expanding local access between employment centers and neighborhoods, giving residents and workers a range of viable travel options.

“The highest priority should be improved ped/bike/transit access for low-income Black and Brown communities.”

**- Community Survey
Respondent**





02

EXISTING
CONDITIONS



OVERVIEW

The project team reviewed relevant planning efforts; federal, state, and local policies; and proposed roadway improvement projects and developments along the Triangle Bikeway corridor. A safety analysis was conducted by evaluating bicycle and pedestrian crash data along the project corridor. The project team also conducted field work by visiting key destinations, existing bicycle and pedestrian facilities, and priority corridors.

PREVIOUS PLANNING EFFORTS

The Capital Area Metropolitan Planning Organization (CAMPO), Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO), and their partnering communities have prioritized multi-modal connectivity throughout the Triangle region in planning efforts over the past decade. The following table provides a summary of key bicycle, pedestrian, and transit recommendations from previous plans and studies that are relevant to the Triangle Bikeway Study.

The Triangle Bikeway is project of regional significance and proposed in locally adopted plans. The segments along NC-54 from US 15-501 to I-40 and along I-40 from NC-54 to Page Rd are included in the DCHC MPO Comprehensive Transportation Plan (CTP), and the segment along I-40 from I-540 to Trenton Rd is included in the CAMPO Metropolitan Transportation Plan (MTP) 2040. The segment from the NC-54 and US 15-501 interchange in Chapel Hill to Harrison Ave along I-40 in Cary is also a key corridor proposed in the NCDOT Great Trails State Plan.

2017

Preliminary Feasibility Analysis for Recreation-Related Development, Wake County
Triangle Bikeway Preliminary Feasibility Study
Wake County Greenway System Plan
Wake County Park Facility Master Plan Update
Durham Bike + Walk Implementation Plan
Durham County Transit Plan
DCHC MPO Comprehensive Transportation Plan
Raleigh-Durham International Airport Vision 2040
Cary 2040 Community Plan

2020

Chapel Hill Mobility & Connectivity Plan
RTP Trails Study

2011

Durham Trails & Greenways Master Plan

2012

NC54/I-40 Corridor Study
City of Raleigh Blue Ridge Road District Study

2013

Town of Chapel Hill Greenways Master Plan
2040 CAMPO-DCHC Metropolitan Transportation Plan
City of Raleigh Comprehensive Pedestrian Plan

2014

Raleigh Capital Area Greenway Planning & Design Guide

2015

Durham Priority Trails Map
Research Triangle Park Master Plan Update

2016

Triangle J COG Center of Region Enterprise Bicycle & Pedestrian Plan
NC54 & More Feasibility Study
Bike Raleigh Plan Update
Wake Transit Plan

2018

Morrisville Parks & Recreation Master Plan

2019

NC54 Pedestrian & Bicycle Corridor Safety Study
2050 CAMPO-DCHC Metropolitan Transportation Plan
Town of Morrisville Comprehensive Transportation Plan Update
Cary Bike & Hike Map

2021

NCDOT Great Trails State Plan

Existing Plan / Study	Key Recommendations Related to the Triangle Bikeway
NC54 Pedestrian & Bicycle Corridor Safety Study, 2019	This NCDOT feasibility study evaluates bicycle and pedestrian safety along NC-54 from Old Fayetteville Rd in Carrboro to Manning Dr in Chapel Hill. Bicycle and pedestrian intersection improvements are recommended at the following locations: Manning Dr, Kingswood/Laurel Ridge, Smith Level Rd, Abbey Lane, Westbrook Dr, Jones Ferry Rd, W. Poplar Ave, W. Main St, and Old Fayetteville Rd.
NC54/I-40 Corridor Study, 2012	This DCHC MPO feasibility study proposes roadway improvements along the NC-54 corridor from US 15/501 in Chapel Hill to NC-55 in Durham. Recommendations include multimodal accommodations such as a shared use path and intersection improvements along the 9.2-mile corridor.
Town of Chapel Hill Greenways Master Plan, 2013	Chapel Hill's municipal greenway plan emphasizes the importance of regional greenway connectivity, and the NC-54 corridor is a priority connection between Chapel Hill and Durham. The plan recommends a shared use path along the north side of NC54 from E. Barbee Chapel Rd to Farrington Rd, a shared use path along NC-54 from Hamilton Road to Burning Tree Dr, bicycle and pedestrian improvements along Raleigh Rd, and extension of the East NC-54 trail to the UNC campus.
Chapel Hill Mobility & Connectivity Plan, 2020	Bicycle and pedestrian recommendations in Chapel Hill's mobility plan include an NC-54 / Raleigh Rd complete street corridor with a 12-foot multi-use trail or cycle track proposed along the north side of Raleigh Rd from Greenwood Rd to Ridge Rd and the extension of the NC-54 shared use path east beyond I-40 in coordination with the City of Durham and DCHC MPO.
Durham Trails & Greenways Master Plan, 2011	Durham's trails plan proposes a comprehensive greenway network with connections to Chapel Hill, RTP, and Wake County. Key recommendations in South Durham include the Third Fork Creek Trail extension south to connect to NC-54, Third Fork Creek Tributary Trail, NC-54 Shared Use Path connecting Hope Creek Trail and Third Fork Creek Trail from I-40 to Biscayne Rd, New Hope Creek Trail, Northeast Creek/American Tobacco Trail Connector, North Prong Creek Trail, Northeast Creek Trail, Herndon Creek Trail, and Crooked Creek Trail.
Durham Priority Trails Map, 2015	Priority trail recommendations in South Durham include the Third Fork Creek Tributary Trail, Third Fork Creek to NC-54 Connector Trail, Woodcroft Parkway Shared Use Path, and North Prong Creek Trail. Key Connector trails in South Durham include North Prong Creek Connector Trail, Northeast Creek Connector Trail, and Davis Drive Shared Use Path. Proposed Long-Term Vision Trails are the NC-54 Shared Use Path, Piney Woods Trail, Southwest Creek Trail, and Burdens Creek Trail.
Durham Bike + Walk Implementation Plan, 2017	Recommendations in Durham's bicycle and pedestrian plan include a shared use path along NC54 from NC55 to Fayetteville Rd/ American Tobacco Trail and sidewalk and intersection improvements along NC55 from NC 54 to Carpenter Fletcher Rd.
Durham County Transit Plan, 2017	This plan aims to provide enhanced access to transit that also facilitates growth of walkable and bikeable neighborhoods throughout Durham County. Key recommendations in the transit plan include the Durham Orange Light Rail Transit Project (proposed from NC-147 in Durham to NC-86 in Chapel Hill including a section along the NC-54 corridor) and the Wake Durham Commuter Rail Project proposed along the NS rail corridor paralleling NC-147 and NC-54.
DCHC MPO Comprehensive Transportation Plan, 2017	The DCHC MPO CTP emphasizes the importance of I-40 to the region's mobility and proposes a shared use path along I-40 from NC-54 at Farrington Rd to Page Rd. Additional multi-use path recommendations include NC-54 shared use path from 15-501 to I-40 at Fayetteville Rd, NC-751 shared use path from Calibre Park Rd to Massey Chapel Rd, NC-147 shared use path from Ellis Rd to I-40, Morgan Creek Trail, Old Mason Farm Rd/Finley Golf Course Rd shared use path, Northeast Creek/American Tobacco Trail Connector, Northeast Creek Connector Trail, Burdens Creek Trail, RTP Greenway, and North Prong Creek Trail.



Existing Plan / Study	Key Recommendations Related to the Triangle Bikeway
2040 CAMPO-DCHC Metropolitan Transportation Plan, 2013	Proposed off-road facilities of regional significance in the CAMPO-DCHC MPO MTP include a shared use path along I-40 from Aviation Parkway to Trenton Rd and a shared use path along Trenton Rd from Reedy Creek Trail to Wake Med Soccer Park. Proposed off-road facilities of local significance are the NC-54 shared use path from Raleigh Rd to NC-751, NC-751 shared use path from NC-54 to I-40, a shared use path along I-40 from NC-751 to NC-54 at Fayetteville Rd, Edwards Mill Rd shared use path, Trinity Rd shared use path, Burdens Creek Trail, a shared use path along Triangle Expressway, Third Fork Creek Trail, Northeast Creek Trail, North Prong Creek Trail, and Piney Wood Trail.
2050 CAMPO-DCHC Metropolitan Transportation Plan, 2019	While the 2050 MTP defers to local and regional transportation plans for bicycle and pedestrian recommendations, a key multi-modal recommendation is the Triangle Bikeway corridor along I-40 from I-540 to Trenton Rd.
Triangle J COG Center of Region Enterprise Bicycle & Pedestrian Plan, 2016	This plan guides municipalities, counties and organizations located in the Center of the Region Enterprise (CORE) area of the Triangle to create a linked network of bicycle and pedestrian facilities. The priority corridors for trail development and improvements in the CORE area are Davis Dr, Crabtree Creek Greenway, Kit Creek Greenway, NC-54, Carpenter Fletcher Rd, S Alston Ave, TW Alexander Drive, Page Road, Brier Creek, and Sycamore Creek Greenway.
Research Triangle Park Master Plan Update, 2015	The RTP Master Plan Update supports regional transportation alternatives and proposes a network of open spaces and greenways to connect within and to the three districts within the park: Triangle Commons, Hub RTP (formerly known as Park Center), and Kit Creek Center.
RTP Trails Study, 2020	This plan outlines improvements to and expansion of the Research Triangle Park trail network. Proposed trail segment upgrades include expanding the trail segment widths from 8' to 10'-12' along NC-54 from TW Alexander to Davis Dr, along Davis Dr from Cornwallis Rd to the RTP southeastern boundary, along TW Alexander from Cornwallis Rd to Louis Stephens Dr, along Burdens Creek from NC-54 to TW Alexander Dr, and along Cornwallis Rd from the RTP western boundary to Davis Dr. New trails proposed for RTP include the Burdens Creek Greenway, Isenhour St Link, S Alston Ave Link, Hopson Rd, Kit Creek Link, O'Kelly Chapel Rd Link, North RTP Link, and the long-term vision of trails along each side of all roadways in RTP.
Raleigh-Durham International Airport Vision 2040, 2017	This plan outlines RDU's development over the next two decades, and multi-modal transportation is a key component to future growth of the airport. The plan references the importance of proposed transit projects from Wake County and Durham County transit plans, such as expanded regional bus service, Bus Rapid Transit, and Rail Rapid Transit. The plan also includes proposed future land-uses for airport property north and south of I-40. Areas with proposed commercial and recreational land uses along the I-40 corridor could incorporate multi-use paths when developed.
NC54 & More Feasibility Study, 2016	This NCDOT feasibility study proposes roadway improvements along the NC-54 corridor from NC-540/I-540 to NW Maynard Rd in Morrisville and Cary. Bicycle and pedestrian accommodations are incorporated into the typical cross sections of NC-54 and include a 10-foot shared use path along the east side of NC-54 and a 5ft sidewalk along the west side.
Morrisville Parks & Recreation Master Plan, 2018	This plan supports the creation of parks and open space corridors that connect civic, employment, commercial, and residential destinations. Fifty-eight miles of sidepaths and greenways are planned throughout Morrisville.
Town of Morrisville Comprehensive Transportation Plan Update, 2019	Morrisville's Comprehensive Transportation Plan proposes to enhance mobility and accessibility by combining multimodal improvements with roadway enhancements. Key greenway and sidepath recommendations include the Stirrup Iron Creek Greenway and lake path from Carrington Mill Blvd to Aviation Pkwy, Airport Blvd sidepath from Factory Shops Rd to Indian Creek Greenway, McCrimmon Pkwy sidepath from Aviation Pkwy to Davis Dr, and NC-54/Chapel Hill Rd sidepath through town limits.

Existing Plan / Study	Key Recommendations Related to the Triangle Bikeway
Cary 2040 Community Plan, 2017	Cary's comprehensive plan supports continued investments in multimodal infrastructure to meet the community's diverse mobility needs. Key recommendations include N Harrison sidepath from Harris on Oaks Blvd to Umstead State Park, Weston Pkwy sidepath from Harris on Oaks Blvd to Black Creek Greenway, Aviation Pkwy sidepath from Lake Crabtree County Park to Evans Rd, and Trenton Rd sidepath from I-40 to Wake Med Soccer Park.
Cary Bike & Hike Map, 2019-2020	Proposed greenways and sidepaths on the Cary Bike & Hike Map include N Harrison sidepath from Harris on Oaks Blvd to Umstead State Park, Aviation Pkwy sidepath from Lake Crabtree County Park to Evans Rd, and Trenton Rd sidepath from I-40 to Wake Med Soccer Park.
City of Raleigh Blue Ridge Road District Study, 2012	<p>This small area study evaluates connectivity along Raleigh's Blue Ridge Rd corridor. A key component of the district is access to green space, and recommendations concentrate on providing better connections to existing open space resources, such as the NCMA Museum Park and Umstead State Park.</p> <p>Recommended greenways include Edwards Mill shared use path from Reedy Creek Trail to Trinity Rd, Trinity Rd shared use path from Edwards Mill Rd to Blue Ridge Rd, and Blue Ridge Rd and Hillsborough shared use paths from Trinity Rd to NCSU Centennial Biomedical Campus. The study also proposes a pedestrian crossing under or over Wade Avenue to connect the NCMA greenway network to NCSU Centennial Biomedical Campus and overall improvements to the district's bicycle and pedestrian network.</p>
City of Raleigh Comprehensive Pedestrian Plan, 2013	This plan primarily focuses on sidewalk improvements and expansion throughout Raleigh. Priority sidewalk recommendations include Blue Ridge Rd from Lake Boone Trail to Hillsborough St, Edwards Mill Rd from Wade Park Blvd to Stephen Stroud Rd, and Trinity Rd from I-40 to Blue Ridge Rd. The plan also provides design templates for intersection and mid-block crossing improvements to make it safer for pedestrians to cross city streets.
Raleigh Capital Area Greenway Planning & Design Guide, 2014	This planning and design guide provides specifications of design needs based on user groups; design standards for trail features, intersection, and amenities; and design considerations for greenways and sidepaths in various environments: along riparian corridors, adjacent to naturally sensitive areas, and along roadway corridors. Proposed greenways include Trenton Rd Greenway Connector Trail from I-40 to Reedy Creek Trail and Trinity Rd Greenway Connector Trail from Edwards Mill Trail to Blue Ridge Rd.
Bike Raleigh Plan Update, 2016	Recommendations in Raleigh's bicycle plan update include separated bike lanes along Wade Ave from I-40/Reedy Creek Trail to Capital Blvd, Trenton Rd from I-40 to Reedy Creek Trail, Edwards Mill Rd from Trinity to US-70, and Blue Ridge Rd from Western Blvd to Edwards Mill Rd. Bike lanes are also proposed along Trinity Rd from I-40 to Blue Ridge Rd, Reedy Creek Rd from Edwards Mill Rd to Blue Ridge Rd, and Lake Boone Trail from Edwards Mill Rd to I-440.
Preliminary Feasibility Analysis for Recreation-Related Development, Wake County, NC, 2017	This study evaluates the I-40 corridor between I-540 and Lake Crabtree for further recreational development. The study proposes a recreational district concept with proposed trails north of I-40 along Aviation Pkwy from Brier Creek to Airport Blvd/I-40 and through the proposed development pads between I-40 and Aviation Pkwy. Trails south of I-40 are proposed along Stirrup Iron Creek and Lake Crabtree.

*Existing Plan / Study***Triangle Bikeway Preliminary Feasibility Study, 2017***Key Recommendations Related to the Triangle Bikeway*

This study further evaluates the proposed Triangle Bikeway along I-40, connecting Raleigh and Research Triangle Park from the Hub RTP (formerly known as Park Center) to the NCMA. The study outlines the following alignments along the corridor:

1. Existing bike lanes on Cornwallis Rd to connect to Durham's bicycle and pedestrian network.
2. Intersection improvements proposed for Cornwallis Rd and Davis Dr to transition from the Cornwallis Rd bike lanes to the proposed Davis Drive shared use path.
3. Davis Drive shared use path from Cornwallis Dr to NC-54.
4. Existing shared use path along NC-54 between the future Hub RTP site and Davis Dr. A new section of shared use path should be considered on the north side of NC-54.
5. Intersection improvements proposed for NC-54 and Davis Dr.
6. Existing shared use path along NC-54 between Davis Dr and Wilkinson Farm Rd. This path may need to be widened to accommodate increased bicycle travel.
7. The railroad corridor is a constraint for the bikeway routing north and south of I-40; the nearest crossing is south of I-40 at NC-54.
8. Proposed shared use path along NC-54 from Wilkinson Farm Rd to S Miami Blvd.
9. Intersection improvements proposed for NC-54 and S Miami Blvd.
10. Bike lanes programmed for Slater Rd from S Miami Blvd to Emperor Blvd. Intersection improvements proposed for Slater Rd and Page Rd.
11. Intersection improvements proposed for Slater Rd and Emperor Blvd.
12. Proposed shared use path along the north side of Emperor Blvd and Slater Rd could connect the Slater Rd bike lanes to the Slater Rd bridge over I-540.
13. Existing Slater Rd bridge provides the best existing crossing opportunity for the Triangle Bikeway over I-540 in the vicinity of the I-40 corridor.
14. Lack of I-540 crossings near the north side of I-40.
15. Routing alternatives from I-540 to Airport Blvd include a shared use path along I-40, shared use path along Slater Road or shared use path along Stirrup Iron Creek.
16. Trail underpass proposed for NCDOT's I-40/Airport Boulevard Interchange project (I-5700).
17. Shared Use Path along Airport Blvd (Morrisville STIP project) to connect businesses and services adjacent to the Triangle Bikeway corridor.
18. The section north of I-40 between Airport Blvd and Aviation Pkwy are floodplain and wetland areas, requiring boardwalk and/or bridges along Brier Creek.
19. Section south of I-40 between Airport Blvd and Aviation Pkwy:
 - > Brier Creek shared use path along the north side of Gateway Centre.
 - > Brier Creek shared use path along the south side of Gateway Centre.
 - > On-road connections along Aerial Center Pkwy and Gateway Centre Blvd.
 - > Stirrup Iron Creek Trail
 - > Some combination of these corridors proposed above.
20. The Aviation Pkwy bridge project over I-40 (I-5506) is considered too far along in project development to accommodate changes for the Triangle Bikeway.
21. Opportunity to incorporate a trail north of I-40 between Airport Blvd and Old Reedy Creek Rd in future RDU developments.
22. Proposed trail corridor through Lake Crabtree County Park south of I-40 between Airport Blvd and Old Reedy Creek Rd.
23. A trail connection between Lake Crabtree County Park to Old Reedy Creek Rd south of I-40 poses a ROW constraint.
24. The Old Reedy Creek Trailhead is the best opportunity to cross I-40.

Existing Plan / Study	Key Recommendations Related to the Triangle Bikeway
Triangle Bikeway Preliminary Feasibility Study, 2017 (continued)	<ol style="list-style-type: none"> 25. Unpaved trail in Umstead State Park along I-40 between Old Reedy Creek Road and Harrison Ave cannot be upgraded to a paved trail. <ul style="list-style-type: none"> > Alternative routing along the service road between Wake Stone Quarry and I-40 would require coordination with the quarry. > Alternative routing between quarry and I-40 within the southern border of Umstead State Park would require coordination and easement with NC State Parks. 26. Section south of I-40, between Old Reedy Creek Road and Harrison Avenue: <ul style="list-style-type: none"> > On-road along Old Reedy Creek Road, Weston Parkway, and Harrison Oaks Boulevard. > On-road along a segment of Old Reedy Creek Road, transitioning to a shared-use path along the south side of the treatment plant towards NCDOT ROW along I-40. 27. Proposed two-way separated bicycle lanes Harrison Avenue bridge over I-40. 28. A shared use path along SAS property from Harrison Avenue to Trenton Road is not a viable alignment. 29. Proposed trail corridor north of I-40 between Harrison Ave and Trenton Rd from the Umstead State Park Trailhead along the southern perimeter of Umstead State Park. 30. Trenton Rd shared use path from the existing Reedy Creek Trail to I-40, providing a connection into Raleigh's greenway system. 31. Planned improvements to bicycle and pedestrian connectivity in Raleigh and Cary along Trenton Rd and the bridge over I-40. 32. Existing Reedy Creek Trail, connecting to the NCMA Museum Park.
Wake Transit Plan, 2016	Key recommendations of the Wake County Transit Plan include enhanced transit connections to RDU, Durham, and Chapel Hill, a 37-mile commuter rail connecting Garner, Raleigh, NCSU, Cary, Morrisville, RTP, Durham, and Duke, and Bus Rapid Transit extensions from Wake County to RTP.
Wake County Greenway System Plan, 2017	A prominent theme of this plan was the emphasis on greenway connectivity for both recreational and transportation purposes. A key recommendation of the plan includes the Trenton Rd sidepath from I-40 to Wake Med Soccer Park. Following plan adoption, the Wake County Board amended the plan to include the proposed Triangle Bikeway from Hub RTP to the NCMA in Raleigh.
Wake County Park Facility Master Plan Update, 2017	Proposed greenway recommendations for Lake Crabtree County Park include a loop trail around the lake, expansion of trail connectivity into and within the park, and a proposed greenway/boardwalk along Aviation Pkwy.
Great Trails State Plan, 2021	The NCDOT statewide trail plan proposes a comprehensive network of greenways and sidepaths to connect all one-hundred counties via non-motorized transportation. The Triangle Bikeway from the NC-54 and US 15-501 interchange in Chapel Hill to Harrison Ave in Cary is key corridor in the Division 5 trail network, linking Chapel Hill, Durham, Research Triangle Park, Morrisville, and Cary.



FEDERAL POLICY

"The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems...transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes."

- US Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation



STATE POLICY

The NCDOT Complete Streets Policy Update was adopted by the Board of Transportation in August 2019. This policy requires NCDOT to consider and incorporate multimodal facilities in the design and improvement of all transportation projects in North Carolina.

LOCAL POLICY

Each municipality along the Triangle Bikeway corridor outlines bicycle and pedestrian infrastructure requirements in their respective unified development ordinances. The City of Durham, City of Raleigh, Town of Cary, Town of Morrisville, and Town of Chapel Hill prioritize bicycle and pedestrian connectivity along roadways and between existing and proposed developments. Each municipality also established a major highway corridor overlay district that outlines permitted development activities within required buffers along I-40, I-440, and I-540. Bicycle and pedestrian facilities, such as shared use paths are permitted activities in each overlay district.

POLICY REVIEW

This table provides a summary of key federal, state, and local policies from FHWA, NCDOT, and municipalities along the project corridor that may guide or impact the development of the Triangle Bikeway.

Existing Policy	Key Policies to Guide/Impact Development of the Triangle Bikeway
FHWA Guidance on Shared Use Paths Along or Near Freeways and Bicycles on Freeways, 2011	<p>Under the US Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation, “The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems...transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes.”</p> <p>There are no Federal laws or regulations that prohibit shared use paths or bicycle use along or near Interstate highways or other freeways. Bicycle and pedestrian accommodations may be allowed on Interstate and other major highways and freeways. Bridges are essential in any transportation network, and many Interstate or other freeway bridges often are the only possible bridges across rivers, canyons, railroads, other highways, or other major barriers. Major highway bridges often are necessary links for non-motorized transportation networks.</p> <p><i>Under 23 U.S.C. 217(g), transportation plans must consider bicycle and pedestrian accommodations.</i></p> <p><i>23 U.S.C. 217(g) Planning and Design. --</i></p> <ol style="list-style-type: none"> <i>1. In General. --Bicyclists and pedestrians shall be given due consideration in the comprehensive transportation plans developed by each metropolitan planning organization and State in accordance with sections 134 and 135, respectively. Bicycle transportation facilities and pedestrian walkways shall be considered, where appropriate, in conjunction with all new construction and reconstruction of transportation facilities, except where bicycle and pedestrian use are not permitted.</i> <i>2. Safety considerations. --Transportation plans and projects shall provide due consideration for safety and contiguous routes for bicyclists and pedestrians. Safety considerations shall include the installation, where appropriate, and maintenance of audible traffic signals and audible signs at street crossings.</i> <p><i>Under 23 U.S.C. 217(e), bridge deck replacement and rehabilitation must consider bicyclists:</i></p> <p><i>23 U.S.C. 217(e) Bridges. —</i></p> <p><i>In any case where a highway bridge deck being replaced or rehabilitated with Federal financial participation is located on a highway on which bicycles are permitted to operate at each end of such bridge, and the Secretary determines that the safe accommodation of bicycles can be provided at reasonable cost as part of such replacement or rehabilitation, then such bridge shall be so replaced or rehabilitated as to provide such safe accommodations.</i></p>

*Existing Policy**Key Policies to Guide/Impact Development of the Triangle Bikeway***NCDOT
Complete Streets Policy,
2019**

The NCDOT Complete Streets Policy Update was adopted by the Board of Transportation in August 2019. This policy requires NCDOT to consider and incorporate multimodal facilities in the design and improvement of all transportation projects in North Carolina.

The adopted Comprehensive Transportation Plan (CTP) is considered the controlling plan for the identification of non-motorized facilities to be evaluated as part of a roadway project. The CTP may include and/or reference locally adopted plans for public transportation, bicycle and pedestrian facilities, and greenways.

Bicycle, pedestrian, and public transportation facilities that appear in the CTP directly or by reference will be included as part of the proposed roadway project, and NCDOT is responsible for the full cost of the project.

Bicycle, pedestrian, and transit facilities incidental to a roadway project where a need has been identified through the project scoping process but not identified in an adopted plan may be included in the project. Inclusion of these incidental facilities requires the local jurisdiction to share the incremental cost of constructing the improvements based on population thresholds.

The policy also establishes maintenance responsibility for active transportation facilities. Bicycle, pedestrian, and transit improvements inside a municipal boundary are subject to local maintenance. For bicycle, pedestrian, and transit improvements outside of a municipal boundary where a county maintenance agreement is not executed to maintain the facility, NCDOT will maintain the facility after construction if the bicycle or pedestrian facility lies within NCDOT right-of-way.

Projects that have not completed environmental review prior to August 2019 are subject to the Complete Streets Policy.

**NCDOT
Roadway Design Manual,
2021**

The Roadway Design manual provides general design information, design criteria, and plan preparation guidance for NCDOT roadways. Guidance on clear zones can be referenced in Part 1, Chapter 4, Section 6.1. Guidance states that the recommended clear zone range for flat, level terrain adjacent to a straight section of a 60mph highway with an average daily traffic of 6000 vehicles is a width of 30 to 32 feet. For steeper slopes on a 70-mph roadway, the clear zone range increases to 38 to 46 feet. Additional clear zone guidance is provided for roadway facilities based on design speed, design ADT, and roadside slope.

**NCDOT
Proposed Right of Way,
Permanent Utility
Easement and Utility Pole/
Fixed Object
Placement Memo, 2011**

This memo serves as a technical guidance regarding proposed Right of Way, Permanent Utility Easement, and utility pole/fixed object placement along but not limited to Transportation Improvement Program (TIP) projects. For a curb and gutter section posted at 45 mph, the clear zone is defined as 12 feet. For a curb and gutter section posted at 35 mph, the clear zone is defined as 10 feet. For a curb and gutter section posted at 25 mph, the clear zone is defined as 8 feet. Proposed Right of Way of a shoulder section with limited or full control of access should be set at a dimension that includes the project footprint and encompasses the clear zone as defined by the AASHTO Roadside Design Guide. AASHTO guidance states that clear zones are dependent on design speed, design ADT, and roadside slope.

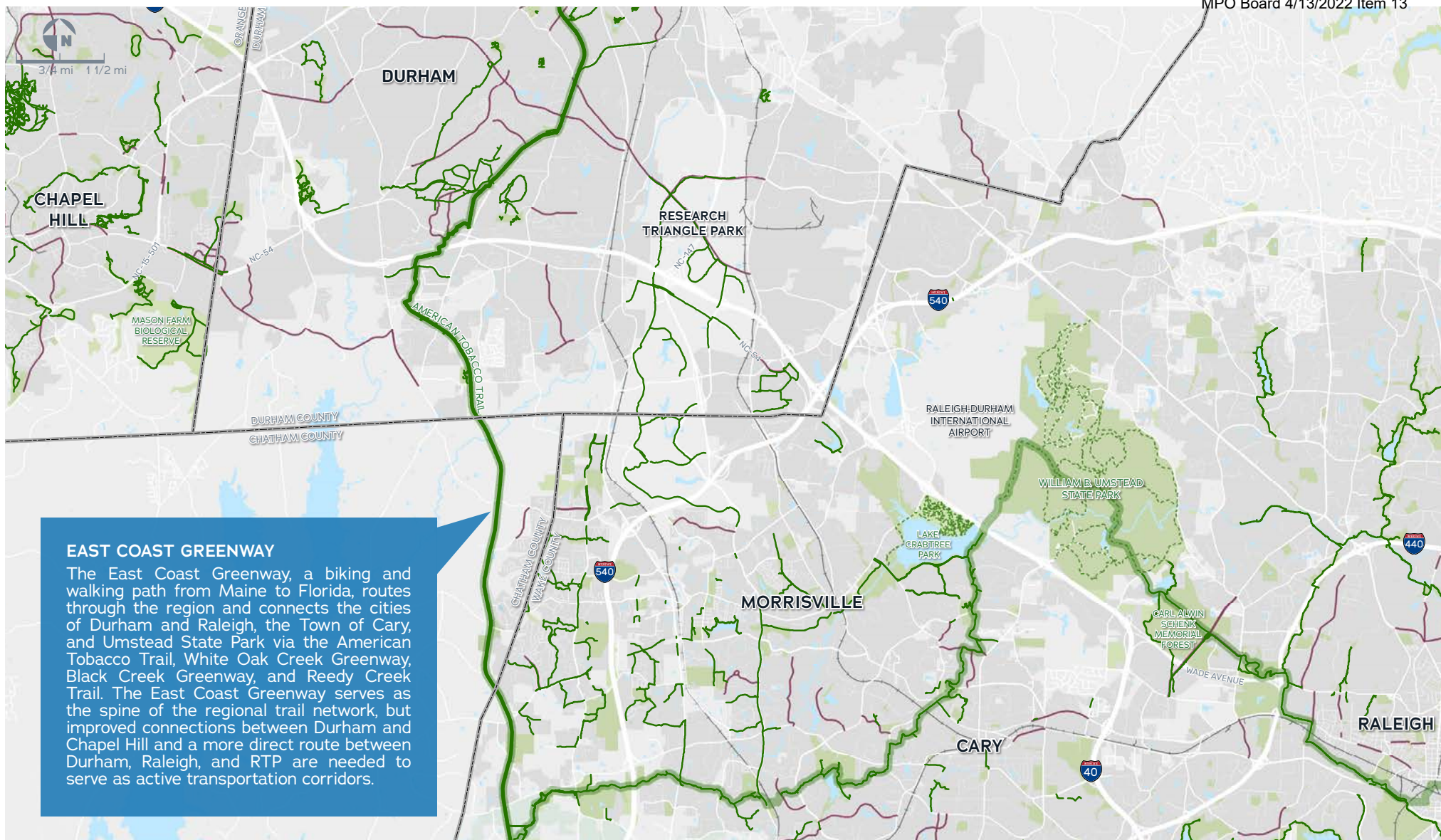
Site specific constraints such as insufficient right of way available, prohibitive slopes, and other factors may make implementation of the full clear zone not feasible. In such cases good engineering judgment should be used. The Proposed Design Criteria sheet created by the roadway design engineer for each TIP project will list the appropriate clear zone. Additional guidance on clear zones can be referenced in the NCDOT Roadway Design Manual, Part 1, Chapter 1-4N.

Existing Policy	Key Policies to Guide/Impact Development of the Triangle Bikeway
NCDOT Facility Type & Control of Access Definitions, 2005	<p>The document defines each facility type and control of access for NCDOT roadways. For full control of access facilities, connections are provided only via ramps at interchanges. All cross-streets are grade separated and no private driveway connections are allowed. A control of access fence is placed along the entire length of the facility.</p> <p>For limited control of access facilities, connections are provided only via ramps at interchanges and at-grade intersections. No private driveways are allowed. A control of access fence is placed along the entire length of the facility, except at intersections.</p> <p>For partial control of access facilities, connections are provided via ramps at interchanges, at-grade intersections, and private driveways. Private driveways are limited to one connection per parcel. Connections may be restricted or prohibited if alternate access is available through other adjacent public facilities. A control of access fence is placed along the entire length of the facility, except at intersections and driveways.</p> <p>For no control of access facilities, connections are provided via ramps at interchanges, at-grade intersections, and private driveways, and there are no physical restrictions. Private driveway connections are defined as one connection per parcel, but additional connections may be considered if they are justified and do not negatively impact traffic operations and public safety.</p>
NCDOT Policy on Street and Driveway Access to North Carolina Highways, 2003	<p>This policy establishes uniform criteria regulating the location, design, and operation of access streets and driveways to North Carolina highways. A Street and Driveway Access Permit is required by NCDOT for street and driveway connections to the state highway system and is issued by the District Engineer.</p> <p>All Permit applications shall be accompanied by complete and detailed site plans. This policy includes guidelines for permit submission and site plans and design criteria for street and driveway access. Some locations require local government approvals.</p>
NCDOT Bridge Policy, 2000	<p>This policy establishes design elements of new and reconstructed bridges on the North Carolina Highway System. Vertical clearances for new structures shall be designed above all sections of pavement including the usable shoulder. Future widening and pavement cross slope will be considered in design clearance. Vertical clearances for facilities are as follows: over interstates, freeways, and arterials: 16'-6" to 17'-0"; over local and collector roads and streets: 15'-0" to 15'-6"; over all railroads: 23'-0" to 23'-6" or less if approved by Railroads; pedestrian overpasses and sign structures vertical clearance: 17'-0" to 17'-6".</p> <p>When a bikeway is required on a bridge, the structure shall be designed in accordance with AASHTO standard design accommodations to give safe access to bicycles. A minimum handrail height of 54" is required where bicyclist will be riding next to the handrail. Sidewalks shall be included on new bridges with curb and gutter approach roadways that are without control of access. A minimum handrail height of 42" is required.</p>
City and County of Durham Unified Development Ordinance (UDO), Section 4.9 Major Transportation Corridor Overlay (MTC), 2006/Updated 2021	<p>The MTC Overlay is established to enhance the economic and aesthetic appeal and development of properties adjacent to major transportation corridors. Except in design districts, the MTC Overlay shall apply to all properties within 1,250 feet of a designated right-of-way and may extend up to 2,500 feet at intersections. A buffer shall be provided along the perimeter of the property line adjacent to the designated right-of-way. A buffer width of 100 feet shall be provided for the I-40 right-of-way between the Orange County line to Research Triangle Park and I-40 right-of-way between Research Triangle Park to the Wake County line. A buffer width of 50 feet shall be provided for the I-540 right-of-way between the Wake County line to the Wake County line.</p> <p>Permitted activity in the buffer area includes trails, but trails may not intrude laterally into the buffer for a distance greater than 50 feet. Trails shall meander to avoid natural features and to prevent clear views through the buffer. No tree over 12 inches in caliper shall be removed for the trail. The maximum trail width shall be 10 feet.</p>



Existing Policy	Key Policies to Guide/Impact Development of the Triangle Bikeway
City and County of Durham Unified Development Ordinance (UDO), Section 12.4 Bicycle and Pedestrian Mobility, 2006/Updated 2021	<p>Sidewalk, walkway, on-road improvements, and trail systems shall be designed to connect with all elements within new development, adjacent areas, and transit stops and can include sidewalks along public or private streets, wide outside travel lanes, bike lanes on roadways, and walkways and trails in alternative locations as appropriate. Design, location, dimensions, dedications, easements, and reservations shall conform to applicable City and County policies and plans for sidewalks, bicycle routes, and trails.</p>
City of Raleigh Unified Development Ordinance (UDO), Section 5.3.1 Special Highway Overlay Districts (SHOD), 2014, Updated 2020	<p>Special Highway Overlay Districts (SHOD-1 and SHOD-2) protect and preserve the natural scenic beauty along designated major access corridors and specified principal arterials. SHODs are located on either side of a Major Access Corridor, Thoroughfare or Arterial, near or adjacent to Metro-Parks, airports, research parks or Wake County Special Highway Overlay Districts, beginning at the outer edge of the right-of-way. I-40 and Wade Avenue between I-440 and I-40 are defined as major access corridors. Each Special Highway Overlay District should be 1,000 to 1,500 feet deep, except a lesser distance should be applied where identifiable conditions exist to screen the visibility of motorists.</p> <p>All SHODs require plantings of shade trees, understory trees, and shrubs. A wall or a solid fence at least 5 feet in height may be erected in lieu of the required shrubs in protective yards that are not tree conservation areas. Any portion of a lot abutting a Major Access Corridor requires a 50-foot landscaped protective yard in SHOD-1 and a 25-foot landscaped protective yard in SHOD-2, and any portion of a lot abutting a Thoroughfare or Commercial Street, other than a Major Access Corridor, that intersects with and gains access from a Major Access Corridor requires a 50-foot landscaped protective yard in SHOD-1 and a 25-foot landscaped protective yard in SHOD-2 for a distance of 200 feet from the intersection of the rights-of-way. Any portion of a lot abutting a Major Access Corridor where the property both adjoins and gains access from a public Marginal Access Street and parallel to a Major Access Corridor requires a 25-foot landscaped protective yard.</p>
City of Raleigh Unified Development Ordinance (UDO), Section 8.3.5 Site Access, 2014, Updated 2020	<p>The UDO promotes development patterns that support safe, effective multi-modal transportation, including bicycle, pedestrian, and transit options. All existing and proposed development must provide vehicular, pedestrian, and bicycle access to and from a street or an adjacent site.</p>
Town of Cary Land Development Ordinance (LDO), Section 7.2.15 Highway Corridor Buffer, 2003	<p>The Highway Corridor Buffer provides orderly development along US 1, I-40, I-440 and NC-540, to encourage the most appropriate use of adjacent lands, to maintain the scenic natural beauty of the area visible from such fully-controlled-access highway and adjacent lands, to provide open space, and to promote the safe and efficient movement of traffic. A buffer strip, with a width extending 100 feet from and parallel to the right-of-way boundary of the fully-controlled-access highway, shall be maintained, and a buffer strip width extending fifty (50) feet from and parallel to the right-of-way for interchange ramps shall be maintained.</p> <p>No grading, development, land-disturbing activities, or removal of vegetation shall occur within buffers or associated tree protection areas with exception of sidewalks, street-side trails, public transit amenities and utilities. Where disturbance within the buffer is allowed, damage to existing vegetation shall be minimized to the extent practicable and supplemental planting shall be provided as necessary to meet the performance standard of the applicable buffer type.</p>

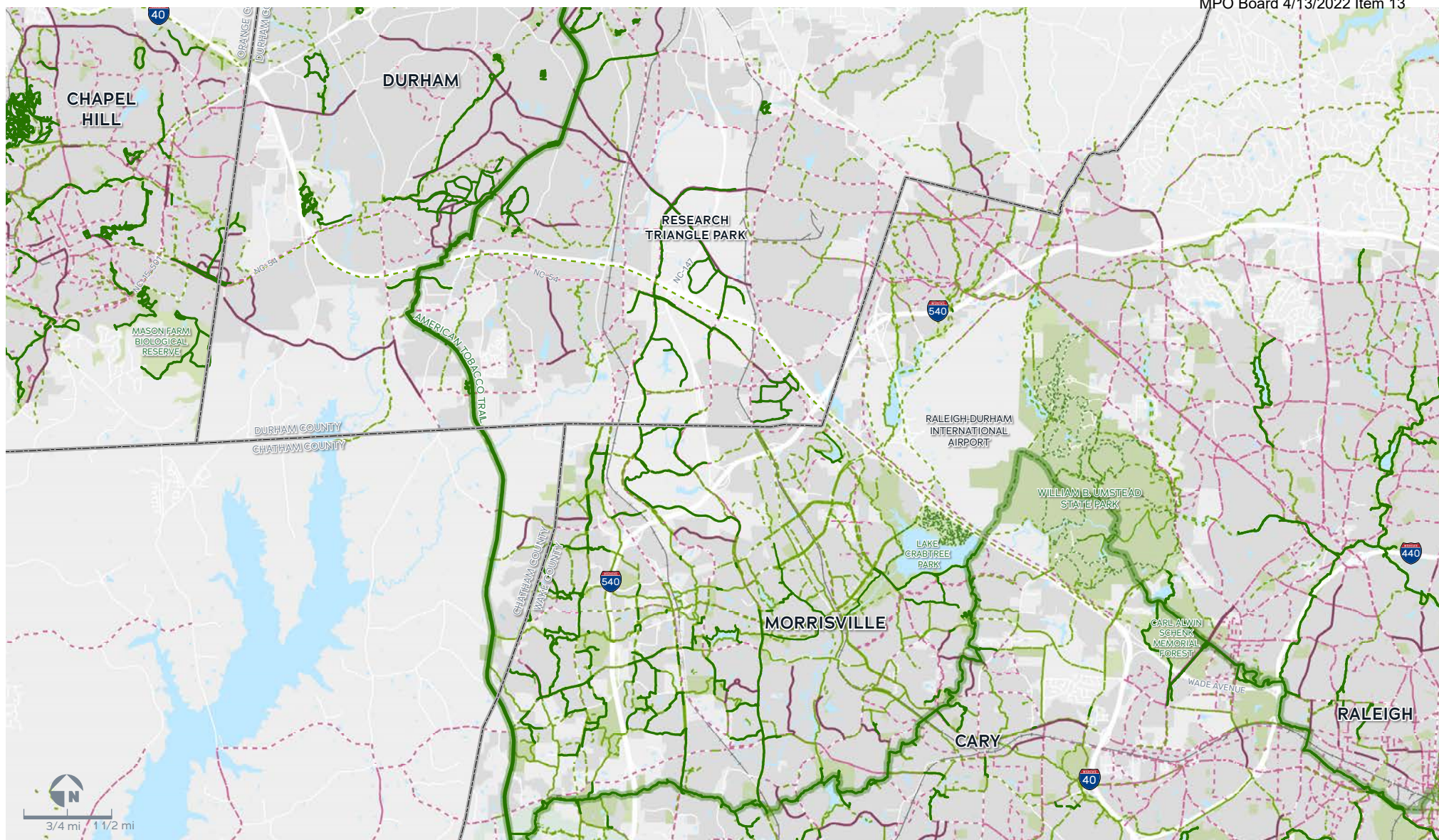
Existing Policy	Key Policies to Guide/Impact Development of the Triangle Bikeway
Town of Cary Land Development Ordinance (LDO), Section 7.10.4 Standards for Pedestrian Facilities, 2003	<p>The Town of Cary's greenway trail system consists of a series of interconnected pedestrian trails located off-road and tied together by on-road street-side trails and sidewalk connectors. All public greenways shall be located based upon the Parks, Recreation and Cultural Resources Facilities Master Plan. Construction of all public greenway trails shall meet Town of Cary standards and specifications as provided by the Parks, Recreation and Cultural Resources Department.</p> <p>Greenway trails located within required perimeter buffers shall meet the requirements of perimeter buffer and landscape areas as specified in the LDO. Greenway easements may be required outside of the perimeter buffer to meet Town standards for both the buffer and greenway. Street-side trails are pedestrian trails located adjacent to roadways and provide supporting linkage to the off-road greenway system.</p> <p>Where the Parks, Recreation and Cultural Resources Facilities Master Plan calls for a street-side trail, a street-side trail shall be constructed in lieu of sidewalk required in the same location. All street-side trails shall be designed and constructed according to Town of Cary standards and specifications as provided by the Transportation and Facilities Department.</p> <p>A Town of Cary Greenway Easement, centered on the trail shall be recorded. Street-side trail locations and the location of the required Town of Cary Greenway Easements relative to current road widths and rights-of-way, shall be determined by the Transportation and Facilities staff.</p>
Town of Morrisville Unified Development Ordinance (UDO), Section 3.8.2 Airport Overlay Districts (AO), 2021	<p>Outdoor lighting in the Airport Overlay-A District or Airport Overlay-B District shall be shielded to minimize direct skyward glare from the light source and otherwise located and designed to avoid producing light emissions that impairs pilot visibility or otherwise interfere with the safe operation of overhead aircraft.</p>
Town of Morrisville Unified Development Ordinance (UDO), Section 5.8 Access and Circulation, 2021	<p>All new developments except individual lot development of a single-family detached, duplex, or manufactured home dwelling on an existing lot (i.e., including subdivisions for such dwellings) shall be served by an internal bicycle circulation system (including shared roadway lanes, widened outside roadway lanes, bike lanes, shoulders, and/or separate bike paths) that permits safe, convenient, efficient, and orderly movement of bicyclists among the origin and destination points within the development.</p> <p>New developments are also required to be served by a system of pedestrian walkways (including sidewalks, pedestrian paths, and/or trails) that permits safe, convenient, efficient, and orderly movement of pedestrians among the origin and destination points within the development. New developments shall incorporate into its required open space any greenway or sidepath called for across the development site by the Comprehensive Plan.</p>
Town of Chapel Hill Land Use Management Ordinance (LUMO), Section 5.8 Access and Circulation, 2016	<p>Bicycle and pedestrian systems in the vicinity of new developments shall be extended to the site to the extent practicable. Access to the site shall be in compliance with and coordinate to existing and future town bicycle and pedestrian systems and the systems of adjacent developments. Bicycle, pedestrian, and transit improvements shall be installed along all public streets within and on the external street frontage of the development, to the extent practicable, in accordance with provisions in the Chapel Hill Design Manual.</p>



EXISTING GREENWAYS + BICYCLE FACILITIES

Triangle municipalities have extensive greenway networks with over 250 miles of greenway in the region. The Town of Chapel Hill has approximately 18 miles of paved or natural surface greenways, and the City of Durham has over 30 miles of greenways. Research Triangle Park has over 20 miles of paved pedestrian trails, and the Town of Morrisville has a growing greenway network with 9 miles. The Town of Cary and the City of Raleigh have robust greenway networks with over 80 miles and 100 miles of greenway, respectively.

While regional bike connectivity is limited, the bicycle networks of Triangle municipalities are growing and provide the framework to build a more connected active transportation system for the region. In Durham, bike lanes along Cornwallis Rd improve connections between Research Triangle Park and Downtown, via the American Tobacco Trail. Similarly, existing bike lanes adjacent to the study area will provide connections to major destinations in Chapel Hill, Durham, and Raleigh and to the employment centers in Research Triangle Park. These bike facilities will expand the reach of and access to the Triangle Bikeway.



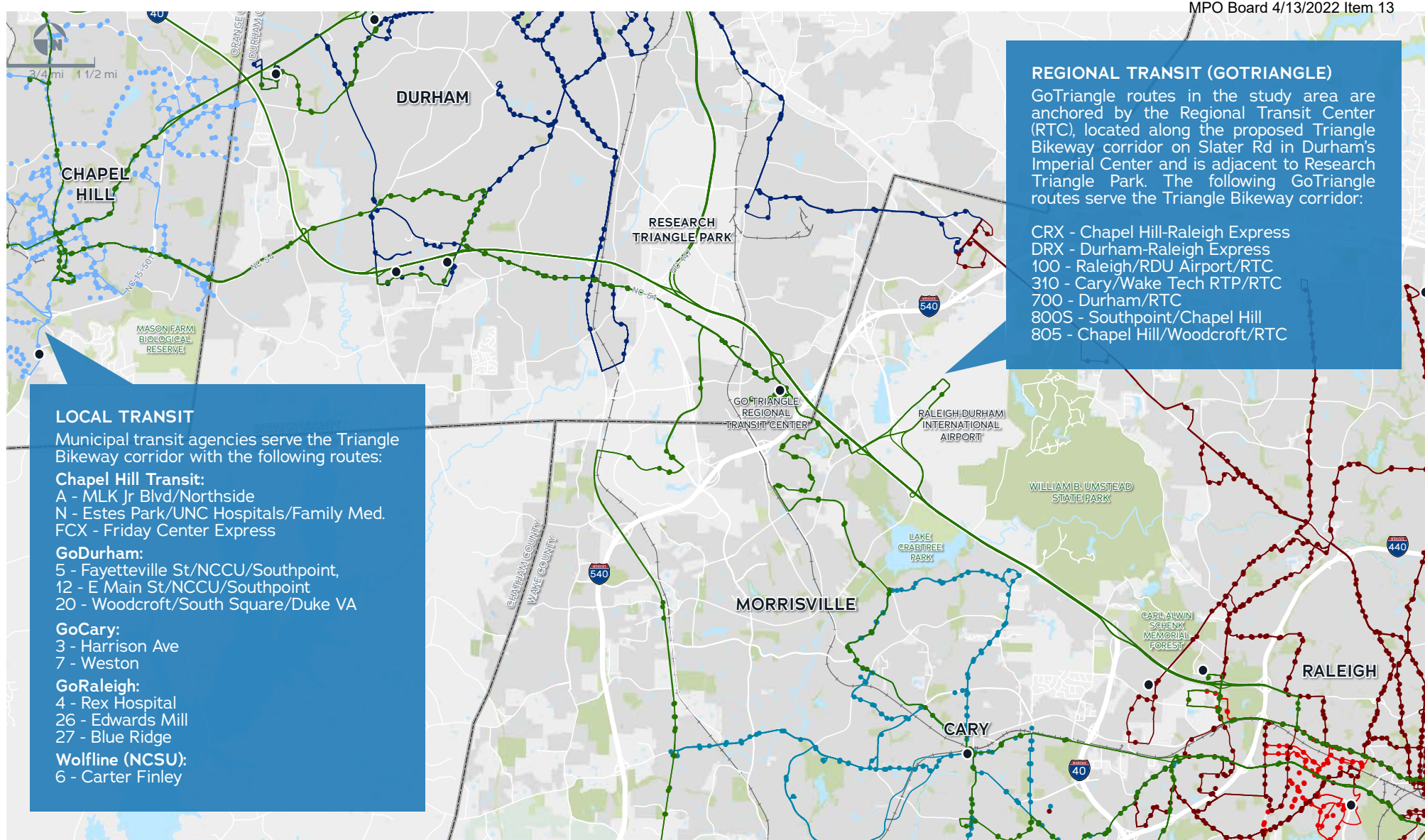
PLANNED GREENWAYS + BICYCLE FACILITIES

The Capital Area Metropolitan Planning Organization (CAMPO), Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO), and their partnering communities have prioritized multi-modal connectivity throughout the Triangle region in planning efforts over the past decade. This map illustrates bicycle and pedestrian recommendations from previous plans and studies that are relevant to the Triangle Bikeway Study.

The Triangle Bikeway is project of regional significance and proposed in locally adopted plans. The segments along NC-54 from US 15-501 to I-40 and along I-40 from NC-54 to Page Rd are included in the DCHC MPO Comprehensive Transportation Plan (CTP), and the segment along I-40 from I-540 to Trenton Rd is included in the CAMPO Metropolitan Transportation Plan (MTP) 2050. The segment from the NC-54 and US 15-501 interchange along NC-54 in Chapel Hill to Harrison Ave along I-40 in Cary is also a key corridor proposed in the NCDOT Great Trails State Plan.

LEGEND

- Planned Greenways
- - - Planned Bike Facilities
- East Coast Greenway
- Existing Greenway
- Existing Bike Lane
- - - Natural Surface Trail
- Park
- Municipality
- County



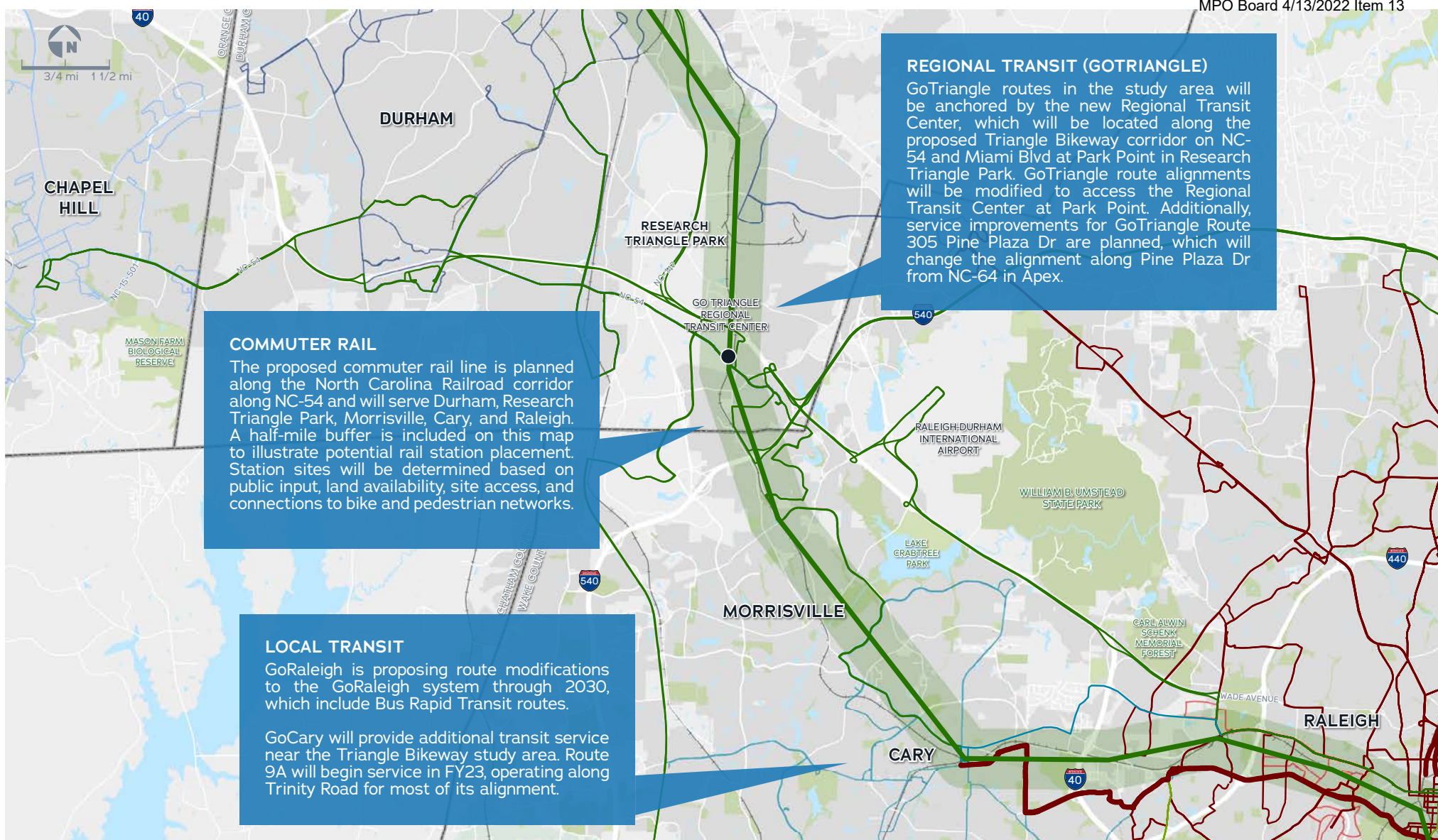
EXISTING TRANSIT

The Triangle Bikeway study area is served by the regional transit authority, GoTriangle; four local transit agencies: Chapel Hill Transit, GoDurham, GoCary, and GoRaleigh; and North Carolina State University's WolfLine transit system.

Transit routes along the Triangle Bikeway corridor are also accessible via twelve park and ride lots in the study area. GoTriangle is served by Eubanks Road, Patterson Place, Regional Transit Center, Renaissance Village, Streets at Southpoint, Cary Train Station, Bent Tree Plaza, Carter Finley Stadium, and District Drive. Chapel Hill Transit is served by Southern Village. GoDurham is served by Parkway Plaza. The Wolfline is served by Carter Finley and Spring Hill. The Triangle Bikeway corridor, coupled with existing transit routes and park and ride facilities, will expand transit accessibility in the region by providing first and last mile connections for those traveling to and from home, work, and essential services.

LEGEND

- GoTriangle
- Chapel Hill Transit
- GoDurham
- GoCary
- GoRaleigh
- WolfLine Transit
- Park + Ride Lot
- Park
- Municipality
- County



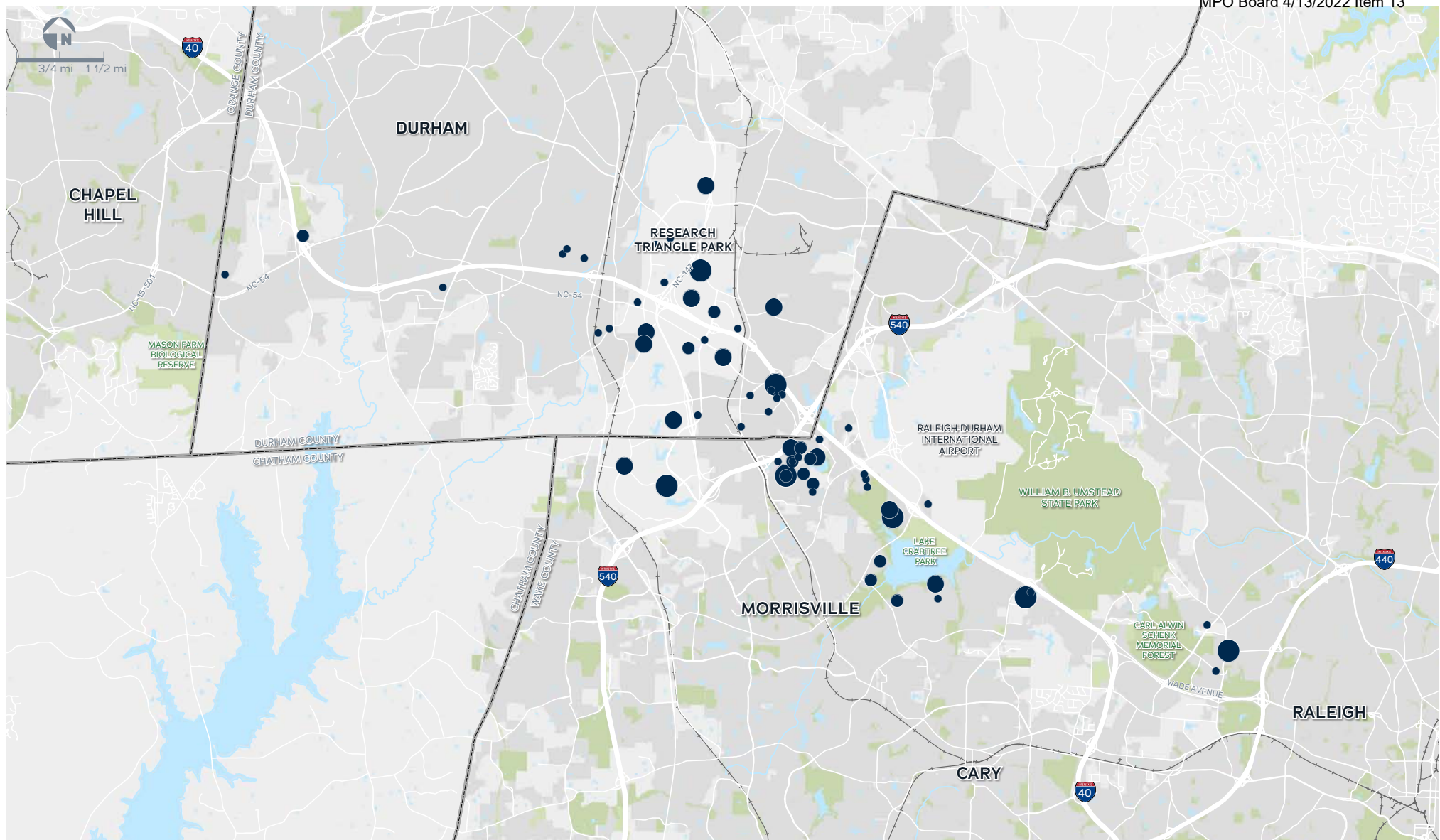
PLANNED TRANSIT

Planned transit improvements that will serve the Triangle Bikeway study area include the relocated regional transit center, regional commuter rail, and route enhancements for GoTriangle, GoRaleigh, GoCary, GoDurham, and Chapel Hill Transit.

The Triangle Bikeway corridor will complement the expanded transit service in the region by providing first and last mile connections for those traveling to and from home, work, and essential services.

LEGEND

- | | |
|--|-------------------------|
| Planned Commuter Rail | Regional Transit Center |
| Commuter Rail 1/2 Mile Buffer - Station Alignments | GoTriangle |
| Planned GoTriangle Route Realignment | Chapel Hill Transit |
| Planned GoTriangle Route 305 | GoDurham |
| Planned GoCary Route 9A | GoCary |
| Planned GoRaleigh 2030 Route Improvements | GoRaleigh |
| Planned GoRaleigh Bus Rapid Transit Routes | WolfLine Transit |

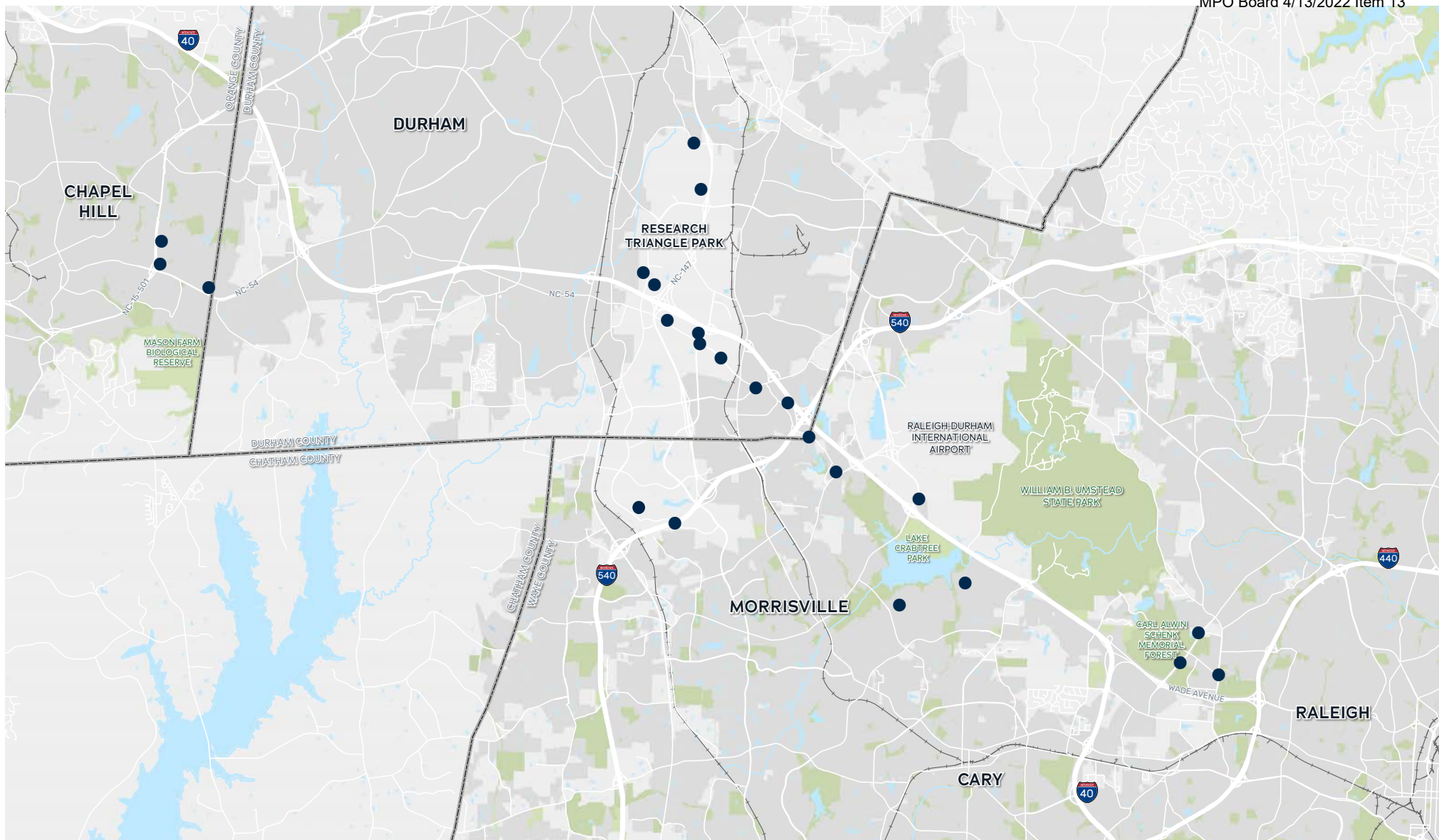


MAJOR EMPLOYERS

Major trip destinations are important to identify when evaluating active transportation opportunities for commuters. The largest employers along the Triangle Bikeway corridor are research institutions, technology companies, hospitality companies, and medical facilities that range in size from 250 - 8,000 employees. There are 68 major employers with that represent 75,000 employees in the study area. Some of the largest employers along the bikeway include Microsoft, Burt's Bees, Relias, Biogen, Teleflex, EPA, Research Triangle Institute, Glaxo Smith Kline, Credit Suisse, Cree, Lenovo, Avenir Technologies, IQVIA, Cisco, SAS Institute, RHO and IBM.

LEGEND

- Major Employer (250-499 Employees)
- Major Employer (500-999 Employees)
- Major Employer (1,000-2,999 Employees)
- Major Employer (3,000-8,000 Employees)
- Park
- Municipality
- County

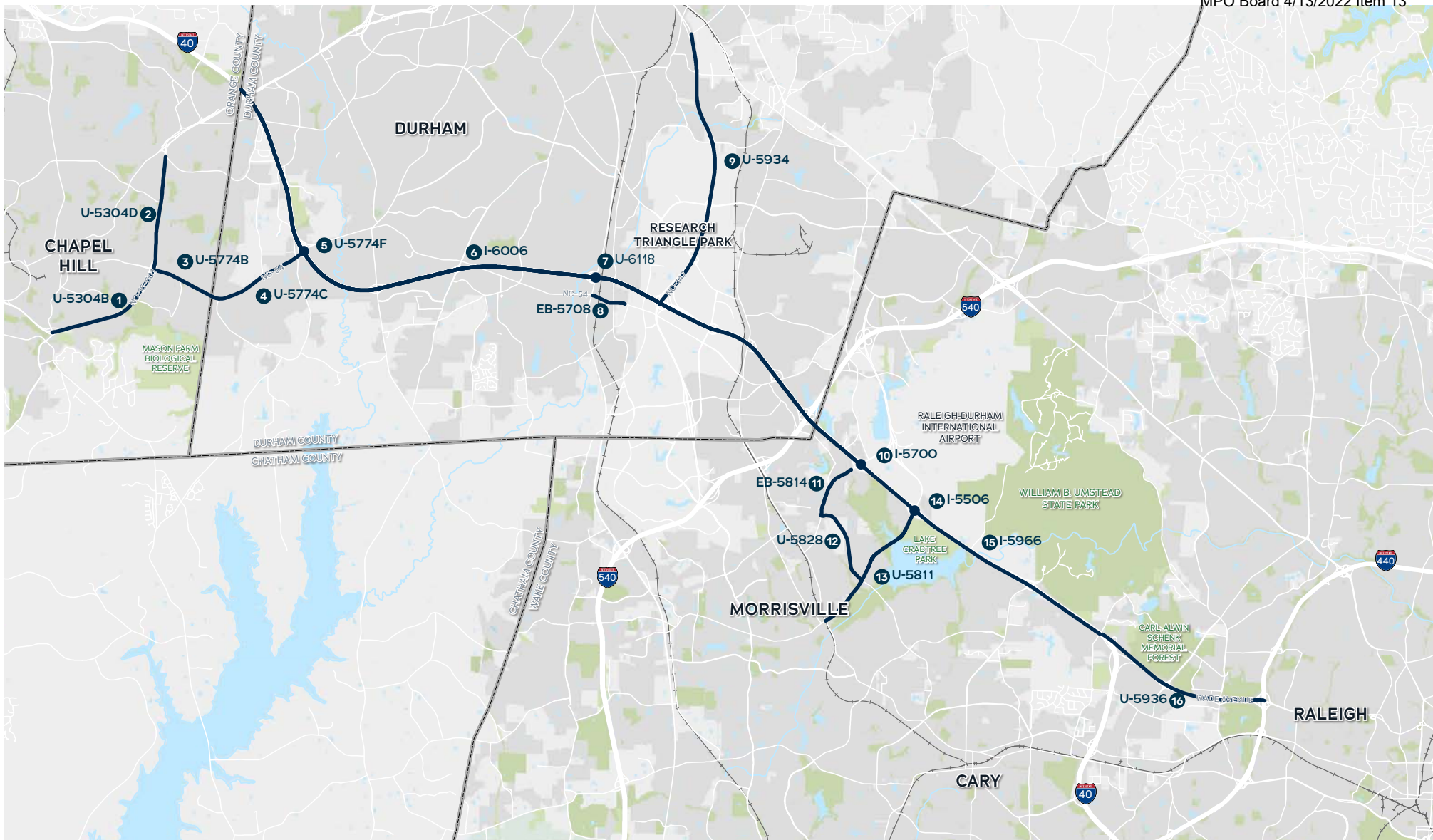


PLANNED COMMERCIAL + MIXED-USE DEVELOPMENTS

The Triangle is one of the fastest growing regions in the nation and has emerged as a research and technology hub anchored by Research Triangle Park (RTP). As the region continues to rapidly develop, there are several planned developments that will expand commercial, office, and mixed-use space along the Triangle Bikeway corridor. Planned developments include expansions within RTP, such as Park Point, Boxyard, and the Hub, Apple, Apjject, and Eli Lilly. Other planned developments along the corridor include the Glen Lennox mixed-use developments in Chapel Hill and the new DHHS Campus in Raleigh. The Triangle Bikeway provides an opportunity to establish a commuter alternative to I-40 that enhances the existing transportation network and creates bicycle and pedestrian connections to these new destinations and employment centers.

LEGEND

- Planned Developments
- Park
- Municipality
- County



NCDOT STIP PROJECTS

Projects identified in the 2020-2029 State Transportation Improvement Program (STIP) inform recommendations of this study. Proposed and committed projects within the study area provide opportunities for coordination between NCDOT and municipalities to incorporate bicycle and pedestrian facilities into roadway improvements. However, STIP projects in the study area may be delayed due to ongoing NCDOT budget shortfalls.

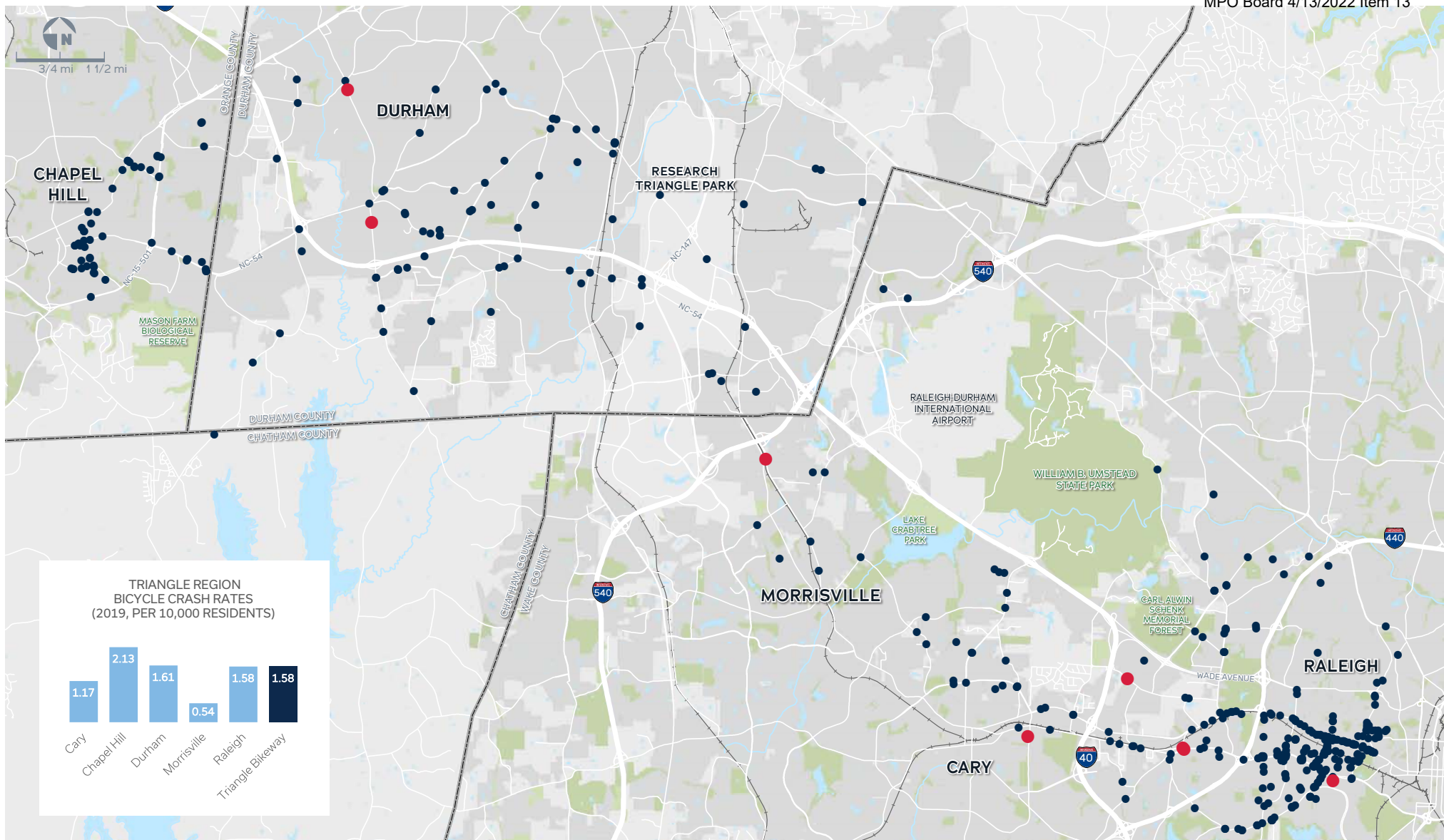
With the adoption of the Complete Streets Policy Update in August 2019, NCDOT is committed to taking a multimodal approach to project development. The policy specifies that bicycle, pedestrian, and transit facilities proposed in an adopted plan will be incorporated into NCDOT roadway projects at no cost to the local jurisdiction. The Complete Streets Policy establishes an avenue to develop segments of the Triangle Bikeway in the projects shown on this map.

LEGEND

- 1 Map ID #
- Interchange Project
- Roadway Project
- Park
- Municipality
- County

Map ID	STIP #	Project Overview
1	U-5304B	NCDOT proposes improvements to US-15/501 from NC-86 to NC-54. Proposed changes include capacity improvements with sidewalks, wide outside lanes, and transit accommodations. The proposed right-of-way year is 2029, and construction is planned after 2029. This project is subject to NCDOT's Complete Streets Policy.
2	U-5304D	NCDOT proposes improvements to US-15/501 from NC-54 to Ephesus Church Rd. Proposed changes include capacity improvements with sidewalks, wide outside lanes, and transit accommodations. The proposed right-of-way year is 2029, and construction is planned after 2029. This project is subject to NCDOT's Complete Streets Policy.
3	U-5774 B	NCDOT proposes improvements to NC-54 from US-15/501 to Barbee Chapel Rd to reduce traffic congestion and provide accommodations for bicyclists, pedestrians, and transit users. Proposed changes include upgrading the roadway corridor and converting the at-grade intersection with Barbee Chapel Rd to an interchange. The proposed right-of-way year is 2027, and construction is planned after 2027. This project is subject to NCDOT's Complete Streets Policy.
4	U-5774C	NCDOT proposes improvements to NC-54 from Barbee Chapel Rd to I-40 to reduce traffic congestion and provide accommodations for bicyclists, pedestrians, and transit users. Proposed changes include upgrading the roadway corridor. The proposed right-of-way year is 2027, and construction is planned after 2027. This project is subject to NCDOT's Complete Streets Policy.
5	U-5774F	NCDOT proposes interchange improvements at NC-54 and I-40 to reduce traffic congestion. The proposed right-of-way year is 2029, and construction is planned after 2029. This project is subject to NCDOT's Complete Streets Policy.
6	I-6006	NCDOT proposes improvements to I-40 from NC-54 to Wade Ave. Proposed changes include converting the roadway facility to a managed freeway with ramp metering and other ATM/ITS components. The proposed right-of-way year is 2028, and construction is planned in 2029. This project is subject to NCDOT's Complete Streets Policy.
7	U-6118	NCDOT proposes improvements to the NC-55 / I-40 / Meridian Pkwy Interchange. Proposed changes include adding a third southbound lane and upgrade ramp terminals. The proposed right-of-way year is 2028, and construction is planned after 2028. This project is subject to NCDOT's Complete Streets Policy.

Map ID	STIP #	Project Overview
8	EB-5708	This non-highway project proposes pedestrian improvements along the south side of NC-54 from NC-55 to Research Triangle Park. The City of Durham will acquire right-of-year in 2021, and sidewalk construction is planned in 2022.
9	U-5934	NCDOT proposes improvements to NC-147 from I-40 to Future I-885. Proposed changes include adding lanes and rehabilitating pavement. The proposed right-of-way year is 2028, and construction is planned for 2028. This project is subject to NCDOT's Complete Streets Policy.
10	I-5700	NCDOT is constructing auxiliary lanes on the I-40 / Airport Blvd Interchange along I-40E from I-540 to Airport Blvd and from Airport Blvd to Aviation Pkwy. This project is currently under construction.
11	EB-5814	This non-highway project proposes pedestrian improvements along Airport Blvd from McCrimmon Pkwy to Factory Shoppes Rd in Morrisville. Construction of 8' wide sidewalks is planned in 2022.
12	U-5828	NCDOT is widening McCrimmon Pkwy to multi-lanes from Airport Blvd to Aviation Pkwy. This project is currently under construction.
13	U-5811	NCDOT proposes improvements to Aviation Pkwy from NC-54 to I-40. Proposed changes include widening lanes to multi-lanes with interchange modifications at I-40. The proposed right-of-way year is 2029, and construction is planned after 2029. This project is subject to NCDOT's Complete Streets Policy.
14	I-5506	NCDOT is constructing auxiliary lanes on the I-40 / Aviation Pkwy Interchange along I-40W from Aviation Pkwy to Airport Blvd. This project is currently under construction.
15	I-5966	NCDOT proposes improvements to I-40 from Aviation Pkwy to Harrison Ave. Proposed changes include construction of auxiliary lanes in both directions. The proposed right-of-way year is 2028, and construction is planned after 2028. This project is subject to NCDOT's Complete Streets Policy.
16	U-5936	NCDOT proposes improvements to Wade Ave from I-40 to I-440. Proposed changes include adding travel lanes. The proposed right-of-way year is 2028, and construction is planned after 2028. This project is subject to NCDOT's Complete Streets Policy.



BICYCLE CRASH ANALYSIS

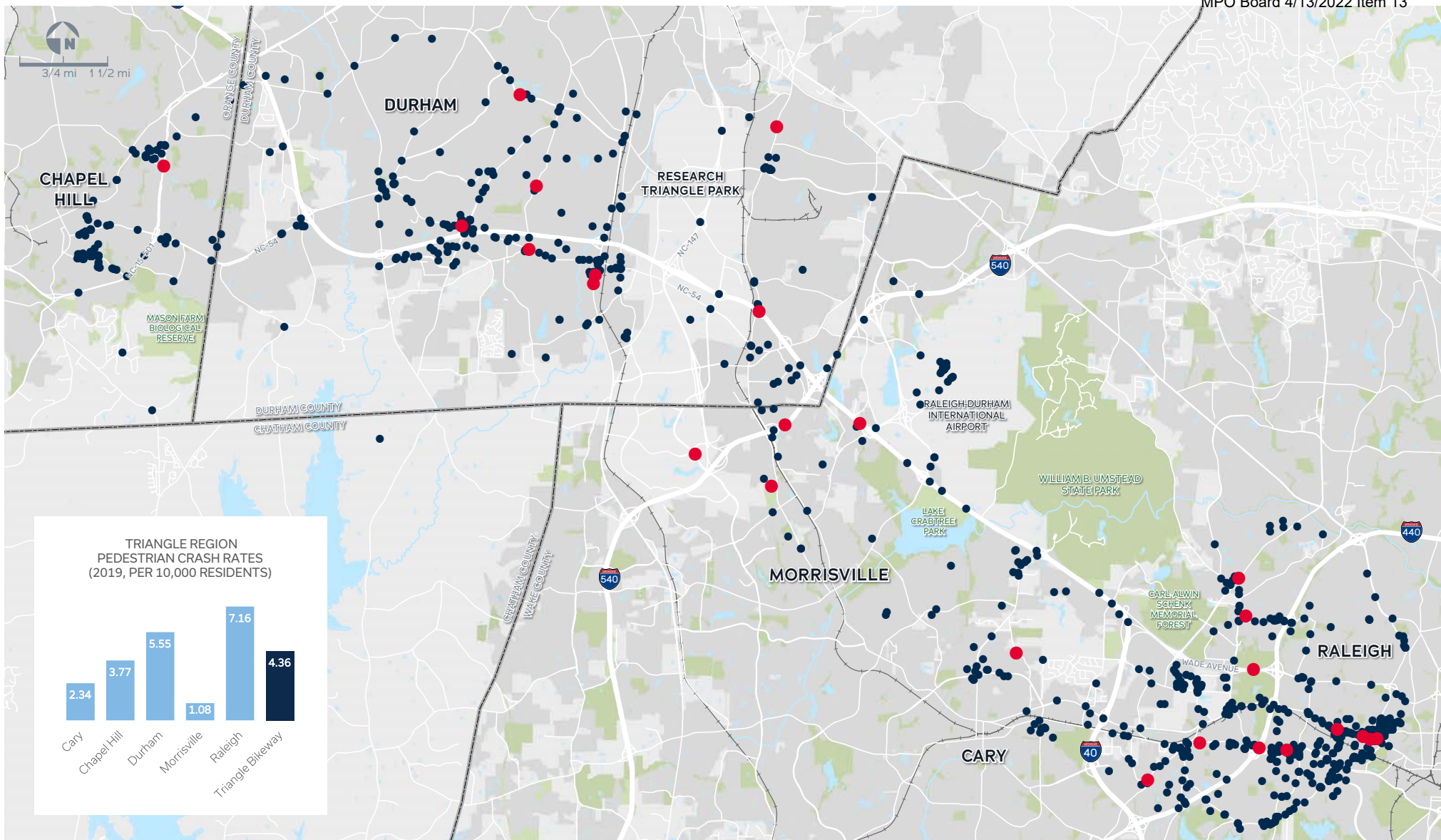
This map shows bicycle-motor vehicle crashes along the Triangle Bikeway corridor within a 3-mile radius from the potential trail alignment. From 2007 to 2019, there were 474 crashes, 12 of which were serious injuries and 8 were fatal.

Most crashes occurred on the campuses of and in neighborhoods adjacent to the University of North Carolina and North Carolina State University in Chapel Hill and Raleigh, respectively. High-crash corridors include: NC-54, Raleigh Rd, Manning Dr, Hillsborough St, Western Blvd, Gorman St, and Avent Ferry Rd.

Compared to crash rates of municipalities along the project corridor, the Triangle Bikeway study area has the third highest bicycle crash rate per 10,000 residents in 2019, tied with Raleigh.

LEGEND

- Bicycle Crash
- Bicycle Fatality
- Park
- Municipality
- County



PEDESTRIAN CRASH ANALYSIS

This map shows pedestrian-motor vehicle crashes along the Triangle Bikeway corridor within a 3-mile radius from the potential trail alignment. From 2007 to 2019, there were 945 crashes, 65 of which were serious injuries and 25 were fatal.

Most crashes occurred along major arterials in the study area. High-crash corridors include: NC-54, Raleigh Rd, Manning Dr, Fayetteville Rd, NC-55, I-40, Harrison Ave, Blue Ridge Rd, Lake Boone Trail, Hillsborough St, Western Blvd, and Avent Ferry Rd.

Compared to crash rates of municipalities along the project corridor, the Triangle Bikeway study area has the third highest pedestrian crash rate per 10,000 residents in 2019.

LEGEND

- Pedestrian Crash
- Pedestrian Fatality
- Park
- Municipality
- County

***"I love the idea of this corridor!
As a resident of Durham who
commutes to Chapel Hill, I embrace
the opportunity to connect the
Triangle with bike trails. "***

**- Community Survey
Respondent**





03

COMMUNITY +
STAKEHOLDER
ENGAGEMENT



OVERVIEW + ENGAGEMENT STRATEGY

The launch of the Triangle Bikeway Study coincided with the outbreak of the COVID-19 pandemic in March 2020. Many of the traditional outreach approaches outlined for the study could not be implemented with new social-distancing policies and safety concerns. Despite the limitations brought on by the pandemic, the project team performed a robust public engagement process for the study. Input from the community, Triangle Bikeway Working Group (TBWG), municipal and county partners, stakeholder groups, and MPO staff informed and guided the study's development through two primary phases of engagement. The first phase guided the development of preferred bikeway corridor alignments, and the second phase informed the proposed bikeway design.

The Triangle Bikeway Study's engagement strategy focused on effective multi-jurisdictional coordination, broad stakeholder involvement, meaningful engagement with under-represented groups, and adaptive outreach during the COVID-19 pandemic. One key engagement technique included a unique role for the Working Group to not only guide project development, but also build consensus among jurisdictional partners and stakeholders, and hosting virtual and socially distant engagement opportunities. The community engagement plan consisted of virtual public meetings, focus group meetings, working group meetings, surveys, online engagement, and several collaborative meetings with interjurisdictional stakeholders, as well as meetings with neighboring agencies and employers.



Effective Multi- Jurisdictional Coordination

Include decision makers early.



Broad Stakeholder Involvement

Ensure all necessary parties are involved.



Meaningful Engagement with Under- Engaged Groups

Engage groups historically marginalized from planning.



Adaptive Engagement During Covid-19

Combine virtual and socially distanced in-person engagement.

40+ Bi-weekly Project Meetings

9 Working Group Meetings

7 Regional Planning Meetings

3 Focus Group Meetings

10 Elected Officials Meetings

20+ Key Stakeholder Meetings

4 Virtual Public Meetings

8 Pop-Up Events

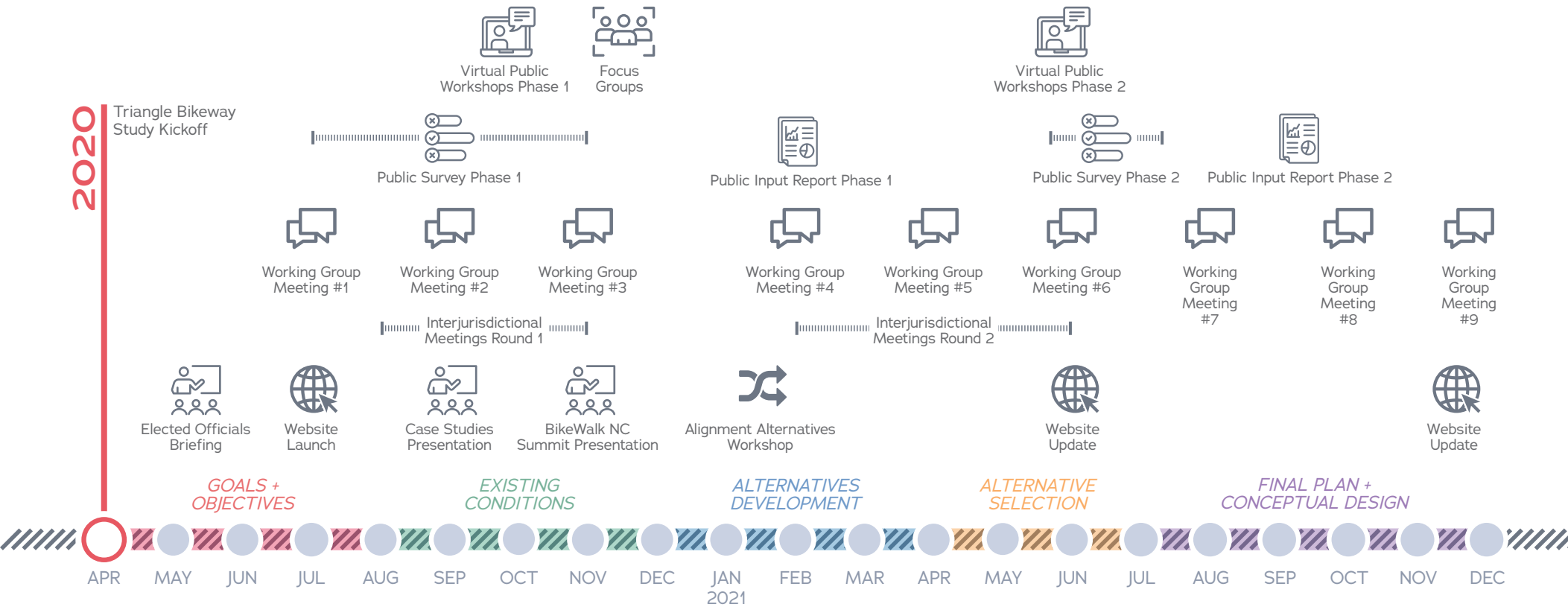
11 Jurisdictional Meetings

4,025 User Surveys Completed



COMMUNITY ENGAGEMENT TIMELINE

The following timeline details community and stakeholder engagement activities throughout the 21-month study process.





TRIANGLE BIKEWAY WORKING GROUP

The Triangle Bikeway Working Group (TBWG) was composed of regional representatives from municipalities, major employers, universities, key resident and business stakeholders, transit authorities, state and federal agencies, active transportation advocates, and civic organizations. Working group members met bi-monthly throughout the planning process and provided guidance for the study by reviewing and providing feedback on relevant data including community input, engagement efforts, bikeway route alignments, and corridor design. The working group also supported the project team by disseminating information and communication materials to the public.





JURISDICTIONAL PARTNERS

As a collaborative effort, the Triangle Bikeway Study included extensive coordination with the jurisdictions along the project corridor. Municipal staff and elected officials from the Town of Chapel Hill, City of Durham, Research Triangle Park (RTP), Town of Morrisville, Town of Cary, and City of Raleigh provided support and feedback on community engagement efforts, routing alternatives, and corridor design. Meetings with interjurisdictional partners were held throughout the planning process and included staff from Planning, Parks and Recreation, Public Works, and Transportation departments to ensure that feedback was considered from various perspectives. Early in the study, in the summer of 2020, roundtables were held with each jurisdiction for input on project goals, policies, and design considerations. Additional meetings with interjurisdictional partners discussed specific routing alignments, maintenance considerations, and implementation recommendations. Key take-aways from the interjurisdictional meetings are highlighted below.

JURISDICTIONAL VOICES:

TOWN OF CHAPEL HILL

- › Consider multi-modal opportunities for development projects near the terminus of study area.
- › Potential bikeway connection with the proposed extension of Morgan Creek Greenway towards the NC Botanical Garden.
- › Bicycle and pedestrian alignments previously considered for the Durham-Orange light rail project that may be viable routing options for the bikeway.
- › Consider connections to major employers and park-n-ride lots.
- › Consider accommodations for e-bikes in the corridor design.
- › A shared use path along Raleigh Rd from 15-501 to UNC-Chapel Hill is a priority and critical connection between the bikeway and Downtown Chapel Hill.

CITY OF DURHAM

- › Preference for routing the bikeway along NC-54, which is prioritized for bicycle and pedestrian facility enhancements.
- › Shared use paths along both sides of NC-54 would minimize unsafe intersections and crossings.
- › Providing access to the bikeway on both sides of I-40 and NC-54 interchange is critical.
- › Consider multi-modal connections between the Triangle Bikeway, GoDurham transit routes, and the proposed GoTriangle commuter rail line.
- › Consider connections between the Triangle Bikeway corridor and the City's greenway network.
- › City priorities focus on building out the local greenway network.
- › Consider maintenance needs in the proposed bikeway design.

TOWN OF MORRISVILLE

- › Consider connections between the Triangle Bikeway corridor and the Town's greenway network.
- › Inclusion of wayfinding along the bikeway to local bicycle and pedestrian networks is critical.
- › Supports alignment of the bikeway in NCDOT right-of-way along I-40.
- › Consider connections to major employers along the bikeway corridor.
- › Consider multi-modal opportunities for development projects near the terminus of study area.
- › Coordinate on proposed maintenance recommendations for the bikeway.

**TOWN OF CARY**

- › Consider connections between the Triangle Bikeway corridor and the Town's greenway network.
- › Consider multi-modal connections between the Triangle Bikeway and GoCary routes along Weston Parkway.
- › Consider routing opportunities within new developments. Parcels along Aviation Pkwy and Airport Blvd are slated for redevelopment.
- › Old Reedy Creek Rd bridge replacement may provide an opportunity for crossing I-40.
- › Consider public safety concerns of routing the bikeway near the Water Treatment Plant along I-40.

CITY OF RALEIGH

- › Importance of highlighting the bikeway as a commuter route.
- › Preference for routing the bikeway along I-40 and Wade Ave.
- › Consider connections between the Triangle Bikeway corridor and the City's greenway network.
- › Consider width of bikeway corridor to accommodate high multimodal traffic volumes and various non-motorized travel modes.
- › Consider multi-modal connections between the Triangle Bikeway, GoRaleigh transit routes, and the proposed GoTriangle commuter rail line.
- › Emphasis on outreach with diverse populations along the corridor to ensure equitable community engagement.

CAMPO & DCHC MPO BOARDS

- › Emphasis on outreach with diverse populations along the corridor to ensure equitable community engagement.
- › Support for multimodal improvements along NC 54 and I-40.
- › Interest in improving connections to local greenway networks to expand multimodal accessibility in the study area.
- › Emphasis on active transportation options that connect people to employment opportunities and essential services.

“I'd like to see the trail stay along I-40 and Wade Ave and connect to the Rocky Branch Trail where it meets House Creek and Reedy Creek Trails...It would provide better service for active transportation users by creating a direct connection to destinations inside Raleigh's beltline.”

- Comment from jurisdictional partner



KEY STAKEHOLDERS

The project team held targeted discussions and briefings with project stakeholders early in the planning process to identify concerns and opportunities to help shape the study. These groups included representatives from NCDOT, NC State Parks, GoTriangle, RDU Airport Authority, Research Triangle Park Foundation, North Carolina Museum of Art, US Army Corps of Engineers, SAS, and other major employers. Key take-aways from project stakeholders are highlighted below.

STAKEHOLDER VOICES:

- › Project should be equitable and provide connections to underserved communities and jobs.
- › Connections to communities and destinations is critical.
- › Opportunities to coordinate bikeway alignment with major development projects such as the Regional Transit Center, Hub RTP, and Park Point.
- › Consider alignments from the previous light rail project as potential routes for the bikeway corridor.
- › Supportive of proposed bikeway corridor within the I-40 right-of-way.
- › Consider environmental constraints and future highway improvement plans along the I-40 corridor.
- › Opportunities to establish the Triangle Bikeway as a regional greenway spine and improve connectivity between local greenway networks.
- › Consider multi-modal connections between the Triangle Bikeway, transit routes, and proposed commuter rail and bus rapid transit.
- › Design the bikeway primarily as an active transportation commuter corridor and provide connections to major employment centers.
- › Consider potential environmental impacts of the bikeway corridor to Umstead State Park and the New Hope River Waterfowl Impoundment Area.
- › Consider public safety and security concerns of routing the bikeway near the SAS property.
- › Coordinate proposed lighting elements with the RDU Airport Authority to avoid impacts to flight traffic.
- › Concerns for bicycle and pedestrian safety at intersections.

“Most importantly, the Triangle Bikeway should connect to as many jobs as possible.”

- Comment from project stakeholder



COMMUNITY ENGAGEMENT

As part of the data collection process and study development, the project team solicited input from residents, workers, and visitors in the Triangle Bikeway study area. Community feedback was collected over the course of the project in two primary phases. The first phase guided the development of preferred bikeway corridor alignments, and the second phase informed the proposed bikeway design. Outreach for each phase included a community survey and virtual public workshops. Additionally, focus group meetings were held in phase one to ensure under-engaged groups were represented in community input. In phase two, the project team also hosted in-person pop-up events to supplement survey feedback on proposed routing alignments and design elements. Study communications included an email distribution list with email updates sent throughout the process, social media, digital advertising, and print advertising.



2,116
PEOPLE
RESPONDED
- to the -
**PHASE I
SURVEY**



5,508
POINTS
- added to the -
**DESTINATION
SURVEY MAPS**



2,009
PEOPLE
RESPONDED
- to the -
**PHASE II
SURVEY**



15
MEETINGS,
WORKSHOPS
- and -
EVENTS



133
COMMENTS
- on the -
**CROWDSOURCE
WEB MAP**

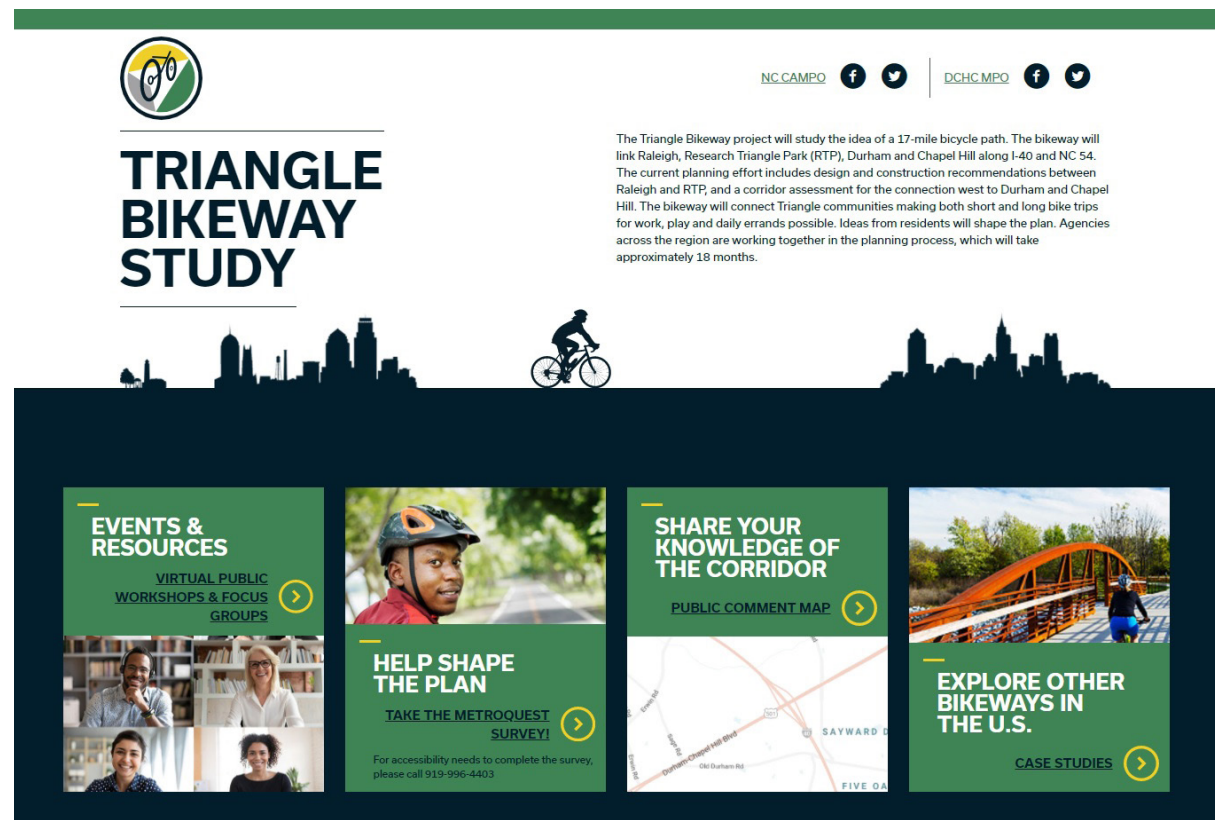


ENGAGEMENT PHASE I

The first phase of community engagement allowed the public to gain an understanding of the project, contribute ideas, and express concerns for the Triangle Bikeway corridor. Community input and feedback collected in this phase of engagement guided the development of the preferred bikeway corridor alignments. Outreach efforts included an interactive project website, public survey, focus groups, and virtual public workshops.

PROJECT WEBSITE

The project website served as a resource for community members to learn about and engage with the Triangle Bikeway Study. Online resources and interactive materials were updated through engagement phase I and include a project overview, community engagement plan and schedule, overview of case studies, community surveys, and an interactive, crowdsource web map. Triangle residents, employees, and visitors were encouraged to map destinations to which they frequently travel in the region.



“Excited to see this project happening. I will be able to safely switch to 100% bike commuting when the bikeway is complete.”

- Comment on project website



PUBLIC SURVEY

As part of the community engagement efforts, the first survey was distributed to community members to share their bicycling preferences for the proposed Triangle Bikeway corridor. The survey was hosted on the MetroQuest platform, along with an additional map-based survey hosted on the project website. The goal of this survey was to understand what makes people feel safe and encourages them to bike, as well as where and for what reasons they would bike along the corridor. The survey was open from July - November 2020 with a total of 2,116 respondents. Survey questions focused on the following:

- › Bicycling Facility Preference (i.e., on-road vs. off-road facilities).
- › Triangle Bikeway Corridor Preference (i.e., proximity to or away from I-40).
- › User Preferences (i.e., estimated frequency of use; type of use; and comfort level).
- › Desired Destinations (i.e., recreational, retail, civic, and school destinations).
- › Commuting Patterns (i.e., home and work zip codes; and mode of transportation).
- › Demographics (i.e., age; gender; race/ethnicity; income; access to vehicles; and disability).

SURVEY HIGHLIGHTS:

- › Preference for separated facilities, such as greenways and protected bike lanes.
- › Slight preference for bikeway corridor near I-40, rather than directly parallel to I-40.
- › 67% of respondents would use the bikeway at least once a week.
- › 73% of respondents currently commute by driving alone, but 90% of respondents prefer to have a multimodal commute.
- › Significant number of destinations along the corridor.



**MAJORITY
OF RESPONDENTS**

- PREFER -

**PROTECTED &
SEPARATED BIKE
FACILITIES**



**2 in 3
RESPONDENTS**

- WOULD -

**USE THE
BIKEWAY AT
LEAST ONCE A
WEEK**



**90%
OF RESPONDENTS**

- WOULD PREFER A -

**MULTIMODAL
COMMUTE**



VIRTUAL PUBLIC WORKSHOPS

As part of the overall community engagement efforts, virtual public workshops were held during two different phases of the planning project. During the first phase, two public workshops were held on October 29, 2020. The workshops were well attended and the audience was engaged. Key takeaways for those workshops included:

COMMUNITY VOICES:

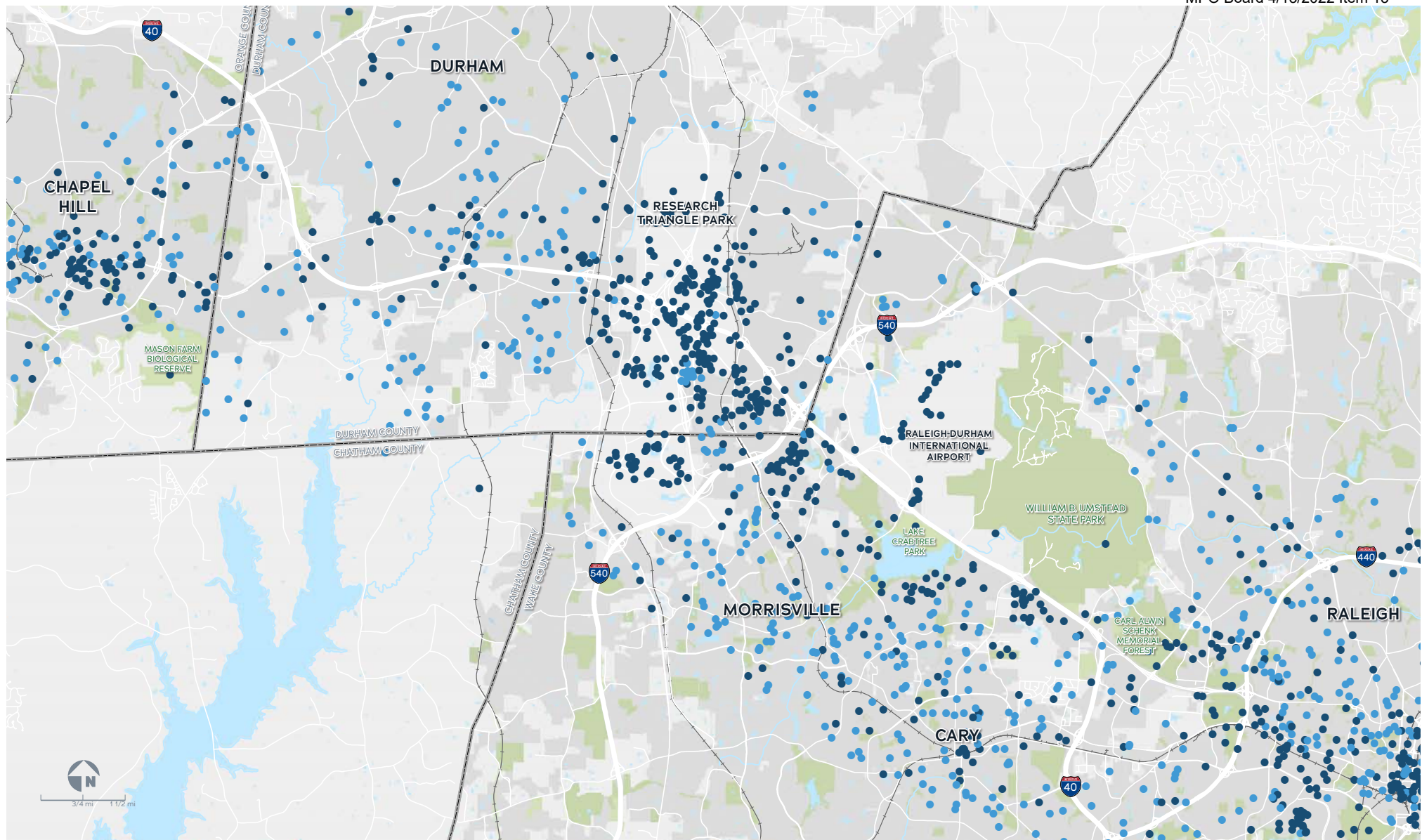
- › Trail access from neighborhoods (particularly underserved) is very important.
- › Desire for a very direct route, don't mind being near the highway if able to ride directly to their destination. Amenable to a hybrid of alternatives (directly along I-40 and on parallel roads) as necessary.
- › Connections to existing trails and systems (e.g., RTP trails) is critical to success.
- › Desire to find the alternative that would require the shortest construction timeline.
- › Some challenging intersections along I-40 (e.g., NC 54, Airport Blvd, Aviation Pkwy, etc.) pose safety concerns.

FOCUS GROUPS

To ensure engagement with traditionally under-engaged populations, focus group meetings were held to solicit additional feedback from minority populations, transit-dependent residents, and those residing in moderate-to-low-income households in the study area. The project team coordinated with community groups, elected officials, and civic organizations to create several focus groups representing Black, Asian, and Hispanic populations; transit riders; and residents with household incomes below \$75,000. Three small-group discussions were facilitated between November 11-20, 2020, and all participants were compensated for their time. Each focus group meeting began with a project overview, review of case studies, and an overview of interim survey results, followed by a Q&A session for participants to ask questions and voice their interests and concerns about the project. Key takeaways from those sessions are highlighted below.

FOCUS GROUP VOICES:

- › Participants expressed enthusiasm for the project, especially for its potential to improve regional greenway connectivity.
- › Emphasis on connections to existing trails and local bicycle and pedestrian networks.
- › Requests for trail amenities such as lighting, benches, and restrooms at regular intervals, especially for senior citizens using the corridor.
- › Concerns about safety, regarding existing and potential crime along the corridor, trail user conflicts, and potential conflicts with motorists.
- › Desire for integration with transit routes and stops - convenient transitions from bicycle and pedestrian facilities to transit facilities are needed along the corridor.
- › Interest in potential health benefits of the corridor by providing residents with opportunities to walk and bike to destinations and lead active lifestyles.
- › Concern for the cost of the project and impact of those costs on residents.
- › Ensure that all community members have equitable access to the corridor.
- › Ensure that the facility is designed for users of all ages and abilities and not just for experienced cyclists.
- › Focus additional outreach efforts with under-represented group at food banks and transit shelters.

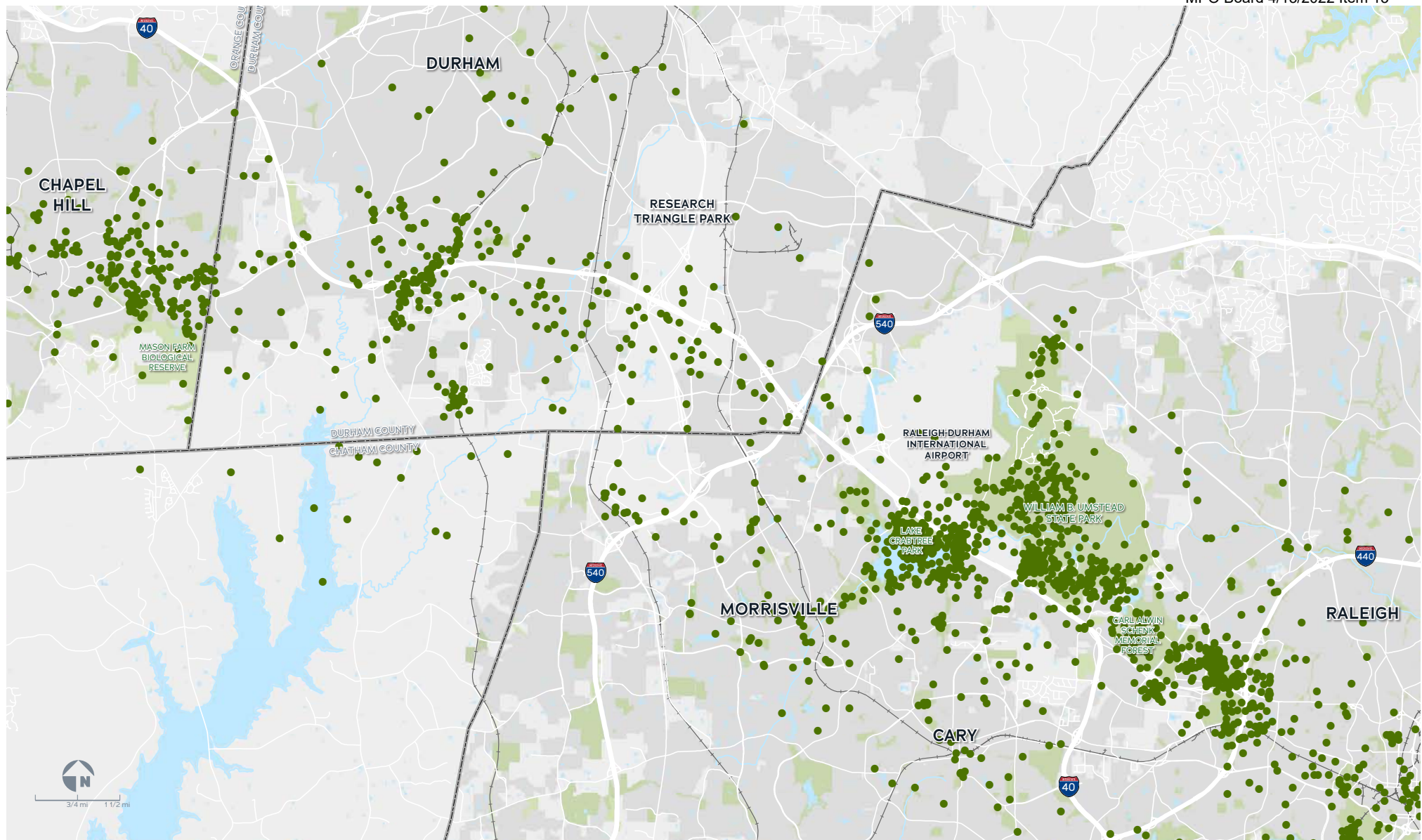


LIVE/WORK DESTINATIONS

In the first community survey, participants were asked to map destinations to which they frequently travel in the Triangle Region. Participants provided 1,572 live and work destinations. Major employment centers and residential neighborhoods in Raleigh, Cary, Morrisville, Research Triangle Park, Durham, and Chapel Hill are well represented in the survey responses.

LEGEND

- Work
- Home
- Park
- Municipality
- County

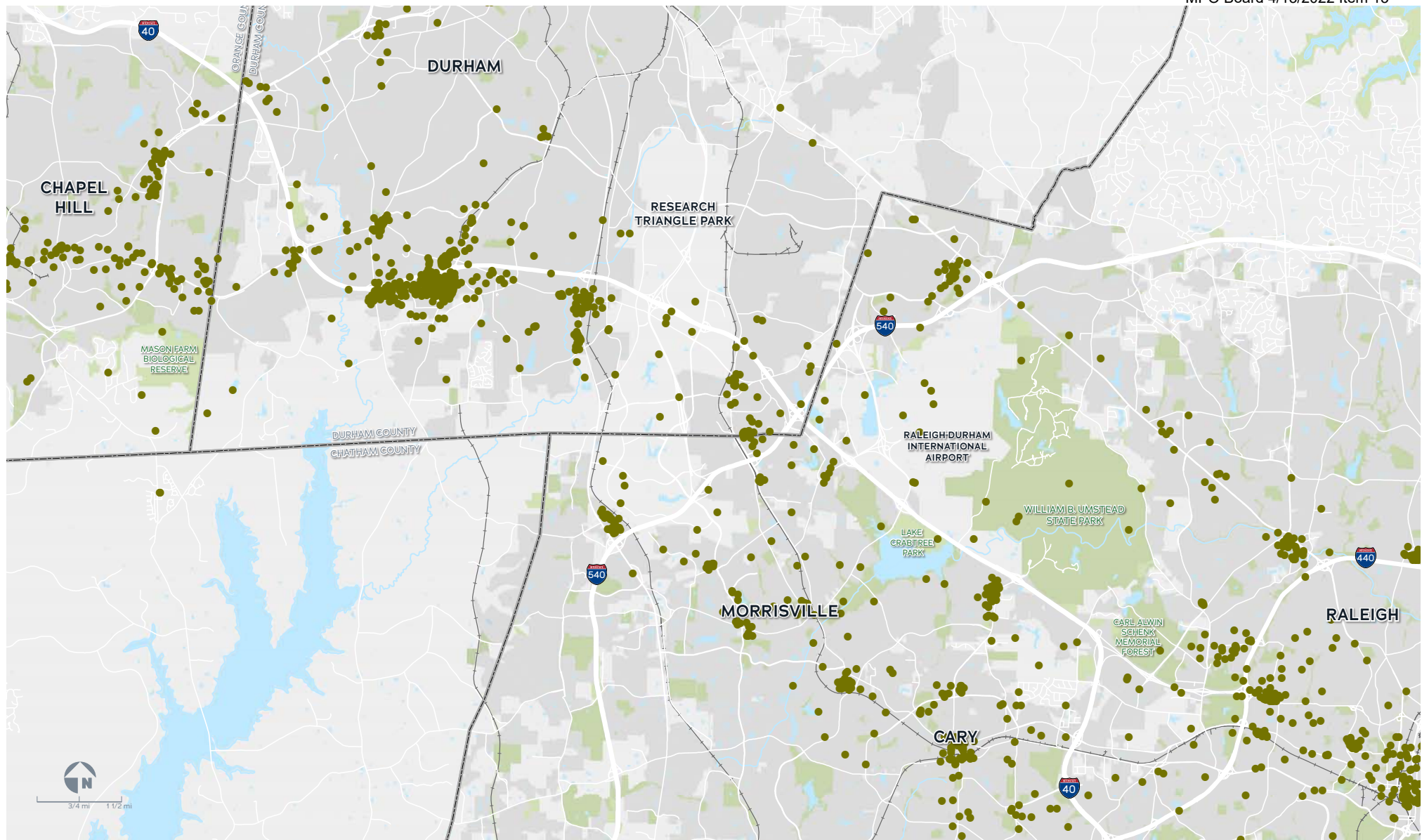


RECREATION DESTINATIONS

In the first community survey, participants were asked to map destinations to which they frequently travel in the Triangle Region. Participants provided 2,142 recreational destination points. Popular recreational area in the study area, such as American Tobacco Trail, Umstead State Park, Lake Crabtree, NC Museum of Art, NC Botanical Garden, Jordan Lake, Lake Johnson, and local greenway networks are well represented in the survey responses.

LEGEND

- Recreation
- Park
- Municipality
- County

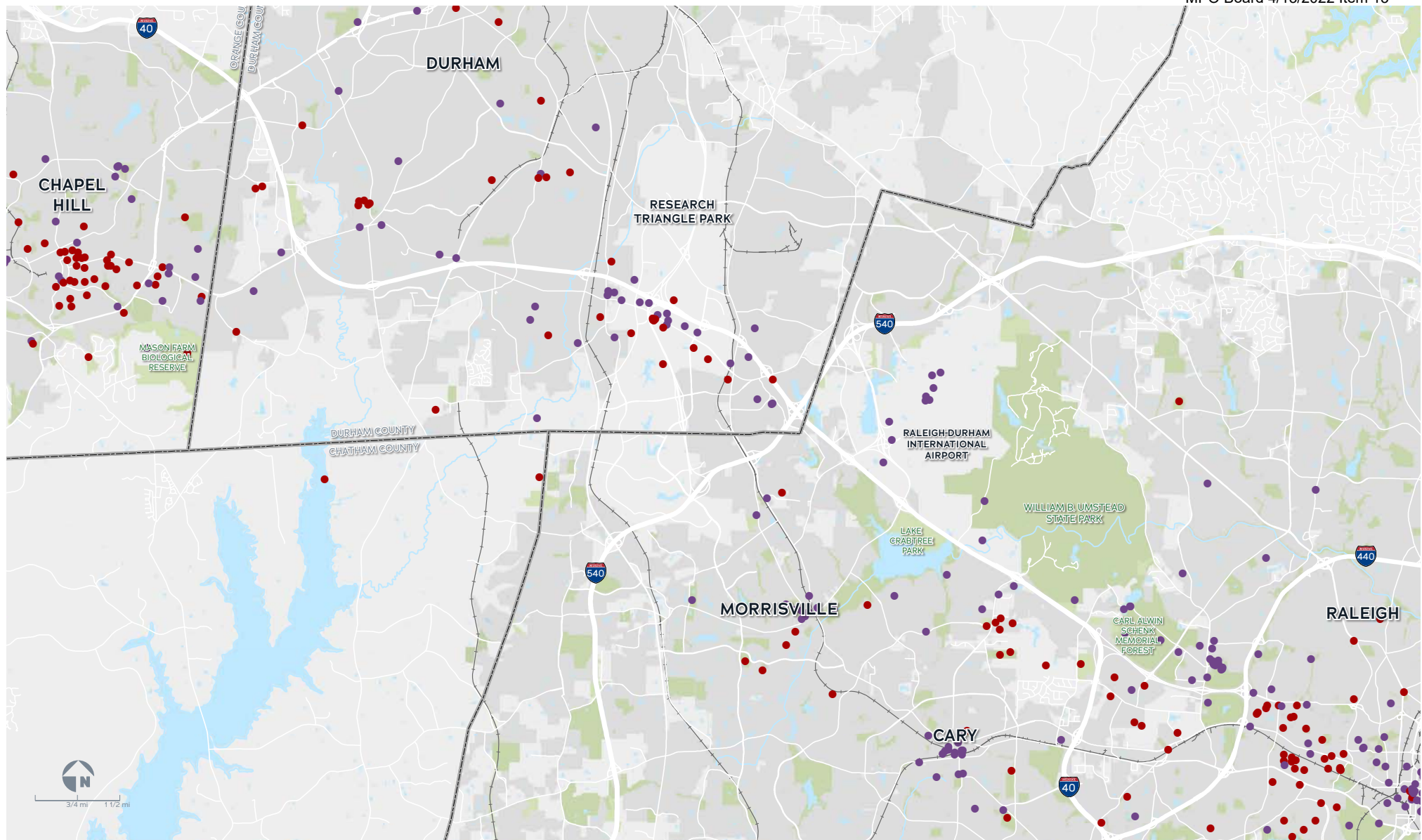


RETAIL DESTINATIONS

In the first community survey, participants were asked to map destinations to which they frequently travel in the Triangle Region. Participants provided 1,442 retail destination points. Popular shopping centers and commercial area in the study area, such as the Downtown areas, Southpoint Mall, Crabtree Mall, NC Farmers Market, grocery stores, restaurants, and bike shops are well represented in the survey responses.

LEGEND

- Retail
- Park
- Municipality
- County



SCHOOL / CIVIC DESTINATIONS

In the first community survey, participants were asked to map destinations to which they frequently travel in the Triangle Region. Participants provided 352 educational and civic destination points. Major universities, community colleges, secondary schools, libraries, municipal buildings, and museums in the study area are well represented in the survey responses.

LEGEND

- School
- Civic Space
- Park
- Municipality
- County

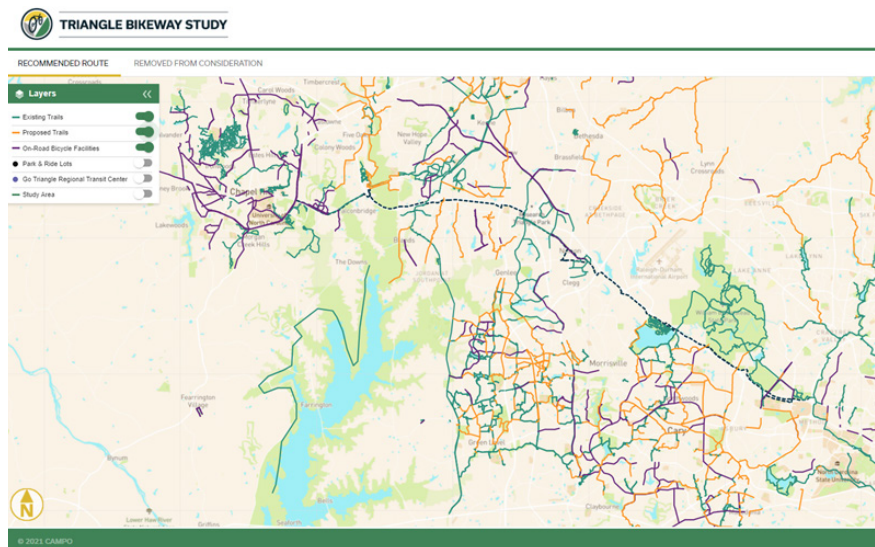


ENGAGEMENT PHASE II

The second phase of community engagement gave the public an opportunity to provide feedback on preferred routing alignments and input on the design of the Triangle Bikeway corridor including the typical cross section and intersection treatments. Engagement efforts consisted of a public survey, an interactive, crowdsourced map on the project website, pop-up events, and virtual public workshops.

PROJECT WEBSITE

For the second phase of community engagement, the project website was revamped to gather feedback on recommended routes via an interactive, crowdsourced map. Triangle residents, employees, and visitors were also encouraged to provide their desired walking locations and trail access points on the web map. In addition, the website was updated to include resources on existing conditions, route maps, presentation slides and recordings, community engagement results from the first phase, and a video rendering of the proposed bikeway design, which highlighted the proposed typical cross section and intersection treatments.



PUBLIC SURVEY

The second survey was distributed to community members to share their walking preferences and their anticipated access locations for the proposed Triangle Bikeway corridor. The survey was hosted on the Public Input platform, along with an additional map-based survey hosted on the project website. The goal of this survey was to understand how people would like to use and access the corridor to inform bikeway design elements. The survey was open from June - July 2021 with a total of 2,009 respondents. Survey questions focused on the following:

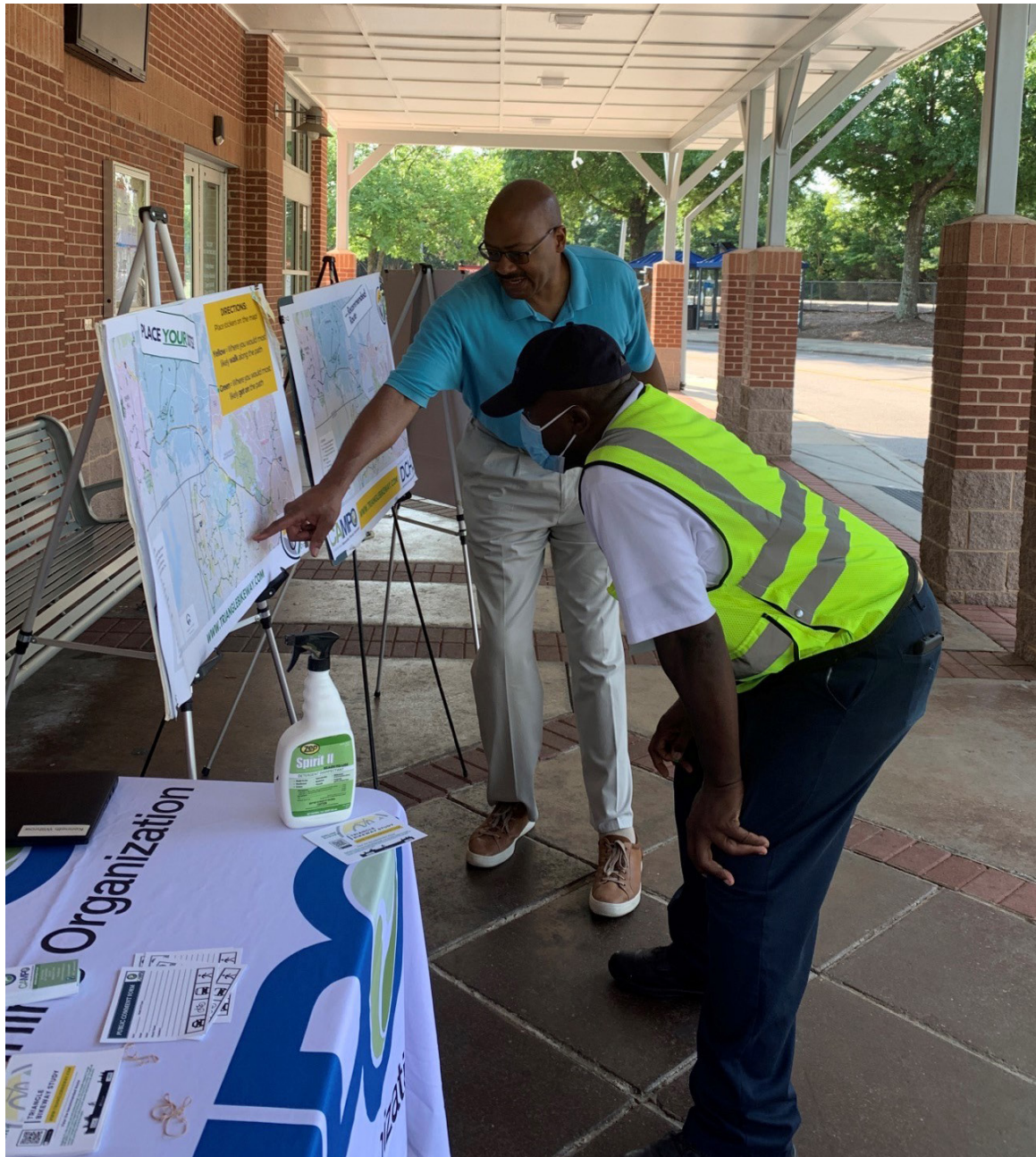
- › Walking preferences along the corridor.
- › Preferred access points along the corridor.
- › Preferred connection points along the corridor.
- › Commuting Patterns (i.e., home and work zip codes; and mode of transportation).
- › Demographics (i.e., age; gender; race/ethnicity; income; access to vehicles; and disability).

SURVEY HIGHLIGHTS:

- › Preference for walking along the entire corridor.
- › Preference for accessing the bikeway along the entire corridor, with clusters of preferred access at the termini in Chapel Hill and Raleigh, near Southpoint Mall, RTP, Lake Crabtree Park, and Umstead State Park.
- › 58% indicated they would use the bikeway for commuting, running errands, shopping, etc.

“I work in RTP and live in Cary. If there were connections to trails in Morrisville and Cary, I could walk or ride my bike to work.”

- Comment from phase II public survey



MAJORITY OF RESPONDENTS

- PREFER TO -

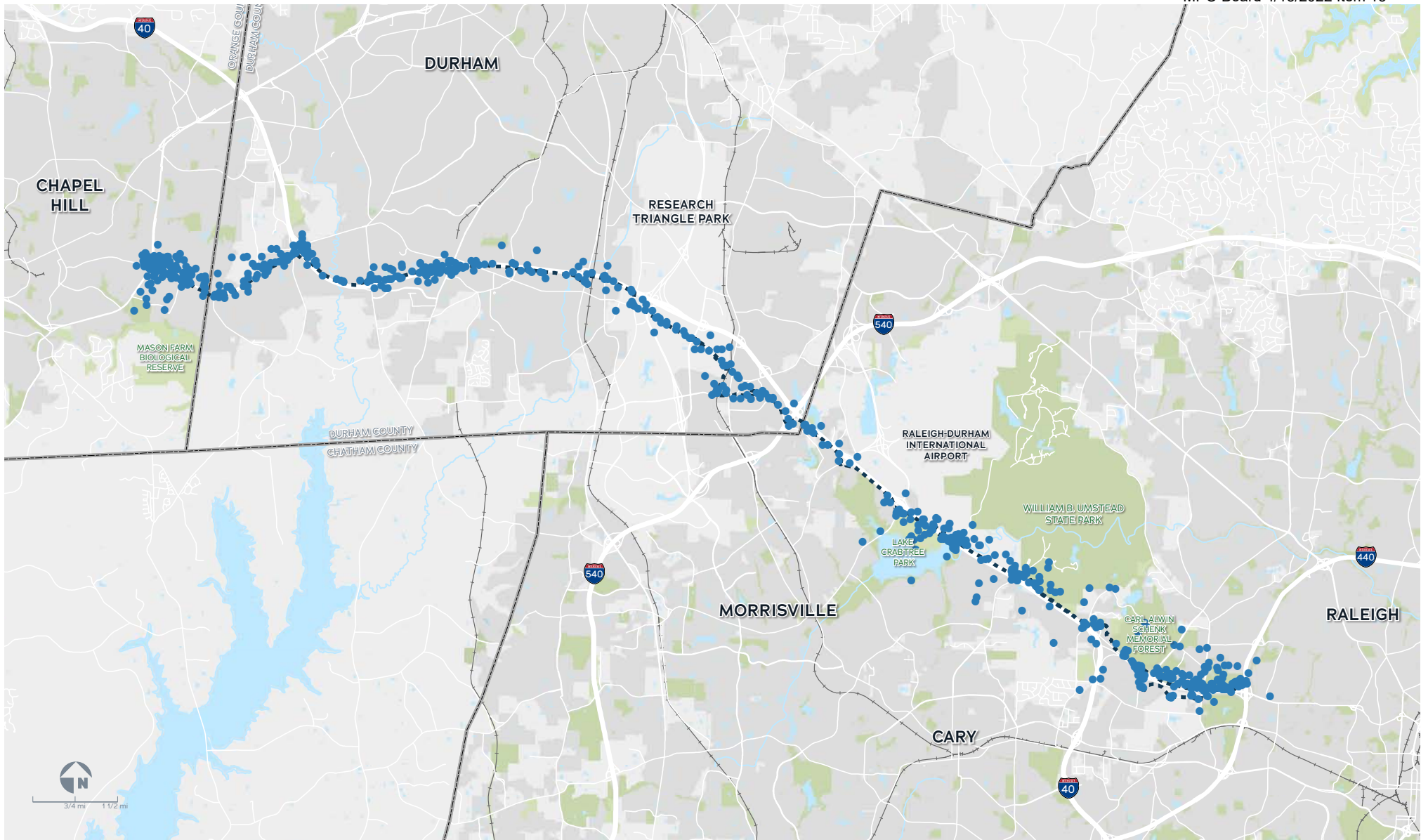
**WALK & BIKE
ALONG THE
BIKEWAY**



**58%
OF RESPONDENTS**

- WOULD -

**COMMUTE & RUN
ERRANDS ALONG
THE BIKEWAY**

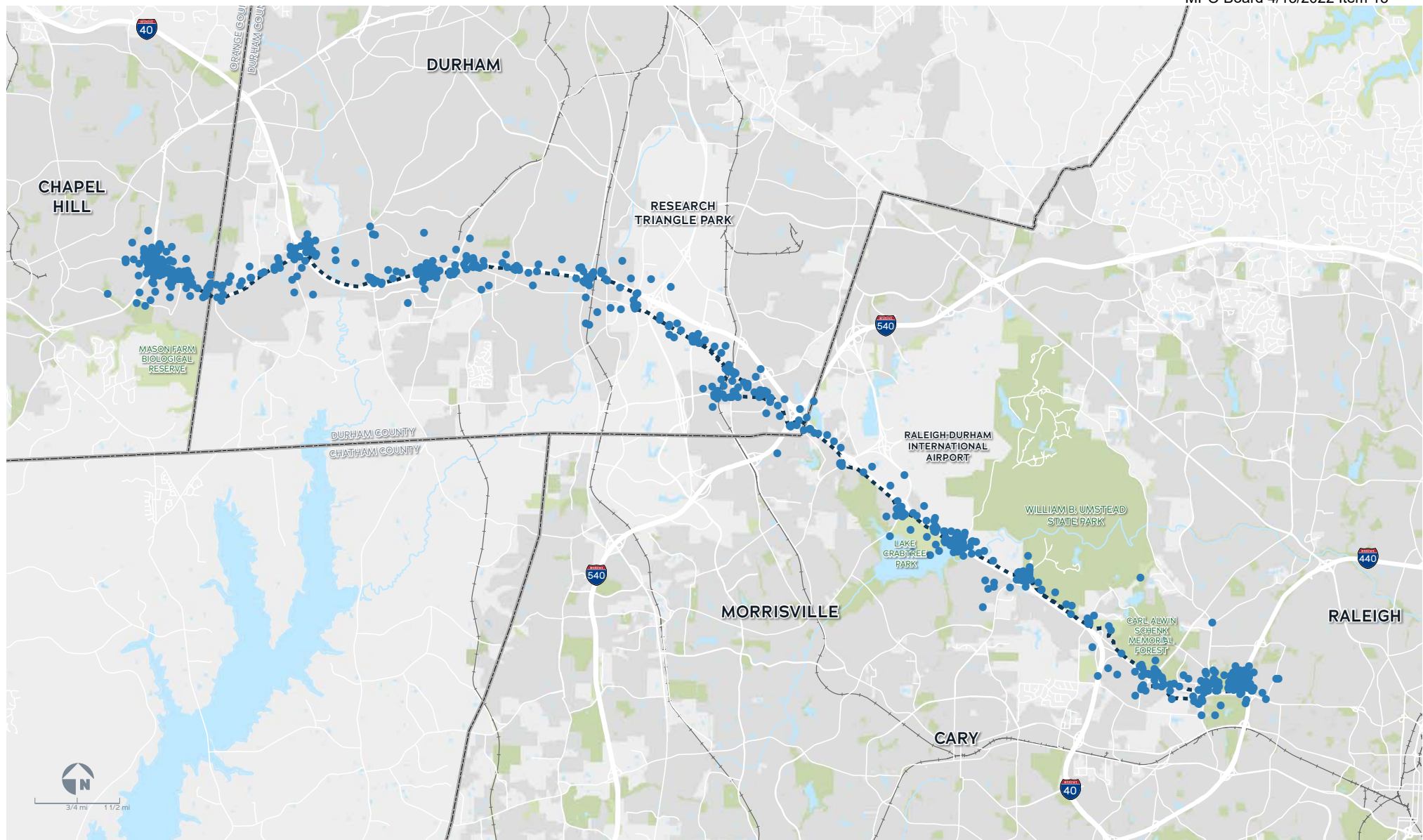


DESIRED WALKING LOCATIONS

In the second community survey, participants were asked to map where they would like to walk along the Triangle Bikeway. Respondents prefer to walk along the entire corridor, as the map illustrates. Survey input shows that the demand for walking extends throughout the entire corridor. Preference for both walking and biking along the corridor helps to inform bikeway design decisions, such as the width of the corridor and need for mode separation.

LEGEND

- Preferred Walking Locations
- Triangle Bikeway Corridor
- Park
- Municipality
- County



DESIRED ACCESS LOCATIONS

In the second community survey, participants were asked to map where they would like to access the Triangle Bikeway. Respondents prefer to access the bikeway along the entire corridor, with clusters of preferred access at the termini in Chapel Hill and Raleigh, near Southpoint Mall, RTP, Lake Crabtree Park, and Umstead State Park. Preference for access along the entire corridor helps to inform bikeway design decisions, such as intersection treatments and locations of connectors to local bicycle and pedestrian facilities.

LEGEND

- Preferred Access Locations
- - Triangle Bikeway Corridor
- Park
- Municipality
- County



VIRTUAL PUBLIC WORKSHOPS

As part of the second phase of community engagement efforts, two public workshops were held virtually on Zoom on June 29, 2021. The workshop goals were to share a summary of the first phase of public engagement efforts, inform the community about the route development process, present the recommended route for review and comment, and understand where the community desires access points and where the facility should be suitable for both walking and biking. The meeting attendees were also encouraged to visit the project website, take the survey, and share study information with their networks. Key take-aways from the public workshops are highlighted below.

COMMUNITY VOICES:

- › Desired connections to existing trails, local neighborhoods, transit stops, and park-n-ride lots.
- › Preference for walking along the entire corridor and separation between pedestrians and bicyclists.
- › Concerns of bicycle and pedestrian conflict points at intersections along the corridor.
- › Preference for physical and vertical separation between the corridor and parallel roadways.
- › Interest in available funds and funding mechanisms proposed for the project.
- › Interest in proposed maintenance plan for the corridor.

POP-UPS

Supplementing virtual workshops, pop-up events were hosted by CAMPO and DCHC MPO staff to solicit additional feedback on how people would like to use and access the corridor. The pop-up events were drop-in style engagement opportunities without formal presentations. A table was set up at each pop-up event and included general information about the project, maps, and a survey station for participants to provide their feedback on desired areas for walking along the corridor and preferred connections to local bicycle and pedestrian networks. The pop-ups were held in high trafficked areas throughout the Triangle Region from July 3rd – July 15th. Locations are highlighted below:

- > Town of Morrisville: Farmers Market
- > Town of Morrisville: July 4th Event
- > Town of Cary: GoCary Depot
- > Research Triangle Park: The Boxyard
- > City of Durham: GoTriangle Regional Transit Center
- > Town of Morrisville: Western Wake Farmers Market
- > City of Durham: GoDurham Bus Stops (multiple)
- > City of Raleigh: North Hills

“I am very excited for this project and would love to be able to access more areas by biking and walking. Hopefully this will help reduce traffic and be better for the environment and community.”

- Comment from phase II public survey



Pop-Up Events in Research Triangle Park and Town of Cary during Community Engagement Phase II

“ *Having a trail along an existing interstate right-of-way can help those visiting the area easily understand a trail route. Combined with transit initiatives, the Bikeway will help fill gaps in commuter routes for alternative modes of transportation.* **”**

**- Community Survey
Respondent**





O4

**FEASIBILITY +
RECOMMENDATIONS**



OVERVIEW + PROCESS

Potential routes for the Triangle Bikeway were developed and evaluated using an approach with considerations of the built, natural, social and economic environments.

Over 90 routes were developed using the study area demographic information, previous planning efforts, policy review and existing conditions information as presented in Chapters 1 and 2. Routes identified in previous studies were included for evaluation. The evaluation process combined desktop analysis and on-the-ground fieldwork to provide a better understanding of existing conditions and help identify opportunities and constraints along the study corridor. Preliminary three-dimensional corridor modeling of the potential routes was performed to better understand possible construction impacts, confirm longitudinal grades meet accessibility criteria and provide detailed quantity information for the development of higher quality cost estimates.

Evaluation of the route alternatives was informed by input from the public as well as feedback from coordination meetings with NCDOT and other major stakeholders in the study area. The recommendations presented in this chapter for preferred alignment(s), typical sections, facility amenities and connections to transit and greenways also reflect the input and feedback received throughout the evaluation process. The map on the following page illustrates the routes studied for feasibility for the Triangle Bikeway facility.

NATURAL ENVIRONMENT

How will the bikeway connect users with nature while also minimizing impacts to natural resources and environmental features?

BUILT ENVIRONMENT

How will the bikeway leverage and connect with existing and planned multimodal transportation infrastructure?

SOCIAL ENVIRONMENT

How will the bikeway connect users to destinations that promote community interaction in areas such as public health, arts and culture, entertainment, or education among others?

ECONOMIC ENVIRONMENT

How will the bikeway connect users to jobs and support regional economic development and competitiveness?

BY THE NUMBERS...



92

ROUTES

- STUDIED -

FOR FEASIBILITY



100+

MILES

- MODELED -

**IN 3D USING CAD
SOFTWARE**



6

MEETINGS

- HELD -

WITH NCDOT

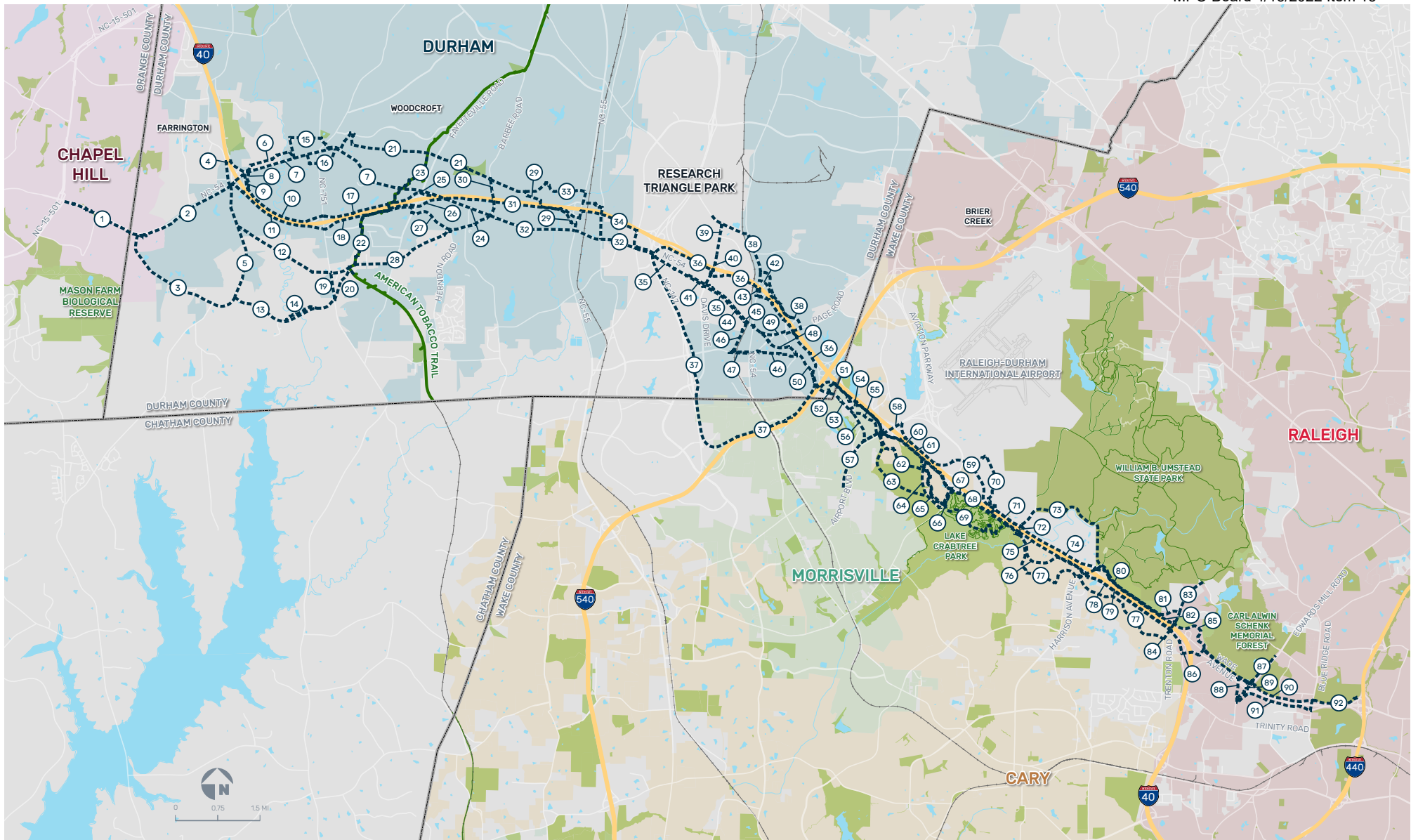


15

MEETINGS

- HELD -

**WITH MAJOR
STAKEHOLDERS**



ROUTES STUDIED FOR FEASIBILITY

NC-15/501 TO I-440

LEGEND

- Routes Studied
- Park

- | | |
|---------------|-----------|
| ■ Chapel Hill | ■ Cary |
| ■ Durham | ■ Raleigh |
| ■ Morrisville | ■ County |



OPPORTUNITIES + CONSTRAINTS

To support the development and evaluation of potential routes for the Triangle Bikeway, an analysis of opportunities and constraints within the study area was performed. Key considerations included, but were not limited to the following:



ENVIRONMENT

Connect users with natural resources while minimizing impacts to environmental features and habitat.



CONNECTIVITY

Make meaningful connections to transit and active transportation networks as well as employment centers and local neighborhoods.



SAFETY

Address the safety needs of users of all ages and abilities in the route selection and roadway crossing recommendations.



PERMITTING

Consider permitting requirements associated with the route and impacts to project cost and schedule.



CONSTRUCTIBILITY

Evaluate route for ease of construction access, construction methods and impacts to traffic during construction.



REAL ESTATE

Consider required permanent and temporary construction easements on publicly- and privately-owned land associated with the route.



ROUTE EFFICIENCY

Consider directness of route to make user trips most time efficient and minimize overall facility length to reduce construction costs.



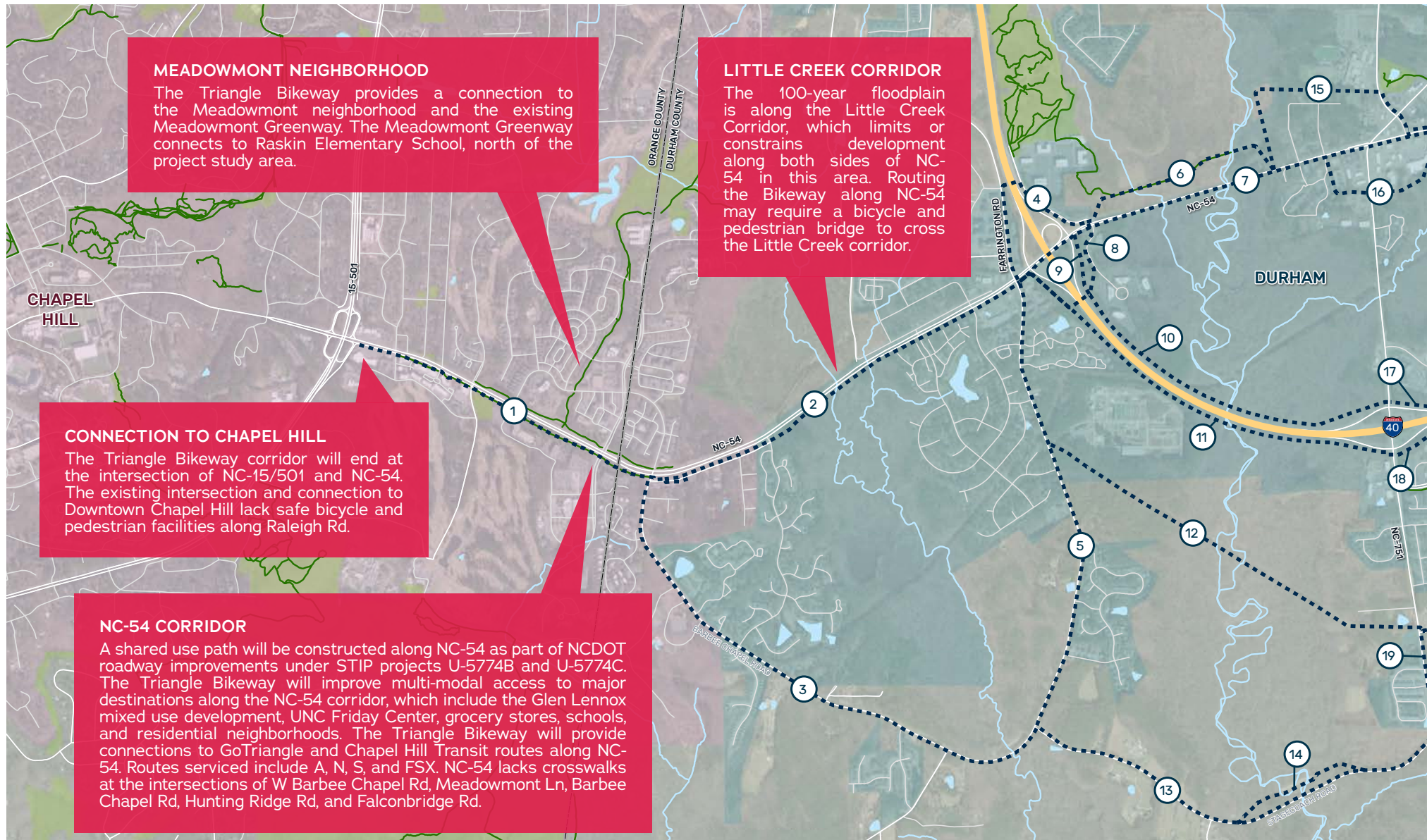
FUTURE PLANS

Avoid conflicts with planned roadway projects and consider how route connects to future greenways /other planned bicycle and pedestrian infrastructure.



STAKEHOLDER INPUT

Understand interests and concerns from stakeholders throughout the corridor as well as input from the public and the potential impacts on route selection.



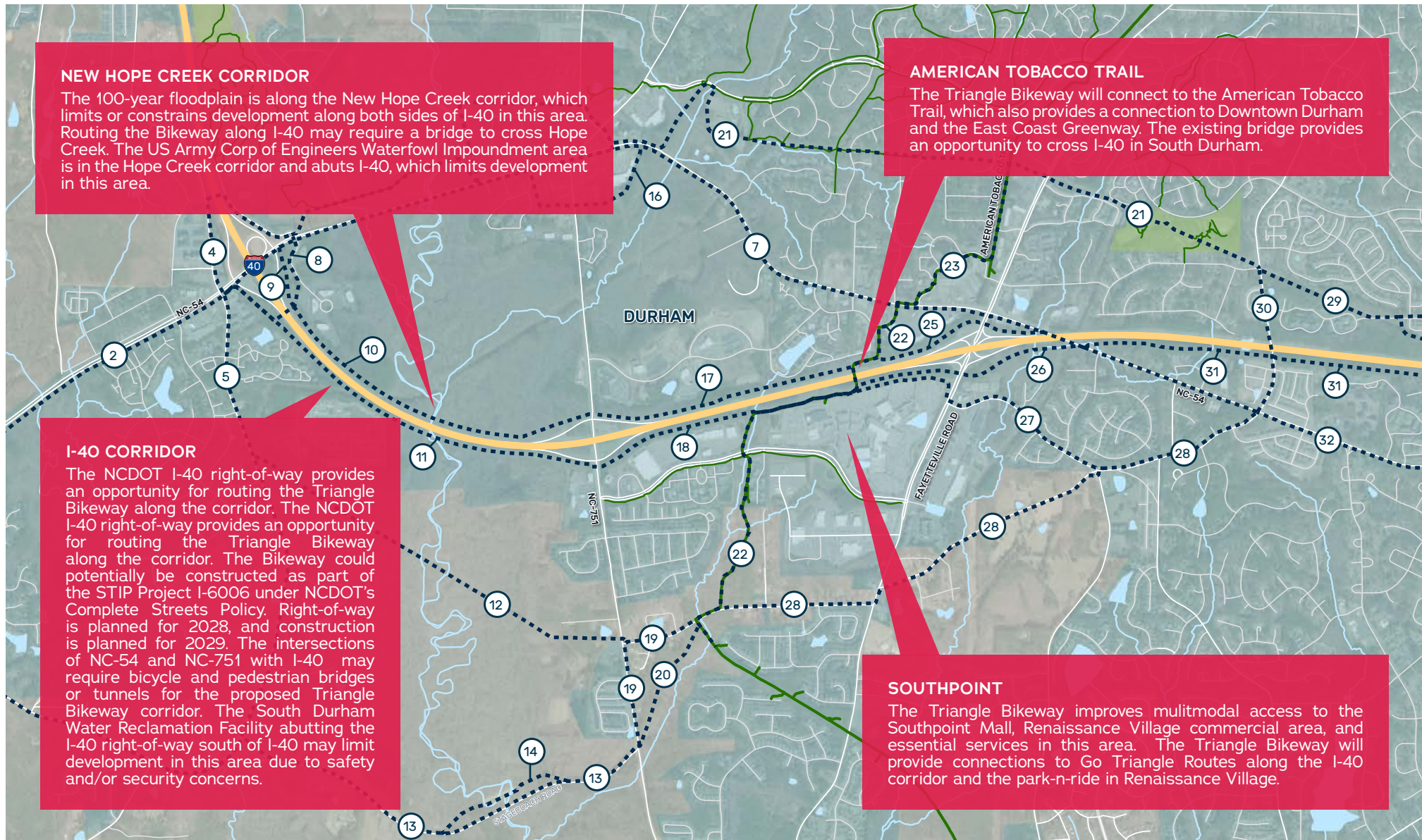
OPPORTUNITIES + CONSTRAINTS

NC-15/501 TO FARRINGTON ROAD

LEGEND

- Routes Studied
- Park

- Chapel Hill
- Durham
- Morrisville
- Cary
- Raleigh
- County



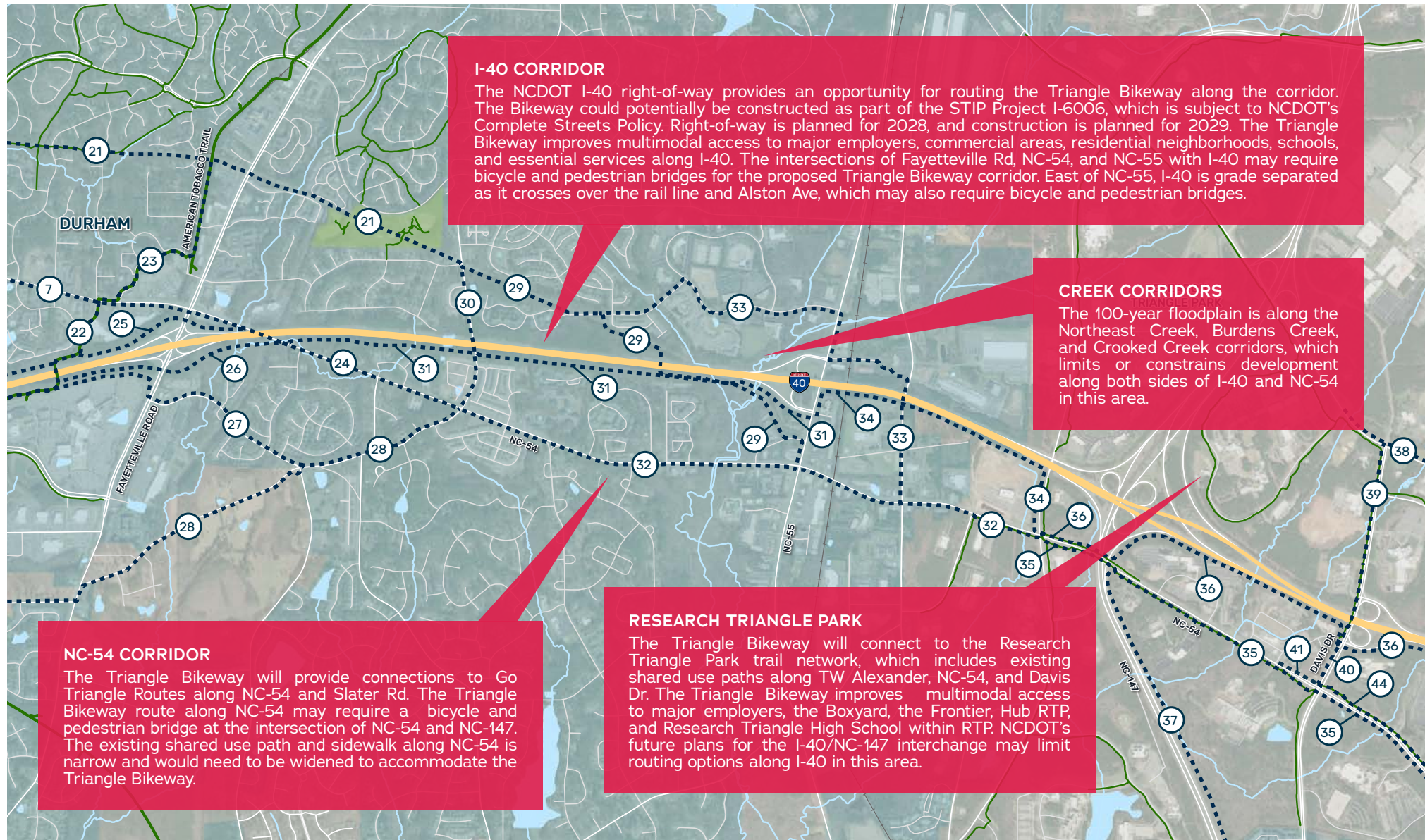
OPPORTUNITIES + CONSTRAINTS

NC-54 TO AMERICAN TOBACCO TRAIL

LEGEND

--- Routes Studied
 Park

Chapel Hill	Cary
Durham	Raleigh
Morrisville	County



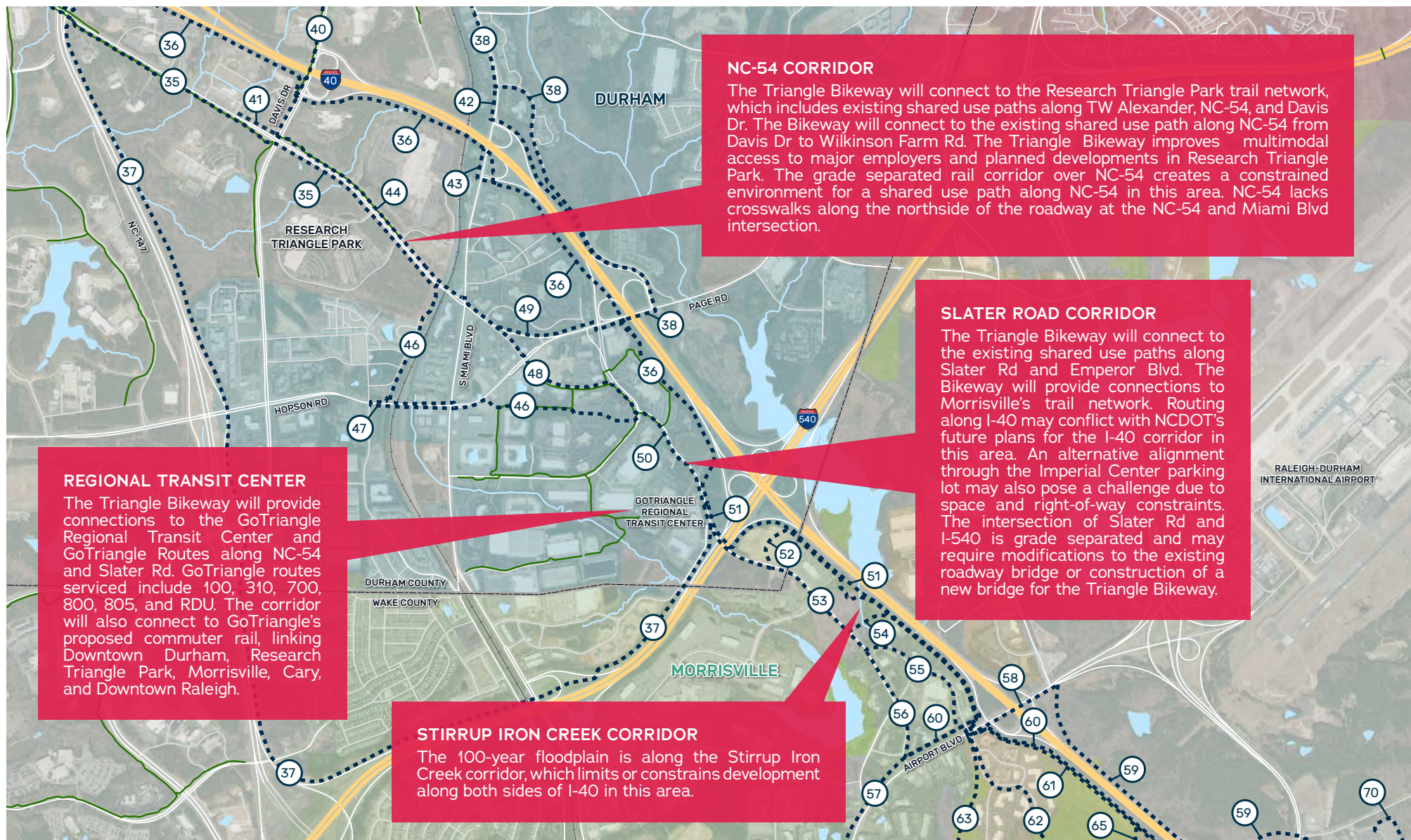
OPPORTUNITIES + CONSTRAINTS

AMERICAN TOBACCO TRAIL TO DAVIS DRIVE

LEGEND

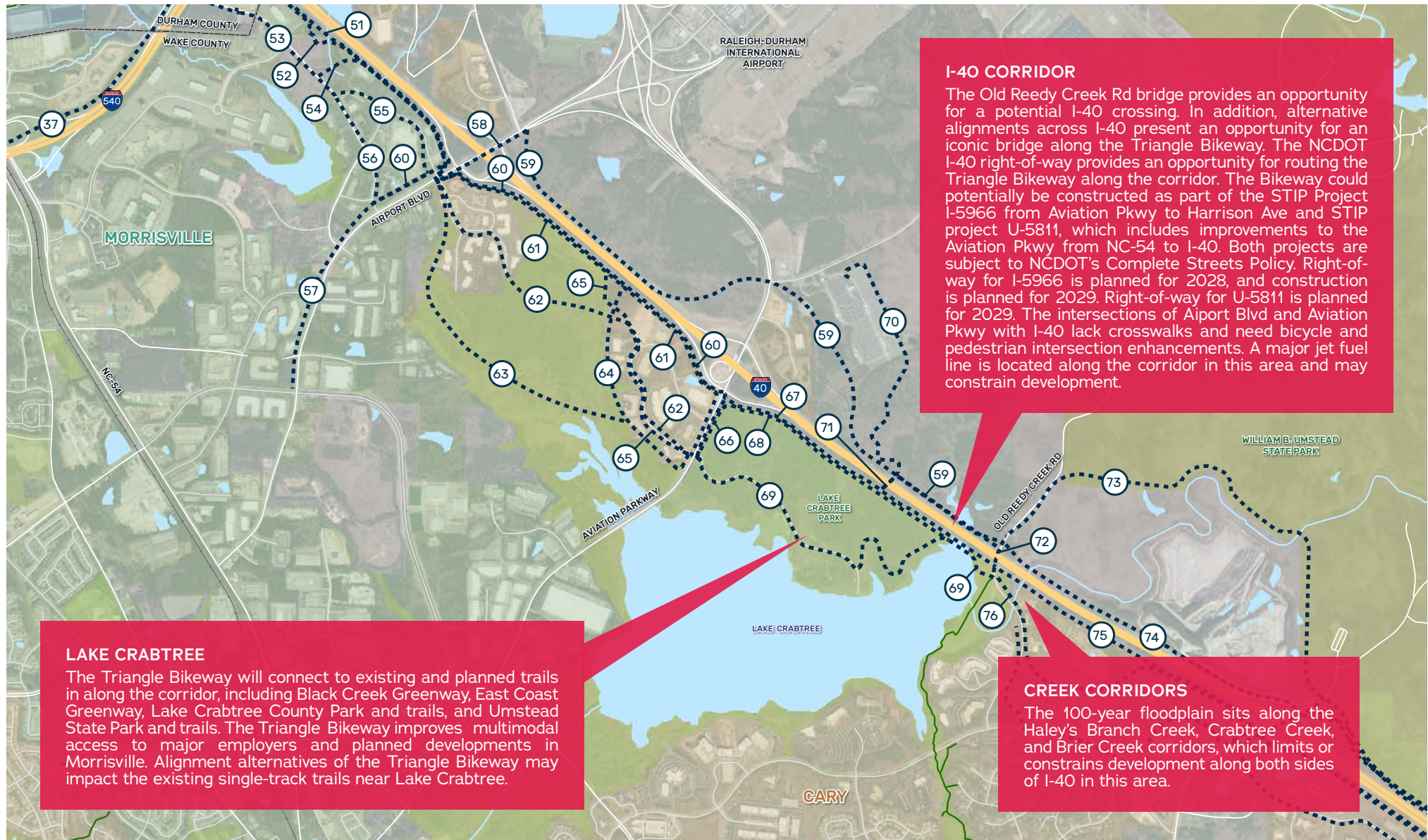
--- Routes Studied
 ■ Park

■ Chapel Hill
 ■ Durham
 ■ Morrisville
 ■ Cary
 ■ Raleigh
 ■ County



OPPORTUNITIES + CONSTRAINTS

DAVIS DRIVE TO AIRPORT BOULEVARD



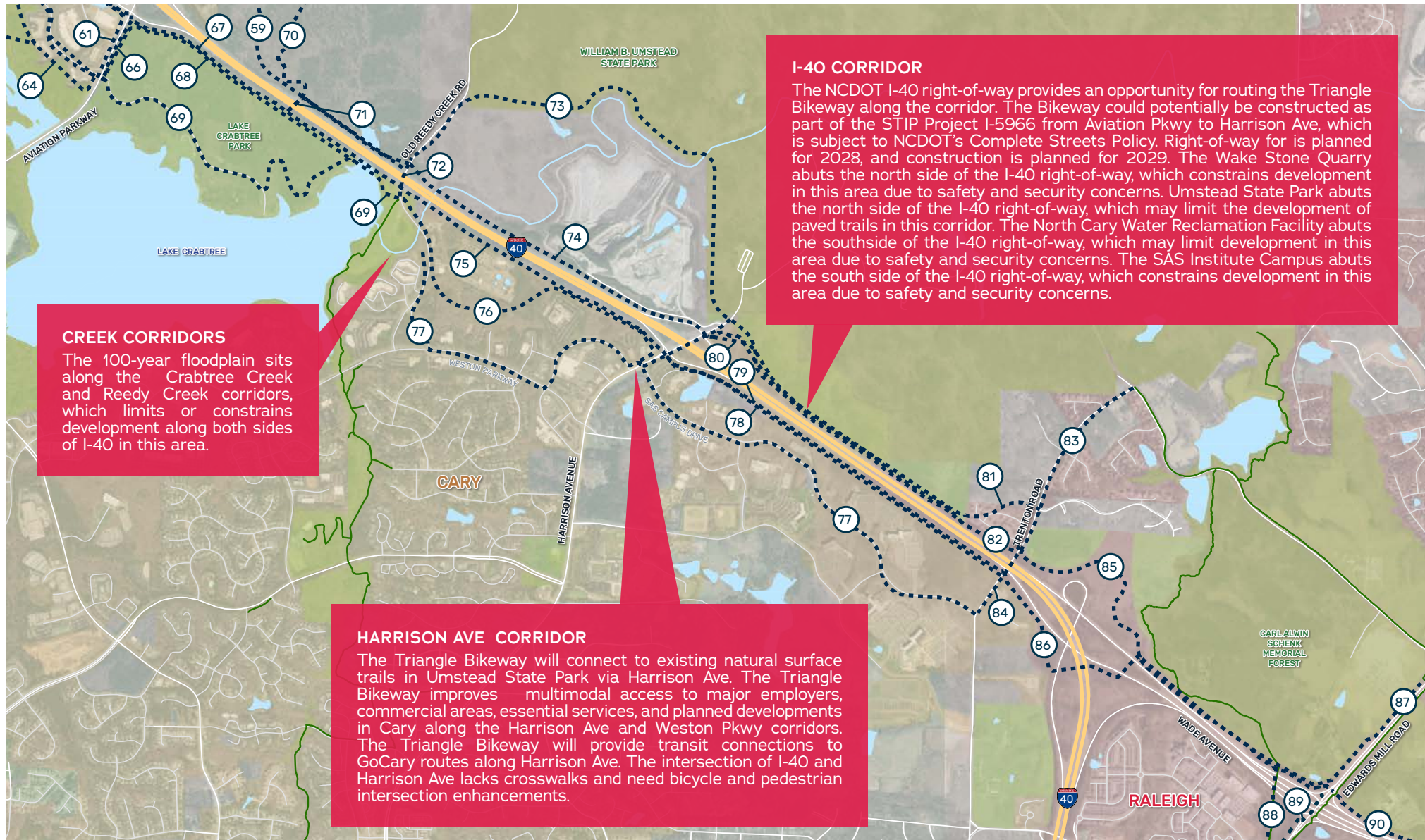
OPPORTUNITIES + CONSTRAINTS

AIRPORT BOULEVARD TO OLD REEDY CREEK ROAD

LEGEND

--- Routes Studied
 Park

Chapel Hill	Cary
Durham	Raleigh
Morrisville	County



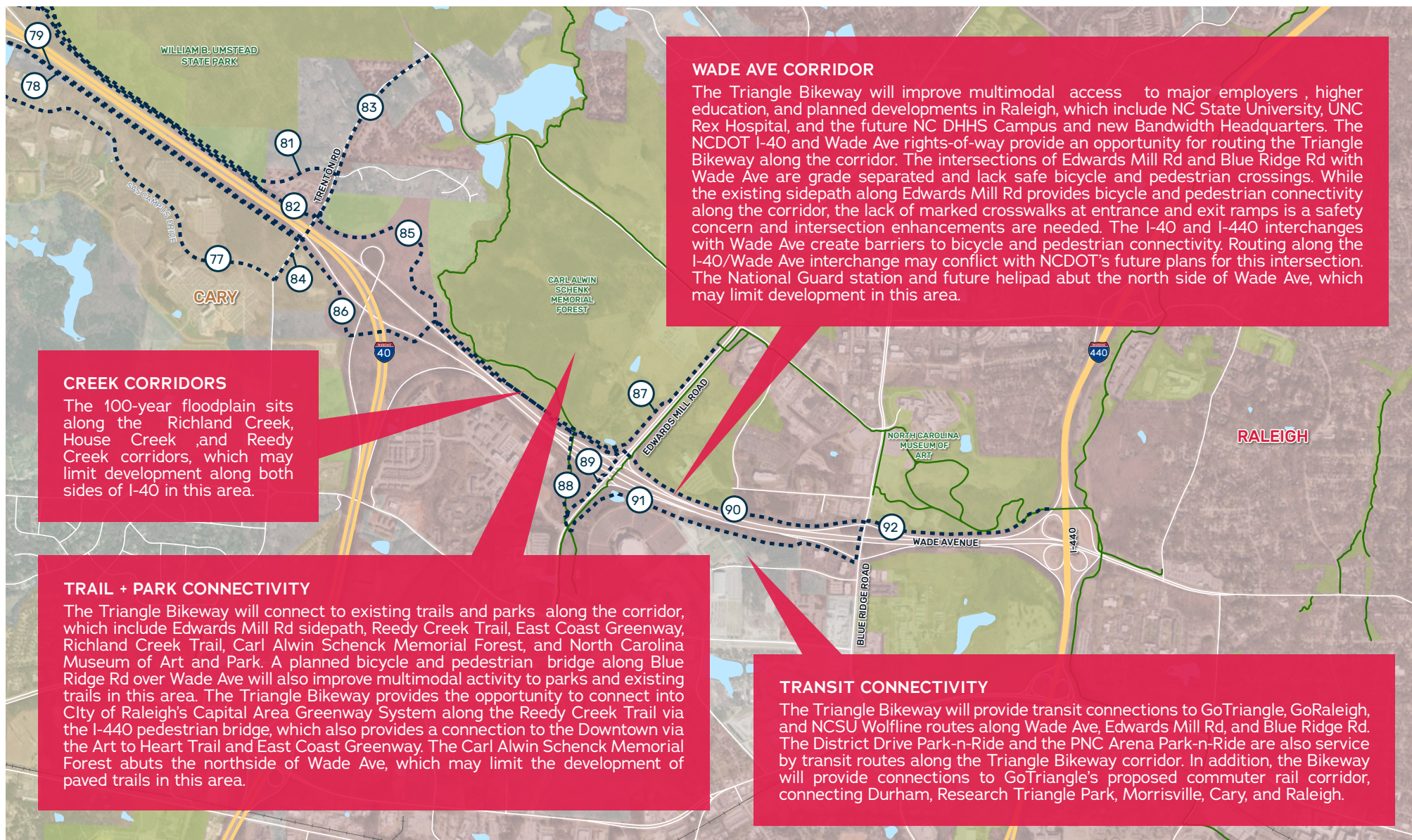
OPPORTUNITIES + CONSTRAINTS

OLD REEDY CREEK ROAD TO TRENTON ROAD

LEGEND

--- Routes Studied
 ■ Park

■ Chapel Hill	■ Cary
■ Durham	■ Raleigh
■ Morrisville	■ County



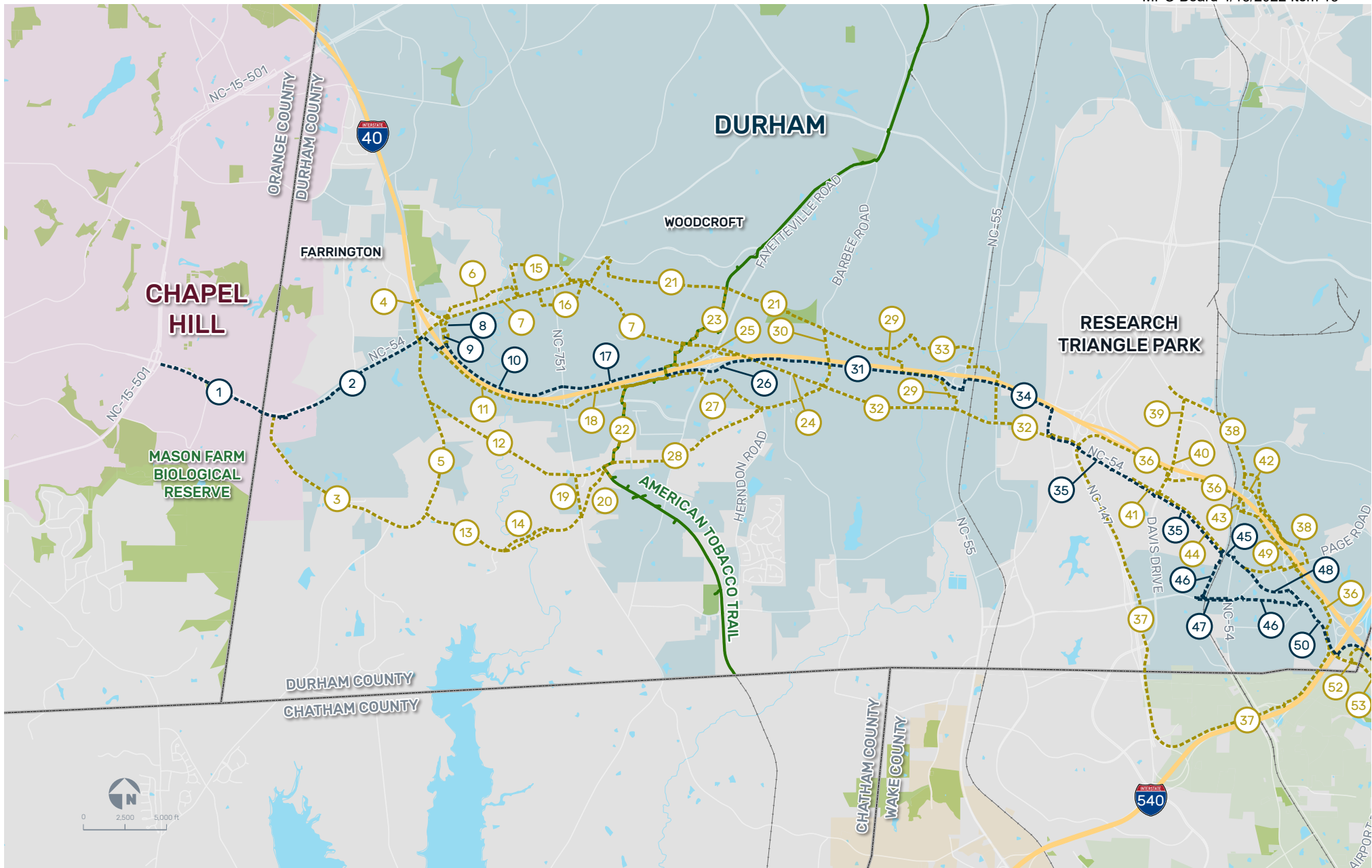
OPPORTUNITIES + CONSTRAINTS

TRENTON ROAD TO I-440

LEGEND

--- Routes Studied
 ■ Park

■ Chapel Hill
 ■ Durham
 ■ Morrisville
 ■ Cary
 ■ Raleigh
 ■ County



EVALUATED ROUTES

NC-15-501 TO I-540

LEGEND

- | | | |
|--------------------------|-------------|---------|
| --- Recommended Route | Chapel Hill | Cary |
| --- Other Routes Studied | Durham | Raleigh |
| ■ Park | Morrisville | County |

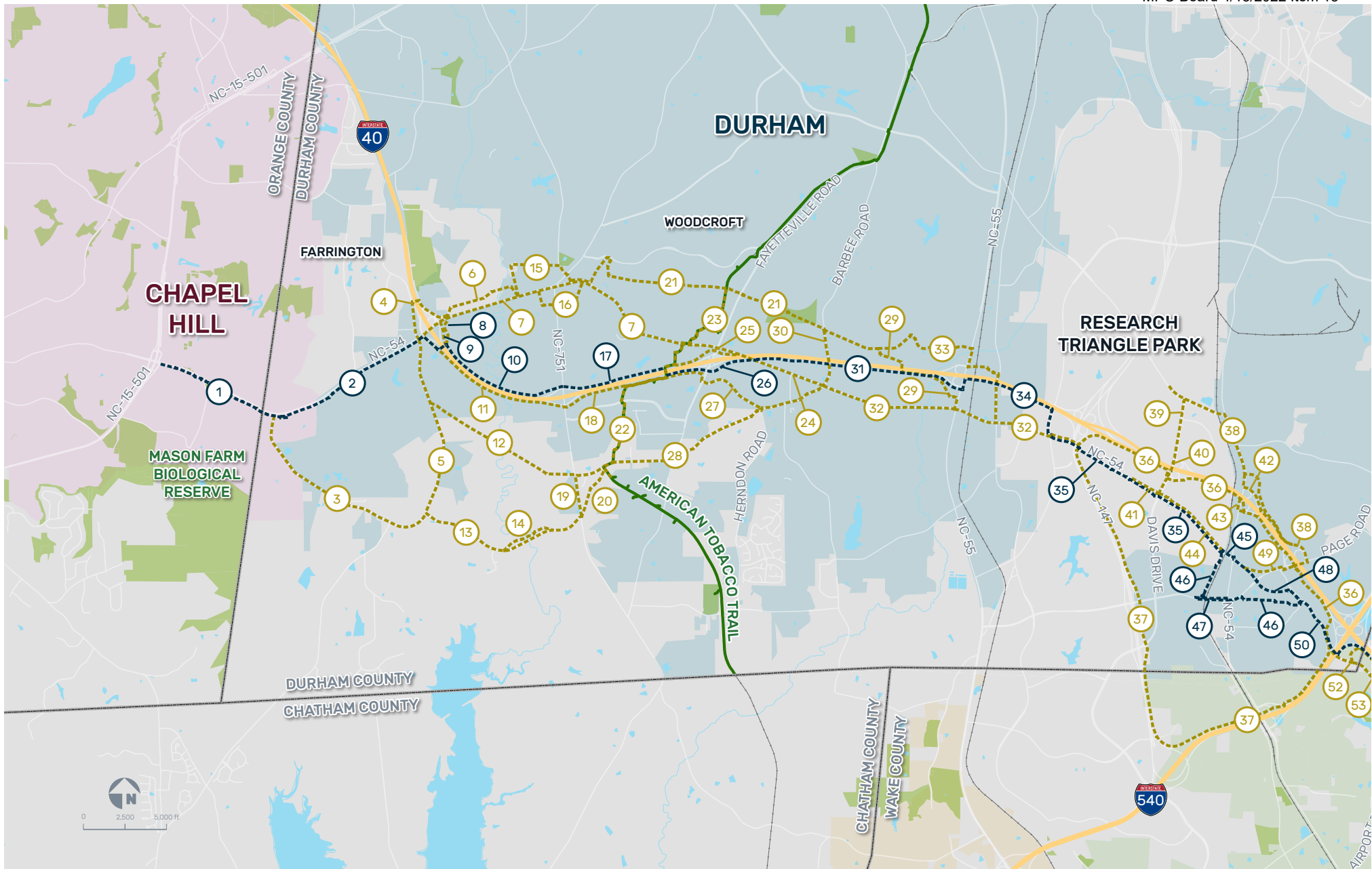
ROUTES REMOVED FROM CONSIDERATION

The following tables provide a summary of routes which were studied but ultimately removed from consideration for the preferred alignment for the Triangle Bikeway.

ID	Jurisdiction	Category	Notes	Key Stakeholders
3	Chapel Hill/Durham	Dependent Upon Infeasible Route	Barbee Chapel Road in this area includes a large tract preserve under the NC Agricultural Development and Farmland Preservation Trust, which creates a narrow right-of-way.	USACE; Chapel Hill; Durham; NCDOT
4	Durham	Safety Concerns	Pedestrian bridge over I-40 west of the exit would require several high ADT crossings with free flow turning movements of I-40/NC54 interchange.	USACE; Durham; NCDOT
5	Durham	Dependent Upon Infeasible Route	Segment #13 has been removed from consideration and therefore makes this segment void.	USACE; Durham; NCDOT
6	Durham	Environmental Constraints	Under the conditions for the creation of Jordan Lake the Army Corps of Engineers is obligated to keep these lands open to hunting and deem trails an incompatible use. Any trails need to be located in existing NCDOT right-of-way. In addition to USACE mitigation commitments all options through Waterfowl Impoundment would require extensive boardwalk and would likely be prohibitively expensive.	USACE; Durham
7	Durham	Included in Another Project	Shared use paths are recommended on both sides of NC54 as part of the U-5774 project.	USACE; Durham; NCDOT
8	Durham	Dependent Upon Infeasible Route	Segment #4 has been removed from consideration and therefore makes this segment void for the bikeway through movement. Recommended for connection to the future bikeway facility.	Durham; NCDOT
9	Durhams	Dependent Upon Infeasible Route	Segment #4 has been removed from consideration and therefore makes this segment void for the bikeway through movement. Recommended for connection to the future bikeway facility.	Durham; NCDOT
11	Durham	Environmental Constraints	Under the conditions for the creation of Jordan Lake the Army Corps of Engineers is obligated to keep these lands open to hunting and deem trails an incompatible use. Any trails need to be located in existing NCDOT right-of-way. This south side of I-40 through USACE property would also require building structure over a spillway.	USACE; Durham; NCDOT
12	Durham	Environmental Constraints	Under the conditions for the creation of Jordan Lake the Army Corps of Engineers is obligated to keep these lands open to hunting and deem trails an incompatible use. Any trails need to be located in existing NCDOT right-of-way. In addition to USACE mitigation commitments all options through Waterfowl Impoundment would require extensive boardwalk and would likely be prohibitively expensive.	USACE; Durham; Dominion Energy
13	Durham	Environmental Constraints	Under the conditions for the creation of Jordan Lake the Army Corps of Engineers is obligated to keep these lands open to hunting and deem trails an incompatible use. Any trails need to be located in existing NCDOT right-of-way, which not wide enough on Stagecoach Rd to accommodate the facility.	USACE; Durham; NCDOT
14	Durham	Environmental Constraints	Under the conditions for the creation of Jordan Lake the Army Corps of Engineers is obligated to keep these lands open to hunting and deem trails an incompatible use. Any trails need to be located in existing NCDOT right-of-way. This segment through USACE property would also require building structure over a spillway.	USACE; Durham; NCDOT
15	Durham	Dependent Upon Infeasible Route	Segment #6 has been removed from consideration and therefore makes this segment void.	USACE; Durham Schools; NCDOT
16	Durham	Indirect/Lacks Connections	Route conflicts with development plans and would be redundant to shared use paths planned for NC54 in U-5774	USACE; Durham



ID	Jurisdiction	Category	Notes	Key Stakeholders
18	Durham	Dependent Upon Infeasible Route	Segment #11 has been removed from consideration and therefore makes this segment void. Route north of I-40 is recommended due to fewer environmental conflicts and better crossing geometry with NC751.	USACE; Durham
19	Durham	Dependent Upon Infeasible Route	Segments #12-14 have been removed from consideration and therefore make this segment void.	USACE; Durham; NCDOT
20	Durham	Dependent Upon Infeasible Route	Segments #12-14 have been removed from consideration and therefore make this segment void.	USACE; Durham
21	Durham	Indirect/Lacks Connections	While this route does connect to existing bicycle facilities in South Durham, it deviates away from employment and commercial centers. Would also require extensive property/easement acquisition.	Durham; Duke Energy
21	Durham	Indirect/Lacks Connections	While this route does connect to existing bicycle facilities in South Durham, it deviates away from employment and commercial centers. Would also require extensive property/easement acquisition.	Durham; Duke Energy
22	Durham	Dependent Upon Infeasible Route	Segments #12-14; #19-20; and #28 have been removed from consideration and therefore make this segment void.	Durham
23	Durham	Indirect/Lacks Connections	While this route utilizes the existing American Tobacco Trail in South Durham, it deviates away from employment and commercial centers. In addition, Segment #21 has been removed from consideration, which would also make this segment void.	Durham
24	Durham	Included in Another Project	Shared use paths are recommended on both sides of NC54 as part of the U-5774 project.	Durham
25	Durham	Safety Concerns	NC54 west under I-40 bridge does not have adequate space for a protected bike facility. Recommended route uses American Tobacco Trail Bridge over I-40 to cross to southern route to avoid pinch point.	Durham; NCDOT
27	Durham	Dependent Upon Infeasible Route	Segment #28 has been removed from consideration and therefore makes this segment void.	Durham; NCDOT
28	Durham	Dependent Upon Infeasible Route	All routes connecting to this route from the west have been removed from further consideration and therefore make this segment void.	Durham; NCDOT
29	Durham	Dependent Upon Infeasible Route	Segment #21 has been removed from consideration and therefore makes this segment void. In addition, this route would require an underpass under I-40 and traversing across a power line easement.	Durham; NCDOT
30	Durham	Dependent Upon Infeasible Route	All routes connecting to this route from the south and north have been removed from further consideration and therefore make this segment void.	Durham
32	Durham	Included in Another Project	Shared use paths are recommended on both sides of NC54 as part of the U-5774 project.	Durham; RTP; NCDOT
33	Durham	Dependent Upon Infeasible Route	Segment #21 has been removed from consideration and therefore makes this segment void. This route would also require an at-grade crossing of the railroad.	Durham
36	RTP	Indirect/Lacks Connections	Recommended route utilizes NC54 to provide greater connections to jobs. This route also conflicts with NCDOT future plans for I-40.	Durham; RTP; NCDOT
37	RTP/Morrisville	Indirect/Lacks Connections	Routing the bikeway south along NC147 to continue north on I-540 would require extensive pedestrian bridges and tunnels. There is no feasible option for crossing of railroad and Church Street.	NCDOT
38	RTP/Durham	Conflicts with NCDOT Project	Recommended route utilizes NC54 to provide greater connections to jobs. This route also conflicts with NCDOT future plans for I-40.	Durham; RTP; NCDOT
39	RTP	Conflicts with NCDOT Project	Recommended route utilizes NC54 to provide greater connections to jobs. This route also conflicts with NCDOT future plans for I-40.	RTP



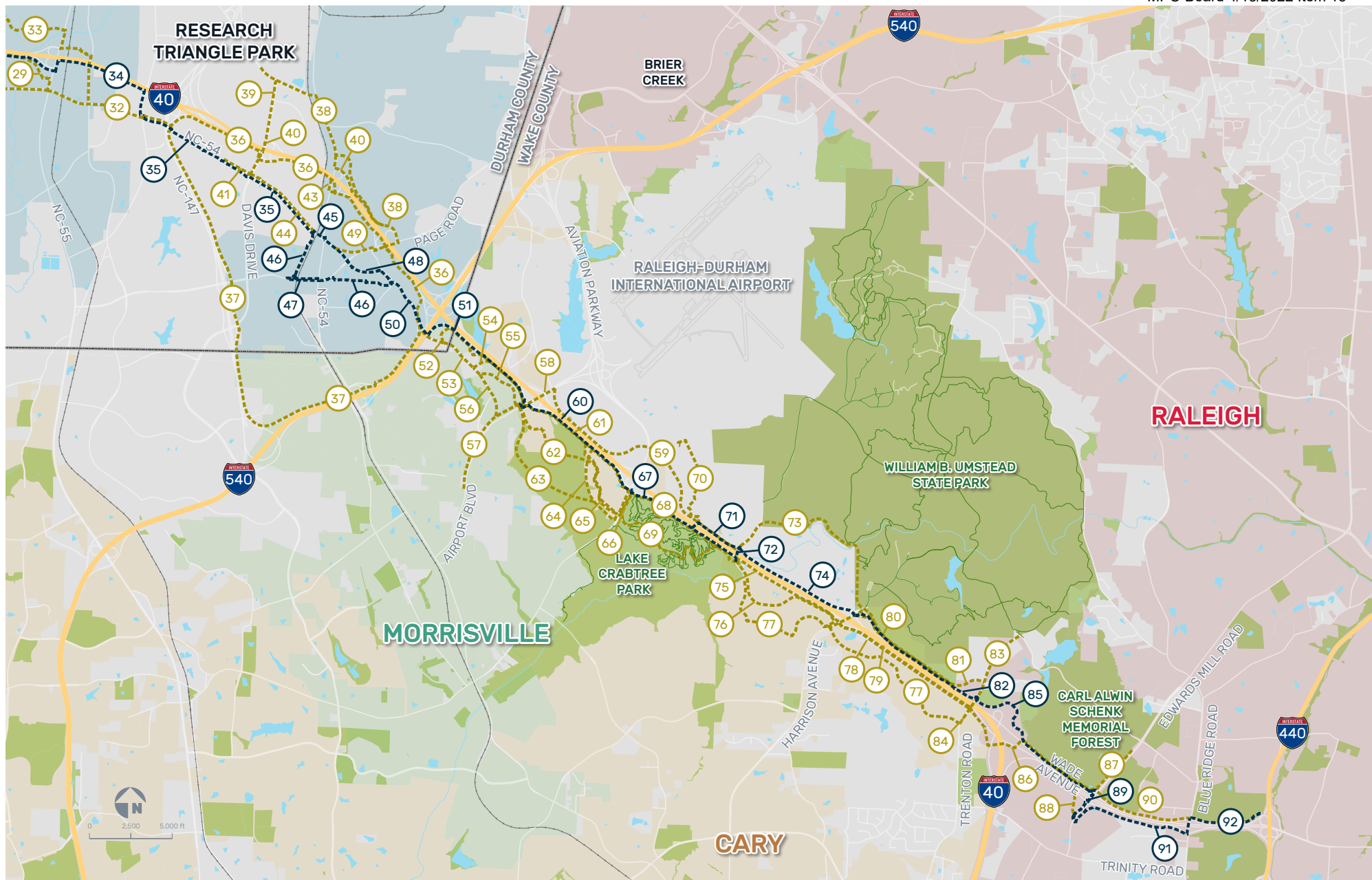
EVALUATED ROUTES

NC-15-501 TO I-540

LEGEND

- Recommended Route
- Other Routes Studied
- Park

- Chapel Hill
- Durham
- Morrisville
- Cary
- Raleigh
- County



EVALUATED ROUTES NC-55 TO I-440

LEGEND

- Recommended Route
- Other Routes Studied
- Park

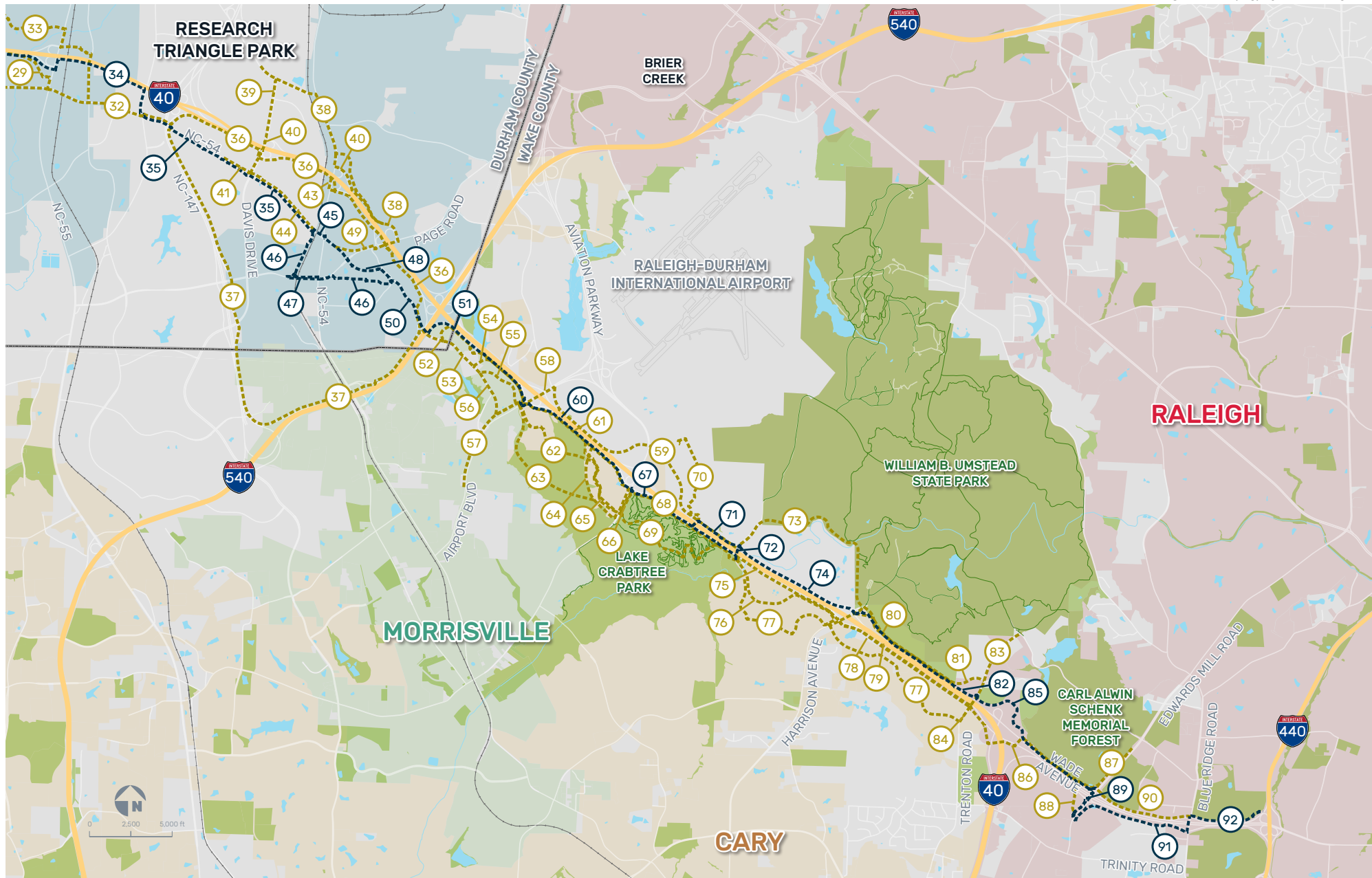
- Chapel Hill
- Durham
- Morrisville

- Cary
- Raleigh
- County

ID	Jurisdiction	Category	Notes	Key Stakeholders
40	RTP	Conflicts with NCDOT Project	Recommended route utilizes NC54 to provide greater connections to jobs. This route also conflicts with NCDOT future plans for I-40.	RTP; NCDOT
41	RTP	Recommended Connection	Recommended as a connection to future facility to access HUB RTP site.	RTP; NCDOT
42	Durham	Conflicts with NCDOT Project	Recommended route utilizes NC54 to provide greater connections to jobs. This route also conflicts with NCDOT future plans for I-40.	RTP; NCDOT
43	Durham	Conflicts with NCDOT Project	Recommended route utilizes NC54 to provide greater connections to jobs. This route also conflicts with NCDOT future plans for I-40.	Durham; NCDOT
44	RTP	Safety Concerns	Greater number of driveway conflict points than on southern side of NC54. Existing sidewalk will provide connection to future bikeway facility.	RTP; NCDOT
49	Durham	Conflicts with NCDOT Project	Recommended route utilizes NC54 to provide greater connections to jobs. This route also conflicts with NCDOT future plans for I-40.	Durham; NCDOT
52	Morrisville	Property Challenge	This parcel has been developed and no longer provides a viable route.	Morrisville; NCDOT
53	Morrisville	Safety Concerns	Available right-of-way inadequate for separated facility. In addition, this route includes many driveway cuts.	Morrisville; NCDOT
54	Morrisville	Property Challenge	Would bisect private property that is slated for future development. Recommendation is to provide connection to the future facility when property is developed.	Morrisville; NCDOT
55	Morrisville	Environmental Constraints	Floodplain and easement acquisition challenges have resulted in this option being removed from further consideration	Morrisville; NCDOT
56	Morrisville	Dependent Upon Infeasible Route	Segment #53 has been removed from consideration and therefore makes this segment void.	Morrisville; NCDOT
57	Morrisville	Recommended Connection	Recommended as a connection to the future facility but does not provide the through connection required for the bikeway.	Morrisville; NCDOT
58	RDU/Wake County	Safety Concerns	New Diverging Diamond Interchange at Airport Blvd does not provide efficient through movement for cyclists. Also connects to the north side of I-40 which has been removed from further consideration for this segment.	RDU; NCDOT
59	RDU/Wake County	Dependent Upon Infeasible Route	Segment #58 has been removed from consideration and therefore makes this segment void.	RDU
59	RDU/Wake County	Dependent Upon Infeasible Route	Segment #58 has been removed from consideration and therefore makes this segment void.	RDU
61	RDU/Wake County	Property Challenge	The project is considering a similar route to this but one that is entirely within the I-40 Right-of-way.	RDU; NCDOT
62	Cary/Wake County	Environmental Constraints	This segment is a close variation of the recommended route through this area. It has been eliminated because amount of right-of-way that is needed and the amount of structures needed to cross environmentally sensitive areas.	Wake County
63	Cary/Wake County	Environmental Constraints	This segment was removed from consideration because of the close proximity to environmentally sensitive areas that alternate routes avoided with similar right-of-way impacts.	Wake County
64	Cary/Wake County	Environmental Constraints	This segment was removed from consideration because of the close proximity to environmentally sensitive areas that alternate routes avoided with similar right-of-way impacts.	Cary; Wake County
65	Cary	Dependent Upon Infeasible Route	Segments #62 & 64 have been removed from consideration and therefore make this segment void.	Cary; Wake County
66	Cary	Safety Concerns	Recommended crossing at the interchange. This crossing will be considered if challenges arise with that solution.	Cary; NCDOT



ID	Jurisdiction	Category	Notes	Key Stakeholders
68	RDU/Wake County	Environmental Constraints	This route would negatively impact existing trails and green space in Lake Crabtree County Park.	RDU; Utility Company
69	RDU/Wake County	Environmental Constraints	This route would negatively impact existing trails and green space in Lake Crabtree County Park.	RDU; Utility Company
69	RDU/Wake County	Environmental Constraints	This route would negatively impact existing trails and green space in Lake Crabtree County Park.	RDU; Utility Company
70	RDU	Dependent Upon Infeasible Route	Recommended route utilizes southern I-40 right-of-way	RDU
73	RDU/State Parks	Environmental Constraints	This route's impacts to Umstead State Park deemed unacceptable.	RDU; NC State Parks
75	Cary	Dependent Upon Infeasible Route	Recommended route on the north side of I-40 to avoid conflicts with Cary Wastewater Treatment Plant and difficult design constraints crossing I-40 on Harrison Blvd.	Cary; NCDOT
76	Cary	Dependent Upon Infeasible Route	Recommended route on the north side of I-40 to avoid conflicts with Cary Wastewater Treatment Plant and difficult design constraints crossing I-40 on Harrison Blvd.	Cary
77	Cary	Dependent Upon Infeasible Route	Recommended route on the north side of I-40 to avoid conflicts with Cary Wastewater Treatment Plant and difficult design constraints crossing I-40 on Harrison Blvd.	Cary
78	Cary	Dependent Upon Infeasible Route	Recommended route on the north side of I-40 to avoid conflicts with Cary Wastewater Treatment Plant and difficult design constraints crossing I-40 on Harrison Blvd.	Cary; SAS
78	Cary	Dependent Upon Infeasible Route	Recommended route on the north side of I-40 to avoid conflicts with Cary Wastewater Treatment Plant and difficult design constraints crossing I-40 on Harrison Blvd.	Cary; SAS
79	Cary	Dependent Upon Infeasible Route	Recommended route on the north side of I-40 to avoid conflicts with Cary Wastewater Treatment Plant and difficult design constraints crossing I-40 on Harrison Blvd.	Cary; NCDOT
80	State Parks	Environmental Constraints	This route's impacts to Umstead State Park deemed unacceptable, future bikeway facility to be located within I-40 right-of-way.	NC State Parks
81	Raleigh	Property Challenge	Property has been developed and no longer offers a viable route	Private Property (Trenton Pointe)
83	Raleigh	Recommended Connection	Recommended as a connection to the future facility but does not provide the through connection required for the bikeway.	Raleigh; NCDOT
84	Raleigh	Dependent Upon Infeasible Route	Segments #77-79 have been removed from consideration and therefore make this segment void.	Raleigh; NCDOT
86	Raleigh	Conflicts with NCDOT Project	Conflicts with NCDOT plans for modifications to I-40 / Wade Ave interchange	Raleigh; NCDOT
87	Raleigh	Recommended Connection	Recommended as a connection to the future facility but does not provide the through connection required for the bikeway.	Raleigh; NCDOT
88	Raleigh	Safety/Maintenance Concerns	Existing culvert not recommended for bikeway through movement due to safety and maintenance concern related to flooding. Connection to future bikeway facility may be possible depending on floodplain permitting impacts.	Raleigh; NCDOT
90	Raleigh	Property Challenge	This route may conflict with North Carolina National Guard Joint Force Headquarters plans to construct a helipad.	Raleigh; NCDOT



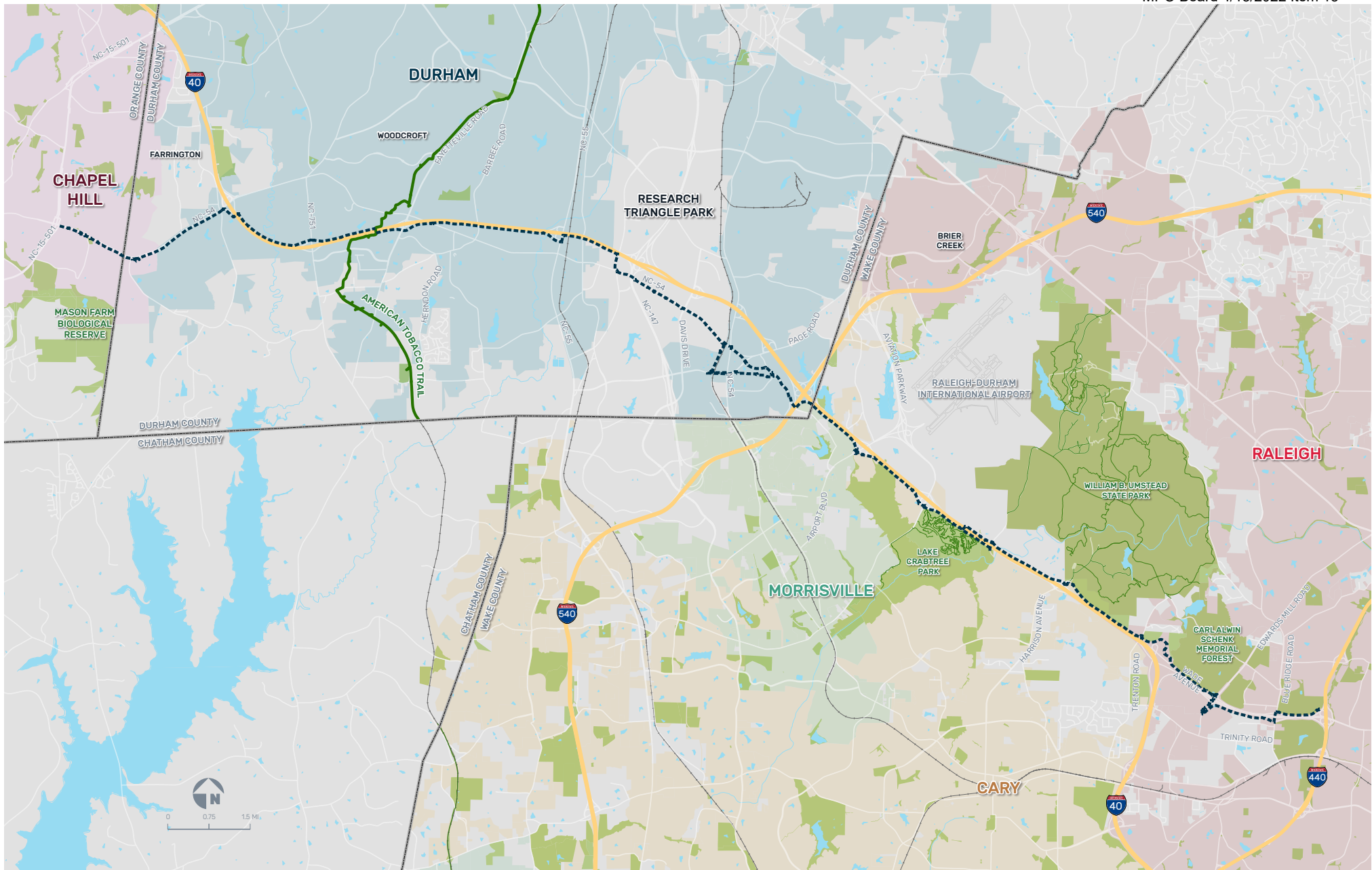
EVALUATED ROUTES NC-55 TO I-440

LEGEND

- Recommended Route
- Other Routes Studied
- Park

- Chapel Hill
- Durham
- Morrisville

- Cary
- Raleigh
- County



PREFERRED ALIGNMENT NC-15/501 TO I-440

LEGEND

- Recommended Routes
- Park

- Chapel Hill
- Durham
- Morrisville
- Cary
- Raleigh
- County

PREFERRED ALIGNMENT

Based on the results of the opportunity and constraints analysis and feedback received from both the public and major stakeholders along the corridor, the preferred alignment for the Triangle Bikeway was identified as shown on this map. The alignment spans approximately 23 miles from NC-15/501 in Chapel Hill to I-440 in Raleigh. It represents the most feasible and practicable route for implementation which also achieves the overall goals for the project and provides the desired high-quality user experience. Given the scale of the Triangle Bikeway, the alignment was divided into seven segments (as shown in the map on page 132) for implementation purposes as follows:

SEGMENT 1 - Begins at the US-15/501 interchange and will widen/replace the existing sidepath along the south side of NC-54 from Hamilton Rd to Barbee Chapel Rd and new sidepath will be constructed to Farrington Rd. Impacts to the waterfowl impoundment land owned by the USACE will be minimized by using boardwalk/bridge and will require coordination. Proposed pedestrian signals will be installed for crossings at Huntingridge Rd and Farrington Rd. This segment may be constructed as part of the programmed STIP project U-5774 in accordance with NCDOT's Complete Streets Policy.

SEGMENT 2 - Begins at Farrington Rd as a separated use path and runs along the I-40 eastbound on-ramp for a short distance before crossing over to the north side of the interstate with a separated use bridge. The segment continues along the north side of I-40, crosses New Hope Creek and Third Fork Creek via a series of boardwalks and bridges, crosses under NC-751 via a separated use tunnel, and ends at the connection to the existing American Tobacco Trail at the existing pedestrian bridge at Southpoint.

SEGMENT 3 - Begins at the existing American Tobacco Trail bridge and heads east along the south side of I-40 as a separated use path. Multiple grade-separated road crossings, at-grade road crossings, and creek crossings are required along the route before entering Research Triangle Park (RTP). Once inside RTP, the typical section changes to a shared use sidepath and runs along the west side of TW Alexander Dr before continuing east along the south side of NC-54 and ending at Davis Dr. The existing NC-54 bridge over NC-147 will be modified to accommodate the bikeway. Proposed pedestrian signals will be installed for intersection crossings at NC-55, Park Forty Plaza, TW Alexander Dr, and Davis Dr. Mid-block crossings will be installed at NC-54, Barbee Rd, and S Alston Ave.

SEGMENT 4 - Three options are feasible for this segment. Option A begins at Davis Dr as a shared use sidepath and runs along the south side of NC-54 before crossing mid-block just west of the railroad and Miami Blvd intersection. Continuing east along the north side of NC-54, the route crosses S Miami Blvd onto Slater Rd and turns onto the south side of Emperor Blvd. The route crosses at a signalized intersection to the south side of Slater Rd and passes the GoTriangle Regional Transit Center before crossing mid-block to the north side just prior to Shiloh Glenn Dr then crossing over I-540. The separated use path section continues east along the south side of I-40, crosses Stirrup Iron Creek, and ends at Airport Blvd. Proposed pedestrian signals will be installed for crossings at New Millennium Way, S Miami Blvd, and Airport Blvd.

Option B begins at Davis Dr as a shared use sidepath and runs along the south side of NC-54 before turning south just west of the railroad to follow a transmission power easement to Hopson Rd. After crossing Hopson Rd at the Keystone Park Dr intersection the route continues east along the south side of Hopson Rd below the railroad, across S Miami Blvd, and along Page Rd to First Citizens Bank. The route follows and extends existing trails through parking lots and turns onto the south side of Emperor Blvd. The route crosses at a signalized intersection to the south side of Slater Rd and passes the

GoTriangle Regional Transit Center before crossing mid-block to the north side just prior to Shiloh Glenn Dr then crossing over I-540. The separated use path section continues east along the south side of I-40, crosses Stirrup Iron Creek, and ends at Airport Blvd. Proposed pedestrian signals will be installed for crossings at New Millennium Way, Hopson Rd, and Airport Blvd.

Option C begins at Davis Dr as a shared use sidepath and runs along the south side of NC-54 before turning south just west of the railroad to follow a transmission power easement to Hopson Rd. The route continues east along the north side of Hopson Rd under the railroad and crosses at the S Miami Blvd intersection onto the south side of Page Rd to First Citizens Bank. The route follows and extends existing trails through parking lots and turns onto the south side of Emperor Blvd. The route crosses at a signalized intersection to the south side of Slater Rd and passes the GoTriangle Regional Transit Center before crossing mid-block to the north side just prior to Shiloh Glenn Dr then crossing over I-540. The separated use path section continues east along the south side of I-40, crosses Stirrup Iron Creek, and ends at Airport Blvd. Proposed pedestrian signals will be installed for crossings at New Millennium Way and Airport Blvd.

SEGMENT 5 - Two options are feasible for this segment. Option A begins at Airport Blvd and travels east along the south side of I-40 as a separated use path. A bridge crosses over Brier Creek and the route continues along I-40 before crossing Aviation Pkwy via proposed pedestrian signal. The route continues along the south side of I-40 adjacent to Lake Crabtree County Park before crossing to the north side of I-40 via a signature separated use path bridge. Continuing along the north side of I-40 adjacent to Raleigh-Durham (RDU) International Airport property, the route crosses Haley's Branch on boardwalk before ending at Old Reedy Creek Rd.

Option B begins at Airport Blvd and travels east along the south side of I-40 as a separated use path. A bridge crosses over Brier Creek and the route continues along I-40 before crossing Aviation Pkwy via proposed pedestrian signal. The route continues along the south side of I-40 adjacent to Lake Crabtree County Park before crossing over Lake Crabtree via boardwalk. After connecting with the Old Reedy Creek Rd Trailhead, users then cross to the north side of I-40 via modification of the existing Old Reedy Creek Rd roadway bridge.

SEGMENT 6 - Begins with a mid-block crossing of Old Reedy Creek Rd and heads east as a separated use path before crossing Crabtree Creek via a system of boardwalks and a bridge. The route continues along the north side of I-40 adjacent to the Wake Stone Corporation rock quarry before crossing Harrison Ave via a proposed pedestrian signal. The bikeway continues east adjacent to William B. Umstead State Park and ends with a mid-block crossing of Trenton Rd.

SEGMENT 7 - Begins at Trenton Road as a separated use path and heads east along the north side of the I-40 / Wade Ave interchange. The bikeway continues along the north side of Wade Ave adjacent to the Richland Creek corridor via a system of boardwalks to Edwards Mill Rd. The route heads south with at-grade crossings of the Wade Ave westbound on-ramp and eastbound off-ramp and crosses Edwards Mill Rd via the existing Richland Creek Trail pedestrian tunnel near the Wade Park Blvd intersection. The segment continues on the south side of Wade Ave and crosses back to the north side via a pedestrian bridge that will be constructed as part of a separate project along Blue Ridge Rd. Users will cross Blue Ridge Rd via pedestrian signals installed as part of the Blue Ridge Rd project and continue along the north side of Wade Ave and end at a connection to the existing pedestrian bridge over I-440 at the NC Museum of Art.

**Conceptual design plans for Segments 4, 5, and 6 are included in Appendix B.*



RECOMMENDED DESIGN STANDARDS

Given the regional and multi-jurisdictional nature of the Triangle Bikeway, consistent design standards should be applied for the length of the project. Utilizing consistent facility widths and materials provides a seamless and intuitive user experience and also promotes predictable user behavior that contributes to making the facility safe for users of all ages and abilities.

In conjunction with wayfinding and other branding efforts, applying consistent design standards will also increase recognition of the bikeway not only by users already on the facility but passing motorists as well. Recognition of the facility by the public in multiple locations through the course of their daily lives helps highlight and reinforce the connections the bikeway makes and may result in individuals considering alternative modes of transportation for some trips.

A 16-foot wide separated use facility type with delineation between areas for bicycling and areas for walking is proposed as the default typical section for the bikeway. The selection of this facility type reflects input received from the public, working group members and other stakeholders. Providing adequate width and separating use types supports the vision for the bikeway to serve not only as a commuter facility but to also meet the recreational use demand identified during public outreach. As the rise in popularity of bicycling and use of e-bikes generates greater interest in multi-modal commuting, the proposed user type separation will increase safety by reducing conflicts between those walking and those traveling at higher speeds by bike.

For user experience and safety, grade-separated crossings of high speed / high traffic volume roadways should be implemented to the maximum extent practicable as design constraints and specific site conditions allow. Separation from both pedestrians and motor vehicles allows bicyclists to maintain speed resulting in greater trip efficiency and the ability to accommodate a greater volume of users during peak commuting hours.

Recognizing the impracticality of applying a single typical section for the entire length of the corridor due to environmental and other design constraints, the following pages detail several additional typical sections and the context in which they should be applied. Material types specified seek to balance up-front construction costs and to minimize maintenance burden and reduce overall life-cycle costs. Images of similar design precedents are also provided for reference. Additional design resources are located in Appendix E.



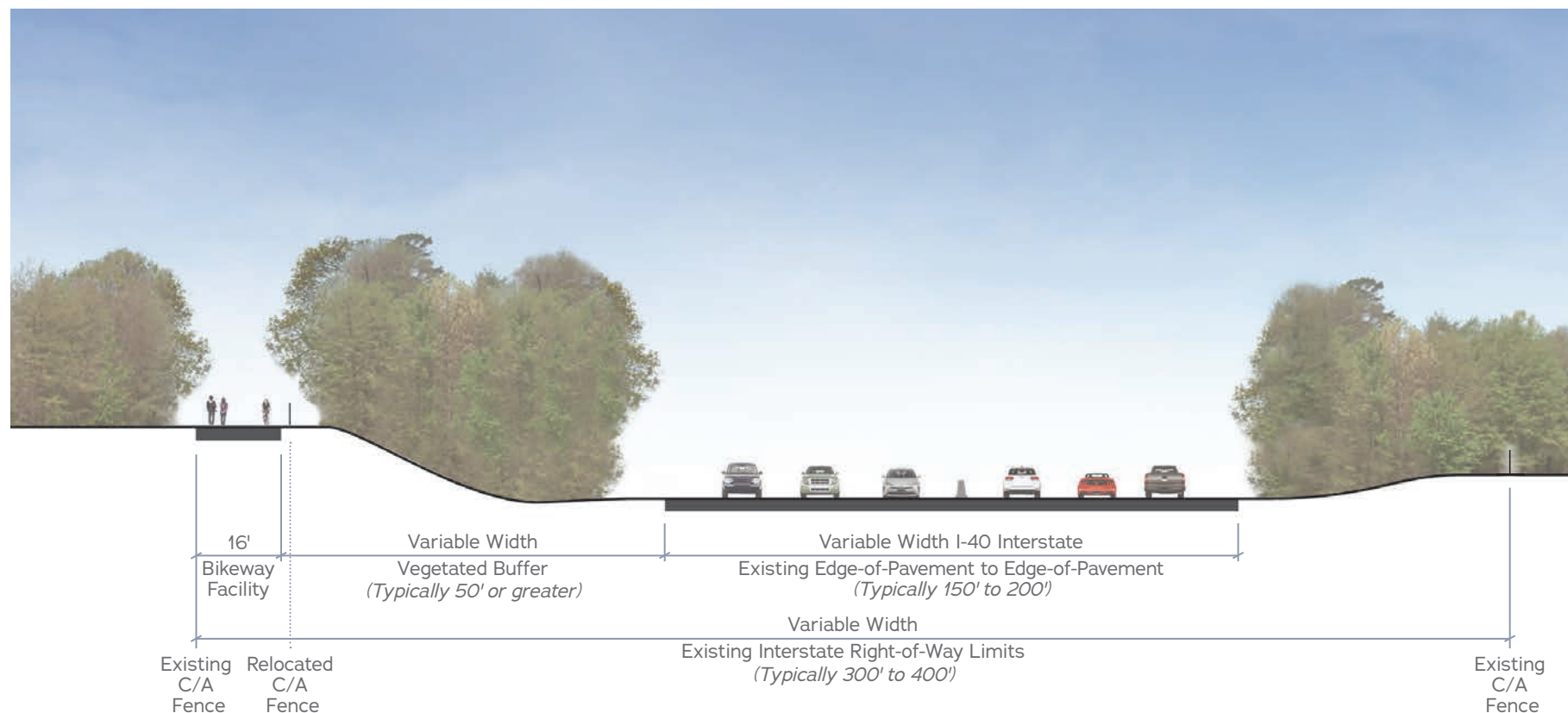
Rendering of Triangle Bikeway at Blue Ridge Rd



Rendering of Triangle Bikeway Within Highway Corridor



Rendering of Triangle Bikeway Bridge over I-40



RELATIONSHIP TO INTERSTATE CORRIDOR

The Triangle Bikeway parallels I-40 within existing NCDOT right-of-way for the majority of the preferred alignment. The edge of the outside stone shoulder of the bikeway shall be located as close to the existing right-of-way line as possible, maximizing separation of the facility from vehicular traffic via a vegetated buffer to provide the best user experience and preserve as much right-of-way adjacent to the existing roadway as possible for future roadway expansion projects. The vegetated buffer width is typically 50' or greater along the corridor, but may narrow as the facility approaches constrained areas such as along interchange ramps.

A permanent access and maintenance easement within the existing NCDOT right-of-way shall be acquired for the bikeway facility. Easement width may vary by location depending on bikeway typical section and presence

of any seating/other amenity areas that will not be maintained by NCDOT. Additional temporary construction easement outside permanent easements will be required for construction access, grading, and other construction activities.

As I-40 is a controlled access facility, construction of the bikeway will require the relocation of the control-of-access fence from the existing right-of-way line to the inside of the bikeway to prevent users from reaching the interstate facility. The distance from the bikeway to the fence should promote a sense of openness to enhance user comfort and safety, but may be installed along the edge of the stone shoulder in constrained areas. Exact fence location will vary throughout the corridor and will require coordination and approval from the NCDOT Control of Access Review Committee.



SEPARATED USE PATH

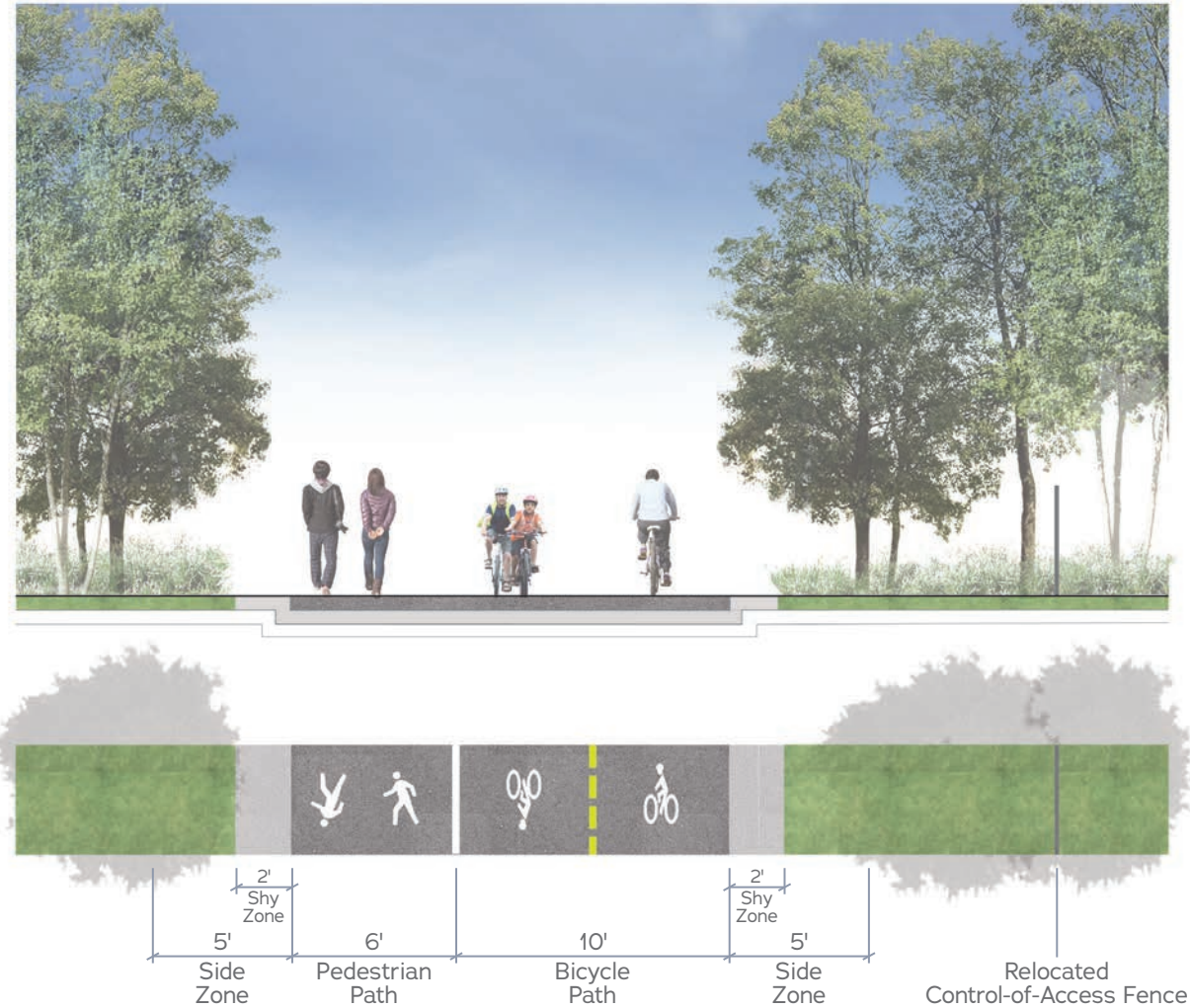
This is the preferred typical section for the Triangle Bikeway and is recommended as the default facility type unless a spatial constraint exists that cannot be overcome.

A 10 foot two-way asphalt bike path is directionally separated by a dashed yellow centerline.

An adjoining six foot asphalt pedestrian path is separated from the bike path by a solid white line.

Two foot shy zones/stone shoulders provided on either side of the facility help ensure user safety by limiting adjacent obstructions and allow for use of the full paved width.

Five foot side zones provide space for enhancements such as lighting, wayfinding, seating, landscaping and other amenities.





Separated Use Path - Boulder, CO



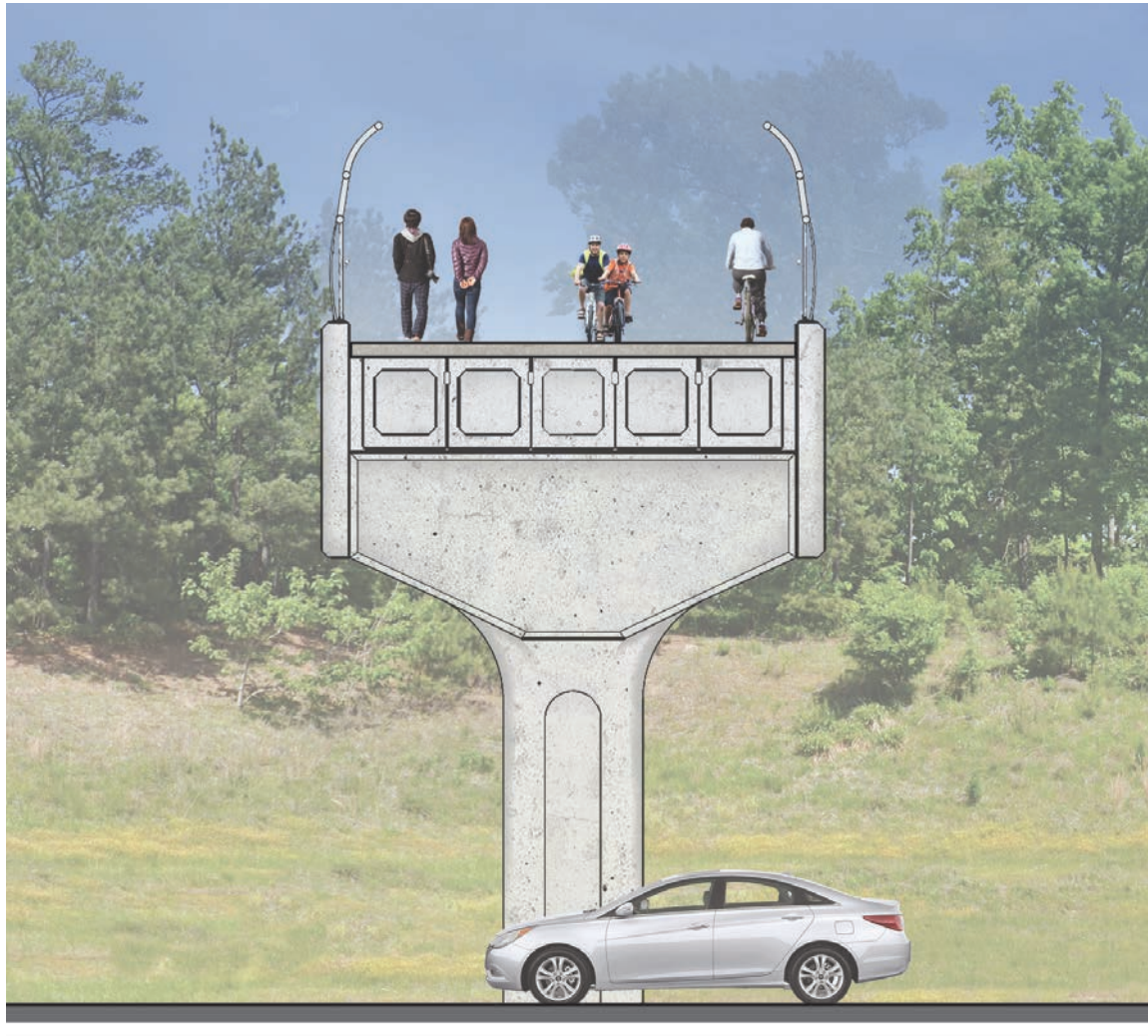
Separated Use Path on Libba Cotten Bikeway - Carrboro, NC



Separated Use Path - Long Beach, CA



Separated Use Path on Chandler Bikeway - Burbank, CA



SEPARATED USE BRIDGE

This typical section should be used to elevate the Triangle Bikeway over roadways (such as I-40) and connect to separated use path sections at either end of the bridge. Minimum vertical clearance over roadways shall be provided based on NCDOT Bridge Policy requirements.

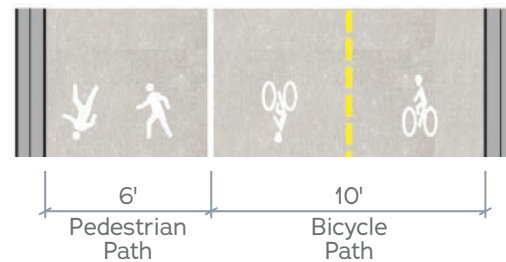
A 10 foot two-way concrete bike path is directionally separated by a dashed yellow centerline.

An adjoining six foot concrete pedestrian path is separated from the bike path by a solid white line.

A variety of design types are available including truss bridges, girder (beam) bridges, arch bridges, suspension bridges, and cable-stayed bridges among others. Bridge design type selection will vary depending on specific site conditions, cost constraints, and potential impacts to traffic during construction.

Safety rails and hand rails should be provided in accordance with applicable building codes and NCDOT Bridge Policy.

Given the high-visibility of these areas to the traveling public, these bridges present a unique opportunity for branding and placemaking. Consideration should be given to design aesthetics and potential incorporation of public art, dynamic lighting, or other elements that create a distinct sense of place in the community.





Separated Use Path on Bridge - Calgary, Canada



Separated Use Path on Bridge - Oakland, CA



Separated Use Path on Bridge - Brisbane, Australia



Separated Use Path on Bridge - Minneapolis, MN



SEPARATED USE TUNNEL

This typical section should be used for grade-separated crossings under roadways and connect to separated use path sections at either end of the tunnel.

A 10 foot two-way concrete bike path is directionally separated by a dashed yellow centerline.

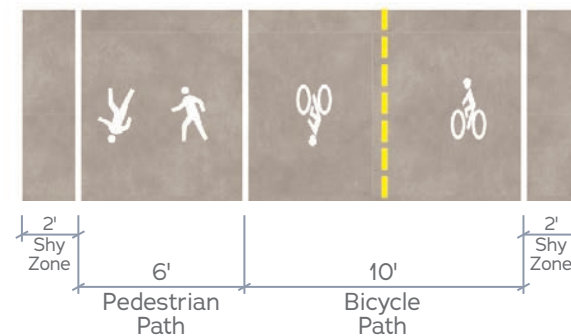
An adjoining six foot concrete pedestrian path is separated from the bike path by a solid white line.

Two foot shy zones/concrete shoulders with white edge lines provided on either side of the facility help ensure user safety by keeping users away from the tunnel side walls and allowing for use of the full bike and pedestrian path widths.

Desired minimum vertical clearance inside the tunnel is 12 feet. Designs should maximize the vertical clearance within the tunnel to the extent practicable based on specific site constraints to maintain a sense of openness and security for users.

Lighting inside the tunnel is required to ensure continual visibility and user safety at all times.

Consideration should also be given to potential incorporation of dynamic lighting, vibrant murals or other public art elements that create a comfortable and inviting environment for users.

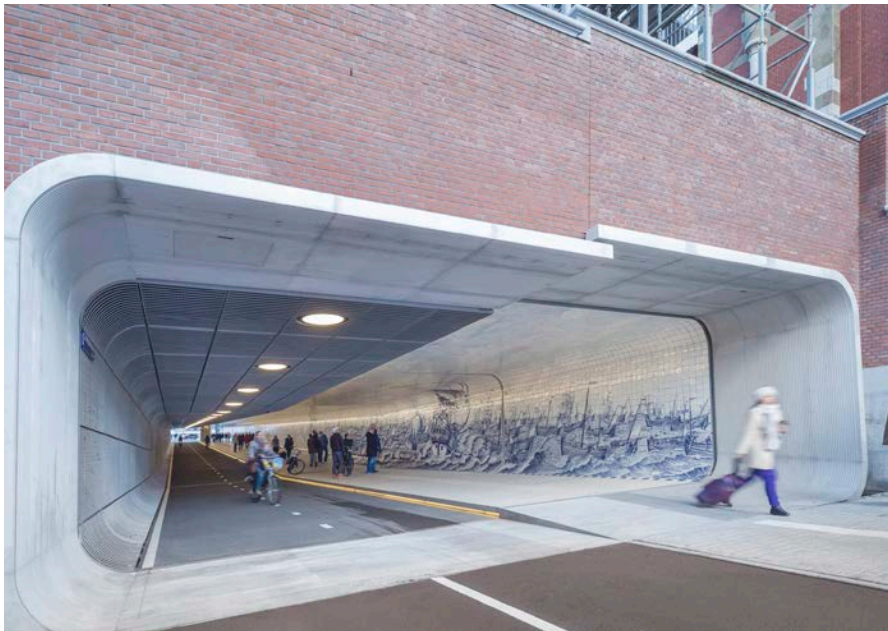




Separated Use Path Underpass - Tucson, AZ



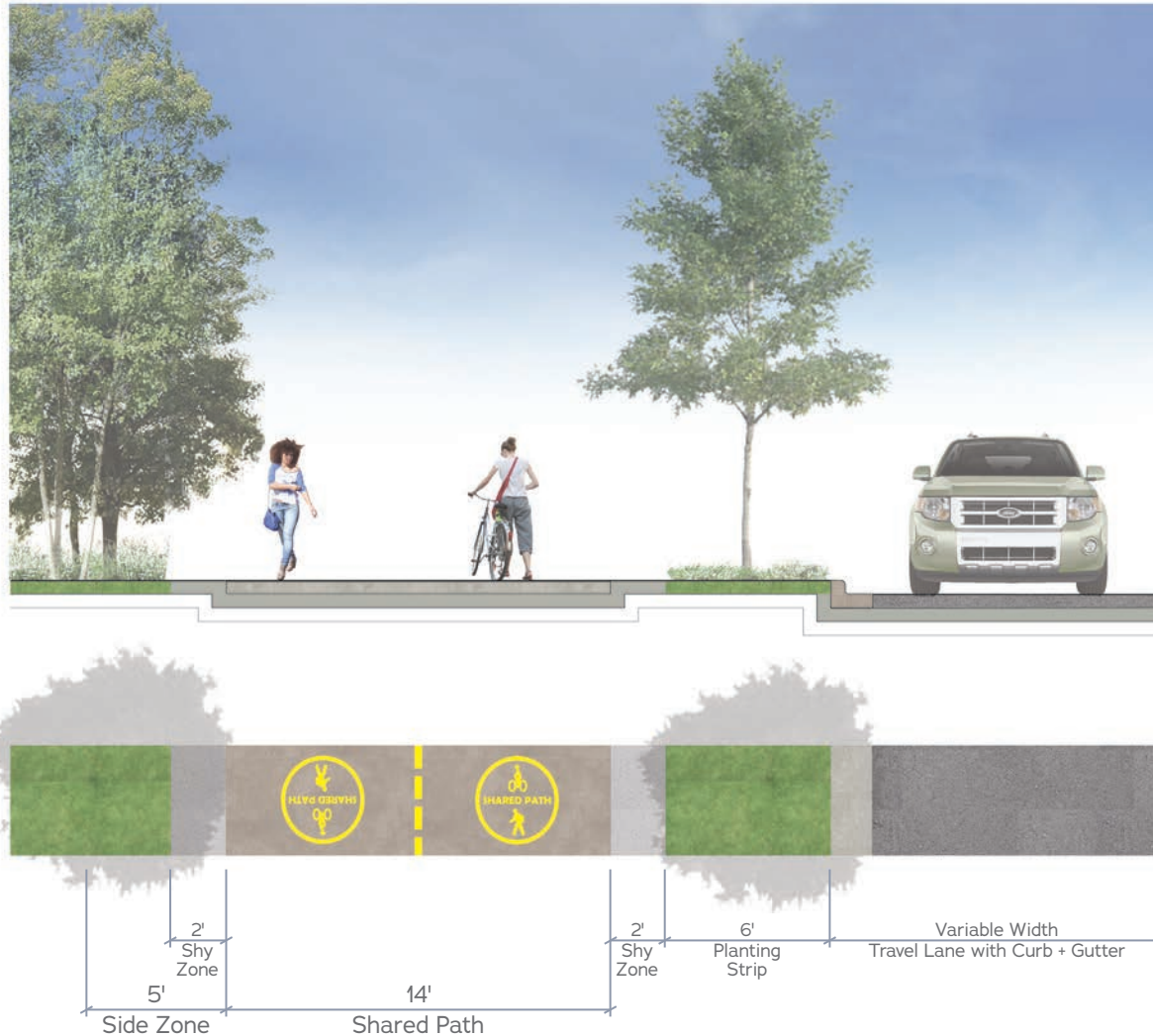
Farmington Canal Heritage Trail Tunnel - Hamden, CT



Separated Use Path in Tunnel - Amsterdam, Netherlands



Separated Use Path in Tunnel - Netherlands



SHARED USE SIDEPATH

This typical section should be used for areas of the Triangle Bikeway where the alignment leaves the interstate corridor and spatial constraints do not allow for construction of the preferred separated use path facility.

A 14 foot two-way concrete shared use path for bicyclists and pedestrians is directionally separated by a dashed yellow centerline.

A six foot planting strip is provided to separate users from motorized traffic on the adjacent roadway. Planting strip width may be reduced in highly constrained areas.

Two foot shy zones/stone shoulders provided on either side of the facility help ensure user safety by limiting adjacent obstructions and allow for use of the full paved width. As an alternative, shoulders may be concrete but may increase construction cost from the estimates contained in this report.

A five foot side zone on the outside provides space for enhancements such as lighting, wayfinding, seating, landscaping and other amenities.

Pavement markings and signage should be used to provide visual continuity and inform bicyclists and pedestrians to share the same space and enhance safety.



Shared Use Path Adjacent to Roadway - Ridgeland, MS



Shared Use Path Adjacent to Roadway - NC-54 - Chapel Hill, NC



Shared Use Path Adjacent to Roadway - PATH 400 - Atlanta, GA



Shared Use Path Adjacent to Roadway - Alexandria, VA



SHARED USE BOARDWALK

This typical section should be used to elevate the Triangle Bikeway in select areas such as wetlands to minimize environmental impacts, along streams to limit flooding on the facility / minimize impacts to the 100-year floodplain elevation, and along areas of natural steep topography to achieve accessible longitudinal grades for users on the bikeway.

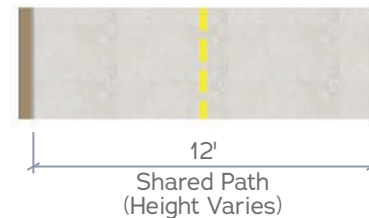
A 12 foot clear width two-way shared use path for bicyclists and pedestrians is directionally separated by a dashed yellow centerline. As an alternative, the clear width may be increased to 16 feet but will increase costs above the estimates contained in this report.

Pavement markings and signage should be used to provide visual continuity and inform bicyclists and pedestrians to share the same space and enhance safety.

The deck surface should be concrete (cast-in-place or pre-cast) which provides greater friction to reduce the risks of slips and falls and reduces long-term maintenance burdens compared to those associated with other materials such as timber.

Safety rails and hand rails should be provided in accordance with applicable building codes. A variety of materials for railing are available, but it is recommended that a single railing design and material be selected and used throughout the entire Triangle Bikeway corridor to ensure a consistent user experience and streamline any associated maintenance.

Boardwalk substructure design and materials may vary depending upon specific site conditions and geotechnical recommendations.





Elevated Concrete Deck Boardwalk on Toby Creek Greenway - Charlotte, NC



Elevated Concrete Deck Boardwalk on White Oak Greenway - Cary, NC



Elevated Concrete Deck Boardwalk on Lake Crabtree - Cary, NC



Elevated Concrete Deck Boardwalk on Toby Creek Greenway - Charlotte, NC



SHARED USE BRIDGE

This typical section should be used to elevate the Triangle Bikeway over creeks, roadways, and railroads to connect shared use path sections at either end of the bridge.

A 12 foot clear width two-way shared use path for bicyclists and pedestrians is directionally separated by a dashed yellow centerline. As an alternative, the clear width may be increased to 16 feet but will increase costs above the estimates contained in this report.

Pavement markings and signage should be used to provide visual continuity and inform bicyclists and pedestrians to share the same space and enhance safety.

Prefabricated steel truss bridges are a common, cost effective bridge type in this application and are the recommended bridge type for this typical section. A variety of truss designs and finishes are available to choose from. Corten / weathering steel is a finish which should be considered for its ability to blend well with natural surroundings and its minimal maintenance requirements as compared to those for painted finishes.

The deck surface should be concrete which provides greater friction to reduce the risks of slips and falls and reduces long-term maintenance burdens compared to those associated with other materials such as timber.

Safety rails and hand rails should be provided in accordance with applicable building codes. A variety of materials for railing are available, but it is recommended that a single railing design and material be selected and used throughout the entire Triangle Bikeway corridor to ensure a consistent user experience and streamline any associated maintenance.

Bridge substructure design and materials may vary depending upon bridge design type, specific site conditions, and geotechnical recommendations.



Shared Use Bridge on Little Sugar Creek Greenway - Charlotte, NC



Shared Use Bridge on Lake Fayetteville Trail - Fayetteville, AR



Shared Use Bridge on Brushy Creek Regional Trail - Williamson County, TX



Shared Use Bridge on Smith Creek Greenway - Wake Forest, NC



LIGHTING

Well placed and properly maintained lighting can improve visibility, increase overall bikeway access and give users a greater sense of security. Commuters traveling on the bikeway, especially in winter months with shorter hours of daylight, have a greater need for lighting than weekend visitors, who may be more likely to limit their activities to daylight hours. Lighting on the bikeway shall:

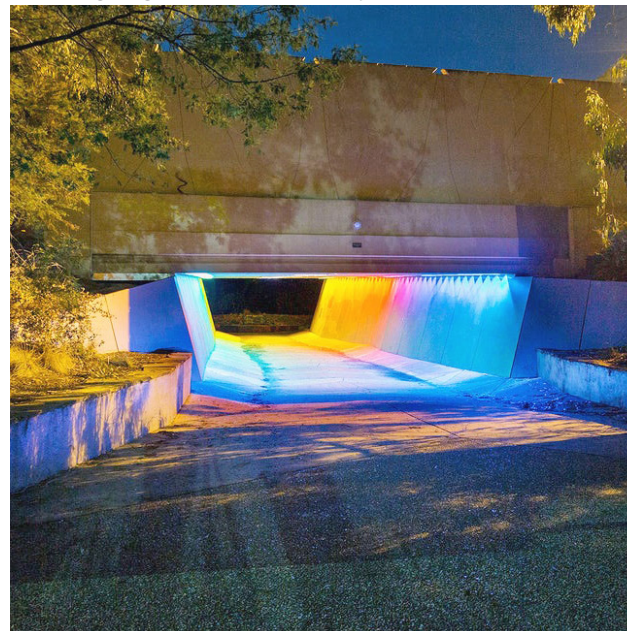
- › Meet the American Association of State Highway and Transportation Officials' (AASHTO) Guide for the Development of Bicycle Facilities requirements for shared-use paths.
- › Light only what's needed and comply with dark-sky requirements to help minimize light pollution, which impacts people, animals, and the environment.
- › Be of appropriate scale and spacing to ensure adequate coverage.
- › Be placed where required for safety at tunnels and overpasses; trailheads; bridges; gathering places; along streets; crosswalks; where the bikeway crosses another path or sidewalk; and on signage.
- › Be aesthetically consistent along the length of the bikeway to provide a seamless user experience.

A variety of lighting types are available including wired, battery-powered, and solar-powered each of which offers unique advantages or disadvantages with regard to cost, maintenance burden, and environmental impacts.

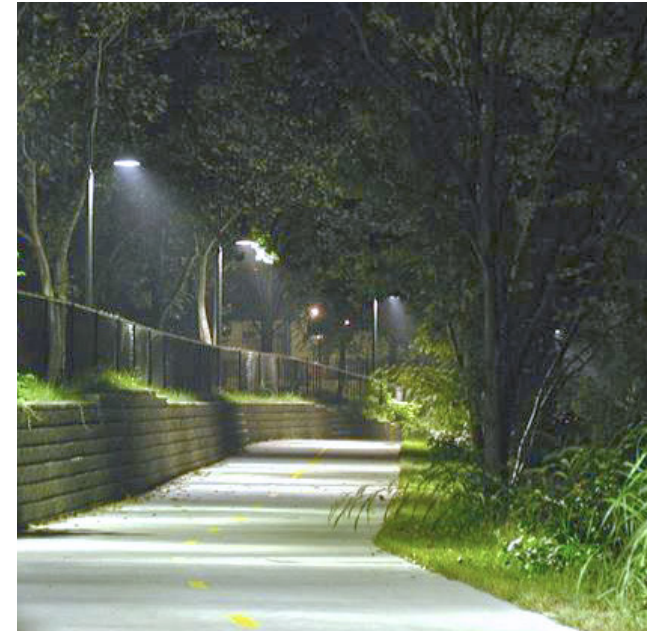
Use of colored and/or dynamic lighting schemes in select areas (such as tunnels and bridges) can enhance the user experience, contribute to the overall brand/identity of the bikeway, and raise awareness of the facility to the traveling public.



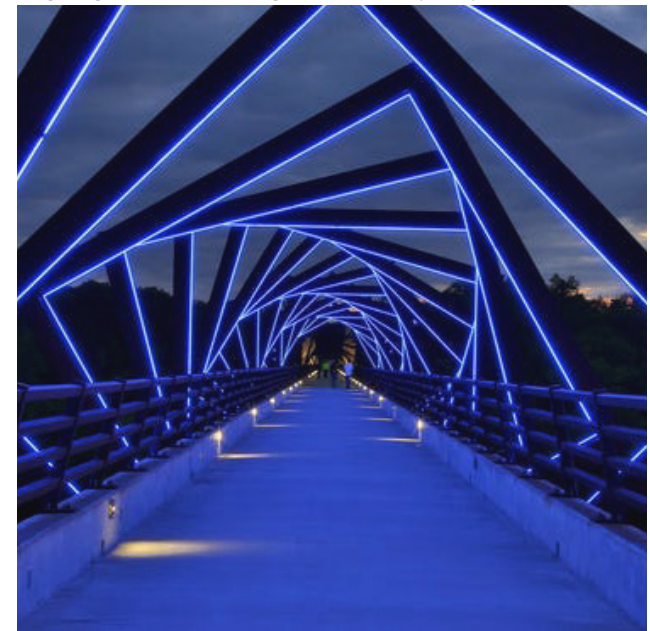
Solar Lighting on Whittier Greenway - Whittier, CA



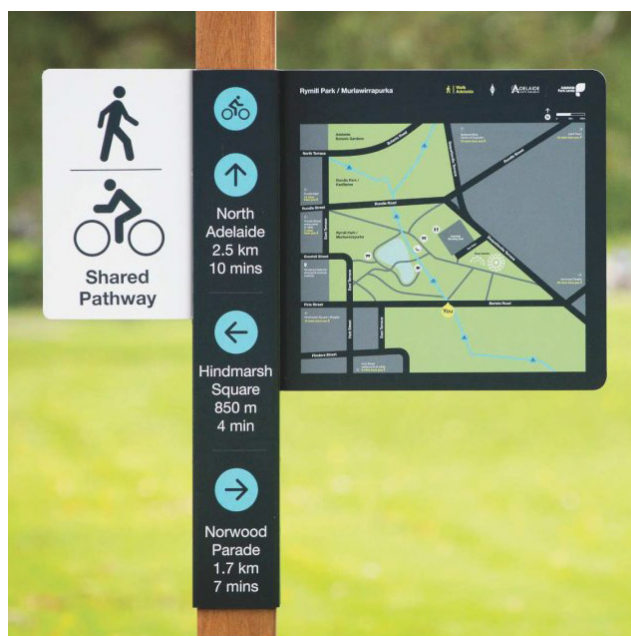
Colored Lighting at Larissa Underpass - Maroondah, Australia



Lighting on Razorback Regional Greenway - Fayetteville, AR



Colored Lighting at High Trestle Trail Bridge - Madrid, IA



Shared Pathway Wayfinding Signage - Adelaide, Australia



Oak Leaf Trail Wayfinding Signage - Milwaukee, WI



US 36 Bikeway Wayfinding Signage - Broomfield, CO



Milemarker Wayfinding on BeltLine Trail - Atlanta, GA

WAYFINDING

Wayfinding consists of comprehensive signage, mapping, and marking systems that help inform and educate users as they make their way to, from, and along the Triangle Bikeway.

A cohesive system across the corridor will enhance access, provide a greater sense of security and comfort, promote desired user behaviors, improve awareness of nearby trail and transit networks, and reinforce the brand/identity of the facility. The following principles should guide the development of the Triangle Bikeway wayfinding system:

- › **CONSISTENCY** - User experience should feel consistent and continuous across the entire corridor, regardless of jurisdiction.
- › **CONNECTIVITY** - A primary function of wayfinding is to connect users to destinations and other routes. It should clearly communicate current locations, access points, adjacent streets, distances, directions, destinations, estimated travel times, and historical/cultural/environmental information where applicable.
- › **IDENTITY** - A strong wayfinding identity will make the bikeway more recognizable and memorable to visitors and local residents alike. Custom designs and graphics should be used to create a unique identity which reflects the goals of the bikeway and the character of the region it will serve.
- › **PREDICTABILITY** - Apply wayfinding in a predictable manner (including sign placement, design, and content) to allow users to quickly understand the information being presented. For users, this builds trust, increases comfort, reduces stress, and provides a welcoming and low-stress experience as they navigate the bikeway.
- › **SIMPLICITY** - Present information in a clear, logical, universal way to reach the widest possible demographic. The longer it takes to understand the information presented, the less likely the system will be used or relied upon.



DATA COLLECTION

Bicycle and pedestrian count data are an essential tool to justify investments in active transportation infrastructure and communicate with the public, elected officials, and other stakeholders. Collecting this data provides insights into temporal user volume trends (time of day and seasonal), user type trends (biking vs. walking), and user volume trends by geographic location (which sections are most frequently used). This information can also help identify potential areas of need as municipalities plan their future pedestrian and bicycling infrastructure projects.

A variety of counting technologies and products are available depending on the specific application and budget. These range from inductive loop detectors, pneumatic tube detectors, and passive infrared detectors among others.

Mobile counters provide the flexibility to collect data in one location before moving to another collection location and are typically battery-powered. Fixed counters are used at locations where long-term data collection is desired and may be wired or battery-powered. Some blend in with their surroundings and others utilize real-time display totems to present daily and yearly counts and engage directly with those users being counted. A combination of these counter types is anticipated for deployment on the Triangle Bikeway.

Depending on the specific product, count data may be retrieved manually from the counter or may streamline the process via wireless transmission, reducing trips to the field. Online, easy-to-use data platforms are also offered to analyze and visualize the data. Features include dashboards and interfaces to provide access to count data for the development of custom websites and mobile applications.

The emerging use of "Big Data" crowdsourced from mobile phone users, via services such as Streetlight and Strava, may also be an option for collecting user count data.



Real-time Display Bicyclist + Pedestrian Counter - Jacksonville, FL



Real-time Display Counter - Montreal, Canada



Bicyclist + Pedestrian Counter - Granby, Canada



High Line Branding - New York City, NY



Fonta Flora State Trail Branding - Burke County, NC



Carolina Thread Trail Branding - Cleveland County, NC

BRANDING

The most popular trails and bikeways establish strong brands and identities to drive recognition at the local and regional levels and beyond to attract users. A consistent, high-quality user experience may be achieved through repeating brand elements such as typical sections (including materials selection), wayfinding (including logos, graphics, and color palette), lighting, furnishings, and other amenities.

A comprehensive branding study should be conducted with community input to establish these elements to be used across the entire Triangle Bikeway corridor. A preliminary logo was developed for use in this feasibility and implementation study, which may serve as inspiration during the branding study.



CROSSINGS

Crossings vary in design and are vital to the overall safety and efficiency of a community's multimodal network. A variety of conflicts associated with off-road bicycle and pedestrian facilities occur at roadway crossings; therefore, it is critical facility design reduces risk of crashes and fatalities. Crossing design should facilitate visibility and predictability for all users, creating an environment in which complex movements feel safe, easy, and comfortable. Design guidance documents that provide specific recommendations for crossing treatments include the 2019 NACTO Don't Give Up at the Intersection, the FHWA Safe Transportation for Every Pedestrian and the 2012 AASHTO Guide for the Development of Bicycle Facilities (updated version forthcoming). Treatments should also comply with the Manual on Uniform Traffic Control Devices (MUTCD).

The following images represent some of the recommended typical treatments. As images are collected from across the United States, details and specific design features may vary from proposed treatments ultimately implemented for the Triangle Bikeway. The recommended crossing treatments are not a comprehensive list of best practices. Rather, recommended crossing treatments respond to existing conditions along the proposed alignment. All crossings along the proposed alignment were categorized based on existing conditions. The following pages contain a table showing the relationship between existing crossing type and proposed treatments in addition to preliminary crossing concepts for select intersections. Additional information on the application of crossing treatments is shown in Appendix B.



High-Visibility Crosswalk + Median Refuge



Driveway High-Visibility Conflict Markings



Bicycle + Pedestrian Bridge



Pedestrian Bridge Over I-40 (By Others) & Proposed At-Grade Crossing at Blue Ridge Road



High Intensity Activated Crosswalk (HAWK)



Rectangular Rapid Flash Beacon (RRFB)



Truck Apron



Raised Driveway Crossing



High-Visibility Crossing + Pedestrian Signal



Signal Enhancements + Turning Restriction



Interstate Overpass



Pedestrian + Bicycle Underpass



Trail Crossing Warning Sign



CROSSING TYPES AND RECOMMENDED TREATMENTS

Existing Crossing Type	Example Location	Recommended Treatment
Type A Existing Conditions: 2 Lane mid-block or uncontrolled Highway Ramp; 25 - 45 MPH	› Triangle Expressway and Park Center Loop	› High-Visibility Crosswalk with Advance Stop Bar / Yield Lines › Narrowed Travel Lanes + Median Refuge (where possible) › Trail Crossing Warning Sign
Type B Existing Conditions: 3+ lane mid-block; 25 - 45 MPH	› Hopson Road and Keystone Park Drive	› High-Visibility Crosswalk › Rectangular Rapid Flash Beacon (RRFB) or High-Intensity Activated Crosswalk (HAWK) › Narrowed Travel Lanes + Median Refuge (where possible)
Type C Existing Conditions: 2-4 lane intersection with traffic control device; 25 - 45 MPH	› Slater Road and Emperor Boulevard	› High-Visibility Crosswalk › Pedestrian Signal Enhancements + Vehicle Turning Restrictions (i.e. no right-on-red) › Median Refuge (where possible) › Truck Aprons and/or Tighter Corner Radii
Type D Existing Conditions: 5+ lane intersection with traffic control device; 25 - 45 MPH	› NC 55 and Park Forty Plaza	› High-Visibility Crosswalk › Pedestrian Signal Enhancements + Vehicle Turning Restrictions (i.e. no right-on-red) › Enhanced Lighting › Median Refuge (where possible) › Truck Aprons and/or Tighter Corner Radii
Type E Existing Conditions: Interstate, freeway, and expressway; ≥ 55 MPH	› I-40 between Aviation Parkway and Old Reedy Creek Road	› Pedestrian- and Bicycle-only Bridge › Interstate Overpass › Pedestrian- and Bicycle-only Underpass › Pedestrian- and Bicycle-only Tunnel
Type F Existing Conditions: Unsignalized commercial driveway	› Commercial driveways along Hopson Road	› High-Visibility Conflict Markings › Raised Driveway Crossing or Median Refuge (where possible) › Driveway Consolidation and/or Narrowing (where possible) › Truck Aprons and/or Tighter Corner Radii (depends on traffic volumes)

* Grade-separated crossings, which are recommended as standard treatments for Type E locations may be appropriate for other crossings but increase cost of implementation..



Proposed Triangle Bikeway Bridge Over I-40

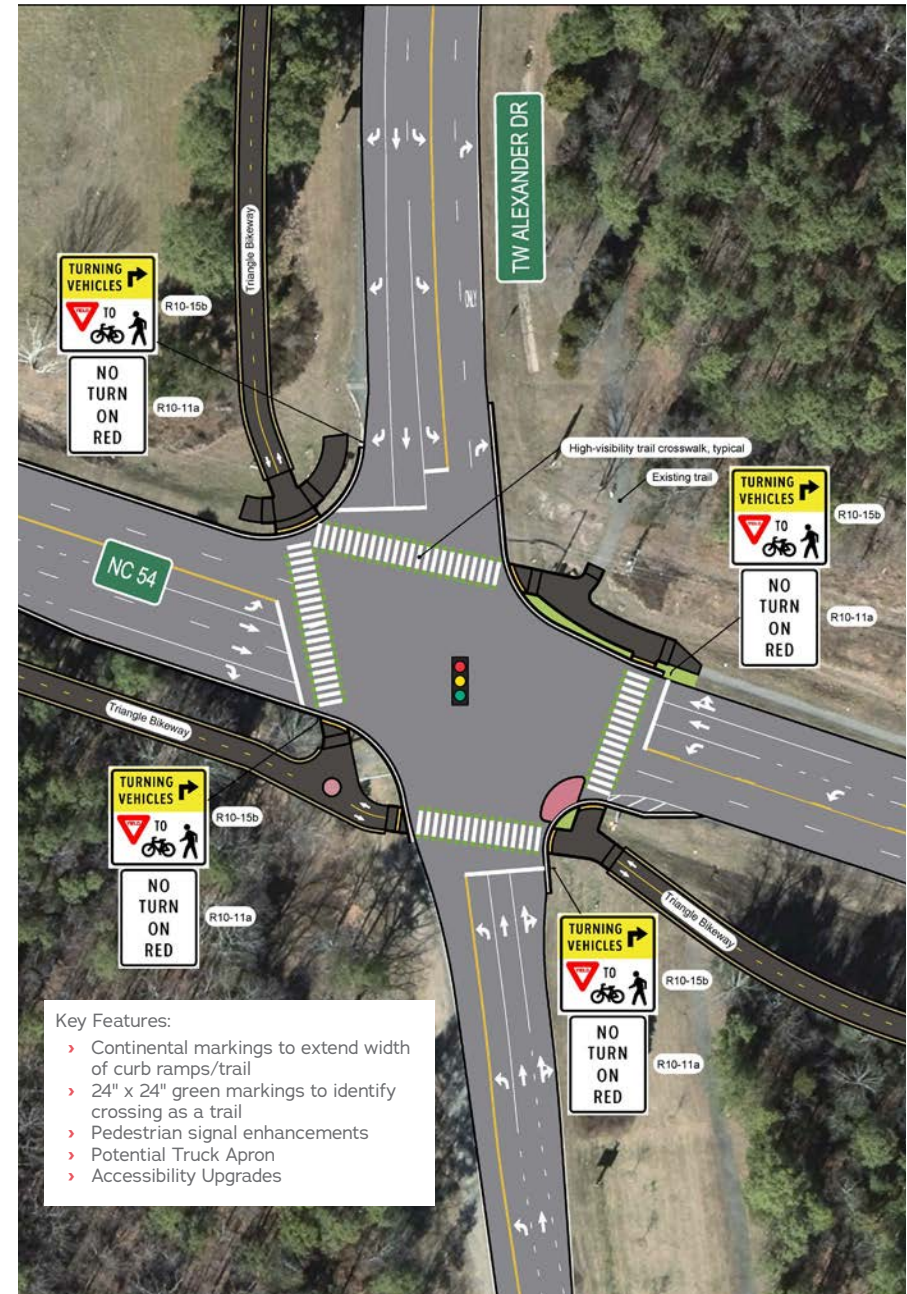


Proposed At-Grade Crossing at Blue Ridge Road & Pedestrian Bridge Over I-40 (By Others)



Proposed At-Grade Crossing at Blue Ridge Road & Pedestrian Bridge Over I-40 (By Others)

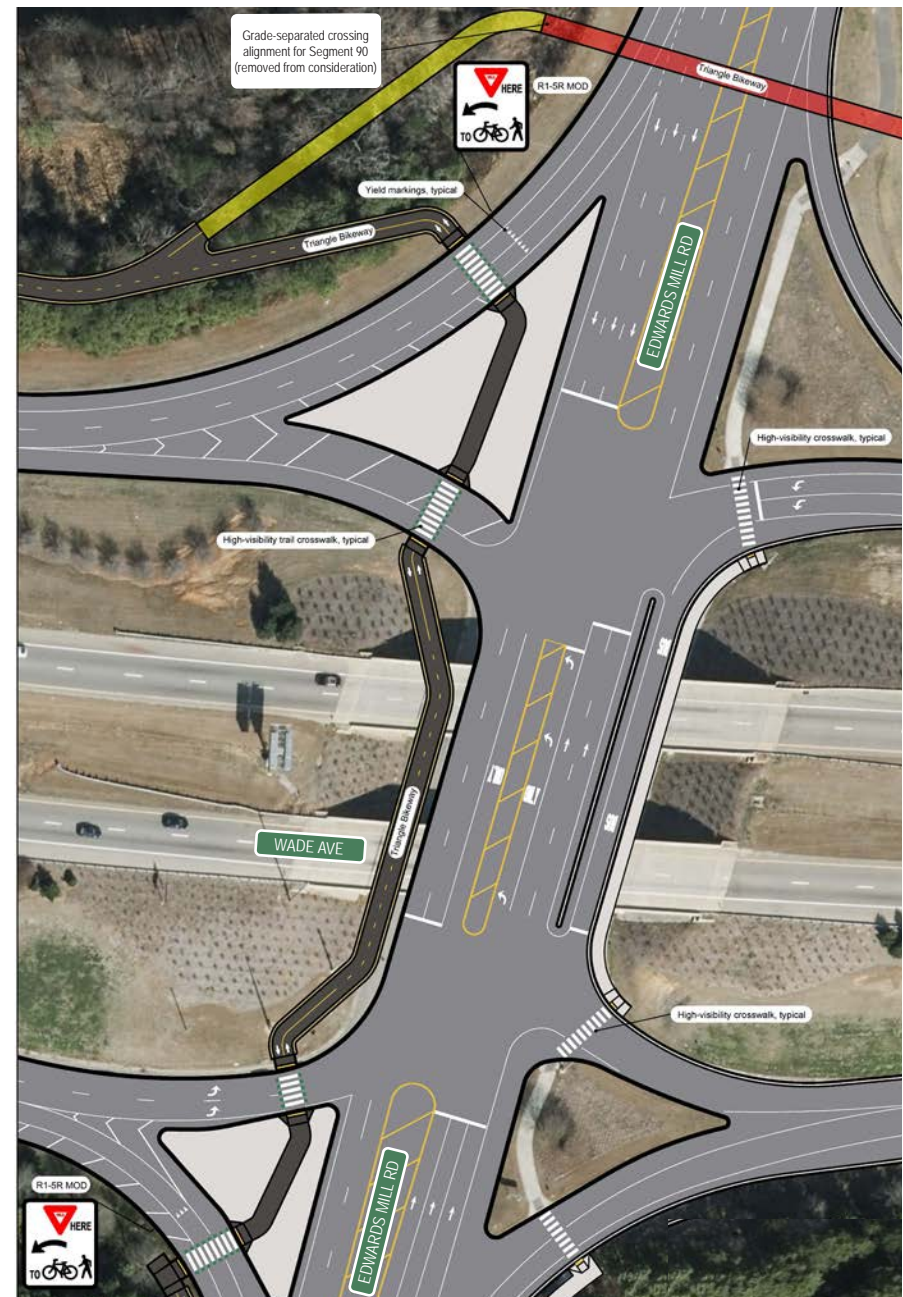
124 TRIANGLE BIKEWAY STUDY



Preliminary Intersection Crossing Concept - NC-54 at TW Alexander Drive



Preliminary Intersection Crossing Concept - N Harrison Avenue at I-40 Exit 287



Preliminary Interchange Crossing Concept - Edwards Mill Road at Wade Avenue

" *This needs to be made, I love the idea so much! I know so many people who would bicycle and walk more if they had access to a trail like this.* **"**

**- Community Survey
Respondent**





05

IMPLEMENTATION

OVERVIEW

Recommendations outlined in the Triangle Bikeway Study represent a major investment in multimodal transportation that will positively impact the way in which residents, employees, and visitors travel throughout the region. Successful implementation of the Triangle Bikeway will require a coordinated and consistent effort with a wide range of community partners. Key agencies and partners include the Capital Area MPO, Durham-Chapel Hill-Carrboro MPO, NCDOT, municipalities and counties along the corridor, transit agencies, advocacy organizations, private partners, and members of the community.

This chapter outlines action steps, design considerations, and a set of implementation scenarios to guide key agencies and stakeholders in the funding, design, and construction of the Triangle Bikeway. Action steps prioritize implementation strategies over a 10-year planning horizon. Cut sheets of the recommended route present design considerations of each corridor segment, defining potential roadway crossings, transit connections, bicycle and pedestrian connections, right-of-way and permitting needs, and estimated costs. Implementation scenarios outline potential paths to develop the Triangle Bikeway based on accelerated, incremental, and gradual time frames.

IMPLEMENTATION PARTNERS

As a multi-jurisdictional project, achieving success in the development of the Triangle Bikeway relies on collaboration with community partners and stakeholders at the state, regional, and local levels. Implementation will require both individual and coordinated efforts by all project stakeholders. Key roles in the implementation of the Triangle Bikeway are outlined below.

COMMUNITY PARTNERS

Commitment to sustaining equitable community engagement as the project moves from planning to design and eventually to construction is critical to the success of the Triangle Bikeway. Project leaders should implement the following community engagement practices when making decisions with community partners as the project develops.

- › Develop and implement an equitable engagement plan that identifies desired outcomes and measures for community engagement efforts. Following the adoption of the Durham Belt Line Master Plan, the City of Durham drafted the Equitable Community Engagement Blueprint to guide the design and construction of the Belt Line Trail. The community engagement principles outlined in this document should be used as a resource when developing an engagement plan for the Triangle Bikeway.
- › Partner with community-based organizations that have experience working with community members in the project area. Collaborate with the Triangle Bikeway Working Group, A Better Wake, City of Durham NIS Community Engagement, City of Raleigh Office of Equity and Inclusion, One Orange Community Engagement, and Triangle Diversity, Equity, and Inclusion Alliance to identify community organizations working directly with residents in the study area. Community organizations should guide the development of the equitable engagement plan and conduct engagement efforts throughout the life cycle of the Bikeway. Community partners should be compensated for their time and expertise.

CAPITAL AREA MPO (CAMPO) + DURHAM-CHAPEL HILL-CARRBORO MPO (DCHC MPO)

The CAMPO and DCHC MPO maintain the federally-compliant Metropolitan Transportation Plan (MTP) and Transportation Improvement Programs (TIP), which prioritizes federal transportation funding for the region. The MPOs allocate federal funds to local projects through the Locally Administered Projects Program (LAPP). CAMPO and DCHC MPO also rank and prioritize projects submitted to the Strategic Transportation Prioritization (SPOT), which is the methodology NCDOT uses to develop the State Transportation Improvement Program (STIP). As leaders of this planning effort and project prioritization in the region, CAMPO and DCHC MPO are responsible for the following roles in project implementation:

- › Adopt the Connect 2050 Metropolitan Transportation Plan (MTP) to include the Triangle Bikeway alignment.
- › Lead and facilitate project development and coordination between jurisdictions along the Triangle Bikeway corridor.
- › Establish Triangle Bikeway Regional Advisory Committee to guide the development of the project and coordinate with other local bicycle and pedestrian advisory committees to ensure there are seamless connections to existing and planned bicycle and pedestrian facilities.
- › Develop an Equitable Engagement Plan.
- › Lead coordination with NCDOT on Control of Access approval to construct the Triangle Bikeway within the I-40 and NC-54 right of way.
- › Lead coordination with NCDOT on STIP project development in the study area to ensure alignment with the Triangle Bikeway.

- › Lead development of funding strategies based on implementation scenarios for construction of the Triangle Bikeway.
- › Lead development of a Branding, Wayfinding, and Public Art Plan.
- › Lead development of a Triangle Bikeway maintenance plan.
- › Lead coordination with transit agencies, major employers, and jurisdictions along the corridor to provide multi-modal connections to the bikeway.
- › Support jurisdictions to amend local plans and policies to incorporate the Triangle Bikeway in their local bicycle and pedestrian networks.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION (NCDOT)

NCDOT allocates federal and state funding and establishes policies for transportation improvements in communities across North Carolina. Every two years, NCDOT develops the State Transportation Improvement Program (STIP), which identifies projects that will receive funding during a 10-year period. NCDOT policies, such as Complete Streets and Control of Access, provide guidance and oversight for permitting and implementing projects. The Complete Streets Policy, adopted in August 2019, requires NCDOT to consider and incorporate multimodal facilities in the design and improvement of the state's transportation projects. The Control of Access Policy provides design guidance and defines permitted activities within the right-of-way for limited, partial, and full control access roadways. Because preferred alignments of the Triangle Bikeway are within NCDOT right-of-way along NC-54 and I-40, coordination with NCDOT is of critical importance. As the lead state agency allocating funding, guiding implementation of the Complete Streets policy, and approving activities in limited access roadway corridors, NCDOT's responsibilities in the implementation of Triangle Bikeway are outlined below:

- › Participate in the Triangle Bikeway Regional Advisory Committee.
- › Participate in the development of the Equitable Engagement Plan.
- › Provide guidance on funding strategies for the design and construction of the Triangle Bikeway.
- › Provide guidance on the design of the Triangle Bikeway.
- › Lead coordination with CAMPO and DCHC MPO on Control of Access approval to construct the Triangle Bikeway within the I-40 and NC-54 right-of-way.
- › Lead coordination with regional and municipal partners in Complete Streets implementation for STIP projects along the Triangle Bikeway corridor.
- › Coordinate with regional and municipal partners and transit agencies to ensure connections between the Triangle Bikeway and transit routes.

MUNICIPALITIES + COUNTIES

Municipal and county governments lead or support the development of transportation projects within their jurisdiction. On projects they play a supporting role, municipal and county staff are the primary coordinators for community engagement, policy development, and maintenance. Jurisdictions along the Triangle Bikeway corridor include the Town of Chapel Hill, Orange County, City of Durham, Durham County, Town of Morrisville, Town of Cary, City of Raleigh, and Wake County. Each jurisdiction has established Capital Improvement Programs (CIP) that identify and prioritize multimodal projects for funding and bicycle and pedestrian-friendly policies in their Unified Development Ordinances (UDO) that require facilities identified in locally adopted plans to be developed. Most jurisdictions along the corridor also develop community engagement plans and procedures that guide public participation for active transportation projects. As project partners in the development of Triangle Bikeway segments within their jurisdictions, municipal and county roles in implementation include:

- › Adopt the Resolutions of Support for the Triangle Bikeway Study.
- › Amend local plans to include the Triangle Bikeway alignment.
- › Participate in the Triangle Bikeway Regional Advisory Committee.
- › Participate in the development of the Equitable Engagement Plan.
- › Coordinate with regional agencies and neighboring jurisdictions on funding strategies for the design and construction of the Triangle Bikeway based on implementation scenarios.
- › Coordinate with regional agencies and neighboring jurisdictions on the design and construction of the Triangle Bikeway.
- › Support regional agencies with NCDOT coordination on STIP project development to ensure alignment with the Triangle Bikeway.
- › Coordinate with regional agencies on the development of a Branding, Wayfinding, and Public Art Plan.
- › Coordinate with regional agencies on the development of a Triangle Bikeway maintenance plan.
- › Support regional agencies on coordination with transit agencies, major employers, and jurisdictions along the corridor to provide multi-modal connections to the Triangle Bikeway.



STATE + REGIONAL AGENCIES

Other governmental organizations that have jurisdictional authority, maintain land, or administer services along the Triangle Bikeway corridor play a key role in project implementation by working with lead agencies to advance shared goals of improving multi-modal connectivity and expanding travel choices in the region. Key agency partners include NC State Parks, Research Triangle Park, Raleigh-Durham International Airport Authority (RDU), Go Triangle, GoRaleigh, GoDurham, GoCary, Chapel Hill Transit, Wolfline Transit, and the Regional Transportation Alliance (RTA).

NC State Parks, Research Triangle Park, US Army Corps of Engineers (USACE), Triangle J Council of Governments (TJCOG), Research Triangle Foundation, and Raleigh-Durham International Airport Authority guide project development for the Bikeway segments along and adjacent to their respective jurisdictions: Umstead State Park, Research Triangle Park, and RDU Airport. GoTriangle guides project development near the Regional Transit Center. GoTriangle, local transit agencies, and RTA also coordinate on connections between the Bikeway and transit routes along the corridor. Additionally, these agencies are responsible for the following roles in project implementation:

- › Support regional and municipal governments in the adoption of the Triangle Bikeway Study.
- › Participate in the Triangle Bikeway Regional Advisory Committee.
- › Participate in the development of the Equitable Engagement Plan.
- › Support regional agencies in developing public/private partnerships to fund the design and construction of the Triangle Bikeway.
- › Coordinate with regional agencies and municipalities on the design of the Triangle Bikeway.
- › Coordinate with regional agencies on the development of a Triangle Bikeway maintenance plan.
- › Support regional agencies on coordination with transit agencies, major employers, and jurisdictions along the corridor to provide multi-modal connections to the Triangle Bikeway.

ADVOCACY ORGANIZATIONS

Organizations that promote bicycling and walking as viable forms of transportation serve a key role in advocating for project investment. These organizations generate support for projects by raising awareness amongst the public, advocating to elected officials to prioritize funding for active transportation, and fostering collaboration amongst jurisdictional partners. Key advocacy organizations supporting the Triangle Bikeway include BikeWalkNC, Bike Durham, Oaks & Spokes, East Coast Greenway Alliance, Triangle Trails Initiative, local advisory commissions, Partnership for a Healthy Durham, Live Well Wake, and Wake Up Wake County. Responsibilities of these organizations in the implementation of the Triangle Bikeway include:

- › Support regional and municipal governments in the adoption of the Triangle Bikeway Study.
- › Participate in the Triangle Bikeway Regional Advisory Committee.
- › Participate in the development of the Equitable Engagement Plan.
- › Support regional agencies in developing public/private partnerships to fund the design and construction of the Triangle Bikeway.
- › Coordinate with regional agencies and municipalities on the design of the Triangle Bikeway.
- › Coordinate with regional agencies on the development of a Branding, Wayfinding, and Public Art Plan.
- › Support regional agencies on coordination with transit agencies, major employers, and jurisdictions along the corridor to provide multi-modal connections to the Triangle Bikeway.

PRIVATE SECTOR

Private entities adjacent to the Triangle Bikeway constitute the major potential generators of bicycle and pedestrian travel along the corridor. As a result, they may have the resource capacity to advance the project and make the case for increased investment in bicycle and pedestrian infrastructure within the region. Major employers, foundations, and private developers along the corridor provide opportunities for lead and supporting agencies to explore funding outside of traditional revenue streams. Key roles of private sector partners in the implementation of the Triangle Bikeway include:

- › Participate in the Triangle Bikeway Regional Advisory Committee.
- › Support regional agencies and municipalities in developing public/private partnerships to fund the design and construction of the Triangle Bikeway.
- › Support regional agencies and municipalities on coordination with transit agencies and jurisdictions along the corridor to provide multi-modal connections to the Triangle Bikeway.
- › Provide end of trip facilities for bicycle and pedestrian commuters and offer active transportation incentives for employees.

PARTNER ROLES IN IMPLEMENTATION

NCDOT

Provide technical assistance to regional and municipal partners on Complete Street Policy implementation, STI, and other state funding opportunities. Lead coordination with CAMPO and DCHC MPO on Control of Access approval, and provide guidance on the design of the Triangle Bikeway.

**Integrated Mobility Division
Transportation Planning Branch
Division 5
Division 7**

CAMPO + DCHC MPO EXECUTIVE BOARDS

Adopt the Triangle Bikeway Study and incorporate study recommendations into the MTP.

CAMPO + DCHC MPO

Lead development of the Triangle Bikeway through design, construction, and maintenance. Coordinate with NCDOT, municipalities, counties, and other regional agencies on funding opportunities through the LAPP program, STI, RAISE, etc. Facilitate the development of the equitable engagement plan, branding and wayfinding plan, and maintenance plan with state and municipal partners.

MUNICIPALITIES + COUNTIES

Lead development of local segments of the Triangle Bikeway through design, construction, and maintenance. Coordinate with NCDOT and regional agencies on funding opportunities. Support the development of the equitable engagement plan, branding and wayfinding plan, and maintenance plan with state and regional partners.

**Town of Chapel Hill
City of Durham
Town of Morrisville
Town of Cary
City of Raleigh
Durham County
Wake County
Orange County**

STATE + REGIONAL PARTNERS

Coordinate with lead agencies on design of the Triangle Bikeway and provide guidance on multimodal connections to the corridor.

**Research Triangle Park
Raleigh-Durham International Airport
Authority
GoTriangle
GoRaleigh
GoDurham
GoCary
Chapel Hill Transit
WolfLine Transit
Regional Transportation Alliance
NC State Parks
Triangle J Council of Governments
US Army Corps of Engineers**

COMMUNITY PARTNERS

Provide public support of the Triangle Bikeway and lead development of the Equitable Engagement Plan with project stakeholders.

PRIVATE SECTOR

Support regional agencies and municipalities in developing public-private partnerships to fund the design and construction of the Triangle Bikeway and provide guidance on multimodal connections to the corridor.

ADVOCACY ORGANIZATIONS

Build public support of the Triangle Bikeway. Support the development of the equitable engagement plan, branding and wayfinding plan, and maintenance plan with state and municipal partners.

**Bike Durham
Oaks and Spokes
Bicycle Alliance of Chapel Hill (BACH)
BikeWalkNC
East Coast Greenway Alliance
Triangle Trails Initiative
Partnership for a Healthy Durham
Wake Up Wake County
Live Well Wake
Local Advisory Commissions**

ACTION PLAN

The following table provides a summary of action steps to implement the Triangle Bikeway over a ten-year planning horizon.

Task #	Action	Lead	Partners	Dependencies	Time Frame	Performance Measures
1	Adopt the Triangle Bikeway Study. This action allows the study to become the official planning document for the Triangle Bikeway and demonstrates regional intention to support project implementation.	CAMPO and DCHC MPO Executive Boards	CAMPO, DCHC MPO, NCDOT IMD, NCDOT Division 5, NCDOT Division 7, Wake County, Durham County, Orange County, Chapel Hill, Durham, RTP, Morrisville, Cary, and Raleigh	N/A	Winter-Spring 2022	Plan Adoption
2	Adopt the Connect 2050 CAMPO - DCHC MPO Metropolitan Transportation Plan (MTP) to include the Triangle Bikeway alignment and to reference network and policy recommendations of the Triangle Bikeway Study into the MTP.	CAMPO and DCHC MPO Executive Boards, NCDOT Transportation Planning Division	NCDOT IMD, NCDOT Division 5, NCDOT Division 7, Wake County, Durham County, Orange County, Chapel Hill, Durham, RTP, Morrisville, Cary, and Raleigh	Plan Adoption	Spring 2022	MTP Adoption
3	Jurisdictions along the Triangle Bikeway corridor adopt Resolutions of Support for the Triangle Bikeway Study and amend local plans to reference network and policy recommendations of the Triangle Bikeway Study.	Wake County, Durham County, Orange County, Chapel Hill, Durham, RTP, Morrisville, Cary, Raleigh	CAMPO, DCHC MPO, NCDOT IMD, BikeWalkNC, Oaks and Spokes, Bike Durham, ECGA, Regional Transportation Alliance	Plan Adoption	Spring - Summer 2022	Resolutions of Support and Plan Amendments
4	Formalize the Triangle Bikeway Working Group as the Triangle Bikeway Regional Advisory Committee to lead interjurisdictional coordination and guide project development.	CAMPO and DCHC MPO	NCDOT IMD, NCDOT Division 5, NCDOT Division 7, TJCOG, Wake County, Durham County, Orange County, Chapel Hill, Durham, RTP, Morrisville, Cary, and Raleigh, BikeWalkNC, Oaks and Spokes, Bike Durham, ECGA, Regional Transportation Alliance, Go Triangle, Local Transit Agencies, NC State Parks, RDU	Plan Adoption	Spring - Summer 2022	Meeting Agendas and Minutes
5	Develop an equitable engagement plan to seek community feedback and inform the public throughout development of the project.	CAMPO, DCHC MPO, Triangle Bikeway Regional Advisory Committee	NCDOT IMD, Wake County, Durham County, Orange County, Chapel Hill, Durham, RTP, Morrisville, Cary, and Raleigh, TJCOG, BikeWalkNC, Oaks and Spokes, Bike Durham, ECGA, Regional Transportation Alliance, Go Triangle, Local Transit Agencies, NC State Parks	Plan Adoption and Designation of Triangle Bikeway Regional Advisory Committee	Spring - Summer 2022	Draft Engagement Plan
6	Develop funding strategy and designate operating agency to maintain project website, TriangleBikeway.com.	CAMPO, DCHC MPO	Triangle Bikeway Regional Advisory Committee	Plan Adoption and Designation of Triangle Bikeway Regional Advisory Committee	Spring 2022 - Winter 2023	Live and Active Website
7	Utilize TJCOG's non-profit organization, Triangle J Regional Partnership Corporation, as a funding mechanism to garner project support and develop a public/private partnership strategy for funding opportunities.	CAMPO, DCHC MPO, TJCOG	Triangle Bikeway Regional Advisory Committee, BikeWalkNC, Oaks and Spokes, Bike Durham, ECGA, Research Triangle Park, Regional Transportation Alliance	Plan Adoption and Designation of Triangle Bikeway Regional Advisory Committee	Summer - Fall 2022	Meeting Agendas and Minutes

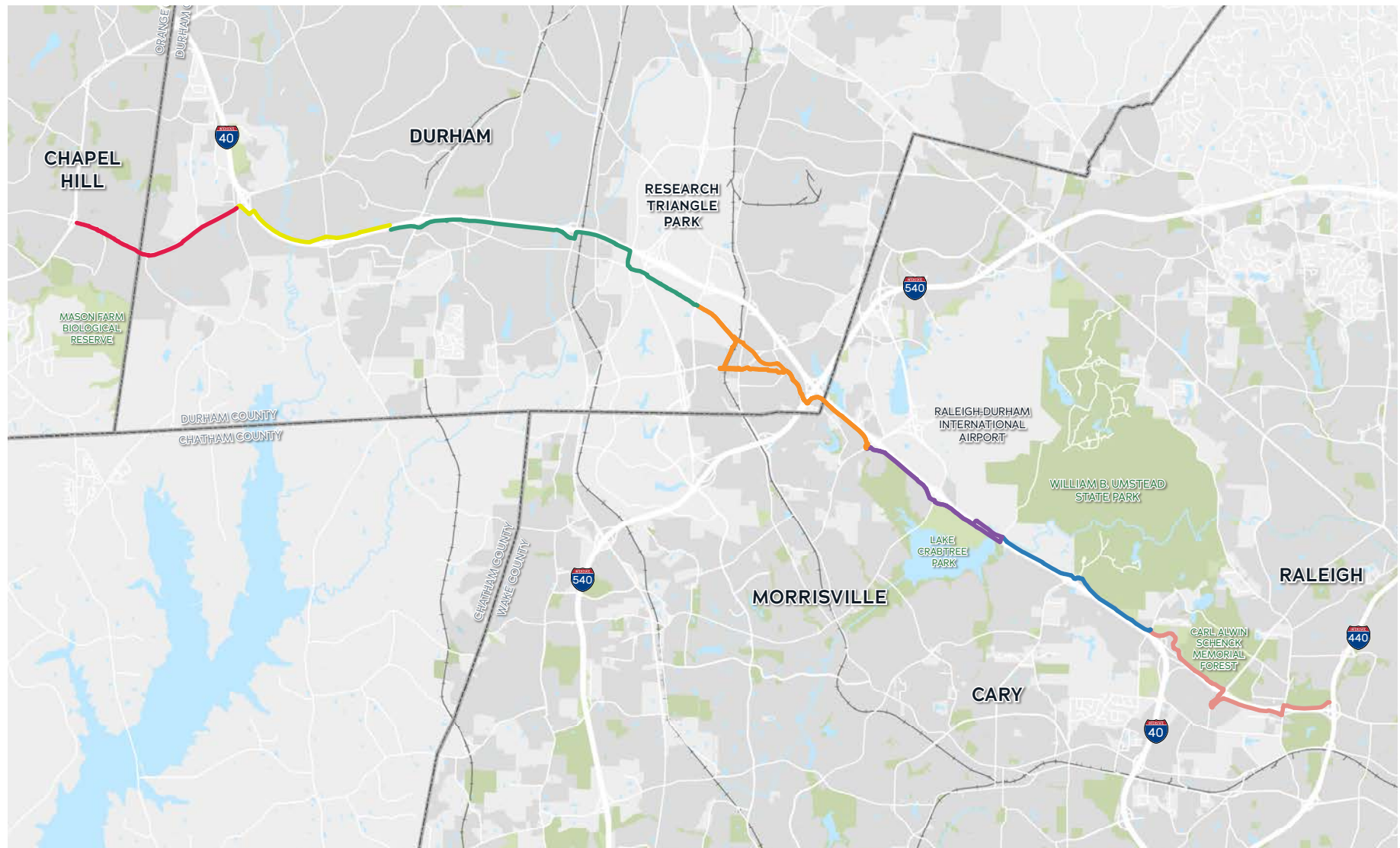
Task #	Action	Lead	Partners	Dependencies	Time Frame	Performance Measures
8	Design eastern segment of the Triangle Bikeway (Hub RTP to Raleigh).	CAMPO	DCHC MPO, Triangle Bikeway Regional Advisory Committee, NCDOT IMD, NCDOT Division 5, Wake County, Durham County, RTP, Morrisville, Cary, Raleigh, TJCOG, RDU, NC State Parks, Go Triangle, Local Transit Agencies	Plan Adoption, Funding for Design, Engagement Plan	Summer 2022 - Spring 2023	Design Plans
9	Develop construction funding strategies based on proposed implementation scenarios for the eastern segment of the Triangle Bikeway Corridor (RTP Park Point to Raleigh).	CAMPO	DCHC MPO, Triangle Bikeway Regional Advisory Committee, NCDOT IMD, NCDOT Division 5, Wake County, Durham County, RTP, Morrisville, Cary, Raleigh, TJCOG, Regional Transportation Alliance	Plan Adoption, Eastern Segment Design, Engagement Plan	Spring 2023	Draft Funding Strategy Plan, Meeting Agendas and Minutes, Dedicated Funding for Bike/Ped Facilities
10	Develop Implementation Study and 30% Design for western segment of the Triangle Bikeway (Chapel Hill to RTP Park Point).	DCHC MPO	CAMPO, Triangle Bikeway Regional Advisory Committee, NCDOT IMD, NCDOT Division 7, Durham County, Orange County, Chapel Hill, Durham, RTP	Plan Adoption, Funding for Western Segment Implementation Study, Engagement Plan	Fall 2022 - Summer 2023	Draft Implementation Study and 30% Design Plans
11	Submit a USDOT RAISE Grant to fund construction of the eastern segment of the Triangle Bikeway (RTP Park Point to Raleigh).	CAMPO	DCHC MPO, Triangle Bikeway Regional Advisory Committee, NCDOT IMD, NCDOT Division 5, Wake County, Durham County, RTP, Morrisville, Cary, and Raleigh, TJCOG	Plan Adoption, Funding and Design of Eastern Segment, Local Match for Eastern Segment Construction	Summer 2023	USDOT RAISE Grant Application Submittal
12	Design western segment of the Triangle Bikeway (Chapel Hill to RTP Park Point).	DCHC MPO	CAMPO, Triangle Bikeway Regional Advisory Committee, NCDOT IMD, NCDOT Divisions 5 & 7, Durham County, Orange County, Chapel Hill, Durham, RTP, TJCOG, GoTriangle, Local Transit Agencies	Plan Adoption, Western Segment Implementation Study, Funding for Design, Engagement Plan	Fall/Winter 2023 - Fall/Winter 2024	Design Plans
13	In conjunction with Task #12, develop construction funding strategies based on proposed implementation scenarios for the western segment of the Triangle Bikeway Corridor (Chapel Hill to RTP Park Point).	DCHC MPO	CAMPO, Triangle Bikeway Regional Advisory Committee, NCDOT IMD, NCDOT Division 7, Durham County, Orange County, Chapel Hill, Durham, RTP, TJCOG, Regional Transportation Alliance	Plan Adoption, Western Segment Design, Engagement Plan	Winter 2024	Draft Funding Strategy, Meeting Agendas and Minutes, Dedicated Funding for Bike/Ped Facilities
14	Develop a branding, wayfinding, and public art plan for the Triangle Bikeway Corridor.	CAMPO, DCHC MPO, Triangle Bikeway Regional Advisory Committee	Wake County, Durham County, Orange County, Chapel Hill, Durham, RTP, Morrisville, Cary, Raleigh, TJCOG, BikeWalkNC, Oaks and Spokes, Bike Durham, ECGA, Regional Transportation Alliance	Plan Adoption, Engagement Plan	FY2023 - FY2024	Draft Branding, Wayfinding, and Public Art Plan



IMPLEMENTATION

Task #	Action	Lead	Partners	Dependencies	Time Frame	Performance Measures
15	Obtain approval from NCDOT's Control of Access (CA) Committee for construction of the Triangle Bikeway within NCDOT I-40 right-of-way.	CAMPO, DCHC MPO, NCDOT Transportation Planning Division	NCDOT IMD, NCDOT Division 5, NCDOT Division 7, Triangle Bikeway Regional Advisory Committee	Plan Adoption, Triangle Bikeway Design (Eastern and Western Segments)	FY2025	CA Meeting Agendas and Minutes, CA Approval by NCDOT
16	Develop a maintenance plan for the Triangle Bikeway.	CAMPO, DCHC MPO, Triangle Bikeway Regional Advisory Committee	NCDOT IMD, NCDOT Division 5, NCDOT Division 7, Wake County, Durham County, Orange County, Chapel Hill, Durham, RTP, Morrisville, Cary, Raleigh, TJCOG, NC State Parks	Plan Adoption, Plan Amendments, Triangle Bikeway Design and Funding (Eastern and Western Segments), CA Approval by NCDOT	FY2025	Meeting Agendas and Minutes, Draft Maintenance Plan
17	Coordinate with NCDOT on STIP Projects U-5774B, U-5774C, U-5774F for the design and development of shared use paths with NC-54 roadway improvements.	NCDOT Division 5 and Division 7, DCHC MPO	NCDOT IMD, CAMPO, Triangle Bikeway Regional Advisory Committee, Chapel Hill, Durham	Plan Adoption, Connect 2050 MTP Adoption	FY2025 - FY2030	Project Agendas and Meeting Minutes, Design and Construction Plans for NC-54 Shared Use Paths
18	Coordinate with NCDOT on STIP Projects I-6006, I-5966, and U-5936 to ensure alignment of the Triangle Bikeway corridor within the NC-54 and I-40 right-of-way.	NCDOT Division 5 and Division 7, CAMPO, DCHC MPO	NCDOT IMD, Triangle Bikeway Regional Advisory Committee, Durham, Cary, Morrisville, Raleigh	Plan Adoption, Connect 2050 MTP Adoption	FY2022 - FY2030	Project Meeting Agendas and Meeting Minutes
19	Coordinate with GoTriangle on the development of the new Regional Transit Center to ensure multi-modal connectivity between the transit center and the Triangle Bikeway.	CAMPO, DCHC MPO, GoTriangle	NCDOT IMD, Durham County, Durham, Triangle Bikeway Regional Advisory Committee, Regional Transportation Alliance, Local Transit Agencies, RDU	Plan Adoption, Engagement Plan	FY2022 - FY2025	Meeting Agendas and Minutes
20	Coordinate with GoRaleigh and Wake County on the development of Bus Rapid Transit (BRT) routes to ensure multi-modal connectivity between the BRT and the Triangle Bikeway.	CAMPO, DCHC MPO, GoRaleigh, Wake County	NCDOT IMD, Raleigh, GoTriangle, GoCary, Cary, Triangle Bikeway Regional Advisory Committee, Wake Up Wake County, Regional Transportation Alliance	Plan Adoption, Engagement Plan	FY2022 - FY2029	Meeting Agendas and Minutes
21	Coordinate with GoTriangle, GoRaleigh, WolfLine Transit, GoCary, GoDurham, Chapel Hill Transit on route and stop improvements to ensure multi-modal connectivity between transit and the Triangle Bikeway.	CAMPO, DCHC MPO	GoTriangle, GoRaleigh, WolfLine Transit, GoCary, GoDurham, Chapel Hill Transit, Triangle Bikeway Regional Advisory Committee, NCDOT IMD, Wake County, Durham County, Research Triangle Park, Morrisville, Cary, Raleigh, Wake Up Wake County, Regional Transportation Alliance	Plan Adoption, Engagement Plan	FY2022 - FY2030	Draft Transit Plans and/or Plan Amendments, Meeting Agendas and Minutes

Task #	Action	Lead	Partners	Dependencies	Time Frame	Performance Measures
22	Coordinate with Research Triangle Park on multi-modal connections between Triangle Bikeway and RTP destinations and to provide end-of-trip facilities for bicyclists and pedestrians at Park Point and the Hub.	CAMPO, DCHC MPO, Research Triangle Park	Triangle Bikeway Regional Advisory Committee, Durham County, TJCOG, Research Triangle Park Foundation	Plan Adoption, Engagement Plan	FY2022 - FY2030	Draft Plans and/or Plan Amendments, New Multimodal Connections Included in Developments
23	Coordinate with jurisdictions along the project corridor to plan and develop connector trails to the Triangle Bikeway.	CAMPO, DCHC MPO, Triangle Bikeway Regional Advisory Committee	Wake County, Durham County, Orange County, Chapel Hill, Durham, RTP, Morrisville, Cary, Raleigh	Plan Adoption, Engagement Plan	FY2022 - FY2030	Local Jurisdiction Plan Amendments and/or Draft Plans, New Multimodal Connections
24	Coordinate with jurisdictions along project corridor to ensure that land use policies and ordinances encourage and/or require bicycle and pedestrian facilities, amenities, and connections between planned developments and the Triangle Bikeway.	CAMPO, DCHC MPO, Triangle Bikeway Regional Advisory Committee	Wake County, Durham County, Orange County, Chapel Hill, Durham, RTP, Morrisville, Cary, Raleigh	Plan Adoption, Engagement Plan	FY2022 - FY2030	UDO Amendments, New Multimodal Connections Included in Developments
25	Coordinate with employers along the Triangle Bikeway corridor to provide end of trip facilities for bicycle and pedestrian commuters and to offer active transportation incentives for employees.	CAMPO, DCHC MPO, Triangle Bikeway Regional Advisory Committee	RTP, Major Employers along the Triangle Bikeway, Triangle Transportation Choices, Wake County, Durham County, Orange County, Chapel Hill, Durham, Morrisville, Cary, Raleigh, Regional Transportation Alliance	Plan Adoption, Engagement Plan	FY2022 - FY2030	Meeting Agendas and Minutes, Adopted Employer Active Transportation Policies



PREFERRED ALIGNMENT SEGMENTS FOR IMPLEMENTATION

LEGEND

- | | | |
|---|---|--|
| — Segment 1 | — Segment 5 | ■ Park |
| — Segment 2 | — Segment 6 | ■ Municipality |
| — Segment 3 | — Segment 7 | ■ County |
| — Segment 4 | | |

PREFERRED ALIGNMENT IMPLEMENTATION

As mentioned in Chapter 4, the preferred alignment was divided into seven segments for implementation given the scale of the Triangle Bikeway corridor. Factors that influenced determination of segment termini included construction access and connectivity to existing trails among others. The following pages provide cut sheets for each of the segments and include information such as a segment description, lengths, structures required, at-grade and grade separated road crossings, connections to transit and trails, destinations served, and illustrative typical sections. Also included are summaries of potential right-of-way and permitting needs.

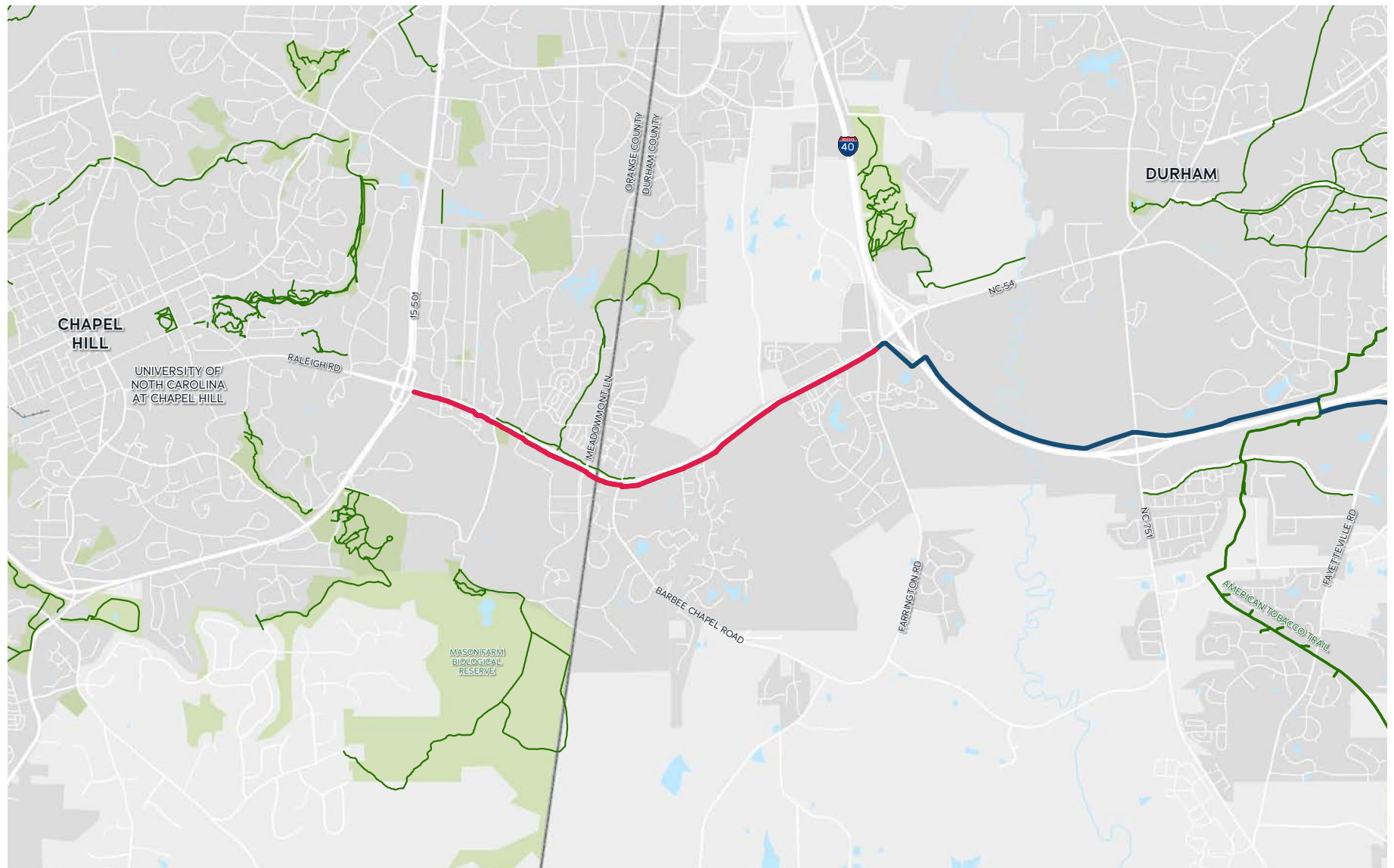
Preliminary project cost information provided includes a 2021 base construction cost derived from quantity takeoffs from preliminary three-dimensional corridor modeling that was performed publicly available GIS data. Preliminary estimates for design services including survey, design, permitting and other pre-construction costs are also provided. With the exact construction time frame unknown, escalated construction costs were provided for 2025 and 2030 build years scenarios. Contingency and costs for construction engineering and inspection (CEI) services were also estimated and added to the escalated construction costs for high-level budget planning purposes. It is anticipated that construction cost estimates will be refined during the preliminary design process and the refined estimates will be used to guide decision-making when securing construction funding. Costs associated with right-of-way acquisition are not included and will be determined during the design process. Detailed cost estimate information with quantities and unit costs are located in Appendix C.

CONSTRUCTION COST CONTEXT

When evaluating costs for the Triangle Bikeway, many may look to historical greenway construction costs for comparison purposes. While both serve bicyclists and pedestrians, they differ in their primary use cases and user experiences. Greenways have been primarily geared toward recreational use and the design and user experience have been optimized to that end. Bikeways are designed to accommodate a high volume of commuter cyclists and are optimized to promote quick and efficient trips as a means of affordable transportation. Key differences between greenway projects and the Triangle Bikeway project influencing costs include, but are not limited to, the following:

- › **Pavement Width** - The bikeway consists primarily of a 16-foot wide separated use path as compared to 12-foot wide greenway, representing a 33% increase.
- › **Lighting** - Greenways typically close from dusk to dawn whereas the bikeway will incorporate lighting along its length to facilitate commuting, especially in winter months with shorter hours of daylight.
- › **Grade Separation** - Greenways typically follow streams and leverage existing underpass areas and box culverts or follow former rail lines which have existing bridges that may be modified for trail use to achieve grade-separated road crossings. The bikeway does not generally follow riparian or railroad corridors and must construct new pedestrian tunnels or bridges to achieve the same grade separation. Additionally, the bikeway should be raised or kept out of areas prone to frequent flooding in order to keep the facility a functional, dependable commuter route regardless of weather conditions.
- › **At-Grade Crossings** - The roadways the bikeway will cross at-grade are generally subject to higher traffic volumes and speeds compared to those greenways typically cross at-grade. This requires an increased number of robust crossing treatments including rectangular rapid flashing beacons (RRFB), high-intensity activated crosswalk (HAWK), and pedestrian signals or other phasing accommodations at signalized intersections.
- › **Maintenance of Traffic** - The bikeway will have increased interaction with high-volume roadways as compared to greenways requiring robust traffic control measures during construction.
- › **Fencing** - Installation of control-of-access fence will be required for the entire length along I-40 and Wade Ave as compared to the minimal fencing and safety rail usually required on greenway projects.
- › **Pavement Markings** - The bikeway separated use path will have pavement markings to delineate the bi-directional bicycle zone and walking zone from one another and a centerline on the shared use path section compared to the typically minimal pavement markings on greenways.





SEGMENT 1

NC-15/501 TO FARRINGTON RD

LEGEND

- | | |
|--|--|
| — Segment 1 | — Park |
| — Adjoining Segments | — Municipality |
| — Existing Greenway | — County |

SEGMENT 1

Segment 1 begins at the US-15/501 interchange and will widen/replace the existing sidepath along the south side of NC-54 from Hamilton Rd to Barbee Chapel Rd and new sidepath will be constructed to Farrington Rd. Impacts to the waterfowl impoundment land owned by the USACE will be minimized by using boardwalk/bridge and will require coordination. Proposed pedestrian signals will be installed for crossings at Huntingridge Rd and Farrington Rd. This segment may be constructed as part of the programmed STIP project U-5774 in accordance with NCDOT's Complete Streets Policy.

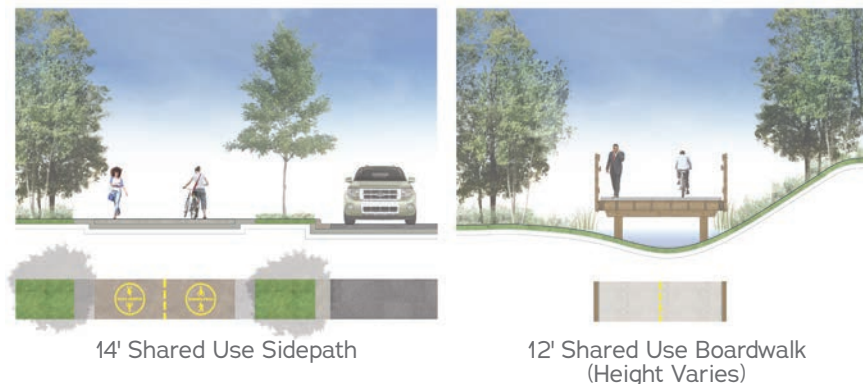
PROJECT SNAPSHOT

- › Location: NC-54
- › Jurisdictions / Stakeholders: Chapel Hill, City of Durham, Durham County
- › Facility Type(s): Shared Use Sidepath, Shared Use Boardwalk, Shared Use Bridge
- › Total Length: 2.69 miles
- › Structures: 1 Bridge (approx. 200 LF), 2 Boardwalks (approx. 1,500 LF)
- › Grade-Separated Road Crossings: None
- › At-Grade Road Crossings:
 - › S Hamilton Rd
 - › Barbee Chapel Rd
 - › Falconbridge Rd
 - › Environ Way
 - › Little John Rd
 - › Farrington Rd
 - › Finley Golf Course Rd
 - › Downing Creek Pkwy
 - › Friday Center Dr
 - › Huntingridge Rd
- › Transit Connections:
 - › GoTriangle Routes 800, 805
 - › Chapel Hill Transit Routes A, B, FCX, N, S + Safe Ride G
- › Trail Connections:
 - › Meadowmont Trails
 - › NC 54 Sidepath + Tunnel
- › Destinations Served:
 - › Glenwood Elementary
 - › Shopping Centers
 - › Meadowmont Village
 - › Friday Center
 - › East 54 Mixed-Use
 - › UNC Healthcare

POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way, 10 Privately-Owned Parcels
- › Temporary Construction Easement: 16 Privately-Owned Parcels (13 Owners)

PRIMARY TYPICAL SECTIONS



ESTIMATED PROJECT COSTS

2021 Base Construction Cost Estimate \$ 7,733,000
 Estimated Design Services (13% of Construction Cost) \$ 1,006,000

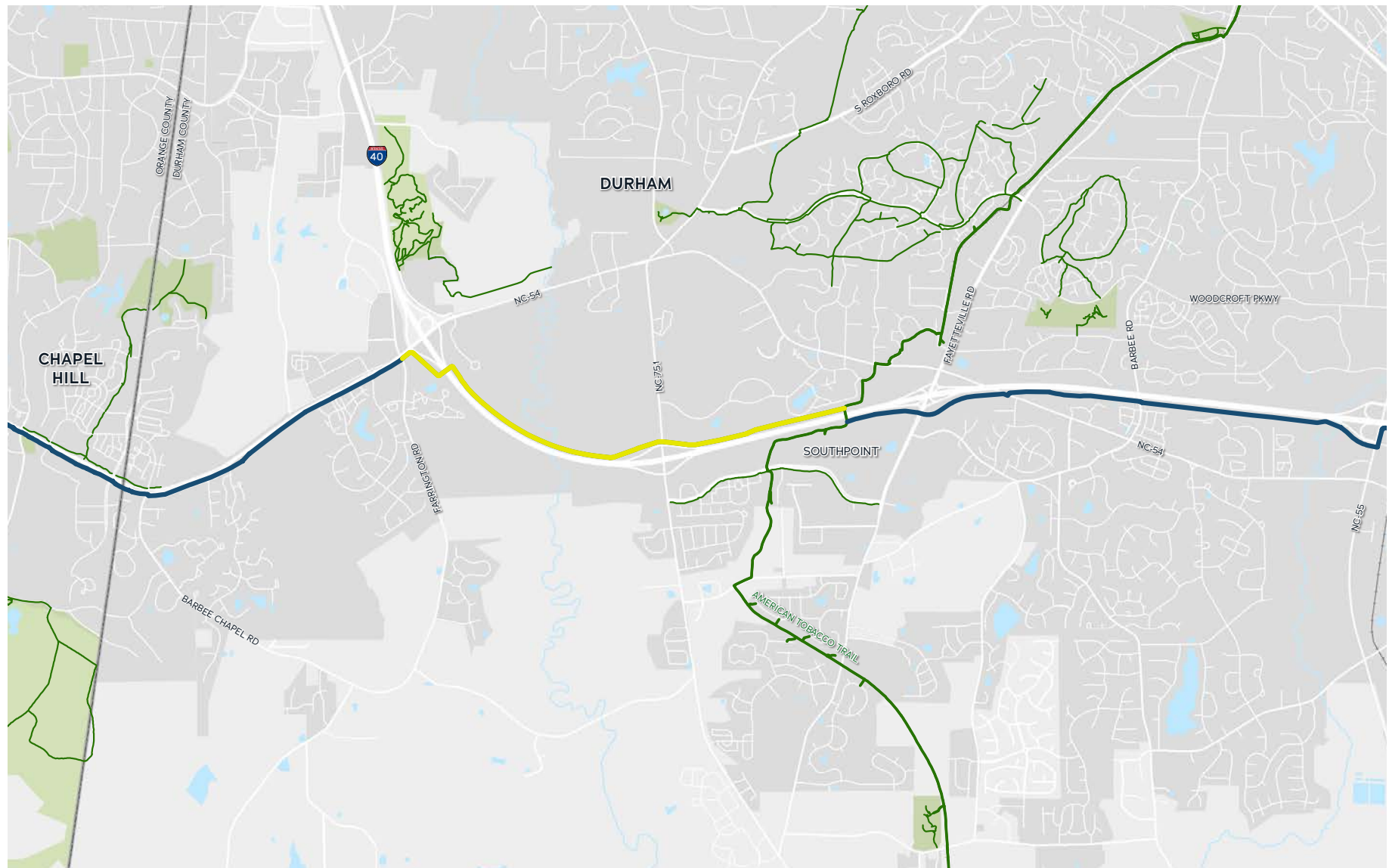
Build Year	2025	2030
Construction Cost Estimate Escalated to Build Year	\$ 8,704,000	\$ 10,090,000
Contingency (20% of Construction Cost)	\$ 1,741,000	\$ 2,018,000
Estimated CEI Services (12% of Construction Cost)	\$ 1,045,000	\$ 1,211,000
TOTAL CONSTRUCTION COST ESTIMATE	\$ 11,490,000	to \$ 13,319,000

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

**Detailed cost information is located in Appendix C.

POTENTIAL PERMITTING NEEDS

- › Erosion Control Permit
- › 401 / 404 Permit
- › Floodplain Development Permit
- › NCDOT Encroachment
- › USACE Coordination



SEGMENT 2

FARRINGTON RD TO AMERICAN TOBACCO TRAIL

LEGEND

- Segment 2
- Adjoining Segments
- Existing Greenway
- Park
- Municipality
- County

SEGMENT 2

Segment 2 begins at Farrington Rd as a separated use path and runs along the I-40 east bound on-ramp for a short distance before crossing over to the north side of the interstate with a separated use bridge. The segment continues along the north side of I-40, crosses New Hope Creek and Third Fork Creek via a series of boardwalks and bridges, crosses under NC-751 via a separated use tunnel, and ends at the connection to the existing American Tobacco Trail at the existing pedestrian bridge at Southpoint.

PROJECT SNAPSHOT

- › Location: NC-54 (0.04 miles), I-40 (2.50 miles)
- › Jurisdictions / Stakeholders: City of Durham
- › Facility Type(s): Separated Use Path, Separated Use Bridge, Separated Use Tunnel
- › Total Length: 2.54 miles
- › Structures: 2 Bridges (approx. 440 LF), 2 Boardwalks (approx. 2,810 LF), 1 Tunnel (approx. 220 LF)
- › Grade-Separated Road Crossings: I-40 (Over), NC-751 (Under)
- › At-Grade Road Crossings: None
- › Transit Connections: No Direct Connections
- › Trail Connections:
 - › American Tobacco Trail (East Coast Greenway)
- › Destinations Served:
 - › Quadrangle Office Park
 - › Shopping Centers
 - › Southpoint Mall
 - › Leigh Farm Park

POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way,
- › Temporary Construction Easement: 12 Privately-Owned Parcels (9 Owners)

POTENTIAL PERMITTING NEEDS

- › Erosion Control Permit
- › Floodplain Development Permit
- › 401 / 404 Permit
- › NCDOT Encroachment

PRIMARY TYPICAL SECTIONS



16' Separated Use Path



16' Separated Use Bridge
(Min. 17' Vertical Clearance over I-40)

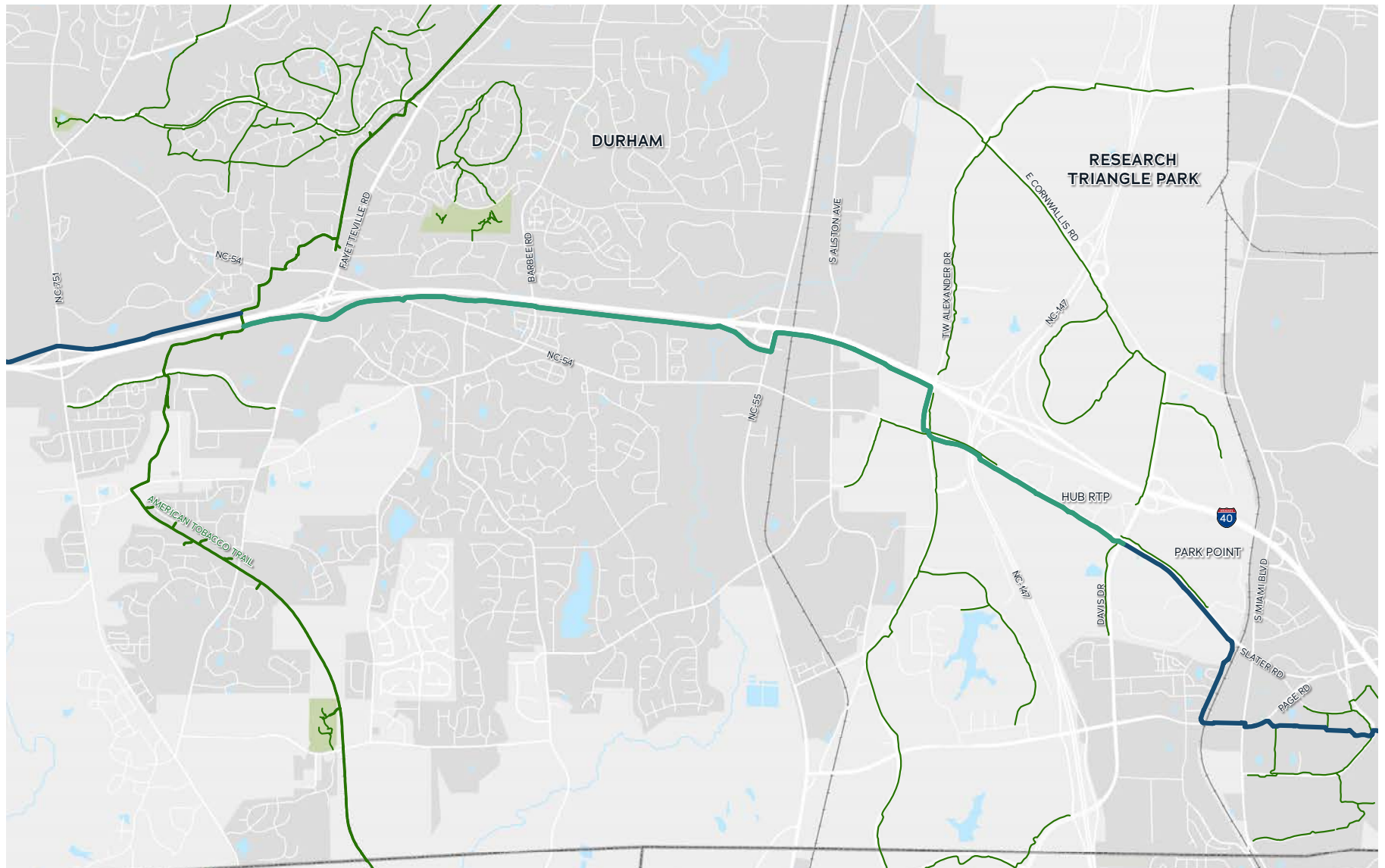
ESTIMATED PROJECT COSTS

2021 Base Construction Cost Estimate	\$ 10,674,000
Estimated Design Services (13% of Construction Cost)	\$ 1,388,000

Build Year	2025	2030
Construction Cost Estimate Escalated to Build Year	\$ 12,014,000	\$ 13,928,000
Contingency (20% of Construction Cost)	\$ 2,403,000	\$ 2,786,000
Estimated CEI Services (12% of Construction Cost)	\$ 1,442,000	\$ 1,672,000
TOTAL CONSTRUCTION COST ESTIMATE	\$ 15,859,000	to \$ 18,386,000

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

**Detailed cost information is located in Appendix C.



SEGMENT 3

AMERICAN TOBACCO TRAIL TO DAVIS DR

LEGEND

- Segment 3
- Adjoining Segments
- Existing Greenway
- Park
- Municipality
- County

SEGMENT 3

Segment 3 begins at the existing American Tobacco Trail bridge and heads east along the south side of I-40 as a separated use path. Multiple grade-separated road crossings, at-grade road crossings, and creek crossings are required along the route before entering Research Triangle Park (RTP). Once inside RTP, the typical section changes to a shared use sidepath and runs along the west side of TW Alexander Dr before continuing east along the south side of NC-54 and ending at Davis Dr. The existing NC-54 bridge over NC-147 will be modified to accommodate the bikeway. Proposed pedestrian signals will be installed for intersection crossings at NC-55, Park Forty Plaza, TW Alexander Dr, and Davis Dr. Mid-block crossings will be installed at NC-54, Barbee Rd, and S Alston Ave.

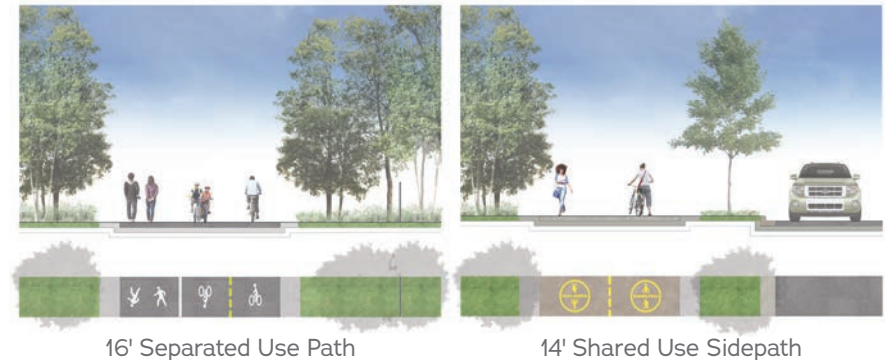
PROJECT SNAPSHOT

- › Location: I-40 (3.80 miles), TW Alexander Dr (0.23 miles), NC-54 (1.17 miles)
- › Jurisdictions / Stakeholders: City of Durham, Durham County, RTP
- › Facility Type(s): Separated Use Path, Separated Use Bridge + Tunnel, Shared Use Sidepath, Shared Use Boardwalk
- › Total Length: 5.20 miles
- › Structures: 3 Bridges (approx. 400 LF), 3 Boardwalks (approx. 965 LF), 1 Tunnel (approx. 240 LF)
- › Grade-Separated Road Crossings: Fayetteville Rd (Under), NC-147 (Over)
- › At-Grade Road Crossings:
 - › NC-54
 - › S Alston Ave
 - › Davis Dr
 - › Barbee Rd
 - › TW Alexander Dr
 - › NC-55
 - › NC-54
- › Transit Connections:
 - › GoTriangle Route 805
 - › GoDurham Route 12
- › Trail Connections:
 - › American Tobacco Trail
 - › RTP Sidepath Network
- › Destinations Served:
 - › Southpoint Mall
 - › Durham Co. South Regional Library
 - › Park 40 Plaza
 - › Frontier
 - › Multiple RTP Employers
 - › Hub RTP

POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way, 4 Privately-Owned Parcels
- › Temporary Construction Easement: 31 Privately-Owned Parcels (26 Owners)

PRIMARY TYPICAL SECTIONS



ESTIMATED PROJECT COSTS

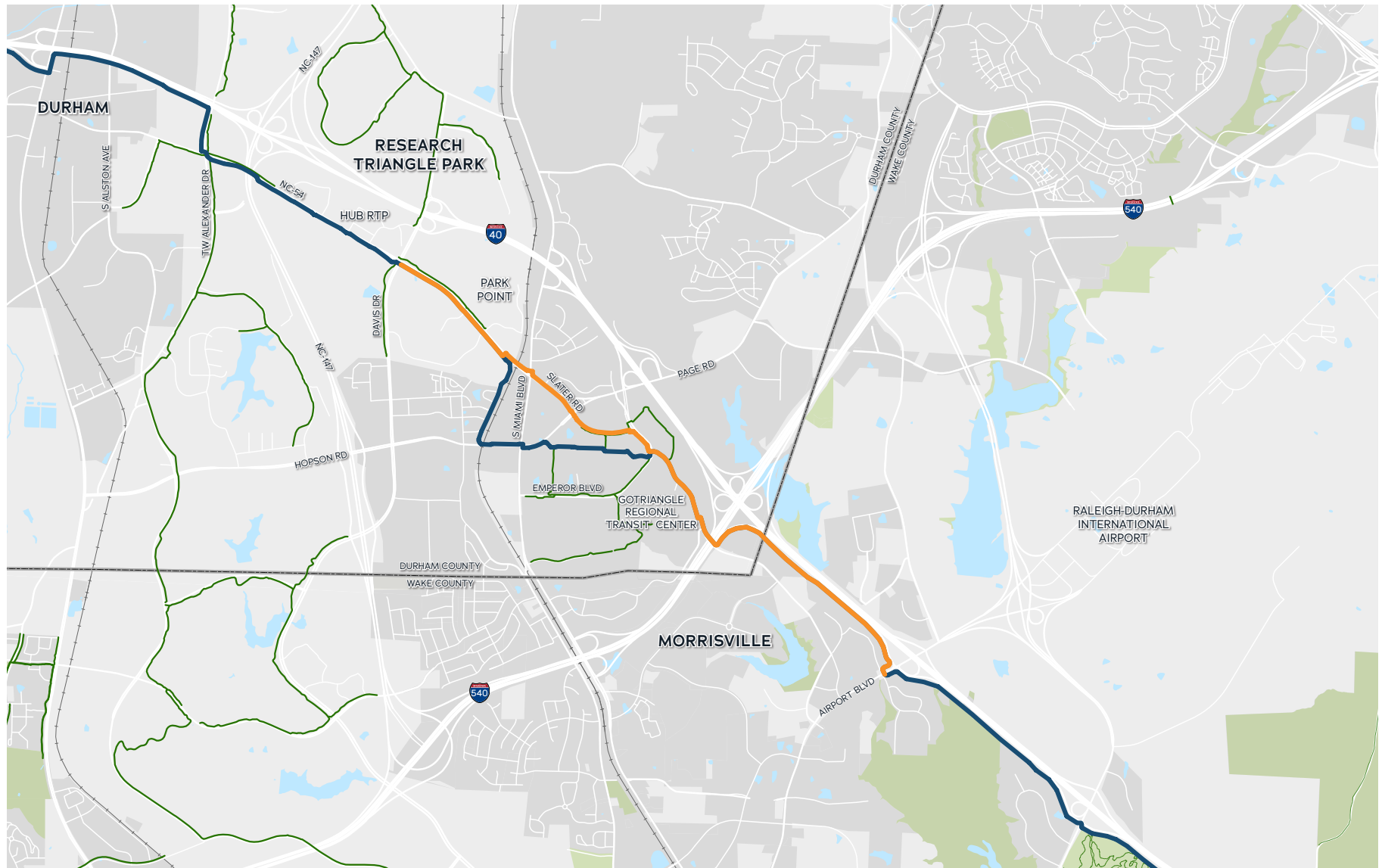
2021 Base Construction Cost Estimate			\$ 13,167,000
Estimated Design Services (13% of Construction Cost)			\$ 1,712,000
Build Year	2025	2030	
Construction Cost Estimate Escalated to Build Year	\$ 14,820,000	\$ 17,180,000	
Contingency (20% of Construction Cost)	\$ 2,964,000	\$ 3,436,000	
Estimated CEI Services (12% of Construction Cost)	\$ 1,779,000	\$ 2,062,000	
TOTAL CONSTRUCTION COST ESTIMATE	\$ 19,563,000	to \$ 22,678,000	

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

**Detailed cost information is located in Appendix C.

POTENTIAL PERMITTING NEEDS

- › Erosion Control Permit
- › Floodplain Development Permit
- › 401 / 404 Permit
- › NCDOT Encroachment



SEGMENT 4A

DAVIS DR TO AIRPORT BLVD

LEGEND

- Segment 4A
- Adjoining Segments
- Existing Greenway
- Park
- Municipality
- County

SEGMENT 4A

Segment 4A begins at Davis Dr as a shared use sidepath and runs along the south side of NC-54 before crossing mid-block just west of the railroad and Miami Blvd intersection. Continuing east along the north side of NC-54, the route crosses S Miami Blvd onto Slater Rd and turns onto the south side of Emperor Blvd. The route crosses at a signalized intersection to the south side of Slater Rd and passes the GoTriangle Regional Transit Center before crossing mid-block to the north side just prior to Shiloh Glenn Dr then crossing over I-540. The separated use path section continues east along the south side of I-40, crosses Stirrup Iron Creek, and ends at Airport Blvd. Proposed pedestrian signals will be installed for crossings at New Millennium Way, S Miami Blvd, and Airport Blvd.

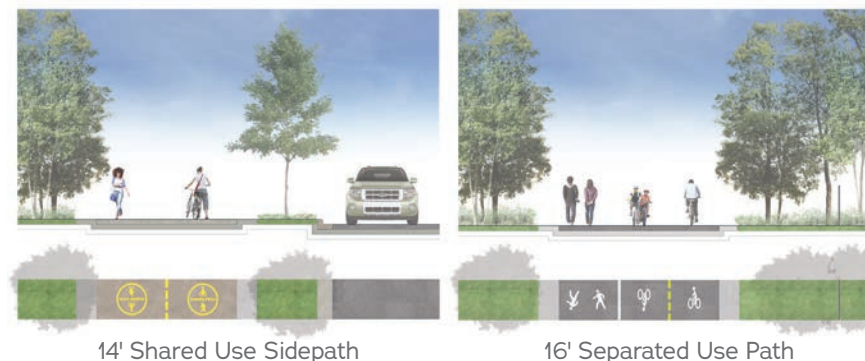
PROJECT SNAPSHOT

- › Location: NC-54 (0.91 miles), Slater Rd (1.28 miles), Emperor Blvd (0.15 miles), I-40 (1.31 miles)
- › Jurisdictions / Stakeholders: City of Durham, Durham County, Morrisville, RTP
- › Facility Type(s): Shared Use Sidepath, Separated Use Path, Separated Use Bridge, Shared Use Boardwalk, Shared Use Bridge
- › Total Length: 3.65 miles
- › Structures: 2 Bridges (approx. 380 LF), 4 Boardwalks (approx. 1,255 LF)
- › Grade-Separated Road Crossings: I-540 (Over)
- › At-Grade Road Crossings:
 - › NC-54
 - › S Miami Blvd
 - › Page Rd
 - › Slater Rd
 - › Emperor Blvd
 - › Slater Rd
 - › Airport Blvd
- › Transit Connections:
 - › GoTriangle Routes 100, 310, 700, 800, 805, RDU
- › Trail Connections:
 - › RTP Sidepath Network
- › Destinations Served:
 - › Fidelity Campus
 - › GoTriangle Regional Transit Center
 - › Page Rd Corridor
 - › Miami Blvd Corridor
 - › Davis Dr Corridor
 - › Imperial Center

POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way, 13 Privately-Owned Parcels
- › Temporary Construction Easement: 28 Privately-Owned Parcels (26 Owners)

PRIMARY TYPICAL SECTIONS



ESTIMATED PROJECT COSTS

2021 Base Construction Cost Estimate \$ 9,305,000
Estimated Design Services (13% of Construction Cost) \$ 1,210,000

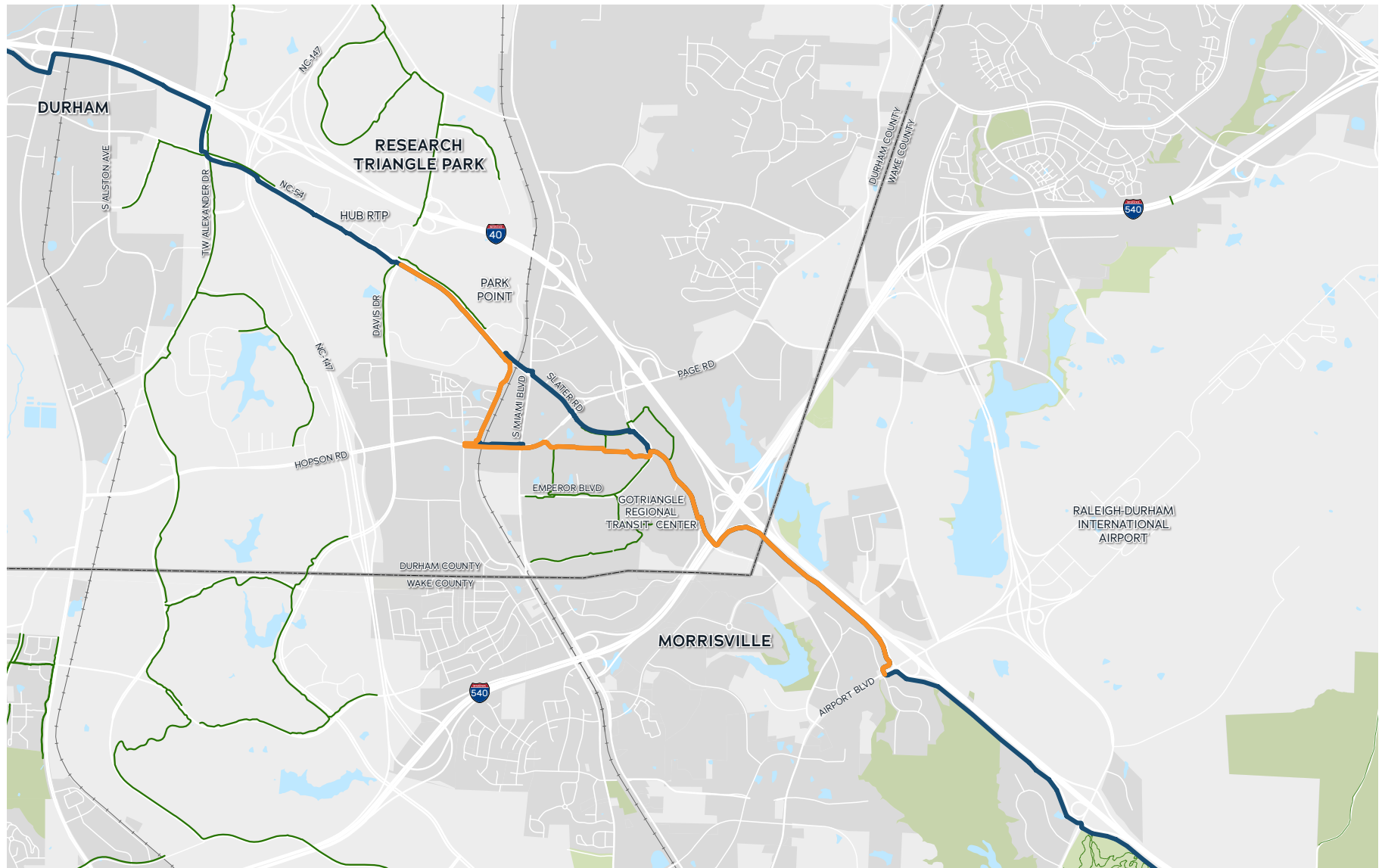
Build Year	2025	2030
Construction Cost Estimate Escalated to Build Year	\$ 10,473,000	\$ 12,141,000
Contingency (20% of Construction Cost)	\$ 2,095,000	\$ 2,429,000
Estimated CEI Services (12% of Construction Cost)	\$ 1,257,000	\$ 1,457,000
TOTAL CONSTRUCTION COST ESTIMATE	\$ 13,825,000	to \$ 16,027,000

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

**Detailed cost information is located in Appendix C.

POTENTIAL PERMITTING NEEDS

- › Erosion Control Permit
- › Floodplain Development Permit
- › 401 / 404 Permit
- › NCDOT Encroachment



SEGMENT 4B

DAVIS DR TO AIRPORT BLVD

LEGEND

- Segment 4B
- Adjoining Segments
- Existing Greenway
- Park
- Municipality
- County

SEGMENT 4B

Segment 4B begins at Davis Dr as a shared use sidepath and runs along the south side of NC-54 before turning south just west of the railroad to follow a transmission power easement to Hopson Rd. After crossing Hopson Rd at the Keystone Park Dr intersection the route continues east along the south side of Hopson Rd below the railroad, across S Miami Blvd, and along Page Rd to First Citizens Bank. The route follows and extends existing trails through parking lots and turns onto the south side of Emperor Blvd. The route crosses at a signalized intersection to the south side of Slater Rd and passes the GoTriangle Regional Transit Center before crossing mid-block to the north side just prior to Shiloh Glenn Dr then crossing over I-540. The separated use path section continues east along the south side of I-40, crosses Stirrup Iron Creek, and ends at Airport Blvd. Proposed pedestrian signals will be installed for crossings at New Millennium Way, Hopson Rd, and Airport Blvd.

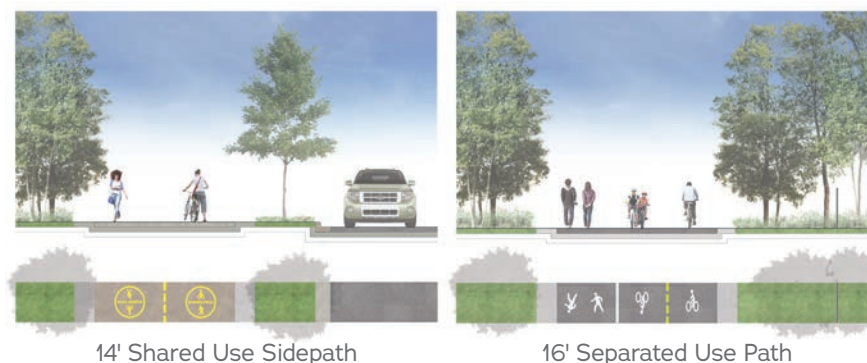
PROJECT SNAPSHOT

- › Location: NC-54 (0.76 miles), Hopson/Page Rd (0.48 miles), Slater Rd (0.62 miles), I-40 (1.31 miles)
- › Jurisdictions / Stakeholders: City of Durham, Durham County, Morrisville, RTP
- › Facility Type(s): Shared Use Sidepath, Separated Use Path, Separated Use Bridge, Shared Use Boardwalk, Shared Use Bridge
- › Total Length: 4.25 miles
- › Structures: 2 Bridges (approx. 380 LF), 4 Boardwalks (approx. 1,255 LF)
- › Grade-Separated Road Crossings: I-540 (Over)
- › At-Grade Road Crossings:
 - › Hopson Rd
 - › Slater Rd
 - › S Miami Blvd
 - › Airport Blvd
 - › Emperor Blvd
- › Transit Connections:
 - › GoTriangle Routes 100, 310, 700, 800, 805, RDU
- › Trail Connections:
 - › RTP Sidepath Network
- › Destinations Served:
 - › Fidelity Campus
 - › Miami Blvd Corridor
 - › GoTriangle Regional Transit Center
 - › Davis Dr Corridor
 - › Page Rd Corridor
 - › Imperial Center

POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way, 22 Privately-Owned Parcels
- › Temporary Construction Easement: 36 Privately-Owned Parcels (28 Owners)

PRIMARY TYPICAL SECTIONS



ESTIMATED PROJECT COSTS

2021 Base Construction Cost Estimate	\$ 9,261,000
Estimated Design Services (13% of Construction Cost)	\$ 1,204,000

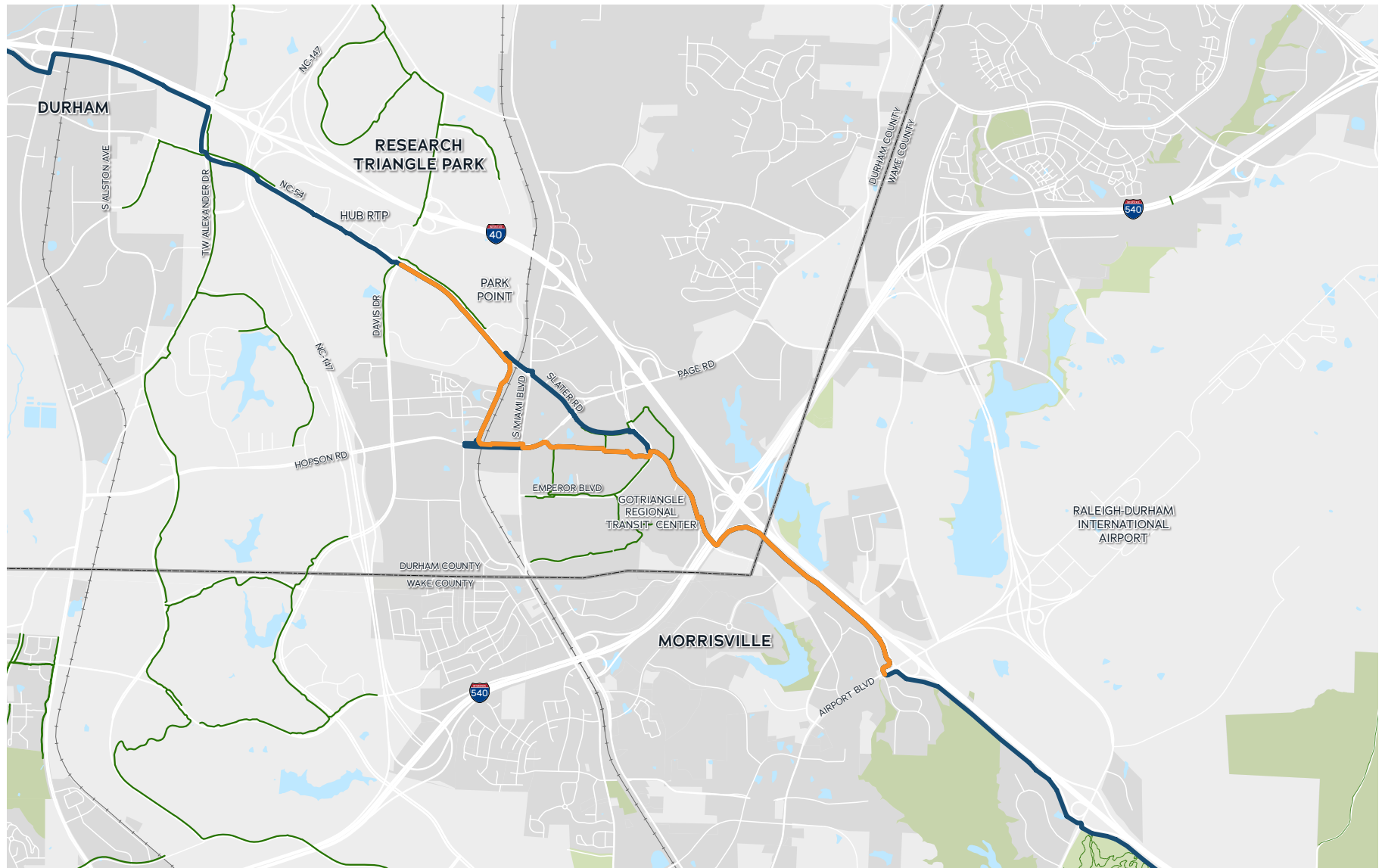
Build Year	2025	2030
Construction Cost Estimate Escalated to Build Year	\$ 10,424,000	\$ 12,084,000
Contingency (20% of Construction Cost)	\$ 2,085,000	\$ 2,417,000
Estimated CEI Services (12% of Construction Cost)	\$ 1,251,000	\$ 1,451,000
TOTAL CONSTRUCTION COST ESTIMATE	\$ 13,760,000	to \$ 15,952,000

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

**Detailed cost information is located in Appendix C.

POTENTIAL PERMITTING NEEDS

- › Erosion Control Permit
- › Floodplain Development Permit
- › 401 / 404 Permit
- › NCDOT Encroachment



SEGMENT 4C

DAVIS DR TO AIRPORT BLVD

LEGEND

- Segment 4C
- Adjoining Segments
- Existing Greenway
- Park
- Municipality
- County

SEGMENT 4C

Segment 4C begins at Davis Dr as a shared use sidepath and runs along the south side of NC-54 before turning south just west of the railroad to follow a transmission power easement to Hopson Rd. The route continues east along the north side of Hopson Rd under the railroad and crosses at the S Miami Blvd intersection onto the south side of Page Rd to First Citizens Bank. The route follows and extends existing trails through parking lots and turns onto the south side of Emperor Blvd. The route crosses at a signalized intersection to the south side of Slater Rd and passes the GoTriangle Regional Transit Center before crossing mid-block to the north side just prior to Shiloh Glenn Dr then crossing over I-540. The separated use path section continues east along the south side of I-40, crosses Stirrup Iron Creek, and ends at Airport Blvd. Proposed pedestrian signals will be installed for crossings at New Millennium Way and Airport Blvd.

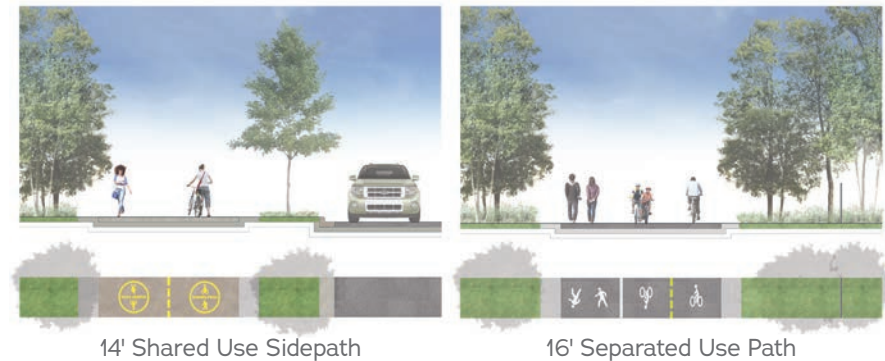
PROJECT SNAPSHOT

- › Location: NC-54 (0.76 miles), Hopson/Page Rd (0.36 miles), Slater Rd (0.62 miles), I-40 (1.31 miles)
- › Jurisdictions / Stakeholders: City of Durham, Durham County, Morrisville, RTP
- › Facility Type(s): Shared Use Sidepath, Separated Use Path, Separated Use Bridge, Shared Use Boardwalk, Shared Use Bridge
- › Total Length: 4.12 miles
- › Structures: 2 Bridges (approx. 380 LF), 4 Boardwalks (approx. 1,255 LF)
- › Grade-Separated Road Crossings: I-540 (Over)
- › At-Grade Road Crossings:
 - › S Miami Blvd
 - › Slater Rd
 - › Page Rd
 - › Airport Blvd
 - › Emperor Blvd
- › Transit Connections:
 - › GoTriangle Routes 100, 310, 700, 800, 805, RDU
- › Trail Connections:
 - › RTP Sidepath Network
- › Destinations Served:
 - › Fidelity Campus
 - › Miami Blvd Corridor
 - › GoTriangle Regional Transit Center
 - › Davis Dr Corridor
 - › Page Rd Corridor
 - › Imperial Center

POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way, 25 Privately-Owned Parcels
- › Temporary Construction Easement: 41 Privately-Owned Parcels (31 Owners)

PRIMARY TYPICAL SECTIONS



ESTIMATED PROJECT COSTS

2021 Base Construction Cost Estimate	\$ 9,269,000
Estimated Design Services (13% of Construction Cost)	\$ 1,205,000

Build Year	2025	2030
Construction Cost Estimate Escalated to Build Year	\$ 10,433,000	\$ 12,094,000
Contingency (20% of Construction Cost)	\$ 2,087,000	\$ 2,419,000
Estimated CEI Services (12% of Construction Cost)	\$ 1,252,000	\$ 1,452,000
TOTAL CONSTRUCTION COST ESTIMATE	\$ 13,772,000	to \$ 15,965,000

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

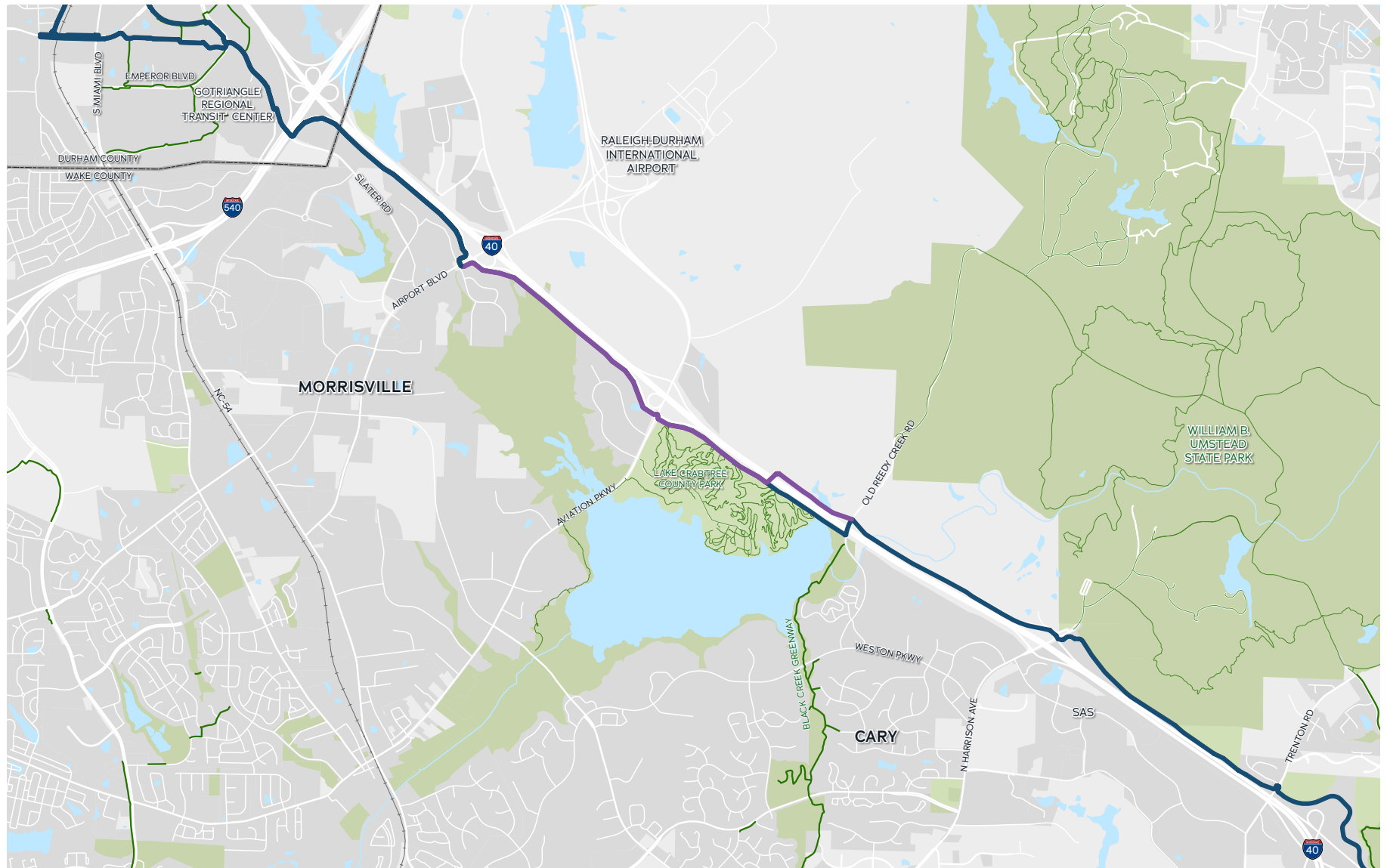
**Detailed cost information is located in Appendix C.

POTENTIAL PERMITTING NEEDS

- › Erosion Control Permit
- › Floodplain Development Permit
- › 401 / 404 Permit
- › NCDOT Encroachment



IMPLEMENTATION



SEGMENT 5A

AIRPORT BLVD TO OLD REEDY CREEK RD

LEGEND

- Segment 5A
- Adjoining Segments
- Existing Greenway
- Park
- Municipality
- County

SEGMENT 5A

Segment 5A begins at Airport Blvd and travels east along the south side of I-40 as a separated use path. A bridge crosses over Brier Creek and the route continues along I-40 before crossing Aviation Pkwy via proposed pedestrian signal. The route continues along the south side of I-40 adjacent to Lake Crabtree County Park before crossing to the north side of I-40 via a signature separated use path bridge. Continuing along the north side of I-40 adjacent to Raleigh-Durham (RDU) International Airport property, the route crosses Haley's Branch on boardwalk before ending at Old Reedy Creek Rd.

PROJECT SNAPSHOT

- › Location: I-40
- › Jurisdictions / Stakeholders: Cary, RDU Airport
- › Facility Type(s): Separated Use Path, Separated Use Bridge, Shared Use Boardwalk, Shared Use Bridge
- › Total Length: 2.55 miles
- › Structures: 2 Bridges (approx. 350 LF), 4 Boardwalks (approx. 4,590 LF)
- › Grade-Separated Road Crossings: I-40 (Over)
- › At-Grade Road Crossings: Aviation Pkwy
- › Transit Connections: No Direct Connections
- › Trail Connections:
 - › Black Creek Greenway (East Coast Greenway)
 - › Lake Crabtree County Park Trails
- › Destinations Served:
 - › Lake Crabtree County Park
 - › Weston Ave Employers
 - › RDU Airport

POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way,
- › Temporary Construction Easement: 11 Privately-Owned Parcels (10 Owners)

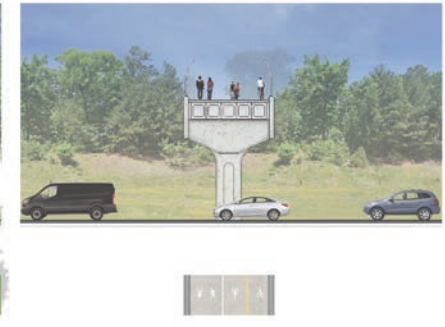
POTENTIAL PERMITTING NEEDS

- › Erosion Control Permit
- › 401 / 404 Permit
- › Floodplain Development Permit
- › NCDOT Encroachment
- › RDU Coordination

PRIMARY TYPICAL SECTIONS



16' Separated Use Path



16' Separated Use Bridge
(Min. 17' Vertical Clearance over I-40)

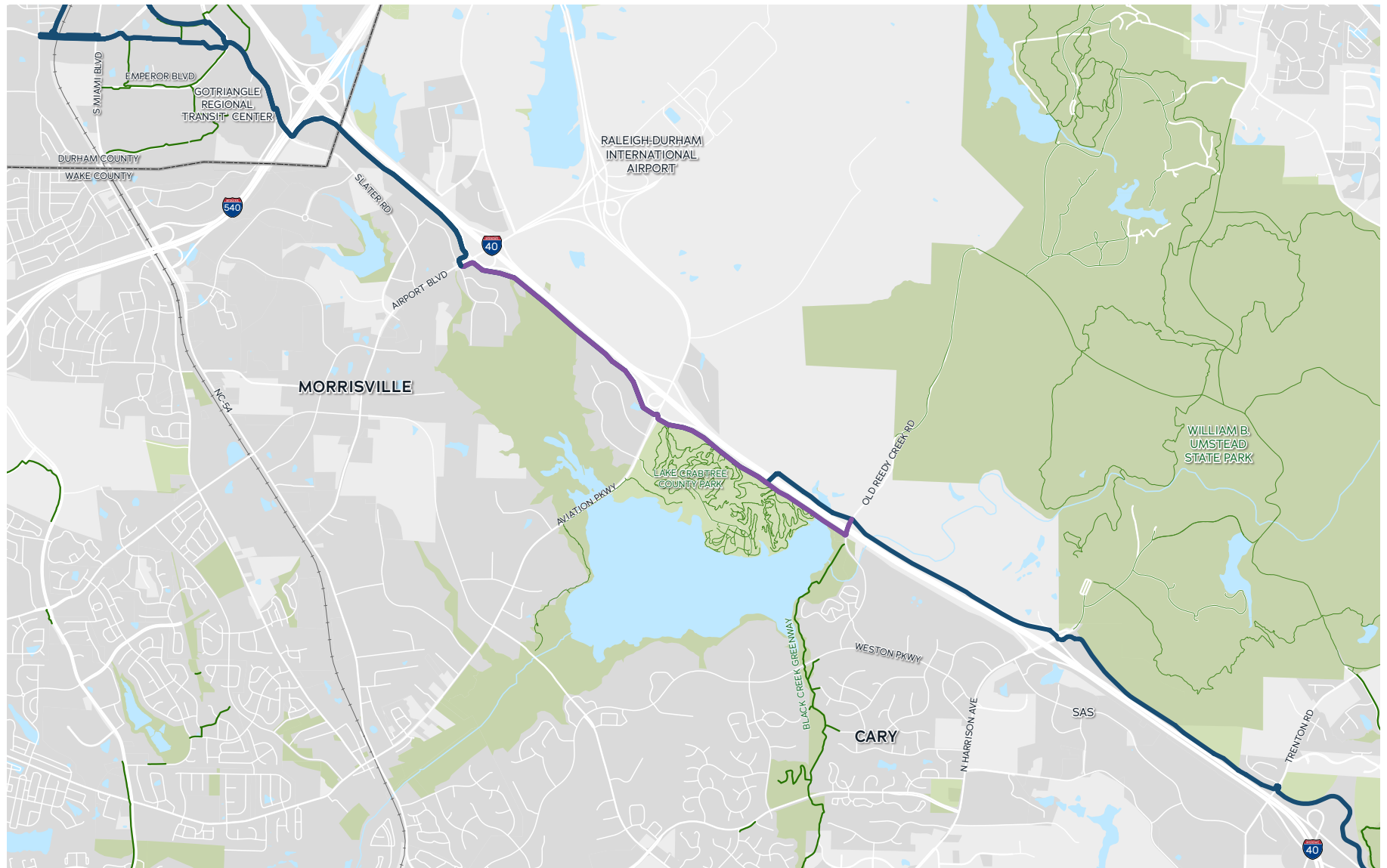
ESTIMATED PROJECT COSTS

2021 Base Construction Cost Estimate	\$ 10,996,000
Estimated Design Services (13% of Construction Cost)	\$ 1,430,000

Build Year	2025	2030
Construction Cost Estimate Escalated to Build Year	\$ 12,377,000	\$ 14,348,000
Contingency (20% of Construction Cost)	\$ 2,476,000	\$ 2,870,000
Estimated CEI Services (12% of Construction Cost)	\$ 1,486,000	\$ 1,722,000
TOTAL CONSTRUCTION COST ESTIMATE	\$ 16,339,000	to \$ 18,940,000

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

**Detailed cost information is located in Appendix C.



SEGMENT 5B

AIRPORT BLVD TO OLD REEDY CREEK RD

LEGEND

- Segment 5B
- Adjoining Segments
- Existing Greenway
- Park
- Municipality
- County

SEGMENT 5B

Segment 5B begins at Airport Blvd and travels east along the south side of I-40 as a separated use path. A bridge crosses over Brier Creek and the route continues along I-40 before crossing Aviation Pkwy via proposed pedestrian signal. The route continues along the south side of I-40 adjacent to Lake Crabtree County Park before crossing over Lake Crabtree via boardwalk. After connecting with the Old Reedy Creek Rd Trailhead, users then cross to the north side of I-40 via modification of the existing Old Reedy Creek Rd roadway bridge.

PROJECT SNAPSHOT

- › Location: I-40
- › Jurisdictions / Stakeholders: Cary, Wake County, RDU Airport
- › Facility Type(s): Separated Use Path, Shared Use Boardwalk, Shared Use Bridge
- › Total Length: 2.60 miles
- › Structures: 1 Bridge (approx. 70 LF), 3 Boardwalks (approx. 3,590 LF)
- › Grade-Separated Road Crossings: I-40 (Over)
- › At-Grade Road Crossings: Aviation Pkwy
- › Transit Connections: No Direct Connections
- › Trail Connections:
 - › Black Creek Greenway (East Coast Greenway)
 - › Lake Crabtree County Park Trails
- › Destinations Served:
 - › Lake Crabtree County Park
 - › Weston Ave Employers
 - › Old Reedy Creek Rd Trailhead

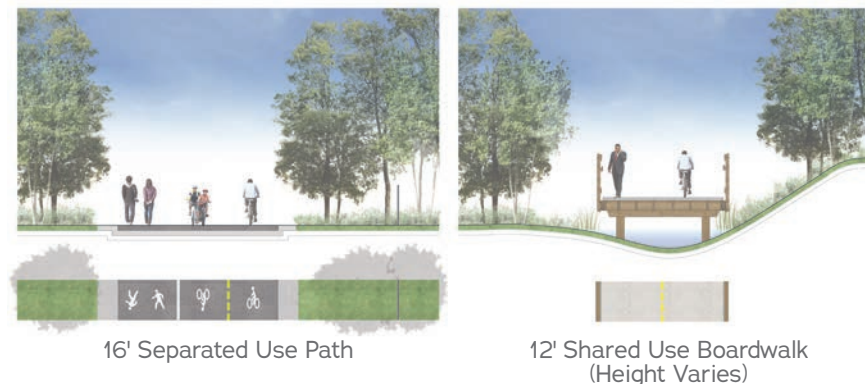
POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way,
- › Temporary Construction Easement: 11 Privately-Owned Parcels (10 Owners)

POTENTIAL PERMITTING NEEDS

- › Erosion Control Permit
- › Floodplain Development Permit
- › 401 / 404 Permit
- › NCDOT Encroachment

PRIMARY TYPICAL SECTIONS



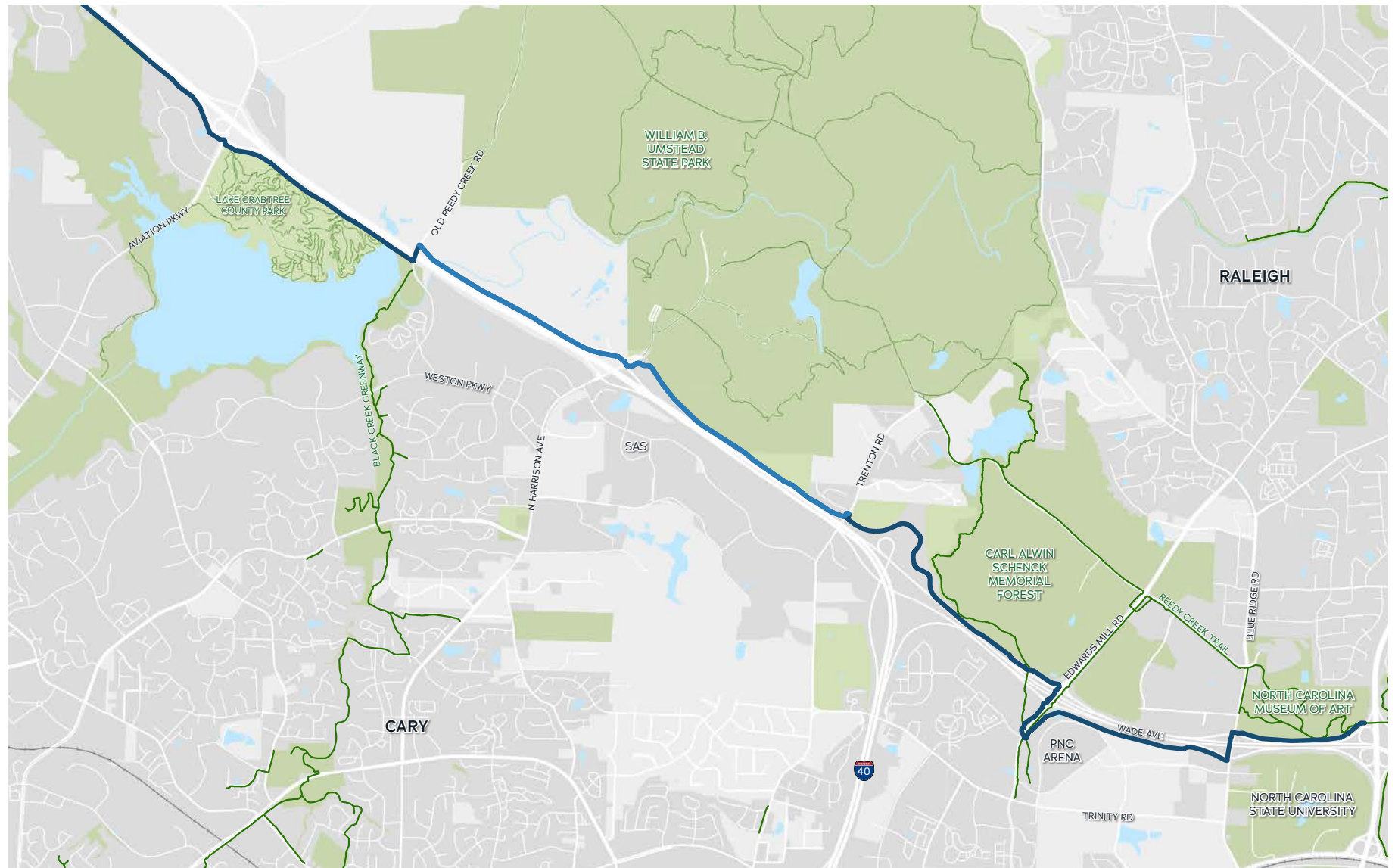
ESTIMATED PROJECT COSTS

2021 Base Construction Cost Estimate \$ 7,592,000
Estimated Design Services (13% of Construction Cost) \$ 987,000

Build Year	2025	2030
Construction Cost Estimate Escalated to Build Year	\$ 8,545,000	\$ 9,906,000
Contingency (20% of Construction Cost)	\$ 1,709,000	\$ 1,982,000
Estimated CEI Services (12% of Construction Cost)	\$ 1,026,000	\$ 1,189,000
TOTAL CONSTRUCTION COST ESTIMATE	\$ 11,280,000	to \$ 13,077,000

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

**Detailed cost information is located in Appendix C.



SEGMENT 6

OLD REEDY CREEK RD TO TRENTON RD

LEGEND

- | | |
|--------------------|--------------|
| Segment 6 | Park |
| Adjoining Segments | Municipality |
| Existing Greenway | County |

SEGMENT 6

Segment 6 begins with a mid-block crossing of Old Reedy Creek Rd and heads east as a separated use path before crossing Crabtree Creek via a system of boardwalks and a bridge. The route continues along the north side of I-40 adjacent to the Wake Stone Corporation rock quarry before crossing Harrison Ave via a proposed pedestrian signal. The bikeway continues east adjacent to William B. Umstead State Park and ends with a mid-block crossing of Trenton Rd.

PROJECT SNAPSHOT

- › Location: I-40
- › Jurisdictions / Stakeholders: Cary, Raleigh, NC State Parks
- › Facility Type(s): Separated Use Sidepath, Shared Use Boardwalk, Shared Use Bridge
- › Total Length: 2.69 miles
- › Structures: 1 Bridge (approx. 210 LF), 4 Boardwalks (approx. 2,980 LF)
- › Grade-Separated Road Crossings: None
- › At-Grade Road Crossings:
 - › Old Reedy Creek Rd
 - › N Harrison Ave
 - › Trenton Rd
- › Transit Connections: No Direct Connections
- › Trail Connections:
 - › William B. Umstead State Park Trails
 - › Black Creek Greenway
 - › Trenton Rd Connector
- › Destinations Served:
 - › William B. Umstead State Park
 - › Harrison Square Shopping Center
 - › SAS Campus
 - › Lake Crabtree County Park

POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way
- › Temporary Construction Easement: 12 Privately-Owned Parcels (11 Owners)

POTENTIAL PERMITTING NEEDS

- › Erosion Control Permit
- › Floodplain Development Permit
- › 401 / 404 Permit
- › NCDOT Encroachment

PRIMARY TYPICAL SECTIONS



16' Separated Use Path



12' Shared Use Boardwalk
(Height Varies)

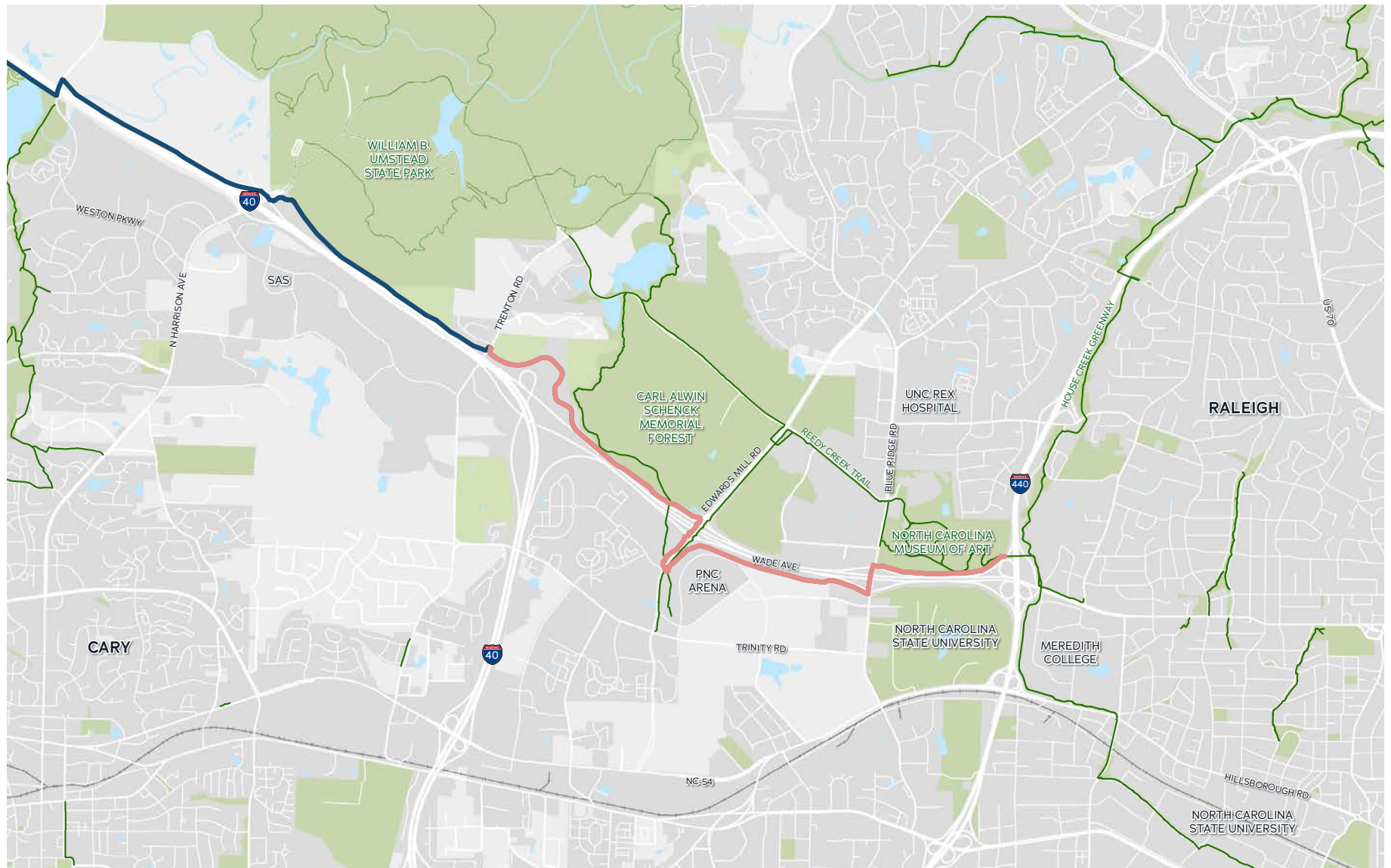
ESTIMATED PROJECT COSTS

2021 Base Construction Cost Estimate	\$ 8,648,000
Estimated Design Services (13% of Construction Cost)	\$ 1,125,000

Build Year	2025	2030
Construction Cost Estimate Escalated to Build Year	\$ 9,734,000	\$ 11,284,000
Contingency (20% of Construction Cost)	\$ 1,947,000	\$ 2,257,000
Estimated CEI Services (12% of Construction Cost)	\$ 1,169,000	\$ 1,355,000
TOTAL CONSTRUCTION COST ESTIMATE	\$ 12,850,000 to	\$ 14,896,000

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

**Detailed cost information is located in Appendix C.



SEGMENT 7

TRENTON RD TO I-440

LEGEND

- Segment 7
- Adjoining Segments
- Existing Greenway
- Park
- Municipality
- County

SEGMENT 7

Segment 7 begins at Trenton Road as a separated use path and heads east along the north side of the I-40 / Wade Ave interchange. The bikeway continues along the north side of Wade Ave adjacent to the Richland Creek corridor via a system of boardwalks to Edwards Mill Rd. The route heads south with at-grade crossings of the Wade Ave westbound on-ramp and eastbound off-ramp and crosses Edwards Mill Rd via the existing Richland Creek Trail pedestrian tunnel near the Wade Park Blvd intersection. The segment continues on the south side of Wade Ave and crosses back to the north side via a pedestrian bridge that will be constructed as part of a separate project along Blue Ridge Rd. Users will cross Blue Ridge Rd via pedestrian signals installed as part of the Blue Ridge Rd project and continue along the north side of Wade Ave and end at a connection to the existing pedestrian bridge over I-440 at the NC Museum of Art.

PROJECT SNAPSHOT

- › Location: I-40 (0.25 miles), Wade Ave (2.99 miles),
Edwards Mill Rd (0.60 miles), Blue Ridge Rd (0.15 miles)
- › Jurisdictions / Stakeholders: Raleigh
- › Facility Type(s): Separated Use Path, Shared Use Boardwalk
- › Total Length: 3.99 miles
- › Structures: 5 Boardwalks (approx. 4,395 LF)
- › Grade-Separated Road Crossings: Edwards Mill Rd (Under), Wade Ave (Over)
- › At-Grade Road Crossings:
 - › Edwards Mill Rd / Wade Ave Interchange
 - › Blue Ridge Rd
- › Transit Connections:
 - › GoRaleigh Route 26
- › Trail Connections:

<ul style="list-style-type: none"> › Trenton Rd Connector › Richland Creek Trail › Edwards Mill Rd Connector 	<ul style="list-style-type: none"> › Reedy Creek Trail › House Creek Trail
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- › Destinations Served:

<ul style="list-style-type: none"> › SAS Campus › William B. Umstead State Park › Carl Alwin Schenk Memorial Forest › PNC Arena › Carter Finley Stadium 	<ul style="list-style-type: none"> › NC State Fair Grounds › NC State College of Veterinary Medicine › NC Museum of Art › Bandwidth Campus
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POTENTIAL RIGHT-OF-WAY NEEDS

- › Permanent Easement: Within NCDOT Right-of-Way
- › Temporary Construction Easement: 3 Privately-Owned Parcels (2 Owners)

PRIMARY TYPICAL SECTIONS



16' Separated Use Path



12' Shared Use Boardwalk
(Height Varies)

ESTIMATED PROJECT COSTS

2021 Base Construction Cost Estimate	\$ 9,863,000
Estimated Design Services (13% of Construction Cost)	\$ 1,283,000

Build Year	2025	2030
Construction Cost Estimate Escalated to Build Year	\$ 11,101,000	\$ 12,869,000
Contingency (20% of Construction Cost)	\$ 2,221,000	\$ 2,574,000
Estimated CEI Services (12% of Construction Cost)	\$ 1,333,000	\$ 1,545,000
TOTAL CONSTRUCTION COST ESTIMATE	\$ 14,655,000	to \$ 16,988,000

*Costs associated with right-of-way acquisition to be determined during design process and are not included in this estimate.

**Detailed cost information is located in Appendix C.

POTENTIAL PERMITTING NEEDS

- | | |
|--|---|
| <ul style="list-style-type: none"> › Erosion Control Permit › 401 / 404 Permit | <ul style="list-style-type: none"> › Floodplain Development Permit › NCDOT Encroachment |
|--|---|

IMPLEMENTATION SCENARIOS

Spanning over 20 miles and seven jurisdictions, the Triangle Bikeway will be implemented in phases and will involve a coordinated effort to design, fund, and construct the corridor. Project development opportunities will require collaboration from multiple agencies and utilize various funding sources. The following implementation scenarios outline potential paths to develop the Triangle Bikeway based on accelerated, incremental, and gradual time frames. Each scenario defines jurisdictional commitments and presents typical funding mechanisms for design and construction. Due to the complexity of the corridor, the Triangle Bikeway will likely be developed using aspects of each of these scenarios. Project leaders are also encouraged to explore additional implementation methods as new funding opportunities arise at the federal and state levels. (*Funding resources referenced in the implementation scenarios are provided in Appendix A*).



SCENARIO 1: ACCELERATED

Wake County and Durham County fund design of the Triangle Bikeway and submit a USDOT RAISE Grant Application to fund construction of the corridor.

In this scenario, counties prioritize the development of the Triangle Bikeway by funding the design of the corridor in two segments. The western segment spans 7.74 miles from Chapel Hill to Research Triangle Park. The eastern segment spans 13.53 miles from Research Triangle Park to Raleigh. Utilizing local funding for the design of the corridor accelerates project implementation by eliminating the need to seek grant funding for both design and construction.

Funding Mechanisms + Opportunities:

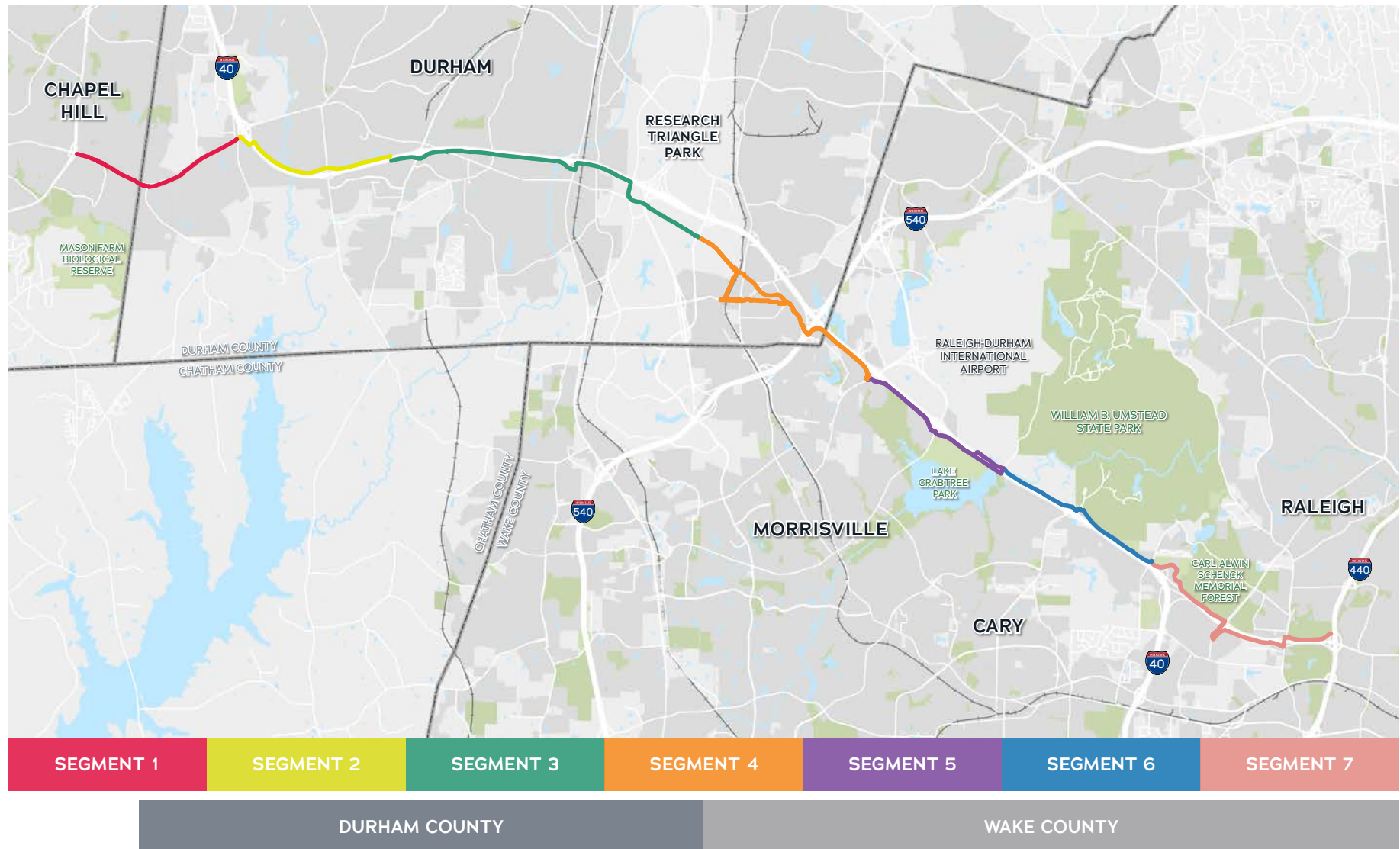
- › Potential funding sources include Capital Improvement Programs (CIP) and bonds. American Rescue Plan (ARP) may be an additional funding source for design.
- › USDOT RAISE Grants fund capital investments in surface transportation that will have a significant local or regional impact. RAISE grants require a minimum local match of 20% at time of construction.
- › Lead agencies should explore private funding opportunities to establish a public-private partnership to fund the RAISE grant local match..

Strengths of this Scenario:


- › Fastest path to construction.
- › Avoids construction cost escalation.
- › Consistent design.
- › Regional approach to implementation.
- › Constructed independent of NCDOT roadway improvements.

Challenges of this Scenario:

- › Relies on a successful RAISE Grant or other Federal investment for funding.
- › Counties may have limited bandwidth for project administration.
- › Chapel Hill segment not included in this scenario.



SCENARIO 1: ACCELERATED COUNTY-FUNDED DESIGN + RAISE GRANT-FUNDED CONSTRUCTION

- LEGEND**
-  Triangle Bikeway
 -  Park
 -  Municipality
 -  County



SCENARIO 2: INCREMENTAL

Town of Chapel Hill, City of Durham, Research Triangle Park, Town of Morrisville, Town of Cary, and City of Raleigh fund design and construction of the Triangle Bikeway.

In this scenario, municipalities prioritize the development of the Triangle Bikeway by funding the design and construction of the corridor in multiple segments that are based on jurisdiction boundaries. This scenario takes an incremental approach to project implementation that allows municipalities to prioritize design and construction of the Bikeway as funding allows or when additional funding opportunities become available.

Funding Mechanisms + Opportunities:

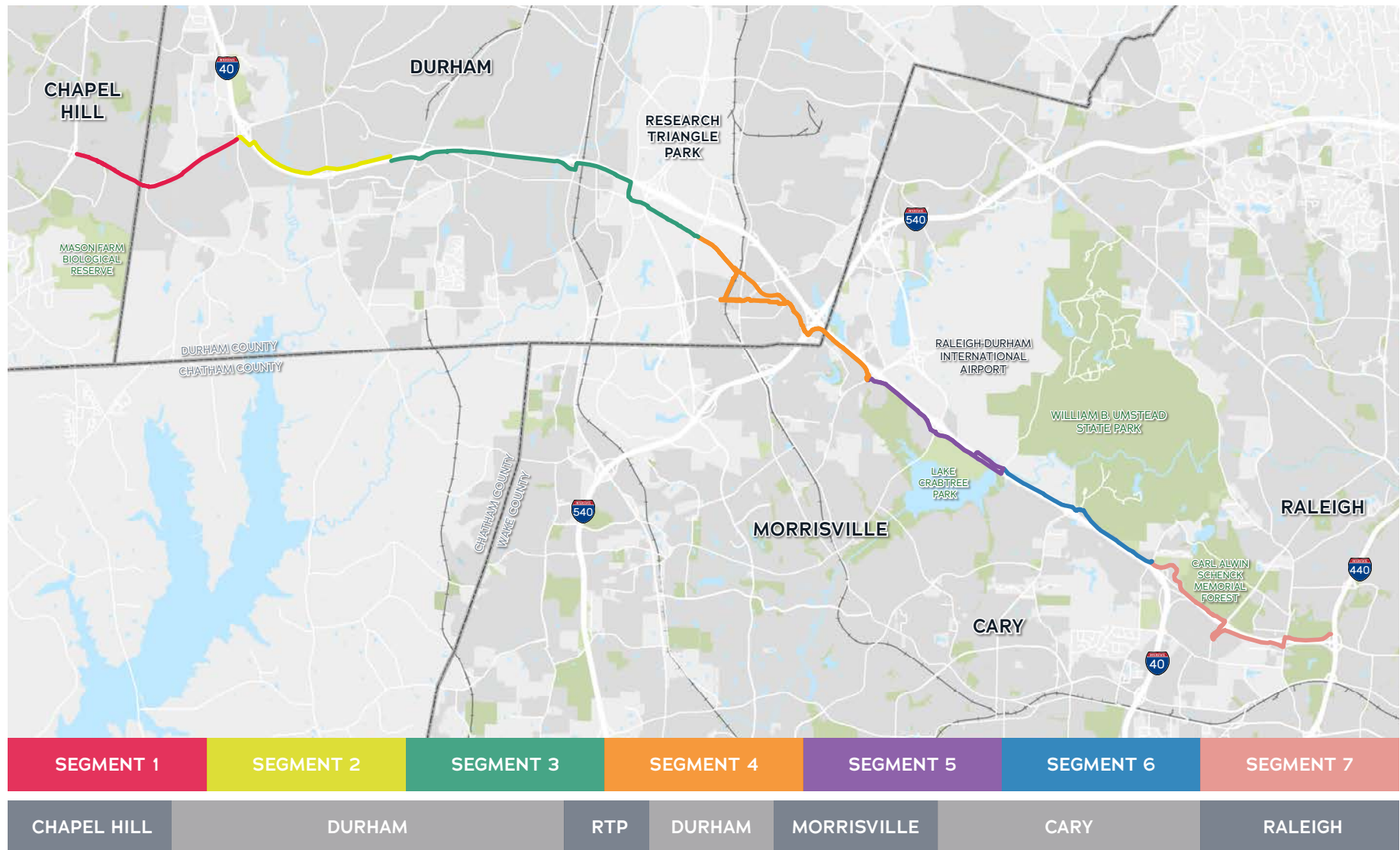
- › Design costs for each municipality vary, based on length of the Bikeway through each jurisdiction.
- › Potential local funding sources include Locally Administered Projects Program (LAPP), Capital Improvement Program (CIP), and municipal bonds.
- › Municipalities may also pursue USDOT RAISE grants for construction. Municipalities should consider partnering with neighboring jurisdictions to strategically combine segments that provide connections to employment centers, neighborhoods, and schools, etc.
- › Municipalities should explore private funding opportunities to establish a public-private partnership to fund construction or to put towards a RAISE grant local match.

Strengths of this Scenario:

- › Improves project feasibility by funding design and construction at the municipal level.
- › Reasonable time frame for design + construction.

Challenges of this Scenario:

- › Potential for a slower implementation time frame compared to the accelerated scenario.
- › Potential for disjointed design.
- › Municipalities face significant funding constraints for planned bicycle and pedestrian facilities.
- › Other trail and sidewalk projects may be prioritized over the Triangle Bikeway at the local level.



SCENARIO 2: INCREMENTAL MUNICIPAL-FUNDED DESIGN + CONSTRUCTION



SCENARIO 3.1: GRADUAL NCDOT funds the design and construction of the Triangle Bikeway through roadway improvements via the NCDOT Complete Streets Policy.

In this scenario, NCDOT funds the design and construction of the Triangle Bikeway as the agency programs roadway improvements along the corridor in the State Transportation Improvement Program (STIP). The Complete Streets Policy requires NCDOT to consider and incorporate multimodal facilities in the design and improvement of the state's transportation projects. While this scenario takes a gradual approach to project implementation, it significantly reduces the financial burden on municipal and regional partners to fund the Triangle Bikeway.

Funding Mechanisms + Opportunities:

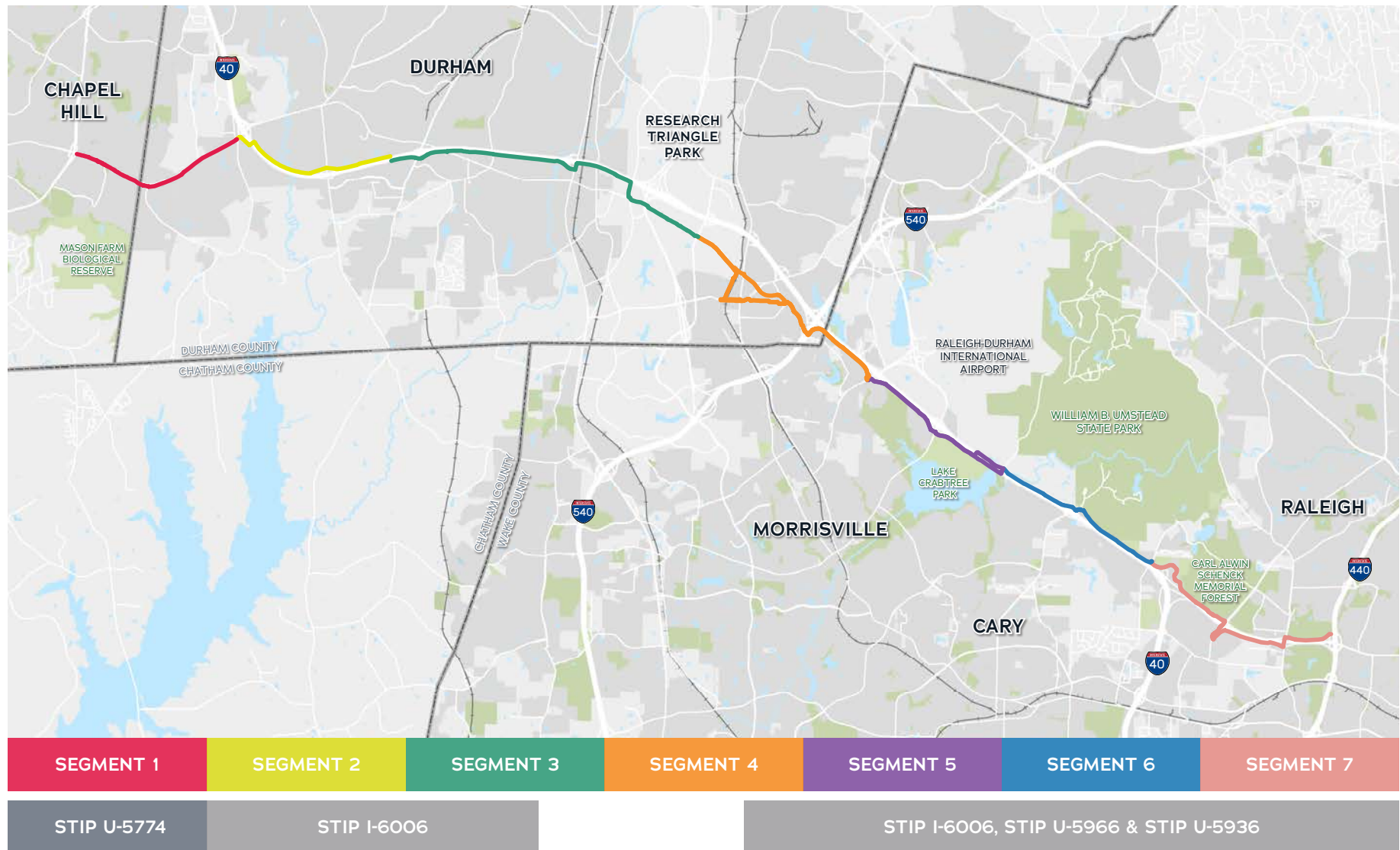
- › Projects U-5774B, U-5774C, and U-5774F are programmed in the 2020-2029 STIP and include multi-use paths along NC-54 from 15-501 to I-40. These projects may potentially fund Segment 1 of the bikeway along NC 54 in Durham and Chapel Hill. Right-of-way acquisition for these projects is programmed for 2027-2029.
- › Projects I-6006, U-5966, and U-5936 are programmed in the 2020-2029 STIP and include roadway and intersection improvements along I-40 and Wade Ave from 15-501 in Chapel Hill to I-440 in Raleigh. These projects do not include multi-modal facilities and may be exempt from the Complete Streets Policy since pedestrians and bicyclists are prohibited on interstate corridors.
- › No STIP projects are currently programmed along NC-54 through Research Triangle Park. Local and regional agencies would be responsible for design and construction of the RTP segment if the project is not programmed in the next STIP.

Strengths of this Scenario:


- › Project funded by NCDOT.
- › Reduces burden of design and construction costs for municipalities.

Challenges of this Scenario:

- › Gradual project development will result in higher construction cost due to escalation.
- › Proposed amenities and additional width of the corridor beyond 10-12ft could be considered betterments in the implementation of the Complete Streets Policy. Betterments must be funded by municipalities.
- › 2024-2033 STIP will be developed with existing projects from 2020-2029 STIP due to budget shortfalls.
- › Segments proposed along I-40 may be exempt from Complete Streets Policy since pedestrians and bicyclists are prohibited on interstates.
- › STIP Projects U-5774B/C/F may not be a priority for Durham County in the 2022 MTP Update.



SCENARIO 3.1: GRADUAL NCDOT-FUNDED DESIGN + CONSTRUCTION

- LEGEND**
-  Triangle Bikeway
 -  Park
 -  Municipality
 -  County



SCENARIO 3.2: GRADUAL

Regional and municipal partners fund the design and construction of the Triangle Bikeway through the NCDOT STIP as independent bicycle and pedestrian projects.

In this scenario, CAMPO, DCHC MPO, and municipalities prioritize the development of the Triangle Bikeway by funding the design and construction of the corridor in segments as independent bicycle and pedestrian projects through the STIP. Independent bicycle and pedestrian projects are funded through federal transportation programs that are allocated by NCDOT, such as Transportation Alternatives (TA) and Congestion Mitigation and Air Quality (CMAQ). As with scenario 3.1, this scenario takes a gradual approach to project implementation, but it reduces the financial burden on municipal and regional partners to fund the Triangle Bikeway.

Funding Mechanisms + Opportunities:

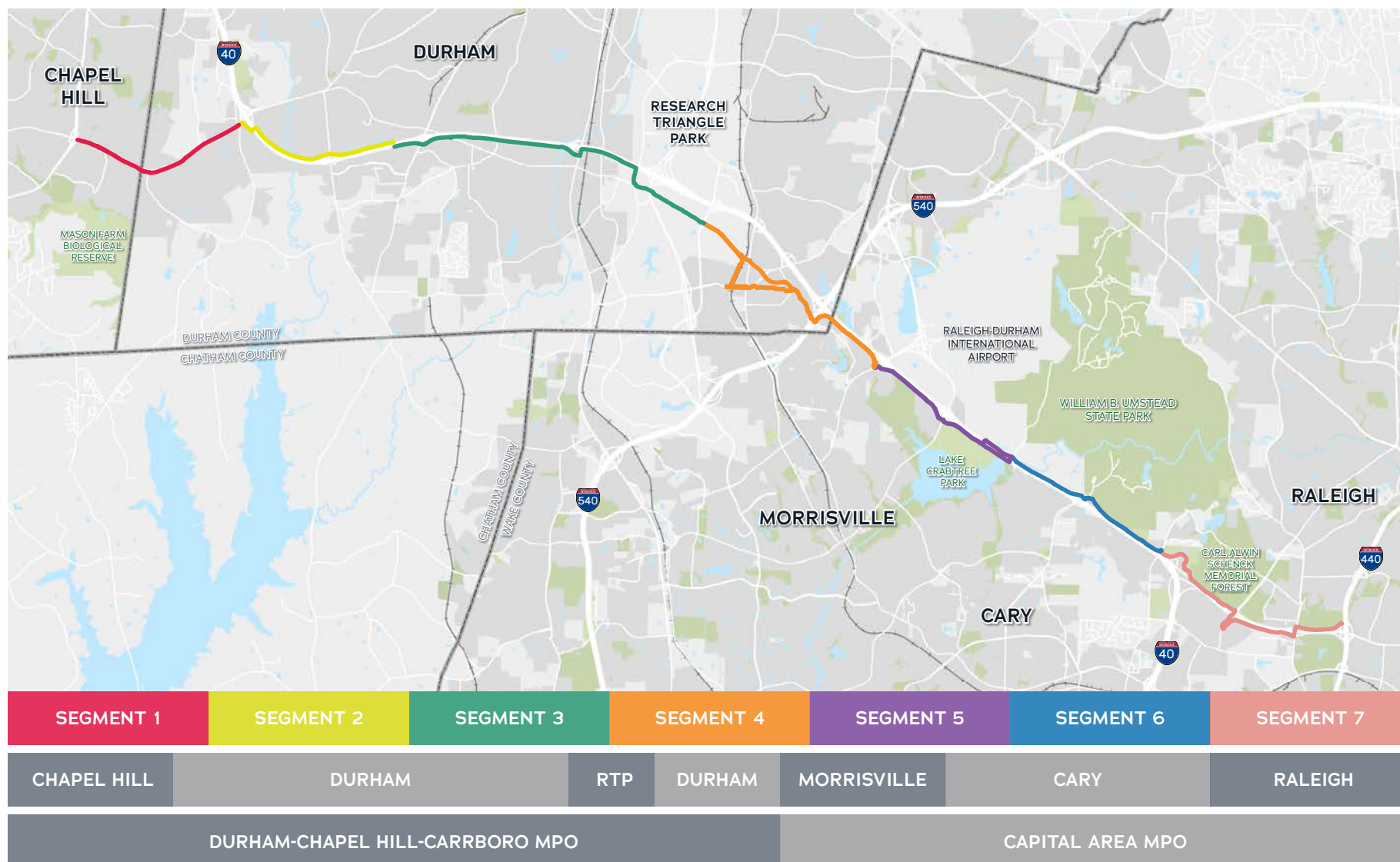
- › Independent bicycle and pedestrian projects prioritized in the NCDOT STIP require a minimum local match of 20%.
- › Opportunity to bundle Triangle Bikeway segments into one or more projects through the STI prioritization process. Bundling multiple segments into one project requires a lead agency responsible for project administration.
- › Lead agencies should explore private funding opportunities to establish a public-private partnership to fund the STIP local match

Strengths of this Scenario:





- › If the state match allowance for independent bicycle and pedestrian projects is reinstated in North Carolina, project funding could include state investment.
- › Reduces burden of design and construction costs for municipalities.
- › Bundled projects typically receive higher quantitative scores and are more competitive in the STI prioritization process than stand-alone bicycle and pedestrian projects.

Challenges of this Scenario:

- › Slower implementation time frame compared to the accelerated and incremental scenarios.
- › Gradual project development will result in higher construction cost due to escalation.
- › Limited funds available for independent bicycle and pedestrian projects.
- › Municipalities face significant funding constraints for planned bicycle and pedestrian facilities.
- › Other trail and sidewalk projects may be prioritized over the Triangle Bikeway at the local level.



SCENARIO 3.2: GRADUAL DESIGN + CONSTRUCTION THROUGH NCDOT SPOT SUBMITTAL

- LEGEND**
-  Triangle Bikeway
 -  Park
 -  Municipality
 -  County



MAINTENANCE

Maintenance of the Triangle Bikeway is essential to the long-term viability of the facility as a regional commuter corridor. This study recommends a collaborative approach to maintenance with the development of a maintenance plan to prioritize funding and responsibilities amongst regional and local partners. The maintenance plan should be reviewed and updated annually, responding to lessons learned and changes in tasks, operational policies, standards, and maintenance goals. Key considerations for the Triangle Bikeway maintenance plan include:

- › Understanding the anticipated needs of the corridor and assessing the capacity of municipal and regional governments to meet those maintenance needs.
- › Estimation of maintenance costs by determining necessary maintenance activities, such as mowing, edging, landscaping, trash removal, debris clearing, lighting, drainage, seasonal maintenance needs, sealcoating, repaving, patching, and bridge repair.
- › Consideration of labor costs based on which maintenance activities can be completed in-house versus contracted out.
- › Assessment of available technologies to collect data on facility conditions and facilitate maintenance functions.
- › Developing methodology to prioritize annual maintenance needs based on facility conditions and available funding.
- › Consideration of emergency services including designated ingress/egress locations, mile-marker signage along the facility for location identification, and any emergency notification systems.

MAINTENANCE RESPONSIBILITIES

The Triangle Bikeway is proposed predominantly within NCDOT right-of-way along NC-54 and I-40. Therefore, maintenance of the corridor is subject to NCDOT's maintenance policies during construction and following project completion. NCDOT's Complete Streets Policy, adopted in August 2019, specifies maintenance policies for bicycle and pedestrian facilities constructed as part of roadway improvements within NCDOT right-of-way. Regarding maintenance responsibility, the Complete Streets Implementation Guidance states:

A local maintenance agreement will be executed within the time frame identified in the Project Development Network for all separated bicycle and pedestrian improvements (e.g., sidewalk or shared-use path) inside or outside a municipal boundary. In the event an agreement cannot be reached, the next highest non-separated facility type will be evaluated for inclusion in the project.

Exceptions may be made on a case-by-case basis and NCDOT may agree to maintain separated facilities when a maintenance agreement is not in place in unique project areas of high pedestrian/bicycle demand or high risk related to crossing distance or other conditions.

Maintenance Task	Task Type	Recommended Frequency
Routine Maintenance: Tree/Brush Trimming Mowing Trail Sweeping Signage/Map Updates/Replacement Trash Removal/Litter Clean-Up Planting, Pruning, Landscaping Flooding Repairs Repainting/Restriping Minor Patching Minor Bridge Repairs Lighting Replacement	Routine	On-Going / Annually
Shared-Use Path Sealcoating	Minor Repairs	Every 5 years
Shared Use Path Resurfacing: Asphalt Concrete Boardwalk	Major Reconstruction	Every 10-15 years Every 20 years 10 years
Complete Replacement, Regrading, Resurfacing	Major Reconstruction	Every 20 years

Source: Best Practices in Trail Maintenance: A Manual by the Ohio River Greenway, Perdue University

Per policy guidance, maintenance of the Triangle Bikeway will become the responsibility of municipalities along the corridor, which include Town of Chapel Hill, City of Durham, Town of Morrisville, Town of Cary, and City of Raleigh. Understanding the limited funding and resources available at the municipal level for greenway maintenance, proposed design elements and materials of the Triangle Bikeway have been selected to lower life cycle costs and reduce future maintenance burdens. This study also recommends that policies and standards developed during the maintenance planning process are consistent with municipal maintenance programs. Municipal partners should consider local segments of the Triangle Bikeway as additional miles in their respective greenway networks.

As a regionally significant project, intergovernmental and inter-agency coordination is strongly encouraged to collectively address maintenance needs, policies, standards, and funding. Regional and county governments should consider providing financial assistance to supplement municipal maintenance programs for activities conducted along the Triangle Bikeway. Additionally, regional partners should explore public-private partnerships as a potential funding mechanism for maintenance.

ENCROACHMENT + MAINTENANCE AGREEMENTS

When construction is proposed within NCDOT right-of-way, an encroachment agreement is required between NCDOT and the municipality constructing the facility. The following encroachment agreements will be required by NCDOT prior to construction of the Triangle Bikeway:

16.1A – Two-Party, Non-Utility, Not Related to Road Construction: *This encroachment agreement is used for the installation of signs, fencing, sidewalks, shared-use paths, etc. within NCDOT right-of-way. NCDOT states that applicants submitting this agreement must install and maintain the facility installed.*

16.7 Grading or Alteration of Drainage (C/A): *This encroachment agreement is used for grading and/or the alteration of drainage within controlled access rights-of-way during construction of a facility not related to road construction.*

Municipalities entering into an encroachment agreement with NCDOT must include language on maintenance responsibility of the facility following construction. The agency's standard maintenance language included in encroachment agreements with municipalities is provided below:

The Municipality, at no expense or liability to NCDOT, shall assume all maintenance responsibilities for the [bicycle-pedestrian facility].



Routine Greenway Maintenance - Cary, NC