



# Traveling to Work in Wake: EXPLORING THE COMMUTER RAIL OPTION

## STUDY HIGHLIGHTS

Conducted by:  
Center for Urban Affairs & Community  
Services NC State University  
June 2016

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## *Background*

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Commuter rail offers a viable form of transit in metropolitan areas where commuters travel to work at consistent times each day. Commuter rail is particularly suited to areas characterized by urban sprawl. Compared with light rail, commuter rail spans greater distances, serves fewer stations, and utilizes heavier rail cars. Commuter rail runs on existing tracks or requires the addition of tracks tangential to existing tracks. Service is typically every 30 to 60 minutes during peak travel hours; trains travel on average at a speed of 30 to 50 miles per hour with a maximum speed of 79.<sup>17</sup>

This summary highlights key findings of a study exploring the viability of commuter rail in the Wake County, North Carolina area. The study was conducted in 2016 by the Center for Urban Affairs and Community Services at NC State University on behalf of the North Carolina Department of Transportation (NCDOT), Rail Division. The full report<sup>†</sup> explores sociodemographic, transportation, and railway characteristics that may impact plans for development of commuter rail in the Wake County area. The report presents general information to inform the debate concerning transit alternatives and the feasibility of commuter rail as a means of increasing capacity in and around the Raleigh-Wake County area.

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## *Characteristics of the Study Area*

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The study area included Wake County, northern Johnston County, and southeastern Durham County. All three counties are growing rapidly and have seen tremendous increases in both population and traffic in recent years.

- ✚ **POPULATION GROWTH:** Wake County's 2010 population was 900,993. By July 1, 2015, the county's estimated population was 1,024,198, representing a 13.7% increase.<sup>21</sup> Comparable 2015 population estimates for Durham and Johnston counties are 300,952 and 185,660, respectively.
- ✚ **URBAN SPRAWL:** The Triangle region of North Carolina is characterized by urban sprawl, which leads to dependency on the single-occupant vehicle, congestion, and pollution due to CO emissions.<sup>1,7,15</sup> Such a sprawling pattern has been identified as compatible with commuter rail. In sprawling metropolitan areas, commuter rail can link suburbs to central urban centers. In these areas, commuter rail is also seen as a means of reduction of environmental problems associated with transportation.<sup>4</sup>
- ✚ **CROSSOVER EMPLOYMENT:** The sprawling land use pattern, coupled with job location, has led to crossover trips among workers in Wake, Durham, and surrounding counties. In 2014, 258,585 persons traveled into Wake County for work related to their primary jobs and 152,279 traveled out of the County.<sup>11</sup>

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<sup>†</sup> The full report is available from NCDOT: <https://connect.ncdot.gov/resources/Pages/Rail-Division-Resources.aspx>

## Characteristics of the Study Area

- ✚ **TRAFFIC DENSITY:** Employment crossover has led to increased traffic density in the area. The Wake County portion of I-40 sees an annual average daily traffic count (AADT) of 116,353. The most congested segments of this route fall between Exits 285 and 287 (Aviation Parkway and Harrison Avenue) with an AADT of 162,000, followed by the segment between Exits 287 and 289 (Harrison Avenue and Wade Avenue) at 157,000 AADT.<sup>14</sup>

## Catchment Areas and Potential Service Areas

Nine study sites in and near Wake County were examined based on population and employment characteristics, traffic patterns, and railway infrastructure. Three study sites—Raleigh, Durham, and Cary—have existing train stations with passenger service. The station locations were used as the center point for creating potential commuter rail catchment areas.

Six study sites—Wake Forest, Knightdale, Garner, Clayton, Fuquay-Varina, and Apex—do not have passenger service but employment characteristics and traffic patterns suggest that they might serve as trip origin points for commuter rail. These communities are referred to in this summary as “potential commuter rail service areas.” Work-related traffic largely flows into Raleigh from these outlying communities (inflow) but flows in both directions between Raleigh, Cary, and Durham (inflow and outflow). A five-mile radius was used to delineate both catchment areas and potential service areas, utilizing a center point based on the location of existing or former train stations in each community.<sup>2</sup>

## Key Features of Catchment Areas

**RALEIGH:** As of 2014, there were a total of 323,609 primary job in Raleigh. Of these, 85,429 workers lived and worked in Raleigh.<sup>20</sup>

- ✚ **Worker Inflow:** A total of 238,180 workers traveled to Raleigh from surrounding municipalities and other locations, representing almost three quarters of Raleigh jobs.
- ✚ **Worker Outflow:** A total of 97,243 Raleigh workers (over half) traveled outside the city for work related to their primary jobs.
- ✚ **Primary Place Types Surrounding the Raleigh Train Station:** Future land-use patterns (referred to as Place-Types<sup>10</sup>) projected for the area near Raleigh Union Station include an array of pedestrian-friendly and diverse uses, including Metropolitan Center, Urban Neighborhood, and Suburban Office Center.<sup>10</sup> Such mixed-use land development patterns tend to support and promote transit use.<sup>2</sup>



RALEIGH UNION STATION

**CARY:** In 2014, Cary was the center for 78,003 primary jobs. A total of 13,511 Cary workers both lived and worked in Cary.<sup>20</sup>

- ✚ **Worker Inflow:** In 2014, 64,492 non-residents traveled to Cary for work.
- ✚ **Worker Outflow:** Among Cary residents, 55,836 traveled out of the city for work.

- ✚ **Primary Place-Types Surrounding the Cary Train Station:** The predominant projected land-use pattern, or Place Type, immediately surrounding Cary Station is Town Center. This pattern is defined by a pedestrian- and transit-friendly development layout with a variety of residential and non-residential buildings. The Cary catchment area is also projected to support the Urban Neighborhood Place Type, characterized by a mix of small-lot homes, condominiums, townhouses, and apartments, providing a base of potential transit riders.



CARY STATION

**DURHAM:** In 2014 Durham was the site of 149,645 primary jobs. A total of 45,139 Durham residents also worked in Durham.<sup>20</sup>

- ✚ **Worker Inflow:** A total of 104,506 workers traveled to Durham for work in 2014.
- ✚ **Worker Outflow:** Among working residents, 55,185 traveled out of the City for work.

- ✚ **Primary Place-Types Surrounding the Durham Train Station:** The predominant projected land-use patterns surrounding the Durham Station are similar to those in downtown Raleigh and include Mixed-Use areas, Metropolitan Center, and Civic and Institutional areas. Downtown Durham also contains a significant amount of land devoted to Transit-Oriented Development.



DURHAM STATION

## RESEARCH TRIANGLE PARK AS AN EMPLOYMENT DESTINATION

Research Triangle Park (RTP) is North America's largest high technology research park, home to over 170 firms in 2015.<sup>6</sup> Primary access to RTP is via Interstate 40 between Raleigh and Durham.



I-40 DURING PEAK HOUR







RTP boundaries intersect Morrisville and Cary and Wake County outside the boundaries of a municipality, with the greatest portion of RTP falling within Durham County. RTP is bounded on each side by railroads running between Wake and Durham Counties. The greatest number of local RTP workers live in Raleigh (5,493), Cary (4,982), and Durham (3,410).<sup>20</sup> AADT in the RTP area is among the highest traffic density rates in the Raleigh-Durham MSA. In 2014, AADT between Wade Avenue and I-540 access near RTP was approximately 153,000.<sup>14</sup>

## Key Features of Potential Service Areas

Although the six potential service areas do not have existing train stations, they once hosted operative train stations in their downtown areas. Similar to other locations across the country, these communities discontinued their passenger service with the advent of highway transportation and the emerging dominance of the automobile.<sup>3</sup>

Today, the majority of workers in these municipalities are employed out of town and many commute along densely traveled highways—typically to Raleigh and frequently to Cary or Durham (including RTP). The Wake Forest to Raleigh drive via Capital Boulevard represents one of the slower and most over-taxed corridors traveled by local workers coming into Raleigh.

**Table 1. Location of Employment among Workers Residing in Potential Commuter Rail Service Areas.**

Potential Service Area	Location of Employment				
	City of Residence	Raleigh	Cary	Durham	Other Locations
 Wake Forest	884	5,344	830	1,240	5,639
 Knightdale	190	2,744	436	475	2,211
 Garner	741	5,174	1,037	731	5,229
 Clayton	461	2,559	430	379	3,915
 Fuquay-Varina	642	2,452	1,144	608	4,471
 Apex	1,370	4,986	3,323	2,345	8,279

## Rail Infrastructure in the Study Area

Development of commuter rail must take into account a variety of factors. Agreements must be reached among railway owners and operators and issues pertaining to liability for accidents must be resolved. Suitability of existing rail corridors for the addition of commuter trains must be confirmed. Likewise, safety concerns related to railroad crossings must be considered. The need for addition of parallel tracks where freight and commuter trains can pass must be assessed in relation to the need for managing schedules among trains. Current and impending improvements to rail corridors and/or highways will further impact plans for commuter rail.

Table 2 identifies six local rail corridors that connect the previously discussed catchment and service areas. These corridors represent sections of statewide corridors running east-west and north-south. Each corridor shown in the table is labeled in relation to its path to Raleigh Union Station, which is treated as the hub for railways in this study. The table highlights key aspects of the corridors that may impact possible future development of commuter rail and also identifies highways typically used for travel to Raleigh in the absence of commuter rail.

The only corridor with more than one continuous track runs from Cary to Raleigh and is owned by NCRR. This section of track is approximately 8.16 miles long and is part of the Durham-RTP-Cary to Raleigh corridor and the Apex-Cary to Raleigh corridor. This section and has three passing sidings—extra tracks that allow trains to pass one another—and currently provides the greatest opportunity for freight and commuter trains to share rail corridor space.

The Clayton-Garner to Raleigh corridor also provides three passing sidings offering a total of approximately 4.5 miles of siding space. Knightdale to Raleigh and Fuquay-Varina to Raleigh each have one passing siding and Wake Forest to Raleigh has no passing sidings.

The number of open (in use) crossings in the area ranges from twenty-six to forty-six. The number of at-grade open crossings ranges from thirteen along the Clayton-Garner to Raleigh corridor to twenty-six along the Durham-RTP-Cary to Raleigh corridor.

**Table 2. Characteristics of Rail Corridors Leading into Raleigh.**

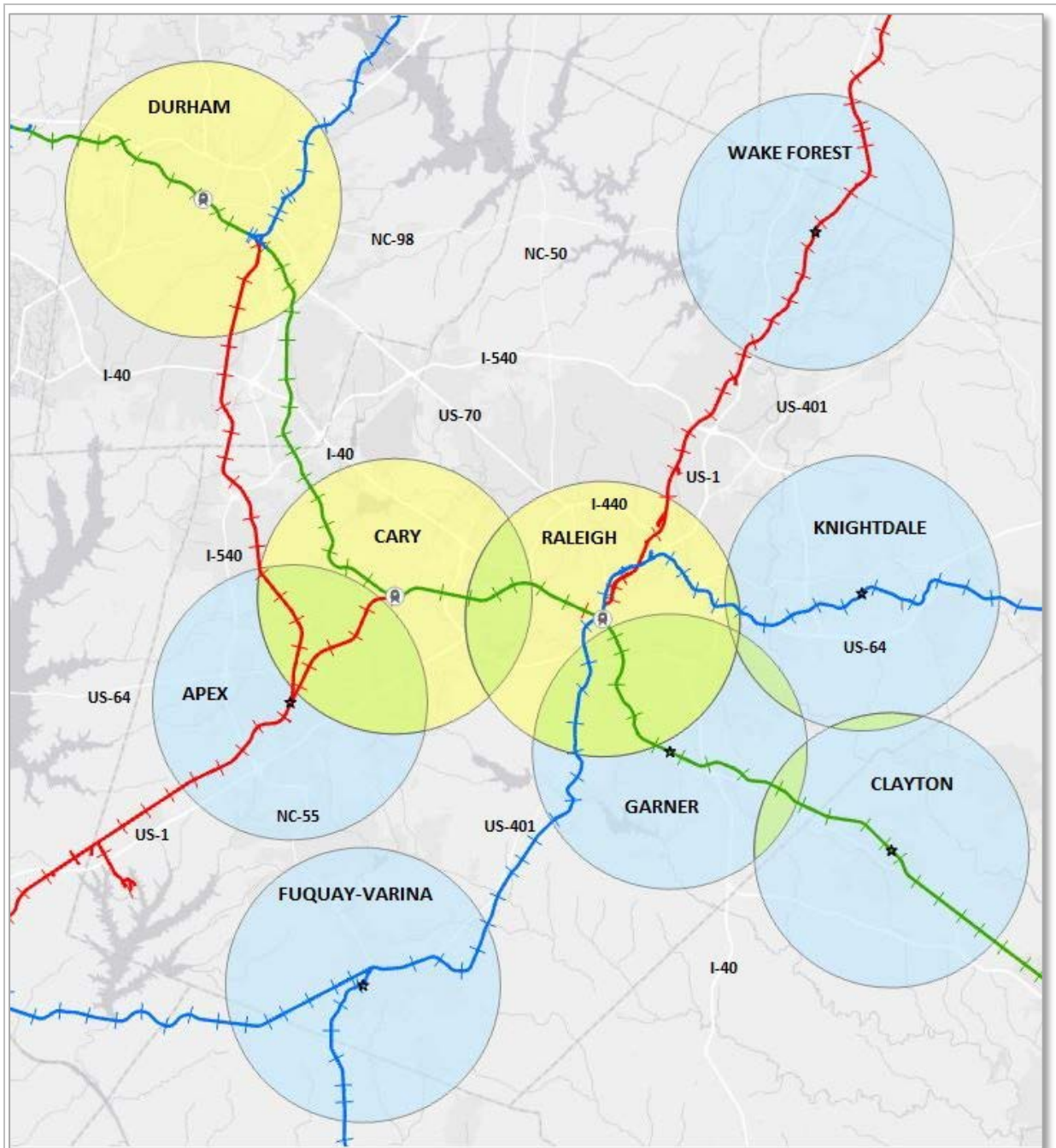
Corridor Characteristic	Study Area Rail Corridor					
	Wake Forest to Raleigh	Knightdale to Raleigh	Clayton-Garner to Raleigh	Fuquay-Varina to Raleigh	Apex-Cary to Raleigh	Durham-RTP-Cary to Raleigh
Total Miles in Corridor	16.9	12.5	15.2	19.5	13.96	26.16
Maximum Number Continuous Tracks	1	1	1	1	2	2
Number of Miles with 1 Track	16.9	12.5	15.2	19.5	5.80	18.00
Number of Miles with 2 Tracks	0	0	0	0	8.16 (Cary to Raleigh)	8.16 (Cary to Raleigh)
Number of Passing Sidings	0	1	3	1	3	3
Rail Yard between Origin Point and Raleigh Union Station	Yes (Raleigh)	Yes (Raleigh)	No	No	No	Yes (Durham)
Total Number of Open Crossings / At-Grade Crossings	33 / 18	33 /15	28 /13	37 /25	26 /20	46/26
Station to Station Main Route	US 1 South, Capital Blvd.	US 64 West	US 70 West, I-40 West	US 401North, Wilmington St.	US 1 North, Hillsborough St.	NC 147, I-40, Chatham St, Hillsborough St.

*Sources:*

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Figure 1 shows the rail corridors of interest, including corridor ownership and parallel highways. Catchment areas and potential services areas with overlapping boundaries in the five-mile radius are also shown in the map.

**Figure 1. Catchment and Service Areas, Rail Corridors with Ownership, and Parallel Highways.**



**Legend**

Catchment Area with Existing Train Station	Potential Commuter Rail Service Area	Overlapping Catchments and/or Service Areas
Norfolk Southern	CSX	NCRN, Operated by Norfolk Southern

Source: NCDOT 2016



## *Implications for Wake County*

Travel by rail was common in Wake County's past but the advent of the automobile led to the ultimate demise of local rail travel. Similarly for the state as a whole, changes in travel mode led to the eventual destruction of over 85 percent of North Carolina railroad stations.<sup>19</sup>

The extent to which rail travel in the Wake County area can be revived via commuter rail remains to be seen. Survey research conducted by NCDOT<sup>13</sup> found that, among eleven proposed alternatives, commuter rail was the preferred method for reducing congestion on I-40. Other research in North Carolina<sup>18</sup> found that, along the Greensboro to Goldsboro corridor, Cary, Clayton, Durham, and Raleigh are likely to have the highest number of commuter rail boardings.



Raleigh Downtown Skyline

In the Triangle Area of North Carolina, as in other regions nationwide, factors predicting the use of transit vary at the individual level as well as the structural level. Research suggests that demographic characteristics predispose individuals to choose or avoid transit. A nationwide study<sup>15</sup> finds that members of the millennial generation are open to transit, in contrast with baby boomers, who grew up dependent on automobile travel. In addition to individual demographic factors, structural demographic factors such as population density<sup>7</sup> have been found to influence transit use in a direct manner. Other commonly studied influences include layout and design of the residential neighborhood,<sup>15</sup> the work destination neighborhood,<sup>5</sup> and the design of transit stop itself.<sup>2</sup>

Likewise, the ability of the transit stop neighborhood to support trip chaining (conducting errands before or after the transit ride) may be critical to transit success, as research indicates that trip chaining is increasing over time.<sup>22</sup> Early research on commuter rail<sup>9</sup> suggests that minimization of time spent in travel is particularly important for work trips. Other factors that support the goal of successful implementation of commuter rail as a transit form include convenient bus service, employer assistance with fares, and limited parking at the destination point.<sup>5</sup>

In considering the transit future of Wake County and surrounding areas, planners must account for these previously studied factors. Likewise, the push for multi-use and transit-oriented development in Raleigh are likely to support the move toward alternate forms of transit. In light of current employment patterns, traffic density, and population growth, the region may benefit from the implementation of commuter rail in the future.

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### Images:

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