

# Raleigh-Cary Rail Crossing Study

R E C O M M E N D A T I O N S



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April 2016

# Raleigh-Cary Rail Crossing Study for the Corridor from NE Maynard Road, Cary to Gorman Street, Raleigh

Prepared for:



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A handwritten signature in black ink, reading "Teresa Gresham", is written over a horizontal line.

Teresa Gresham, P.E.

April 21, 2016

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# Table of Contents

PROJECT OVERVIEW ..... 1

PLANNING PROCESS ..... 3

EXISTING CONDITIONS ..... 19

RECOMMENDED IMPROVEMENTS ..... 46

CONCLUSIONS ..... 74

APPENDIX

# Executive Summary

The Raleigh-Cary Rail Crossing Study was conducted through a partnership of the Capital Area Metropolitan Planning Organization (CAMPO), City of Raleigh, Town of Cary, North Carolina Department of Transportation (NCDOT), GoTriangle, North Carolina Railroad Company, and Norfolk Southern Railroad.

The purpose of this study was to evaluate potential improvements to the at-grade highway/rail crossings from NE Maynard Road in Cary to Gorman Street in Raleigh, and to study how changes at the crossings will affect future land uses and the community. In addition to looking at existing crossings, this study also considered possible new roadway extensions across the railroad within the corridor.

Safety improvements may include additional signage, medians and median barriers, grade separation (a road bridge over the railroad or a railroad bridge over the road), or closing the crossing.

The process began with data collection and public outreach. Community members and major stakeholders along the corridor were asked to identify which aspects — vehicular, multimodal, land use, community cohesion, or others — worked well today and which do not work well. They were asked to describe how and why they traveled through the corridor. Combining this information with collected data, an understanding of previous studies in this area, and a site review, the project team developed a Vision, Issues, and Opportunities summary.

Following the first public meeting, design began on a range of solutions at each existing crossing. Several new roadway extensions, either currently included on the local transportation plan or identified as part of this study, were evaluated. This corridor is part of the Sealed Corridor Program developed by NCDOT in conjunction with the railroad agencies. Therefore, only grade separations were considered for new crossings.

The first step in the design process was to determine the specific goals for potential improvements. A range of options were considered for each of the following six design principles:

1. Build safety through urbanization
2. Choose the paths of least resistance
3. Invest in crossings that leverage the corridor's strengths
4. Invest in crossings that respond to critical issues
5. Invest in crossings where significant development potential exists
6. Balance regional transportation and local circulation needs

The potential solutions developed to meet the design principles were then evaluated in a three-tiered analysis process. Some options were eliminated early in the process based on geometric constraints. Conceptual design graphics were developed for the remaining options in order to study them further. Other options were eliminated following traffic, community, safety, and economic impact analyses. More detailed designs were developed for a smaller number of options to better understand potential impacts. These options were presented to the public for further feedback.

Following the conclusion of the analysis and input from the public, one alternative was determined to be most feasible at each existing and proposed future crossing. The designs for these recommended alternatives were further refined to develop cost estimates. A summary of these is on the following page.



RCRX Study Recommendations

Crossing	Report Page Reference	Crossing No.	Milepost	Crossing Type	Recommendation	Time Frame	Potential Cost Estimate*
NE Maynard Road	56	643 351A	CSX - 164.20 NS - 73.76	Existing at-grade	Railroad bridge over NE Maynard Rd, shifting the Maynard Rd/Chatham St intersection to outside of the 200-foot railroad corridor	Long-term	\$38 million
Trinity Road	58	630 657S	CSX - 163.43 NS - 74.51	Existing at-grade	Trinity Rd bridge over the railroad with Trinity Rd extensions to Chapel Hill Rd and Cary Towne Blvd (southern extension could be built as a separate phase)	Long-term	\$52 million
Corporate Center Drive	60	N/A		Future	Corporate Center Dr extension to Bashford Rd with a bridge over the railroad	Long-term	\$22 million
Nowell Road	60 & 62	630 654W	CSX - 162.42 NS - 75.52	Existing at-grade	Close Nowell Road railroad crossing in conjunction with extension of Corporate Center Dr and/or Edwards Mill Rd across the railroad	Long-term	\$36,000
Edwards Mill Road	62	N/A		Future	Edwards Mill Rd extension to Hillsborough St with a railroad bridge over the new road	Long-term	\$48 million
Jones Franklin Road	64	N/A		Future	Jones Franklin Rd extension to Chapel Hill Rd with a railroad bridge over the new road	Long-term	\$26 million
Powell Drive	66	630 650U	CSX - 161.33 NS - 76.62	Existing at-grade	Realignment of Powell Dr to connect with Youth Center Dr with a railroad bridge over the realigned road	Long-term	\$44 million
Beryl Road	68	630 647L	CSX - 159.94 NS - 78.02	Existing at-grade	Close Beryl Rd and add a new connector from Beryl Rd to Royal St	Mid-term	\$5 million
Royal Street	68	630 646E	CSX - 159.73 NS - 78.21	Existing at-grade			

\* Includes a planning-level cost estimate for construction, temporary railroad work, and right of way.

# Project Overview

The Raleigh-Cary Rail Crossing Study has two primary goals:

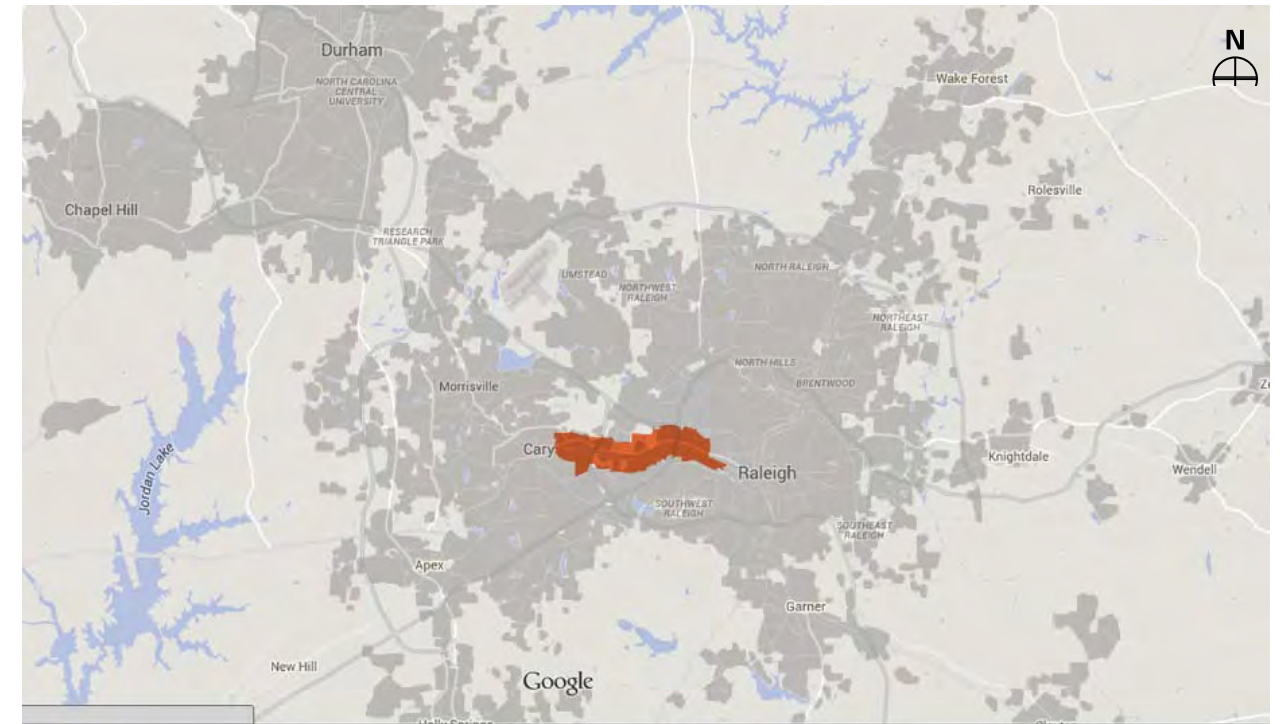
1. To improve safety at locations where roads cross the railroad tracks at-grade.
2. To determine the best way for proposed roads in local plans to cross the railroad.
3. To study how potential road/rail improvements will affect future land uses and the community.

## Why invest in crossings?

The North Carolina Department of Transportation (NCDOT), in coordination with the North Carolina Railroad Company (NCR), Norfolk Southern, and CSX, has created the Sealed Corridor Program. The goal of the program is to eliminate or improve rail-highway at-grade crossings from Raleigh to Charlotte. Efforts include using enhanced traffic control devices, closing crossings, and grade separating crossings. With this program, no new at-grade railroad crossings will be constructed.

As freight and passenger train volumes grow, the need for these improvements grows as well. While no specific funding exists for improving crossings along this corridor, it is important to establish the logic behind investing. Should the funding become available, decisions can readily be made using this hierarchy:

- » Crossings should be built so they may be safely used by all transportation modes and should be sited at regular intervals so that sufficient redundancy exists for emergency responders if a particular crossing is blocked.
- » Crossings should be built in the most cost-effective and practical form that builds value for surrounding properties.
- » Crossings should unlock development opportunities to provide a sufficient return on the investment made in the crossing structure.
- » Crossings should support rail performance, local circulation, and regional transportation needs.

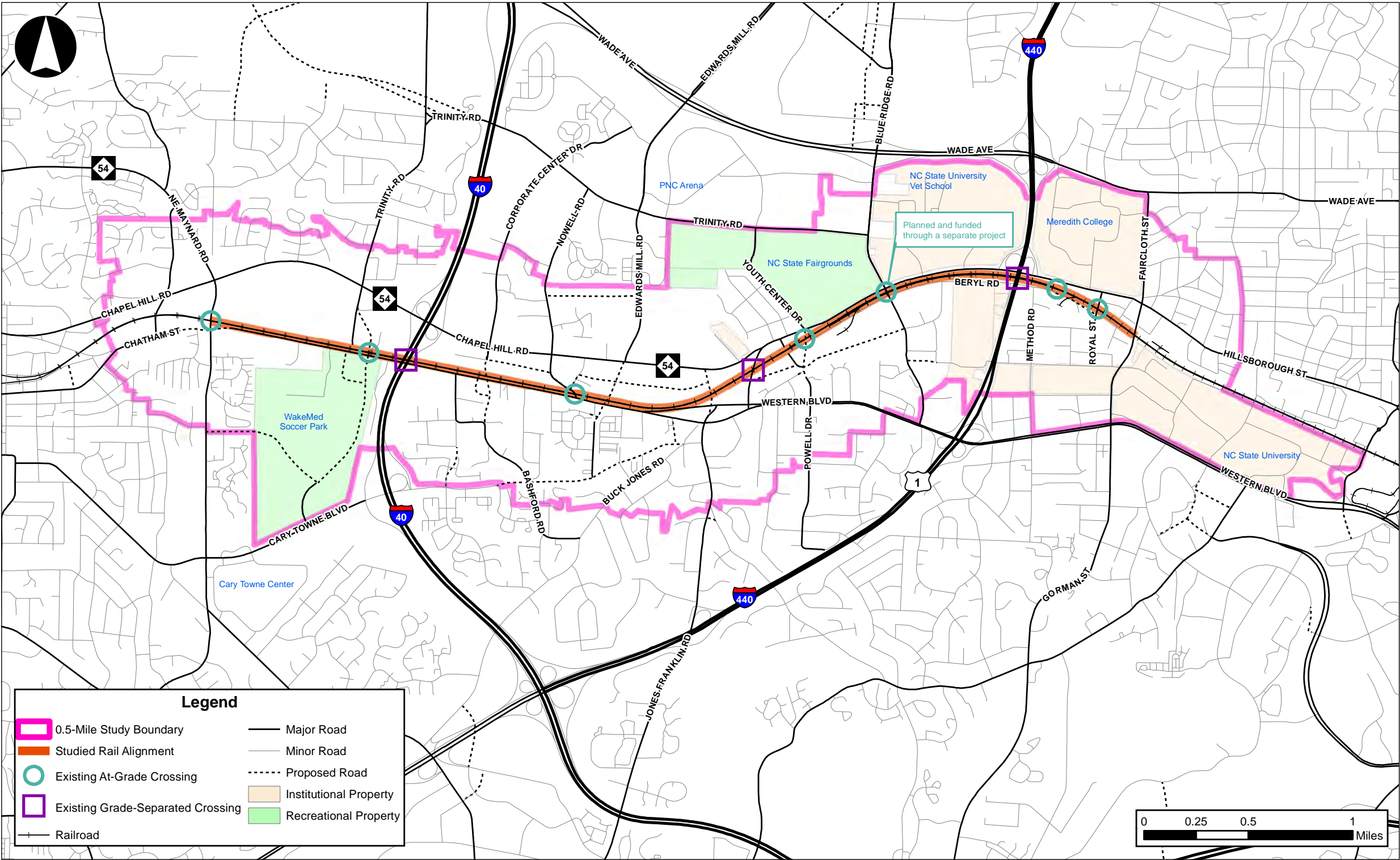


LOCATION MAP

APPROACH
1 Study the corridor's current form and how it works today
2 Find out from the public, stakeholders, and data what is and is not working well in the corridor
3 Cross reference research, public input, and the municipalities' potential development analyses to identify areas that have major strengths worth developing further, have major weaknesses that development can help resolve, and have significant new development potential that is unlocked by grade-separated crossings
4 Create a rationale for reconfiguring or enhancing crossings to improve safety and allow urban development along the rail corridor
5 Identify areas of focus for subsequent phases of work

Study Area

The study area sits generally between NE Maynard Road in Cary and Gorman Street in Raleigh and from Chapel Hill Road/Hillsborough Street on the north to Chatham Street/Western Boulevard on the south. It includes the neighborhoods and uses that abut these approximate boundaries.





## Planning Process

Several alternatives were considered for each at-grade crossing location. Short, mid, and long-term safety alternatives were considered. This range of options allows for improvements to be phased in as funding and needs allow. Mid- and long-term options may include grade separating the road and railroad (road over rail or rail over road), realigning the road across the railroad, closing the crossing, or retaining the existing crossing.

Public outreach was an important part of this study. Meetings with the public and stakeholders were held before alternative development began. Data was collected through Fall 2014, including the following sources:

- » Federal Railroad Administration (FRA)
- » North Carolina Department of Transportation (NCDOT)
- » US Census Data
- » City of Raleigh, Town of Cary, CAMPO, and other institutional plans
- » City of Raleigh and Town of Cary traffic data
- » Site inspection

The project team held the first set of public meetings in November 2014. The issues and opportunities along the corridor identified by the public, along with concerns highlighted by the data, formed the basis for identification of potential solutions.

Design principles were developed to clearly articulate the goals of the improvements. Potential alternatives were developed based on each of these principles. The principles and alternatives will be described in more detail later in this section.

The alternatives were evaluated in three steps, or tiers. At each tier, the designs were refined with more detail and additional analyses were performed.

A second set of meetings was held after a range of alternatives was developed, to help the project team select a recommended alternative at each crossing. Finally, the results of the study will be presented at a public hearing to report on the conclusions of the study and gather final comments.



IN THIS SECTION
» Public outreach
» Vision, issues, and opportunities
» Design principles
» Design assumptions
» Steps of analysis
» Conceptual alternatives

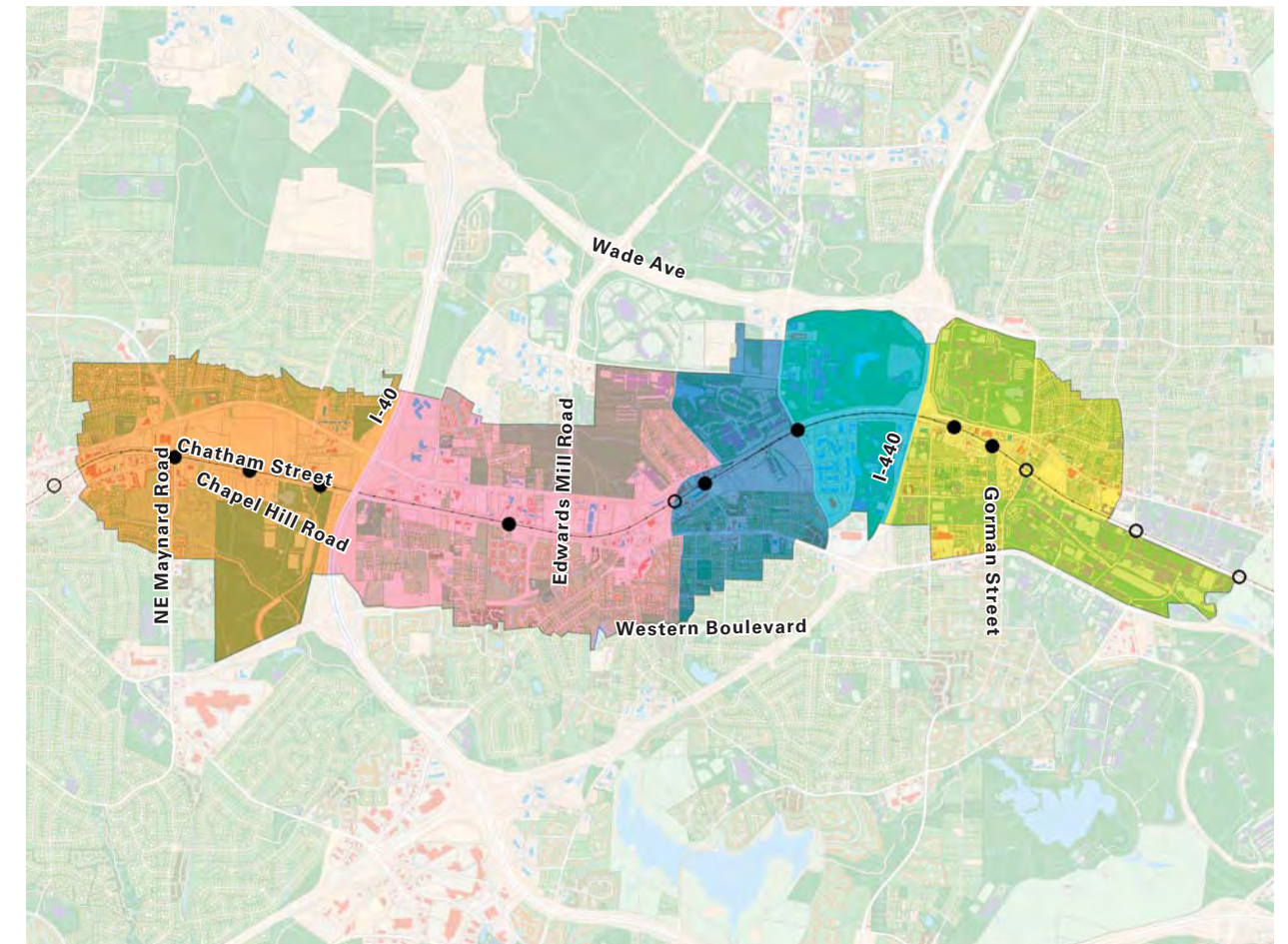
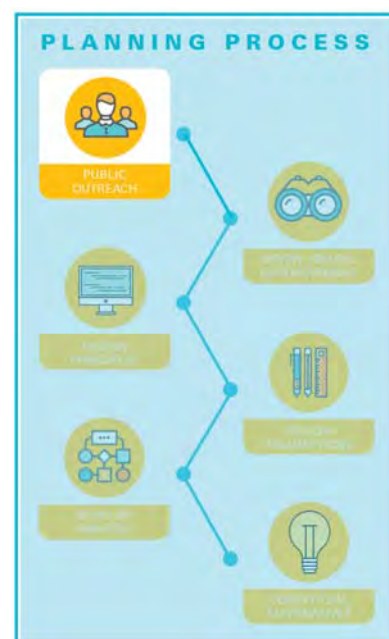
## Public Outreach

Public outreach occurred during three key milestones in the study. This process provided opportunities for the public to be engaged with the project before solutions were developed, after designs were proposed, and once a final alternative was developed. The input from the public throughout this process steered the direction and decisions of the project team. Meetings were held with the public, key stakeholders, and Spanish-speaking members of the community.

- » A set of kick-off meetings provided the project team an opportunity to discuss the corridor with the public, learning about issues and local visions from those who live and work in the study area. Input from the first meetings informed the Vision, Issues, and Opportunities summary, presented on **page 7**.
- » Once the project team had developed broad solutions based on the initial public input and other research, a design charrette was held to allow the public to interact with the team as specific alternatives were created. At the end of the charrette, these designs were presented to the public for their feedback.
- » The report was presented to the Raleigh City Council and Cary Town Council. Following those meetings, a final public engagement opportunity was held at the conclusion of the project, when the study report was presented at a public hearing held by CAMPO.

The corridor was divided into four geographic areas for easier discussion, shown in the graphic to the right.

Meetings were advertised through direct mailers to property owners within a half mile of the railroad corridor. Placards were posted near each crossing, and a notification was advertised in the local newspapers, municipal e-blasts, and on the project website. The design charrette was advertised to the Spanish-speaking community through door-to-door interactions.



**STUDY AREA** For public outreach activities, the study area is broken into four sub areas associated with one or more crossings.

- NE MAYNARD ROAD/TRINITY ROAD AREA
- NOWELL ROAD AREA
- POWELL DRIVE AREA
- BERYL ROAD/ROYAL STREET AREA
- AT-GRADE RAIL CROSSING
- GRADE-SEPARATED RAIL CROSSING



### Public Meetings

The first set of meetings was on November 17, 2014 at WakeMed Soccer Park in Cary and on November 18, 2014 at Method Community Center in Raleigh. The purpose of the first set of meetings was to inform citizens about the project and learn of the community's priorities regarding the rail crossings. The public was asked which roads, sidewalks, and bike routes in the corridor work well now, and which don't work well. They were also asked which properties or areas they felt were important to the community and which had the most opportunity for growth or redevelopment. This information was used to identify areas needing improvement in the study corridor. A short presentation kicked off the meeting and then participants were invited to join facilitated discussions focused on the crossing area or areas that most interested them. Some citizens focused their time during the meeting on one sub area, while others participated in discussions at multiple tables.

The second public event was a design charrette in March 2015, held at the NC State Fairgrounds. The project team worked on-site from Monday, March 16 to Wednesday, March 18 to refine the designs and develop potential future land uses. The public was invited to drop in twice during the work sessions, and a formal presentation was held on Wednesday evening. The anticipated mid- and long-term solutions (grade separations and crossing closures) had been advertised prior to the design charrette, and the presentation on the final day reviewed the potential designs for those alternatives.

### Limited English Outreach

Part of the public engagement effort was to reach citizens and businesses in the study corridor that spoke English with limited proficiency. Facilitated Limited English Proficiency (LEP) outreach activities included community canvassing, community leader interviews, and providing translator assistance at the March 18 public design charrette.

Project team members went door-to-door to survey 25 community members living in areas with limited English proficiency and higher than average populations which speak Spanish. The primary focus areas were the businesses and mobile home parks near the intersection of NE Maynard Road and Chatham Street as well as businesses along Western Boulevard and Chapel Hill Road.

An interview was held with the El Pueblo community advocacy organization. Contact also was attempted with three other local organizations who chose not to participate. El Pueblo helped identify major residential, employment, and social areas for Spanish-speaking populations.

## Stakeholder Meetings

The project team met with targeted stakeholders during the November 2014 and March 2015 public meeting events. Stakeholders were grouped into “Business,” “Government and Large Institution,” and “Neighborhood” interests for purpose of these discussions. These small-group meetings provided the key stakeholders an opportunity to discuss their ideas and concerns about the corridor in more detail with the project team. It also allowed stakeholders to hear input from other agencies or organizations with interests in the study.

The discussions followed the public meeting topics. Stakeholders identified issues of concern, strengths along the corridor, and vision for change at the first meeting. The potential alternatives were discussed with stakeholders at the second meeting.

## Steering Committee

Project decisions were made by the Core Leadership Team (CLT), a steering committee comprised of the Capital Area Metropolitan Planning Organization (CAMPO), City of Raleigh, Town of Cary, NCDOT, GoTriangle, North Carolina Railroad Company, Norfolk Southern Railroad, and CSX Railroad. This committee met biweekly through the course of the study and was responsible for making decisions about alternative selection, design assumptions, and other aspects of the study.

### STAKEHOLDERS— GOVERNMENT & LARGE INSTITUTION GROUP

- » City of Raleigh Manager
- » Raleigh Planning Commission
- » Raleigh Fire Department
- » Raleigh Police Department
- » Western Wake Fire Rescue
- » Wake County EMS
- » Town of Cary Manager
- » Cary Fire Department
- » Cary Police Department
- » Cary Area EMS
- » Passenger Rail Task Force
- » NC State University
- » Meredith College
- » NC State Fairgrounds (NC Dept. of Agriculture)

### STAKEHOLDERS— NEIGHBORHOOD & COMMUNITY GROUP

- » Citizen Advisory Council #7 (Hillsborough)
- » Citizen Advisory Council #18 (Wade)
- » Citizen Advisory Council #19 (West)
- » Raleigh Bicycle and Pedestrian Advisory Commission
- » Capital Area Bicycle and Pedestrian Stakeholder Group
- » Method Civic League
- » GoRaleigh/Raleigh Transit Authority
- » C-Tran

### STAKEHOLDERS— BUSINESS GROUP

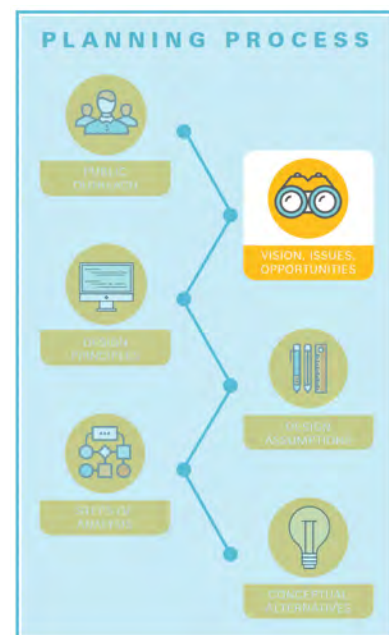
- » Cary Chamber of Commerce
- » Greater Raleigh Chamber of Commerce
- » Wake County Economic Development
- » Raleigh Economic Development
- » Blue Ridge Corridor Alliance
- » Capital Area Friends of Transit
- » Wake Up Wake County
- » Regional Transportation Alliance
- » Hillsborough Street Community Service Corp.
- » Chatham Square
- » WakeMed Soccer Park



## Vision, Issues, and Opportunities

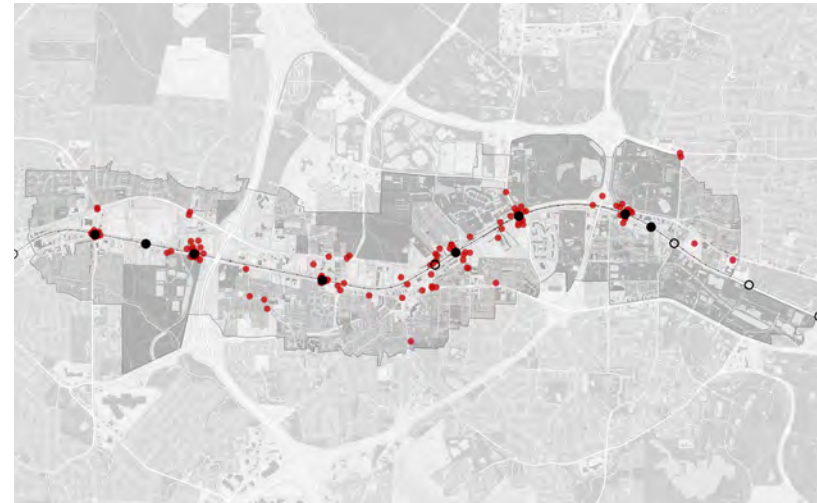
### PUBLIC ENGAGEMENT

Focus groups were formed and public meetings held in November 2014 to help understand how the study area functions today and begin to establish criteria for measuring success in this planning effort. Participants were asked what works best (green dots on the map), what does not work (red dots), and where the greatest opportunities exist (blue dots). The summary of the feedback is presented here.



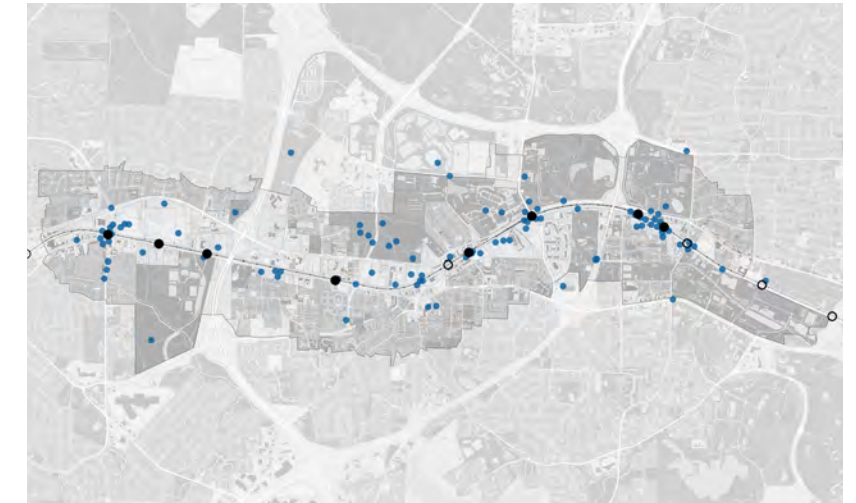
#### STRENGTHS IDENTIFIED BY THE COMMUNITY

- » Number of rail crossings provides adequate redundancy in transportation system
- » Places where pedestrian and bike safety has been designed into streets: Western Boulevard, Hillsborough Street near Gorman Street, Gorman Street overpass, NC State University campus, and greenways
- » High visibility destination uses such as PNC Arena, Carter-Finley Stadium, Meredith College, the NC State Fairgrounds, and WakeMed Soccer Park
- » Good diversity of neighborhoods such as Wolf Creek, University Park, Westover, and Cooper
- » Many people who are highly mobile in the study corridor, including walking and bicycling across the railroad tracks



#### WEAKNESSES IDENTIFIED BY THE COMMUNITY

- » Lack of urban infrastructure such as sidewalks, bike paths, and street lighting
- » Not sure if the corridor wants to be a rural or urban place
- » Large intersections such as NE Maynard Road and Chapel Hill Road, Trinity Road and Chapel Hill Road, and NE Maynard Road and Chatham Street
- » Good regional road network but poor local street connectivity
- » Frequency and impacts of large events
- » Existing crime rate issues along rail corridor
- » A lot of great destinations near each other but hard to get from one to the other
- » All of the crossings have a number of properties that depend on them
- » Pass-through commuter traffic amplifies traffic volumes and speeds without investing in local developments
- » Poor existing bus routes and frequency, no alternative transit
- » Some railroad crossings may present a safety or travel concern



#### OPPORTUNITIES & VISIONS OF THE COMMUNITY

- » Upgrade crossings to improve safety
- » Maintain and improve spacing of crossings based on potential new grade separated crossings and resultant changes to the transportation network
- » Urban street standards: interconnected grid, bike and pedestrian infrastructure, lighting, etc.
- » Connect broader network of bike paths, trails, and greenways
- » More hospitality and neighborhood service uses
- » Continued new and infill development under the Unified Development Ordinance's (UDO) most up-to-date guidelines
- » Crime prevention through environmental design (CPTED)



## Design Principles

The initial analysis of existing conditions and input from the community at the November 2014 public meetings generated some early observations and principles that helped focus the subsequent investigation into design and planning strategies for the corridor's future. The principles are based generally in good urban development practices but were calibrated to the specific opportunities present in the study area.

These principles yielded clear areas of focus for improving the safety and functionality of arterial and local street crossings at locations where the greatest potential for development and return on investment may exist. These improved and new crossing locations together create a logic for a street network and land use strategy that further supports incremental development of the study area, regardless of transit routes or technologies employed.

The principles are as follows:

### 1. Build safety through urbanization

The safest rail crossings, both grade-separated and at-grade, are those where the appropriate behavior of vehicles, pedestrians, and bicycles is clear in the design of development, streets, and signalization. Urbanization through buildings close to streets; streets with sidewalks, trees, lighting, and on-street parking; and clear markings and signage slow traffic speeds and encourage more aware, thus safer, rail crossing behavior.

### 2. Choose the paths of least resistance

With the rail generally at the highest point in the corridor, overpasses may be the most costly form of grade separation. Similarly, some of the existing at-grade crossings may not be ideally suited to grade separation. Conversely, the most cost-effective crossing solutions may be found in building new underpasses along new alignments. This has the added benefit of keeping existing crossings open and unobstructed until they are no longer necessary.

### 3. Invest in crossings that leverage the corridor's strengths

The corridor has many strengths and existing development which attract continuing growth that could be further encouraged by upgrades to existing crossings or installation of road extensions across the railroad.

### 4. Invest in crossings that respond to critical issues

Investments in crossings, either new or upgraded, can not only support the strengths of the study area but also serve to mitigate its weaknesses. In addition to safety concerns, this focus can be on creating pedestrian and bike linkages where they are warranted, resolving awkward and counterintuitive geometries, relocating non-compatible uses, or provide greater choice and redundancy in the transportation network.

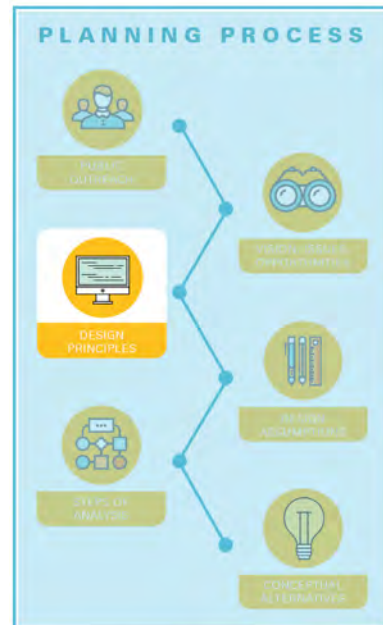
### 5. Invest in crossings where significant development potential exists

Among the most supportable types of major infrastructure expenditures are those that unlock new or improved development potential inducing sufficient return on investment in the new infrastructure. Alternatively, simply upgrading a crossing absent a development rationale may induce through traffic, which contributes nothing to, or even negatively impacts, the economy and livability within the study area.

### 6. Balance regional transportation and local circulation needs

For the foreseeable future, demand will likely exist for the regional transportation network in the study area. It is essential that crossing investments balance the functionality of the regional network with the everyday mobility and livability needs of a highly functional, livable, and flexible local network.

Graphics, included in the appendix, were developed to demonstrate the varied ideas generated through each design principle. Some concepts met one design principle, while others were applicable to several principles.





## Design Assumptions

### Conceptual Sketch Design

InfraWorks 360 (a program that uses basic design guidelines to provide a high-level look at potential transportation alternatives) was used for the initial consideration of alignments (Tier I). This software was used, rather than a more detailed design software, to explore a large number of alignments. InfraWorks 360 incorporates horizontal and vertical manipulation of a GIS-based map.

For this first phase, both horizontal and vertical elements were considered, using the following guidelines:

- » The roadway footprint was used. This did not include sidewalks, bike lanes, construction limits, slopes, or right of way.
- » Retaining walls were used in all locations rather than a combination of retaining walls and slopes.
- » Relocated buildings were not specifically identified. Instead, the software was allowed to “stretch” and drape the aerial when interrupted by a vertical change.
- » Retaining walls show the aerial “stretched” on them rather than a new concrete or brick surface.
- » Building footprints reflect the most recent available aerial, but 3D heights and appearances of buildings may not be accurate.

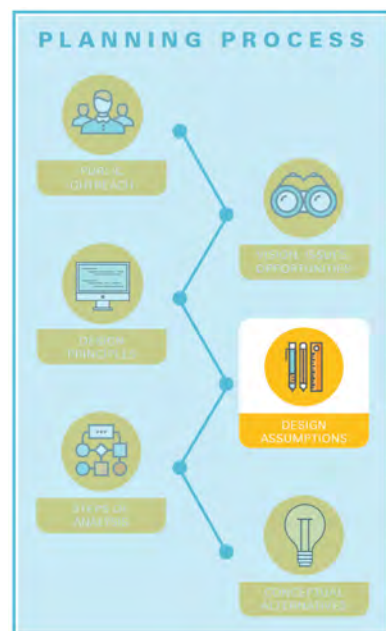
Available information about proposed projects crossing the railroad from previous studies has been incorporated into this assessment. Assumptions about potential future transit stations have not been included at this time. It is assumed that it will be beneficial to improve pedestrian and bicycle facilities across all railroad crossings within the corridor and on the local street network.

### Roadway Design

Beginning at Tier II, alternatives were developed in MicroStation. Although the level of detail is still high level, this software allows for more precise design which was important during the decision-making process. Assumptions were conservative, with the understanding that all design parameters and alignments will be revisited during a future phase (once funding is available), and impacts are likely to decrease at that time. The following factors were considered:

- » Typical sections for all roads in the study area were based on adopted Cary and Raleigh transportation plans.
- » Design speeds were set for 5 mph over the posted speed limit.
- » Horizontal and vertical curves followed AASHTO minimum values based on design speeds and terrain type. All curves were designed with normal crown (super elevation will be investigated during detailed design), with vertical grades not below 0.03 ft/ft.
- » Vertical clearance was assumed to be 23 feet for road bridges over the railroad (from base of girder to top of rail tie) and 17 feet for rail bridges over the road (from base of girder to top of road).
- » Basic decisions about use of retaining walls versus slopes were made based on existing and potential land uses adjacent to the bridges. Retaining walls are more expensive than slopes but impact less land.

The recommended improvement graphics show roadway projects currently listed on approved municipal plans. The typical sections for the adjacent roadway network are in the appendix.



*Examples of a railroad bridge over a 4-lane divided road.*



*Example of a 4-lane undivided road bridge with a parallel greenway over a railroad.*



## Rail Design

Although the rail elevation is higher than the adjacent road elevation along this corridor, grade separation options included consideration of both a rail bridge over the road and a road bridge over the rail.

The proposed improvements span the existing 200-foot railroad right of way. This allows for expansion of the existing two tracks for additional freight/Amtrak/commuter rail tracks. Cost estimates developed as part of this study for railroad bridges and temporary railroad detours assume two railroad tracks.

The current commuter rail study underway by NCCR modeled up to 40 commuter trains per day. An increase in Amtrak and freight trains is anticipated, potentially up to 10 additional Amtrak trains and a doubling of freight trains, based on input from railroad companies.

For alternatives with a road bridge over the railroad, the railroad was not modified and the road was carried over the existing railroad elevation and location. The primary benefit of bridging over the railroad is that the cost of a road bridge is notably less than the cost of a railroad bridge. The primary disadvantage is that a road bridge must be higher than a rail bridge (due to clearance requirements), often resulting in more property impacts and costs.

For alternatives with a railroad bridge over the road, the current railroad location and elevation was retained and the road was lowered to cross under the railroad. The primary benefit of a railroad bridge over the road is the lower clearance requirements. The primary disadvantages are that lowering the road under the railroad can create drainage issues and can create a “tunnel” feel, depending on the roadway typical section and the design of the bridge.

This study did not consider altering the railroad elevation since that would result in impacts along the railroad line that may affect other nearby crossings. During the next, more detailed design phase, this would be an option as part of the strategy for minimizing property impacts at the crossing.

A bridge depth of 8 feet was assumed for all road and rail bridges. This is an average assumption, with the understanding that width, span lengths, use of a center pier, building materials, and other factors will be considered during detailed design to minimize impacts.

## Transit Design

This plan is consistent with the 2015 Recommended Wake County Transit Plan (draft December 2015).

It assumes that by 2040, commuter rail will be operational along the Norfolk Southern rail line, including one potential station at Corporate Center Drive.

The Wake County Transit Plan did not identify specific routes for the proposed bus rapid transit (BRT) service line or potential stops/stations. The crossing recommendations in the RCRX Study can accommodate BRT traversing east-west through the corridor, but have not been modified to include station locations. Although BRT has the potential to alter the type and timeframe of land uses at the stations, this study has already incorporated changes in land use at all crossings, and development in this part of Cary and Raleigh is expected to be more heavily influenced by factors such as new roads across the railroad and demonstrated market demand.

## Steps of Analysis

Crossing alternative concepts were developed and analyzed in three phases. More detail about each analysis is included in the Recommended Improvements section beginning on [page 46](#).

### 1. Tier I

The first analysis phase was comprised of an engineering exercise to evaluate potential options based on geometric limitations and a high-level assessment of direct impacts. For example, alternatives were eliminated that directly impacted historic resources or required closing an adjacent major intersection. A range of options was considered at each crossing. Some were eliminated based on clear objections while others were developed at a sketch level to help the project team decide whether to carry them forward for more analysis.

### 2. Tier II

A traffic forecast and capacity analysis were performed for the alternatives carried forward from Tier I. This step considered the traffic impacts of closing some at-grade crossings, assuming the traffic would be diverted to adjacent crossings. Tier II also included a community impact assessment and a crossing safety analysis. The alternatives were evaluated based on a slightly higher level of design, incorporating basic horizontal and vertical assumptions.

### 3. Tier III

Tier III included consideration of impacts from other adjacent projects and an economic impact analysis. The designs for these alternatives were refined further, adding details such as retaining walls and connections to adjacent roads.

At each tier, the project team had an opportunity to add or eliminate alternatives. These alternatives are listed briefly on the following pages. Alternatives can be classified into one of the following:

#### » Potential for closing

Discussion for potentially closing the crossing is provided for all at-grade crossings as a comparison with the other long-term solutions.

#### » Alternatives considered but not studied

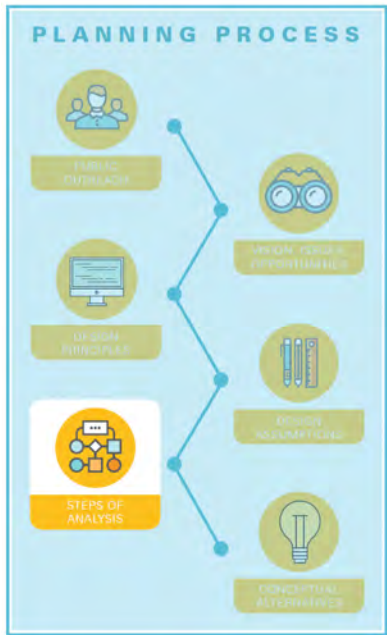
These concepts were discussed but were eliminated before a sketch was developed due to anticipated impacts or similarity to other alternatives. These are listed in the following “Conceptual Alternatives” section.

#### » Alternatives developed conceptually but eliminated

A sketch was prepared for a range of concepts to understand the level of potential impacts. Additional design was prepared for some alternatives to provide enough information for the project team to make a decision. Several alternatives were eliminated due to anticipated impacts or because the concept did not offer any advantages over other alignments that had other benefits or fewer impacts. Sketches for eliminated alternatives are located in the appendix.

#### » Alternatives selected as “most feasible”

After all analyses were completed, one alternative for each at-grade crossing was identified as the most feasible, or the “recommended” alternative based on this study. This does not reflect the “selected” alternative, which will be determined in the future after a more detailed planning and design process. Graphics for recommended alternatives are located in the “Recommended Improvements” section.





Conceptual  
Alternatives

Reedy Creek Extension

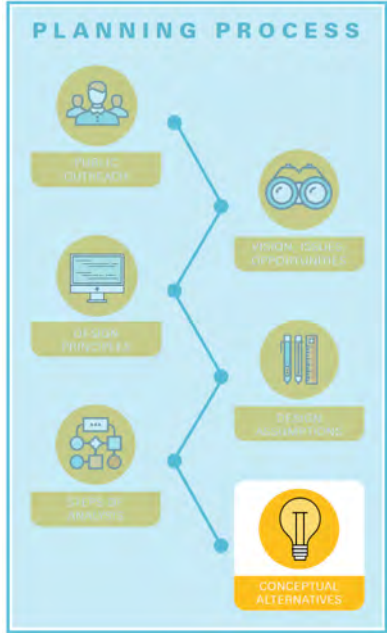
A new north-south road west of NE Maynard Road connecting to Reedy Creek Road was considered as an alternate to the NE Maynard Road grade-separation option. This would be on or similar to a previous at-grade crossing of Reedy Creek Road at the railroad. This crossing was closed in 2007 (see photo below).

A new alignment crossing could be built without affecting traffic through the NE Maynard/Chatham Street intersection, and would open new access to the properties south of Chatham Street. This option was eliminated because it was determined that the new alignment would not have sufficient connectivity to replace NE Maynard Road, and an additional crossing only 0.2-miles from a major railroad crossing would not have enough benefits to outweigh the costs and impacts.

**Recommendation**

✕ No action is recommended

Reedy Creek Road at the railroad



## NE Maynard Road

### Background Data

*2015 daily traffic volumes:* 24,000 vpd at the railroad

*Road classification:*

NCDOT - Minor Arterial

Town of Cary - Major Arterial

*Physical constraints:* Chatham Street runs parallel with the railroad, approximately 130 feet south of the tracks in this location (center-to-center); the Maynard Road/Chatham Street intersection is within the 200-foot railroad corridor. Chapel Hill Road is approximately 1,000 feet north of the railroad.

*Community constraints:* Chatham Square, a vibrant international business node, is located in the southwest quadrant of the crossing.

### Consideration for Closure

This crossing is not recommended for consideration of closure because of the high traffic volumes and critical access and mobility connections.

### Consideration for Grade Separation

Several grade separation alternatives were examined at this crossing:

*Alternatives considered but not studied:*

✗ NE Maynard Road bridge over the railroad, shifting the Maynard Road/Chatham Street intersection outside of the 200-foot railroad corridor

*Alternatives developed but eliminated:*

✗ NE Maynard Road bridge over the railroad

✗ NE Maynard Road bridge over the railroad and Chatham Street

✗ Railroad bridge over both NE Maynard Road and Chatham Street

✗ Railroad bridge over NE Maynard Road

### Recommended Alternative (page 56)

✓ Railroad bridge over NE Maynard Road, shifting the Maynard Road/Chatham Street intersection to outside of the 200-foot railroad corridor.

*NE Maynard Road Crossing Facing North*



*NE Maynard Road Crossing Facing South*





New Trinity Road/Fincastle Drive Extension

A new location grade separation west of Trinity Road, connecting east to Trinity, north to Fincastle Drive, and south to Cary Towne Boulevard, was considered. The idea behind this concept was two-fold: first, if a grade-separated crossing and extension of Trinity Road was not feasible, this new alignment would serve much the same purpose as the proposed Trinity Road extension. Second, a new road into a largely undeveloped area of Cary would open the land for improved development opportunities. This potential alternative was eliminated because it was determined that a Trinity Road grade separation and extension was feasible, and because the cost for a third crossing of the railroad in the 0.7-mile distance from NE Maynard Road to Trinity Road was not an efficient use of public funds.

Recommendation

✗ No action is recommended

Trinity Road

Background Data

2015 daily traffic volumes: 3,500 vpd at the railroad

Road classification:

NCDOT - Major Collector

Town of Cary - Major Arterial

Physical constraints: Chatham Street runs parallel with the railroad, approximately 80 feet south of the tracks in this location (center-to-center); the Trinity Road/Chatham Street intersection is currently within the 200-foot railroad corridor. Trinity Road currently crosses the railroad tracks at a skew. The Cary Comprehensive Transportation Plan proposes a four-lane divided road extending Trinity Road from north of the railroad to Cary Towne Boulevard, through WakeMed Soccer Park.

Community constraints: WakeMed Soccer Park, including the stadium and a cross-country course, is south of the Trinity Road railroad crossing. Several businesses are in the northeast quadrant of the crossing.

Trinity Road Crossing



Consideration for Closure

This crossing is not recommended for consideration of closure because of the access to businesses, the arena, and North Carolina State University property to the north as well as the future connection to WakeMed Soccer Park and Cary Towne Boulevard to the south.

Consideration for Grade Separation

Several grade separation alternatives were examined at this crossing:

Alternatives developed but eliminated:

- ✗ Railroad bridge over Trinity Road at new crossing location with loop ramp to Chatham Street
- ✗ Trinity Road bridge over the railroad at new crossing location with loop ramp to Chatham Street
- ✗ Railroad bridge over Trinity Road at new crossing location, shifting the Trinity Road/Chatham Street intersection to outside of the 200-foot railroad corridor
- ✗ Trinity Road bridge over the railroad at existing location with Trinity Road extension to Cary Towne Boulevard
- ✗ Railroad bridge over Trinity Road at existing location with Trinity Road extensions to Chapel Hill Road and Cary Towne Boulevard
- ✗ Railroad bridge over Trinity Road at new crossing location with Trinity Road extension to Cary Towne Boulevard

Recommended Alternative (page 58)

- ✓ Trinity Road bridge over railroad with Trinity Road extensions to Chapel Hill Road and Cary Towne Boulevard

## Corporate Center Drive Extension

### Background Data

*2015 daily traffic volumes:* 6,000 vpd at Chapel Hill Road

*Road classification:*

NCDOT - Local

City of Raleigh - Mixed Use Street/Avenue 2-Lane, Undivided

*Physical constraints:* Hillsborough Street is within the railroad right of way south of the railroad tracks, and Chapel Hill Road is approximately 800 feet to the north. If Corporate Center Drive was extended across the railroad, it would be more feasible to go under the railroad based on elevation of the adjacent roads and railroad. The Raleigh Street Plan proposes extending Corporate Center Drive to the east parallel with Chapel Hill Road.

*Community constraints:* Land uses are primarily office north of the crossing and residential south of the crossing. Low density retail and small industrial sites are immediately adjacent to the railroad near the crossing. Ole Time Barbeque on the south side of the Hillsborough Street is a local business important to the community.

### Consideration for Grade Separation

Several grade separation alternatives were examined at this crossing:

*Alternatives developed but eliminated:*

- ✗ Corporate Center Drive extension to Hillsborough Street with a bridge over the railroad
- ✗ Railroad bridge over Corporate Center Drive extension, extended to Hillsborough Street
- ✗ Railroad bridge over Corporate Center Drive extension, extended to Bashford Road with curved alignment
- ✗ Railroad bridge over Corporate Center Drive extension, extended to Bashford Road with straight alignment

### Recommended Alternative (page 60)

- ✓ Corporate Center Drive extension to Bashford Road with a straight alignment and a bridge over the railroad

## Nowell Road

### Background Data

*2015 daily traffic volumes:* 4,000 vpd at the railroad

*Road classification:*

NCDOT - Major Collector

City of Raleigh - Mixed Use Street/Avenue 2-Lane, Divided

*Physical constraints:* Hillsborough Street is within the railroad right of way south of the railroad tracks. Chapel Hill Road is approximately 1,000 feet north of the railroad. The existing rail elevation at the proposed crossing location is approximately 4 feet higher than at Chatham Street to the south. The Raleigh Street Plan proposes realigning Nowell Road across the railroad to intersect with Hillsborough Street at more of a 90 degree angle.

*Nowell Road Crossing*



*Community constraints:* Wolf Creek Apartments begins approximately 400 feet south of the railroad tracks, and land uses north of the railroad are primarily office and warehouse.

### Consideration for Closure

The crossing was considered for closure based on crash history and the proximity to the future Corporate Center Drive and Edwards Mill Road crossings.

### Consideration for Grade Separation

Several grade separation alternatives were examined at this crossing:

*Alternatives considered but not studied:*

- ✗ Railroad bridge over Nowell Road at existing location
- ✗ Nowell Road bridge over the railroad, realigned to a 90 degree angle
- ✗ Nowell Road bridge over the railroad, realigned to extend to Wolfe Green Drive

*Alternatives developed but eliminated:*

- ✗ Nowell Road bridge over the railroad with loop extension ramp to Hillsborough Street

### Recommended Alternative (pages 60 & 62)

- ✓ This crossing is not recommended for consideration of closure as a stand-alone project. However, if Corporate Center Drive (0.5 miles west) and/or Edwards Mill Road (0.1 mile east) were extended across the railroad, Nowell Road is recommended to be closed. A new east-west connector road could be built between Corporate Center Drive and Edwards Mill Road as this area develops, resulting in additional network connections.

## Edwards Mill Road Extension

### Background Data

*2015 daily traffic volumes:* 5,200 vpd north of Chapel Hill Road

*Road classification:*

NCDOT - Major Collector north / Local south of Trinity Road

City of Raleigh - Mixed Use Street/Avenue 4-Lane, Divided

*Physical constraints:* Edwards Mill Road currently ends at Chapel Hill Road, approximately 1,000 feet north of the railroad. The Raleigh Street Plan proposes extending Edwards Mill Road south to an extension of Western Boulevard/Cary Towne Boulevard, intersecting near Buck Jones Road. If Edwards Mill Road is extended, it would be more feasible to go under the railroad based on elevation of the adjacent roads and railroad.

*Community constraints:* Land uses near the railroad in this area include industrial north of the tracks. South of the tracks, the Wolf Creek Apartment and Retreat at Raleigh complexes are adjacent to low-density residential and retail.

### Consideration for Grade Separation

One grade separation alternative was examined at this crossing, consistent with previous design plans.

#### **Recommended Alternative (page 62)**

- ✓ Edwards Mill Road extension to Hillsborough Street with a railroad bridge over the new road

## Pylon Drive Extension

A new road was considered to extend from Pylon Drive north across the railroad into the NC State Biomedical Campus. The goal of this concept was to improve connectivity between NC State's Central and West campuses and the JC Raulston Arboretum. Due to the cost and impacts of this alternative compared with the benefits, this alternative was not carried forward for further study.

### **Recommendation**

- ✗ No action is recommended

## Jones Franklin Road Extension

### Background Data

*2015 daily traffic volumes:* 18,400 vpd south of Western Boulevard

*Road classification:*

NCDOT - Major Collector

City of Raleigh - Mixed Use Street/Avenue 4-Lane, Divided

*Physical constraints:* Jones Franklin Road currently ends at Hillsborough Street, approximately 400 feet south of the railroad. If Jones Franklin Road is extended, it would be more feasible to go under the railroad based on elevation of the adjacent roads and railroad. This is consistent with the Jones Franklin/Western/Hillsborough Small Area Study proposal. The Raleigh Street Plan proposes extending Buck Jones Road north to Western Boulevard.

*Community constraints:* Land uses near the railroad in this area are primarily retail. The Small Area Study envisions future community mixed use and neighborhood mixed use along the proposed extension.

### Consideration for Grade Separation

One grade separation alternative was examined at this crossing, consistent with the adopted Small Area Study and Raleigh Comprehensive Plan.

#### **Recommended Alternative (page 64)**

- ✓ Jones Franklin Road extension to Chapel Hill Road with a railroad bridge over the new road



Powell Drive Crossing Facing North



Powell Drive Crossing Facing South



Powell Drive

Background Data

2015 daily traffic volumes: 2,500 vpd at the railroad

Road classification:

- NCDOT - Local
- City of Raleigh - Mixed Use Street/Avenue 2-Lane, Undivided

Physical constraints: Hillsborough Street is less than 200 feet north of the railroad tracks.

Community constraints: Burke Brothers Hardware, located on Powell Drive at Hillsborough Street, is a local business important to the community. Land uses adjacent to the crossing are primarily office and retail.

Consideration for Closure

This crossing is not recommended for consideration of outright closure because it provides parallel access from Western Boulevard and the adjacent neighborhoods. If the Powell Drive crossing was closed, most of the traffic would likely shift to the Hillsborough Street connection between Western Boulevard and Chapel Hill Road, a two-lane road with 11,000 vpd (2011) that is constrained from future widening by the railroad bridge.

Consideration for Grade Separation

Several grade separation alternatives were examined at this crossing:

Alternatives developed but eliminated:

- ✗ Powell Drive bridge over the railroad on existing alignment
- ✗ Realignment of Powell Drive to connect with Youth Center Drive with a railroad bridge over Powell Drive
- ✗ Railroad bridge over Powell Drive on existing alignment

Recommended Alternative (page 66)

- ✓ Realignment of Powell Drive to connect with Youth Center Drive with a bridge over the railroad, with closure of existing crossing at time of realignment

*Royal Street Crossing*



*Beryl Road Crossing*



## Beryl Road and Royal Street

### Background Data

*2015 daily traffic volumes:* Beryl Road - 6,000 vpd at the railroad  
 Royal Street - 700 vpd at the railroad

*Road classification (for both roads):*

NCDOT - Local

City of Raleigh - Mixed Use Street/Avenue 2-Lane, Undivided

*Physical constraints:* The Beryl Road and Royal Street crossings are approximately 0.22 miles apart. Hillsborough Street is approximately 100 feet north of the railroad at Beryl Road and approximately 250 feet north of the railroad at Royal Street.

*Community constraints:* Method is a cohesive community south of the railroad, with access to both Beryl Road and Royal Street. Neomonde is a local business important to the community. Land uses immediately adjacent to the crossings are primarily industrial and retail, with residential neighborhoods to the south. The Royal Baking Company on the northwest corner of the Royal Street crossing is on the National Register of Historic Places. The campus of Meredith College fronts Hillsborough Street to the north.

### Consideration for Closure

Neither crossing is recommended for consideration of closure as a stand-alone project because of the high traffic volumes and access from the community to Hillsborough Street.

### Consideration for Grade Separation

Several grade separation alternatives were examined at this crossing:

*Alternatives considered but not studied:*

- ✗ Railroad bridge over Royal Street
- ✗ Beryl Road realignment to I-440 SB ramps, Pylon Drive, or Meredith College entrance

*Alternatives developed but eliminated:*

- ✗ Beryl Road realignment to I-440 NB ramps/Method Road
- ✗ Railroad bridge over Royal Street and close Beryl Road

### Recommended Alternative (page 68)

- ✓ Close Beryl Road and add a new connector from Beryl Road to Royal Street

# Existing Conditions

Data collected from various sources were isolated and distilled in order to better understand the physical attributes of the study area. They demonstrate patterns that have developed here over time and are instructive in highlighting issues and opportunities for the planning team to consider as strategies emerge. The information is organized into four primary subject areas:

- 1. Community
- 2. Transportation and Safety
- 3. Land Use
- 4. Market Trends and Forecasts

The existing conditions information presented in this report was completed by compiling available data from county and city resources, combining it with input from the public and stakeholders, and verifying it in the field. This report summarizes a more detailed description of existing conditions documented in the “Raleigh-Cary Rail Crossing Study Existing Conditions Report” (December 2014) and the “Existing Conditions and Strategy Analysis” (January 2015).

IN THIS SECTION
» Community
» Transportation
» Land Use
» Market Trends and Forecast



## Community

*Chatham Square Shopping Center*



*Dorton Arena, North Carolina State Fairgrounds*



Community features, neighborhoods, and demographics were inventoried and analyzed. A summary of findings is provided below. Detailed information and mapping was documented in the December 2014 Existing Conditions Report.

### Community Features

Community features, including schools, colleges, parks and recreation areas, religious institutions, and historic sites, were mapped for the half-mile area surrounding the major populated existing or potential crossings:

- » NE Maynard Road crossing area — The community facilities in the NE Maynard Road area are primarily places of worship, government services, and daycare centers. Many of the buildings in the Chatham Square Shopping Center are community gathering places, restaurants, and shops celebrating diverse, multi-cultural populations.
- » Corporate Center Drive and Nowell Road crossing area — The community facilities in this area are primarily places of worship and state government land uses. WakeMed Soccer Park and state-owned land for sale south of WakeMed Soccer Park lie between the NE Maynard Road and Corporate Center Drive areas.
- » Edwards Mill Road and Jones Franklin Road crossing area — Places of worship are the dominant community facility in this node, in addition to a shopping center and undeveloped State Fairground property.
- » Powell Drive crossing area — State-owned property dominates the land use of this area, with major land holdings belonging to the NC State Fairgrounds, North Carolina State University (NCSU), and NCDOT. Two historic buildings listed on the National Register of Historic Places — Dorton Arena and the Commercial and Education Buildings — are located on the NC State Fairgrounds.

- » Beryl Road and Royal Street crossing area — The community facilities within this area are diverse, with substantial land area belonging to Meredith College and NCSU housing and athletic facilities. The Royal Baking Company building, located across from Meredith College, is listed on the National Register of Historic Places and now houses restaurants and shops.

### Neighborhoods

The neighborhoods in the Town of Cary are diverse in terms of size and housing types. The Braeloch, Carriage Woods, and Maynard Creek neighborhoods consist of newer, large, single-family homes north of Chapel Hill Road. There are also newer townhome neighborhoods located in this area (Davidson Point Townhomes). The neighborhoods west of Maynard Road and/or south of Chatham Street are primarily older homes or townhomes likely built between the 1960s and 1980s. Most of these neighborhoods are one- to two-story homes on moderately sized lots. There are two large mobile home parks located south of E. Chatham Street. American Community Survey Census data indicates that the mobile home parks are majority Hispanic. Several Hispanic businesses are located nearby at Maynard Plaza and in the retail strip on Reed Street.

The City of Raleigh organizes its neighborhoods on a large scale by Citizen Advisory Councils (CACs), which work with the City of Raleigh and residents on a variety of development and neighborhood concerns. The CACs in the study area include West (between I-40 and I-440), Wade (Meredith College), and Hillsborough (NCSU area).



Overall, the neighborhoods in the Raleigh portion of the study area are a mix of single-family homes, duplexes, and infill townhome development—in many areas, all of these housing types exist along one street. The Raleigh portion of the study area appears to have a large portion of rental properties, some of which appear to be rented to NCSU students as indicated by NCSU yard and vehicle merchandise.

In addition, many students live in on-campus housing at Meredith College and NCSU. There is one National Register Historic District within the study area: the West Raleigh Historic District. A portion of its boundary extends into the neighborhood just east of Gorman Street and north of Hillsborough Street. There are no City of Raleigh or Town of Cary local historic districts within the study area.

## Demographics

The study area is racially diverse with the highest percentage minority Block Groups located south of the railroad corridor.

- » The two Block Groups with the highest Hispanic population concentration are the Block Groups containing the two large mobile home parks in Cary, in the southwest and southeast quadrants of the Maynard Road/Chatham Street intersection.
- » One Block Group in the study area has a high concentration of Asian residents, along Ligon Street in Raleigh. This Block Group includes NCSU-owned graduate student housing.
- » The two areas with relatively higher percentages of African American residents are along Buck Jones and Method Roads, historically African American communities.

The American Community Survey provides estimates for adults speaking other languages as a primary language who speak English “less than very well.” The estimated populations speaking Spanish that speak English less than very well mirror the Hispanic population concentrations and businesses along Maynard Road in Cary and east of Jones Franklin Road in Raleigh. Several Latino tiendas are located on Maynard Road and Reed Street in Cary and near Jones Franklin Road in Raleigh. The total number of adults who speak Spanish who speak English less than very well in the study area exceeds the LEP threshold of 1,000 persons or 5% of the study area population.

Other notable characteristics include the geographic distribution of low-income population, older residents, and residents with no vehicle. The highest concentrations of persons below the poverty line are located south of the railroad, near NCSU, and in the Block Group containing the mobile home parks in Cary. Residents aged 65 and older are most heavily concentrated in Cary and near I-440. The Block Groups with the highest concentration of zero-car households are the Block Groups with high concentrations of students adjacent to Meredith College and NCSU.

*Patel Brothers Grocery Store*



*Wolf Creek Apartments*



## Transportation

The transportation system includes the infrastructure — roads, paths, and railroad tracks — as well as use of these facilities. This section documents the existing transportation system within the study area, with particular focus on the network near the existing at-grade railroad crossings.

### Roadways

This study is focused on the six roads that currently cross the railroad at grade.

Crossing Data

Road	Crossing Number	Railroad Milepost	NCDOT Classification
Maynard Rd	643 351A	CSX-164.20 NS-73.76	Minor Arterial
Trinity Rd	630 657S	CSX-163.43 NS-74.51	Major Collector
Nowell Rd	630 654W	CSX-162.42 NS-75.52	Major Collector
Powell Dr	630 650U	CSX-161.33 NS-76.62	Local
Beryl Rd	630 647L	CSX-159.94 NS-78.02	Local
Royal St	630 646E	CSX-159.73 NS-78.21	Local

Within the study area, I-40 and I-440 are designated national truck routes. A truck restriction is signed on Powell Drive south of the railroad tracks.

As part of the study, a traffic forecast was prepared. This forecast considered a future (2040) scenario with the existing transportation network, and alternate future scenarios with some crossings grade separated and others closed. This was used during the Tier II evaluation to determine if it was feasible to close particular crossings. A summary of the traffic volumes is in the table below; details are in the May 2015 Traffic Forecast.

Existing Traffic Forecast

Road (at railroad crossing, unless otherwise noted)	Vehicles Per Day	
	2015 Existing	2040 No Build*
Maynard Rd	24,000	45,600
Trinity Rd	3,500	4,400
Corporate Center Dr (at Chapel Hill Rd)	6,000	10,000
Nowell Rd	4,000	7,600
Edwards Mill Rd (north of Chapel Hill Rd)	5,200	8,600
Jones Franklin Rd (south of Western Blvd)	18,400	35,000
Powell Dr	2,500	2,800
Beryl Rd	6,000	10,000
Royal St	700	1,600

Note: A forecast was not performed at Royal Street because the traffic volumes were very low, but an estimate is provided based on March 2015 traffic counts.

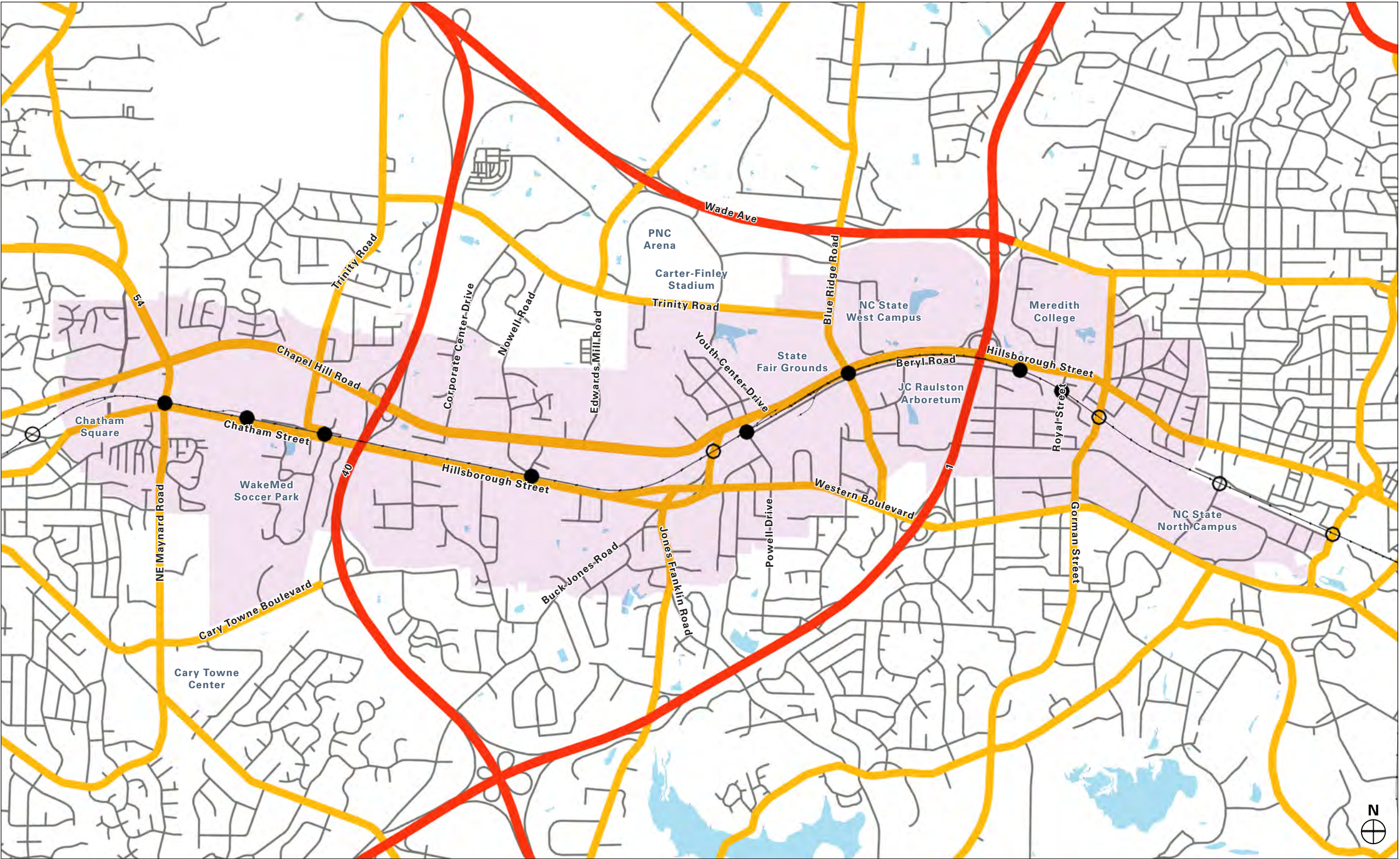
\* No Build: Assuming the same roadway network as today.



# Existing Transportation and Mobility

The transportation system in the study area was designed primarily to get people in and out of downtown Raleigh as fast as possible. To that end, a robust system of large arterials and limited-access highways were built over time. Simultaneously, large regional attractions such as the universities, their sports facilities, the Fairgrounds, and WakeMed Soccer Park placed increased demands on the region’s transportation infrastructure.

The local streets, on the other hand, were mainly built as trunk lines to both feed the regional transportation system and limit the amount of cut-through traffic. As a result, much of what has developed here over the past generation is disconnected from each other. This has the effect of making the area difficult to walk and bike, so a car is required for most trips.





Adjacent Crossings

The nearest adjacent railroad crossings are listed in the following table.

Adjacent Railroad Crossings

Road	Parallel Crossing	Distance (miles)	Crossing Type
Maynard Rd	E. Durham Rd	0.7	Grade separated
	Trinity Rd	0.8	At-grade
Trinity Rd	I-40	0.2	Grade separated
	Nowell Rd	1.0	At-grade
Nowell Rd	Trinity Rd	1.0	At-grade
	Hillsborough St	0.9	Grade separated
Powell Dr	Hillsborough St	0.2	Grade separated
	Blue Ridge Rd	0.6	At-grade*
Beryl Rd	I-440	0.2	Grade separated
	Royal St	0.2	At-grade
Royal St	Beryl Rd	0.2	At-grade
	Gorman St	0.2	Grade separated

\* Proposed to be grade separated through a separate project

Sidewalks and Bicycle Facilities

An analysis of pedestrian and bicycle accommodations at 141 intersections along the study corridor was completed as part of this study. This analysis helped identify priority locations for pedestrian and bicycle improvements based on where conditions currently are not supportive of walking and biking and where transit usage is already present. The analysis assigns each intersection a point rating based on how well it accommodates pedestrians and bicyclists.

Criteria included:

- » Whether the intersection was signalized
- » The presence of sidewalks
- » The presence of crosswalks at each leg
- » If there were pedestrian signals
- » The presence of curb ramps on each corner
- » Bike lanes
- » Sharrows
- » The presence of a median
- » Whether there were slip ramps
- » How many lanes each street at the intersection had

Based on the analysis, five intersections are currently rated as pedestrian-friendly. A set of measures have been identified that would improve access and connectivity for pedestrians and bicyclists within the corridor. The full intersection analysis is in the appendix.

Bus Routes

Four public transportation systems (GoRaleigh, Cary Transit (C-Tran), GoTriangle, and the NCSU Wolfline) and the Wake County public school system (WCPSS) operate buses in the study area. In addition, several private buses shuttle residents from nearby apartment communities to the NCSU and Meredith campuses. The table below summarizes the number of public buses that utilize the study roads across the railroad each weekday.

Bus Routes Across At-Grade Crossings

Road	GoRaleigh	C-Tran	Wolfline	WCPSS
Maynard Rd		28 (Rt 1&2)		132
Trinity Rd				
Nowell Rd				55
Powell Dr				
Beryl Rd	23 (Rt 12)		26 (Rt 4)	6
Royal St				1

Note: GoTriangle does not operate across the six at-grade crossings

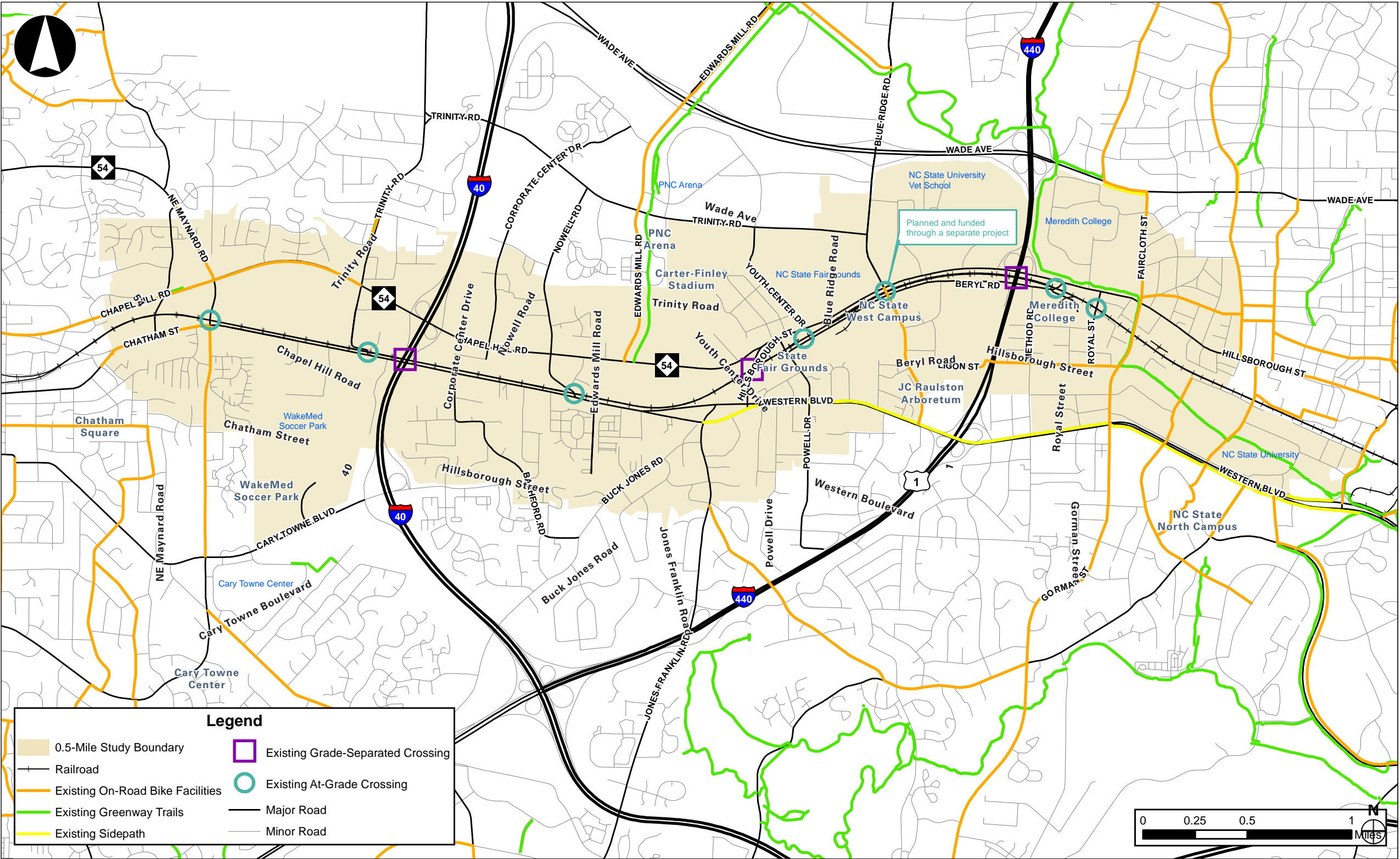
Train Routes

The Norfolk Southern and CSX tracks are used for freight and passenger (Amtrak) trains.

- There is currently an average of 14 freight trains per day (combined) on the Norfolk Southern and CSX tracks through the study area. Typically, 10 of these operate during the day and four operate at night. Their speed ranges up to 49 mph over the crossing. The freight trains’ crossing times vary from day to day.
- Amtrak uses both sets of tracks. The Piedmont and Carolinian trains use the Norfolk Southern tracks, with a total of three trains in each direction daily. The Silver Star uses the CSX tracks, with one train in each direction daily. During the State Fair in October, a temporary stop is added near the Blue Ridge Road crossing.
- There are currently two tracks (one Norfolk Southern, one CSX).

Existing Bike Infrastructure

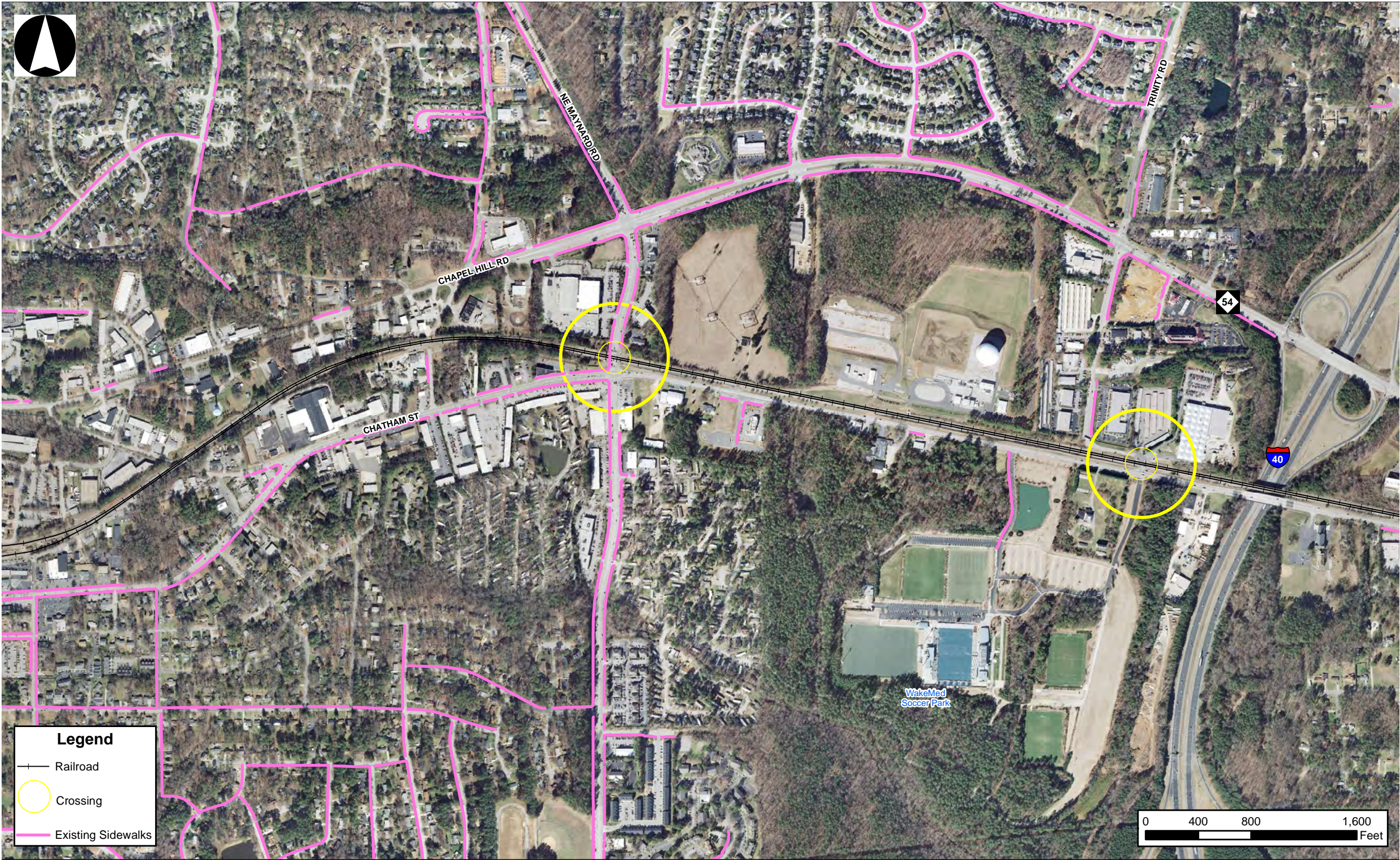
Except for the universities, the study area is poorly served by its bicycle infrastructure. Routes that do exist are disconnected from one another. The most notable of these conditions is the lack of a true connection between existing routes on Chapel Hill Road and Western Boulevard.





Existing  
Sidewalk  
Infrastructure

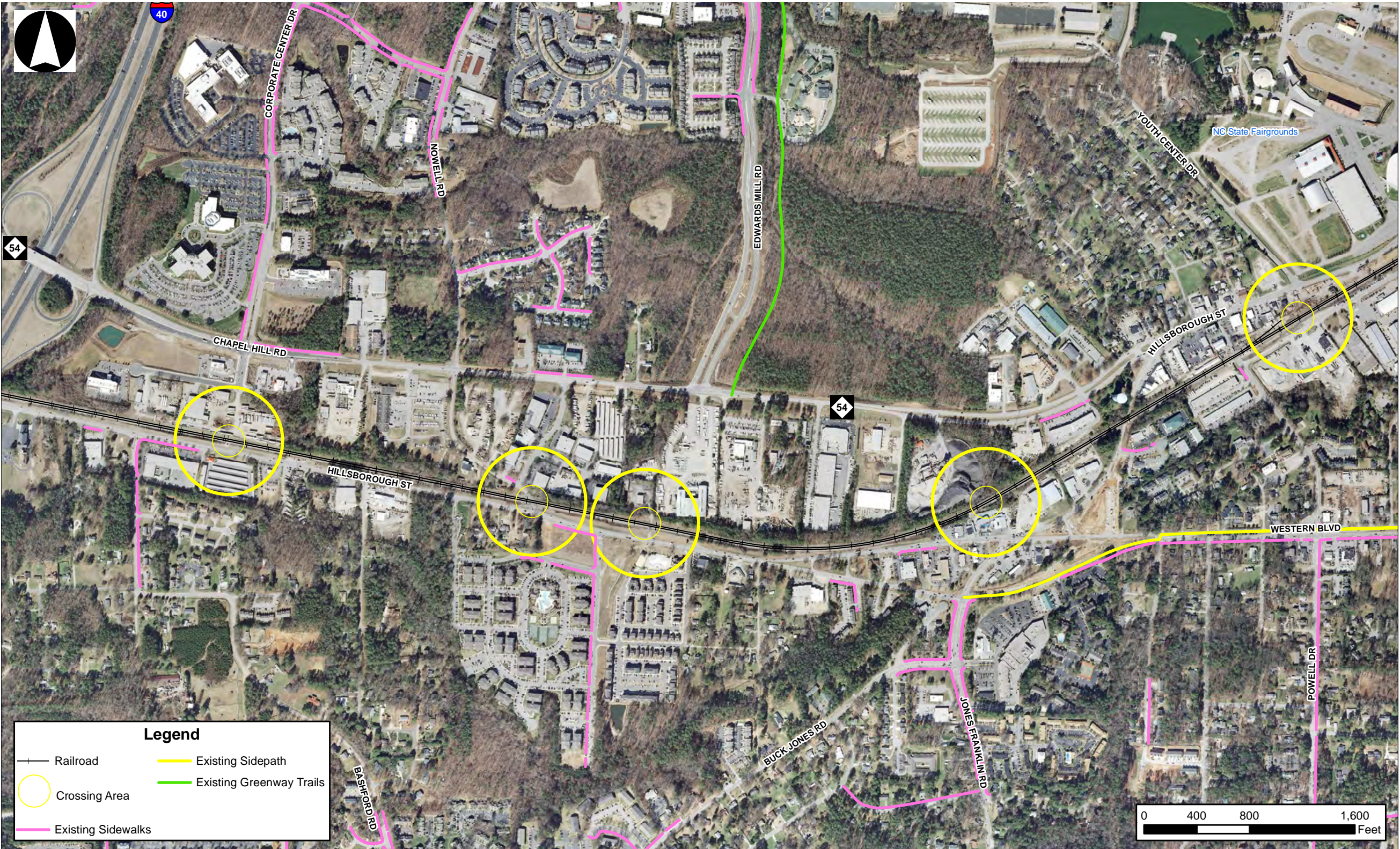
NE Maynard Road  
Trinity Road





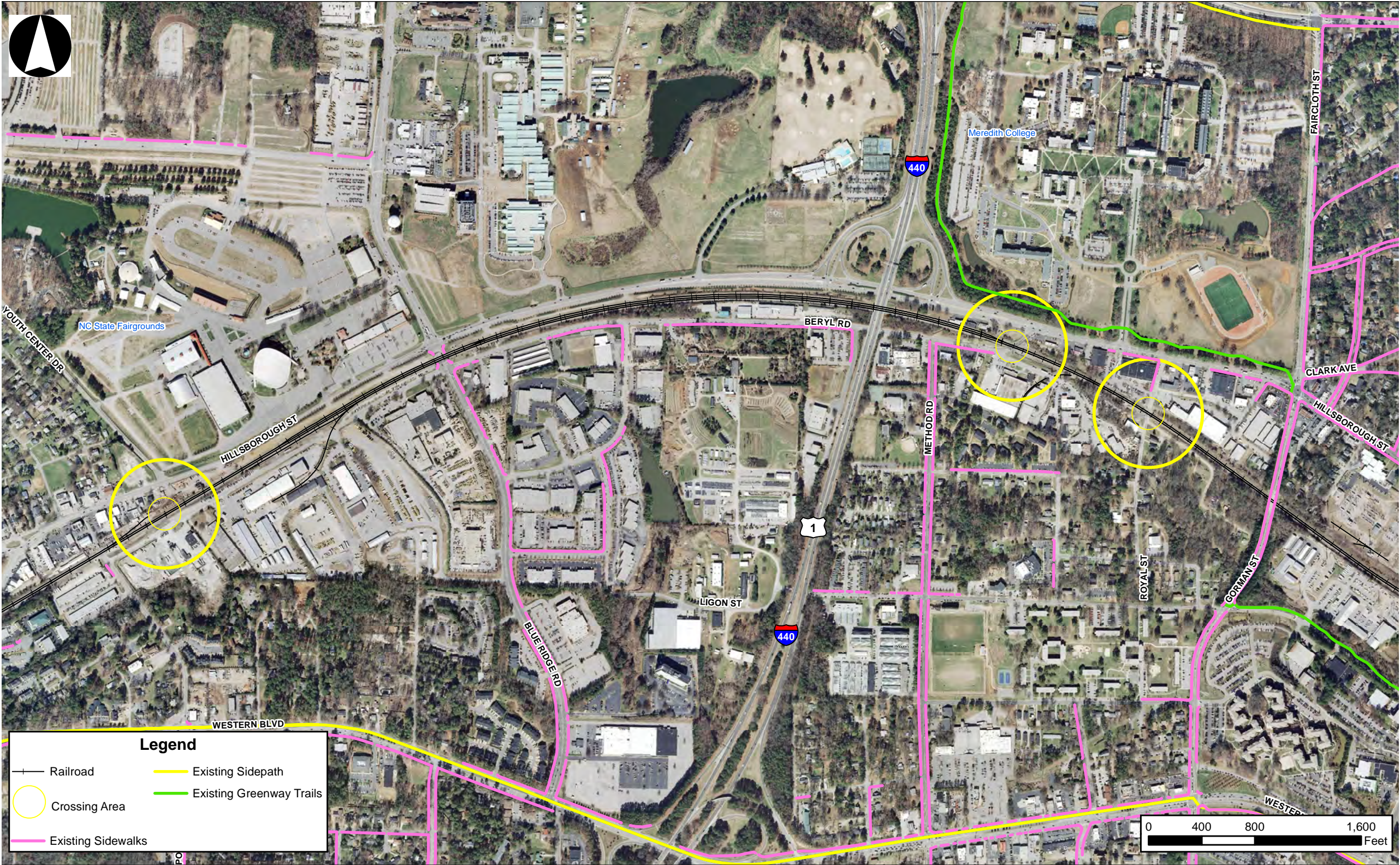
Existing  
Sidewalk  
Infrastructure

- Corporate Center Drive
- Nowell Road
- Edwards Mill Road
- Jones Franklin Road
- Powell Drive





Existing  
Sidewalk  
Infrastructure  
  
Beryl Road  
Royal Street





Safety and Mobility Issues

Warning devices at at-grade railroad crossings may include active and/or passive devices. Active devices such as gate arms, flashers, and warning bells warn drivers of an approaching train and may also physically prevent them from crossing the tracks when a train is approaching or present. Passive devices such as signs and pavement markings notify drivers of the presence of a crossing but do not prevent them from driving across the railroad tracks.

In addition to crossing protection devices, roadway characteristics contribute to the safety of a crossing. This section documents the existing safety conditions at each at-grade crossing in the study area.

Crossing Protection Devices

Overall, the six at-grade crossings have sufficient warning devices. All crossings have both active and passive devices, and none of the signs need to be replaced. All of the advanced pavement markings are visible.

Vehicles Queuing Across Railroad Tracks

Vehicles may queue over the railroad tracks when the tracks are near parallel roadways, especially when vehicles on the road across the railroad tracks are required to stop at a stop sign or traffic signal. All study crossings have “Do Not Stop On Tracks” and/or “Stop Here When Flashing” signs, as appropriate. In several locations where the railroad tracks are close to the adjacent signalized intersection, the stop bar with a “Stop Here On Red” sign is behind the railroad tracks. The intent of this design is to discourage drivers from queuing over the railroad tracks when stopped at the traffic signal. If vehicles are queued over the tracks when the train is approaching, they may become trapped by the vehicles in front of them and behind them, and become unable to exit from between the gates.

All of the existing at-grade crossings are near parallel roadways, and vehicles were observed stopping on the tracks at the NE Maynard Road, Trinity Road, Nowell Road, and Beryl Road crossings.

Four-quadrant gate treatments involve gate arms on both the approaches and departures of the crossing roadway. This restricts vehicles from being able to drive around the approach gate arms. However, care must be taken to prevent vehicles from becoming trapped inside the gate arms. To avoid this situation, the gates are timed for the approach arms to lower before the departure arms, 16 feet of clearance is generally provided between the gates and the tracks, and either breakaway arms are used or a gap is provided between the tips of the arms to allow a vehicle to exit.

The following table lists the study crossings that are within 75 feet of a parallel roadway, and locations with four-quadrant gates.

At-Grade Study Crossings Within 75 Feet of Parallel Roadway

Road	Approx. Distance (ft)*	Parallel Roadway	Adjacent Intersect. Control Type	Four-Quad Gate System
Maynard Rd	75	Chatham St	Signalized	Yes
Trinity Rd	50	Chatham St	Unsignalized	No**
Nowell Rd	50	Hillsborough St	Unsignalized	No***
Powell Dr	60	Beryl Rd	Unsignalized	No
Beryl Rd	N/A	N/A	N/A	No
Royal St	45	Hogan Ln	Unsignalized	No

\* Measured from edge of track to edge of intersection  
\*\* Three-quad gate  
\*\*\* A traffic signal has been proposed at the intersection of Hillsborough Street and Nowell Road, but is not currently funded

Regulatory Signs



Advanced Warning Signs



Grade-Crossing Warning Signs



Advanced Warning Pavement Markings



*Humped Crossing on Trinity Road*



## Humped Crossings

A “humped” crossing occurs when the elevation of the railroad crossing is significantly higher than the intersecting roadway, which results in steep grades on the approaches to the crossing. Within the study area, Trinity Road has a humped crossing over the railroad tracks.

Humped crossings can cause driver discomfort or “bottoming out” of vehicles with long wheelbases or low clearances; vehicles can be damaged or even become stuck on the crossing. A humped crossing has a combination of short crest and sag vertical curves, and is most easily identified by scrapes in the asphalt on the approaches. Routine track maintenance tends to exacerbate the problem over time, as track ballast work typically adds about 3 inches to track height per occurrence. Over a 10-year period, the railroad could rise about one foot as a result of this routine maintenance, depending on frequency.

## Median Separators

Median separators consist of markers mounted on raised islands along the roadway centerline to discourage motorists from driving in opposite travel lanes to avoid lowered gate arms. A narrow median with flexible bollards is on Maynard Road south of the railroad to Chatham Street (about 45 feet long) and for about 75 feet north of the railroad tracks.

Where markers are not desired, a 4-foot median can be constructed with an 8-inch curb, which allows for landscaping. Median treatments typically extend 70 feet to 100 feet back from the gates, but they may be precluded by driveways or intersection roads within the distance.

*Median Separator on Maynard Road*



## Roadway Improvements

Roadway improvements can reduce both accident potential and traffic delay at highway/railroad crossings. Realignment and regrading can improve skewed crossing alignments, thereby improving visibility and reducing the time required to traverse a crossing. Additional lanes increase capacity and may reduce the residual delay following a crossing event. New roadways can provide alternate routes, allowing crossings to occur at more desirable locations and potentially eliminating some trips. Roadway crossing angles should be as near to 90 degrees as possible, and not be less than 70 degrees.

The Trinity Road crossing is near 90 degrees, but it has a sharp curve immediately north of the railroad tracks. Nowell Road crosses the railroad at a 78-degree angle, and Beryl Road crosses the railroad at a 46-degree angle.

*Skewed Nowell Road Crossing*





**Sight Distance**

Limited sight distance along the railroad tracks or along the adjacent unsignalized intersection also can contribute to difficulty for drivers in crossing the railroad tracks safely. Based on design principles in the Federal Highway Administration (FHWA) Railroad Crossing Handbook, the following at-grade crossings have limited sight distance:

- » NE Maynard Road — Trees are within the railroad right of way and obstruct the design sight lines, particularly limiting the sight distance for drivers traveling south.
- » Trinity Road — Trees are within the southeast quadrant design sight lines, but southbound drivers are required to stop before the crossing for the Chatham Street intersection, which gives them time to look for trains.
- » Nowell Road — Trees are within the design sight lines, and visibility is particularly difficult because of the skew of Nowell Road across the railroad tracks. A driver is unable to see a train approaching until within 50 to 100 feet of the crossing.
- » Powell Drive — Buildings are within the northeast, northwest, and southwest quadrant design sight lines. Views for drivers traveling north are most notably obstructed.
- » Beryl Road — The proximity of the railroad to the Hillsborough Street/Nowell Road intersection, and the skew at which Beryl Road crosses the tracks creates a sight distance concern. A new traffic signal at the Hillsborough Street/Nowell Road intersection has been proposed but is currently unfunded.
- » Royal Street — Trees and buildings are within the design sight lines in both directions.

**Railroad Crossing Condition**

A poor grade crossing surface is not a safety concern, but it can result in a rough, uneven ride and require increased maintenance of the track and the road itself. None of the study crossings have a poor grade crossing surface.

**Crash Data**

Crash data from the Federal Railroad Administration (FRA) was analyzed for the 20-year period from 1994 to 2014, and includes crashes related to trains at the crossings. Crash data immediately at the railroad crossing from NCDOT was analyzed for the 3-year period from July 2011 to June 2014. Vehicle-only crashes at the tracks were typically run-off road, rear-end, and sideswipe crashes. Crashes at the six at-grade railroad crossings are summarized in the following table. None of the crashes involved pedestrians or bicyclists. Crash data within the rest of the corridor is shown on the Design Principle 1 figure in the appendix.

*Crashes on the Railroad at At-Grade Crossings*

Road	20-Year FRA Data			3-Year NCDOT Data		
	PDO*	Fatality	Injury	PDO*	Fatality	Injury
Maynard Rd	1	0	0	6	0	1
Trinity Rd	0	0	0	2	0	0
Nowell Rd	1	0	0	0	0	0
Powell Dr	0	1	0	0	0	0
Beryl Rd	0	0	0	1	0	0
Royal St	0	1	0	0	0	0

\* PDO = property damage only

**Exposure Index**

NCDOT uses an exposure index as one factor to determine if a grade-separated crossing is warranted. The exposure index is calculated by multiplying the number of trains per day on the rail line being crossed by the number of vehicles per day at that crossing.

The exposure index is one measure used when considering the need for a grade separation. As a rule of thumb, grade separations are generally considered in urban areas where the exposure index is greater than 30,000. All crossings in this study area are urban. The exposure index was calculated for each of the study crossings using the year 2015 ADT volumes provided by NCDOT and the existing number of trains per day as reported by the NCDOT Rail Division, Norfolk Southern, and CSX.

As seen below, the existing exposure index exceeds the threshold for all crossings except Royal Street.

*Existing Exposure Index for At-Grade Crossings*

Road	Vehicle 2015 AADT	Existing Daily Train Volume	Existing Exposure Index
Maynard Rd	24,000	22	528,000
Trinity Rd	3,500	22	77,000
Nowell Rd	4,000	22	88,000
Powell Dr	2,500	22	55,000
Beryl Rd	6,000	22	132,000
Royal St	700	22	15,400

## Transportation Plans

The alternatives proposed in this study incorporate the corridor’s other transportation plans. The recommendations build on, and in some cases, modify the existing and planned roadway, bicycle, and pedestrian network. Below, adopted transportation plans are briefly summarized. Planned improvements within the corridor are shown on the design maps in the Crossing Designs section.

### Roadway Plans

#### *2040 Joint Metropolitan Transportation Plan (2013)*

CAMPO’s 2040 Long Range Transportation Plan includes multiple transportation projects in the study area. In addition to several widening projects, the following new location roadway and grade separation projects are proposed:

- Blue Ridge-Hillsborough Grade Separation (2020 horizon)
- Chatham/Maynard Grade Separation (2030 horizon)
- Chatham/Trinity Grade Separation (2030 horizon)
- Trinity Road Extension: E. Chatham Street to Cary Towne Boulevard (2030 horizon)

#### *2030 City of Raleigh Comprehensive Plan (2009)*

The 2030 Comprehensive Plan includes multimodal transportation facility recommendations. The plan proposes reclassifying thoroughfares and arterials as highways, multimodal streets, urban streets, and parkways. New typical sections are shown in the appendix of this report. The plan promotes “Complete Streets” designs to better accommodate pedestrians and bicycles as well as quality transit services to enhance mobility. The plan proposes revising the City’s Streets, Sidewalks, and Driveways Access Handbook to require sidewalks on both sides of streets in most contexts.

The recommendations for future roadways on new location within the study area include:

- » Edwards Mill Road – Extend from Chapel Hill Road to Western Boulevard and from Western Boulevard Extension to existing Edwards Mill Road
- » Western Boulevard – Extend from Jones Franklin Road to existing Western Boulevard/Cary Towne Boulevard near the I-40 interchange

The recommendations for widening existing roadways within the study area include:

- » Chapel Hill Road – Widen from Hillsborough Street to Corporate Center Drive to a 4-lane divided major thoroughfare
- » Hillsborough Street – Widen from Western Boulevard to I-440 and I-40 to Western Blvd to a 4-lane divided major thoroughfare
- » Jones Franklin Road – Widen from I-440 to Buck Jones Road to a 2-lane divided major thoroughfare
- » Western Boulevard – Widen from Hillsborough Street to Kent Road to a 6 lane divided secondary arterial

#### *Town of Cary Comprehensive Transportation Plan (2008)*

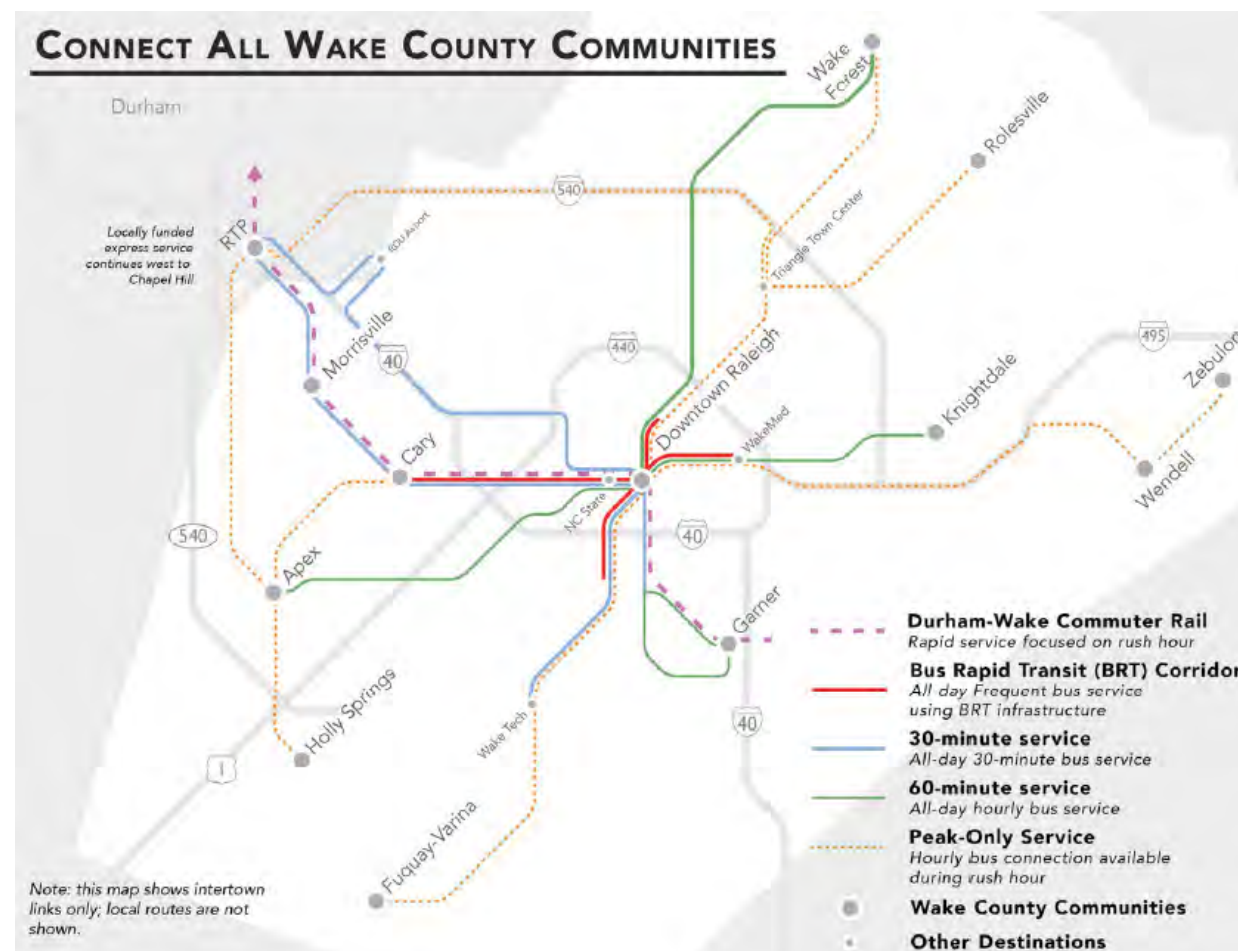
Cary’s plan includes multimodal transportation facility recommendations. The plan’s roadway recommendations within the study area include extending NW Cary Parkway to connect with Trinity Road, and extending Trinity Road to the south from E. Chatham Street to Cary Towne Boulevard. Pedestrian and greenway recommendations are addressed in the Cary Comprehensive Pedestrian Plan, below.

## Transit Plans

### *Recommended Wake County Transit Plan (Draft 2015)*

The Recommended Wake County Transit Plan proposed a combination of bus rapid transit (BRT), commuter rail, and increased local bus service. The plan envisions four “big moves” to connect the region across county lines, connect all Wake County communities to the transit network, provide frequent, reliable urban mobility to the densifying areas of the County, and give enhanced access to transit across Wake County.

### *Recommended Wake County Transit Plan (Draft 2015)*



### *CAT Short Range Transit Plan (2012)*

The Short Range Transit Plan lays out GoRaleigh’s (previously Capital Area Transit) coordinated service changes for Fiscal Years 2013 through 2016. In FY 2016, the Chatham route is scheduled to be introduced to the corridor, traveling along Hillsborough Street from the downtown Cary train station to NCSU. Service will be offered every 30 minutes during peaks, and hourly midday, Saturday, and Sunday. The Blue Ridge Crosstown will operate between downtown Cary and the Town North Shopping Center on Creedmoor Road. The new crosstown route will travel Chapel Hill Road, Corporate Center Drive, Trinity Road past PNC Arena, Blue Ridge Road, Edwards Mill Road, through the Crabtree Mall Transit Center, and north on Creedmoor to the current end-of-the-line on the 4 Rex Hospital route.

### *Town of Cary Comprehensive Transportation Plan (2008)*

The CTP includes a description of transit within the study area, including existing bus and Amtrak service serving Cary, connection between land use and transit services, and proposed bus route and service modifications. The Cary Community Plan (“Imagine Cary”), currently underway, will update all portions of the CTP.

### *Railroad Commuter Study (Underway)*

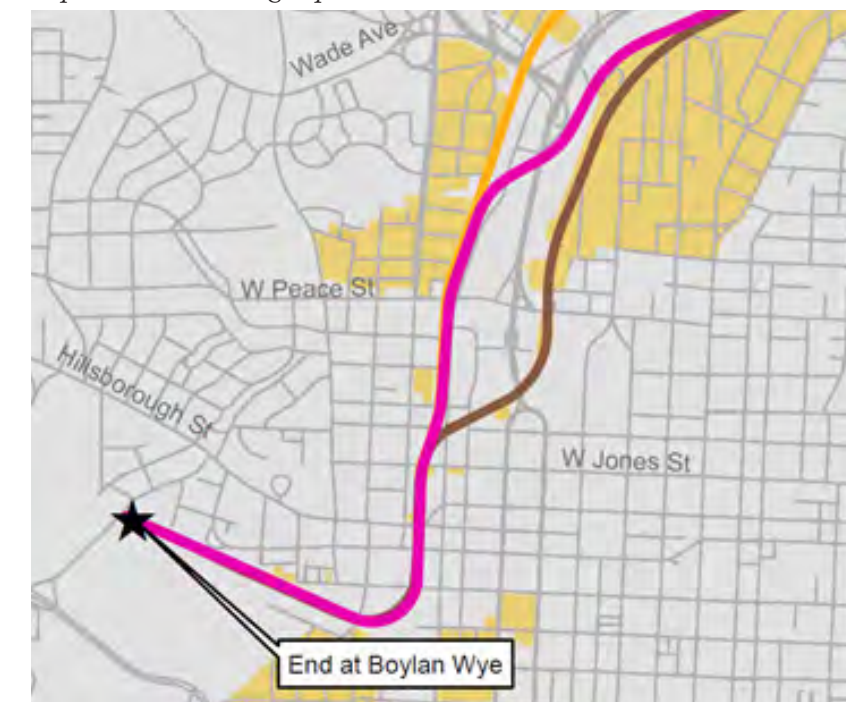
Increased commuter bus service that will link Cary with Research Triangle Park and NCSU is possible, as is commuter rail service linking downtown Cary with Durham, Raleigh, Garner, and points between. GoTriangle and NCR, in conjunction with Norfolk Southern, are currently conducting a commuter rail capacity study to identify the railroad infrastructure requirements for various levels of commuter rail service. Additional service enhancements may lengthen operating hours, decrease headways along existing bus routes, and expand routes outward toward adjacent municipalities.

### *Southeast High Speed Rail*

The Southeast High Speed Rail (SEHSR) project encompasses several projects at different phases of planning and development. From Raleigh to Charlotte, NCDOT is implementing the Piedmont Improvement Program, which is proposed to operate within the existing railroad corridor as a combination of new tracks (“double tracking”) and strategic addition of siding.

No infrastructure improvements are currently proposed within the study corridor. Future improvements are proposed from Washington, D.C. to the Boylan Wye in Raleigh, Charlotte to Atlanta, and Richmond to Hampton Roads. Once the SEHSR is operational, the number and speed of trains are anticipated to increase.

### *Proposed Southeast High Speed Rail*





## Pedestrian and Bicycle Plans

*BikeRaleigh Plan (2009) & BikeRaleigh Map (2013)*

The City of Raleigh is in the process of updating the 2009 BikeRaleigh Plan. The BikeRaleigh 2015 Draft Plan includes goals for Raleigh to become designated as a “Silver Level Bicycle Friendly Community” by the League of American Bicyclists by 2018, and to become a “Vision Zero” city and reduce crash rates involving bicycles.

Based on the 2013 BikeRaleigh map, bicycle facilities within the study area include paved greenways, bike lanes, and sidepaths:

- » Bike Lanes: Bike lanes are on Gorman Street between Wade Avenue and Hillsborough Street, on Blue Ridge Road between Beryl Road and Western Boulevard, on E. Chatham Street between SE Maynard Road and E. Durham Road, and on NC 54 between Trinity Road and Reedy Creek Road.

*BikeRaleigh Map (2013)*

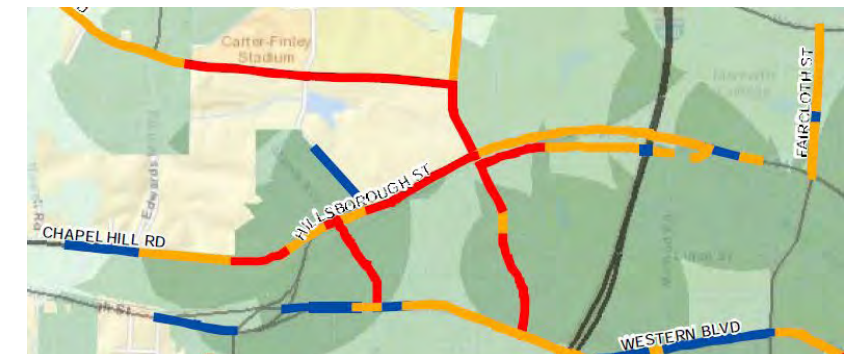


- » Greenways: The Rocky Branch Trail travels from south of downtown to Meredith College where it turns into the Reedy Creek Trail. The section of the Rocky Branch Trail in the project study area travels from the western edge of Pullen Park through NCSU parallel to Western Boulevard, turns north at Gorman Street, and travels around the western edge of Meredith College. The Rocky Branch Trail turns into the Reedy Creek Trail at Meredith College and merges with the House Creek Trail after passing under the Wade Avenue Trail underpass. The trail goes on to connect to other greenways and the Edwards Mill Connector.
- » Sidepaths: The map shows a paved sidepath parallel to Western Boulevard between Jones Franklin Road and Pullen Road. In addition to showing bicycle facilities, the map shows recommended roads for bicycling. Bicycle facilities and bicycle-friendly roadways create a well-connected network throughout the study area. The most visible gaps are along stretches of

NC 54 near the I-40 interchange and the NC State Fairgrounds as well as Buck Jones Road, Jones Franklin Road, and Trinity Road (between E. Chatham Street and I-40).

*Raleigh Pedestrian Plan (2013)*

The City of Raleigh Pedestrian Plan includes an inventory of existing facilities as well as a prioritized list of over 200 proposed sidewalk projects throughout the City. The plan includes maps that identify missing sidewalks within the city as well as the need for improved pedestrian facilities. Recommendations in the plan include installing new sidewalks where missing, ensuring new development projects include pedestrian accommodations, and collaborating with GoRaleigh and GoTriangle to improve access to bus stops.





*Cary Comprehensive Pedestrian Plan (2008)*

The Town of Cary Pedestrian Plan includes an inventory of existing facilities and recommendations for crossing improvements and new sidewalks and greenways. Potential pedestrian intersection improvement projects recommended in the project study area at Chatham Street and Maynard Road and on several sections of Maynard Road. Proposed sidewalks within the study area are located at the entrance to WakeMed Soccer Park (now built) and along Trinity Road north of NC 54.

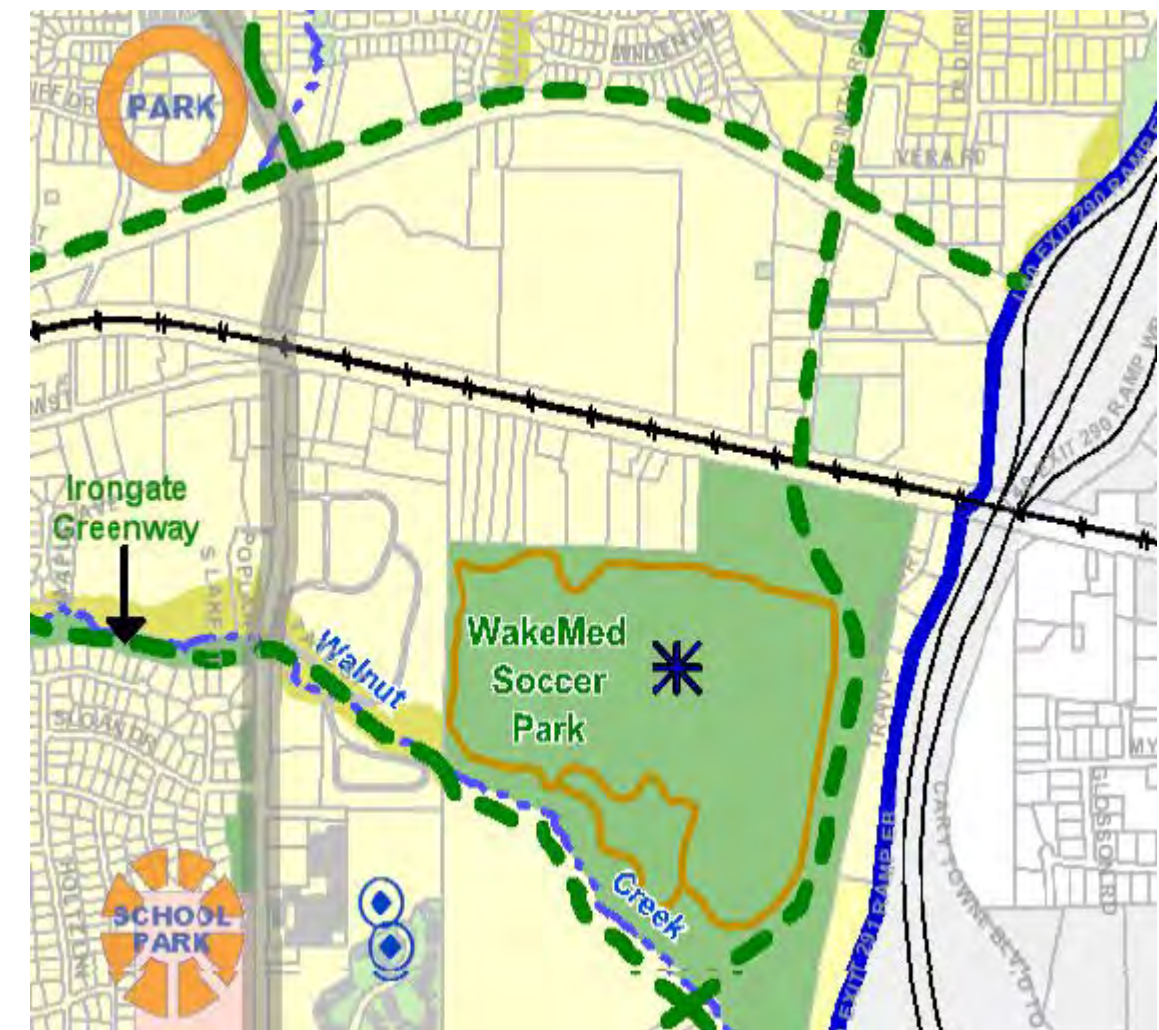
*Bike & Hike Cary Map (2015)*

The Bike & Hike Cary Map shows existing and short-term proposed bicycle, pedestrian, and trail facilities in Cary. Within the RCRX Project Study Area, a greenway is proposed along Trinity Road as a “streetside trail” traveling from WakeMed Soccer Park to Trenton Road, where the trail will split to travel north to Umstead State Park and beyond. The map also shows a proposed paved off-road greenway traveling from downtown Cary to the WakeMed Soccer Park and continuing onward into southwest Cary. NC 54 and NE Maynard Road between NC 54 and Medfield Road are signed bicycle routes. NC 54 is recommended as a future “streetside trail” corridor. The map shows bicycle lanes on E. Chatham Street between SE Maynard Road and E. Durham Road and on NC 54 between Trinity Road and Reedy Creek Road. The plan also shows signed bicycle routes on Maynard Road between Walnut Street and Reedy Creek Road and on NC 54 between the bike lanes and the western segment of the Maynard Road loop. The plan notes the potential for a bicycle project along Chatham Street that would link downtown Cary to the bike lanes on E. Chatham Street.

*Parks, Recreation and Cultural Resources Master Plan (2012)*

The Town’s PRCR Master Plan aims to create a balanced system of cultural arts, active and passive recreation, and conservation facilities, focusing on the next five to ten year time period. Within the project study corridor, greenways are proposed on Chapel Hill Road, on Trinity Road and the future extension, and along Walnut Creek. A park is proposed at the NE Maynard Road/Chapel Hill Road intersection (land has not yet been acquired) and along SE Maynard Road at East Cary Middle School.

*Parks, Recreation and Cultural Resources Master Plan (2012)*



## Land Use

### Existing Land Use

Highlights of existing land uses are described below:

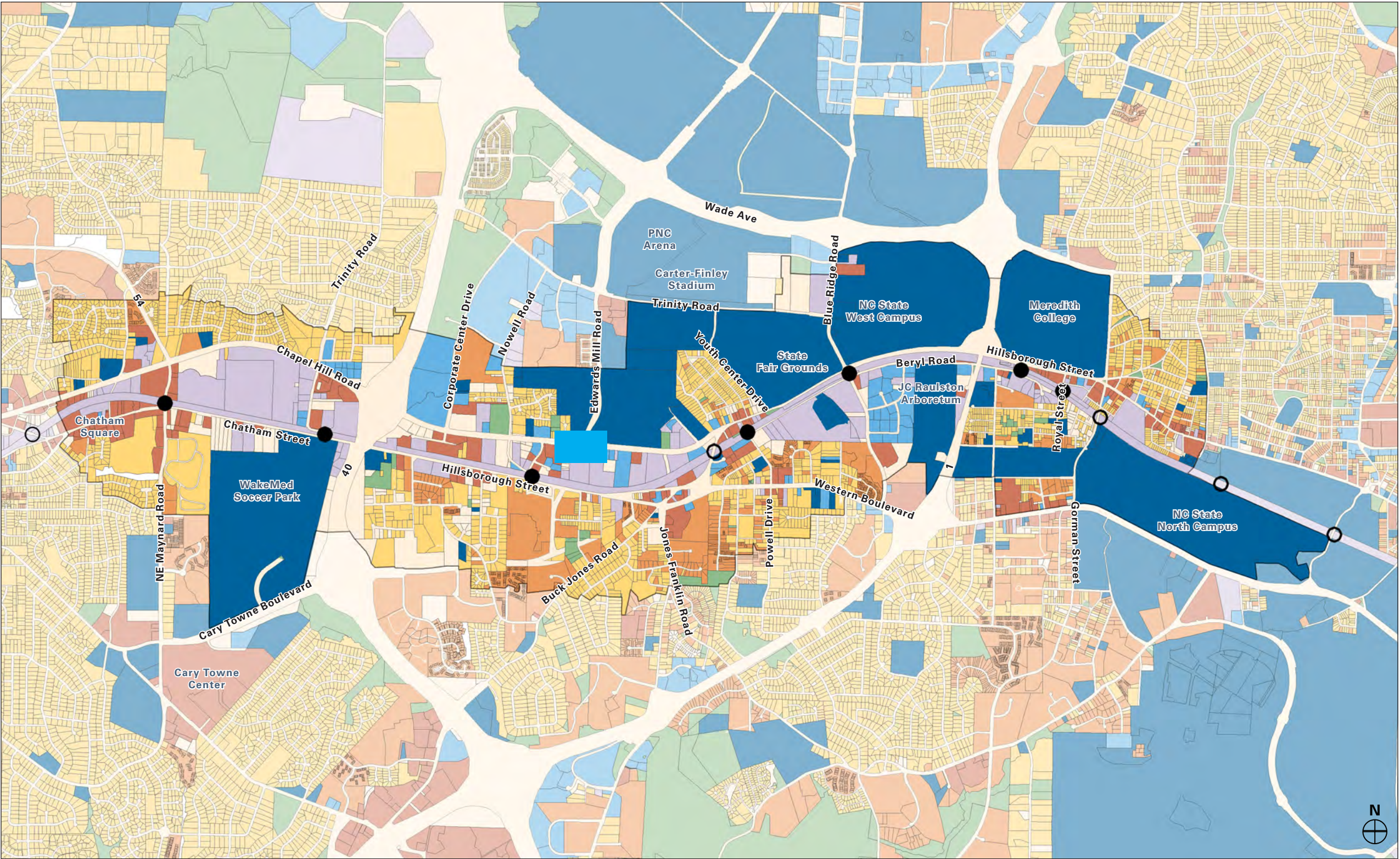
- » Residential—Neighborhood fabric extends into the study area from the northwest, south, and northeast. Since industrial and other non-residential uses historically dominated the rail corridor, very little neighborhood development abuts the rail itself. Similarly, rail rarely, if ever, divides neighborhoods since the rail predates most of the residential subdivisions.
- » Commercial—The commercial uses within the study area largely follow major surface transportation routes and are typically built in a suburban format with surface parking. Cary Towne Center and Cameron Village are two shopping destinations just outside the study area. There are a number of corporate and employment centers that complement the universities that serve as the primary employers in the area.
- » Institutional—Institutional uses anchor the study area, driving a lot of the peak transportation demands and some of the supporting land uses. Much of the institutional land use has direct adjacency to the rail corridor with only North Carolina State University divided by the corridor. This is of particular note given the number of crossings by students and faculty to access various parts of the campus. Similarly, there are primary and secondary schools with student populations that span both sides of the rail corridors. Many of the crash incidents along the corridor involved school buses.
- » Industrial—Much of the industrial land use grew up along the rail line that served it. A number of industrial parcels in various stages of use exist along the corridor with direct rail access. Some of these uses may transition to other uses once the industrial operation is no longer viable. Of particular note are the concrete plant near Powell Drive, the gas storage facility between NE Maynard Road and Trinity Road, and the radio tower parcel between Chapel Hill Road and Chatham Street.
- » Parks and Open Space—Most of the open space in the study area is associated with the institutions that own and manage it. WakeMed Soccer Park is the largest active recreational facility while the university and college campuses provide opportunities for passive recreation such as walking or non-commuting bicycling. The Method Community Park is on Method Road south of Beryl Road. The Method Road Complex is an NC State facility with two multipurpose fields, located in the southeast quadrant of the Method Road/Ligon Street intersection.



Existing Land Use

The corridor is not a monolithic use. Rather, it features a diverse blend of uses including residential, commercial, and industrial. It is anchored by a large amount of institutional uses that provide a large draw to the area for everyday uses and special events. Many of these uses are inherited from a time where this area was largely part of the county and at the edges of Cary and Raleigh. Much of the area is in transition as it evolves from a rural character into a more urban form.

- SINGLE-FAMILY RESIDENTIAL
- MULTI-FAMILY RESIDENTIAL
- COMMERCIAL MIXED-USE
- OFFICE
- INSTITUTIONAL
- INDUSTRIAL
- VACANT/NO INFORMATION
- PUBLIC OPEN SPACE
- AT-GRADE RAIL CROSSING
- GRADE-SEPARATED RAIL CROSSING





## Future Land Use

Future land use information is based on currently adopted local plans. A soft site analysis was performed within the corridor. This began with previous analyses completed by Cary and Raleigh. Development suitability was based on the following descriptions:

- » Vacant — Land that is vacant or where the value of those structures or buildings is a small fraction of the total land value.
- » Ready — Land that is highly likely to redevelop within 10-20 years and tends to have a relatively low ratio of building value to land value (typically less than 1:1).
- » Marginal — Land that is marginally likely to redevelop within 10-20 years, most likely only if a development spur such as light rail is built.
- » Firm — Land that has existing primary structures, and that is highly unlikely to redevelop over the next 10-20 years.

Based on the future land use policy and the soft site analysis, the following areas are expected to experience changes in land use:

- » NE Maynard Road/Chapel Hill Road — The area generally bound by Maynard Road, Chapel Hill Road, I-40, and south of Cary Towne Boulevard has been identified by the Town as the East Cary Gateway Special Planning Area. The adopted land use plan anticipates some of the single family residential areas will convert to office/institutional mixed use, and some additional commercial mixed use will infill along Chatham Street. The Town is in the process of updating its land use plan, which may now also include an “innovation district” and commercial mixed use with hotels.

- » Trinity Road — Along the proposed extension south to Cary Towne Boulevard, the property south of WakeMed Soccer Park is vacant and has been identified by developers and the Town as a likely site for new development.
- » Corporate Center Drive to Edwards Mill Road — The area along Hillsborough Street and Chapel Hill Road is expected to continue to fill in with commercial and industrial mixed use. Although some areas, particularly along Chatham Street/ Hillsborough Street and Chapel Hill Road are likely to see redevelopment from industrial to mixed use and office, other undeveloped areas are likely to see new light industrial uses.
- » Powell Drive to Blue Ridge Road — The area between Hillsborough Street and Western Boulevard is anticipated to redevelop from industrial to mixed use.

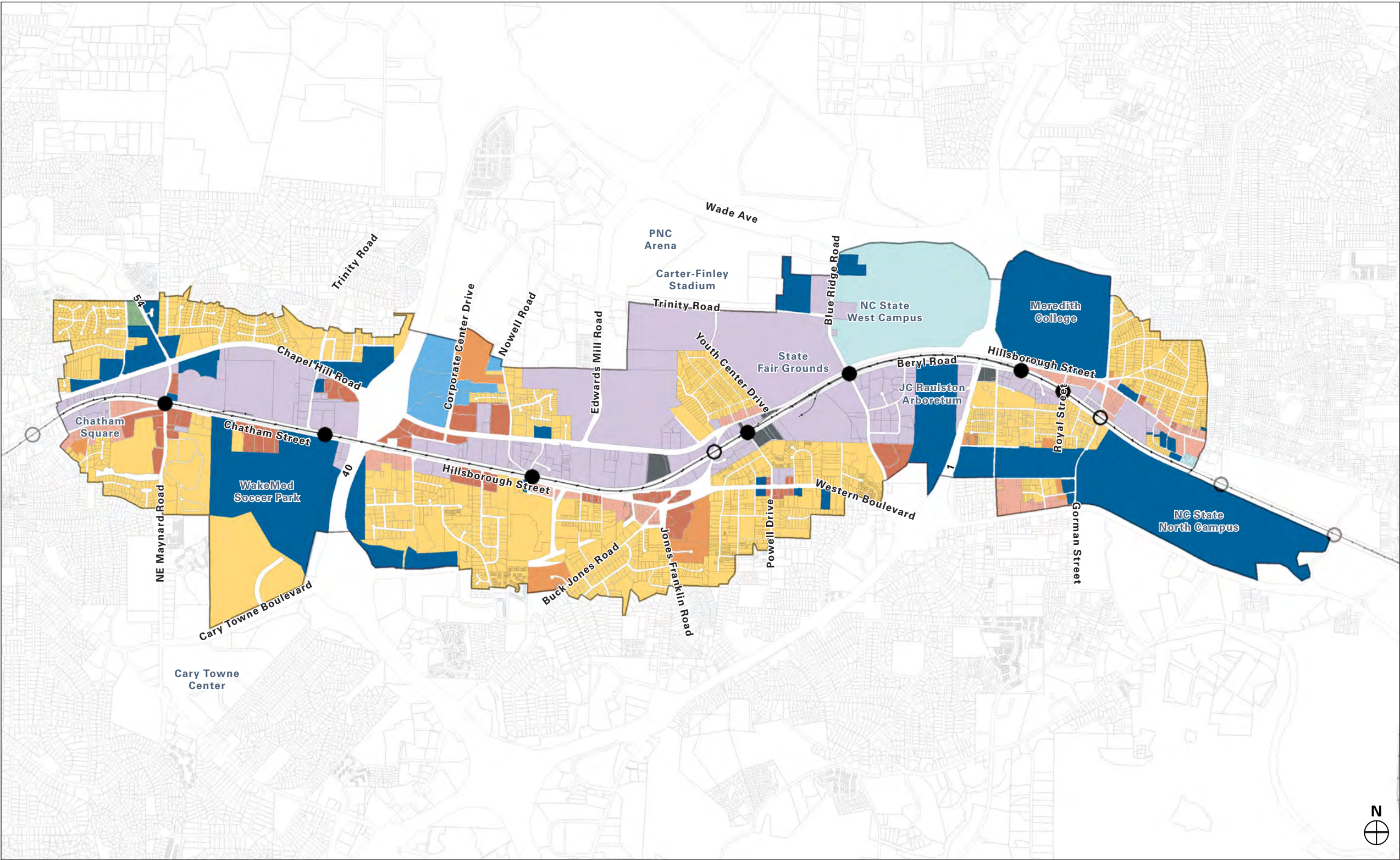
Major potential economic development zones were identified near the NE Maynard Road, Trinity Road, Edwards Mill Road, and Powell Drive crossings.

# Future Land Use Policy

This diagram is a synthesis of Raleigh’s proposed rezoning map of the Unified Development Ordinance (UDO) of 2013 and Cary’s Land Use Plan of 1996. By unifying the land use types of Cary and Raleigh the general patterns of the study area start to show. The municipalities tend to keep the commercial, office, and mixed uses closer to the rail corridor, while keeping residential neighborhoods behind this mixed use buffer.

The study area’s largest parcels tend to fall into the Industrial Mixed Use categorization. This is intended to allow for the introduction of retail, service, and commercial activities within the existing industrial zones. The overall result of the rezoning will be a denser, more diverse development of the corridor.

- SINGLE-FAMILY RESIDENTIAL
- MULTI-FAMILY RESIDENTIAL
- NEIGHBORHOOD MIXED USE
- COMMERCIAL MIXED USE
- OFFICE PARK
- OFFICE/INSTITUTIONAL MIXED USE
- INDUSTRIAL MIXED USE
- HEAVY INDUSTRIAL
- PLANNED DEVELOPMENT
- PARKS, OPEN SPACE, GREENWAYS
- AT-GRADE RAIL CROSSING
- GRADE-SEPARATED RAIL CROSSING





## Land Use and Facility Master Plans

Future land uses were developed throughout the corridor, with special focus on the crossing areas. These land use assumptions began with an understanding of how the Town, City, and major institutions in the corridor anticipate their growth. Summaries of local land use plans are included below.

### City of Raleigh

#### *2030 Comprehensive Plan (2009)*

The 2030 Comprehensive Plan targets growth in the project study area. The plan calls for Transit Oriented Development at future rail stations at the rail intersections at Blue Ridge Road and just west of Edwards Mill Road. Additionally, the plan identifies the area north of Hillsborough Street, east of I-40, west of I-440, and south of Wade Avenue as a future growth area. The Future Land Use Map shows much of the area remaining institutional or office/research land uses and also proposes new areas of mixed-use development and medium- to high-density residential near Blue Ridge Road and Chapel Hill Road. The Arena Plan is the small area plan for this area within the larger Comprehensive Plan. Notable Arena Plan recommendations include preserving at least 30% of land as open space, and placing a park in the vicinity of the Edwards Mill Road and Chapel Hill Road intersection.

#### *Blue Ridge Road District Study (2012)*

The Blue Ridge Road District Study focuses on the 2-mile stretch of Blue Ridge Road from Edwards Mill Road to Western Boulevard. The southern portion of the plan area from Wade Avenue to Western Boulevard is in the RCRX Study Area. The plan recommends that the area bounded by Wade Avenue to the north, Hillsborough Street to the south, I-440 to the east, and Edwards Mill Road to the west become the Entertainment and Education District. The plan calls for creating modified street grids in each district and notes locations for future activity centers, including one at or near Blue Ridge Road just south of Hillsborough Street.

#### *Jones Franklin/Western/Hillsborough Small Area Study (2011)*

This small area plan focuses on the area where Buck Jones Road and Jones Franklin Road intersect Western Boulevard. Land use recommendations call for a mixed-use neighborhood centered on the confluence of Jones Franklin Road, Buck Jones Road, and Western Boulevard. Infrastructure projects include extending Jones Franklin Road to Chapel Hill Road and the addition of two new roadway blocks that will create a more connected transportation network. Aesthetic recommendations call for mixed-use infill development, open space, and landscaping oriented toward the street that encourage a safer, more walkable neighborhood.

#### *The City of Raleigh Parks, Recreation and Cultural Resources System Plan (2014)*

The System Plan identifies park and cultural resources existing conditions, needs, and monitoring procedures for future facility planning. The plan examines the level of service using buffers around existing facilities based on their service area to determine park and recreation facility service gaps. The plan suggests this area is underserved by neighborhood parks, community parks, and to a lesser extent by metro parks, greenways, and selected recreation facilities and fields.

#### *Hillsborough Street Streetscape Project (Ongoing)*

This project will extend the streetscape improvements on Hillsborough Street by four blocks from Brooks Avenue to Shephard Street. Half of the project is in the study area. The project will widen sidewalks, bury overhead utility lines, enhance landscaping, and install roundabouts at Brooks Avenue, Dixie Trail, and Shephard Street. The project will begin construction in Spring 2016 and finish in Spring 2017.

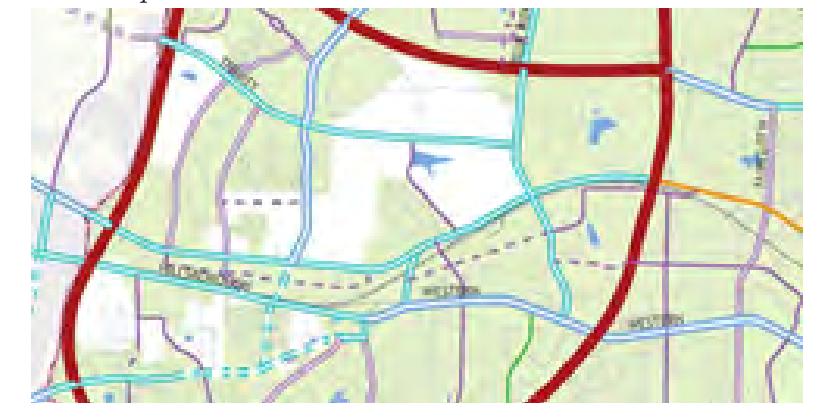
#### *Blue Ridge Road District Study (2012)*



#### *Jones Franklin/Western/Hillsborough Small Area Study (2011)*



#### *2030 Comprehensive Plan (2009)*



## Town of Cary

*Town of Cary Community Plan “Imagine Cary” (Ongoing)*

Imagine Cary is currently being developed by the Town to update and connect its many specific topic plans into a single, integrated comprehensive policy guide for the future. This effort will update the existing 1996 Land Use Plan and the 2008 Comprehensive Transportation Plan. The entire planning process is expected to be complete by late 2016.

## Facility Master Plans

*State Government Facilities Master Plan (2007)*

The plan provides an inventory of state government facilities, projected growth, transportation needs, and implementation recommendations by state government property districts.

*State Government Facilities Master Plan (2007)*



The “Research and Development District” extends along Blue Ridge Road from Edwards Mill Road to Hillsborough Street. State-owned properties within the study area include the NC State Fairgrounds, NCDOT’s County Yard and Equipment Yard, the Highway Patrol Service Yard, and numerous NCSU facilities including the Veterinarian School, Alumni Center, Raulston Arboretum, and Horticulture Center. The plan calls for redeveloping the stretch of Blue Ridge Road between the NC Museum of Art and Hillsborough Street.

*NC State Fairgrounds Master Plan (2009)*

The master plan identifies 48 projects to be completed over the next 20 to 30 years. The projects on the Main Campus will add new exposition space, enhance the fairground’s layout, and improve pedestrian and traffic flow. The Main Campus is bounded by Blue Ridge Road, Hillsborough Street, Youth Center Drive, and Trinity Road. The plan calls for new parking lots accommodating 5,000 spaces in the undeveloped Western Property of the fairgrounds, which flanks Edward Mills Road at Hillsborough Street.

*Centennial Biomedical Campus Development and Design Guidelines (2010)*

The NCSU Centennial Biomedical Campus is bounded by Hillsborough Street, Blue Ridge Road, Wade Avenue, and I-440. The plans calls for preserving all of the existing structures

and open space while adding a new campus organized around quads along Blue Ridge Road. New buildings are planned for the corners of Hillsborough Street near Blue Ridge Road and near I-440, leaving the central portion of the campus along Hillsborough Street undeveloped with pasture views from Hillsborough Street.

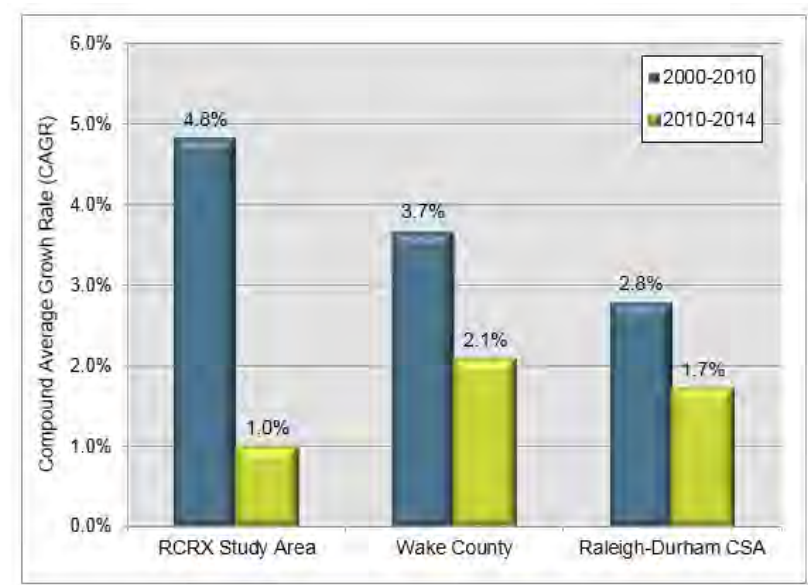
*NC State Fairgrounds Master Plan (2009)*





## Market Trends and Forecasts

Population Compound Average Growth Rates



## Population Trends and Forecasts

Population and household data has been analyzed and forecasted for the RCRX Study Area, Wake County, and the 11-county Raleigh/Durham/Chapel Hill Combined Statistical Area (CSA). Wake County and the CSA provide broader geographic context for capturing office, residential, and retail demand in the RCRX Study Area.

### Trends

The RCRX Study Area grew almost 60% between 2000 and 2010, equating to a compound annual growth rate (CAGR) of 4.8%. In comparison, Wake County and the CSA grew at slower rates of 3.7% and 2.8%, respectively, because of the larger population bases for both geographies. Much of the study area increase was generated by enrollment growth at North Carolina State University (NCSU), represented in group quarters population contained in on-campus housing. NCSU added over 5,000 students during the ten-year period.

All three areas posted reduced growth rates between 2010 and 2014, in response to lower household formation and mobility, both nationally and regionally, following the 2007-2009 recession. The Study Area was also impacted by a drop in enrollment at NCSU, and a diminished supply of developable land for residential uses. Wake County and the CSA grew at 2.1% and 1.7%, respectively, well below 2000-2010 rates.

### Forecasts

The North Carolina Office of State Budget and Management (State) provides population forecasts by county. Wake County is expected to experience an increase of 53.5% between 2014 and 2040. The State also estimates the CSA grow 44%. The study area forecast of 6,981 people is based on Wake County growth rates modified to reflect student enrollment changes and the supply of developable residential land.

Projected Population Percentage Change, 2014-2040

Area	2014-2020	2020-2025	2025-2030	2030-2035	2035-2040
RCRX Study Area	1.1%	1.3%	1.2%	1.2%	1.2%
Wake County	1.9%	1.7%	1.6%	1.5%	1.5%
Raleigh/Durham/Chapel Hill CSA	1.6%	1.5%	1.4%	1.3%	1.3%

Source: ESRI, NC Office of State Budget and Management

## Household Trends and Forecasts

### Trends

The RCRX Study Area added 265 households between 2000 and 2010, representing a 6.2% increase. The 0.6% CAGR was well below 4.8% for population, indicating the predominant influence of student enrollment growth on Study Area population during the period. The household CAGRs for Wake County and the CSA were almost identical to those for population, indicating relatively stable household sizes.

Number of Households, 2000-2010

Area	2000	2010	2000-2010 Change		
			#	%	CAGR
RCRX Study Area	4,246	4,511	265	6.2%	0.6%
Wake County	242,031	345,645	103,614	42.8%	3.6%
Raleigh/Durham/Chapel Hill CSA	560,301	734,728	174,427	31.1%	2.7%

Source: ESRI, Woods & Poole

Study Area household growth accelerated over the last four years, with the addition of 335 households tied directly to occupancy of the 350-unit Camden Asbury Apartments located at the intersection of Corporate Center Drive and Handsworth Lane. This upturn was counter to the population trends over the two periods, reflecting declines in student enrollment at NCSU.

Number of Households, 2010-2014

Area	2010	2014	2010-2014 Change		
			#	%	CAGR
RCRX Study Area	4,511	4,846	335	7.4%	1.8%
Wake County	345,645	373,102	27,457	7.9%	1.9%
Raleigh/Durham/Chapel Hill CSA	734,728	783,357	48,629	6.6%	1.6%

Source: ESRI, Woods & Poole

Forecasts

Household forecasts are based on average household sizes applied to population growth between 2014 and 2040. Approximately 2,100 new households are possible in the Study Area over the 26-year period between 2014 and 2040, equating to a 1.4% CAGR. Wake County and the CSA are forecasted to grow at similar 1.6% and 1.3% CAGRs, respectively.

All three geographies are expected to exhibit declining household CAGRs during the five incremental forecast periods.

Projected Number of Households Percentage, 2014-2040

Area	2014-2020	2020-2025	2025-2030	2030-2035	2035-2040
RCRX Study Area	1.7%	1.6%	1.3%	1.2%	1.2%
Wake County	2.1%	1.7%	1.4%	1.3%	1.3%
Raleigh/Durham/Chapel Hill CSA	1.8%	1.4%	1.2%	1.1%	1.1%

Source: ESRI, Woods & Poole

Average household sizes increased in all three geographies between 2000 and 2010, driven by the boom in detached single family development prior to 2008. By 2010, limited land available for development in the Study Area and shifting preferences toward multi-family housing after the 2007-2009 Recession resulted in a declining average household size. Approximately one-third of the market-rate apartments in the Study Area were also completed after 2010, attracting households generally smaller than those in single family housing. Wake County and the Triangle have continued to post slight increases in average household size with higher shares of single family development.

All three areas are forecasted to experience declining household sizes until 2020. The Study Area is likely to continue a gradual descent toward a 2.4 average household size, with residential development focused on multi-family units. Wake County and the Triangle Region could have increased average household sizes between 2020 and 2040 as Millennials marry and have children. These families will prefer single family housing, which will have limited development opportunities in the largely built-out Study Area.

Employment Trends and Forecasts

Wake County added 23,876 jobs between 2008 and 2013, representing a 5.3% increase. The highest absolute increase was in Administrative and Waste Services, followed by Professional and Technical Services. This differed from the expansion of Health Care and Social Assistance in the CSA, reflecting the concentration of jobs in that sector at the Duke and UNC hospital systems in neighboring Durham and Orange counties. Most of Wake County’s job losses were focused in the construction sector.

Wake County Employment Trends, 2008-2013

Industry	2008	2013	2008-2013 Change	
			#	%
Administrative and Waste Services	33,228	43,499	10,271	30.9%
Professional and Technical Services	38,808	45,296	6,488	16.7%
Accommodation and Food Services	37,047	43,288	6,241	16.8%
Health Care and Social Assistance	45,993	49,366	3,373	7.3%
Arts, Entertainment, and Recreation	6,892	9,892	3,000	43.5%
Retail Trade	51,633	53,622	1,989	3.9%
Information	16,527	17,664	1,137	6.9%
Educational Services	39,921	40,715	794	2.0%
Wholesale Trade	19,898	20,540	642	3.2%
Management of Companies and Enterprises	10,089	10,660	571	5.7%
Public Administration	39,588	39,768	180	0.5%
Finance and Insurance	16,958	17,010	52	0.3%
Other Services, Ex. Public Admin	15,146	14,820	-326	-2.2%
Natural Resources and Mining	1,453	1,126	-327	-22.5%
Utilities	1,397	875	-522	-37.4%
Real Estate and Rental Leasing	8,702	7,942	-760	-8.7%
Manufacturing	23,681	22,525	-1,156	-4.9%
Transportation and Warehousing	11,258	9,595	-1,664	-14.8%
Construction	31,870	25,763	-6,107	-19.2%
Total	450,089	473,965	23,876	5.3%

Source: NCESC



Woods and Poole expects Wake County to add 381,186 jobs between 2013 and 2040, representing an increase of 80.4%. Health care and social assistance is estimated to post the highest absolute increase, followed by educational services. Job growth would be more diverse across sectors than for the overall CSA.

Wake County Employment Forecast, 2013-2040

Industry	2013	2040	2013-2040 Change	
			#	%
Health Care and Social Assistance	49,366	127,487	78,121	158.2%
Educational Services	40,715	106,012	65,297	160.4%
Administrative and Waste Services	43,499	102,236	58,737	135.0%
Accommodation and Food Services	43,288	84,002	40,714	94.1%
Retail Trade	53,622	91,110	37,488	69.9%
Professional and Technical Services	45,296	81,817	36,521	80.6%
Arts, Entertainment and Recreation	9,892	20,634	10,742	108.6%
Management of Companies and Enterprise	10,660	21,390	10,730	100.7%
Construction	25,763	36,447	10,684	41.5%
Finance and Insurance	17,010	26,571	9,561	56.2%
Other Services, Ex. Public Admin	14,820	23,684	8,864	59.8%
Wholesale Trade	20,540	26,106	5,566	27.1%
Transportation and Warehousing	9,594	12,250	2,936	30.6%
Real Estate and Rental and Leasing	7,942	10,610	2,668	33.6%
Information	17,664	19,402	1,738	9.8%
Manufacturing	22,525	22,893	368	1.6%
Public Administration	39,768	40,115	347	0.9%
Utilities	875	953	78	8.9%
Natural Resources and Mining	1,126	1,124	8	0.7%
Total	473,965	855,133	381,168	80.4%

Source: NCESC

Retail Market Trends

Retail Trade Area

Three retail nodes have been selected in the RCRX Study Area for more detailed study, based on road access and current land use patterns. The three nodes have comparatively larger land holdings with redevelopment potential with new households and jobs supporting retail expansion. They are likely to emerge with distinct and complementary retail concepts reflective of parcel sizes, road access, visibility, and local demographics. The nodes are located in the vicinity of the following intersections:

- » Gorman Street/Hillsborough Street
- » Jones Franklin Road/Hillsborough Street
- » Maynard Road/NC 54

Separate trade areas have been drawn for each node, based primarily on drive-times from the intersections. The trade areas for the three retail nodes contain the entire RCRX Study Area. The Maynard Road/NC 54 trade area is the largest, due to the existing road network and consumer willingness to drive slightly farther in a more suburban location than the Gorman Street/Hillsborough Street area, which is more urban and includes a portion of the NC State campus. There are 21 retail centers in or near the trade area, containing a total of 5.3 million square feet. Most national big box and junior anchor chains operate within the trade area. The largest center is the Cary Towne Center with one million square feet anchored by four department stores. The Sears store closed recently in response to the chain’s continued underperformance nationwide. The Macy’s store has also announced it will close in Spring 2016 due to low holiday sales.

Retail Centers in Trade Area

Center Name	Address	Center Size (Sq. Ft.)	Anchor Tenants
Cary Towne Center	1105 Walnut Street	1,004,210	JC Penney, Dillard’s, Macy’s*
Park West Village	Cary Parkway/NC-54/Chapel Hill Road	750,000	Target, TJ Maxx, Gander Mountain, Stone Theaters
Crossroads Plaza	213 Crossroads Boulevard	681,067	Bed Bath & Beyond, Dick’s, Michaels, Marshalls
Cameron Village Shopping Center	1900 Cameron Street	629,216	Harris Teeter, Fresh Market, Ann Taylor
Centrum at Crossroads	2416 Walnut Street	345,797	BJ’s, Kohl’s, PetSmart, JoAnn Fabrics
South Hills Shopping Center	1201 Buck Jones Road	246,596	Burlington Coat Factory, Roses
Target/Home Depot	2021 Walnut Street	237,002	Target/Home Depot
Village Square Shopping Center	Walnut Street/SE Maynard Road	184,716	Harris Teeter, Ollies Bargain Outlet, Planet Fitness
Park Place Shopping Center	9545 Chapel Hill Road	171,551	Food Lion, Carmike Park Place 16
Shoppes of Kildaire	1394 Kildaire Farm Road	145,101	Trader Joes, Staples, Hallmark
Harrison Pointe Shopping Center	270 Grande Heights Drive	130,758	Harris Teeter, Staples
Avent Ferry Shopping Center	3200 Avent Ferry Road	117,000	Food Lion, Walgreens, Family Dollar
Harrison Square	1805 N Harrison Avenue	105,000	Bass Pro Shops
Ridgewood Shopping Center	3510 Wade Avenue	97,541	Whole Foods, Rite Aid Pharmacy
Preston Corners Shopping Center	968 High House Road	89,982	Lowes Foods
Northwoods Shopping Center	NW Maynard Road/N Harrison Avenue	78,217	Walmart Neighborhood Market, Dollar Treet
The Arboretum at Weston	111 Weston Parkway	77,800	Golf Tec, Ruth’s Chris, Bonefish Grill
Mayfair Plaza	980 Kildaire Farm Road	68,907	Food Lion, Dollar General
Chatham Square	740 E Chatham Street	65,480	n/a
Plaza West Shopping Center	5563 Western Boulevard	62,558	Harris Teeter, Dollar Tree, Planet Fitness
Reedy Creek Plaza	900 NE Maynard Road	57,775	Food Lion, Dollar General
Total		5,346,274	

Source: NCESC

\* Macy’s in Cary Towne Center is scheduled to close in Spring 2016



# Recommended Improvements

## Analysis

Crossing alternative concepts were developed through three phases, using a variety of analyses.

### Geometric Evaluation (Tier I)

The geometric analysis considered factors such as vertical elevation (i.e., the elevation of the rail compared with the road and clearance requirements of road and rail bridges), horizontal alignment (i.e., the feasibility of realigning a road), and notable obstacles (i.e., historic resources).

### Traffic Analysis (Tier II)

The traffic forecast considered a future No Build scenario using the current roadway network, and a future Build scenario using the recommended transportation network. The Build scenario also includes addition of the Ligon Street Extension, which is not currently funded but is consistent with the transportation and land use plans recommended in this study. Details are in the May 2015 Traffic Forecast.

#### Future Traffic Forecast

Road (at railroad crossing)	Vehicles Per Day	
	2040 No Build	2040 Build
Maynard Rd	45,600	44,700
Trinity Rd	4,400	3,300
Corporate Center Dr	10,000	13,000*
Nowell Rd	7,600	Closed
Edwards Mill Rd	8,600	14,500*
Jones Franklin Rd	35,000	39,200
Powell Dr	2,800	1,500
Beryl Rd	10,000	Closed
Royal St	1,600	6,400*

Note: A forecast was not performed at Royal Street, but counts were taken for use in the traffic analysis.

\* Includes traffic from closing of adjacent crossing.

Incorporating the 2040 traffic forecast volumes, a traffic capacity analysis was completed. This was used to identify necessary turn lanes, and also to ensure that traffic diverted by closing a crossing could be sufficiently accommodated by the adjacent crossings.

Level of service (LOS) is measured by “A” through “F.” LOS A represents few vehicles on the road, and LOS F represents a heavily congested road. All new alternatives were designed to achieve acceptable levels of service, generally considered to be LOS A through LOS D.

The February 2016 Traffic Capacity Analysis details the results of the analysis and the proposed turn lanes at each crossing. Key results of the analysis are summarized in the table below.

#### Traffic Analysis

Crossing (Intersection)	Level of Service (AM/PM Peak)		
	2015 Existing	2040 No Build	2040 Build
Maynard Rd (Maynard/Chatham)	D/D	F/F	D/D
Trinity Rd (Trinity/Chatham)	F/F	F/F	A/B
Corporate Center Dr (Corporate Center/Chapel Hill)	C/D	F/F	D/D
Nowell Rd (Nowell/Hillsborough)	F/E	F/F	Closed
Edwards Mill Rd (Edwards Mill/Chapel Hill)	A/B	B/B	D/D*
Jones Franklin Rd (Jones Franklin/EB Western)	B/C	F/C	D/C*
Powell Dr (Powell/Hillsborough)	F/F	F/F	A/B
Beryl Rd (Beryl/Hillsborough)	B/B	D/C	Closed
Royal St (Royal/Hillsborough)	E/E	F/F	B/C**

\* Includes traffic from closing of adjacent crossing.

\*\* The current Royal/Hillsborough Street intersection is unsignalized, and is assumed to be signalized in the the future.

IN THIS SECTION
» Analysis
» Individual crossing recommendations
» Network overview

Community Impact Assessment (Tier II)

Methodology

An abbreviated community impact assessment (CIA) was conducted to inform the design of each alternative and help identify the most feasible option. Project renderings, aerial photography, field visits, and information gathered from stakeholders and the public were used to identify potential impacts. The CIA documented the findings in detail, which are summarized briefly on the following page for each recommended alternative. Only long-term impacts are included in this summary; temporary access and mobility impacts are also anticipated for all grade separation and realignment projects. The table below explains the process used to determine potential impacts for each category.

Findings

Overall, the highest potential negative impacts would be to the physical environment. These impacts are anticipated for each proposed project due to the likely need to acquire new property, impacts to parking areas, and possible relocations. Changes to the social fabric of the communities is anticipated at the NE Maynard Road and Beryl Road/Royal Street crossings. Impacts to low income and/or minority populations could potentially occur as a result of the NE Maynard Road, Corporate Center Drive, and Beryl Road/Royal Street alternatives.

Positive impacts are anticipated, primarily in the access/mobility and safety categories. Six of the eight projects, with the exception of Nowell Road and Beryl Road/Royal Street, are anticipated

to improve access and mobility. These projects would create improvements in travel times and circulation that improve the existing transportation network. Four projects (NE Maynard Road, Trinity Road, Nowell Road, and Powell Drive) are anticipated to have safety benefits by eliminating potential conflicts between vehicles, pedestrians, and trains. The Beryl Road/Royal Street project will improve safety by redirecting traffic from the Beryl Road crossing, a skewed crossing, to the Royal Street crossing. Three projects (Corporate Center Drive, Edwards Mill Road, and Jones Franklin Road) would decrease travel time and increase access and mobility for emergency responders by extending a road across the railroad.

Further community impact analysis would be conducted for any projects that move forward for detailed study.

CIA Impact Categories

	Description	Positive Impact	Negative Impact
Physical	Acquisition of property or buildings.	Not applicable (property and building impacts were not considered to be positive).	Potential impact on property (such as taking undeveloped land, parking or storage areas) and/or relocation of buildings.
Social	Effects to a community’s access to or continued use of community gathering spaces, employment centers, and/or other indicators of community cohesion.	Potential to improve community quality of life by enhancing pedestrian and/or vehicle access. Potential to facilitate broader land use and access changes that would enhance the surrounding area’s quality of life.	Potential to impact use of community resources by removing parking, eliminating access, or removing community resources as part of property acquisition. Potential impact on neighborhood cohesion from the extent or location of property acquisition of community resources and/or business and residential relocations.
Access and Mobility	Changes in access to properties via a roadway or driveway, or changes in mobility that affect the ease of traveling throughout the transportation network as a pedestrian or motorist.	Potential to improve travel access and mobility by adding new roads or crossings. New access may improve development potential of adjacent properties.	Potential to alter access or mobility through crossing closures or detours that would decrease existing access to properties and increase travel time.
Safety	Effects on safety through the removal of conflicts at existing at-grade crossings, or by improving travel safety through adding/extending a new road or realigning a roadway.	Potential to remove existing rail-vehicle conflicts through a proposed grade separation or crossing closure. Potential decrease in travel time and increase in access for emergency responders. Potential to improve safety through measures such as roadway reconfiguration or pedestrian infrastructure improvements.	Potential on-going safety concern by retaining an at-grade crossing.
Environmental Justice	Impacts to minority or low income communities using American Community Survey Census data for Race, Income, Hispanic or Latino Origin and Limited English Proficiency, and as identified through meetings with the community and local planners.	Potential benefit to low income or minority community through improvement in access to a neighborhood or business node.	Potential impact on properties or buildings within an area with notable low income or minority populations. Potential effect on low income or minority community through changes to neighborhood cohesion or a business node.



## NE Maynard Road

- » **Physical** — Potential business relocations and impacts to parking.
- » **Social** — Many of the buildings in the Chatham Square Shopping Center that may be impacted are community gathering places, restaurants, and shops celebrating diverse, multi-cultural populations.
- » **Access and Mobility** — Eliminates travel delay at the existing at-grade crossing. Potential impacts to business access.
- » **Safety** — Eliminates potential for vehicle/train conflicts.
- » **Low Income & Minority Communities** — Impacts to individual businesses or to the overall Chatham Square business node may have an adverse effect on the low income and minority community nearby.

## Trinity Road

- » **Physical** — Potential business relocations.
- » **Access and Mobility** — Eliminates travel delay at the existing at-grade crossing. Potential impacts to business access. New connection point to Chatham Street would change access into WakeMed Soccer Park; turning movements would be easier for traffic exiting the complex and traveling northbound, but more difficult for traffic entering the complex from the north. A right-in/right-out driveway from the WakeMed parking lot to the new loop, if feasible, would improve access in both directions.
- » **Safety** — Eliminates potential for vehicle/train conflicts.

## Corporate Center Drive

- » **Physical** — Potential commercial, industrial, and residential relocations and impacts to parking.
- » **Access and Mobility** — Improves vehicular, pedestrian, and bicycle connectivity between Chapel Hill Road and Hillsborough Street and across the railroad. Potential impacts to business access.
- » **Safety** — Increases access and decreases travel time for emergency responders.
- » **Low Income & Minority Communities** — The communities south of Hillsborough Street near Bashford Road and I-40 include minority and low income residents. However, residential relocations are anticipated to be minimal, and so impacts are not anticipated to be disproportionately high or adverse to minority and low income communities.

## Nowell Road

- » **Access and Mobility** — Closing the crossing reduces north-south mobility. However, the crossing will only be closed with extension of Corporate Center Drive or Edwards Mill Road, which is anticipated to mitigate this impact. A new east-west connection may be built as part of future development, which would decrease travel time to the adjacent crossing(s).
- » **Safety** — Eliminates potential for vehicle/train conflicts. Slightly increases travel time north of the railroad from Raleigh Fire Station #8 if closed in conjunction with Corporate Center Drive extension without Edwards Mill Road extension.

## Edwards Mill Road

- » **Physical** — Potential commercial and industrial relocations.
- » **Access and Mobility** — Improves vehicular, pedestrian, and bicycle connectivity between Chapel Hill Road and Hillsborough Street and across the railroad. Potential impacts to business access.
- » **Safety** — Increases access and decreases travel time for emergency responders.

## Jones Franklin Road

- » **Physical** — Potential business relocations and impacts to parking.
- » **Access and Mobility** — Improves vehicular, pedestrian, and bicycle connectivity between Chapel Hill Road and Hillsborough Street/Western Boulevard and across the railroad. Potential impacts to business access.
- » **Safety** — Increases access and decreases travel time for emergency responders.

## Powell Drive

- » **Physical** — Potential business and residential relocations and impacts to parking.
- » **Access and Mobility** — Eliminates travel delay at the existing at-grade crossing. Realignment of Powell Drive to connect with Youth Center Drive improves north-south mobility through the area. Potential impacts to business access.
- » **Safety** — Eliminates potential for vehicle/train conflicts. Eliminates dog-leg for north-south mobility between Powell and Youth Center Drives.

## Beryl Road/Royal Street

- » **Physical** — Potential business relocations and impacts to parking.
- » **Social** — Changing travel route options may affect the Method community, a historic African American community centered on Method Road between Beryl Road and Ligon Street.
- » **Access and Mobility** — Closing the crossing reduces mobility across the railroad. However, the addition of a new 0.2-mile connector between Beryl Road and Royal Street is proposed as part of this alternative to mitigate this impact. A new traffic signal at Royal Street/Hillsborough Street would address increased traffic at that intersection.
- » **Safety** — Eliminates potential for vehicle/train conflicts.
- » **Low Income & Minority Communities** — Reduces travel time savings for cut-through traffic, therefore reducing traffic volumes through the neighborhood.

## Crossing Safety Analysis (Tier II)

### Crash Prediction

The Federal Railroad Administration (FRA) predicts accidents and severity of accidents at road/railroad crossings using the “Summary of the DOT Rail-Highway Crossing Resource Allocation Procedure-Revised” (1987). This analysis was completed for the Royal Street crossing, since it is proposed to remain at grade. All other crossings are proposed to be grade separated or closed, which would eliminate the potential for a train/vehicle accident.

Based on the FRA prediction calculations, Royal Street and Beryl Road are each predicted to have 0.1 accidents per year in the current No Build scenario. The probability of a fatal accident is 0.0018 and the probability of a casualty accident is 0.0766 at both crossings. The combined casualty index is 0.0131 at Royal Street and 0.0181 at Beryl Road.

In the Build scenario, Royal Street is predicted to have 0.2 accidents per year and the combined casualty index increases 0.0294. Other probability indices remain the same. The increase is a result of traffic shifting to Royal Street from Beryl Road, where the probability of a train/vehicle accident is eliminated.

### Realigned Crossings

Roads with a skewed crossing across the railroad tracks often experience increased safety issues. At-grade crossing realignments were considered at Beryl Road, connecting to the I-440 SB ramps, I-440 NB ramps, Pylon Drive, and Meredith College. None of these were retained as recommended alternatives.

### Closed Crossings

Crossings were considered for closure that have a combination of the following factors: low traffic volumes, geometric concerns (such as a skew), a high exposure index, and/or are near to another viable crossing (a “redundant” crossing). Nowell Road and Beryl Road are recommended for closure, but both in conjunction with other new projects.

### New Grade Separated Crossings

A corridor level review of the crossings also included consideration of new crossings. A new crossing was considered when it might relieve traffic congestion on an existing crossing, when the roadway network had a “gap” in the north-south connectors, or when a new roadway would improve development opportunities.

New crossings were considered in the following locations:

- » West of NE Maynard Road (potentially connecting to Reedy Creek Road) — eliminated
- » Between NE Maynard Road and Trinity Road (potentially connecting to Fincastle Drive) — eliminated
- » Corporate Center Drive (potentially connecting to Bashford Road) — recommended
- » Edwards Mill Road (potentially connecting to future Western Boulevard extension) — recommended
- » Jones Franklin Road (potentially connecting to Chapel Hill Road) — recommended
- » Powell Drive (potentially connecting to Youth Center Drive) — recommended
- » Pylon Drive (potentially connecting into NC State’s campus) — eliminated



## Effect of Other Proposed Projects (Tier III)

The alternatives incorporated adopted Cary, Raleigh, CAMPO, and local transit agency plans for new or improved facilities and services within the study area. However, the recommended alternatives propose several changes to the adopted plans.

### Roadway Projects

- » The recommended alternatives are consistent with local plans to extend Trinity Road and Edwards Mill Road, and to create new east-west connectors between Corporate Center Drive and Hillsborough Street, and between Jones Franklin Road and Pylon Drive (or Ligon Street).
- » Grade separations across the railroad are proposed in CAMPO's 2040 Long Range Transportation Plan on NE Maynard Road and Trinity Road.
- » Bridge lengths and locations incorporate future widths of parallel roads as proposed in all local plans.

### Transit Projects

- » Improvements are underway along the section of rail from Charlotte to Raleigh. Through the Piedmont Improvement Program, NCDOT is planning to add 12 new bridges, 32 miles of parallel track, 12 miles of new highway construction, close 24 public railroad crossings, and add new Amtrak stops and routes. There are no proposed improvements within the RCRX corridor.
- » North Carolina Railroad Company (NCRR) is studying the feasibility of adding commuter rail along this corridor, and also considering the most likely location of future track expansion. The new bridges proposed as part of this project span the full 200-foot railroad right of way in all locations, and would not impact or preclude any future track lines. A commuter station has been incorporated into the land use design at Corporate Center Drive, which is consistent with the draft NCRR commuter study.
- » The new bridges proposed as part of this project span the full 200-foot railroad right of way in all locations, and would not impact or preclude any future track lines. A commuter station has been incorporated into the land use design at Corporate Center Drive, which is consistent with the draft NCRR commuter study.
- » Nowell Road and Beryl Road both carry public bus routes (Beryl Road currently carries a GoRaleigh route, and Beryl Road carries Wake County Public School System buses). During conversations with the agencies, both noted that they would change their routes when those projects were constructed.

Economic Impacts (Tier III)

This section provides a summary of economic considerations for the proposed land use scenarios for six rail corridor crossings investigated in Raleigh and Cary. Economic considerations focus on supported direct jobs, increase in direct wages, and gross ad valorem tax revenue. Ad valorem revenue forecasts have been presented separately for the City of Raleigh, the Town of Cary, and Wake County based on current tax rates.

Land Use Summary

All job and tax revenue forecasts presented in this section are based on the recommended development program created for each crossing location, as described in the Recommended Improvements section. There are 5,229 residential units planned at build-out of the six crossings. The Powell, Trinity, and Maynard crossing areas represent nearly 80% of the projected residential total. Multifamily units comprise 90% of all of the residential units planned at the crossing areas.

Including retail, office, hotel, and industrial, there is over 2.2 million square feet of non-residential uses planned for the six corridor crossings. With 1.5 million square feet, office comprises the largest share by use. The Trinity crossing is anticipated to attract the most non-residential development potential with 683,917 square feet making up 30.4% of the total at build-out.

Summary of Planned Residential Units at Build-Out

Road	Residential Units			Total	Share of Total
	Single-Family Detached	Townhouse	Multifamily		
Maynard Rd	0	140	1,275	1,415	27.1%
Trinity Rd	97	34	976	1,107	21.2%
Corporate Center Dr	0	0	294	294	5.6%
Edwards Mill Rd	0	39	461	500	9.6%
Powell Dr	0	78	1,557	1,635	31.3%
Royal St	62	23	193	278	5.3%

Summary of Planned Non-Residential Square Feet at Build-Out

Road	Non-Residential Square Feet				Total	Share of Total
	Retail	Office	Hotel	Industrial		
Maynard Rd	152,000	346,800	0	0	498,800	22.1%
Trinity Rd	104,274	553,368	0	26,275	683,917	30.4%
Corporate Center Dr	20,000	320,000	88,000	0	428,000	19.0%
Edwards Mill Rd	90,781	244,000	0	140,207	474,988	21.1%
Powell Dr	118,548	0	0	0	118,548	5.3%
Royal St	47,929	0	0	0	47,929	2.1%

Supported Direct Jobs and Annual Wages

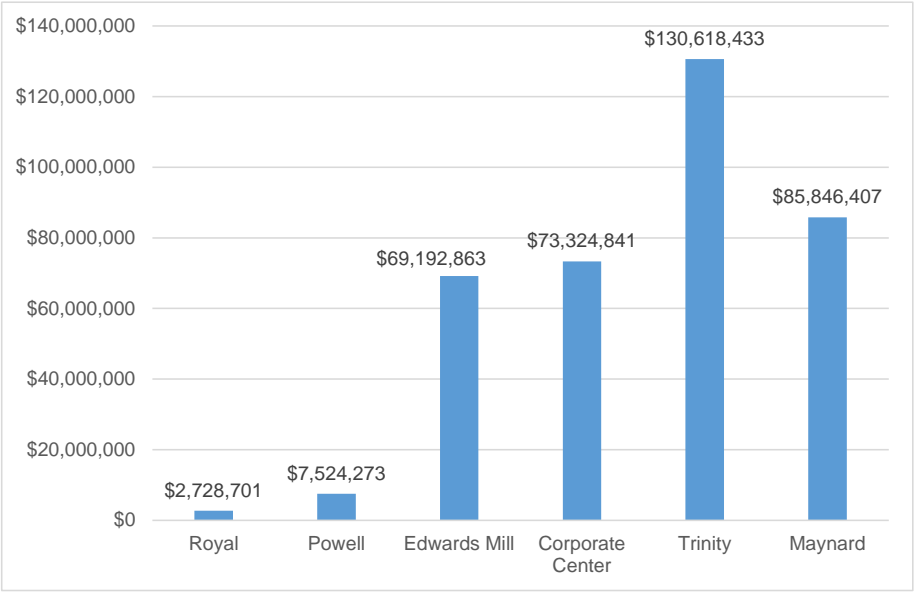
This section estimates the permanent full-time equivalent (FTE) jobs that could be supported through the development of the future land uses at each crossing area. Using average wage data for Wake County, total annualized payroll that could result at build-out is also calculated. It is important to note that these numbers don't necessarily reflect jobs that are new to the market, they could represent businesses that have relocated to the crossing areas from elsewhere in Wake County. Temporary construction jobs are not included in the totals.

Supported Direct Jobs. Supported direct jobs were calculated for multifamily residential and all non-residential uses. No jobs are assumed for the single-family detached or townhouse land uses. Total jobs were based on the prescribed number of multifamily units and non-residential square feet based on the following employee per square foot assumptions:

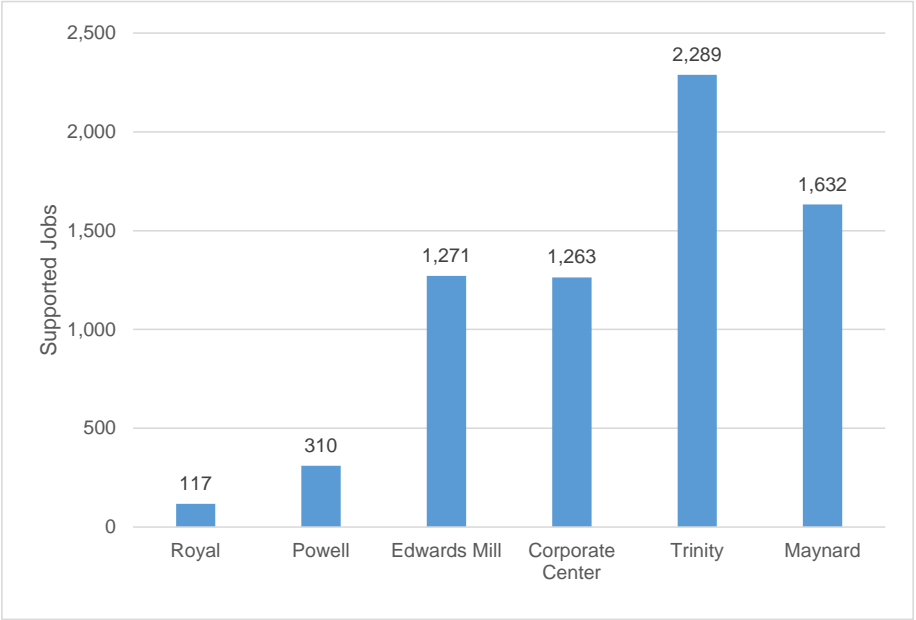
- » Multifamily: 0.2 employees/unit
- » Retail: 400 square feet/employee
- » Office: 250 square feet/employee
- » Hotel: 1,500 square feet/employee
- » Industrial: 750 square feet/employee

For retail, office, and industrial uses a 10% vacancy rate was applied to account for non-occupied space that hosts no employees. In total, over 6,800 FTE jobs are projected for the six





Total Annual Wages by Crossing Area at Build-Out



Total Supported Jobs by Crossing Area at Build-Out

crossing areas. With over 500,000 square feet of office space, Trinity would host approximately one-third of the total jobs.

**Annual Wages.** The calculation of potential total annualized wages generated by the new FTE jobs uses the most recent average annual wages reported by the North Carolina Employment Security Commission. Average salaries were broken down into the most relevant North American Industrial Classification System (NAICS) industry sector for Wake County. Based on the estimated FTE jobs projected for the station areas and salary averages, the total annualized wage could be over \$369 million at build-out.

Annual Wage Assumptions Based on NAICS Code

Land Use	Assumed NAICS Industry Sector	NAICS Code(s)	Annual Wage
Multifamily	Rental and Leasing	532	\$39,884
Retail	Retail Trade/Food Services	44, 722	\$22,754
Office	Financial Activities/Business Services	1023, 1024	\$61,448
Hotel	Accomodation	721	\$21,216
Industrial	Manufacturing/Transportation & Warehousing/Information	31, 48, 51	\$59,317

Source: North Carolina Department of Commerce; QCEQ

Project Value Assumptions

This section provides value assumptions by use for Wake County, including residential, retail, office, hotel, and industrial uses. Wake County assessed values are based on the standard appraisal practice of reconciling the income, sales, and construction cost approaches. For the purposes of assigning a potential stabilized value to the planned land uses, comparable product located in or near the RCRX corridor were evaluated. The following table demonstrates the assumed values used in the calculation of future ad valorem taxes generated by the crossing areas.

Assumed Property Values by Land Use

Land Use	Assumed Value	Measure
Single-Family Residential	\$450,000	per unit
Townhouse	\$230,000	per unit
Multifamily	\$90,000	per unit
Retail	\$225	per square foot
Office	\$150	per square foot
Hotel	\$100	per square foot
Industrial	\$50	per square foot

Gross Ad Valorem Revenue

This section presents the potential annual gross ad valorem revenue to the City of Raleigh, Town of Cary, and Wake County that could be generated at build-out and stabilization of the crossing areas. Ad valorem taxes are paid separately for real, business, and personal property. Real property is defined as land and associated buildings or improvements. Business property includes machinery, furniture, and furnishings that are not physically attached to a structure. Personal property largely represents privately-owned vehicles for residential uses. It should be noted that these numbers represent gross ad valorem revenue and do not include local costs to serve the new development.

Real Property. As shown in the table below, based on current tax rates per \$100 in valuation in the City of Raleigh (\$0.38), the Town of Cary (\$0.35), and Wake County (\$0.53), the estimated annual real property tax revenue that could be generated by build-out in the six crossing areas would be nearly \$8.6 million. Approximately 27% of the revenue would be associated with the Maynard Crossing in Cary.

Business Property. Business property includes all equipment, furniture, and furnishings that are required to conduct business and are not permanently attached to the structure. For the purposes of this analysis, business property is estimated at 10% of real property value. These shares are subject to change based on the type of tenancy of the office and retail space, the number of employees, and the level of investment in furniture, work stations, and technology.

As shown in the following table, the total forecasted business property revenue that could be generated at build-out of the six crossing areas is approximately \$285,700 per year. The Trinity and Maynard crossing areas would generate more than half of the forecasted annual business property revenue.

Personal Property. For the purpose of this analysis, personal property is defined as automobiles owned by residents of the planned residential units. It is assumed that the residential units, regardless of type, have an occupancy rate of 93%. Average vehicles per occupied unit are assumed to range from 2.0 for single-family detached product to 1.25 for multifamily units. The average vehicle is assessed at \$15,000.

The total forecasted personal property revenue that could be generated at build-out of the six crossing areas is approximately \$842,600 per year. With nearly 1,600 multifamily residential units planned, the Powell crossing area would comprise almost one-third of the total new personal property revenue along the RCRX corridor.

Real Property Tax Revenue at Build-Out

Road	City of Raleigh	Town of Cary	Wake County	Total	Share of Total
Maynard Rd	-	\$1,080,605	\$1,235,801	\$2,316,406	27.0%
Trinity Rd	-	\$864,817	\$1,309,580	\$2,174,397	25.3%
Corporate Center Dr	\$336,121	-	\$465,128	\$801,249	9.3%
Edwards Mill Rd	\$436,207	-	\$606,829	\$1,043,036	12.2%
Powell Dr	\$707,567	-	\$979,139	\$1,686,706	19.7%
Royal St	\$234,948	-	\$325,123	\$560,071	6.5%
Total	\$1,714,842	\$1,945,422	\$4,921,601	\$8,581,865	100.0%

Business Property Tax Revenue at Build-Out

Road	City of Raleigh	Town of Cary	Wake County	Total	Share of Total
Maynard Rd	-	\$27,758	\$42,033	\$69,791	24.4%
Trinity Rd	-	\$34,407	\$52,103	\$86,510	30.3%
Corporate Center Dr	\$18,199	-	\$25,192	\$43,391	15.2%
Edwards Mill Rd	\$22,464	-	\$31,086	\$53,551	18.7%
Powell Dr	\$9,705	-	\$13,430	\$23,135	8.1%
Royal St	\$3,924	-	\$5,430	\$9,354	3.3%
Total	\$54,292	\$62,165	\$169,274	\$285,732	100.0%

Personal Property Tax Revenue at Build-Out

Road	City of Raleigh	Town of Cary	Wake County	Total	Share of Total
Maynard Rd	-	\$88,068	\$133,360	\$221,428	26.3%
Trinity Rd	-	\$71,529	\$108,315	\$179,843	21.3%
Corporate Center Dr	\$19,635	-	\$27,171	\$46,806	5.6%
Edwards Mill Rd	\$33,914	-	\$46,930	\$80,844	9.6%
Powell Dr	\$110,236	-	\$152,546	\$262,783	31.2%
Royal St	\$21,358	-	\$29,556	\$50,914	6.0%
Total	\$185,143	\$159,597	\$497,878	\$842,618	100.0%



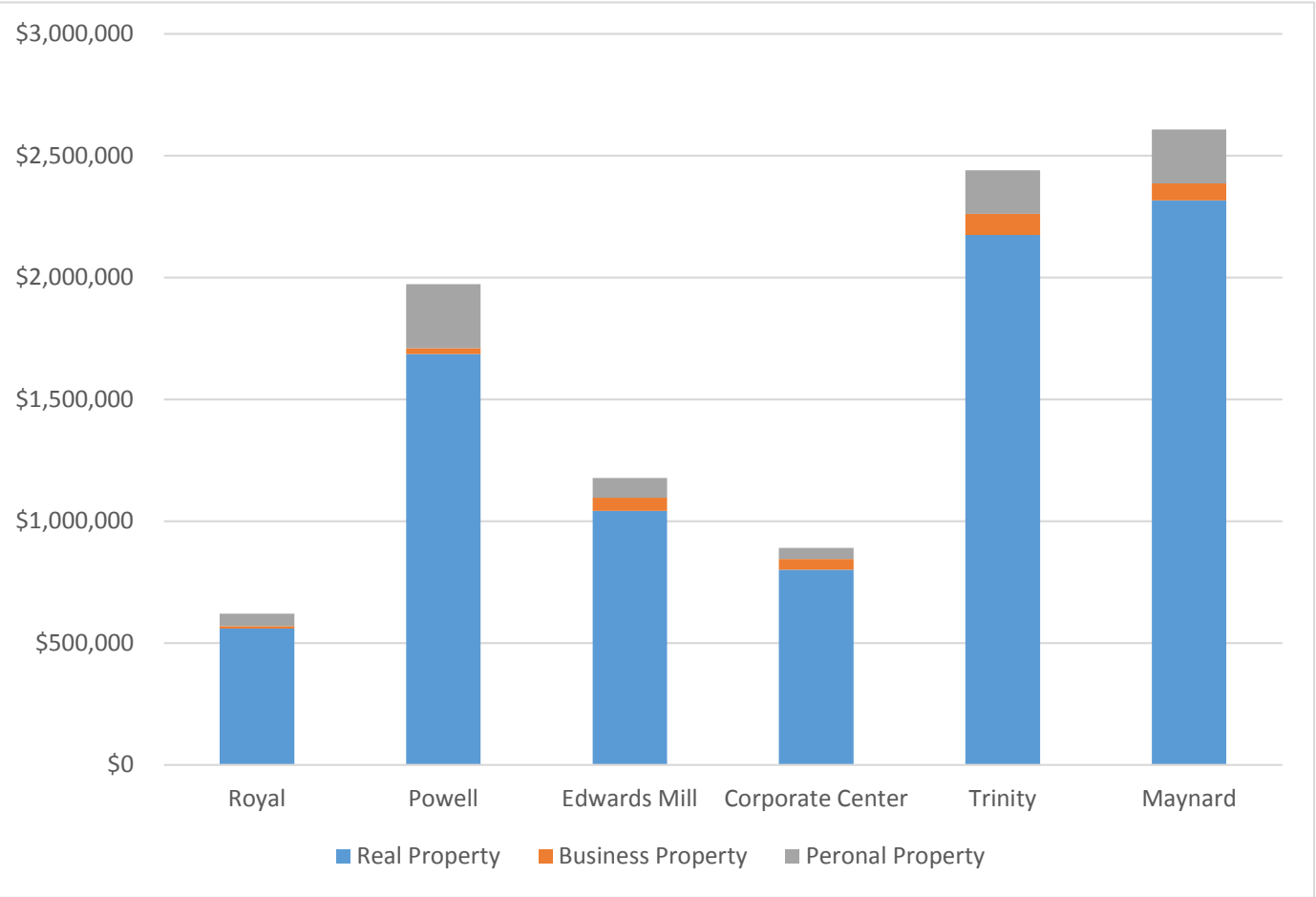
Summary of Gross Ad Valorem Revenue

Combining the potential revenue generated for each jurisdiction, an estimated annual gross ad valorem revenue stream of over \$9.7 million could be generated at build-out of the six crossing areas. Based on the future land use concepts, Trinity and Maynard would account for over 50% of the total revenue.

Total Combined Ad Valorem Tax Revenue at Build-Out

Road	Real Property	Business Property	Personal Property	Total	Share of Total
Maynard Rd	\$2,316,406	\$69,791	\$221,428	\$2,607,625	26.9%
Trinity Rd	\$2,174,397	\$86,510	\$179,843	\$2,440,751	25.1%
Corporate Center Dr	\$801,249	\$43,391	\$46,806	\$891,446	9.2%
Edwards Mill Rd	\$1,043,036	\$53,551	\$80,844	\$1,177.431	12.1%
Powell Dr	\$1,686,706	\$23,135	\$262,783	\$1,972,624	20.3%
Royal St	\$560,071	\$9,354	\$50,914	\$620,338	6.5%
Total	\$8,581,865	\$285,732	\$842,618	\$9,710,215	100.0%

Total Combined Annual Ad Valorem Tax Revenue Generated at Build-Out



## Individual Crossing Recommendations

### Recommended Roadway Alternatives

One design, determined to be most feasible based on the analyses in this study, is recommended at each existing and proposed future crossing.

- » **NE Maynard Road** — Railroad bridge over NE Maynard Road, shifting the Maynard Road/Chatham Street intersection to outside the 200-foot railroad corridor
- » **Trinity Road** — Trinity Road bridge over the railroad with Trinity Road extensions to Chapel Hill Road and Cary Towne Boulevard
- » **Corporate Center Drive** — Corporate Center Drive extension to Bashford Road with a bridge over the railroad
- » **Nowell Road** — Close Nowell Road crossing in conjunction with extension of Corporate Center Drive and/or Edwards Mill Road
- » **Edwards Mill Road** — Edwards Mill Road extension to Hillsborough Street with a railroad bridge over the new road
- » **Jones Franklin Road** — Jones Franklin Road extension to Chapel Hill Road with a railroad bridge over the new road
- » **Powell Drive** — Realign Powell Drive to connect with Youth Center Drive with a railroad bridge over the realigned road, and close the existing crossing
- » **Beryl Road/Royal Street** — Close Beryl Road and add a new connector from Beryl Road to Royal Street

### Future Land Use

A future land use plan was developed for each crossing area, shown on the following figures.

### Proposed Pedestrian and Bicycle Network

Potential improvements to the pedestrian and bicycle infrastructure were identified within the 0.5-mile study corridor. These are consistent with the recommended roadway solutions. These

improvements (with the exception of those on the future roadways) could be implemented by Cary or Raleigh as funds and priorities allow. Detailed maps are in the appendix.

### Schedule of Projects

Each recommended alternative was determined to be most appropriate in the short-, mid-, or long-term time frames. There is currently no funding for any of the projects. The local municipalities, NCDOT, and CAMPO have the option to pursue each project as funding becomes available based on current needs.

### Short-Term Solutions

- » Since all crossings have sufficient safety devices, no short-term recommendations have been identified.

### Mid-Term Solutions

- » Beryl Road is proposed to be closed in conjunction with addition of a new connection from Beryl Road to Royal Street.

### Long-Term Solutions

- » Six grade separations have been proposed, three at existing crossings (NE Maynard Road, Trinity Road, and Powell Drive) and three at proposed future crossings (Corporate Center Drive, Edwards Mill Road, and Jones Franklin Road). Two of these (Corporate Center Drive and Trinity Road) could be built in phases as other development occurs.
- » Nowell Road is proposed to be closed in conjunction with a new adjacent grade separation. In the following pages, the Nowell Road crossing is not shown on a separate graphic, but is included in both the Corporate Center Drive and Edwards Mill Road graphics. A new east-west connector between Nowell Road and the adjacent road(s) could be built as part of development/redevelopment between Chapel Hill Road and the railroad.

The following pages illustrate the conceptual design for each recommended alternative. Graphics of the typical sections referenced in the illustrations are included in the appendix.



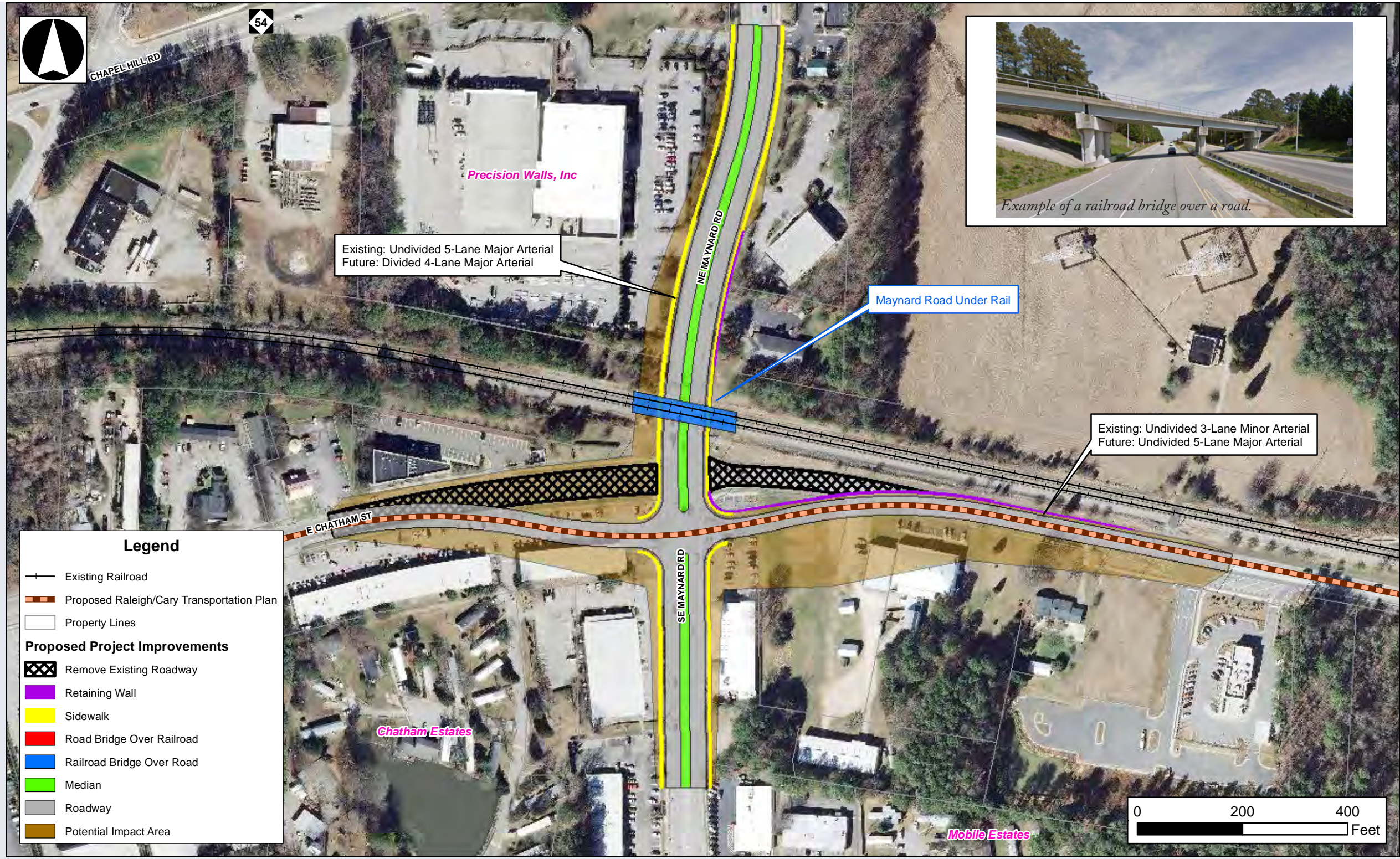
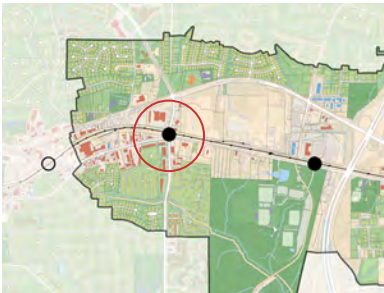
# NE Maynard Road

## Recommended Alternative

Railroad bridge over NE Maynard Road, shifting the Maynard Road/Chatham Street intersection to outside of the 200-foot railroad corridor.

## Performance Measures

This crossing scored well for development potential and new tax revenue, assuming that much of the existing properties would be redeveloped into a higher density use. There are no residential impacts, but are impacts to businesses and to the overall business node. Grade separating the crossing would improve travel time reliability and emergency response service, especially since the nearest parallel crossings are E. Durham Road and Trinity Road, both about ¾ mile away.



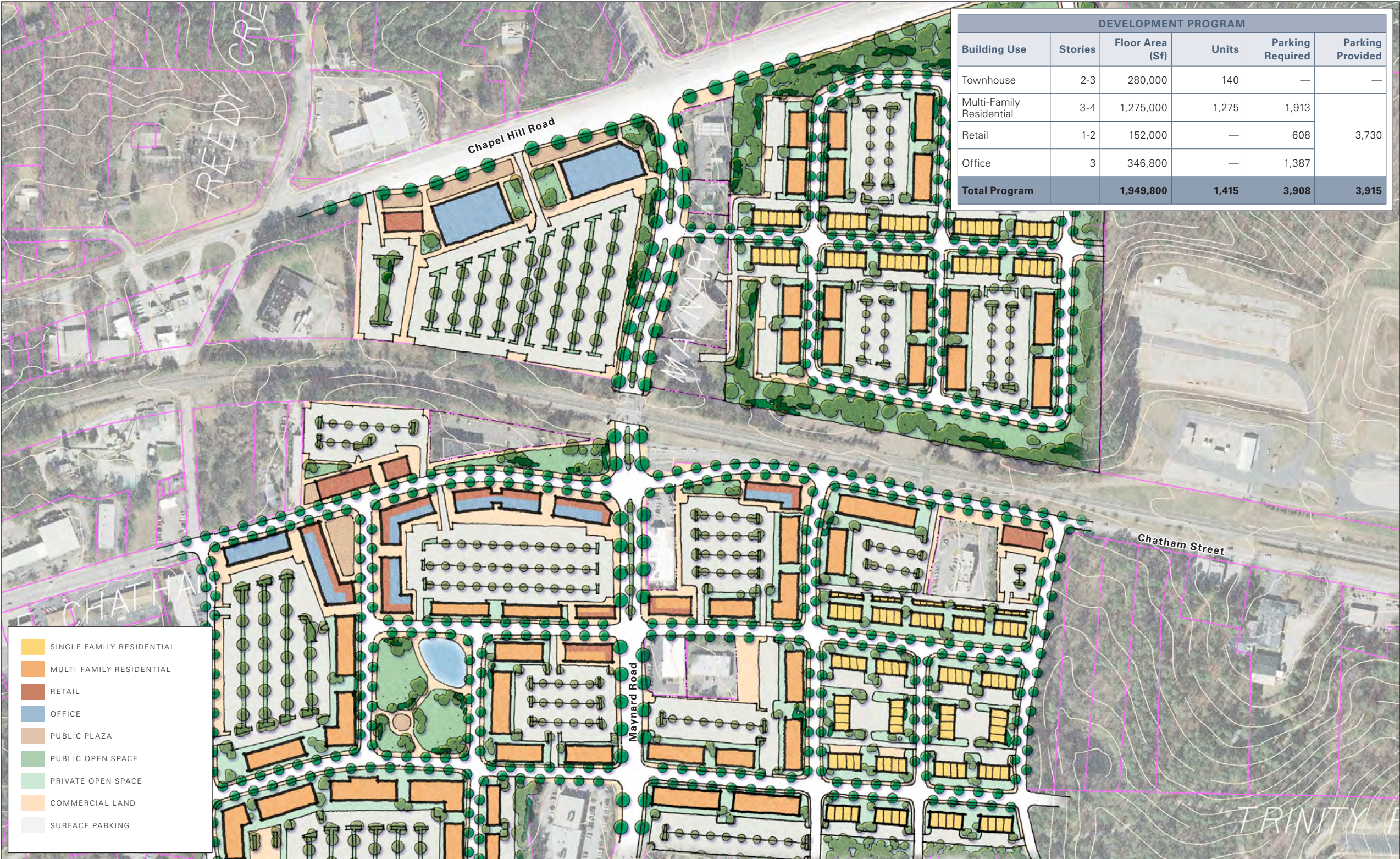
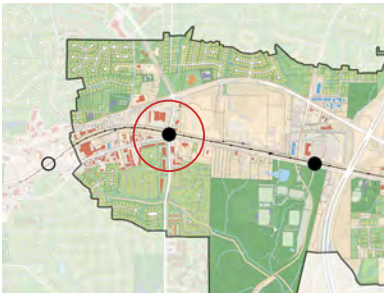


# NE Maynard Road

## Land Use Strategy

Maynard Road is able to support a wide variety of land uses. Office and retail is concentrated along the high visibility routes of Chapel Hill Road and Chatham Street. Popular existing retailers, like those in Chatham Square, are given space in the ground floors of mixed-use buildings. Residential uses decrease in density further from major roads. A central park provides programmable outdoor amenity space for the community.

As part of the Imagine Cary plan, the Town is creating a future land use plan for this area.





Trinity Road

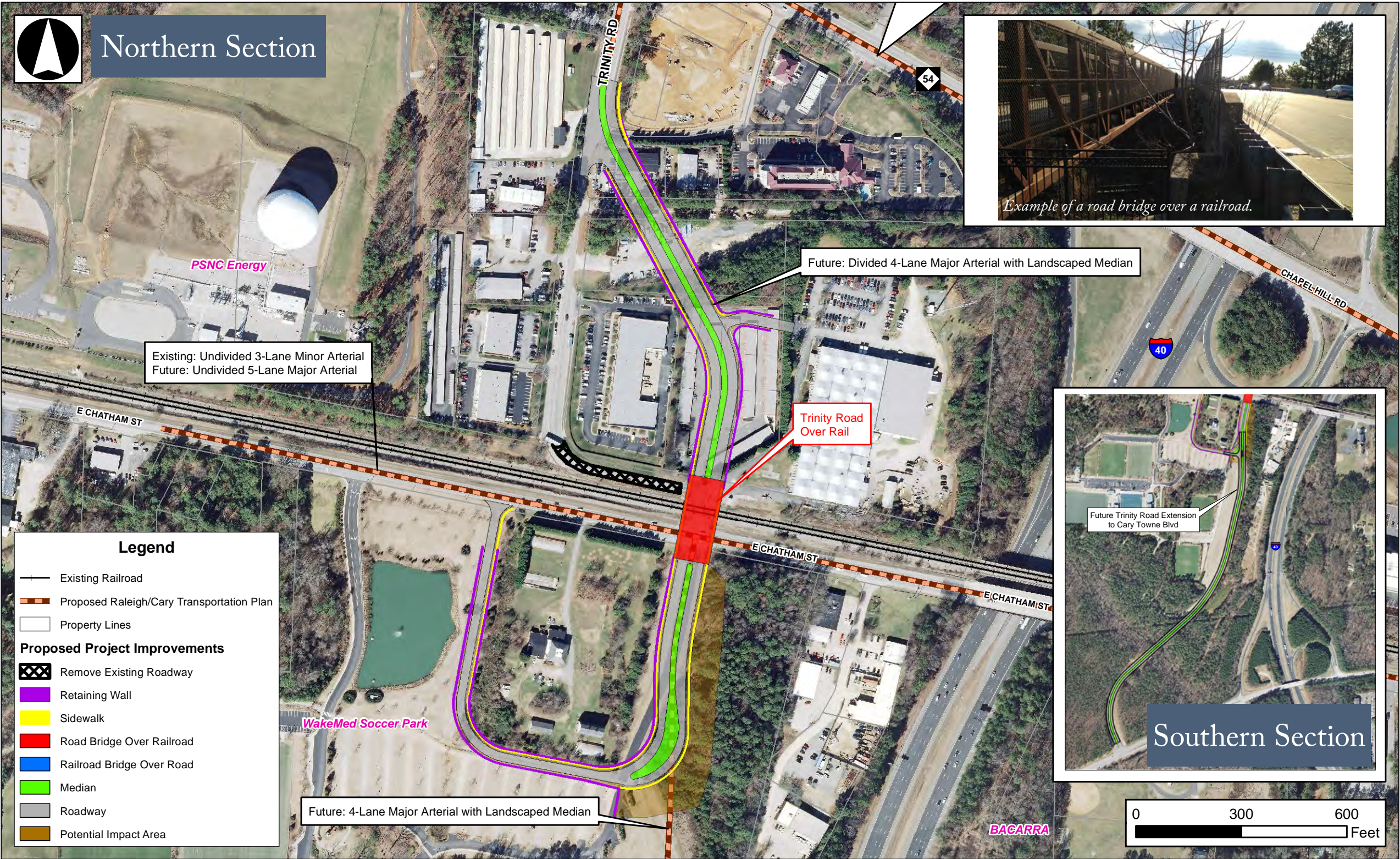
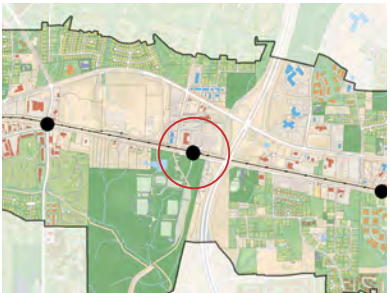
Recommended Alternative

Trinity Road bridge over the railroad with Trinity Road extensions to Chapel Hill Road and Cary Towne Boulevard.

This project could be built in two phases, depending on funding availability for the grade separation and schedule of development near the southern terminus of the proposed extension. The design in the center of the graphic the right shows the potential first phase, assuming the grade separation is built before the extension. The inset shows the potential second phase, an extension south to Cary Towne Boulevard.

Performance Measures

The development potential and new tax revenue near this crossing is based on the ultimate build out, extending Trinity Road to Cary Towne Boulevard. Business impacts are anticipated to be low, and no residential impacts are expected. A grade separation would improve travel time reliability and emergency response service. Reconfiguring the intersection of Trinity Road and Chatham Street is anticipated to decrease travel delay, and extending Trinity Road would improve overall connectivity and mobility within the area.





Trinity Road

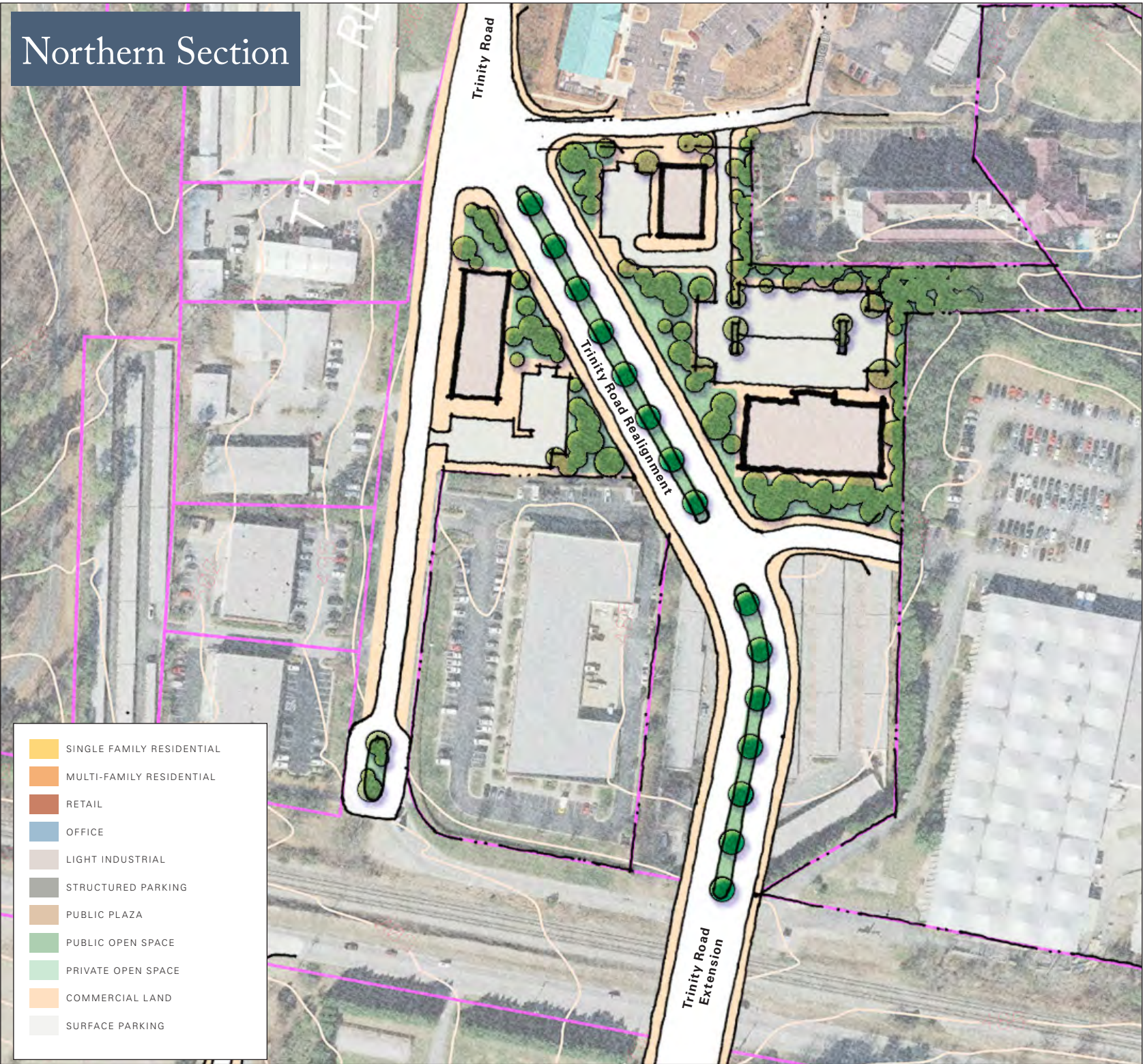
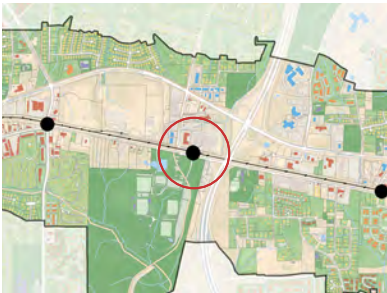
Land Use Strategy

Redevelopment north of the railroad tracks is limited to small light industrial uses due to the visibility and access issues caused by raising Trinity Road.

The large, state-owned parcel south of Wake Med Soccer Park provides more exciting opportunities. Higher density employment uses such as office and retail are concentrated along Cary Towne Boulevard to leverage the high traffic volumes and Cary Towne Center across the street. The uses transition from multi-family to single family residential of a neighborhood scale as you move north. Pedestrian networks of parks and trails reconnect the area to Walnut Creek and the Greenway Corridor.

The area bound by NE/SE Maynard Road, I-40, Chapel Hill Road, and south of Cary Towne Boulevard is identified by the Town of Cary as the East Cary Gateway as part of the Imagine Cary plan. The land uses developed in the RCRX Study will go into the final development of that plan. Initial discussions have identified potential for an innovation center on Cary Towne Boulevard at the southern terminus of the Trinity Road extension.

As part of the Imagine Cary plan, the Town is creating a future land use plan for this area.



DEVELOPMENT PROGRAM					
Building Use	Stories	Floor Area (Sf)	Units	Parking Required	Parking Provided
Single Family Residential	2-3	359,000	131	—	—
Multi-Family Residential	3-4	976,000	976	1,464	4,044
Retail	1	104,275	—	418	
Office	3-4	553,400	—	2,213	
Light Industrial	1	26,275	—	—	—
Total Program		2,018,950	1,107	4,095	4,044





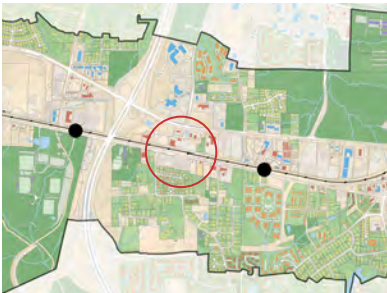
# Corporate Center Drive

## Recommended Alternative

Corporate Center Drive extension to Bashford Road with a bridge over the railroad.

## Performance Measures

This crossing has relatively low development potential, and may have a small number of residential and business impacts. Extending Corporate Center to Bashford Road would improve overall connectivity and mobility within the area, and this is the most likely location along the corridor for a future commuter rail station.



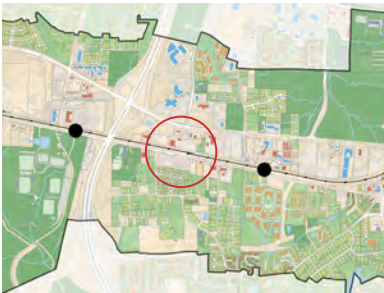


# Corporate Center Drive

## Land Use Strategy

The location of a commuter rail station here would increase land values enough to justify structured parking. As the surface parking is replaced by garages, more development can be built on the land that is freed up. Commercial development is proposed north of the tracks. The commuter rail station also creates demand for new housing. Residential development is better suited to south of the railroad tracks, where it can be used to create a sensitive transition from the existing surrounding neighborhoods.

Depending on the schedule for a future commuter rail station, development is likely in two phases. The first phase would incorporate the new Corporate Center Drive extension and bridge over the railroad. The second phase would be addition of the commuter rail station and adjoining roadway network.





Edwards Mill Road

Recommended Alternative

Edwards Mill Road extension to Hillsborough Street with a railroad bridge over the new road.

Performance Measures

Development and new tax revenue potential near this crossing are limited due to the relatively new residential uses on the south side of Hillsborough Street. Business impacts are low, and no residential impacts are anticipated. Extending Edwards Mill Road would improve overall connectivity and mobility within the area.

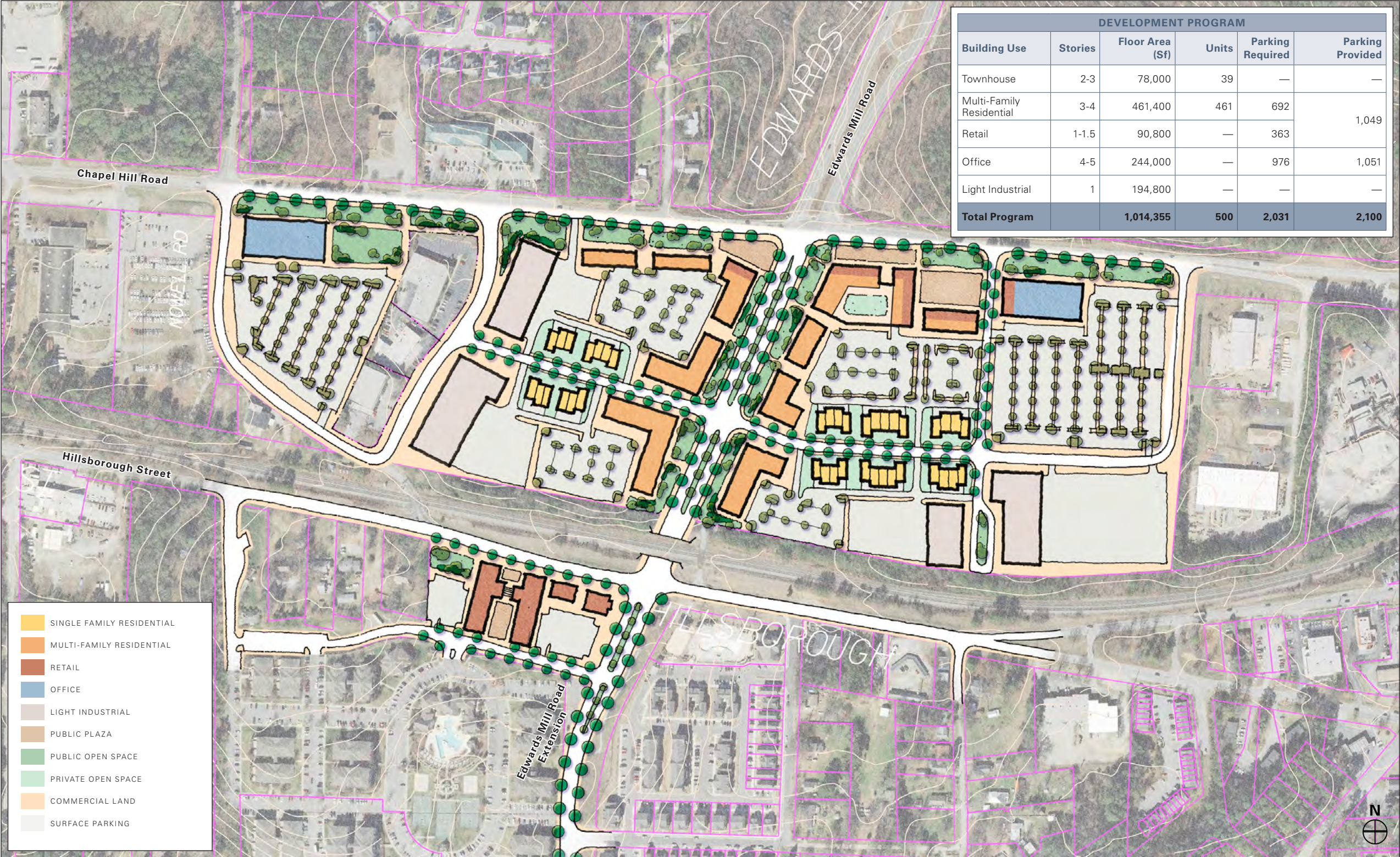




# Edwards Mill Road

## Land Use Strategy

The extension of Edwards Mill Road to Wolf Wood Drive opens up large areas of previous industrial land for redevelopment. The land closer to the rail is reserved for the relocation of some of the displaced light industrial uses. A small amount of retail along Hillsborough Street serves the large student housing complexes and greater neighborhoods on the south side of the tracks.





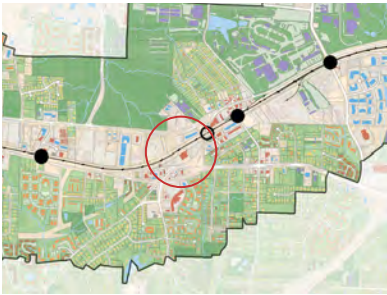
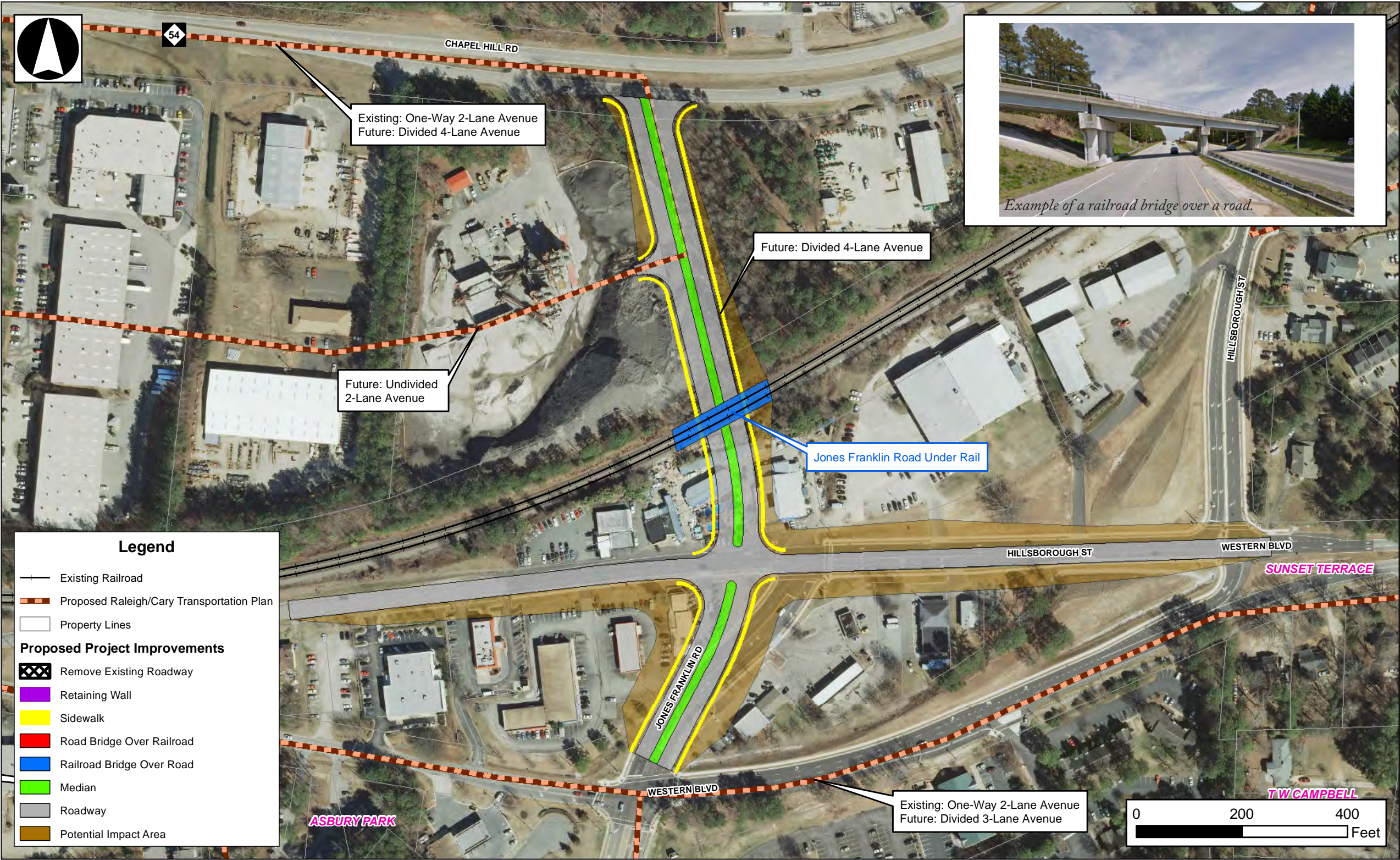
Jones Franklin Road

Recommended Alternative

Jones Franklin Road extension to Chapel Hill Road with a railroad bridge over the new road.

Performance Measures

This grade separation was originally proposed by the City of Raleigh when the previous draft Wake County Transit Plan (2012) envisioned a light rail station at this location. This alternative would impact businesses and the business node.





# Jones Franklin Road

## Land Use Strategy

The land use plan shown to the right is from the 2011 Jones Franklin/Western/Hillsborough Small Area Plan. The plan recommends future development and redevelopment to include more vertical mixed use, focused on neighborhood mixed use in the southwest quadrant and community mixed use in the other three quadrants of the proposed extension and grade separation.



**JONES FRANKLIN / WESTERN / HILLSBOROUGH  
SMALL AREA STUDY**

### Land Use

**Recommended Outcome**

LU-1. Require all new structures to be primarily accessed and oriented toward public streets.

LU-2. Encourage new development to be vertical mixed-use.

LU-3. New development should include a mixture of community and neighborhood scaled mixed use, medium density residential, focusing density and height near the rail corridor.

LU-4. New road alignments should create developable parcels currently within NCDOT right of way.

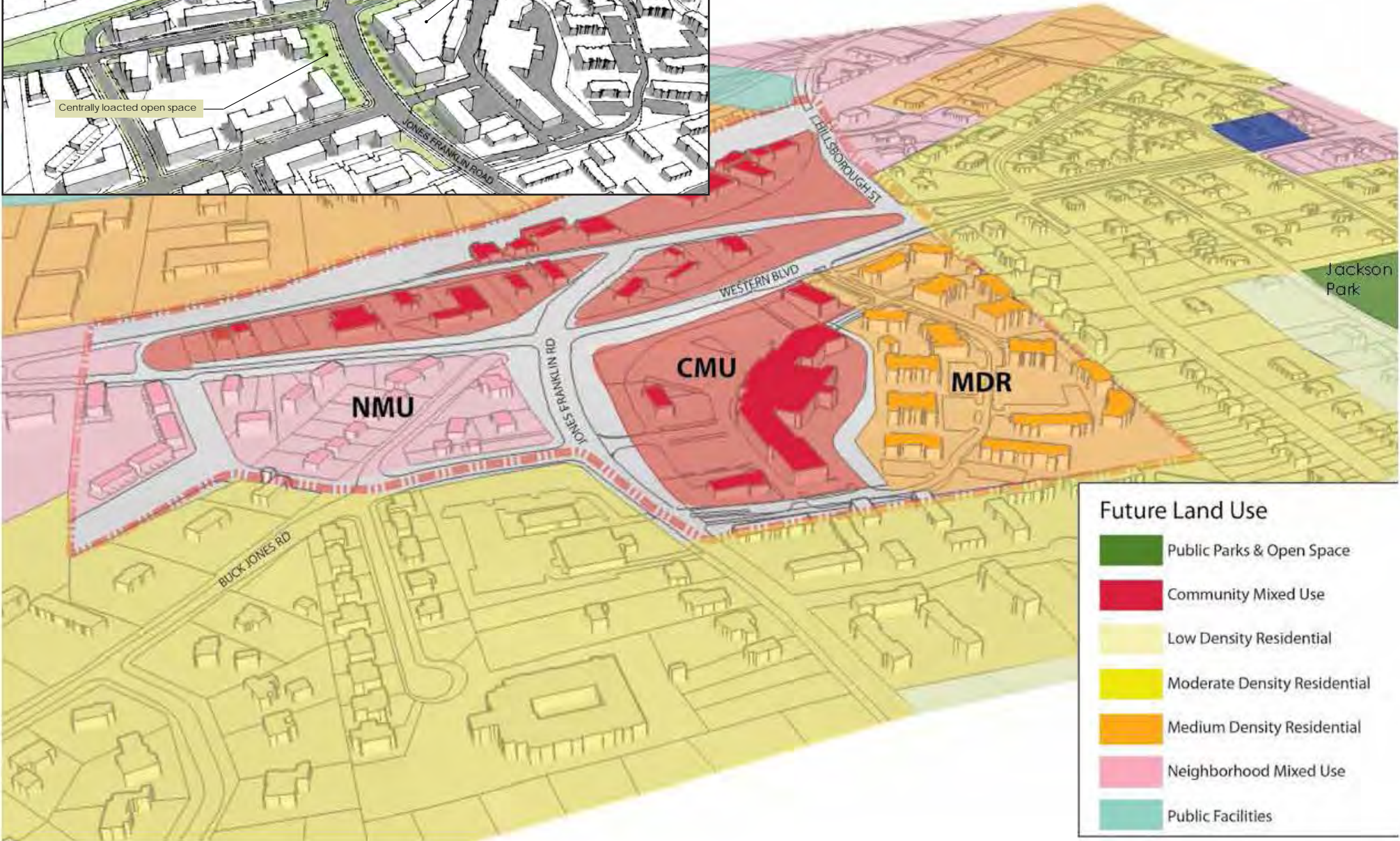
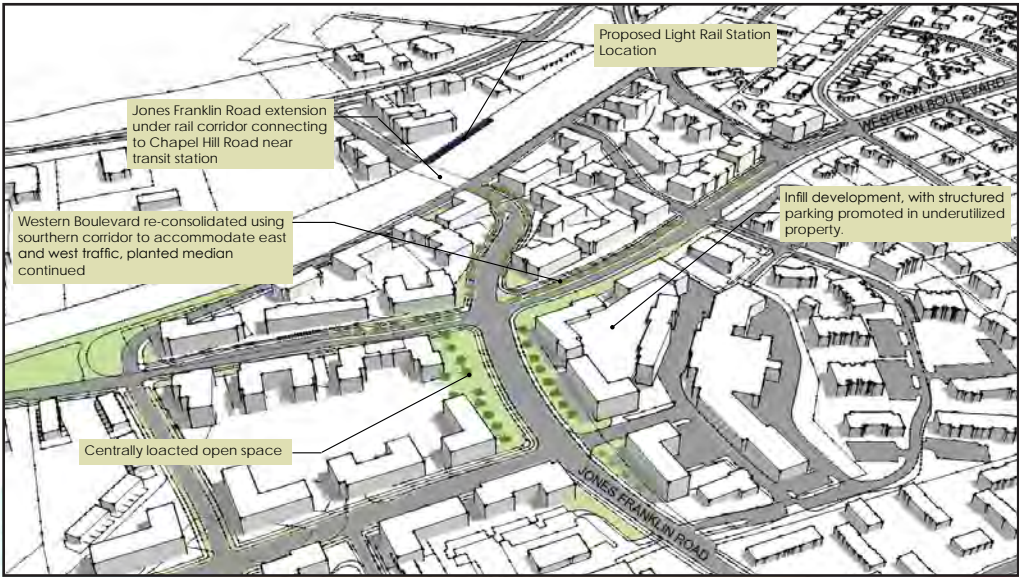
**Recommended Actions**

LU-5. Amend the Future Land Use Map to include land use classifications: (CMU, NMU, MDR) as depicted in the adjacent diagram.

LU-6. Negotiate with NCDOT the transfer of excess right of way to city ownership.

LU-7. Explore text changes that would:

- Incorporate shared parking as described in the new Unified Development Ordinance, on new and existing projects identified in this study.
- Encourage a mix of housing types.





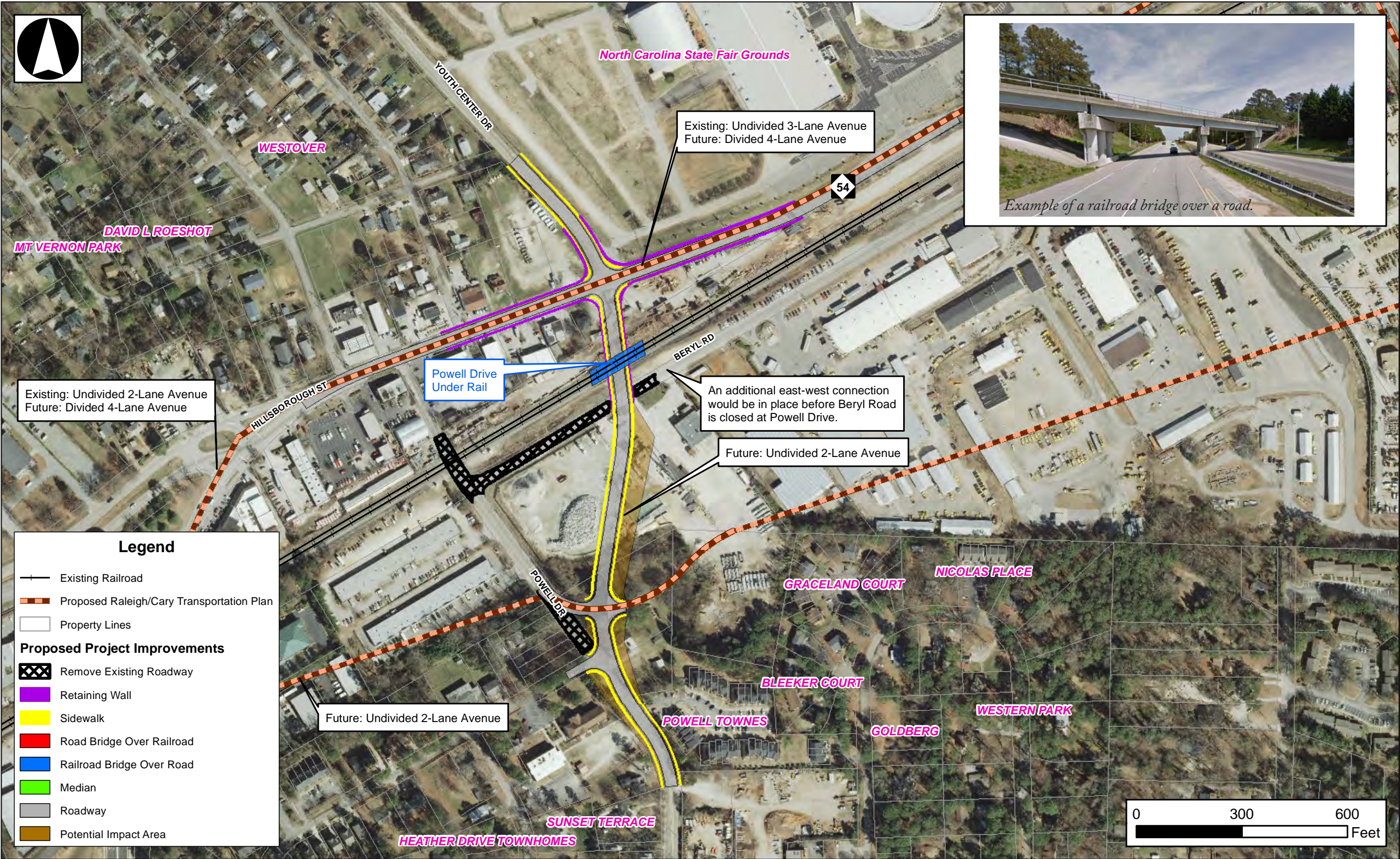
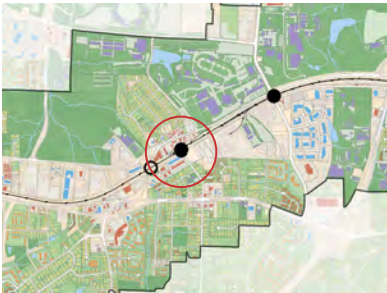
# Powell Drive

## Recommended Alternative

Realign Powell Drive to connect with Youth Center Drive with a railroad bridge over the realigned road, and close the existing crossing.

## Performance Measures

There is a high potential for redevelopment in the southeast quadrant of the proposed realigned road, consistent with the anticipated development plans at the Blue Ridge Road crossing (also proposed to be a grade separation). Residential and business impacts are low, and the new design is anticipated to decrease delay at the Powell Drive/Hillsborough Street intersection. A grade separation would improve travel time reliability and emergency response service.



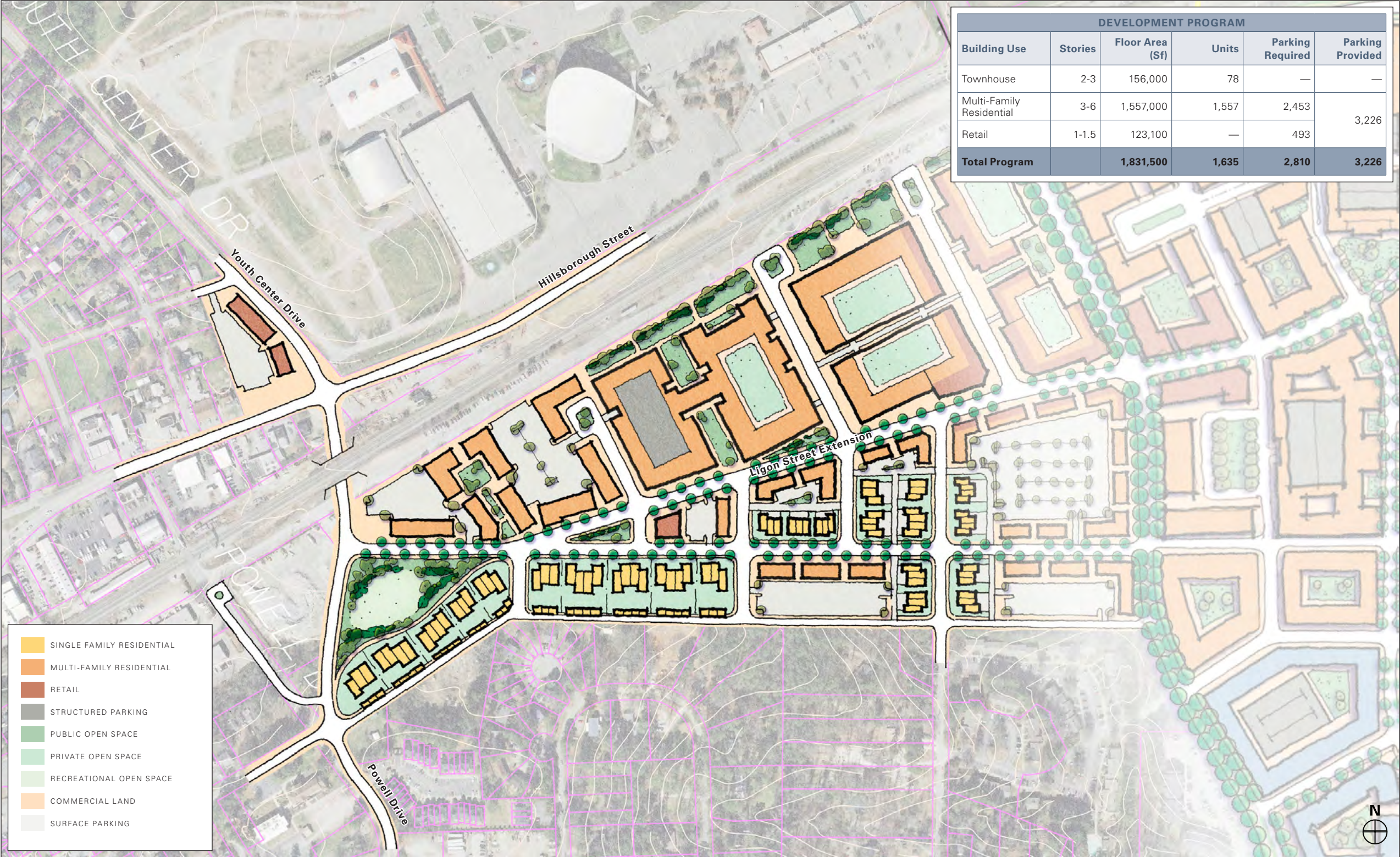
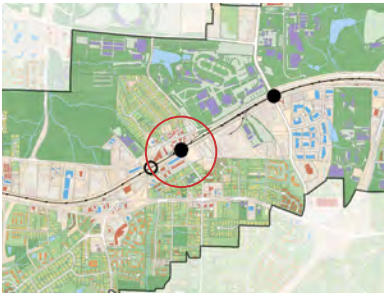


Powell Drive

Land Use Strategy

The land uses at Powell Drive leverage the planned Blue Ridge Road development. Residential development with some small-scale local retail would replace the old industrial uses and be more compatible with the surrounding neighborhoods. The buildings transition from large to small scale between Blue Ridge Road and Powell Drive.

The graphic below shows updated land use assumptions near the Powell Drive crossing and the previously-developed land use assumptions near the Blue Ridge Road crossing. The road network between Powell Drive and Blue Ridge Road has been updated to reflect the proposed roadway realignment.





# Beryl Road/ Royal Street

## Recommended Alternative

Close Beryl Road and add a new connector from Beryl Road to Royal Street.

As the area grows and redevelops, Raleigh could continue to strengthen the roadway network through this neighborhood area, as shown on the following land use plan. The new street connections are not necessary as part of the railroad crossing project, but would provide additional route options to residents in the community while discouraging cut-through traffic.

## Performance Measures

There are minimal opportunities for redevelopment near these crossings, and closing the Beryl Road crossing would have a slight negative affect on network connectivity. One business impact is anticipated. However, this is a low cost alternative that is anticipated to have a strong improvement on safety and has a very high benefit/cost ratio.



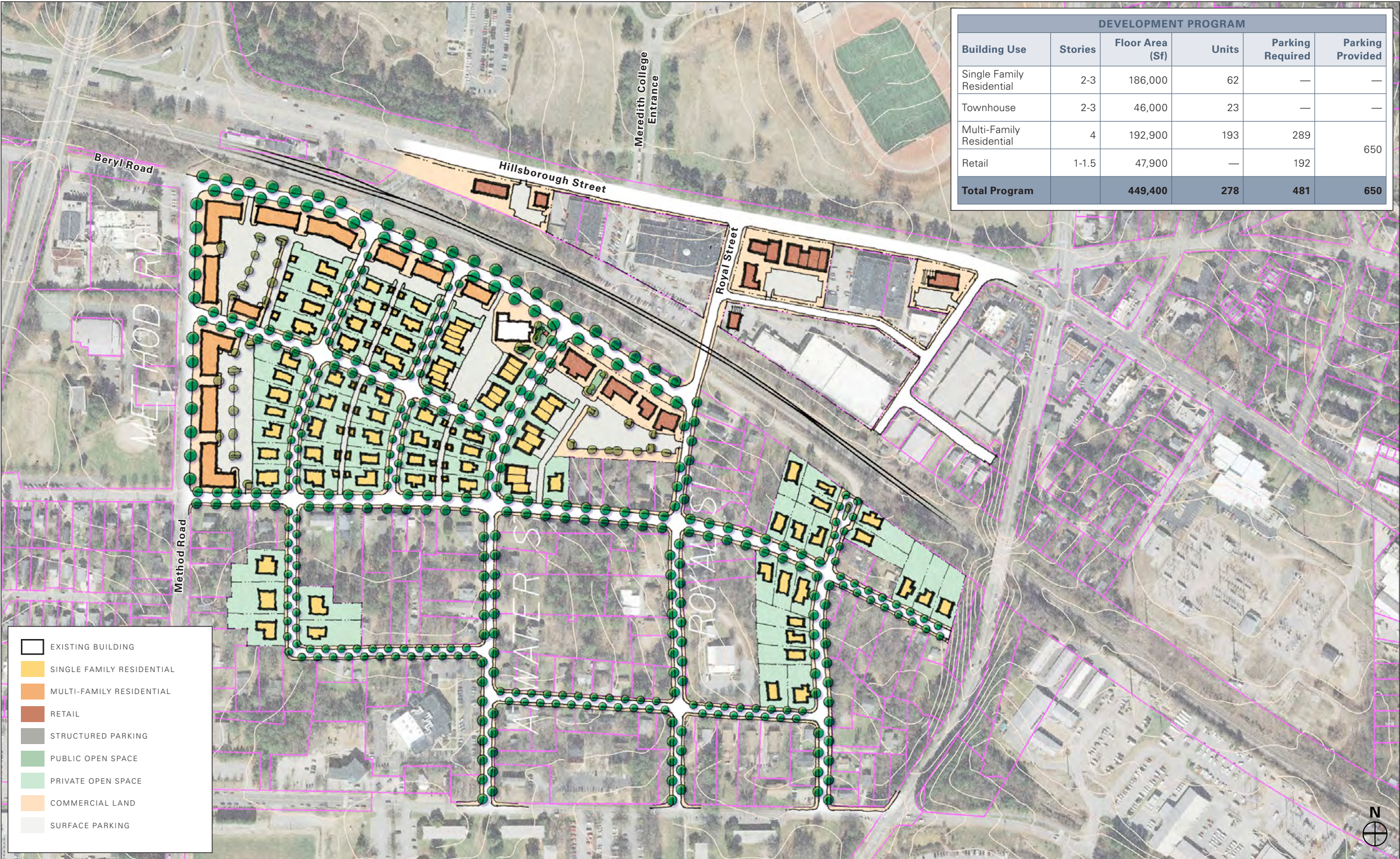
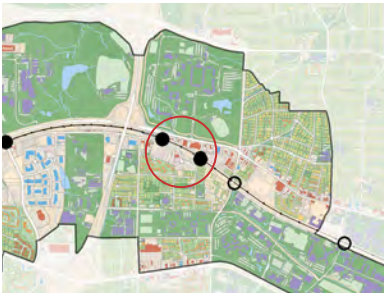


# Beryl Road/ Royal Street

## Land Use Strategy

Closing the Beryl Road crossing, extending it to Royal Street, and completing the street grid in the neighborhoods, allows a logical development pattern to form. Four-story multifamily buildings replace the existing aged apartments and line Method Road across from existing institutional uses. The density decreases to town houses and single family housing with redevelopment of the existing apartment and industrial uses directly adjacent to existing housing. As vacant lots fill in, houses should address onto new streets. Neomonde acts as an anchor restaurant for new commercial development along the Beryl Road extension.

The commercial development north of the railroad tracks creates a continous frontage along Hillsborough Street. The small-scale retail can be parked in surface lots behind.

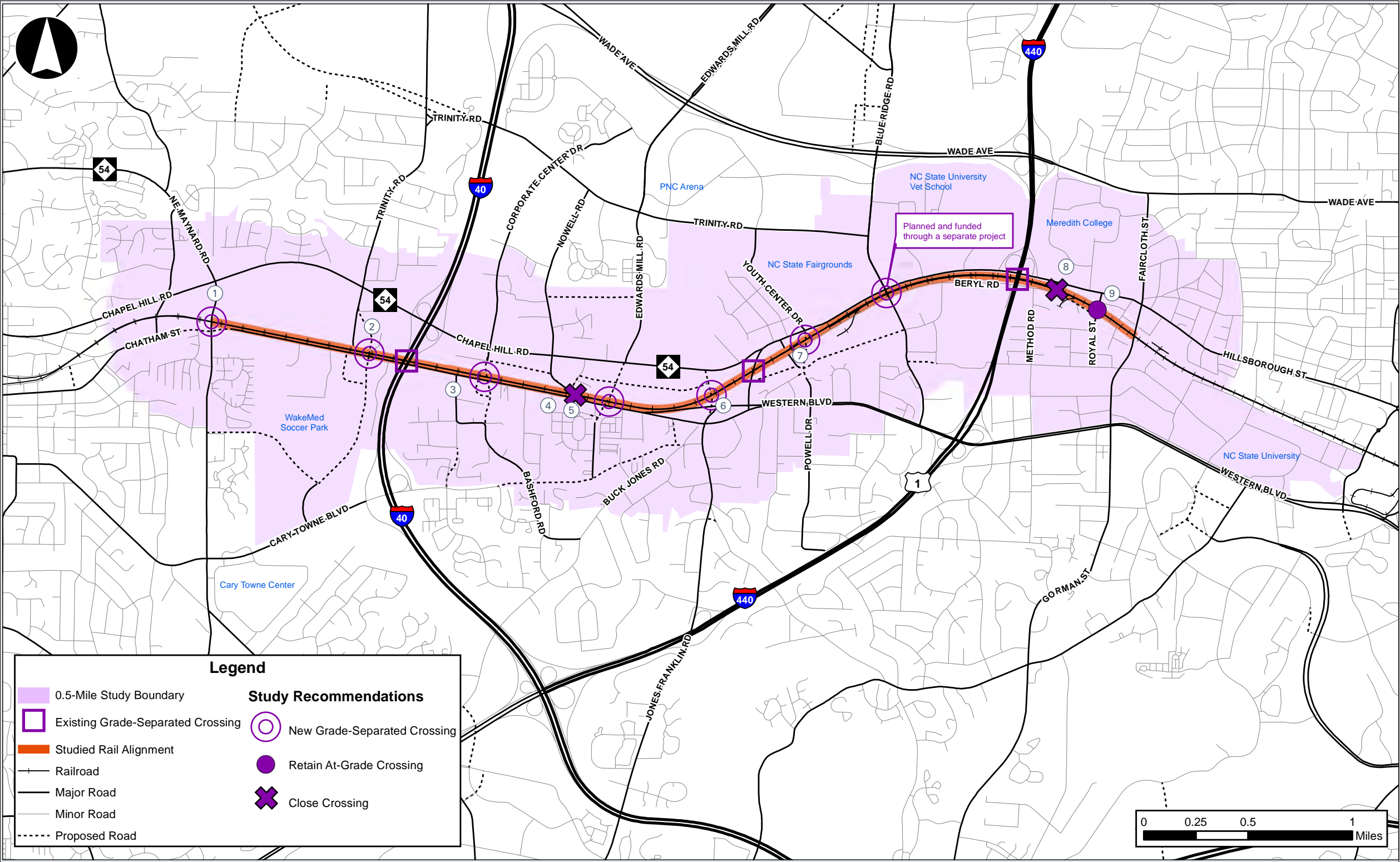




# Network Overview — Roadway Recommendations

The following recommendations were determined to be the “most feasible” improvements to the transportation network. These alternatives are in addition to other planned roadway improvements by Cary and Raleigh.

- 1. NE Maynard Road — RR bridge over NE Maynard Road, shifting the Maynard Road/Chatham Street intersection to outside of the RR corridor
- 2. Trinity Road — bridge over the RR, extending Trinity Road on new location north to Chapel Hill Road and south to Cary Towne Boulevard
- 3. Corporate Center Drive — extend to Bashford Road, crossing over the RR
- 4. Nowell Road — close crossing in conjunction with extending Corporate Center Drive and/or Edwards Mill Road across the RR; new east-west connector may be built as part of future development
- 5. Edwards Mill Road — extend to Hillsborough Street with a rail-road bridge over the new road
- 6. Jones Franklin Road — extend to Chapel Hill Road with a railroad bridge over the new road
- 7. Powell Drive — realign to Youth Center Drive with a railroad bridge over the new road, and close the existing crossing
- 8. Beryl Road — connect from Beryl Road to Royal Street, and close the existing crossing
- 9. Royal Street — retain existing at-grade crossing





## Transportation Network Recommendations

### Pedestrian and Bicycle Improvements

Targeted improvements to bicycle and pedestrian facilities in the study area can have a major positive effect on bicycling and walking in the area. They will make the area safer for bicycling and walking, strengthen connections for people traveling on bike or foot, and create an alternative to driving for short trips.

An in-depth analysis was completed that evaluated the existing condition of intersections within the study area. A score was calculated for bicycle and pedestrian infrastructure at each intersection (summarized in the Existing Conditions - Transportation section of this report). The scores were recalculated based on proposed changes to bicycle and pedestrian facilities.

Proposals to improve bicycle and pedestrian connections included:

- » Sidewalks on both sides of through streets in each crossing area:  
In low-traffic areas and on residential streets, sidewalks can be 5 to 6 feet wide; in high-traffic areas and on commercial streets, they should be between 8 feet and 10 feet wide.
- » Marked, high-visibility crosswalks at all intersections: At long crossings (longer than 45 feet from curb to curb), consider providing median pedestrian refuges.
- » Bicycle accommodations on major through streets in each of the crossing areas to eliminate gaps in the bicycle network: Where heavy vehicle traffic is present, bicycle accommodations should be installed to give people traveling by bike a safe, comfortable path away from vehicles.

Applying the recommended improvements, substantial improvements were found in the pedestrian and bicycle experience at several activity centers in the study area, including:

- » NE Maynard Road along 0.5-mile corridor south of railroad
- » Chatham Street along 0.5-mile corridor west of Maynard Road
- » Jones Franklin Road along 0.3-mile corridor south of Hillsborough Street
- » Blue Ridge Road along corridor from Trinity Road to 0.4 miles south of railroad
- » The intersection of Western Boulevard and Gorman Street
- » Hillsborough Street between NCSU's main campus and I-440
- » Method Road between Beryl Road and Western Boulevard

The area between Corporate Center Drive and Edwards Mill Road would see the greatest improvement in pedestrian and bicycle facilities. Additions that will significantly improve the area's pedestrian and bicycle networks include new sidewalks and crosswalks and a network of bike facilities where none currently exist, increasing connections between neighborhoods and commercial areas.

The next greatest improvements would occur in the Jones Franklin Road and NE Maynard Road area. These areas have large activity centers that would attract lots of pedestrians and bicyclists, such as the Chatham Square shopping center at Maynard and Chatham roads, but there are few sidewalks or bike routes around them. New sidewalks, crosswalks, and bike facilities would help reduce barriers to people traveling by foot or bike.

The remaining areas would see smaller improvements in pedestrian and bicycle infrastructure. In these areas, most streets already have sidewalks, crosswalks, and curb ramps, and some bicycle facilities are already present.

Bicycle facilities are shown in the following figure. The complete list of scores and detailed bicycle and pedestrian facility mapping are in the appendix.

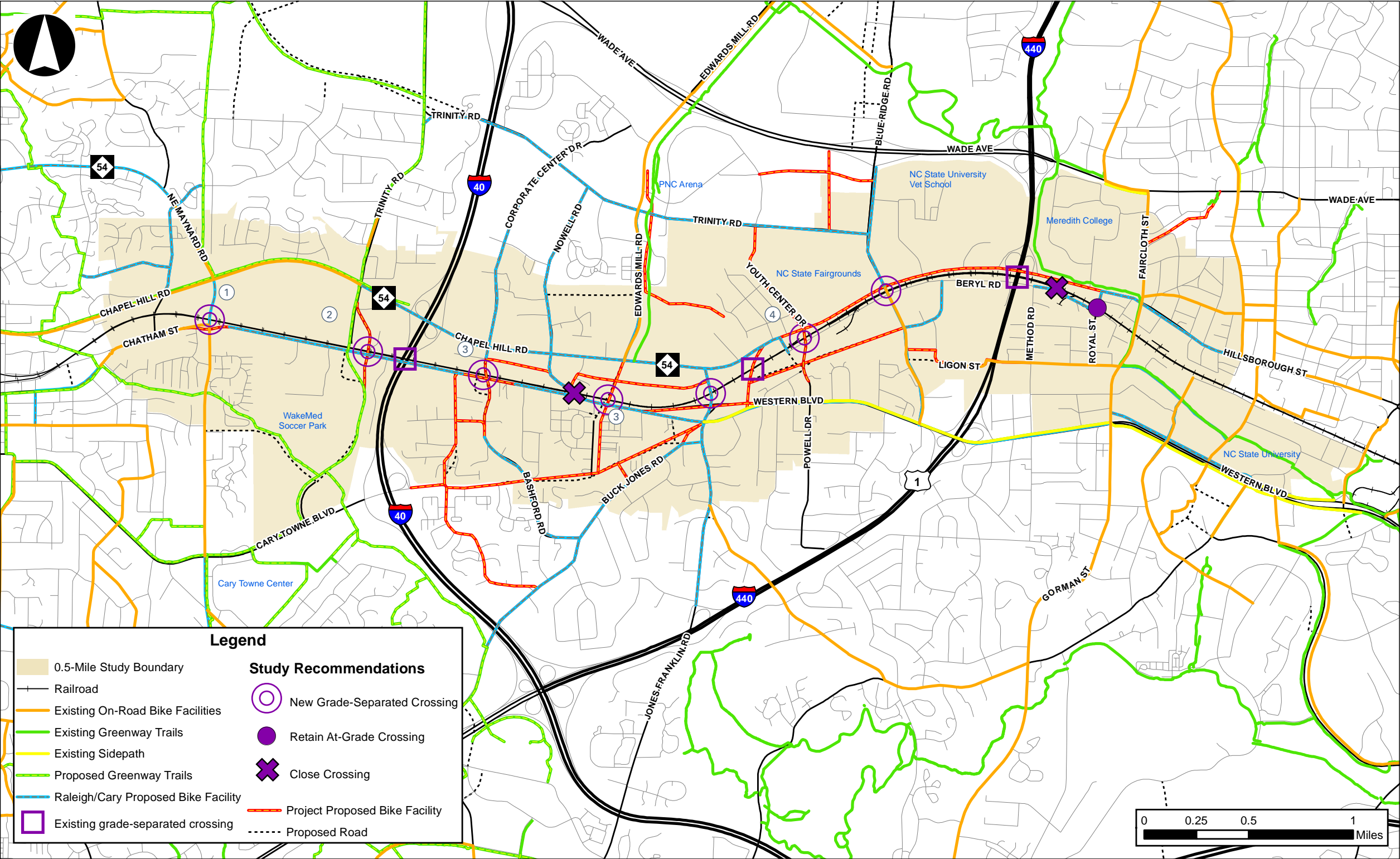


# Network Overview — Bicycle Facility Recommendations

In addition to existing bicycle facilities, Cary and Raleigh have adopted plans proposing extensive additions to the network. These include a range of infrastructure, such as greenways, bike lanes, and wide outside lanes.

As part of this study, the existing and proposed bicycle network was evaluated to identify potential modifications to the local plans. The proposed routes, shown to the right, include several specifically related to the crossing alternatives:

- 1. NE Maynard Road crossing — The recommended alternative shifts the intersection of Maynard Road and Chatham Street south, outside of the railroad right of way. The existing and proposed bicycle facilities at this intersection should be modified accordingly.
- 2. Trinity Road crossing — The current plan proposes a new road and bicycle facility on new alignment from Trinity Road to Cary Towne Boulevard. The bicycle network should follow the final location of the proposed Trinity Road grade separation and extension.
- 3. Corporate Center Drive and Edwards Mill Road crossings — Bike facilities are proposed along the future extensions.
- 4. Powell Drive crossing — When Powell Drive is realigned to Youth Center Drive and the existing crossing is closed, the bicycle network is proposed to do the same.

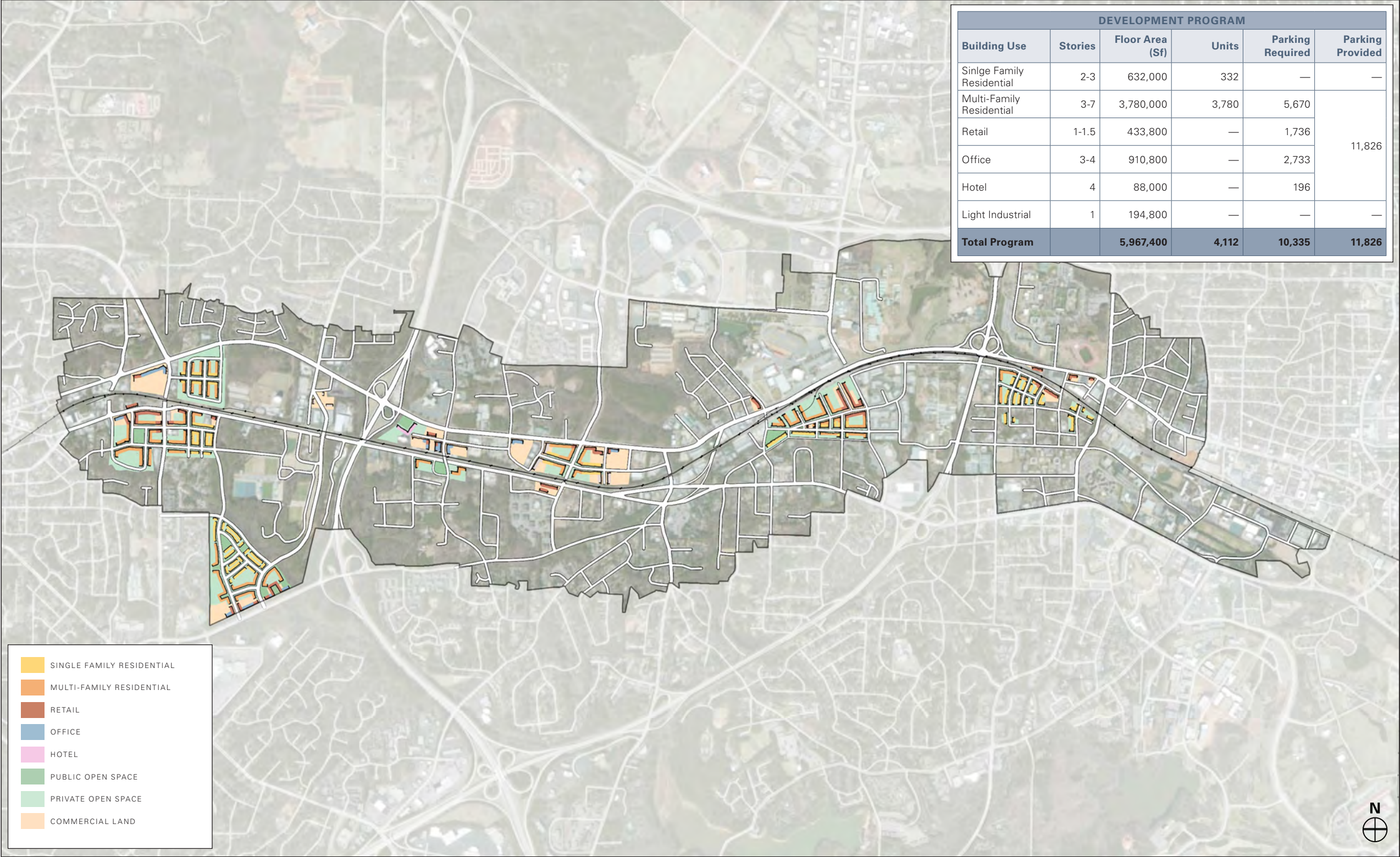




Network Overview

— Land Use Recommendations

Land use alternatives were explored for each crossing based on new opportunities resulting from grade separation. These alternatives were developed in response to market demand and include a mix of commercial, residential, and institutional uses appropriate for each crossing condition and location. Grade separating the crossings and improving the street network will increase access to adjacent land areas and unlock nearly 6 million square feet of development opportunity for the corridor.





# Conclusions

## Performance Measures

The following performance measures were used to rate or “grade” crossing improvement projects proposed as part of this study. Note that “impact” and “change” are used interchangeably, and that both could be either positive or negative.

### Economy and Growth

- » Development potential (acres) — based on the proposed land use plan. Scores are higher for larger potential development.
- » Net new property tax revenue (\$) — based on the economic impact assessment. Scores are higher for greater potential tax revenue.
- » Cost of improvements (\$) — including potential construction and right of way costs. Scores are higher for lower potential cost.

### Safety and Human Environment

- » Impact to residences (# impacted) — based on preliminary impact area. Scores are higher for fewer residential impacts.
- » Impact to commercial and industrial uses (# impacted) — based on preliminary impact area. Scores are higher for fewer commercial and industrial impacts.
- » Safety (reduction in collisions per year) — calculated using GradeDec. Scores are higher for larger potential reduction in collisions.
- » Emergency service — improve or worsen based on ease and reliability of crossing the railroad. Scores are higher for grade separations.
- » Impact to business node — minor or major based on level of impact to business node at crossing. Scores are higher for minimal impact to business node.

### Traffic Operations and Access

- » Average change in intersection delay — if delay increases or decreases. Scores are higher for larger decrease in travel time.
- » Travel time reliability — improve or worsen based on type of railroad crossing. Scores are higher for grade separations.
- » Network mobility and connectivity — changes to larger roadway network. Scores are higher for new roadway connections/ extensions.
- » Exposure index — calculation of existing vehicle and train volumes based on 2015 volumes. Scores are higher for larger exposure index.

### Multimodal Access

- » Potential for transit station — commuter rail or none. Scores are higher for potential commuter rail station.
- » How it might affect existing transit service — Wake County Public School System (WCPSS) or local (GoTriangle, GoRaleigh, or C-Tran). Scores are higher for serving more existing bus services.

IN THIS SECTION
» Performance measures
» Funding opportunities and cost estimates
» Next steps



Performance Measures for Recommended Alternatives

Category	Performance Measure	Indicators			Crossing Location							
		Good	Fair	Poor	Maynard Rd	Trinity Rd	Corporate Center Rd	Nowell Rd	Edwards Mill Rd	Jones Franklin Rd	Powell Dr	Beryl Rd/ Royal St
Economy & Growth	Development Potential	> 40 acre	20 - 40 acre	< 20 acre	44 acre	46 acre	17 acre	0	23 acre	Not Available	42 acre	10 acre
	New Tax Revenue	> \$2 M	\$1 M - \$2 M	< \$1 M	\$2.6 M	\$2.4 M	\$0.9 M	0 M	\$1.2 M	Not Available	\$2.0 M	\$0.6 M
	Improvement Cost	< \$5 M	\$5 M - \$30 M	> \$30 M	\$38 M	\$52 M	\$22 M	\$1 M	\$48 M	\$26 M	\$44 M	\$5 M
Safety & Human Environment	Residential Impacts	None	1	> 1	0	0	2	0	0	0	1	0
	Business Impacts	None	1 - 3	> 3	8	2	3	0	2	5	2	1
	Safety (Red. in Collisions/Yr)	> 0.02	0.01 - 0.02	< 0.01	0.01	0.02	0	0.03	0	0	0.02	0.03
	Change to Emergency Service	Improve	Negligible	Worsen	Improve	Improve	Improve	Worsen	Improve	Improve	Improve	Worsen
	Impact to Business Node	None	Minor	Major	Major	Minor	None	None	None	Major	Minor	Minor
Traffic Operations & Access	Avg. Change in Delay (seconds)	Decrease > 100	Decrease < 100	Increase	-95 seconds	-125 seconds	-120 seconds	N/A	+20 seconds	-40 seconds	-105 seconds	-15 seconds
	Travel Time Reliability	Improve	Negligible	Worsen	Improve	Improve	Improve	Negligible	Improve	Improve	Improve	Worse
	Network Mobility and Connectivity	Improve	No Change	Worsen	No change	Improve	Improve	Worsen	Improve	Improve	Improve	Worsen
	Exposure Index	> 100,000	50,000 - 100,000	< 50,000	528,000	77,000	0	88,000	0	0	55,000	147,400
Multimodal Access	Transit Station Potential	Commuter Rail		None	None	None	Commuter/BRT	None	None	None	None	None
	Existing Transit Service Impacts	WCPSS & Local	WCPSS Only	None	Both	None	None	WCPSS	None	None	None	Both



## Funding Opportunities and Cost Estimates

### Funding Opportunities

This report concludes a feasibility-level study. Funding of the next steps for the recommended alternatives may come from a variety of sources. Typically, local agencies pursue several funding options for the top priority projects, moving forward when one or more sources are available. Potential sources include the following:

- » Raleigh and Cary local funds through a transportation bond or other revenue streams.
- » Local Administered Projects Program (LAPP), administered by CAMPO.
- » NCDOT Freight Rail & Rail Crossing Safety Improvement Fund.
- » State Transportation Improvement Program (STIP), which may include state and/or federal funds.
- » Wake County Transit Plan (Corporate Center if BRT/CR Station)
- » Federal Rail Administration with high speed rail

### Estimated Costs (2015)

Cost estimates were developed based on the conceptual designs for the recommended alternatives. These cost estimates use the CAMPO Planning-Level Cost Estimator Spreadsheet. Estimates are in 2015 dollars and do not include inflation. The costs do not include utility relocation, permitting, mobilization, or drainage. “RR Work” includes a permanent railroad bridge and a temporary detour bridge, when needed. Right of way estimates were based on planning-level assumptions of potential right of way requirements associated with the conceptual designs, and do not incorporate property-level tax values.

The table below summarizes construction and right of way costs for the recommended alternatives.

Estimated Costs (2015 Dollars)

Road	Construction	Right of Way	Total
NE Maynard Rd	\$21 M	\$17 M	\$38 M
Trinity Rd*	\$33 M	\$35 M	\$68 M
Phase I	\$28 M	\$24 M	\$52 M
Phase II	\$5 M	\$11 M	\$16 M
Corporate Center Dr	\$5 M	\$17 M	\$22 M
Nowell Rd	\$36,000	\$0	\$36,000
Edwards Mill Rd	\$28 M	\$20 M	\$48 M
Jones Franklin Rd	\$17 M	\$9 M	\$26 M
Powell Dr	\$36 M	\$8 M	\$44 M
Beryl Rd/Royal St	\$1 M	\$4 M	\$5 M

\*The Trinity Road recommended alternative could be built in two phases: Phase I includes a bridge over the railroad, square loop, and extension to the north. Phase II includes an extension to the south.



### Next Steps

This study serves three key purposes:

- » As a Traffic Separation Study (TSS) — A TSS examines the usage and existing safety conditions at public rail/highway crossings to determine the need for improvements. The TSS helps decision makers prioritize crossings, and is leveraged when applying for funds. The NCDOT Rail Division prepares a TSS for crossings before pursuing state or federal funding.
- » As a corridor plan — This study recommends changes to the transportation plans and future land use plans in east Cary and west Raleigh. The alternatives, while focused primarily on crossing the railroad, also considered wider mobility and connectivity needs throughout the corridor. Detailed economic analyses supported the proposed plans, which can be incorporated into future Cary and Raleigh plan updates.
- » To create a partnership and coordinated vision between NCDOT, local agencies, and transit agencies — Each agency routinely prepares plans for aspects of transportation and land use planning within their domain. By pursuing this study jointly, the Core Leadership Team partners have created a product that can be used by all agencies to pursue funds and implement policies and regulatory changes. In addition, since all partners have participated in developing design assumptions and choosing recommended alternatives, future phases of planning, design, and permitting are likely to encounter less resistance.

As funding becomes available for each alternative, the following steps will be taken:

- » Environmental document and preferred alternative selection — The current study considered the feasibility of a range of alternatives based on conceptual designs. During preparation of an environmental document, the alternative development process will be revisited. The next phase will reevaluate the options in this feasibility study using updated traffic and other data, and may consider additional options. A preferred alternative will be selected, and detailed designs will be prepared. This phase typically extends 1 to 2 years.
- » Final designs — Final plans will be prepared for the preferred alternative. This phase typically extends 12 to 18 months.
- » Right of way and construction — Right of way acquisition often takes 1 to 2 years, with construction following. The duration of construction depends on the type of structure; a rail bridge requires longer construction time than a road bridge.



Appendix

Concept Development . . . . . 1

Eliminated Alternatives . . . . . 9

Traffic Analysis . . . . . 19

Intersection Analysis . . . . . 43

Benefit/Cost Analysis . . . . . 56

Typical Sections . . . . . 58



# Concept Development

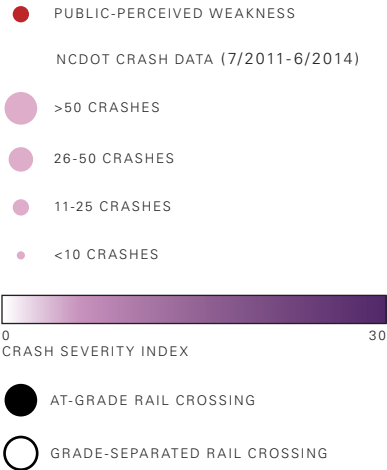


# Principle 1. Build Safety Through Urbanization

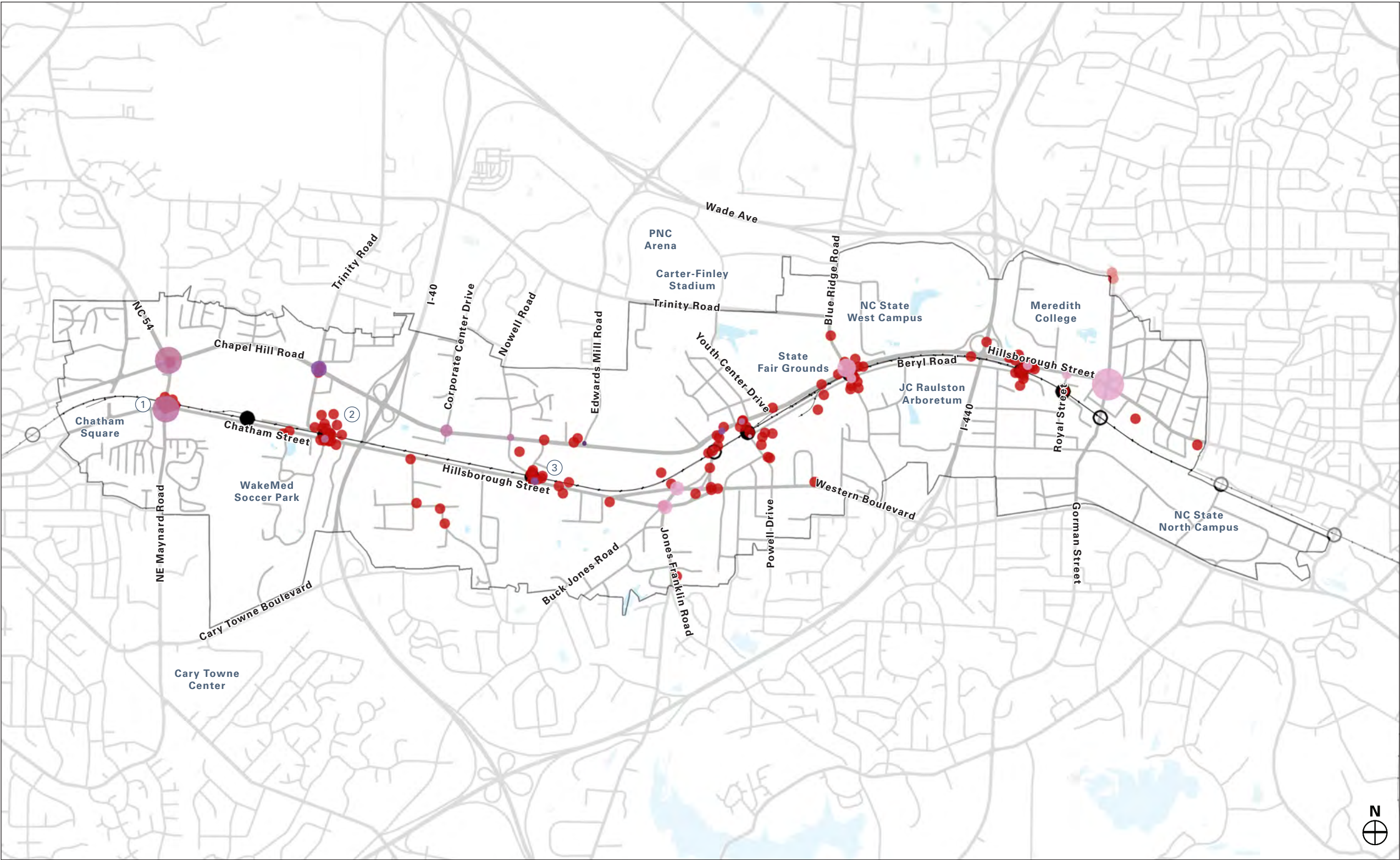
Regardless of development potential, rail crossing safety needs to be addressed. Intersections and crossings with historic or perceived safety concerns often are where traffic volumes and travel speeds are the highest. Safety is further complicated when these busy intersections and crossings are near other busy intersections, (such as the NE Maynard Road rail crossing, NE Maynard Road/Chatham Street intersection, and NE Maynard Road/Chapel Hill Road intersection),

Design alternatives focused on this design principle included the following crossings:

- 1. NE Maynard Road; adjacent to NE Maynard Road/Chapel Hill Road
- 2. Trinity Road; adjacent to Trinity Road/Chapel Hill Road
- 3. Nowell Road; adjacent to Nowell Road/Chapel Hill Road



Concept Development Graphic





## Principle 2. Choose the Paths of Least Resistance

Since the rail rides along a high point along the corridor, the least expensive solution in terms of construction and land acquisition will typically be for the road to go under the rail, not over. Further, not all of the existing crossings are well-suited to a grade-separated solution because of geometric and physical constraints, as well as many other factors.

Grade separations were evaluated in areas where the street parallel to the tracks is sufficiently offset (or may be offset) from the rail to easily allow the road to cross under the rail. Several of the more viable grade separation locations would create meaningful connections to the local and arterial street network.

The following new road extensions under the railroad were considered based on this design principle:

1. West of NE Maynard Road (potentially connecting to Reedy Creek Road)
2. Between NE Maynard Road and Trinity Road (potentially connecting to Fincastle Drive on the north)
3. Edwards Mill Road
4. Powell Drive (potentially connecting to Youth Center Drive)
5. Pylon Drive (connecting into NC State)

- 10 FOOT CONTOUR LINE FROM RAIL
- POTENTIAL ROAD-UNDER-RAIL GRADE SEPARATED ALIGNMENT
- EXISTING ROAD
- PROPOSED ROAD (RALEIGH + CARY PLANS)
- AT-GRADE RAIL CROSSING
- GRADE-SEPARATED RAIL CROSSING

Concept Development Graphic





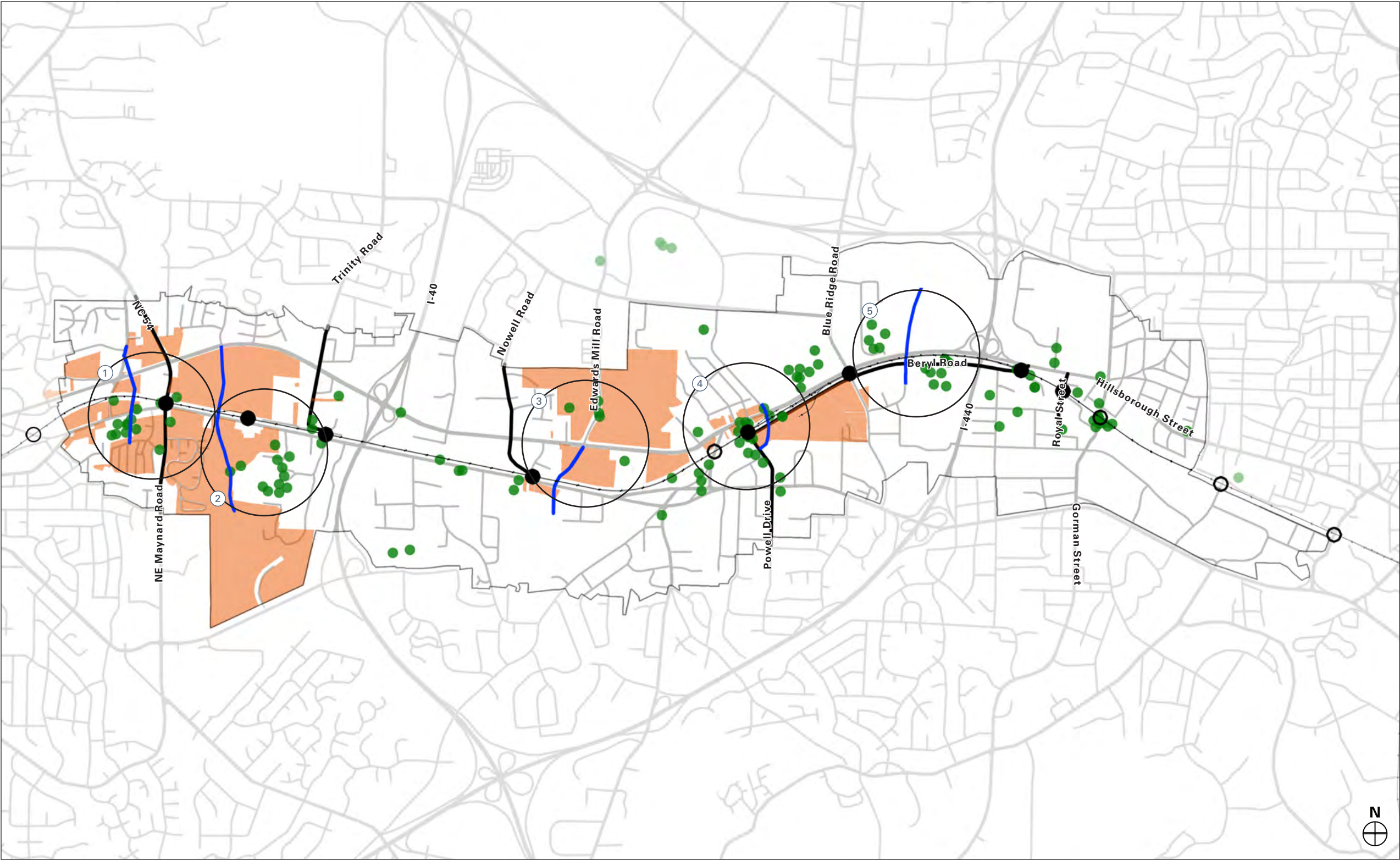
### Principle 3. Invest in Crossings that Leverage the Corridor’s Strengths

Although the number of crossings is considered a strength of the study area, few of them have adjacent strong destinations to warrant crossing the rail at that point. New investments in crossings will likely build on the strengths of the area, suggesting that new grade-separated crossing locations may warrant investigation. Grade separations were evaluated at five crossings based on this design principle:

- 1. NE Maynard Road
- 2. Trinity Road
- 3. Edwards Mill Road
- 4. Powell Drive
- 5. Pylon Drive

- POTENTIAL ROAD-UNDER-RAIL GRADE SEPARATION ALIGNMENT
- EXISTING CROSSING ALIGNMENT
- MAJOR ECONOMIC DEVELOPMENT POTENTIAL ZONE
- PUBLIC-PERCEIVED STRENGTH
- AT-GRADE RAIL CROSSING
- GRADE-SEPARATED RAIL CROSSING

Concept Development Graphic





Concept Development Graphic

Principle 4.  
Invest in  
Crossings that  
Respond to  
Critical Issues

New investments in crossings may also respond to critical weaknesses identified in the study area. The four best opportunities for this are:

- 1. NE Maynard Road/Trinity Road
- 2. Nowell Road/Edwards Mill Road
- 3. Powell Drive
- 4. Beryl Road/Royal Street





Principle 5.  
Invest Where  
Significant  
Development  
Potential Exists

A number of opportunity areas were identified during the public engagement process. Overlaying these opportunities on top of those sites identified as having significant development potential highlights the areas where investment may achieve the best return on investment. Powell Drive appears to be well suited to incentivize development. In addition, several new crossings were explored that both mitigate current crossings and provide the conditions for development. The four crossings that met this design criteria included:

- 1. Reedy Creek Road
- 2. WakeMed Soccer Park
- 3. Edwards Mill Road
- 4. Powell Drive/Youth Center Drive

Concept Development Graphic



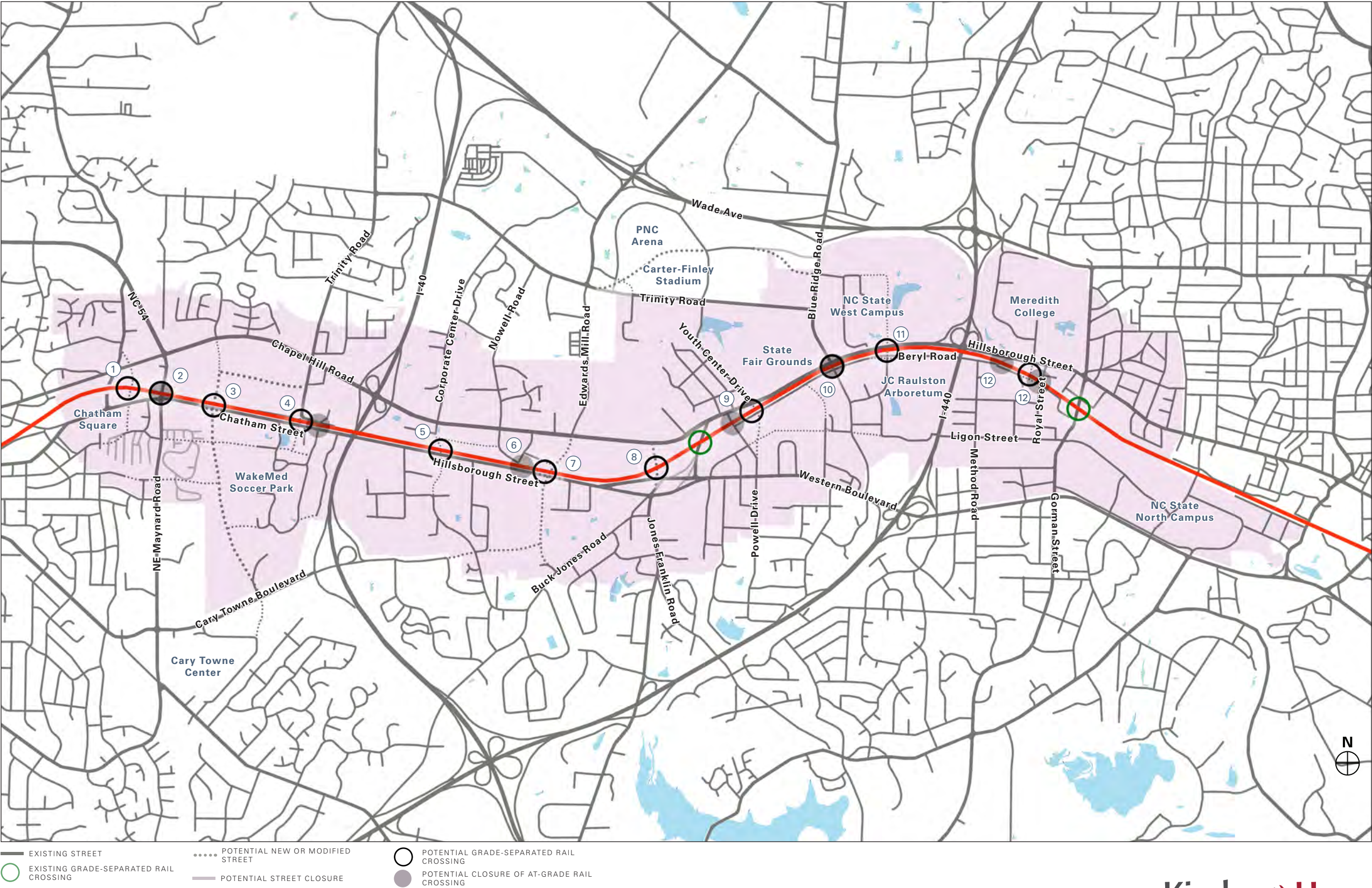


Principle 6.  
Balance Regional  
Transportation  
and Local  
Circulation Needs

A street network comprised of an interconnected arterial and local street system is the best way to distribute traffic, connect neighborhoods, and provide a flexible, safe, and walkable development pattern. This network would be improved by new grade separations, which also supports the vision for a sealed railroad corridor through this area. The following modifications were explored based on this design principle:

1. Introduce a connection from Reedy Creek Road to the south and east with a grade separation across the railroad
2. Improve or grade separate NE Maynard Road across the railroad
3. Create a new grade separated crossing across the railroad west of Trinity Road to connect potential development sites
4. Grade separate Trinity Road on new or realigned location
5. Extend Corporate Center Drive with a grade separation across the railroad
6. Close Nowell Road in conjunction with a new adjacent grade separation
7. Extend Edwards Mill Road south with a grade separation across the railroad
8. Extend Jones Franklin Road north with a grade separation across the railroad
9. Grade separate Powell Drive on existing or realigned location
10. A previous project recommended grade separating Blue Ridge Road across the railroad
11. Extend Pylon Drive north as a campus road connection to a realigned and extended Trinity Road, with a grade separation across the railroad
12. Grade separate Beryl Road or Royal Street, or extend Beryl Road east to Royal Street and close the Beryl Road crossing

Concept Development Graphic





# Eliminated Alternatives



NE Maynard Road —  
Eliminated  
Alternatives



NE Maynard Road bridge over the railroad



NE Maynard Road bridge over the railroad and Chatham Street



Railroad and Chatham Street bridges over NE Maynard Road



Railroad bridge over NE Maynard Road



New Trinity  
Road/Fincastle  
Extension —  
Eliminated  
Alternative



New crossing under the railroad, located between NE Maynard Road and Trinity Road. New road would extend north to Chapel Hill Road and future east-west connector to Cary Towne Boulevard extension



Trinity Road  
— Eliminated  
Alternatives



Railroad bridge over Trinity Road at new crossing location with loop ramp to Chatham Street



Trinity Road bridge over the railroad at new crossing location with loop ramp to Chatham Street



Railroad bridge over Trinity Road at new crossing location, shifting the Maynard Road/Chatham Street intersection to outside of the 200' railroad corridor



Trinity Road  
— Eliminated  
Alternatives



Railroad bridge over Trinity Road at existing location with Trinity Road extensions to Chapel Hill Road and Cary Towne Boulevard



Railroad bridge over Trinity Road at new crossing location with Trinity Road extension to Cary Towne Boulevard



Corporate Center Drive Extension — Eliminated Alternatives



Corporate Center Drive extension to Bashford Road with a bridge over the railroad, shifting Hillsborough Street outside of the 200' railroad corridor



Railroad bridge over Corporate Center Drive extension, extended to Hillsborough Street, connecting extension to Hillsborough Street with loop ramp



Railroad bridge over Corporate Center Drive extension, extended to Bashford Road with curved alignment



Railroad bridge over Corporate Center Drive extension, extended to Bashford Road with straight alignment



## Nowell Road — Eliminated Alternative



Nowell Road bridge over the railroad and Hillsborough Street with loop extension ramp to Hillsborough Street



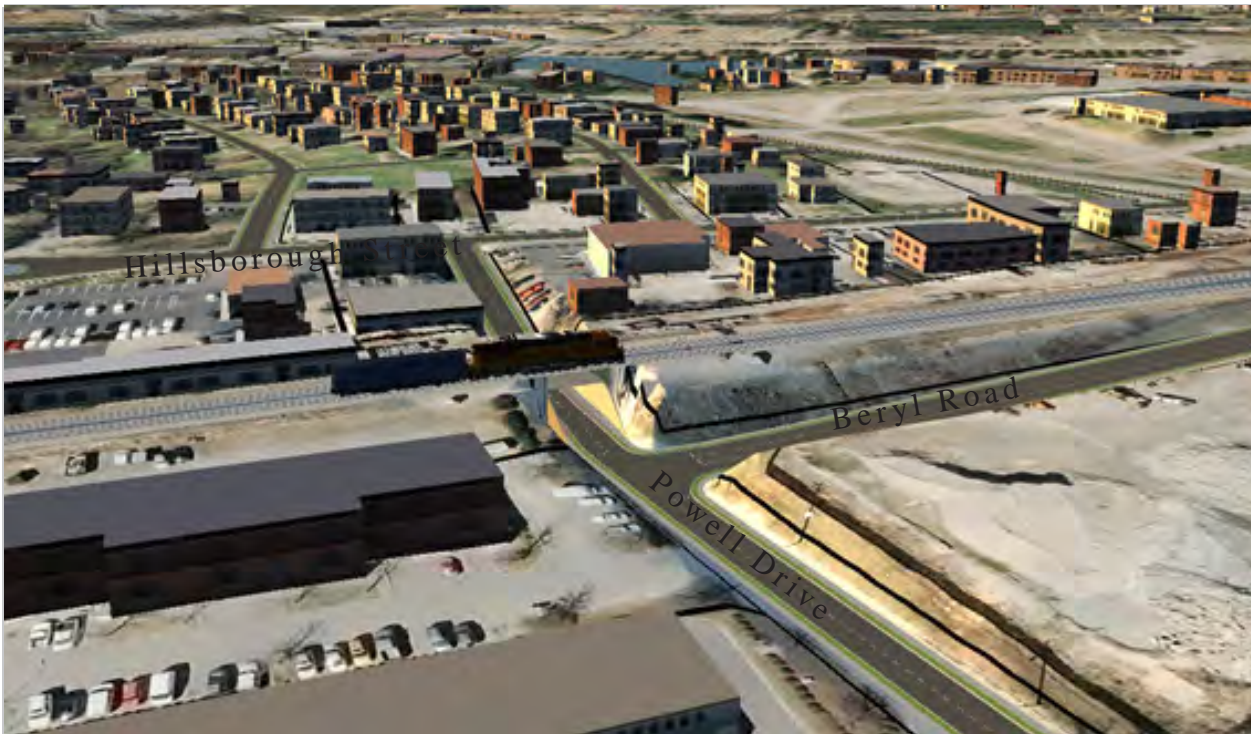
Powell Drive  
— Eliminated  
Alternatives



Powell Drive bridge over the railroad on existing alignment



Realignment of Powell Drive to connect with Youth Center Drive with a bridge over the railroad



Railroad bridge over Powell Drive on existing alignment



Pylon Drive  
— Eliminated  
Alternative





Beryl Road and  
Royal Street  
— Eliminated  
Alternatives



Beryl Road realignment to I-440 NB ramps/Method Road



Railroad bridge over Royal Street, connecting Hillsborough Street via a square loop through the shopping center north of the railroad, add a new connector from Beryl Road to Royal Street and close Beryl Road crossing



Royal Street bridge over the railroad, connecting directly to Hillsborough Street, add a new connector from Beryl Road to Royal Street and close Beryl Road crossing



# Traffic Analysis



## Traffic Analysis

The traffic analysis helped the project team evaluate the feasibility of closing several existing at-grade rail crossings, converting existing at-grade rail crossings to grade-separated crossings, and constructing new grade-separated crossings between NE Maynard Road in Cary and Gorman Street in Raleigh. Through evaluation of the street network, safety data, existing and potential development patterns, and public input, a range of alternatives was developed. This capacity analysis was performed to determine the impact to vehicular traffic associated with the proposed crossing scenarios.

This report presents traffic forecasts, trip redistribution, capacity analyses, and recommendations for transportation improvements required to meet anticipated traffic demands in conjunction with the proposed crossing scenarios in the Future Year (2040). A capacity analysis was also performed for the Existing Year (2015) traffic condition to serve as a benchmark for improvements. The analysis study area is shown on Figure 1, while the existing roadway laneage at the study intersections is shown on Figures 2A & 2B.

## Traffic Forecast & Volume Breakouts

A traffic forecast was performed for the study area by Kimley-Horn. Daily forecast volumes from this report, dated May 19, 2015, were then converted into peak hour turning movement volumes using NCDOT Volume Breakout Spreadsheets to be analyzed in the Existing Year (2015) and Future Year (2040) traffic conditions. The traffic forecast and associated Volume Breakout sheets are attached.

## Crossing Alternatives

Conceptual roadway exhibits for new or reconfigured railroad crossing alternatives are attached. It should be noted that the existing at-grade crossing of Nowell Road is proposed to be closed. While not analyzed as a stand-alone alternative, this closure was included as part of the Corporate Center Drive and Edwards Mill Road alternatives. The traffic analysis was performed during final development of the recommended alternatives, and multiple scenarios were evaluated at the Maynard Road and Corporate Center Drive crossings. Although a recommended alternative has since been selected (as noted in the following section), the analysis for the eliminated alternative was retained in this report for comparison purposes. Since each traffic scenario may be related to more than one design alternative, the alternative numbers listed below are for the traffic analysis only, and do not correspond with the design alternative numbers. The analysis alternatives are summarized below:

### Maynard Road

- » Alternative #1 (Recommended) – Shift the intersection of Chatham Street at Maynard Road to the south to accommodate a grade-separated crossing of the railroad on Maynard Road
- » Alternative #2 – Reconfigure the intersection of Chatham Street at Maynard Road to a square-loop design as part of a grade-separated crossing with loop ramps in the southeast and southwest quadrants of the interchange

### Trinity Road

- » Realign Trinity Road to the east with a grade-separated crossing of the railroad, close the existing crossing, and reconfigure the intersection of Chatham Street at Trinity Road to a square-loop design with a loop ramp in the southeast quadrant of the interchange (included in No Build analysis as well)
- » Extend Trinity Road south to Cary Towne Boulevard



## Corporate Center Drive

- » Alternative #1 – Extend Corporate Center Drive to the south to Hillsborough Street and shift Hillsborough Street south to accommodate a grade-separated crossing of the railroad on Corporate Center Drive
- » Alternative #2 (Recommended) – Extend Corporate Center Drive to the south to Hillsborough Street and construct a square-loop interchange of Hillsborough Street at Corporate Center Drive as part of a grade-separated crossing with a loop ramp in the southwest quadrant of the interchange
- » NOTE: Both scenarios include the extension of Corporate Center Drive south to Bashford Drive. Analyses for both alternatives were performed assuming 1) closure of Nowell Road crossing and 2) closure of both Nowell Road and Edwards Mill Road crossings

## Edwards Mill Road

- » Extend Edwards Mill Road south from Chapel Hill Road to Hillsborough Street across from WolfWood Drive
- » NOTE: Analyses were performed assuming 1) closure of Nowell Road crossing and 2) closure of both Nowell Road and Corporate Center Drive crossings

## Jones Franklin Road

- » Extend Jones Franklin Road to the north from Hillsborough Street to Chapel Hill Road and construct a grade-separated crossing
- » Powell Drive
- » Realign Powell Drive to the east with a grade-separated crossing of the railroad to intersect Hillsborough Street at the existing Youth Center Drive

## Beryl Road

- » Close the existing intersection of Hillsborough Street at Beryl Road and eliminate the existing at-grade crossing on Beryl Road just south of that intersection; extend Beryl Road to the east to intersect with Royal Street (south of the existing crossing on Royal Street)



## Traffic Volume Redistribution

Traffic forecast volumes were adjusted to account for the following potential crossing closure scenarios. Analyzed traffic volumes are shown on Figures 3A-3B for the Existing No-Build condition, Figures 4A-4B for the Future No-Build condition, and Figures 5A-5C for the Future Build condition. Volume redistribution calculations are attached.

### Nowell Road Crossing Closure

The Future Year (2040) forecast volumes include the Nowell Road crossing. Both the Corporate Center Drive and Edwards Mill Road analyses assume the closure of the Nowell Road crossing. Crossing volumes on Nowell Road were diverted to both Corporate Center Drive and Edwards Mill Road in the analysis scenario in which crossings are present on both Corporate Center Drive and Edwards Mill Road.

An analysis was also performed for Corporate Center Drive without crossings on Nowell Road or Edwards Mill Road. All crossing traffic from these three roadways was diverted to Corporate Center Drive. Similarly, an analysis was performed for Edwards Mill Road without crossings on Nowell Road or Corporate Center Drive. All crossing traffic from these three roadways was diverted to Edwards Mill Road.

### Beryl Road Crossing Closure

As the traffic forecast did not originally include the intersection of Hillsborough Street at Beryl Drive, volume balancing was performed between Beryl Drive and Royal Street intersections as part of the Beryl Drive crossing closure alternative in the Future Year (2040). It was assumed as a worst-case scenario that all traffic currently crossing the railroad tracks at Beryl Road would instead use the Royal Street crossing.

## Capacity Analysis

Capacity analyses were performed using Synchro Version 9.1 software. Synchro intersection level-of-service (LOS) reports are attached. The LOS for the study intersections are summarized in Tables 1-7.



Table 1				
Maynard Road Crossing				
Level-of-Service Summary				
CONDITION	No BUILD		BUILD	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chatham Street & Maynard Road (Signalized)				
Existing (2015)	D (47.6)	D (41.9)	-	-
Future (2040)	F (152.0)	F (143.4)	D (53.9)	D (47.0)
Chatham Street & SB Maynard Road Loop (Signalized)				
Future (2040) With Square Loop	-	-	B (12.4)	B (17.4)
Chatham Street & NB Maynard Road Loop (Signalized)				
Future (2040) With Square Loop	-	-	C (20.8)	B (18.7)
Maynard Road & Maynard Road Loop (Signalized)				
Future (2040) With Square Loop	-	-	B (19.5)	B (17.7)



Table 2				
Trinity Road Crossing				
Level-of-Service Summary				
CONDITION	No BUILD		BUILD	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chapel Hill Road & Trinity Road (Signalized)				
Existing (2015)	F (82.0)	D (36.9)	-	-
Future (2040)	F (177.8)	F (152.2)	D (51.2)	E (68.8)
Chatham Street & Trinity Road (Unsignalized)				
Existing (2015)	NB – E (45.2) SB – F (69.0) EBL – B (10.5) WBL – A (8.2)	NB – E (38.9) SB – F (259.0) EBL – A (8.7) WBL – A (9.2)	-	-
Future (2040) With Square Loop	NB – F (104.1) WBL – A (9.9)	NB – F (155.4) WBL – B (10.5)	A (8.6)	B (10.4)
Trinity Road & Trinity Road Loop (Unsignalized)				
Future (2040)	-	-	WB – C (21.9) SBL – A (8.5)	WB – D (29.3) SBL – A (8.6)



Table 3 Corporate Center Drive Crossing Level-of-Service Summary				
CONDITION	No BUILD		BUILD	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chapel Hill Road & Corporate Center Drive (Signalized)				
Existing (2015)	C (25.9)	D (38.0)	-	-
Future (2040)	F (142.4)	F (172.0)	D (42.1)	D (47.7)
Future (2040) With Edwards Mill Closure	-	-	D (43.2)	D (53.3)
Hillsborough Street & Corporate Center Drive (Signalized)				
Future (2040)	-	-	C (22.8)	B (16.5)
Future (2040) With Edwards Mill Closure	-	-	D (38.9)	D (35.0)
Future (2040) With Square Loop	-	-	B (16.6)	C (20.2)
Future (2040) With Square Loop and Edwards Mill Closure	-	-	B (18.8)	C (23.3)
Corporate Center Drive & Corporate Center Drive Loop (Signalized)				
Future (2040) With Square Loop	-	-	B (12.4)	B (11.7)
Future (2040) With Square Loop and Edwards Mill Closure	-	-	A (9.9)	A (8.6)

Table 4 Nowell Road Crossing Level-of-Service Summary				
CONDITION	No BUILD		BUILD	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chapel Hill Road & Nowell Road (Signalized)				
Existing (2015)	C (22.5)	D (45.3)	-	-
Future (2040)	D (48.9)	F (109.0)	-	-
Hillsborough Street & Nowell Road (Unsignalized)				
Existing (2015)	SB - F (65.5) EBL - A (9.4)	SB - E (43.2) EBL - B (10.7)	-	-
Future (2040)	SB - F (955.8) EBL - B (11.8)	SB - F (554.9) EBL - C (15.4)	-	-



Table 5 Edwards Mill Road Crossing Level-of-Service Summary				
CONDITION	No BUILD		BUILD	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chapel Hill Road & Edwards Mill Road (Signalized)				
Existing (2015)	A (4.9)	B (12.1)	-	-
Future (2040)	B (16.3)	B (19.9)	D (37.6)	D (37.8)
Future (2040) With Corporate Center Closure	-	-	D (42.0)	D (46.8)
Hillsborough Street & Edwards Mill Road (Signalized)				
Future (2040)	-	-	E (64.5)	D (38.0)
Future (2040) With Corporate Center Closure	-	-	E (58.8)	D (47.8)

Table 6 Jones Franklin Road Crossing Level-of-Service Summary				
CONDITION	No BUILD		BUILD	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chapel Hill Road & Jones Franklin Road (Signalized)				
Future (2040)	-	-	B (19.6)	B (14.8)
WB Western Boulevard & Jones Franklin Road (Signalized)				
Existing (2015)	B (16.2)	C (22.8)	-	-
Future (2040)	B (18.6)	B (17.5)	C (20.9)	C (24.1)
EB Western Boulevard & Jones Franklin Road (Signalized)				
Existing (2015)	B (15.0)	C (20.2)	-	-
Future (2040)	F (129.5)	C (32.2)	D (48.3)	C (23.3)



Table 7 Powell Drive/Youth Center Drive Crossing Level-of-Service Summary				
CONDITION	No BUILD		BUILD	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Hillsborough Street & Powell Drive/Youth Center Drive (Unsignalized)				
Existing (2015)	NB – F (179.9) WBL – B (10.0)	NB – F (56.4) WBL – A (9.6)	-	-
Future (2040)	NB – F (843.4) WBL – B (12.9)	NB – F (218.7) WBL – B (12.0)	A (8.4)	B (12.3)

Table 8 Beryl Road & Royal Street Crossings Level-of-Service Summary				
CONDITION	No BUILD		BUILD	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Hillsborough Street & Beryl Road (Signalized)				
Existing (2015)	B (13.5)	B (11.6)	-	-
Future (2040)	D (36.4)	C (23.3)	-	-
Hillsborough Street & Royal Street				
Existing (2015) - Unsignalized	NB – E (45.0) WBL – B (11.6)	NB – E (40.6) WBL – B (10.7)	-	-
Future (2040) – No Build - Unsignalized Build - Signalized	NB – F (972.7) WBL – B (14.8)	NB – F (349.1) WBL – B (14.2)	B (13.1)	B (14.4)
Hillsborough Street & Meredith College Driveway (Signalized)				
Future (2040)	-	-	B (13.0)	B (14.3)
Royal Street & Beryl Road (Unsignalized)				
Future (2040)	-	-	EB – B (12.6) NBL – A (8.0)	EBL – C (15.1) NBL – A (8.1)



## Recommendations

The following roadway improvements were assumed to be in place for each of the crossing scenarios in the Future Year (2040) traffic condition per the Town of Cary and City of Raleigh long range transportation plans:

### Chapel Hill Road

- » 6-lane divided section from Maynard Road to I-40 and a 4-lane divided section from I-40 through Powell Drive

### Chatham Street

- » 5-lane undivided section from Reedy Creek Road in Cary to I-40

### Hillsborough Street

- » 4-lane divided cross-section from I-40 through Jones Franklin Road

### Trinity Road

- » 4-lane divided cross-section through the study area (south of Hillsborough Street to north of Chapel Hill Road)

### Edwards Mill Road

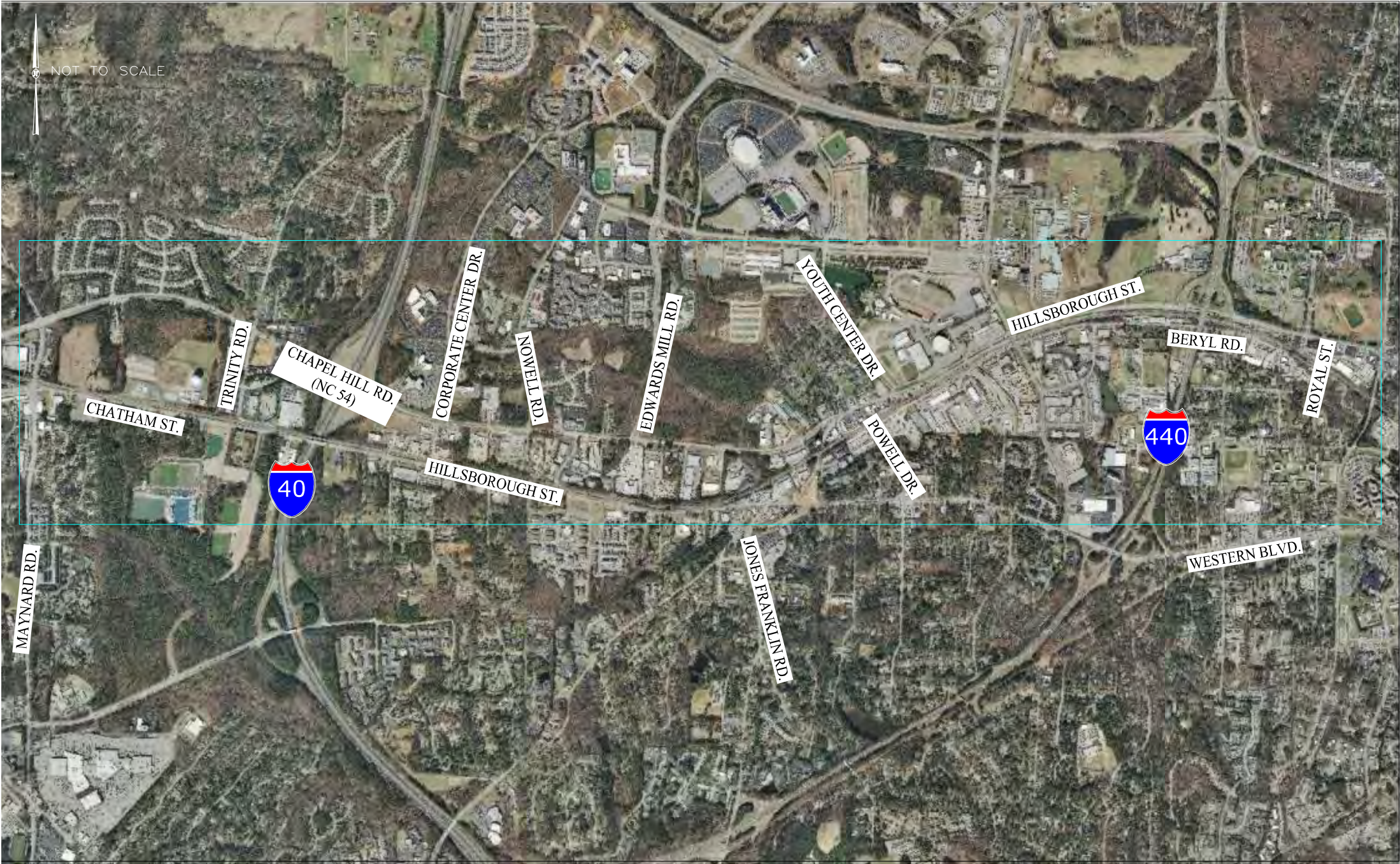
- » Widen Edwards Mill Road to a 4-lane divided cross-section through the study area

Additional roadway improvements were identified to maintain acceptable LOS in both the AM and PM peak hours in the Future Year (2040) for each of the studied crossing alternatives. The ultimate committed and recommended roadway laneage is shown on the attached Figures. Figure 6A shows laneage scenarios for the Maynard Road and Trinity Road crossings, while Figure 6B and 6C show laneage scenarios for the Corporate Center Drive and Edwards Mill Road crossings, respectively. Study intersections from Jones Franklin Road to Royal Street are shown on Figure 6D.

It should be noted that the recommended traffic signal at the intersection of Hillsborough Street at Royal Street be run off the same controller as the signal at the Meredith College entrance. Also, striping the northbound right-turn lane on Royal Street at Hillsborough Street will require the removal of on-street parking on that block of Royal Street.

Improvements to the roadway network are also planned for the area south of Beryl Drive at Royal Street. These improvements were not included in this analysis but, if implemented by the City in the future, will only improve continuity and mobility through this neighborhood.





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RALEIGH-CARY RAIL STUDY  
TRAFFIC CAPACITY ANALYSIS

PROJECT STUDY AREA

FIGURE  
1

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EXISTING ROADWAY LANEA  
- SHEET 1 OF 2

RALEIGH CARY RAIL STUDY  
TRAFFIC CAPACITY ANALYSIS

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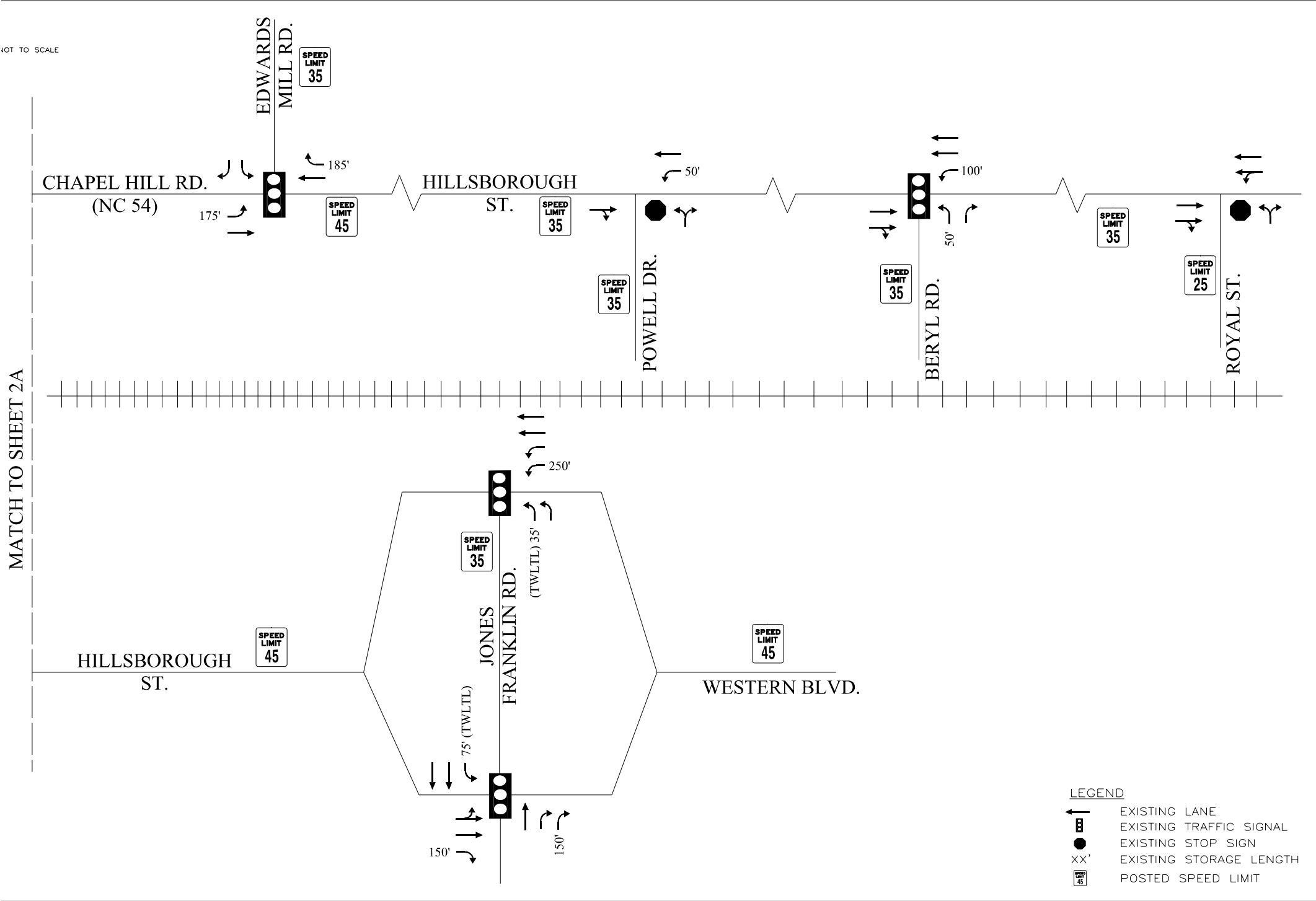


FIGURE  
2B

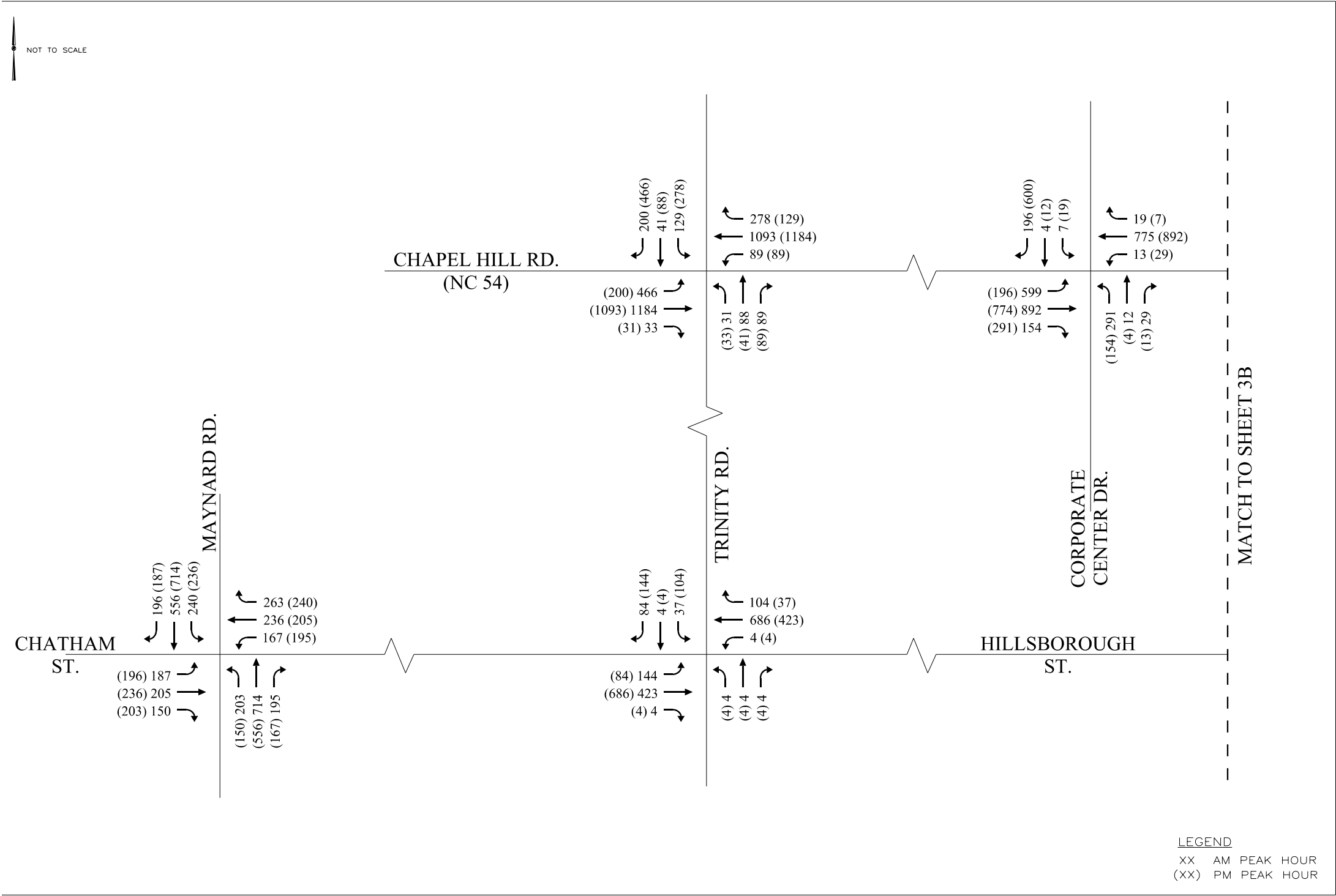
EXISTING ROADWAY LANEAGE  
– SHEET 2 OF 2

RALEIGH CARY RAIL STUDY  
TRAFFIC CAPACITY ANALYSIS



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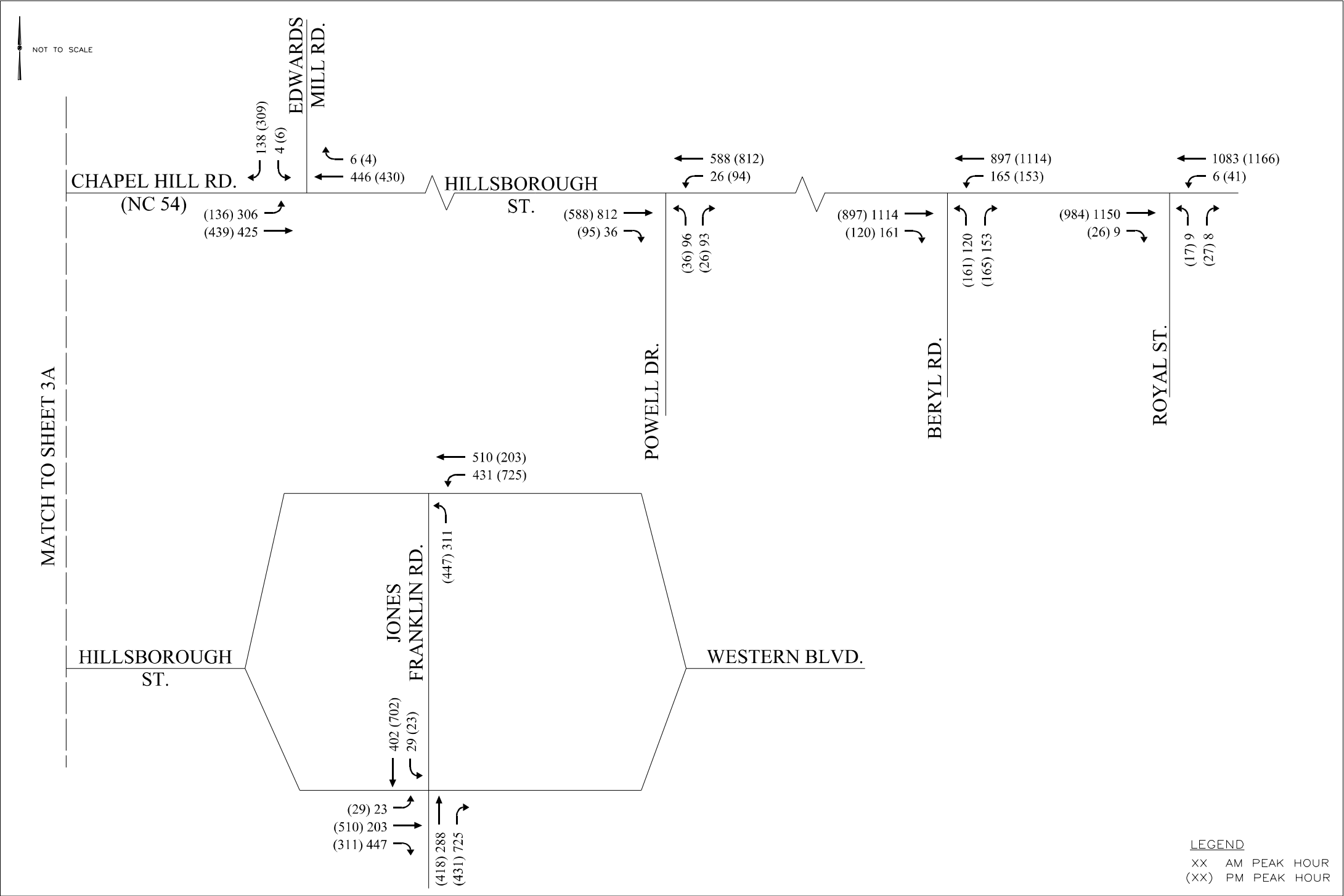


FIGURE  
3B

EXISTING YEAR (2015) NO-BUILD  
PEAK HOUR TRAFFIC VOLUMES  
- SHEET 2 OF 2

RALEIGH CARY RAIL STUDY  
TRAFFIC CAPACITY ANALYSIS



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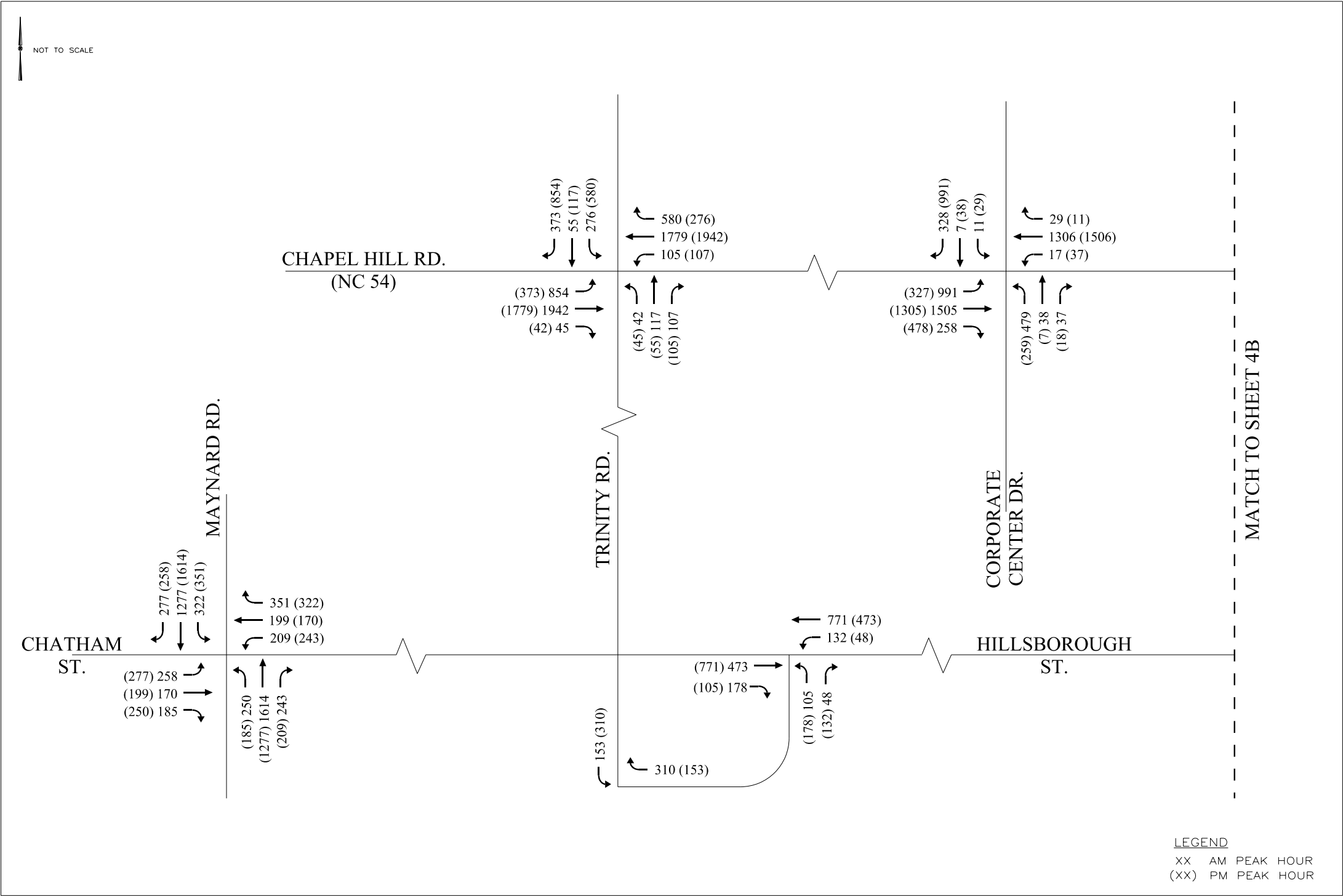


FIGURE  
4A

FUTURE YEAR (2040) NO-BUILD  
PEAK HOUR TRAFFIC VOLUMES  
- SHEET 1 OF 2

RALEIGH CARY RAIL STUDY  
TRAFFIC CAPACITY ANALYSIS



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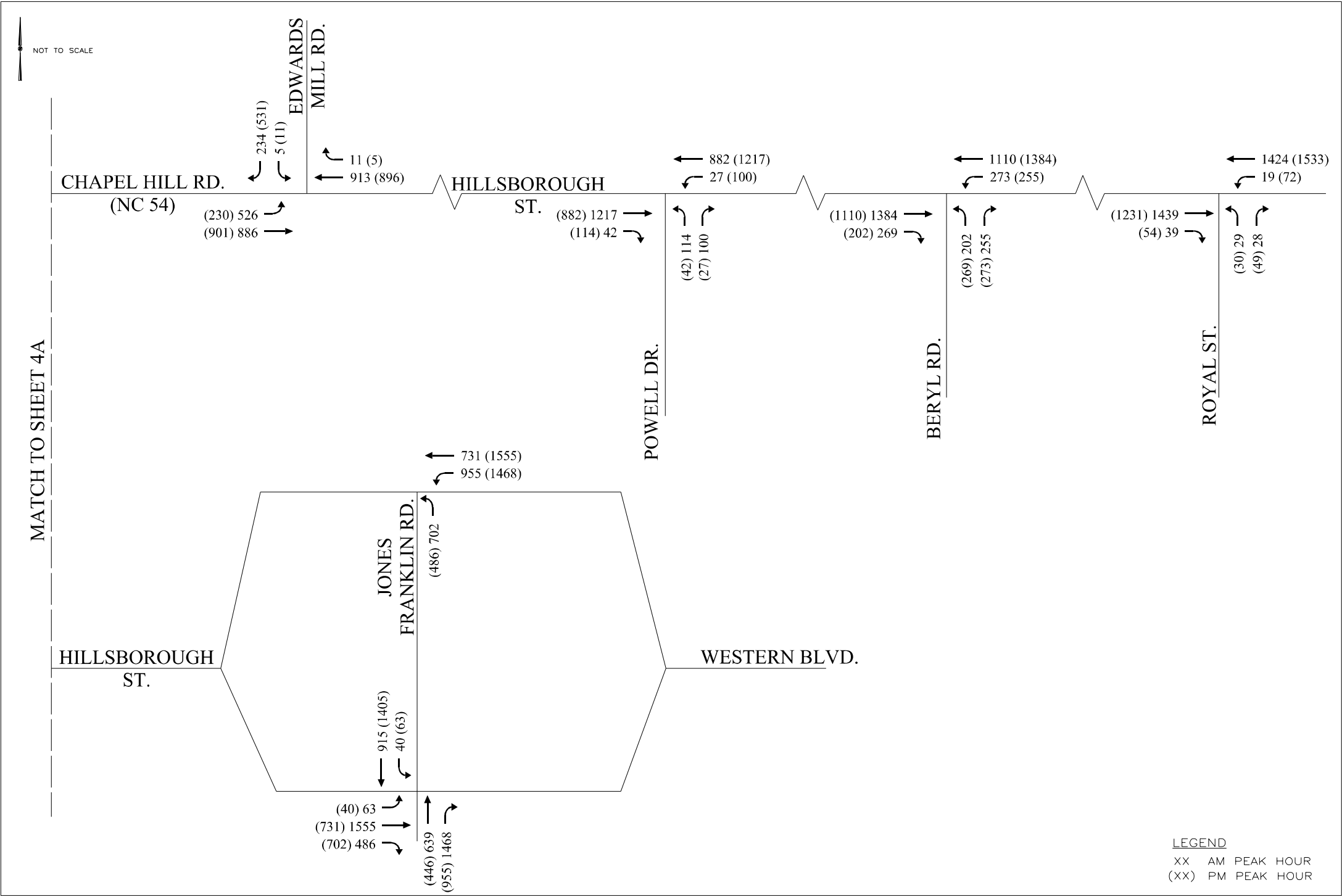


FIGURE  
4B

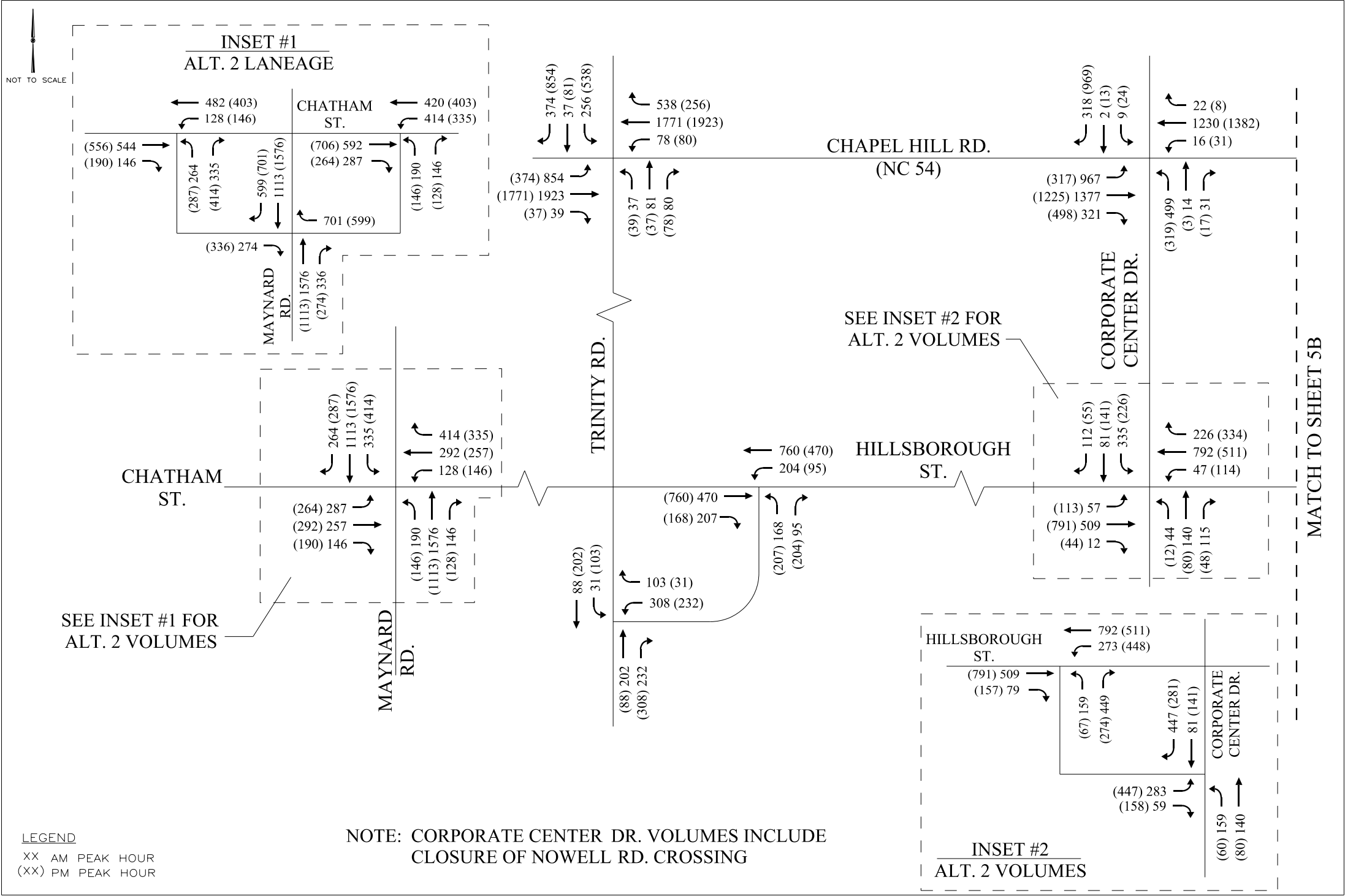
FUTURE YEAR (2040) NO-BUILD  
PEAK HOUR TRAFFIC VOLUMES  
- SHEET 2 OF 2

RALEIGH CARY RAIL STUDY  
TRAFFIC CAPACITY ANALYSIS



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**FIGURE 5A**

**PROJECTED YEAR (2040) BUILD PEAK HOUR TRAFFIC VOLUMES**  
— SHEET 1 OF 3

**RALEIGH-CARY RAIL STUDY TRAFFIC CAPACITY ANALYSIS**

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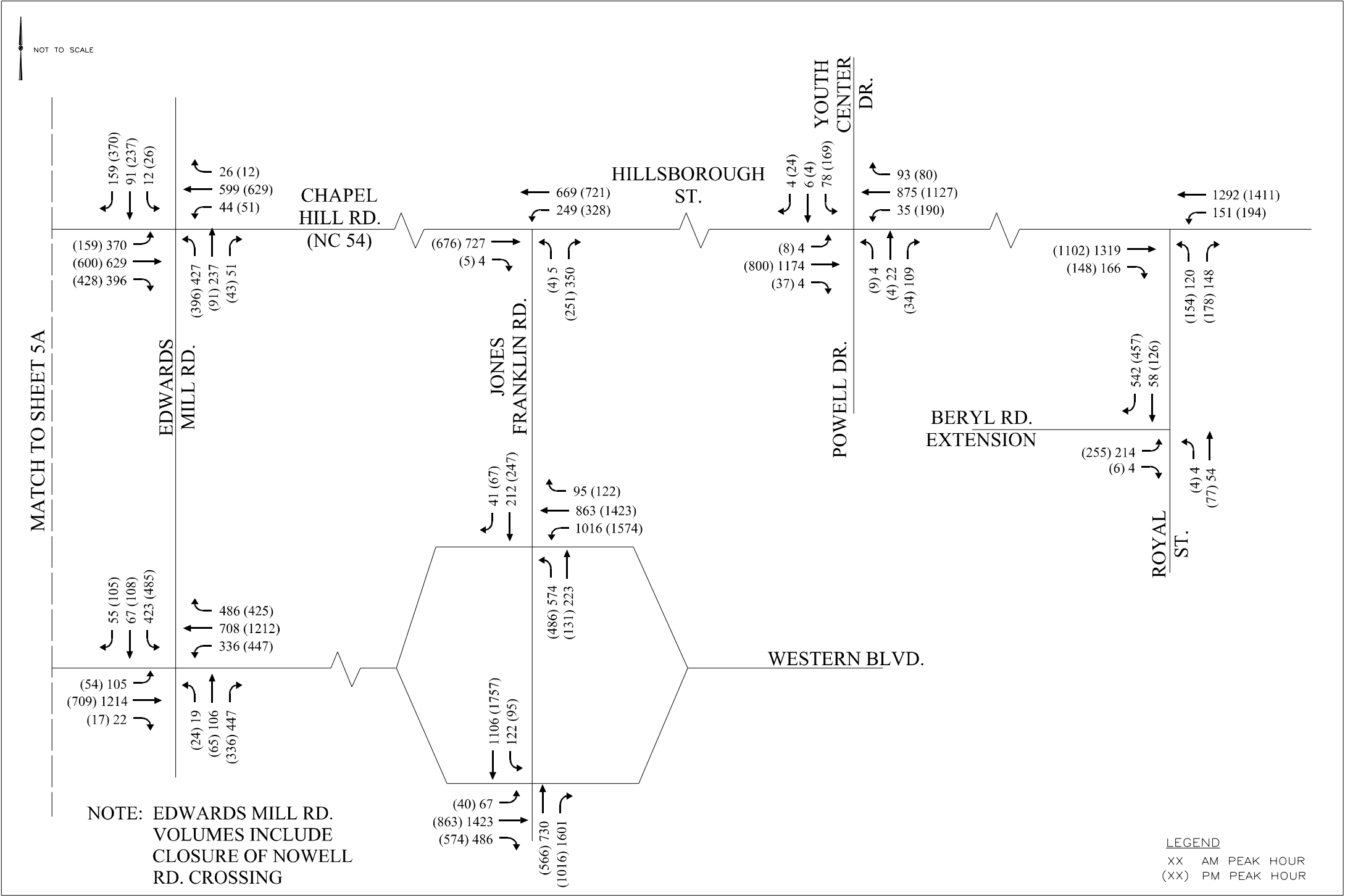


FIGURE  
5B

PROJECTED YEAR (2040) BUILD  
PEAK HOUR TRAFFIC VOLUMES  
– SHEET 2 OF 3

RALEIGH-CARY RAIL STUDY  
TRAFFIC CAPACITY ANALYSIS



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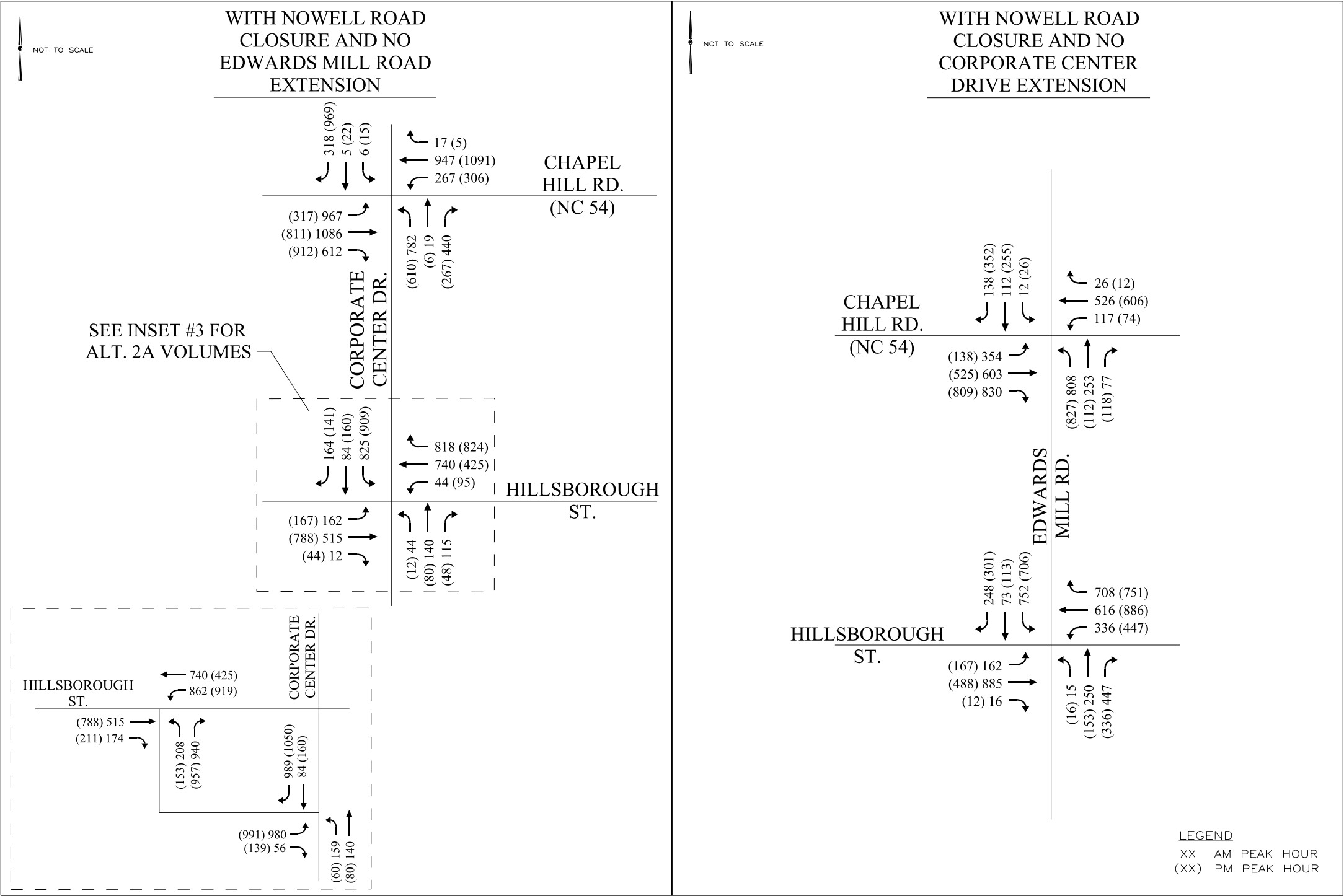


FIGURE 5C

PROJECTED YEAR (2040) BUILD  
PEAK HOUR TRAFFIC VOLUMES  
- SHEET 3 OF 3

RALEIGH CARY RAIL STUDY  
TRAFFIC CAPACITY ANALYSIS



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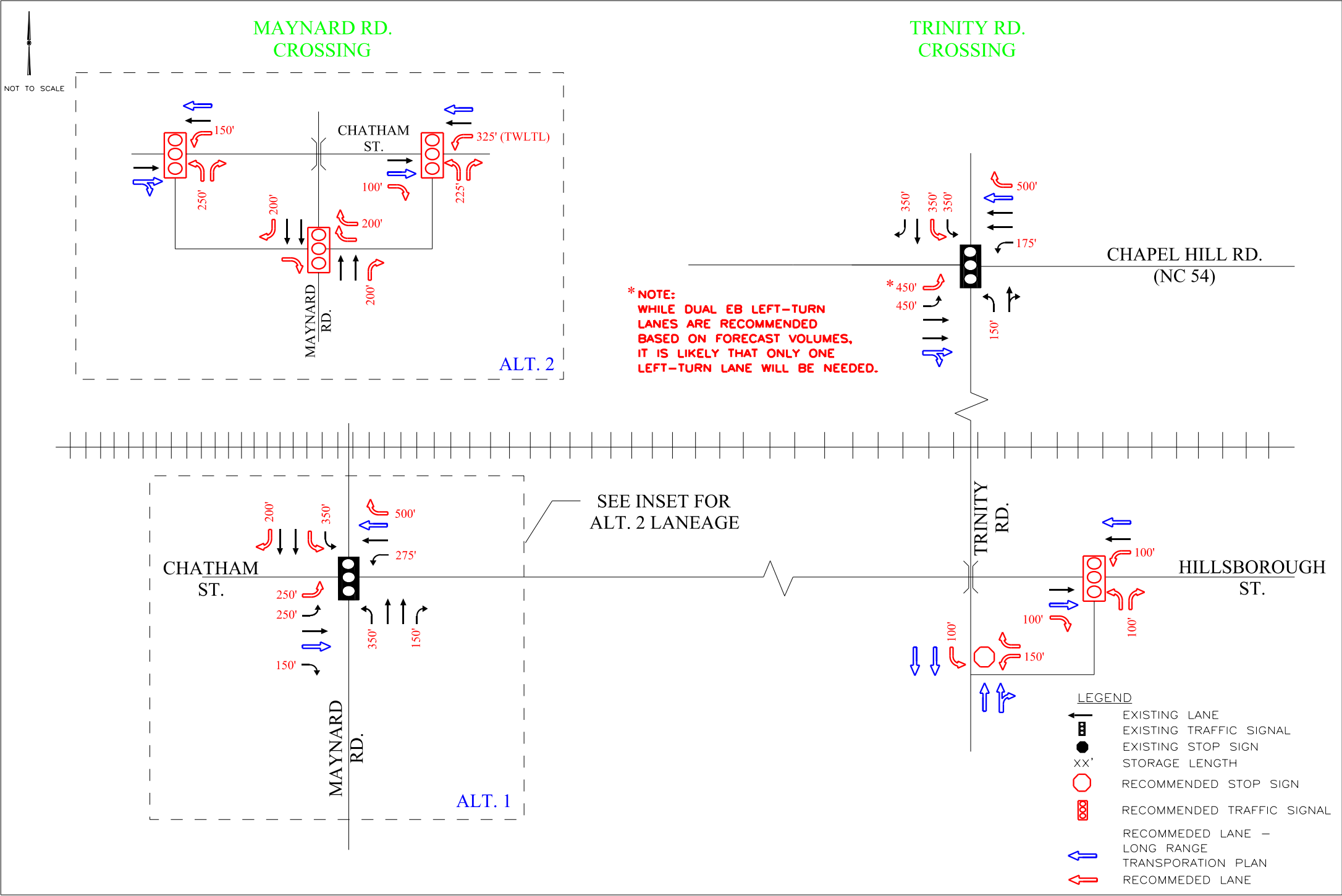


FIGURE 6A

COMMITTED AND RECOMMENDED ROADWAY LANEAGE - SHEET 1 OF 4 MAYNARD RD. & TRINITY RD.

RALEIGH CARY RAIL STUDY TRAFFIC CAPACITY ANALYSIS

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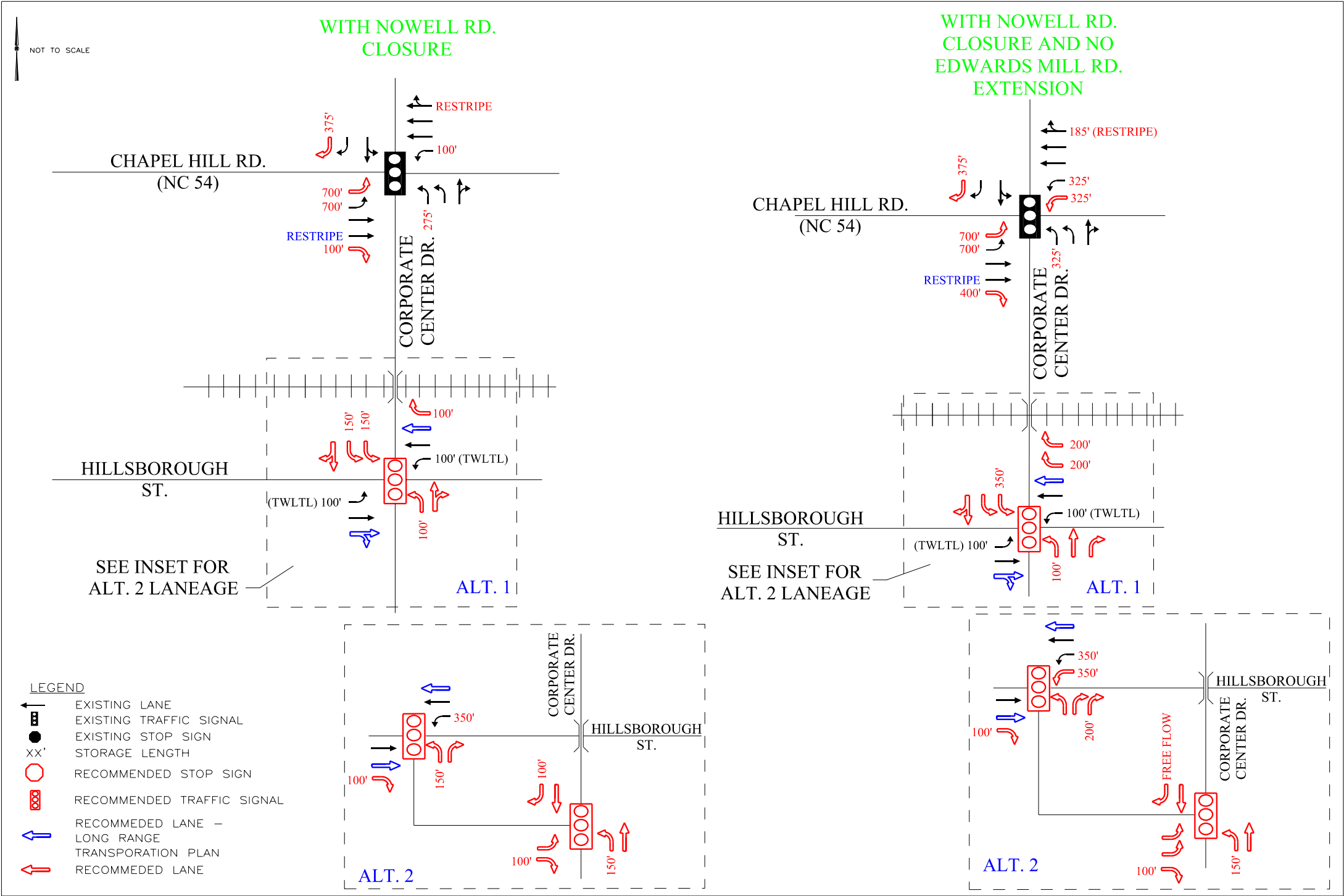


FIGURE 6B

COMMITTED AND RECOMMENDED ROADWAY LANEAGE — SHEET 2 OF 4

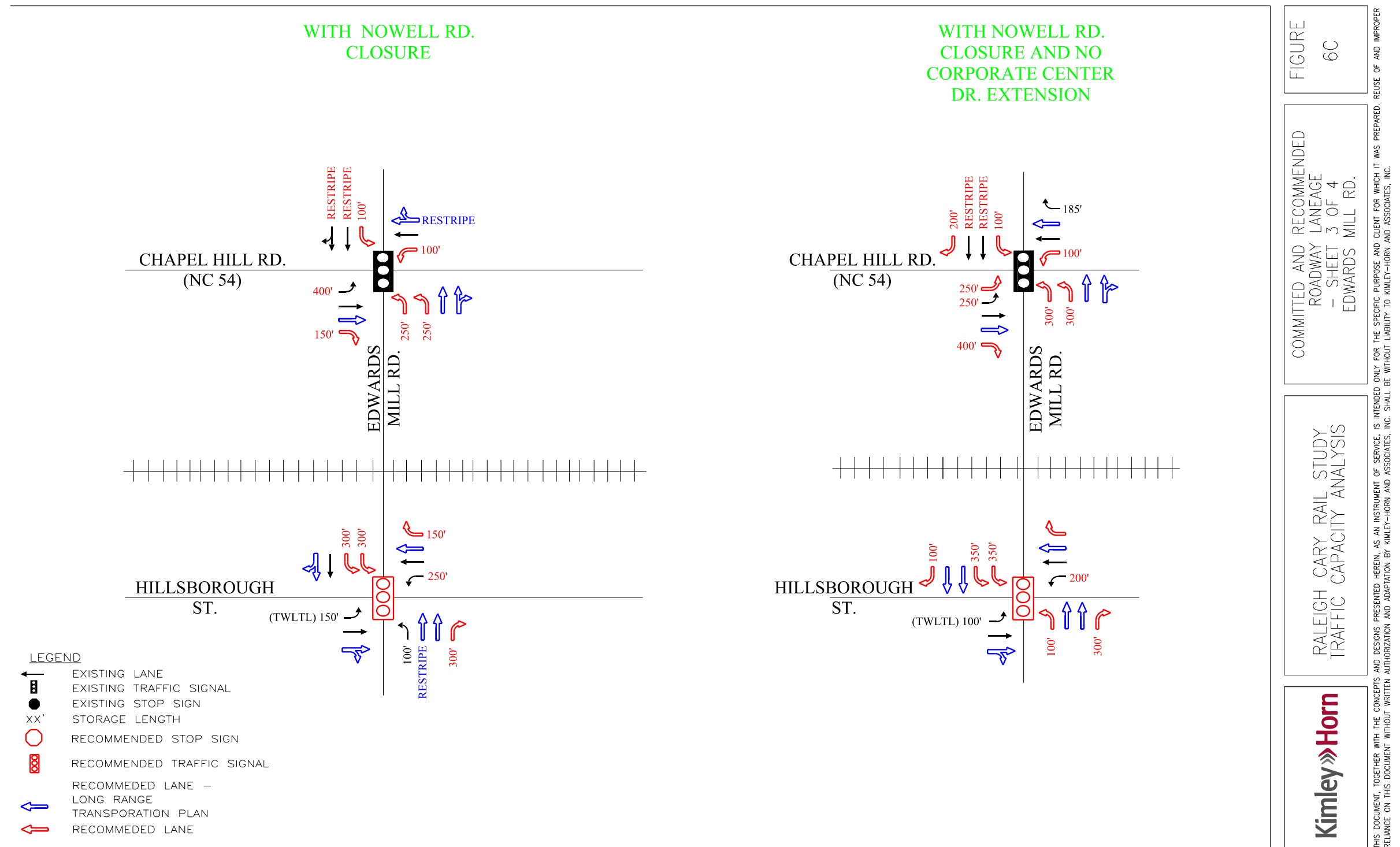
CORPORATE CENTER DR.

RALEIGH-CARY RAIL STUDY TRAFFIC CAPACITY ANALYSIS

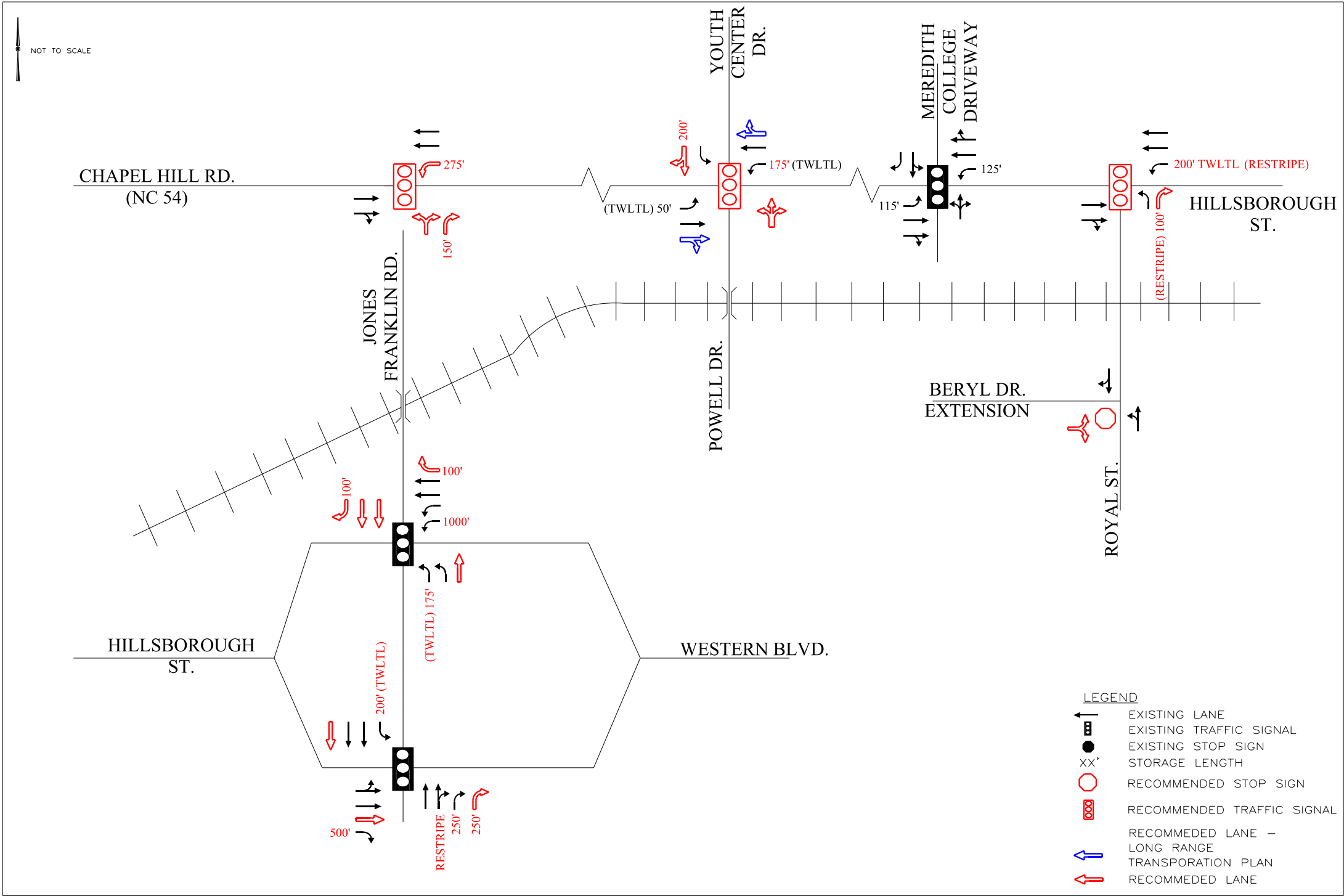
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# Intersection Analysis



## INTERSECTION ANALYSIS — PEDESTRIAN AND BICYCLE IMPROVEMENTS

Targeted improvements to bicycle and pedestrian facilities in the Raleigh-Cary Rail Crossing (RCRX) study area can have a major positive effect on bicycling and walking in the area. They will make the area safer for bicycling and walking, strengthen connections for people traveling on bike or foot, and create an alternative to driving for short trips. This section presents the methodology for scoring bicycle and pedestrian infrastructure, the scores calculated to score the condition of each existing intersection, and how proposed changes will improve the bicycling and walking experience. The following analysis references maps included in the Recommended Improvements section of this report.

### METHODOLOGY

This study looks at intersections within a half-mile radius of five of the most populated rail crossings in the study area:

- » NE Maynard Road
- » Corporate Center Road Extension
- » Jones Franklin Road Extension
- » Powell Drive
- » Beryl Road/Royal Street

The project team scored each intersection on the pedestrian and bicycle facilities currently present. The analysis only considered intersections between two public streets, or a public street and a private street. Cul-de-sacs and dead-end streets were included in the analysis where they served multi-family homes or retail, commercial, industrial, or institutional uses that generate a lot of trips.

Below are the ten categories of components used to score each intersection. The maximum possible score for an intersection is 23.5 points, depending on the number of streets intersecting there. Points can be deducted for design features that are hostile to people traveling by foot or bike, such as overly wide streets with long crossing distances or slip ramps that encourage drivers to make high-speed turns. As a result, lowest possible score is -8 points.



## CATEGORIES

Category	Criteria	Highest possible score
Signal	1 if there's a signal	1
Sidewalks	1 point for each side of each leg	8 (for four-leg intersection)
Crosswalks	1 point for each leg	4 (for four-leg intersection) 3 (for three-leg intersection)
Pedestrian Signals	.5 point if they are present	.5
Curb ramps	.5 point for each corner	2 (for four-leg intersection)
Bike lanes	.5 point for bike lane on each side of each leg .5 point for sharrows on each leg	4 (for four-leg intersection)
Median?	.5 point for each leg	2 (for four-leg intersection)
Slip ramps?	-1 for each slip ramp	0 (for four-leg intersection)
Lanes on major street	1 for 2 lanes or unmarked 0 for 3 lanes -1 for 4 lanes -2 for 5 lanes	1
Lanes on minor street	1 for 2 lanes or unmarked 0 for 3 lanes -1 for 4 lanes -2 for 5 lanes	1
Total		23.5

## PROPOSED IMPROVEMENTS

The project team has recommended several proposals to improve bicycle and pedestrian connections in the study area, including:

- » Sidewalks on both sides of through streets in each crossing area. In low-traffic areas and on residential streets, sidewalks can be 5’ wide; in high-traffic areas and on commercial streets, they should be between 8’ and 10’ wide.
- » Marked, high-visibility crosswalks at all intersections. At long crossings (longer than 45 feet from curb to curb), consider providing median pedestrian refuges.
- » Bicycle lanes on major through streets in each of the crossing areas to eliminate gaps in the bicycle network. Where heavy vehicle traffic is present, buffered bicycle lanes or shared-use paths should be installed to give people traveling by bike a safe, comfortable path away from vehicles.



## CONCLUSION

As shown in the summary tables of each intersection (below), new sidewalks, marked crosswalks, and bicycle lanes provide significant improvements in the pedestrian and bicycle experience at several activity centers within the study area, including:

- » NE Maynard Road between railroad crossing and Sloan Drive
- » Chatham Street between Maynard and Durham roads
- » Jones Franklin Road between Hillsborough Street and Hunt Club Drive
- » Blue Ridge Road between Trinity Road and Faber Road
- » Hillsborough Street between North Carolina State University's main campus and I-440 The intersection of Western Boulevard and Gorman Street
- » Method Road between Beryl Road and Western Boulevard

The Corporate Center Road area would see the greatest improvement in pedestrian and bicycle facilities, with an average 6.64 point increase across all intersections. Improvements that will significantly improve the area's pedestrian and bicycle networks include new sidewalks and crosswalks and a network of bike facilities where none currently exist, increasing connections between neighborhoods and commercial areas.

The next greatest improvements would occur in the Jones Franklin Road and NE Maynard Road areas, with average increases of 6.54 and 6.35 points, respectively. These areas have large activity centers that would attract lots of pedestrians and bicyclists, such as the Chatham Square shopping center at Maynard and Chatham roads, but there are few sidewalks or bike routes around them. New sidewalks, crosswalks, and bike facilities would help reduce barriers to people traveling by foot or bike.

The Beryl Road/Royal Street and Powell Drive areas would see smaller improvements in pedestrian and bicycle infrastructure, with average increases of 4.46 and 3.31 points, respectively. In both areas, most streets already have sidewalks, crosswalks, and curb ramps, and some bicycle facilities are already present.



# INTERSECTION RATINGS

The following is a table of each intersection in the five crossing areas ranked for current pedestrian and bicycle facilities on a 23.5-point scale, as well as a comparison to proposed changes.

## NE Maynard Road Area

Intersection	Existing		Proposed	
	Rating for peds	Rating for bikes	Rating for peds	Rating for bikes
Maynard/Chatham	5	5.5	11	13
Maynard/Chapel Hill	10.5	11.5	10.5	11.5
Maynard/Driveway	4.5	4.5	4.5	4.5
Reedy Creek/Willoughby/Davidson Point	11	11	16	19
Reedy Creek/Branniff	6	6	12	15
Reedy Creek/Chapel Hill	2	2	12	14
Chapel Hill/Sorrell	2	2	11	11
Chapel Hill/Fincastle	8.5	9.5	11.5	12.5
Fincastle/Duxbury	5	5	12	12
Chatham/Lake	7	8	12	13
Chatham/Reedy Creek	5	6	8	9
Lake/Maple	2	2	12	12
Maynard/Reed	5	5	11	11
Maynard/Maple	4	4	9	9
Maynard/Tate	6	6	11	11
Maynard/Apartments	4	4	5	5
York/Tate	2	2	8	8
Reed/Tate (west)	2	2	9	9
Reed/Waco (south)	2	2	11	11
Reed/Tate (east)	2	2	10	10
Reed/Waco (North)	2	2	11	11
Average	4.1	4.2	10.4	11.8



Corporate Center Drive Area

Intersection	Existing		Proposed	
	Rating for peds	Rating for bikes	Rating for peds	Rating for bikes
Chapel Hill/I-40 East ramps	0.5	0.5	5.5	5.5
Chapel Hill/I-40 West ramps	-2.5	-2.5	4.5	4.5
Chapel Hill/Corporate Center	7	7	11	15
Corporate Center/Office Park Entrance	4.5	4.5	8.5	10.5
Corporate Center/Sandwell	8	8	12	14
Corporate Center/Handsworth	12	12	16	18
Sandwell/Nowell	5	5	10	12
Nowell/Nowell Pointe	3.5	3.5	11.5	13.5
Chapel Hill/Nowell	0	0	12	16
Chapel Hill/Germantown	4	4	12	14
Hillsborough/Wolf Green	1.5	1.5	10.5	12.5
Wolf Green/Woodridge	4	4	11	11
Hillsborough/Singleton	1.5	1.5	10.5	10.5
Singleton/Kimbal	2	2	11	11
Singleton/Irelan	2	2	11	11
Hillsborough/Bashford	3.5	3.5	10.5	13.5
Bashford/Spice Ridge	5	5	10	12
Bashford/Myra/Strother	2	2	14	17
Bashford/Angel	2	2	9	11
Bashford/Inona	2	2	11	14
Average	3.3	3.4	10.0	11.8



Jones Franklin Road Area

Intersection	Existing		Proposed	
	Rating for peds	Rating for bikes	Rating for peds	Rating for bikes
Marsh/Merritt	2	2	14	14
Marsh/Dorcas	2	2	14	14
Grand/Dorcas	2	2	11	11
Grand/Hillsborough	1	1	7	9
Marsh/Hillsborough	1	1	7	9
Powell/Hillsborough	1	1	10	12
Beryl/Powell	2	2	10	11
Hillsborough/Chapel Hill	-1.5	-1.5	7.5	7.5
Mount Vernon/Chapel Hill	-0.5	-0.5	6.5	8.5
Chapel Hill/Edwards Mill	4	4.5	10	14
Hillsborough/Etta Burke	5	5	8	11
Hillsborough/Western	6	6	9	12
Western/Carolina	3.5	3.5	12.5	14.5
Western/Grove	3.5	3.5	7.5	9.5
Western/Heather	3.5	3.5	12.5	14.5
Heather/Carolina	2	2	10	10
Carolina/Bradford Pear	2	2	6	6
Western/Powell	6.5	6.5	12.5	14.5
Powell/Powell Townes	3.5	3.5	6.5	6.5
Grove/Linville	2	2	11	11
Grove/Scarlet Maple	3	3	11	11
Western/Hunt Club	1.5	1.5	8.5	10.5
Western/Jones Franklin (eastbound)	8.5	8.5	11.5	15.5
Western/Jones Franklin (westbound)	6	6	13	17
Western/Asbury	3.5	3.5	6.5	8.5
Western/Hillsborough/Burton	1	1	10	13
Hillsborough/Oakdale	2.5	2.5	10.5	12.5
Oakdale/Waycross	5	5	12	12
Jones Franklin/Buck Jones	9.5	9.5	9.5	12.5
Jones Franklin/Hunt Club	3.5	3.5	7.5	9.5
Buck Jones/Xebec/Fieldspring	4.5	4.5	11.5	13.5
Buck Jones/Wilmot	2	2	11	13
Jones Franklin/Bluebird	4	4	10	12
Jones Franklin/Vann	4.5	4.5	12.5	14.5
Average	2.9	3.0	9.4	11.2



Powell Drive Area

Intersection	Existing		Proposed	
	Rating for peds	Rating for bikes	Rating for peds	Rating for bikes
Blue Ridge/Beryl	2.5	2.5	7.5	9.5
Blue Ridge/Hillsborough	3	3.5	9	13
Blue Ridge/Trinity	2.5	2.5	7.5	10.5
Hillsborough/William Moore	-1.5	-1.5	4.5	6.5
Hillsborough/Youth Center	1	1	10	13
Hillsborough/Linda Murphy	-1	-1	5	7
Beryl/Pylon	4.5	4.5	7.5	8.5
Pylon/Uwharrie	2	2	10	11
Blue Ridge/Pylon	2	3	10	14
Pylon/Hutton	2	2	11	13
Blue Ridge/Hutton	2	3	9	12
Blue Ridge/Faber	2	3	8	10
Blue Ridge/Crimson Cross	4.5	5.5	6.5	8.5
Gannett/Faber	2	2	8	8
Gannett/Crockett	2	2	11	11
Average	6.0	6.3	10.5	11.4

Beryl Road/Royal Street Area

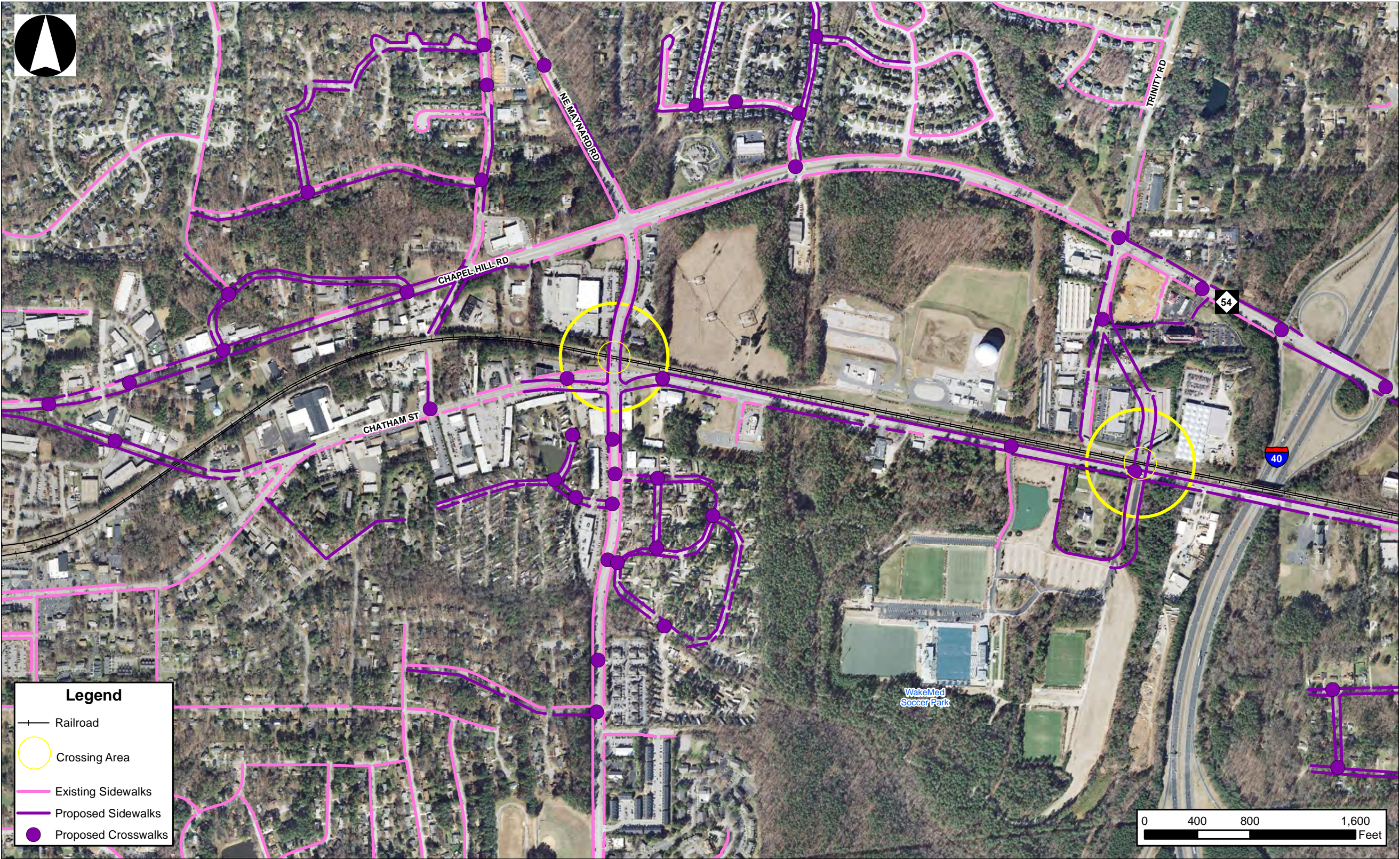
Intersection	Existing		Proposed	
	Rating for peds	Rating for bikes	Rating for peds	Rating for bikes
Hillsborough/Faircloth/Gorman	10.5	10.5	12.5	14.5
Hillsborough/Royal	2.5	3	6.5	9.5
Hillsborough/Meredith College	4.5	5	4.5	6.5
Hillsborough/Beryl	-1.5	-1.5	0	0
Royal/Neil	3.5	3.5	8.5	10.5
Neil/Elizabeth (north)	2	2	10	10
Neil/Elizabeth (south)	2	2	5	5
Hillsborough/Elizabeth	4	4	5	7
Hillsborough/Montgomery	7	7	7	9
Hillsborough/Turner	4	4	6	8
Hillsborough/Furches	7	7	10	12
Hillsborough/Henderson	7	7	11	13
Hillsborough/Stanhope	7	7	7	9
Hillsborough/Shepherd/Rosemary	12.5	12.5	15.5	17.5
Hillsborough/Concord	7	7	8	10
Hillsborough/Daisy	7	7	11	13
Hillsborough/McKnight	4	4	4	4
Faircloth/Clark	7	7.5	8	8.5
Faircloth/Ruffin	6	6.5	8	8.5
Faircloth/Furches	5	5.5	7	7.5
Montgomery/Clark	12	13	16	17
Montgomery/Ruffin	9.5	9.5	12.5	12.5
Furches/Hall	9.5	9.5	9.5	9.5
Furches/Clark	11	11.5	15	15.5
Furches/Merriman	11	11	15	15
Furches/Ruffin	12	12	16	16
Ruffin/Stacy	7	7	10	10
Taylor/Bedford	7	7	12	12
Merriman/Taylor/Pollock	7	7	11	11
Henderson/Clark	9.5	10	12.5	13
Shepherd/Clark	11	11.5	16	16.5
Daisy/Clark	4	4.5	11	11.5
Beryl/Cul-de-sac	2	2	4	6
Method/Woods	9	9	13	13



Intersection	Existing		Proposed	
	Rating for peds	Rating for bikes	Rating for peds	Rating for bikes
Method/Wilder	10	10	12	12
Woods/Atwarter	3	3	11	11
Royal/Woods	2	2	11	11
Royal/O’Kelly	2	2	11	11
O’Kelly/Atwater	2	2	11	11
Atwater/Ligon	2	2	11	11
O’Kelly/Ligon	2	2	10	10
Gorman/Ligon	12.5	12.5	15.5	16.5
Gorman/Jackson/Wolf Village	12	12	11	11
Gorman/Lexington	7	7	11	11
Gorman/Faucette	8	8	8	9
Gorman/Western	11.5	11.5	12.5	13.5
Jackson/Whitmore	4	4	8	8
Lexington/Whitmore	3.5	3.5	13.5	13.5
Western/Whitmore/Clanton	11.5	11.5	11.5	11.5
Varsity/Wolf Village	8.5	9.5	9.5	11.5
Varsity/Sullivan	17	19	17	20
Varsity/Thurman	7	7	7	7
Sullivan/Motor Pool	12	12	13	15
Average	6.9	7.1	10.2	11.1



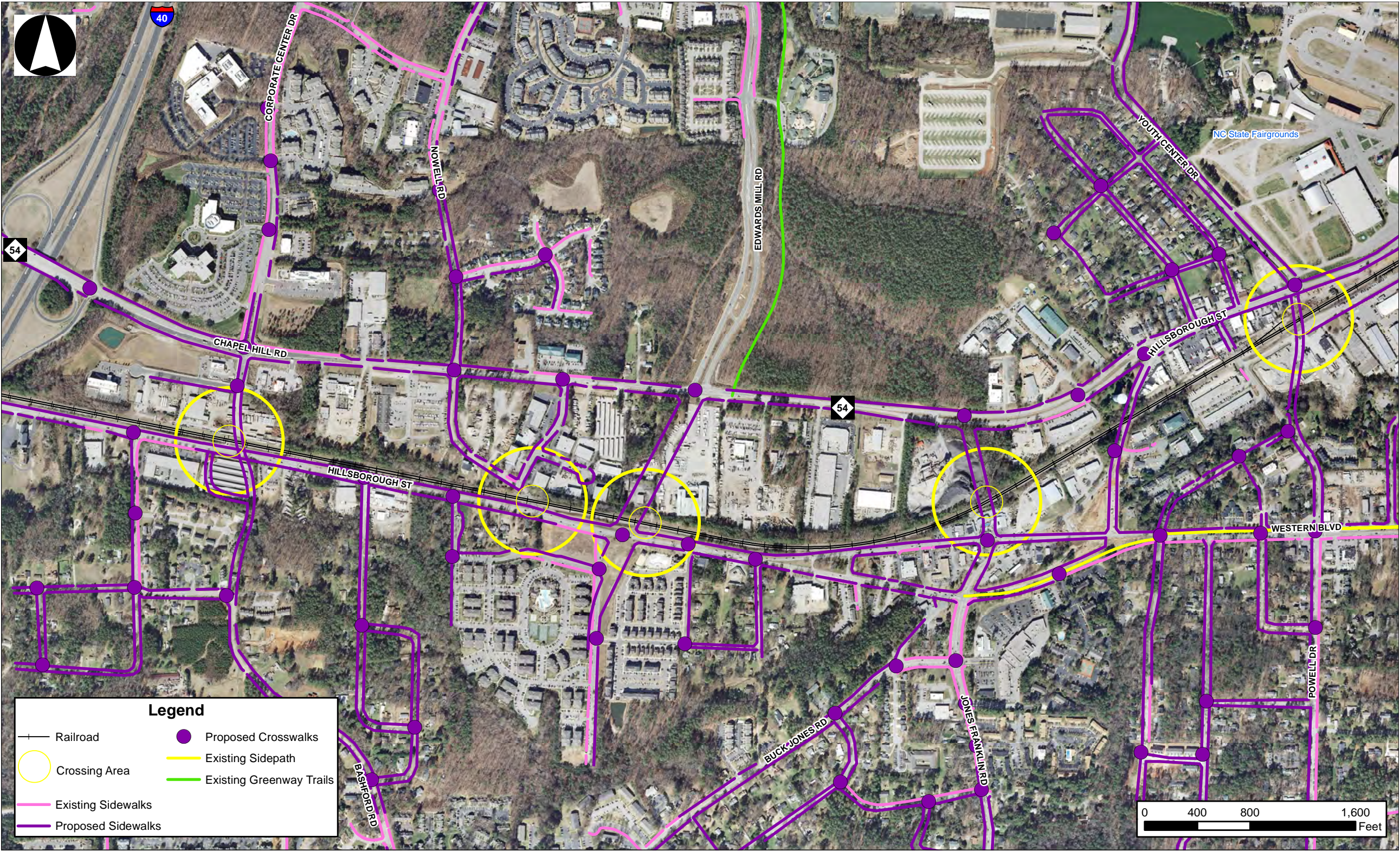
Proposed  
Sidewalk  
Infrastructure  
  
NE Maynard Road  
Trinity Road





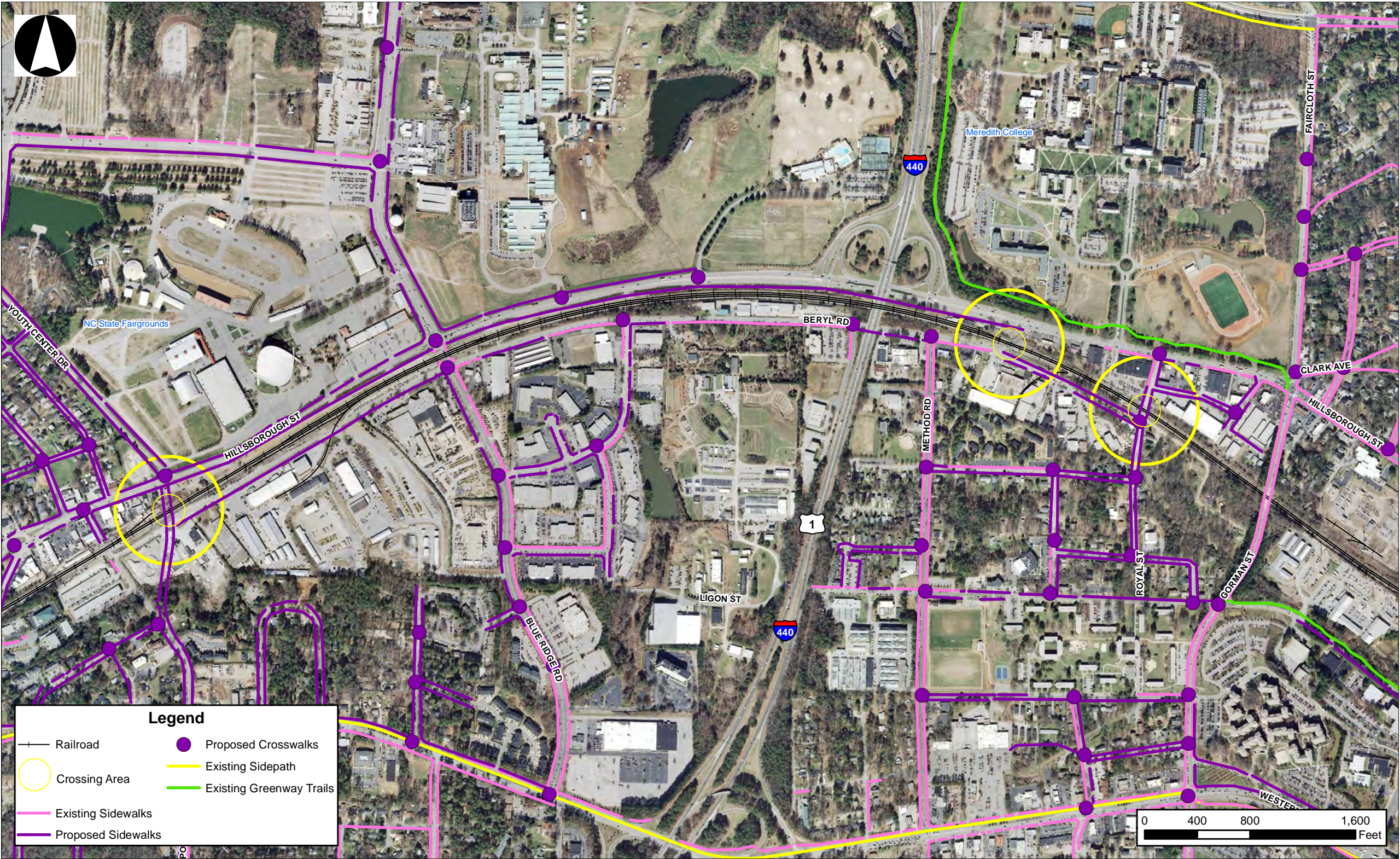
Proposed  
Sidewalk  
Infrastructure

Corporate Center Dr  
Nowell Rd  
Edwards Mill Rd  
Jones Franklin Rd  
Powell Dr





Proposed  
Sidewalk  
Infrastructure  
  
Beryl Road  
Royal Street





# Cost/Benefit Analysis

A cost/benefit analysis was performed for each recommended alternative using GradeDec.net, a web-based decision support tool developed by FRA to evaluate the benefits and costs of highway/rail grade crossing upgrades, separations, and closures. This analysis focuses on rail-based benefits and costs only, and does not incorporate highway-based benefits and costs.

The analysis provides tables and graphs that provide information for use in evaluating potential crossing improvements.

The following table summarizes the results of the GradeDec analysis for each recommended alternative.

GradeDec Cost/Benefit Analysis Results

Road	Benefit-Cost Ratio	Safety Improvements (reduction in collisions per year)			
		Fatal	Injury	PDO*	Total
Maynard Rd	0.092	0.002	0.003	0.006	0.010
Trinity Rd	0.085	0.002	0.005	0.014	0.021
Nowell Rd	0.090	0.003	0.007	0.018	0.029
Powell Dr	0.084	0.002	0.004	0.011	0.0173
Beryl Rd/ Royal St	29.84	0.003	0.007	0.017	0.027

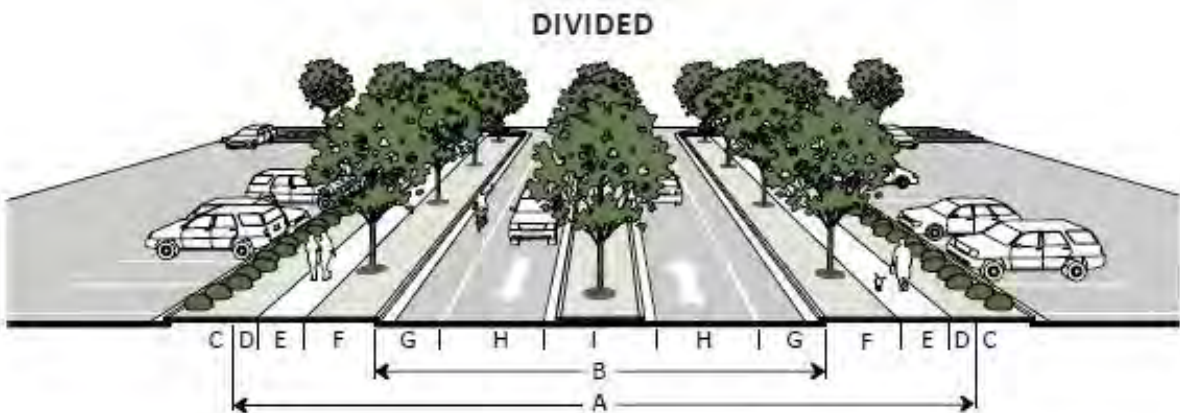
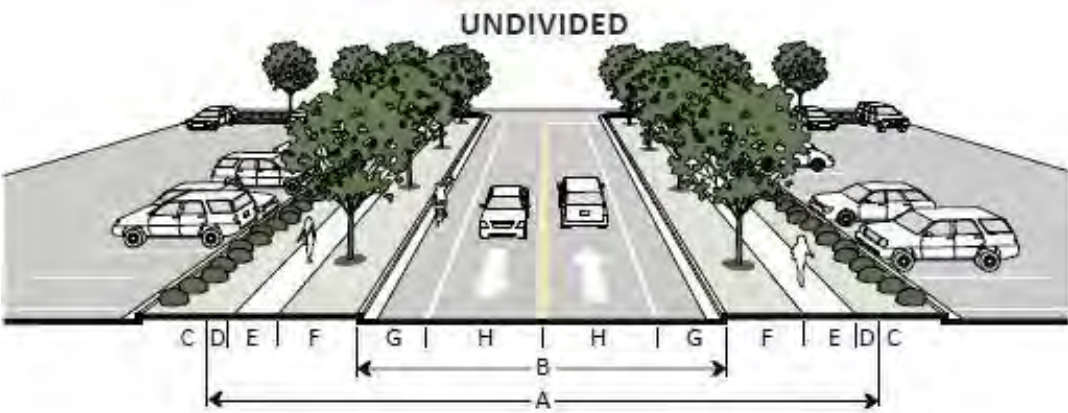
\* PDO = property damage only



# Typical Sections

Raleigh  
Typical  
Sections

2-Lane Avenue



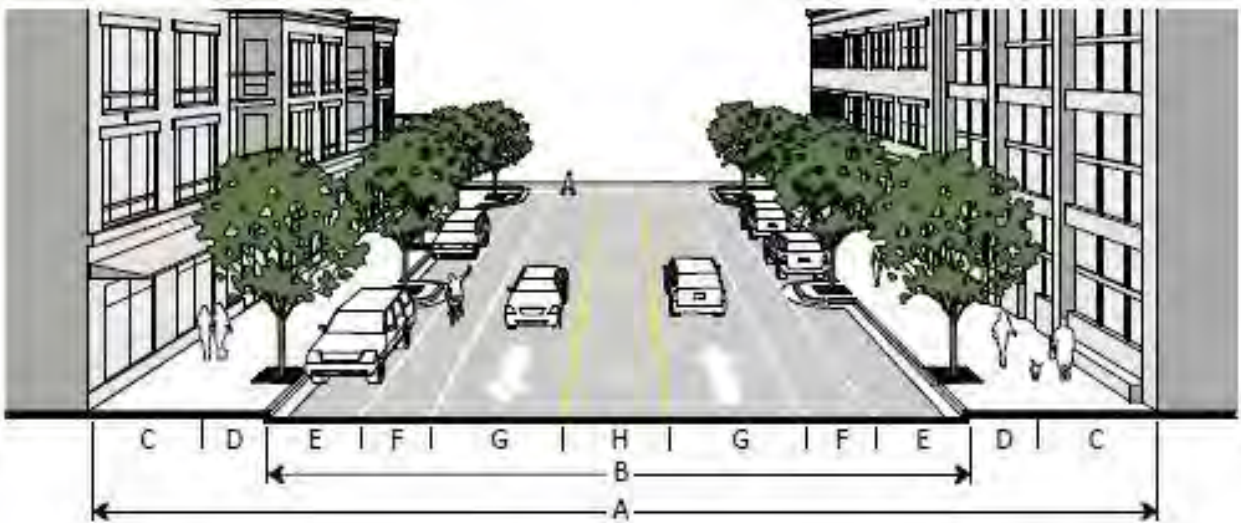
	Undivided	Divided
<b>Width</b>		
A Right-of-way width	64'	—
With center turn lane	—	75'
With median	—	79'
B Back-of-curb to back-of-curb	36'	—
With center turn lane	—	48'
With median	—	52'
<b>Streetscape</b>		
C Utility placement, easement (min)	5'	5'
D Maintenance strip (min)	2'	2'
E Sidewalk (min)	6'	6'
F Planting area (min)	6'	6'
<b>Travelway</b>		
G Bike lane	7'	7.5'
H Travel lane	11'	11'
I Center lane	—	—
Striped turn lane	—	11'
Median	—	15'
<b>General</b>		
Walkway type	Sidewalk	Sidewalk
Planting type	Tree lawn	Tree lawn
Tree spacing	40' o.c. avg	40' o.c. avg

<b>Engineering Specifications</b>	
Design Speed (mph)	30 mph (Undivided) 35 mph (Divided)
Design Vehicle	WB-40
Signalized Intersection Density	As warranted
Driveway Spacing	> 100' apart
Median Opening Distance	> 200' apart
Partial Medians/Island	No
Curb Radii	15'
Lighting	Required on all public streets for new development, pedestrian scale optional and responsibility of developer
Permitted Furniture	Bicycle racks, benches, parking meters, shelters



Raleigh  
Typical  
Sections

3-Lane Undivided Avenue with Parallel Parking

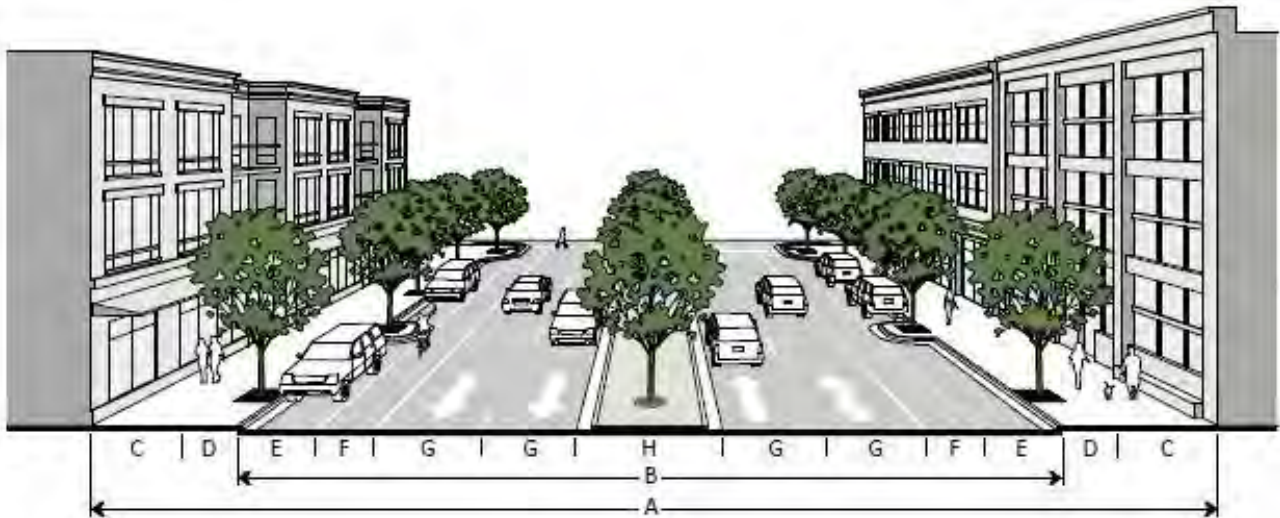


Width	
A Right-of-way width	
With center turn lane	90'
With median	94'
B Back-of-curb to back-of-curb	
With center turn lane	62'
With median	66'
Streetscape	
C Sidewalk (min)	8'
D Planting area (min)	6'
Travelway	
E Parallel parking lane	8.5'
F Bike lane	6'
G Travel lane	11'
H Center lane	
Striped turn lane	11'
Median	15'
General	
Walkway type	Sidewalk
Planting type	Tree grate / lawn
Tree spacing	40' o.c. avg
Parking type	Parallel

Engineering Specifications	
Design Speed (mph)	40 mph
Design Vehicle	WB-40
Signalized Intersection Density	As warranted
Driveway Spacing	> 100' apart
Median Opening Distance	> 200' apart
Partial Medians/Island	Yes
Curb Radii	10'
Lighting	Required on all public streets for new development, pedestrian scale optional and responsibility of developer
Permitted Furniture	Bicycle racks, benches, parking meters, shelters,

Raleigh  
Typical  
Sections

4 Lane Divided Avenue with Parallel Parking



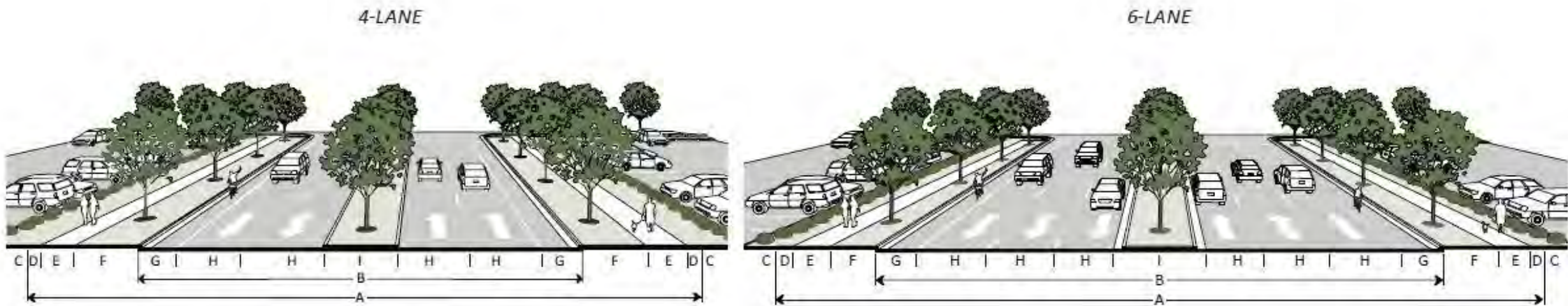
Width	
A Right-of-way width	122'
B Back-of-curb to back-of-curb	90'
Streetscape	
C Sidewalk (min)	10'
D Planting area (min)	6'
Travelway	
E Parallel parking lane	8.5'
F Bike lane	6'
G Travel lane	11'
H Median	17'
General	
Walkway type	Sidewalk
Planting type	Tree grate / lawn
Tree spacing	40' o.c. avg
Parking type	Parallel

Engineering Specifications	
Design Speed (mph)	40 mph
Design Vehicle	WB-40
Signalized Intersection Density	As warranted
Driveway Spacing	200' min
Median Opening Distance	200' min. (may be increased to accommodate a turn lane providing necessary storage length and appropriate taper)
Partial Medians/Island	Yes
Curb Radii	15'
Lighting	Required on all public streets for new development, pedestrian scale optional and responsibility of developer
Permitted Furniture	Bicycle racks, benches, parking meters, shelters,



Raleigh  
Typical  
Sections

4 and 6 Lane Divided Avenue with Landscaped Median

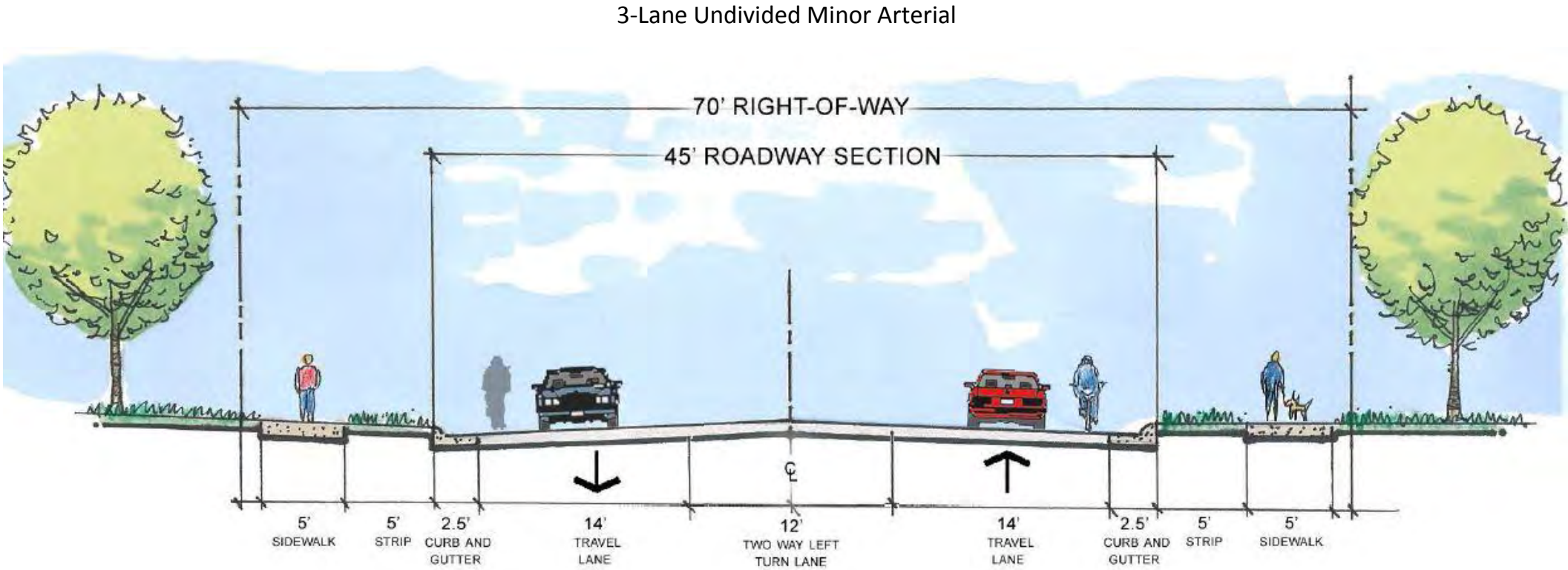
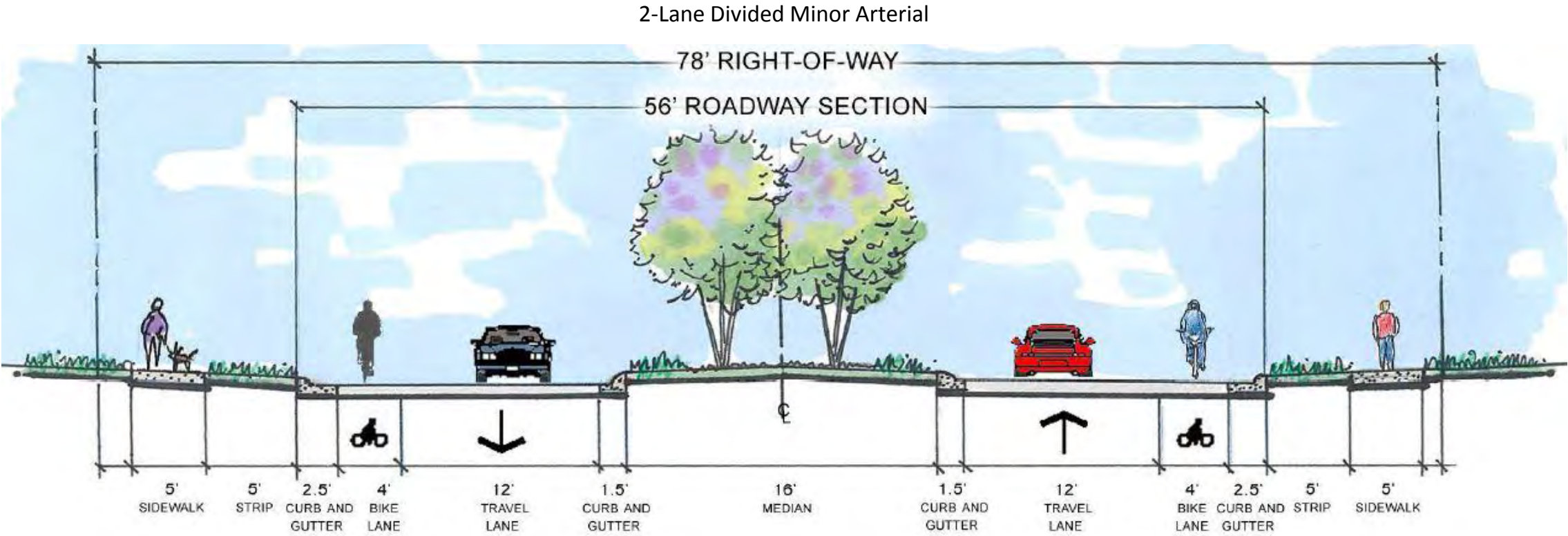


	4-Lane	6-Lane
<b>Width</b>		
A Right-of-way width	104'	126'
B Back-of-curb to back-of-curb	76'	98'
<b>Streetscape</b>		
C Utility placement, easement (min)	5'	5'
D Maintenance strip (min)	2'	2'
E Sidewalk (min)	6'	6'
F Planting area (min)	6'	6'
<b>Travelway</b>		
G Bike lane	7.5'	7.5'
H Travel lane	11'	11'
I Median	17'	17'
<b>General</b>		
Walkway type	Sidewalk	Sidewalk
Planting type	Tree grate / lawn	Tree grate / lawn
Tree spacing	40' o.c. avg	40' o.c. avg

<b>Engineering Specifications</b>	
Design Speed (mph)	40 mph (4 Lane), 50 mph (6 Lane)
Design Vehicle	WB-40
Signalized Intersection Density	As warranted
Driveway Spacing	> 200'
Median Opening Distance	Only at intersections
Partial Medians/Island	Yes
Curb Radii	20'
Lighting	Required on all public streets for new development, pedestrian scale optional and responsibility of developer
Permitted Furniture	Benches, shelters,



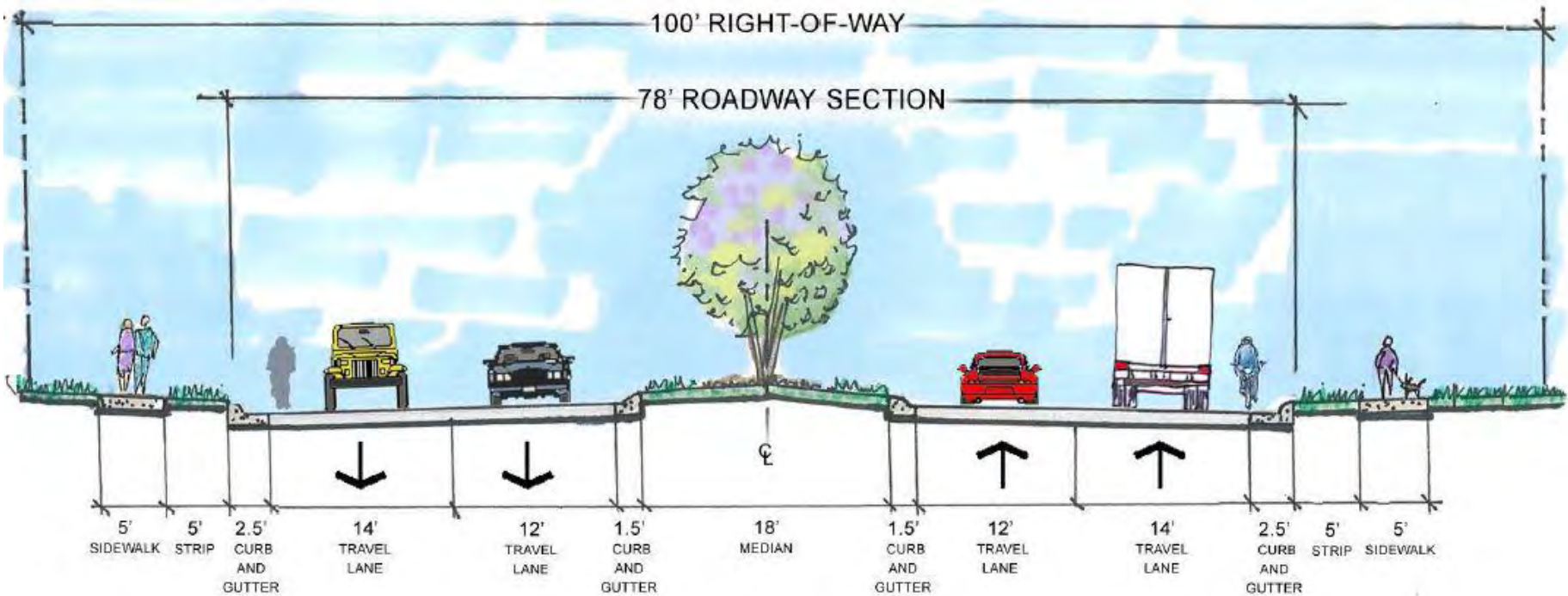
Cary  
Typical  
Sections



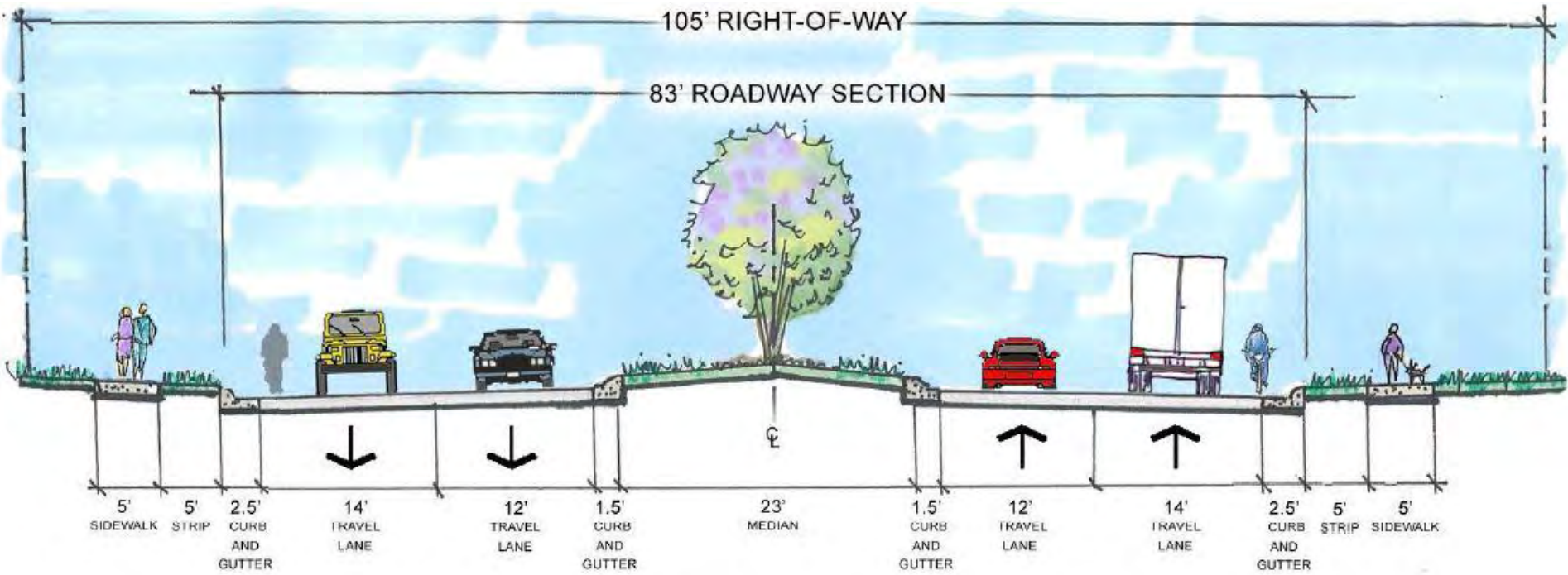


Cary  
Typical  
Sections

4-Lane Divided Major Arterial with 18 Foot Median



4-Lane Divided Major Arterial with 23 Foot Median





Cary  
Typical  
Sections

5-Lane Undivided Major Arterial

