



Transportation Impact Analysis

Fall 2009 Update for the Carolina North Development

SUBMITTED TO

TOWN OF CHAPEL HILL, NORTH CAROLINA

SUBMITTED BY

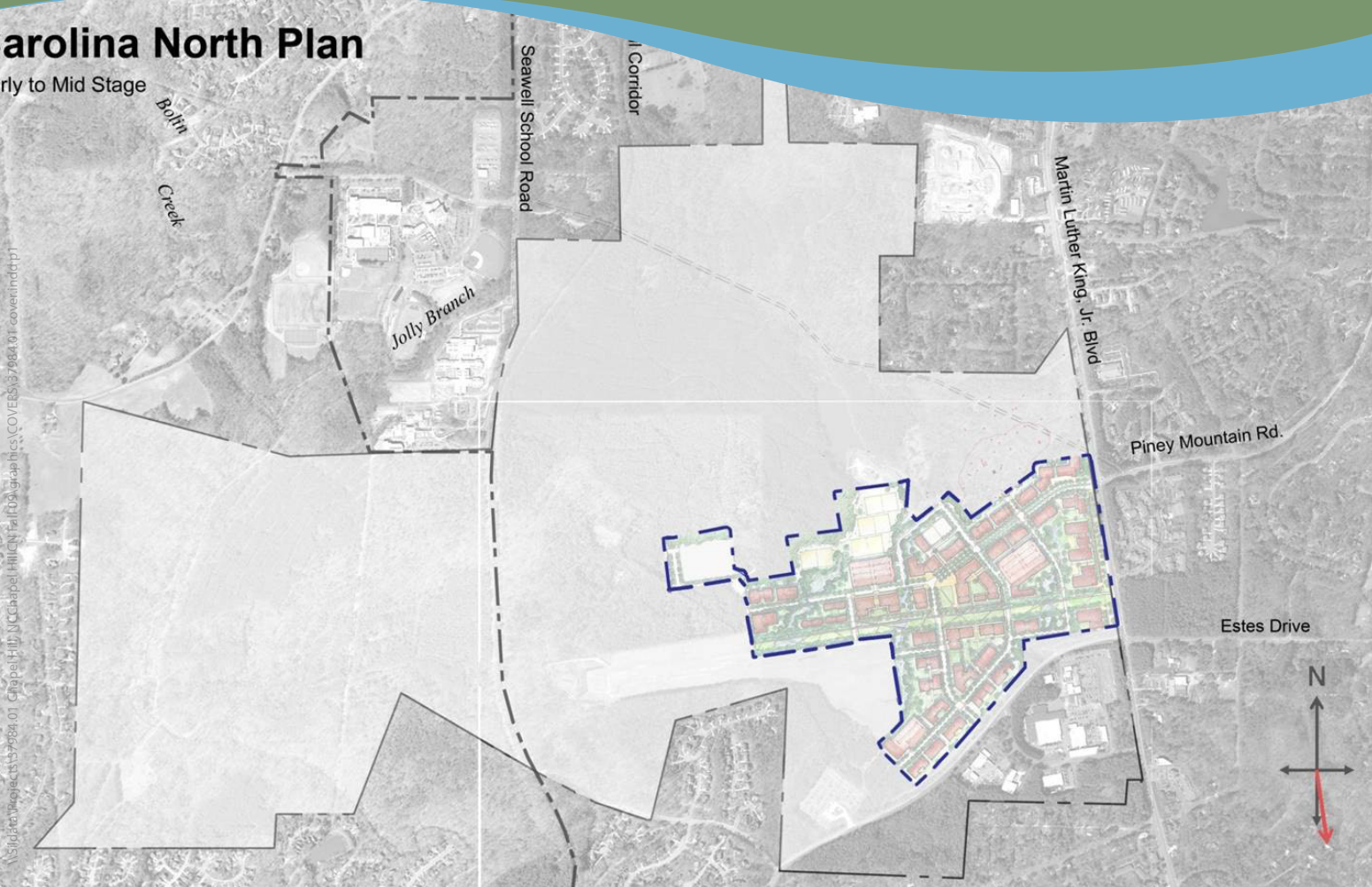


Vanasse Hangen Brustlin, Inc.

DECEMBER 31, 2009

Carolina North Plan

Early to Mid Stage



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1 Introduction

The University of North Carolina at Chapel Hill (the “University”) has proposed redevelopment of the Horace Williams tract as a new campus, referred to as the Carolina North Development. Over the long term, 8 to 10 million square feet of additional campus development is proposed for the site. In the more immediate term, the University has outlined an 800,000 square foot development scenario which has been used as the basis for a 2015 (TIA Phase 1) impact analysis and a 3,000,000 square foot development scenario that has been used as the basis for a 2030 (TIA Phase 2)¹ impact analysis.

VHB originally completed a Transportation Impact Analysis (TIA) for the Carolina North Development dated June 3, 2009, which was prepared with the active participation of Town and University staff. This Fall 2009 TIA serves as an update of the original TIA and is based on new traffic, transit, pedestrian and bicycle data collected in September and October of 2009. This study update also has a modified horizon year for the analysis of the second phase of development from the year 2025 to 2030. This change in the future horizon year does not consider any changes to the program or volume of traffic generated by the Carolina North development, but does consider an additional five years of background traffic growth. It includes additional focus on the multi-modal impacts of the development in the immediate vicinity of the project. It is important to note that this update is not an expansion of the scope or study area for the TIA, but is limited to a validation and update of the analysis based on the new existing transportation data collected.

The University of North Carolina at Chapel Hill is consistently rated one of the nation’s premier colleges and research universities with highly-rated graduate programs in a variety of disciplines. Founded in 1795, the University of North Carolina at Chapel Hill is the oldest public university in the country. The University’s campus now occupies over 700 acres in the heart of Chapel Hill. The university has an enrollment of over 28,000 students, with 6,000 employees at the university, and an additional 3,700 employees at UNC Healthcare. In recent years, the University undertook a major expansion, spearheaded by the “Carolina First” campaign and a strong endowment. Future expansion at the Carolina North mixed-use campus promises to bring major changes to the distribution of uses and transportation access to the University.

Carolina North will be a world-class magnet to attract the best and brightest to North Carolina and will create tremendous economic benefits for the state and local communities. Carolina North is also envisioned to be a compact, mixed-use academic campus that achieves a high degree of sustainability. Some of the key transportation themes defining the characteristics of the plan include support for transit-oriented development, and providing local connections for bike, pedestrian, transit, and motor

¹ These dates and square footage estimates were established for analytical purposes and do not represent a prediction of the Carolina North development program.

vehicles. The planning process for Carolina North to-date has been informed by stakeholder and public involvement, culminating in a development agreement between the University and the Town, endorsed in the summer of 2009. Although the vision for Carolina North is sure to bring numerous benefits, there are also impacts of the project that must be carefully considered and mitigated. Currently, the site is occupied by an airport and several other low-intensity uses. Conversion of the site to a mixed-use campus environment of the scale envisioned will require improvements to the transportation facilities and services that provide access to the site as defined in the development agreement.

This TIA update re-analyzes the transportation-related aspects of the Carolina North project. It provides a comprehensive analysis of traffic, transit, pedestrian, and bicycle impacts to the Chapel Hill-Carrboro area. It is important to note that this TIA is unusual and follows the prescribed requirements in the development agreement. The development program and timeline for Carolina North are not well defined given the need to respond to changing needs and conditions and the long-term planning horizon. As such, this TIA is the first in a series of periodic TIA updates required for the project.

Typically, a TIA recommends specific transportation system improvements that are then implemented along with the development, or at specified dates. This TIA does not make recommendations for improvements that will be implemented on a specific schedule. Instead, this TIA identifies the potential impacts and potential improvements that mitigate the impacts. Much like the conduct of this TIA update, the specific mitigation requirements are determined by the provisions specified in the development agreement.

Given the timeframe of this development, these potential mitigation measures will require more study and evaluation to determine the most appropriate measures at the time in question. In some cases, identified mitigation measures may not be needed. In other cases, modified solutions that address then-current issues will be proposed. In still other cases, entirely different solutions may be identified and implemented. Analysis of then-current conditions as documented in future TIA updates will be needed to determine the specific mitigation characteristics and implementation times.

In essence, this TIA updates the overall assessment of the potential impacts of the project, identifies solutions that address these impacts, and informs the details and timing of specific mitigation commitments as defined in the development agreement for Carolina North. TIAs will continue to be updated at regular intervals of development at Carolina North to reflect changes in the development program, the transportation system, and to refine the mitigation requirements at each interval.

1.1 Project Overview and Study Methodology

The University considers Carolina North a vital component in achieving its charge to lead a transformation in North Carolina's economy and to "compete with national peers for the talent and resources that drive innovation" in a setting that facilitates public-private partnerships, public engagement, and flexibility for collaborative research and interdisciplinary educational opportunities. The Town desires to accommodate this vision, but in a way that preserves the community's values.

This TIA is required under the July 1, 2000 Development Agreement between the Town and the University for Carolina North. It provides an updated analysis of the project impacts during two horizon years: 2015 (TIA Phase 1) and 2030 (TIA Phase 2). Additional analyses are included to show the impacts if the development program is adjusted to provide different amounts of on-site parking at different points in the build out. The Town of Chapel Hill retained VHB in March 2009 to complete the original TIA using a methodology intended to capture the phased build-out of the site and changing transportation behavior over time. This update will incorporate a similar methodology and minor changes that have occurred since the first TIA was completed. The most significant changes in the methodology are the collection of new traffic volume and transit ridership data. The key defining characteristics of this methodology are summarized below.

- **Development Scenarios and Horizon Years.** The TIA is based on two development conditions, an 800,000 square foot scenario modeled in 2015 (TIA Phase 1) and a 3,000,000 square foot scenario modeled in 2030 (TIA Phase 2). These scenarios were selected for analysis purposes and are not a prediction of the development pace. The TIA Phase 2 timeline was extended from 2025 to 2030 to coincide with the term of the development agreement and to better represent the potential timeframe for development of this magnitude on the site.
- **Other Development and Regional Growth.** The TIA includes growth associated with other development projects within the Town and additional growth for the region.
- **Parking and Travel Choices.** The TIA reflects a base analysis condition for each horizon year and includes sensitivity analysis to reflect the impact of different levels of parking availability on the project site.
- **Distribution of Trips.** The TIA estimates the origin or destination of new trips generated by the Carolina North project.
- **Traffic Impacts.** The TIA estimates the impact of Carolina North on traffic conditions within the study area and identifies potential mitigation to offset the impacts of the project. The TIA also summarizes traffic safety conditions near the project site.
- **Transit Impacts.** The TIA estimates the impact of Carolina North on the Chapel Hill Transit system and identifies potential service changes so that adequate transit capacity is available to serve the development.

- **Pedestrian and Bicycle Access.** The TIA evaluates the pedestrian and bicycle facilities available within the study area, assesses select segments for LOS, and discusses potential mitigation measures for these systems.

1.2 Site Location

Carolina North occupies approximately 250 acres on the southeastern portion of the Horace Williams tract, on the west side of Martin Luther King, Jr. Boulevard (NC 86). Overall, the Horace Williams tract contains around 950 acres in both Chapel Hill and Carrboro. Carolina North is located two miles north of the University's Main Campus and less than three miles south of Interstate 40. Due to the transformation impacts of this project, which will have a profound impact on how people move about, the study area extends well beyond the immediate vicinity of the property. A preliminary study area was defined by the Town as a starting point for this study. This preliminary study area contains 52 intersections throughout Chapel Hill and Carrboro and is illustrated in Figure 1-1. All figures can be found at the end of the chapter.

1.3 Description of Site

The site is located on the northwest side of Chapel Hill and is bounded on the east by Martin Luther King, Jr. Boulevard (NC 86). Estes Drive provides a critical east-west connection at the southern end of the tract, connecting east Chapel Hill and Martin Luther King, Jr. Boulevard (NC 86) with Carrboro. Seawell School Road bisects the tract on a north-south axis, linking Estes Drive to the south with Homestead Road to the north. Rail tracks also operate on a north-south access and connect downtown Carrboro and the University Plant to the regional freight rail network. Currently, the property contains the Horace Williams airport, located in the south-east portion of the site. The remainder of the property is forested. A number of facilities and public works activities occur in the southeast quadrant of Martin Luther King, Jr. Boulevard and Estes Drive. The University also maintains a long-term parking lot for students along Estes Drive west of the airport. Three public schools are located adjacent to the property on Seawell School Road: Chapel Hill High School, Smith Middle School, and Seawell Elementary School. Residential areas border the tract to the north, south, and west.

The primary access to the site in the 2015 (TIA Phase 1) scenario is a new roadway in the approximate location of Municipal Drive, opposite Piney Mountain Road. Another roadway connection is planned for the 2030 (TIA Phase 2) scenario to Estes Drive, opposite of Airport Drive. In addition to these primary access points, a roadway limited to public transit vehicles connects to Martin Luther King, Jr. Boulevard (NC 86) between Piney Mountain Road and Estes Drive.

1.4 Development Program

The Carolina North development program has several proposed uses, including academic, research, private sector, residential, and medical facilities. The University envisions a build-out of 8 to 10 million square feet over a 50 year period, with 3 million square feet analyzed in 2030 (TIA Phase 2). An interim step would develop 800,000 square feet analyzed in 2015 (TIA Phase 1). The potential school on the Carolina North site is not included in either scenario and would be the subject of separate study. The development program used in this study is unchanged from the 2009 Spring TIA.

1.4.1 2015 (TIA Phase 1) Development Program

In 2015 (TIA Phase 1) a little over half of the planned 800,000 square feet development will be academic buildings, with most of the rest of the development split between private development, 200 housing units, and a small amount of civic/retail space. To support this development, approximately 1,525 parking spaces are planned. These parking spaces serve a variety of different activities on the site as shown in Table 1-1.

Table 1-1: 2015 (TIA Phase 1) Carolina North Development Program

Land Use	Development (Sq ft)		Parking Spaces*		Approx. Population
	Size	Percent	Number	Percent	Emp./Stud./Res.
Academic	410,000	51%	705	46%	820
Private	180,000	23%	450	30%	540
Civic /Retail	10,000	1%	15	1%	20
Recreation fields (3)	n/a	n/a	105	7%	n/a
Housing	200,000 (200 units)	25%	250	16%	400
Health Care	0	0%	0	0%	n/a
Total	800,000	100%	1,525	100%	1,780

Source: University of North Carolina at Chapel Hill, as compiled by VHB.

*Based on Main Campus ratios for similar uses.

The parking supply defined in Table 1-1 was determined using the following parking ratios:

- 0.5 parking spaces per person (main campus ratio) for 820 academic employees
- 0.25 spaces per commuting student (main campus ratio) for 850 students
- 0.20 spaces per 1,000 square feet for academic visitors
- 2.5 spaces per 1,000 square feet for private uses
- 1.5 spaces per 1,000 square feet for civic/retail buildings
- 1.25 spaces per housing unit (main campus ratio)
- 35 spaces per recreational field

1.4.2 2030 (TIA Phase 2) Development Program

Between the 2015 (TIA Phase 1) and 2030 (TIA Phase 2) scenarios, an additional 2.2 million square feet of development would be developed by the University (see Table 1-2). Academic space will add nearly 900,000 square feet and will continue to be the single largest use at Carolina North. In 2030 (TIA Phase 2), the academic space will account for a smaller share of the total development (roughly one-third), compared with over half of the development in 2015 (TIA Phase 1). Private development and housing units will each add 520,000 and 550,000 square feet of space, respectively, and will continue to account for roughly one-quarter of the development. Between 2015 (TIA Phase 1) and 2030 (TIA Phase 2), health care uses are introduced into Carolina North and will account for nearly 10 percent of the development. Civic and retail space will represent a larger share of the Carolina North development plan, though still a small portion of the total. The proposed 2030 (TIA Phase 2) development program is depicted in Figure 1-2.

Additional parking spaces will be added between 2015 (TIA Phase 1) and 2030 (TIA Phase 2), bringing the total to 5,835 parking spaces, as summarized in Table 1-2. The parking ratios used to derive the 2030 (TIA Phase 2) parking supply are the same as those described for 2015 (TIA Phase 1) with the addition of the following for the Health Care building program:

- 0.5 parking spaces per health care employee
- 2.5 spaces per 1,000 square feet for health care patients and visitors

Table 1-2: 2030 (TIA Phase 2) Carolina North Development Program

Land Use	Development (Sq ft)		Parking Spaces	
	Size	Percent	Number	Percent
Academic	1,280,000	43%	2,035	35%
Private	700,000	23%	1,750	30%
Civic /Retail	70,000	2%	210	2%
Recreation fields (3)	n/a	n/a	105	2%
Housing	750,000	25%	940	16%
Health Care	200,000	7%	900	15%
Total	3,000,000	100%	5,835	100%

1.5 Existing and Committed Transportation Network

The existing transportation network in the vicinity of Carolina North is composed of roads, pedestrian/bicycle facilities, and transit routes. A brief summary of the existing transportation system is described below and a more detailed review is provided in Chapter 2. There have been no changes to the existing transportation network since the Spring 2009 TIA was completed. Transportation improvements including approved development improvements and committed transportation improvements, which are described in brief below and in greater detail in Chapter 3.

1.5.1 Existing Road Network

The road network serving Carolina North includes Martin Luther King, Jr. Boulevard (NC 86) to the east, Estes Drive to the south, Seawell School Road to the west, and Homestead Road to the north.

Martin Luther King, Jr. Boulevard (NC 86) is a major arterial road on a north-south axis that links Interstate 40 with downtown Chapel Hill. It is a five-lane road, with two lanes in the northbound direction, two lanes in the southbound direction, and one center turn lane/median. The posted speed limit on Martin Luther King, Jr. Boulevard at Carolina North is 35 mph.

- At the signalized intersection with Estes Drive, Martin Luther King, Jr. Boulevard has three lanes in both the northbound and southbound directions (one left-turn lane, one thru lane, and one shared thru lane/right-turn lane).
- At the signalized intersection with Homestead Road, Martin Luther King, Jr. Boulevard has four northbound lanes (two left-turn lanes, one thru lane, and one shared thru lane/right-turn lane) and four southbound lanes (one left-turn lane, two thru lanes, and one right-turn lane).

Estes Drive is a minor arterial road on an east-west axis that connects East Chapel Hill with Carrboro. It is a two-lane road with a posted speed limit of 35 mph.

- At the signalized intersection with Martin Luther King, Jr. Boulevard, Estes Drive has three lanes in both the eastbound and westbound directions (one left-turn lane, one thru lane, and one right-turn lane).
- At the signalized intersection with Seawell School Road, Estes Drive has two westbound lanes (one thru lane and one right-turn lane) and two eastbound lanes (one thru lane and one left-turn lane).

Homestead Road is a minor arterial road on an east-west axis that connects Martin Luther King, Jr. Boulevard with Carrboro and points to the west. It is a two-lane road with a posted speed limit of 35 mph.

- At the signalized intersection with Martin Luther King, Jr. Boulevard, Homestead Road has three lanes in the eastbound direction (one left-turn lane, one shared left-turn lane/thru lane, and one right-turn lane).
- At the signalized intersection with Seawell School Road, Homestead Road has two lanes in the westbound direction (one left-turn lane and one thru lane) and one lane in the eastbound direction (shared thru lane/right-turn lane)

Seawell School Road is a collector/minor arterial road on a north-south axis that connects Homestead Road to the north with Estes Drive to the south. It is a two-lane road with a posted speed limit of 35 mph.

- At the signalized intersection with Homestead Road, Seawell School Road has two lanes in the northbound direction (one left-turn lane and one right-turn lane).
- At the signalized intersection with Estes Drive, Seawell School Road has two lanes in the southbound direction (one left-turn lane and one right-turn lane).

Weaver Dairy Road is a minor arterial on an east-west axis that connects Martin Luther King, Jr. Boulevard (and the residential communities to the west of Martin Luther King, Jr. Boulevard) to Fordham Boulevard (US 15-501) via Erwin Road. The cross-section of Weaver Dairy Road varies from two-lanes (one in each direction) with a raised median to the west of Martin Luther King, Jr. Boulevard, to a three-lane cross-section with a center two-way left-turn-lane (TWLTL) to the east of Martin Luther King, Jr. Boulevard, and lastly to a two-lane undivided roadway towards Erwin Road. The posted speed limit is 35 mph.

- At the signalized intersection with Martin Luther King, Jr. Boulevard, Weaver Dairy Road has three lanes in the westbound direction (two left-turn lanes and one shared thru lane/right-turn lane), and three lanes in the eastbound direction (one left-turn lane, one thru lane, and one right-turn lane).

Eubanks Road is a minor arterial road on an east-west axis that connects Old Chapel Hill Hillsborough Road (Old NC 86) to the west to Martin Luther King, Jr. Boulevard (NC 86). It is a two-lane road with a posted speed limit of 35.

- At the signalized intersection with Martin Luther King, Jr. Boulevard, Eubanks Road has two lanes in the eastbound direction (one left-turn lane and one right-turn lane).

Kingston Drive is a collector on a north-south axis that connects Weaver Dairy Road to points south of Weaver Dairy Road. It is a two-lane road with a posted speed limit of 25 mph.

- At the signalized intersection with Weaver Dairy Road, Kingston Drive has two lanes in the northbound direction (one left-turn lane and one shared thru lane/right-turn lane).

Piney Mountain Road is a collector on a north-south axis that connects Martin Luther King Jr. Boulevard to points south and east of Weaver Dairy Road and Martin Luther King Jr. Boulevard, respectively. It is a two-lane road with a posted speed limit that varies from 25 to 35 mph.

- At the signalized intersection with Martin Luther King Jr. Boulevard, Piney Mountain Road has three lanes in the westbound approach (two left-turn lanes and one shared thru lane/right-turn lane).

Hillsborough Street is collector on north-south axis that connects Martin Luther King Jr. Boulevard to Rosemary Street. It is a two lane road with a speed limit of 25 mph.

- At the signalized intersection with Martin Luther King Jr. Boulevard, Hillsborough Street has two lanes in both the eastbound and westbound directions (one left-turn lane and one shared thru lane/right-turn lane).

1.5.2 Pedestrian/Bicycle Network

The sidewalk network and crossing locations bordering the Horace Williams tract are limited. There are no sidewalks on the west side of Martin Luther King, Jr. Boulevard between Estes Drive and Critz Road, nor along Estes Drive west of Martin Luther King, Jr. Boulevard. Sidewalks are provided along the east side of Martin Luther King, Jr. Boulevard, however, they are not continuous between Timber Hollow Court and Homestead Road. There are crosswalks at the intersections of Martin Luther King, Jr. Boulevard and Homestead Road and Martin Luther King, Jr. Boulevard and Northfield Drive. There is a crosswalk on just the eastern leg of the intersections of Martin Luther King, Jr. Boulevard and Estes Drive and Martin Luther King, Jr. Boulevard and Piney Mountain Road. There are no dedicated bicycle lanes on Martin Luther King, Jr. Boulevard, Estes Drive, Homestead Road, or Seawell School Road in the vicinity of Carolina North.

1.5.3 Transit Service

Chapel Hill Transit operates six bus routes in the vicinity of Carolina North: A Route, G Route, HS Route, NS Route, NU Route, and T Route.

The A Route is a local bus service that runs on 30 minute headways throughout most of the day, linking the Northside neighborhood with Homestead Road and North Forest Hills, via the University main campus and downtown Chapel Hill. In the vicinity of Carolina North it runs along Martin Luther King, Jr. Boulevard and Homestead Road. Service begins at 6:25 am and ends at 7:59 pm. Bus stops serving Carolina North are located on Martin Luther King, Jr. Boulevard at Shadowood, Timber Hollow, and the YMCA.

The G Route is a local bus service that runs on 35 minute headways throughout most of the day and connects the Briarcliff neighborhood with the Booker Creek area, via the University main campus and downtown Chapel Hill. In the vicinity of Carolina North it runs along Martin Luther King, Jr. Boulevard and Estes Drive. Service begins at 5:55 am and ends at 9:18 pm. Bus stops serving Carolina North are located on Martin Luther King, Jr. Boulevard at the YMCA and on Estes Drive at the Methodist Church.

The HS Route is a local bus service that runs on 30 minute peak and 60 minute off-peak headways throughout the day. It connects Morris Grove Elementary School, Chapel Hill High School, and downtown Chapel Hill. In the vicinity of Carolina North it runs along Martin Luther King, Jr. Boulevard, Estes Drive, and Seawell School Road. Service begins at 6:15 am and ends at 6:10 pm. The only bus stop serving Carolina North is located on Airport Drive south of Estes Drive.

The NS Route is a local bus service that runs on 10 minute peak and 20 to 50 minute off-peak headways throughout the day. It connects the Eubanks Road park-and-ride lot with the Southern Village park-and-ride lot, via the University and downtown Chapel Hill. In the vicinity of Carolina North it runs along Martin Luther King, Jr. Boulevard. Service begins at 5:45 am and ends at 10:39 pm. Bus stops serving Carolina North are located on Martin Luther King, Jr. Boulevard at Shadowood, Timber Hollow, and the YMCA.

The NU Route is a local bus service that runs on 20 minute peak and 40 minute off-peak headways throughout the day. It connects the PR Lot with the University and downtown Chapel Hill. In the vicinity of Carolina North it runs along Martin Luther King, Jr. Boulevard, Airport Drive, and Estes Drive. Service begins at 7:05 am and ends at 10:40 pm. The only bus stop serving Carolina North is located on Airport Drive south of Estes Drive.

The T Route is a local bus service that runs on 25 to 40 minute headways throughout the day. It connects Weaver Dairy Road with The University and downtown Chapel Hill. In the vicinity of Carolina North it runs along Martin Luther King, Jr. Boulevard. Service begins at 6:15 am and ends at 10:30 pm. Bus stops serving Carolina North are located on Martin Luther King, Jr. Boulevard at Shadowood, Timber Hollow, and the YMCA.

1.5.4 Committed Road Network

The future committed road network consists of a number of roadway improvements that are approved and will be constructed as part of local development projects or by the Town of Chapel Hill as part of their transportation planning program. Figure 1-3 shows the location of the following approved transportation network improvements that are associated with local development projects in the vicinity of the site. The locations are referenced by the intersection number in the map and described in more detail in Section 3 of this TIA.

- Martin Luther King Jr. Boulevard (NC 86) & I-40 WB Ramps
- Martin Luther King Jr. Boulevard (NC 86) & Eubanks Road
- Martin Luther King Jr. Boulevard (NC 86) & Perkins Drive
- Martin Luther King Jr. Boulevard (NC 86) & Weaver Dairy Road
- Martin Luther King Jr. Boulevard (NC 86) & Homestead Road
- Martin Luther King Jr. Boulevard (NC 86) & Hillsborough Road
- Columbia Street (NC 86) & Rosemary Street
- Columbia Street (NC 86) & South Street
- Weaver Dairy Road & Homestead Road
- Estes Drive & Airport Drive
- Rosemary Street & Hillsborough Road

In addition to the approved roadway and intersection improvements, there are also three committed improvements. The Town of Chapel Hill has committed to making these transportation improvements and has identified funding sources for their implementation.

- Martin Luther King Jr. Boulevard signal system modernization to improve coordination and to provide transit priority
- Martin Luther King Jr. Boulevard (near Shadowood Apartments) mid-block crosswalk addition
- Weaver Dairy Road from Martin Luther King, Jr. Boulevard (NC 86) to Sage Road

1.6 Spring 2009 TIA and Fall 2009 TIA Update Comparison

This section gives a brief overview and comparison of the data utilized and resulting potential mitigation measures between the Spring 2009 TIA and the Fall 2009 TIA Update.

1.6.1 Data Comparison

The traffic data utilized for the original TIA document was gathered from a variety of sources and included counts from 2008 and 2009. For this TIA update, all traffic count data that was not collected in the spring of 2009 was updated based on a data collection effort performed in September and October of 2009. For the effort in September and October of 2009, SEPI Engineering Group performed new turning movement counts at forty-five intersections from 7:00 a.m. – 9:00 a.m., 11:30 a.m. – 1:30 p.m., and 4:00 p.m. – 6:00 p.m. between September 15th and October 15th, 2009. *A general comparison of the turning movement count data between the fall 2009 counts and those counts used in the spring 2009 TIA revealed that the fall 2009 counts are in the range of approximately 5 – 10 percent lower at almost every intersection.*

In addition, average daily traffic (ADT) volume counts were also conducted at twenty-one locations between September 15th and October 15th, 2009 using tube counters. Tube counts included the collection of speed data as well as traffic volumes. Table 1-3 compares the ADT volumes taken in the fall of 2009, versus the ADTs used in the spring 2009 TIA. It can be seen in Table 1-3 that the ADTs decrease by just over 8 percent in total between the spring 2009 TIA and the fall 2009 counts.

Table 1-3: ADT Comparison between Spring and Fall 2009 TIAs

ID	Roadway Section	Spring 2009 ADT	Fall 2009 ADT	% Change
1	Martin Luther King, Jr. Blvd (NC 86) between Clyde Rd and Hilltop MHP	7606	7070	-7.05%
2	Eubanks Rd between Northwood Dr and Martin Luther King, Jr. Blvd (NC 86)	7960	7495	-5.84%
3	Martin Luther King, Jr. Blvd (NC 86) between Perkins Dr and Northwood Dr	30280	23361	-22.85%
4	Weaver Dairy Rd Ext between Lonebrook and Martin Luther King, Jr. Blvd (NC 86)	5290	4836	-8.58%
5	Weaver Dairy Rd between Timberlyne Rd and Weatherstone Dr	11291	10178	-9.86%
6	Seawell School Rd between Homestead Rd and Savannah Terrace	4581	4121	-10.04%
7	Homestead Rd between Brookstone Dr and Martin Luther King, Jr. Blvd (NC 86)	8944	9669	8.11%
8	Martin Luther King, Jr. Blvd (NC 86) between Dixie Ln and Homestead Rd	26564	24689	-7.06%
9	Seawell School Rd between Hanover Place and Railroad Xing 0.1 mi to the West	4974	3527	-29.09%
10	Estes Dr Ext between Seawell School Rd and Umstead Rd	13662	12609	-7.71%
11	N. Estes Dr between Martin Luther King, Jr. Blvd (NC 86) and UNC Facilities Dept. Driveway to the west	17171	11806	-31.24%
12	Martin Luther King, Jr. Blvd (NC 86) between N. Estes Dr and YMCA Driveway to the south	21843	21699	-0.66%
13	N. Estes Dr between Halifax Rd and Granville Rd	15567	14148	-9.12%
14	Martin Luther King, Jr. Blvd (NC 86) between Bolin Heights and E. Longview St	17916	19222	7.29%
15	Hillsborough St between North St and Rosemary St	7987	7750	-2.97%
16	Hillsborough St between Bolinwood Dr and Martin Luther King, Jr. Blvd (NC 86)	6949	6589	-5.18%
17	Martin Luther King, Jr. Blvd (NC 86) between Piney Mountain Rd and N. Estes Dr	28090	28391	1.07%
18	Piney Mountain Rd between Timber Hollow Ct and Woodshire Ln	2954	2743	-7.14%
19	Piney Mountain Rd between Lake Ellen Dr and Oosting Dr	2395	2442	1.96%
20	Kingston Dr between Balsam Ct and Kingston Ct	1037	1038	0.10%
21	Homestead Rd between Seawell School Rd and Hearthstone Ln	9472	9030	-4.67%
AVERAGE % CHANGE				-8.66%

Recent transit ridership data were also collected for the fall 2009 TIA update, based on data collected in September of 2009, provided by the Town of Chapel Hill. The following Figure 1-4 and Figure 1-5 depict a comparison between the Fall 2008 data used for the spring 2009 TIA and the September 2009 data. Figure 1-4 shows data for all Chapel Hill Transit routes, and Figure 1-5 compares only those routes that would serve or operate nearby the Carolina North site. In general, the data comparison revealed that ridership had increased overall by 4 percent, mainly due to significant increases in the J, NS, and RU routes. In particular, it should be noted that service on the NS route has been significantly increased and funded by a 1-year CMAQ fund. This explains why ridership has significantly increased between 2008 and 2009.

Figure 1-4: All Transit Ridership Data Comparison between Spring and Fall 2009 TIAs

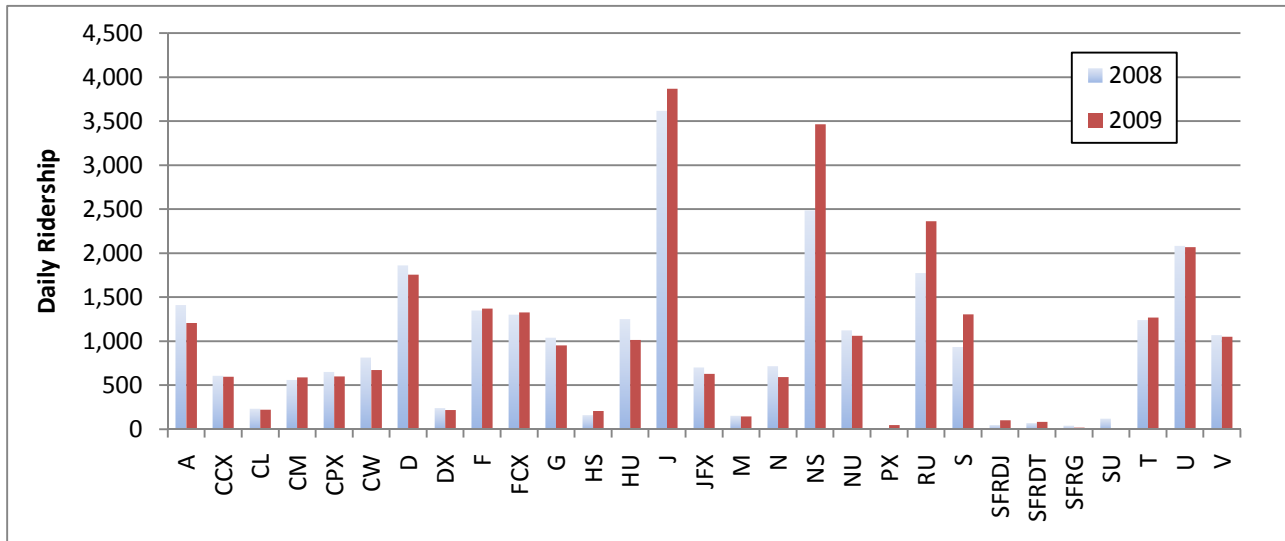
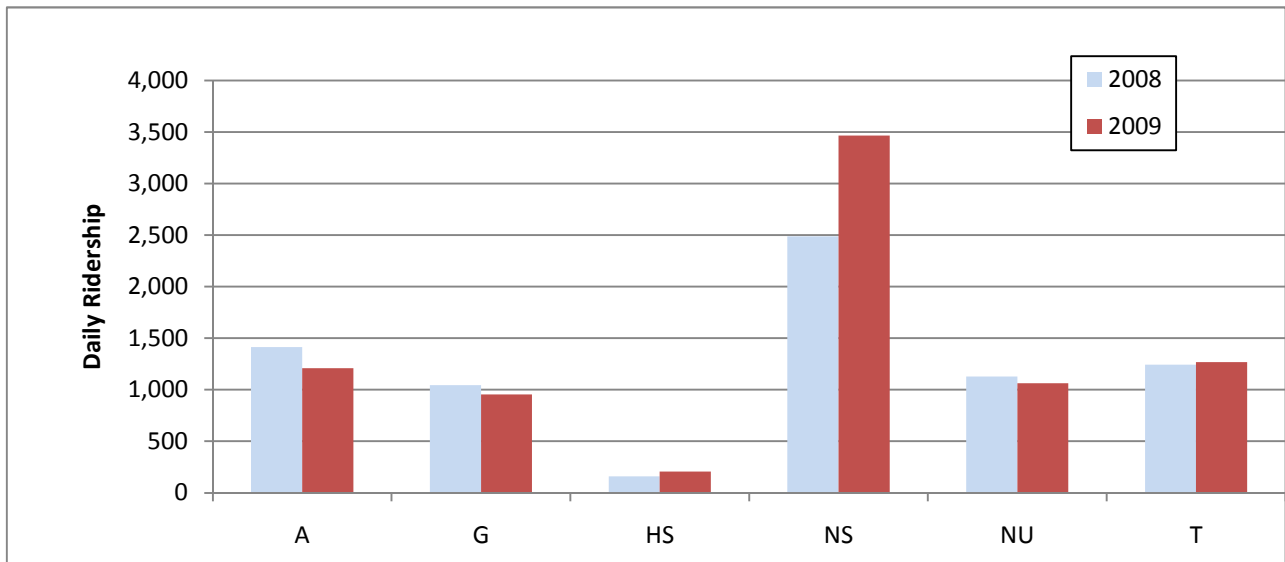


Figure 1-5: Transit Ridership Data Comparison near Carolina North



Related to the transit element, Table 1-4 shows park-and-ride occupancy data from fall 2007, April 2009, and November 2009. There are some minor differences between the data sets, but the overall utilization is consistent. Only one of the University’s and three of the Town’s park-and-ride lots have any significant parking availability based on the November 2009 counts. There are over 700 spaces available among the Eubanks, Jones Ferry, Carrboro Plaza, and Chatham County lots. Eubanks is the park-and-ride closest to Carolina North and has approximately 130 available parking spaces.

Table 1-4: Park-and-Ride Occupancy Comparison between Spring and Fall 2009 TIAs

Lot Name	Owner	Bus Routes Serving Lot	No. of Parking Spaces	Parking Occupancy Fall 2007	Parking Occupancy April 2009	Parking Occupancy Nov 2009	Available Parking Spaces
Eubanks	Chapel Hill	NS	400	234	201	268	132
Carrboro Plaza	Chapel Hill	CPX, CW	145	136	132	111	34
Jones Ferry	Chapel Hill	JFX, CW, CM	443	252	240	230	213
Southern Village	Chapel Hill	NS, V	400	388	332	385	15
NC-54 East	Chapel Hill	HU, S	512	508	505	512	0
Friday Center	University	HU, V, FCX	871	882	867	871	0
Chatham County	University	CCX	550	150	215	214	336
Franklin Street	University	CL, D, F, M	67	67	67	67	0
Martin Luther King, Jr. Blvd	University	G, HS, NS, NU, T	40	39	39	40	0
Total			3,428	2,656	2,598	2,698	730

Source: No. of parking spaces from the University of North Carolina at Chapel Hill.
 Fall 2007 occupancy counts from *The University of North Carolina at Chapel Hill Development Plan Traffic Impact Analysis, December 2007 amended January 2008*.
 April 2009 space-available counts conducted by VHB on Wednesday, April 8th.
 November 2009 space utilization counts conducted on November 17, 2009 by Martin/Alexiou/Bryson.

Note: CCX, CPX, FCX, and JFX are express routes.

1.6.2 Potential Traffic Mitigation Measures Comparison

Table 1-5 provides a brief comparison of the potential traffic mitigation measures in the fall 2009 TIA Update and the spring 2009 TIA. In general, most improvements at the critical intersections are the same, although restriping or geometric improvements are no longer needed at some major intersections along the US 15/501 corridor, as identified in the spring 2009 study. This is due to the decrease in traffic volumes observed with the fall 2009 traffic counts, versus the data used in the spring 2009 TIA.

Table 1-5: Potential Traffic Mitigation Measures Comparison

Location	Spring 2009 TIA Potential Mitigation Measure	Fall 2009 TIA Update Potential Mitigation Measure
Martin Luther King, Jr. Boulevard (NC 86) & Eubanks Road	Restripe eastbound approach as a dual left-turn and a shared left/right	Construct an additional eastbound left-turn lane to provide triple lefts
Martin Luther King, Jr. Boulevard (NC 86) & Weaver Dairy Road	<p>Construct an exclusive westbound right-turn lane</p> <p>Construct an exclusive southbound right-turn lane</p> <p>Construct an exclusive northbound right-turn lane</p>	<p>Construct an exclusive westbound right-turn lane</p> <p>Construct an exclusive southbound right-turn lane</p>
Martin Luther King, Jr. Boulevard (NC 86) & Piney Mountain Road/Municipal Drive	<p>Construct an exclusive southbound right-turn lane</p> <p>Widen eastbound approach to accommodate site traffic</p> <p>Construct a northbound shared through/right-turn lane</p>	<p>Construct an exclusive southbound right-turn lane</p> <p>Widen eastbound approach to accommodate site traffic</p> <p>Construct an exclusive northbound right-turn lane</p>
Martin Luther King, Jr. Boulevard (NC 86) & Estes Drive	<p>Construct an exclusive northbound right-turn lane</p> <p>Construct an additional eastbound and westbound through lane</p> <p>Construct an additional southbound left-turn lane to provide dual lefts</p> <p>Construct an exclusive southbound right-turn lane</p>	<p>Construct an exclusive northbound right-turn lane*</p> <p>Construct an additional eastbound and westbound through lane</p> <p>Construct an additional southbound left-turn lane to provide dual lefts</p>
Martin Luther King, Jr. Boulevard (NC 86) & Homestead Road	Adjust signal timings and offsets	<p>Construct an additional eastbound right-turn lane to provide dual rights</p> <p>Remove north side crosswalk across Martin Luther King, Jr. Boulevard (NC 86)</p>
Martin Luther King, Jr. Boulevard (NC 86) & Airport Drive	Signalize intersection	Signalize intersection
Estes Drive & Caswell Road/Curtis Road	<p>Restripe the southbound approach to a shared left-turn/through lane and an exclusive right-turn lane</p>	<p>Restripe the southbound approach to a shared left-turn/through lane and an exclusive right-turn lane</p>

Estes Drive Extension & Airport Drive	Signalize intersection	Signalize intersection
	Modify westbound approach to include a shared left-turn/through lane, one through lane, and an exclusive right-turn lane	Modify westbound approach to include a shared left-turn/through lane, one through lane, and an exclusive right-turn lane
	Modify eastbound approach to include an exclusive left-turn, one through lane, and a shared through/right-turn lane	Modify eastbound approach to include an exclusive left-turn, one through lane, and a shared through/right-turn lane
	Construct southbound approach (site driveway) to provide an exclusive left-turn lane, one through lane, and an exclusive right-turn lane	Construct southbound approach (site driveway) to provide dual left-turn lanes, one through lane, and an exclusive right-turn lane Construct an exclusive northbound left-turn lane
Estes Drive & Franklin Street	Construct an exclusive southbound right-turn lane	Construct an exclusive southbound right-turn lane
Fordham Boulevard (US 15-501) & Eastowne Drive/BSBC Drive	Restripe the northbound approach to a shared left-turn/through lane and an exclusive right-turn lane	Adjust signal timings and offsets
Fordham Boulevard (US 15-501) & Eastowne Drive/Lakeview Drive	Restripe the northbound approach to a shared left-turn/through lane and an exclusive right-turn lane	Adjust signal timings and offsets
Fordham Boulevard (US 15-501) & I-40 Eastbound Ramps	Restripe the southbound approach to an exclusive right-turn lane, a shared right/through/left-turn lane and an exclusive left-turn lane	Adjust signal timings and offsets

Note: Red text indicates potential mitigation measures suggested for Phase 1 development

*Unless implemented by others

1.6.3 Potential Traffic Calming Measures

Table 1-6 provides a brief comparison of the potential traffic calming measures in the fall 2009 TIA Update and the spring 2009 TIA. Since the ADT volume information for the roadways selected to be studied for traffic calming did not alter significantly enough, the potential mitigation measures between the fall and spring studies are identical.

Table 1-6: Potential Traffic Calming Measures Comparison

Road Segment	Spring 2009 TIA	Fall 2009 TIA Update
Piney Mountain Road	roundabouts, speed humps, speed tables, lane narrowing	same
Hillsborough Street	roundabouts, speed humps, speed tables, lane narrowing	same
Seawell School Road	roundabouts, speed humps, speed tables, lane narrowing	same
North Elliott Road/Curtis Road/Caswell Road	roundabouts, speed humps, speed tables, lane narrowing	same
North Lakeshore Drive	roundabouts, speed humps, speed tables, lane narrowing	same
Barclay Road	roundabouts, speed humps, speed tables, lane narrowing	same
Northwood Road	roundabouts, speed humps, speed tables, lane narrowing	same

1.6.4 Potential Transit Mitigation Measures

Table 1-7 provides a brief comparison of the potential transit mitigation measures in the fall 2009 TIA Update and the spring 2009 TIA. Due to some capacity improvements made in the Summer 2009 to the NS Route and changes in ridership data used for the fall 2009 TIA Update, some minor changes in the potential mitigation measures occurred between the spring and fall studies, as noted in the table. It should be noted that the potential transit mitigation measures identified in this document will be reviewed as part of the development of the Chapel Hill Transit Short Range Transit Plan and incorporated into the analysis of future service needs.

Table 1-7: Potential Transit Mitigation Measures Comparison

	Spring 2009 TIA	Fall 2009 TIA Update
2015 Vehicle Requirements	1 new vehicle needed to serve Carolina North	No new vehicles needed to serve Carolina North
2030 Vehicle Requirements	10 new vehicles needed to serve Carolina North	13 new vehicles needed to serve Carolina North
2015 Capacity Needs	Additional capacity needed on NS Route	No additional capacity needed after 2009 changes to service
2030 Capacity Needs	Additional capacity needed on all routes except NU and HS	Same

Note: Red text indicates potential mitigation measures suggested for Phase 1 development

1.6.5 Potential Pedestrian Facility Mitigation Measures

Table 1-8 provides a brief comparison of the potential pedestrian mitigation measures in the fall 2009 TIA Update and the spring 2009 TIA. It should be noted that for the fall 2009 TIA Update, a higher level of detail was used for the analysis of pedestrian facilities surrounding the site. For the fall 2009 Update, the Pedestrian Level of Service (LOS) was calculated for select roadway segments in the study area accordance with TRB’s

Multimodal Level of Service Analysis for Urban Streets (NCHRP Report 616). Pedestrian LOS reflects the perspective of pedestrians sharing the roadside environment with motor vehicles. This assessment is based primarily on the existence of a sidewalk, lateral separation between pedestrians and motorized vehicles, motorized vehicle volumes, and motorized vehicle speeds. Similar to analyzing vehicular traffic, each level is assigned a letter from A to F, with LOS A representing the best pedestrian accommodations and LOS F representing the worst.

It should be noted that this is a recently developed methodology that has not been adopted by the Town of Chapel, but is a methodology that is being applied in other localities. It is used in this study solely to identify locations that may require improvements to provide a high pedestrian level of service. These potential improvements are not specifically necessary to mitigate impacts generated by Carolina North, and the methodology is not intended to identify improvements that will be required as part of the development. Rather, the potential improvements represent a set of measures to address a lack of widely available and high quality pedestrian facilities near the project site and to inform the design of improvements included in the Development Agreement. Further definition of the specific characteristics and phased implementation for these facilities will be a component of the future design effort for these facilities. Below is a comparison the potential mitigation measures between the spring and fall 2009 TIAs.

Table 1-8: Potential Pedestrian Facility Mitigation Measures Comparison

Location	Spring 2009 TIA	Fall 2009 TIA Update
Martin Luther King, Jr. Boulevard (NC 86) from Homestead Road to Airport Drive	<p>Provide continuous sidewalk along Martin Luther King, Jr. Boulevard (NC 86) from Homestead Road to Airport Drive (continuous sidewalk currently exists south of Airport Drive).</p> <p>Construct sidewalk across driveways to complete sidewalk network. It is important that the sidewalk be consistent in its design so that there is a clear differentiation between the sidewalk and the driveway.</p> <p>Install continental-style crosswalks and pedestrian countdown signals at all legs of signalized intersections along Martin Luther King Jr. Blvd, including at Municipal Dr and Estes Dr.</p> <p>Narrow curb-radii at intersections to 25 feet maximum where feasible to slow turning cars and shorten-pedestrian crossing distances.</p>	<p>Provide continuous sidewalk with a planting strip and street trees along Martin Luther King, Jr. Boulevard (NC 86) from Homestead Road to Hillsborough Street/Umstead Drive on both sides of the roadway (Analysis indicates that it is desirable to match existing sidewalk widths where possible and provide a wide planting strip buffer between the street and sidewalk, depending on the traffic volume on the adjacent street).</p> <p>Construct sidewalk across driveways to complete sidewalk network. It is important that the sidewalk be consistent in its design so that there is a clear differentiation between the sidewalk and the driveway.</p> <p>Install continental-style crosswalks and pedestrian countdown signals at all legs of signalized intersections along Martin Luther King Jr. Boulevard (NC 86) including at Municipal Drive and Estes Drive.</p> <p>Narrow curb-radii at intersections to 25 feet maximum where feasible to slow turning cars and shorten-pedestrian crossing distances.</p>

	Convert (TWLTL) to a planted raised median with median refuges at (warranted) mid-block crossing locations.	Convert (TWLTL) to a planted raised median with median refuges at (warranted) mid-block crossing locations.
	Conduct analysis to determine if and what type of mid-block crossings are warranted.	Conduct analysis to determine if and what type of mid-block crossings are warranted.
	Widen intersections to allow for turning bays and for 8-foot pedestrian refuge areas in the median. Pedestrian signals and push buttons should be installed in the median refuge.	Widen intersections to allow for turning bays and for 8-foot pedestrian refuge areas in the median. Pedestrian signals and push buttons should be installed in the median refuge.
	Stripe 11-foot travel lanes to slow traffic.	Stripe 11-foot travel lanes to slow traffic.
	Add transit stops in the vicinity of the pedestrian access points.	Add transit stops in the vicinity of the pedestrian access points.
Estes Drive from Seawell School Road to Caswell Road	Provide continuous sidewalk along Estes Drive Extension from Seawell School Road to Martin Luther King, Jr. Boulevard (NC 86).	Provide continuous sidewalk along Estes Drive Extension from Seawell School Road to Martin Luther King, Jr. Boulevard (NC 86) on both sides of the roadway (Analysis indicates that it is desirable to provide a 5' minimum sidewalk width and a planting strip).
	Improve pedestrian walkway along both sides of Estes Drive east of Martin Luther King, Jr. Boulevard.	
	Add transit stops in the vicinity of the pedestrian access points to Carolina North.	Add transit stops in the vicinity of the pedestrian access points to Carolina North.
Seawell School Road from Estes Drive to Homestead Road	Provide continuous sidewalk along Seawell School Road from Hanover Place to Estes Drive	Provide continuous sidewalk along Seawell School Road from Estes Drive to Homestead Road on both sides of the roadway (Analysis indicates that it is desirable to provide a 5' minimum sidewalk width and a planting strip).
Homestead Road from Martin Luther King, Jr. Boulevard (NC 86) to Seawell School Road	None	Provide continuous sidewalk along Homestead Road from Martin Luther King, Jr. Boulevard (NC 86) to Seawell School Road on both sides of the roadway (Analysis indicates that it is desirable to provide a 5' minimum sidewalk width and a planting strip).
Airport Drive from Martin Luther King, Jr. Boulevard (NC 86) to Estes Drive	None	Provide continuous sidewalk along Airport Drive from Martin Luther King, Jr. Boulevard (NC 86) to Estes Drive on both sides of the roadway (Analysis indicates that it is desirable to provide a 5' minimum sidewalk width and a planting strip).

1.6.6 Potential Bicycle Facility Mitigation Measures

Table 1-9 provides a brief comparison of the potential bicycle facility mitigation measures in the fall 2009 TIA Update and the spring 2009 TIA. Similar to the pedestrian analysis, it should be noted that for the fall 2009 TIA Update, a higher level of detail was used for the analysis of bicycle facilities surrounding the site. Bicycle LOS was calculated for select roadway segments in the study area accordance with TRB's

Multimodal Level of Service Analysis for Urban Streets (NCHRP Report 616), which is described in more detail in Section 6.5 of this document.

It should be noted that this is also a recently developed methodology that has not been adopted by the Town of Chapel, but is a methodology that is being applied in other localities. Additional detail related to the design of the new or modified bicycle facilities was included in the fall 2009 TIA Update, as shown in the table below and there are some additions to the potential mitigation measures for bicycle facilities on Homestead Road and Airport Drive. These potential improvements are not specifically necessary to mitigate impacts generated by Carolina North, and the methodology is not intended to identify improvements that will be required as part of the development. Rather, the potential improvements represent a set of measures to address a lack of widely available and high quality bicycle facilities near the project site and to inform the design of improvements included in the Development Agreement. Further definition of the specific characteristics and phased implementation for these facilities will be a component of the future design effort for these facilities.

Table 1-9: Potential Bicycle Facility Mitigation Measures Comparison

	Spring 2009 TIA	Fall 2009 TIA Update
Stripe 4-5 foot bike lanes on each side of the road on the following segments:	Martin Luther King, Jr. Boulevard (NC 86) from Homestead Road to Bolinwood Drive	Martin Luther King, Jr. Boulevard (NC 86) from Homestead Road to Franklin Street
	Estes Drive from Seawell School Road to Caswell Road	Estes Drive from Seawell School Road to Caswell Road
	Seawell School Road from Hanover Place to Estes Drive	Seawell School Road from Estes Drive to Homestead Road
	Piney Mountain Road from Martin Luther King Jr. Boulevard (NC 86) to Crow Hollow	Homestead Road from Martin Luther King, Jr. Boulevard (NC 86) to Seawell School Road
		Airport Drive from Martin Luther King, Jr. Boulevard (NC 86) to Estes Drive

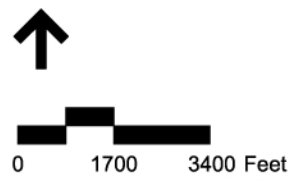


Legend
 # Study Area Intersections

CAROLINA NORTH TIA
 Chapel Hill, North Carolina

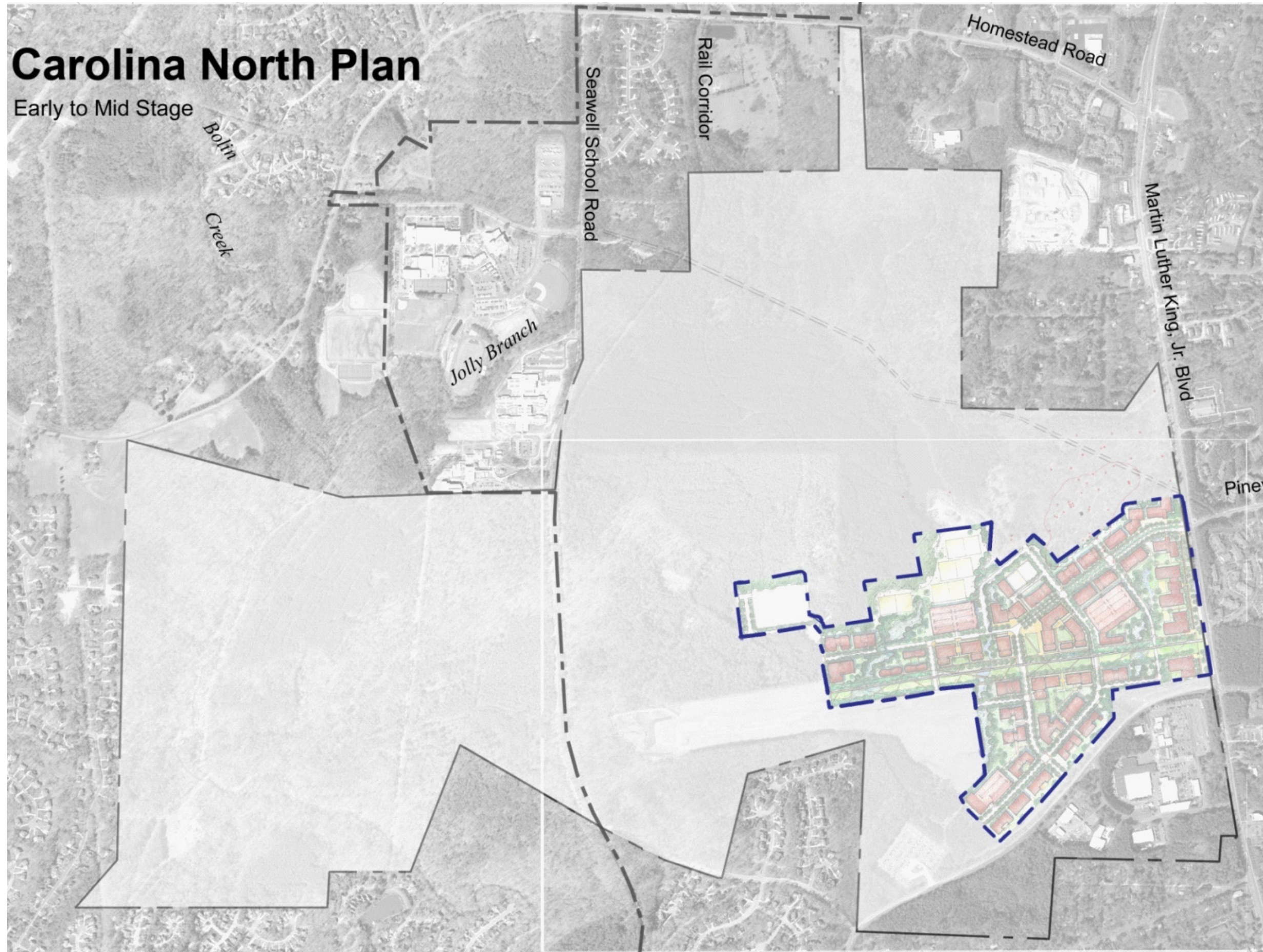
Figure 1-1
 Preliminary Study Area

Chapel Hill, North Carolina



Carolina North Plan

Early to Mid Stage



NTS

Source: University of North Carolina at Chapel Hill

CAROLINA NORTH TIA
Chapel Hill, North Carolina

Figure 1-2

2030 (TIA Phase 2) Carolina North Program

Chapel Hill, North Carolina

TRANSPORTATION NETWORK IMPROVEMENTS

Approved Development Improvements

- 2 Martin Luther King Jr/I-40 WB Ramps**
 - Add exclusive NBT lane to MLK (BG 6, 2012)
- 4 Martin Luther King Jr/Eubanks Road**
 - Add EBL turn lane to Eubanks Road (BG 6, 2012)
 - Add SBR turn lane to MLK Blvd. (BG 6, 2012)
 - Lengthen NBL turn lane to 300 ft. (BG 7, 2008 Implemented)
 - Add paved 'flare' area to SBR turn lane on MLK Blvd. to accommodate tractor-trailers that may go off pavement to turn (BG 7, 2008, Implemented)
- 5 Martin Luther King Jr/Perkins Drive**
 - Add WBL turn lane to Perkins Drive (BG 6, 2012)
- 6 Martin Luther King Jr/Weaver Dairy Road**
 - Adjust signal timing plans and optimize (BG 4, 2007)
- 8 Martin Luther King Jr/Homestead Road**
 - Add NBR taper (BG8, 2019)
- 13 Martin Luther King Jr/Hillsborough Road**
 - Add exclusive WBR turn lane to Hillsborough Drive (BG 3, 2013)
- 14 Columbia Street/Rosemary Street**
 - Add dual EBL turn lane to Rosemary Street (BG 3, 2013)
- 18 Columbia Street/South Street**
 - Decrease radius of NBR turn lane on Columbia Street (leaving a pedestrian refuge island) and provide eastbound exclusive left-turn lane street (BG 1, 2008, Implemented)
 - Remove one vehicular travel lane, add an exclusive lane for buses and one for bicycles on the NB approach, between Manning Drive and South Road (BG 1, 2008, Implemented)
- 25 Weaver Dairy Road/Homestead Road**
 - Monitor for future signalization; warrants not met for future 2013 (BG 5, 2013)
- 40 Rosemary Street/Hillsborough Road**
 - Adjust signal timing plans and optimize (BG 3, 2013)

Committed Improvements

- A Mid-Block Pedestrian Crosswalk with Refuge Island on MLK Blvd near Shadowood Apartments**
 - Located between Estes Dr and Piney Mountain Rd and expected to be installed by fall 2009.
- B Weaver Dairy Road from NC 86 to Sage Rd**
 - Bike Lanes and sidewalk on both sides and turning lanes where needed. Scheduled for construction by 2010.
- C MLK Blvd Signal System Improvement Project**

CAROLINA NORTH TIA Chapel Hill, North Carolina

Figure 1-3
Anticipated and Committed Transportation Improvements

Chapel Hill, North Carolina

