5 Potential Mitigation Measures

This section discusses potential ways to mitigate the impacts of the Carolina North development. The potential mitigation measures are focused on traffic, transit, pedestrian, and bicycle improvements, as well as traffic calming. It should be noted that the mitigations identified in this report represent one way to mitigate the Carolina North impacts, based on the professional judgment of the consultant team. Many of these measures will require refinement as conditions in the study area change and the development program for Carolina North evolves. Additionally, some of the more significant mitigation measures require more detailed study and evaluation of alternatives to address the potential impacts of the project. For example:

- Substantial reconstruction of Estes Drive in the immediate vicinity of the site is identified for the 2030 scenario. Several alternatives for the configurations of this roadway and respective intersections should be evaluated.
- Park-and-ride improvements are concentrated at the Eubanks and Southern Village sites for this TIA. As the *2035 Transit Plan* advances, alternative park-and-ride sites and direct services to Carolina North may be explored.
- Regional transit service improvements such as expanded Triangle Transit service to the site may alleviate the need for expanded Chapel Hill Transit service and park-and-ride capacity.

A series of Carolina North updates is planned to inform a long-term dialog between the University, the Town and other stakeholders so that transportation mitigation for the project can be properly planned, designed, constructed, and operated consistent with the phased implementation of the project.

5.1 Potential Traffic Mitigation Measures

Below is a summary list of the potential roadway measures that would mitigate the traffic impacts of the ultimate development of 3 million square-feet of development of the Carolina North site. These mitigation measures have been designed to bring each intersection's overall levels-of-service back to pre-development levels (or better) when compared to both the year 2015 (TIA Phase 1) and 2030 (TIA Phase 2) No-Build scenarios when traffic from Carolina North has caused a decrease to LOS E or LOS F.

5.1.1 2015 (TIA Phase 1) Build with Mitigation Scenario

These intersections were then evaluated to determine the potential roadway improvements that would mitigate the traffic impacts caused by the Carolina North development. The following potential mitigation measures were determined to offset Carolina North's traffic impacts for the year 2015 (TIA Phase 1) scenario and are shown in Figure 5-1. All figures can be found at the end of the chapter.

Martin Luther King, Jr. Boulevard (NC 86) Corridor:

- Adjust and optimize the traffic signal splits and offsets from Whitfield Road to Hillsborough Street/Umstead Drive

Martin Luther King, Jr. Boulevard (NC 86) & Weaver Dairy Road:

- Construct an exclusive westbound right-turn lane on Weaver Dairy Road

Martin Luther King, Jr. Boulevard (NC 86) and Piney Mountain Road/Municipal Drive:

- Construct an exclusive southbound right-turn lane on Martin Luther King, Jr. Boulevard (NC 86)
- Modify traffic signal to provide a protected northbound left-turn phase

Martin Luther King, Jr. Boulevard (NC 86) and Estes Drive:

- Construct an exclusive northbound right-turn lane on Martin Luther King, Jr. Boulevard (NC 86)

Estes Drive & Caswell Road:

- Adjust the traffic signal cycle length to 150 seconds

Estes Drive & Franklin Street:

- Adjust the traffic signal cycle length to 150 seconds

These potential mitigation measures were input into Synchro 7 software to conduct the year 2015 (TIA Phase 1) Build condition capacity analysis with mitigation. The Highway Capacity Manual (HCM) output reports generated by the Synchro 7 software were used for this analysis. The capacity analysis results for the intersections within the study area are summarized in Table 5-1 for the AM peak hour, Table 5-2 for the Midday peak hour, and Table 5-3 for the PM peak hour. These tables also show the results from the 2015

No-Build and 2015 Build without mitigation conditions that were presented in earlier sections of the report in order to show a comparison between the various scenarios. In addition to the above-listed potential mitigation measures, the following improvements at the intersection of Estes Drive Extension & Airport Drive are potentially needed for the 2015 Build scenario. While these mitigation measures are not needed for capacity, they will provide an additional access point to the development for transit operations allowing buses to enter and loop through the Carolina North site.

Estes Drive Extension & Airport Drive

- Signalize intersection at a 150 second cycle length and coordinate with intersection of Estes Drive & Martin Luther King, Jr. Boulevard (NC 86)
- Construct the southbound approach as Carolina North access point

For purposes of this study, these improvements were not incorporated into the 2015 Build Synchro analysis in order to provide a worst-case scenario of all traffic utilizing the main access point on Martin Luther King, Jr. Boulevard. This provides for acceptable level-of-service at the intersection of Martin Luther King, Jr. Boulevard & Piney Mountain Road/Municipal Drive should the second access point on Estes Drive Extension be restricted to transit only under the first phase of development.

Table 5-1: 2015 (TIA Phase 1) AM Peak Hour Level-of-Service Comparison (#1 to #52)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2015 NO-BUILD			2015 BUILD			2015 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
1	MLK Blvd (NC 86) & Whitfield Rd	Traffic Signal	WB	E	B	15.7	E	B	14.6	E	B	12.8
			NB	A			A			A		
			SB	A			A			A		
2	MLK Blvd (NC 86) & I-40 WB Ramps	Traffic Signal	WB	E	D	35.0	E	D	35.9	E	C	30.0
			NB	B			B			B		
			SB	D			D			C		
3	MLK Blvd (NC 86) & I-40 EB Ramps	Traffic Signal	EB	F	E	76.5	F	F	89.6	D	C	30.2
			NB	B			B			C		
			SB	A			A			C		
4	MLK Blvd (NC 86) & Eubanks Rd	Traffic Signal	EB	E	C	30.7	E	C	31.6	E	C	24.4
			NB	A			B			A		
			SB	D			D			C		
6	MLK Blvd (NC 86) & Weaver Dairy Rd	Traffic Signal	EB	E	D	52.4	E	E	56.5	E	D	42.6
			WB	F			F			F		
			NB	D			D			D		
			SB	D			D			C		
10	MLK Blvd (NC 86) & Piney Mountain Rd/ Municipal Dr	Traffic Signal	EB	E	B	10.4	E	E	67.5	E	B	17.8
			WB	E			E			E		
			NB	A			F			B		
			SB	A			A			A		
11	MLK Blvd (NC 86) & Estes Dr	Traffic Signal	EB	F	D	47.6	F	E	63.1	E	D	40.3
			WB	D			D			E		
			NB	C			C			C		
			SB	C			C			C		
12	MLK Blvd (NC 86) & Airport Dr	Stop Sign	EB	C	-	-	C	-	-	C	-	-
			NB	-			-			-		
			SB	-			-			-		
13	MLK Blvd (NC 86) & Hillsborough St/ Umstead Dr	Traffic Signal	EB	E	B	14.8	E	B	15.2	E	B	12.8
			WB	E			E			E		
			NB	B			B			B		
			SB	A			A			A		
14	Columbia St (NC 86) & Rosemary St	Traffic Signal	EB	D	C	32.2	C	D	40.7	C	D	40.7
			WB	C			C			C		
			NB	C			D			D		
			SB	C			E			E		
18	Columbia St (NC 86) & South Rd/ McCauley Street	Traffic Signal	EB	D	C	21.4	D	C	21.2	D	C	21.2
			WB	D			D			D		
			NB	A			A			A		
27	Homestead Rd & Rogers Rd	Stop Sign	EB	E	-	-	F	-	-	F	-	-
			NB	-			-					
			SB	-			-					
31	Estes Dr Ext & Airport Dr	Stop Sign	EB	-	-	-	-	-	-		-	-
			WB	-			-					
			NB	E			E			E		
32	Estes Dr Ext & Seawell School Rd	Traffic Signal	EB	A	B	10.6	A	B	11.9	A	B	11.9
			WB	B			B			B		
			SB	B			B			B		
35	NC 54 & Main St	Traffic Signal	EB	B	C	20.1	B	C	21.1	B	C	21.1
			WB	C			C			C		
			NB	C			C			C		
			SB	D			D			D		
37	Greensboro St & Weaver St	Traffic Signal	EB	B	C	24.7	C	C	26.1	C	C	26.1
			WB	C			C			C		
			NB	C			C			C		
			SB	C			C			C		
42	Estes Dr & Caswell Rd	Traffic Signal	EB	A	C	30.6	A	E	68.2	A	B	19.5
			WB	E			F			C		
			NB	B			B			D		
			SB	B			B			C		
43	Estes Dr & Franklin St	Traffic Signal	EB	D	D	38.6	D	D	42.2	D	D	37.2
			WB	D			D			D		
			NB	C			C			C		
			SB	D			D			D		

Table 5-2: 2015 (TIA Phase 1) Midday Peak Hour Level-of-Service Comparison (#1 to #52)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2015 NO-BUILD			2015 BUILD			2015 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
1	MLK Blvd (NC 86) & Whitfield Rd	Traffic Signal	WB	E	B	12.0	E	B	10.8	E	B	10.5
			NB	A			A			A		
			SB	A			A			A		
2	MLK Blvd (NC 86) & I-40 WB Ramps	Traffic Signal	WB	E	D	35.7	E	C	33.5	E	C	28.0
			NB	C			C			B		
			SB	C			C			B		
3	MLK Blvd (NC 86) & I-40 EB Ramps	Traffic Signal	EB	E	B	19.8	E	B	18.2	E	B	12.7
			NB	B			B			A		
			SB	A			A			A		
4	MLK Blvd (NC 86) & Eubanks Rd	Traffic Signal	EB	E	A	9.4	E	A	9.3	E	A	9.6
			NB	A			A			A		
			SB	A			A			A		
6	MLK Blvd (NC 86) & Weaver Dairy Rd	Traffic Signal	EB	E	D	42.5	E	D	42.0	E	C	32.6
			WB	E			E			E		
			NB	C			C			B		
			SB	D			D			C		
10	MLK Blvd (NC 86) & Piney Mountain Rd/ Municipal Dr	Traffic Signal	EB	E	A	7.1	E	B	17.9	E	B	14.6
			WB	E			E			E		
			NB	A			B			A		
			SB	A			A			A		
11	MLK Blvd (NC 86) & Estes Dr	Traffic Signal	EB	E	D	42.8	F	E	59.2	E	D	38.3
			WB	E			E			E		
			NB	C			C			C		
			SB	D			E			C		
12	MLK Blvd (NC 86) & Airport Dr	Stop Sign	EB	C	-	-	D	-	-	D	-	-
			NB	-			-					
			SB	-			-					
13	MLK Blvd (NC 86) & Hillsborough St/ Umstead Dr	Traffic Signal	EB	E	B	16.1	E	B	15.9	E	B	15.9
			WB	E			E			E		
			NB	A			A			A		
			SB	A			A			A		
14	Columbia St (NC 86) & Rosemary St	Traffic Signal	EB	D	C	31.7	C	C	33.1	C	C	33.1
			WB	C			C			C		
			NB	C			D			D		
			SB	C			D			D		
18	Columbia St (NC 86) & South Rd/ McCauley Street	Traffic Signal	EB	D	C	25.7	D	C	25.4	D	C	25.4
			WB	D			D			D		
			NB	A			A			A		
27	Homestead Rd & Rogers Rd	Stop Sign	EB	B	-	-	B	-	-	B	-	-
			NB	-			-			-		
			SB	-			-			-		
31	Estes Dr Ext & Airport Dr	Stop Sign	EB	-	-	-	-	-	-	-	-	-
			WB	-			-			-		
			NB	C			C			C		
32	Estes Dr Ext & Seawell School Rd	Traffic Signal	EB	A	A	9.2	A	A	9.5	A	A	9.5
			WB	B			B			B		
			SB	B			B			B		
35	NC 54 & Main St	Traffic Signal	EB	C	C	31.0	C	C	31.2	C	C	31.2
			WB	C			C			C		
			NB	D			D			D		
			SB	D			D			D		
37	Greensboro St & Weaver St	Traffic Signal	EB	B	D	37.9	B	D	42.4	B	D	42.4
			WB	E			E			E		
			NB	D			D			D		
			SB	C			C			C		
42	Estes Dr & Caswell Rd	Traffic Signal	EB	A	A	8.6	A	B	12.1	A	B	10.8
			WB	B			B			B		
			NB	C			B			C		
			SB	B			B			C		
43	Estes Dr & Franklin St	Traffic Signal	EB	E	D	45.4	F	E	56.9	D	D	45.0
			WB	D			D			D		
			NB	D			D			D		
			SB	C			D			D		

Table 5-3: 2015 (TIA Phase 1) PM Peak Hour Level-of-Service Comparison (#1 to #52)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2015 NO-BUILD			2015 BUILD			2015 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
1	MLK Blvd (NC 86) & Whitfield Rd	Traffic Signal	WB	E	C	21.5	E	C	22.3	E	B	19.3
			NB	B			B			A		
			SB	A			A			A		
2	MLK Blvd (NC 86) & I-40 WB Ramps	Traffic Signal	WB	F	D	42.9	F	D	43.1	E	D	39.2
			NB	B			B			C		
			SB	D			D			C		
3	MLK Blvd (NC 86) & I-40 EB Ramps	Traffic Signal	EB	E	C	29.0	E	C	32.3	E	B	13.5
			NB	C			C			A		
			SB	B			B			A		
4	MLK Blvd (NC 86) & Eubanks Rd	Traffic Signal	EB	E	B	13.9	E	B	18.6	E	B	18.5
			NB	B			B			A		
			SB	A			A			B		
6	MLK Blvd (NC 86) & Weaver Dairy Rd	Traffic Signal	EB	E	F	97.5	E	F	105.2	E	D	50.1
			WB	F			F			F		
			NB	F			F			E		
			SB	C			C			C		
10	MLK Blvd (NC 86) & Piney Mountain Rd/ Municipal Dr	Traffic Signal	EB	E	B	10.9	E	C	32.2	F	C	21.9
			WB	E			E			E		
			NB	A			C			A		
			SB	A			B			B		
11	MLK Blvd (NC 86) & Estes Dr	Traffic Signal	EB	F	E	76.9	F	F	111.6	F	E	79.1
			WB	E			F			F		
			NB	F			F			E		
			SB	E			F			E		
12	MLK Blvd (NC 86) & Airport Dr	Stop Sign	EB	F	-	-	F	-	-	F	-	-
			NB	-			-			-		
			SB	-			-			-		
13	MLK Blvd (NC 86) & Hillsborough St/ Umstead Dr	Traffic Signal	EB	E	C	22.9	E	C	23.5	E	B	19.9
			WB	E			E			E		
			NB	B			B			B		
			SB	A			A			A		
14	Columbia St (NC 86) & Rosemary St	Traffic Signal	EB	E	D	46.9	D	D	52.0	D	D	52.0
			WB	E			D			D		
			NB	D			D			D		
			SB	D			D			D		
18	Columbia St (NC 86) & South Rd/ McCauley Street	Traffic Signal	EB	E	D	44.1	E	D	44.6	E	D	44.6
			WB	D			D			D		
			NB	C			D			D		
27	Homestead Rd & Rogers Rd	Stop Sign	EB	D	-	-	E	-	-	E	-	-
			NB	-			-			-		
			SB	-			-			-		
31	Estes Dr Ext & Airport Dr	Stop Sign	EB	-	-	-	-	-	-	-	-	-
			WB	-			-			-		
			NB	F			F			F		
32	Estes Dr Ext & Seawell School Rd	Traffic Signal	EB	A	B	19.4	A	C	32.0	A	C	32.0
			WB	C			E			E		
			SB	B			B			B		
35	NC 54 & Main St	Traffic Signal	EB	B	C	23.9	B	C	24.5	B	C	24.5
			WB	B			C			C		
			NB	D			D			D		
			SB	D			D			D		
37	Greensboro St & Weaver St	Traffic Signal	EB	B	D	45.3	B	D	53.2	B	D	53.2
			WB	D			D			D		
			NB	E			F			F		
			SB	D			D			D		
42	Estes Dr & Caswell Rd	Traffic Signal	EB	A	E	75.9	A	F	93.0	A	B	19.7
			WB	F			F			C		
			NB	B			B			D		
			SB	B			B			D		
43	Estes Dr & Franklin St	Traffic Signal	EB	F	F	114.4	F	F	134.2	F	F	83.6
			WB	E			E			E		
			NB	F			F			F		
			SB	F			F			F		

As shown in Table 5-1 through Table 5-3, all intersections where potential mitigation measures are identified improve the overall levels-of-service at the intersection to equal to, or better than the LOS exhibited during the 2015 (TIA Phase 1) No-Build scenario. The two-way STOP controlled intersection of Homestead Road & Rogers Road would require additional data collection to evaluate if a signal is needed based on the Manual for Uniform Traffic Controlled Devices (MUTCD) methodology.

5.1.2 2030 (TIA Phase 2) Build with Mitigation Scenario

The intersections found to operate at deteriorated LOS over the 2030 (TIA Phase 2) No-Build scenario were then evaluated to determine potential roadway improvements that would mitigate the traffic impacts caused by the Carolina North development. The following potential mitigation measures were determined to offset Carolina North's traffic impacts for the year 2030 (TIA Phase 2) scenario in addition to those measures identified for 2015 (TIA Phase 1) and are shown in Figure 5-2:

Martin Luther King, Jr. Boulevard (NC 86) Corridor:

- Adjust and optimize the traffic signal splits and offsets from Whitfield Road to Hillsborough Street/Umstead Drive

Martin Luther King, Jr. Boulevard (NC 86) & Eubanks Road

- Construct an additional eastbound left-turn lane on Eubanks Road to provide triple lefts. In addition, provide appropriate signage to designate destination for each lane (I-40 westbound, NC 86 northbound, and I-40 eastbound)

Martin Luther King, Jr. Boulevard (NC 86) & Weaver Dairy Road

- Construct an exclusive southbound right-turn lane on Martin Luther King, Jr. Boulevard (NC 86)

Martin Luther King, Jr. Boulevard (NC 86) at Homestead Road (SR 1777)

- Construct an additional eastbound right-turn lane on Homestead Road
- Remove crosswalk on northern leg of intersection and reduce minimum split time for westbound signal phase. Crosswalk on southern leg will continue to accommodate pedestrians crossing Martin Luther King, Jr. Boulevard (NC 86)

Martin Luther King, Jr. Boulevard (NC 86) & Piney Mountain Road/Municipal Drive

- Construct an additional eastbound left-turn lane on Municipal Drive
- Construct an exclusive northbound right-turn lane on Martin Luther King, Jr. Boulevard (NC 86)

Martin Luther King, Jr. Boulevard (NC 86) & Estes Drive

- Construct an additional eastbound through lane and an additional westbound through lane on Estes Drive

- Construct an additional southbound left-turn on Martin Luther King, Jr. Boulevard (NC 86)

Martin Luther King, Jr. Boulevard (NC 86) & Airport Drive

- Signalize intersection at a 150 second cycle length and coordinate with adjacent signals along Martin Luther King, Jr. Boulevard

Columbia Street (NC 86) & Rosemary Street

- Adjust and optimize the traffic signal splits

Pittsboro Street (NC 86) & McCauley Street

- Adjust and optimize the traffic signal splits

US 15-501 & Mount Carmel Church Road/Culbreth Road

- Adjust and optimize the traffic signal splits

Homestead Road & Weaver Dairy Road

- Signalize intersection at a 75 second cycle length

Homestead Road & Seawell School Road

- Modify traffic signal to a 75 second cycle length

Homestead Road & Rogers Road

- Signalize intersection at a 75 second cycle length

Homestead Road & High School Road

- Modify traffic signal to a 75 second cycle length

Homestead Road/Dairyland Road & Old NC 86

- Modify traffic signal to a 90 second cycle length

Estes Drive Extension & Airport Drive

- Construct an additional eastbound through lane, an exclusive eastbound left-turn lane, an additional westbound through lane, and an exclusive westbound right-turn lane on Estes Drive
- Construct an exclusive northbound left-turn lane on Airport Drive
- Construct the southbound approach to consist of dual left-turn lanes, a through lane, and an exclusive right-turn lane

Estes Drive Extension & Seawell School Road

- Modify traffic signal to a 75 second cycle length

Estes Drive Extension & Greensboro Street

- Modify traffic signal to a 75 second cycle length

Greensboro Street & Weaver Street

- Adjust and optimize the traffic signal splits

Greensboro Street & Main Street

- Adjust and optimize the traffic signal splits

Estes Drive & Caswell Road:

- Restripe the southbound approach on Caswell Drive to include a shared left-turn/through lane and an exclusive right-turn lane

Estes Drive & Franklin Street:

- Construct an exclusive southbound right-turn lane on Franklin Street

Franklin Street & Elliott Road

- Adjust and optimize the traffic signal splits

Franklin Street & Ephesus Church Road

- Modify traffic signal to a 150 second cycle length

Fordham Boulevard (US 15-501) Corridor:

- Adjust and optimize the traffic signal splits and offsets from the superstreet intersections to the I-40 Eastbound Ramps

These potential mitigation measures were input into Synchro 7 software to conduct the year 2030 (TIA Phase 2) Build condition capacity analysis with mitigation. The Highway Capacity Manual (HCM) output reports generated by the Synchro 7 software were used for this analysis. The capacity analysis results for the intersections within the study area are summarized in Table 5-4 through Table 5-6 for the AM peak hour, Table 5-7 through Table 5-9 for the Midday peak hour, and Table 5-10 through Table 5-12 for the PM peak hour. These tables also show the results from the 2030 No-Build and 2030 Build without mitigation conditions that were presented in earlier sections of the report in order to show a comparison between the various scenarios.

Table 5-4: 2030 (TIA Phase 2) AM Peak Hour Level-of-Service Comparison (#1 to #18)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2030 NO-BUILD			2030 BUILD			2030 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
1	MLK Blvd (NC 86) & Whitfield Rd	Traffic Signal	WB	E	B	16.2	E	B	14.0	E	B	12.7
			NB	A			A			A		
			SB	A			A			A		
2	MLK Blvd (NC 86) & I-40 WB Ramps	Traffic Signal	WB	E	D	36.8	F	D	49.5	E	D	35.5
			NB	B			B			B		
			SB	D			D			C		
3	MLK Blvd (NC 86) & I-40 EB Ramps	Traffic Signal	EB	F	F	123.8	F	F	151.6	F	F	110.1
			NB	B			B			B		
			SB	A			A			F		
4	MLK Blvd (NC 86) & Eubanks Rd	Traffic Signal	EB	E	D	50.8	E	F	105.6	F	D	51.5
			NB	B			B			B		
			SB	E			F			D		
5	MLK Blvd (NC 86) & Perkins Dr	Traffic Signal	WB	E	B	12.1	E	B	15.8	E	A	10.0
			NB	A			A			A		
			SB	B			B			A		
6	MLK Blvd (NC 86) & Weaver Dairy Rd	Traffic Signal	EB	E	F	103.0	E	F	169.5	E	F	100.3
			WB	F			F			F		
			NB	E			E			D		
			SB	F			F			F		
7	MLK Blvd (NC 86) & Westminster Dr	Traffic Signal	WB	E	A	9.6	E	B	12.3	E	B	11.7
			NB	A			A			A		
			SB	A			A			A		
8	MLK Blvd (NC 86) & Homestead Rd	Traffic Signal	EB	E	C	29.0	D	F	84.5	E	D	50.5
			WB	E			E			E		
			NB	B			B			C		
			SB	C			F			E		
9	MLK Blvd (NC 86) & Northfield Dr	Traffic Signal	EB	E	B	10.6	E	B	12.5	E	A	6.8
			NB	A			A			A		
			SB	B			B			A		
10	MLK Blvd (NC 86) & Piney Mountain Rd/ Municipal Dr	Traffic Signal	EB	E	B	12.2	E	F	113.0	E	C	21.8
			WB	E			E			F		
			NB	A			F			B		
			SB	A			F			B		
11	MLK Blvd (NC 86) & Estes Dr	Traffic Signal	EB	F	F	85.5	F	F	157.0	E	E	63.5
			WB	E			F			F		
			NB	C			D			B		
			SB	D			D			E		
12	MLK Blvd (NC 86) & Airport Dr	Stop Sign	EB	E	-	-	F	-	-	F	C	25.3
			NB	-			-			C		
			SB	-			-			A		
13	MLK Blvd (NC 86) & Hillsborough St/ Umstead Dr	Traffic Signal	EB	E	B	17.8	E	C	21.8	E	C	20.0
			WB	E			E			E		
			NB	B			C			C		
			SB	A			A			A		
14	Columbia St (NC 86) & Rosemary St	Traffic Signal	EB	D	D	41.5	C	E	64.3	E	D	45.5
			WB	C			C			F		
			NB	C			D			C		
			SB	D			F			C		
15	Columbia St (NC 86) & Franklin St	Traffic Signal	EB	D	D	43.6	D	D	47.7	D	D	47.7
			WB	D			D			D		
			NB	D			E			E		
			SB	D			D			D		
16	Columbia St (NC 86) & Cameron Ave	Traffic Signal	EB	C	F	108.7	C	F	138.0	C	F	138.0
			WB	C			C			C		
			NB	F			F			F		
			SB	F			F			F		
18	Columbia St (NC 86) & South Rd/ McCauley Street	Traffic Signal	EB	D	C	22.6	D	C	21.8	D	C	21.6
			WB	D			D			D		
			NB	A			A			A		

Table 5-5: 2030 (TIA Phase 2) AM Peak Hour Level-of-Service Comparison (#19 to #36)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2030 NO-BUILD			2030 BUILD			2030 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
19	Pittsboro St (NC 86) & McCauley St	Traffic Signal	EB	C	C	32.5	C	C	33.3	C	C	33.3
			WB	D			D			D		
			SB	C			C			C		
20	Columbia St (NC 86) & Manning Dr/ Pittsboro St	Traffic Signal	EB	D	C	32.0	D	C	32.5	D	C	32.7
			WB	A			A			A		
			NB	C			C			C		
21	Columbia St (NC 86) & Mason Farm Rd/ Westwood Dr	Traffic Signal	EB	C	E	63.2	C	E	79.9	C	E	79.9
			WB	C			C			C		
			NB	F			F			F		
			SB	C			C			C		
22	Columbia St (NC 86) & Fordham Blvd (NC 54) WB Ramps	Traffic Signal	WB	E	C	20.8	E	C	20.4	E	C	20.4
			NB	A			A			A		
			SB	B			B			B		
23	Columbia St (US 15-501) & Fordham Blvd (NC 54) EB Ramps	Traffic Signal	EB	D	C	30.2	D	C	32.0	D	C	31.0
			NB	C			D			D		
			SB	A			A			A		
24	Columbia St (US 15-501) & Mt Carmel Church Rd / Culbreth Rd	Traffic Signal	EB	F	F	143.4	F	F	172.5	F	F	139.2
			WB	F			F			F		
			NB	F			F			F		
			SB	A			A			A		
25	Homestead Rd & Weaver Dairy Rd	Stop Sign	EB	-	-	-	-	-	-	A	B	11.0
			WB	-			-			A		
			SB	F			F			C		
26	Homestead Rd & Seawell School Rd	Traffic Signal	EB	F	F	152.5	F	F	215.9	E	D	51.4
			WB	C			C			D		
			NB	B			B			C		
27	Homestead Rd & Rogers Rd	Stop Sign	EB	F	-	-	F	-	-	B	B	15.2
			NB	-			-			A		
			SB	-			-			C		
28	Homestead Rd & High School Rd	Traffic Signal	WB	B	F	148.5	B	F	197.1	C	D	45.9
			NB	F			F			E		
			SB	A			A			B		
29	Homestead Rd/ Dairyland Rd & Old NC 86	Traffic Signal	EB	F	E	69.1	F	F	87.2	D	D	37.9
			WB	B			B			C		
			NB	C			C			C		
			SB	F			F			D		
31	Estes Dr Ext & Airport Dr	Stop Sign/ Traffic Signal	EB	-	-	-	F	F	309.5	B	C	25.2
			WB	-			B			B		
			NB	F			F			E		
			SB	-			F			D		
32	Estes Dr Ext & Seawell School Rd	Traffic Signal	EB	B	B	15.1	F	F	92.3	D	D	39.0
			WB	B			B			A		
			SB	C			B			D		
33	Estes Dr Ext & Greensboro St	Traffic Signal	WB	D	C	32.8	F	E	57.4	D	D	43.7
			NB	B			C			D		
			SB	C			D			D		
35	NC 54 & Main St	Traffic Signal	EB	B	C	25.2	C	C	34.0	C	C	32.5
			WB	C			C			C		
			NB	C			C			C		
			SB	D			F			D		

Table 5-6: 2030 (TIA Phase 2) AM Peak Hour Level-of- Service Comparison (#37 to #52)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2030 NO-BUILD			2030 BUILD			2030 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
37	Greensboro St & Weaver St	Traffic Signal	EB	C	C	32.5	C	E	78.8	C	D	54.4
			WB	D			D			D		
			NB	D			F			E		
			SB	C			D			D		
38	Greensboro St & Main St	Traffic Signal	EB	B	E	72.7	C	F	83.7	C	D	53.5
			WB	C			C			C		
			NB	C			D			C		
			SB	F			F			F		
39	Greensboro St & Merritt Mill Rd/ NC 54 WB Ramp	Traffic Signal	WB	D	B	15.6	D	B	14.8	D	B	14.8
			NB	A			A			A		
			SB	A			A			A		
42	Estes Dr & Caswell Rd	Traffic Signal	EB	B	E	60.9	C	F	295.4	C	E	78.0
			WB	F			F			F		
			NB	B			B			E		
			SB	B			B			F		
43	Estes Dr & Franklin St	Traffic Signal	EB	F	E	57.8	F	F	135.2	F	D	54.8
			WB	D			E			E		
			NB	D			D			D		
			SB	D			F			F		
44	Franklin St & Elliott Rd	Traffic Signal	EB	B	C	24.3	C	D	40.2	C	D	36.6
			WB	C			D			D		
			NB	D			D			D		
			SB	D			D			D		
45	Franklin St & Ephesus Church Rd	Traffic Signal	EB	A	B	11.2	A	B	13.0	A	B	15.0
			WB	A			B			B		
			NB	D			D			E		
46	Fordham Blvd (US 15-501) & Erwin Rd/Europa Dr	Traffic Signal (Super Street)	EB	A	B	19.5	A	C	21.2	A	C	21.2
			WB	B			B			B		
			NB	F			F			F		
			SB	E			E			E		
	US 15-501 & South U-Turn	Traffic Signal (Super Street)	EB	C	C	27.0	C	C	29.4	C	C	29.5
			SB	D			D			D		
	US 15-501 & North U-Turn	Traffic Signal (Super Street)	WB	B	C	29.3	D	D	47.9	D	D	43.0
			NB	F			F			F		
47	Fordham Blvd (US 15-501) & Sage Rd/Scarlet Dr	Traffic Signal	EB	D	F	84.4	D	F	122.3	D	E	68.0
			WB	F			F			E		
			NB	F			F			F		
			SB	E			E			F		
48	Fordham Blvd (US 15-501) & Eastowne Dr/BSBC Dr	Traffic Signal	EB	C	D	39.7	C	E	72.8	C	D	49.9
			WB	D			F			E		
			NB	E			E			E		
			SB	F			F			F		
49	Fordham Blvd (US 15-501) & Eastowne Dr/ Lakeview Dr	Traffic Signal	EB	E	E	68.3	E	F	88.9	E	E	78.1
			WB	D			E			E		
			NB	E			E			E		
			SB	F			F			F		
50	Fordham Blvd (US 15-501) & I-40 EB Ramps	Traffic Signal	EB	E	D	40.4	E	D	42.7	E	D	43.2
			WB	B			B			B		
			SB	E			E			E		
51	Fordham Blvd (US 15-501) & I-40 WB Ramps	Traffic Signal	EB	C	E	74.8	C	F	99.8	C	E	79.0
			WB	F			F			F		
			NB	E			E			F		
52	Weaver Dairy Rd & Kingston Dr/ McClamroch Cir	Traffic Signal	EB	B	B	11.9	B	B	12.2	B	B	12.2
			WB	A			A			A		
			NB	B			B			B		
			SB	B			B			B		

Table 5-7: 2030 (TIA Phase 2) Midday Peak Hour Level-of -Service Comparison (#1 to #18)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2030 NO-BUILD			2030 BUILD			2030 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
1	MLK Blvd (NC 86) & Whitfield Rd	Traffic Signal	WB	E	B	12.8	E	A	9.7	E	A	9.2
			NB	A			A			A		
			SB	A			A			A		
2	MLK Blvd (NC 86) & I-40 WB Ramps	Traffic Signal	WB	E	C	35.0	E	C	33.9	E	C	28.9
			NB	C			C			B		
			SB	C			C			C		
3	MLK Blvd (NC 86) & I-40 EB Ramps	Traffic Signal	EB	E	B	19.8	E	B	16.7	E	B	12.8
			NB	B			B			A		
			SB	A			A			A		
4	MLK Blvd (NC 86) & Eubanks Rd	Traffic Signal	EB	E	B	11.0	E	B	17.4	E	B	13.1
			NB	A			A			A		
			SB	A			B			A		
5	MLK Blvd (NC 86) & Perkins Dr	Traffic Signal	WB	E	B	18.7	E	B	20.0	E	B	13.8
			NB	A			A			A		
			SB	B			C			A		
6	MLK Blvd (NC 86) & Weaver Dairy Rd	Traffic Signal	EB	E	D	49.7	E	D	51.6	E	C	33.9
			WB	F			F			E		
			NB	C			D			C		
			SB	D			C			C		
7	MLK Blvd (NC 86) & Westminster Dr	Traffic Signal	WB	E	B	10.0	E	A	6.9	E	B	11.7
			NB	A			A			B		
			SB	A			A			A		
8	MLK Blvd (NC 86) & Homestead Rd	Traffic Signal	EB	D	D	37.5	D	F	94.4	D	D	41.2
			WB	E			E			F		
			NB	C			C			C		
			SB	D			F			D		
9	MLK Blvd (NC 86) & Northfield Dr	Traffic Signal	EB	E	A	2.9	E	A	6.5	E	A	3.1
			NB	A			A			A		
			SB	A			A			A		
10	MLK Blvd (NC 86) & Piney Mountain Rd/ Municipal Dr	Traffic Signal	EB	E	A	7.4	E	E	72.6	E	C	25.2
			WB	E			E			E		
			NB	A			F			B		
			SB	A			C			B		
11	MLK Blvd (NC 86) & Estes Dr	Traffic Signal	EB	F	E	61.4	F	F	193.2	D	D	41.7
			WB	E			F			E		
			NB	C			C			C		
			SB	E			F			C		
12	MLK Blvd (NC 86) & Airport Dr	Stop Sign	EB	F	-	-	F	-	-	E	B	16.6
			NB	-						A		
			SB	-						A		
13	MLK Blvd (NC 86) & Hillsborough St/ Umstead Dr	Traffic Signal	EB	E	B	17.2	E	B	18.8	E	B	18.3
			WB	E			E			E		
			NB	A			B			B		
			SB	A			A			A		
14	Columbia St (NC 86) & Rosemary St	Traffic Signal	EB	D	D	38.1	C	E	56.6	E	D	43.5
			WB	D			C			E		
			NB	D			E			C		
			SB	D			E			C		
15	Columbia St (NC 86) & Franklin St	Traffic Signal	EB	E	E	55.4	E	E	64.7	E	E	64.7
			WB	D			D			D		
			NB	E			F			F		
			SB	D			D			D		
16	Columbia St (NC 86) & Cameron Ave	Traffic Signal	EB	C	F	161.7	C	F	209.6	C	F	209.6
			WB	C			C			C		
			NB	F			F			F		
			SB	F			F			F		
18	Columbia St (NC 86) & South Rd/ McCauley Street	Traffic Signal	EB	D	C	27.4	D	C	27.0	D	C	26.7
			WB	D			D			D		
			NB	B			B			B		

Table 5-8: 2030 (TIA Phase 2) Midday Peak Hour Level-of -Service Comparison (#19 to #36)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2030 NO-BUILD			2030 BUILD			2030 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
19	Pittsboro St (NC 86) & McCauley St	Traffic Signal	EB	C	C	22.5	C	C	22.7	C	C	23.3
			WB	D			D			D		
			SB	B			B			B		
20	Columbia St (NC 86) & Manning Dr/ Pittsboro St	Traffic Signal	EB	E	C	28.3	E	C	28.1	E	C	28.7
			WB	C			C			C		
			NB	B			B			B		
21	Columbia St (NC 86) & Mason Farm Rd/ Westwood Dr	Traffic Signal	EB	C	C	26.6	C	C	30.5	C	C	30.5
			WB	C			C			C		
			NB	D			D			D		
			SB	B			B			B		
22	Columbia St (NC 86) & Fordham Blvd (NC 54) WB Ramps	Traffic Signal	WB	D	C	30.9	E	C	26.0	E	C	26.0
			NB	B			A			A		
			SB	B			B			B		
23	Columbia St (US 15-501) & Fordham Blvd (NC 54) EB Ramps	Traffic Signal	EB	D	B	18.5	D	C	21.0	D	B	19.7
			NB	C			C			C		
			SB	A			A			A		
24	Columbia St (US 15-501) & Mt Carmel Church Rd / Culbreth Rd	Traffic Signal	EB	D	C	22.7	D	C	26.6	D	C	25.8
			WB	D			D			D		
			NB	C			C			C		
			SB	B			B			B		
25	Homestead Rd & Weaver Dairy Rd	Stop Sign	EB	-	-	-		-	-	A	A	7.3
			WB	-						A		
			SB	C			E			B		
26	Homestead Rd & Seawell School Rd	Traffic Signal	EB	A	A	7.4	B	A	8.6	A	A	7.4
			WB	A			A			A		
			NB	B			B			B		
27	Homestead Rd & Rogers Rd	Stop Sign	EB	C	-	-	C	-	-	A	A	6.1
			NB	-						A		
			SB	-						B		
28	Homestead Rd & High School Rd	Traffic Signal	WB	B	A	10.0	B	B	10.2	B	B	10.8
			NB	B			B			B		
			SB	A			A			A		
29	Homestead Rd/ Dairyland Rd & Old NC 86	Traffic Signal	EB	D	C	21.1	C	B	18.5	D	C	20.0
			WB	B			B			B		
			NB	A			B			B		
			SB	B			B			B		
31	Estes Dr Ext & Airport Dr	Stop Sign/ Traffic Signal	EB	-	-	-	F	F	261.5	B	C	25.3
			WB	-			C			A		
			NB	C			D			E		
			SB	-			F			D		
32	Estes Dr Ext & Seawell School Rd	Traffic Signal	EB	A	B	10.4	A	C	32.2	A	B	13.0
			WB	B			E			B		
			SB	B			B			C		
33	Estes Dr Ext & Greensboro St	Traffic Signal	WB	A	B	17.7	A	D	42.1	B	C	23.4
			NB	B			B			C		
			SB	C			F			C		
35	NC 54 & Main St	Traffic Signal	EB	C	C	34.0	C	C	34.0	C	C	33.9
			WB	C			C			C		
			NB	D			D			D		
			SB	E			D			D		

Table 5-9: 2030 (TIA Phase 2) Midday Peak Hour Level-of -Service Comparison (#37 to #52)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2030 NO-BUILD			2030 BUILD			2030 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
37	Greensboro St & Weaver St	Traffic Signal	EB	B	E	67.0	C	F	115.6	E	E	72.3
			WB	F			F			E		
			NB	E			F			F		
			SB	C			E			D		
38	Greensboro St & Main St	Traffic Signal	EB	B	C	29.8	C	E	64.5	E	D	37.3
			WB	B			B			C		
			NB	C			C			C		
			SB	D			F			D		
39	Greensboro St & Merritt Mill Rd/ NC 54 WB Ramp	Traffic Signal	WB	B	B	11.1	B	B	10.8	B	B	10.8
			NB	A			A			A		
			SB	B			B			B		
42	Estes Dr & Caswell Rd	Traffic Signal	EB	A	B	16.9	B	F	89.8	A	B	18.6
			WB	C			F			C		
			NB	B			B			D		
			SB	B			B			D		
43	Estes Dr & Franklin St	Traffic Signal	EB	F	F	87.9	F	F	166.7	F	F	81.5
			WB	E			F			E		
			NB	F			F			F		
			SB	E			F			E		
44	Franklin St & Elliott Rd	Traffic Signal	EB	E	E	57.2	F	F	84.5	E	E	65.0
			WB	C			D			D		
			NB	F			F			F		
			SB	D			D			D		
45	Franklin St & Ephesus Church Rd	Traffic Signal	EB	B	D	37.2	B	D	41.0	B	D	36.5
			WB	B			B			C		
			NB	F			F			F		
46	Fordham Blvd (US 15-501) & Erwin Rd/Europa Dr	Traffic Signal (Super Street)	EB	A	B	17.2	A	B	18.2	A	B	18.3
			WB	B			A			B		
			NB	F			F			F		
			SB	E			E			E		
	US 15-501 & South U-Turn	Traffic Signal (Super Street)	EB	F	F	83.7	F	F	111.3	F	F	111.3
			SB	D			D			D		
	US 15-501 & North U-Turn	Traffic Signal (Super Street)	WB	C	D	37.0	C	C	30.6	C	C	29.4
			NB	F			F			F		
47	Fordham Blvd (US 15-501) & Sage Rd/Scarlet Dr	Traffic Signal	EB	E	E	78.5	E	F	110.8	D	E	72.8
			WB	F			F			E		
			NB	F			F			F		
			SB	E			E			F		
48	Fordham Blvd (US 15-501) & Eastowne Dr/BSBC Dr	Traffic Signal	EB	D	C	33.5	D	D	40.1	D	D	41.2
			WB	B			C			C		
			NB	E			E			E		
			SB	F			F			F		
49	Fordham Blvd (US 15-501) & Eastowne Dr/ Lakeview Dr	Traffic Signal	EB	C	C	32.8	C	D	36.8	B	C	27.3
			WB	C			C			C		
			NB	E			E			E		
			SB	F			F			F		
50	Fordham Blvd (US 15-501) & I-40 EB Ramps	Traffic Signal	EB	C	C	22.5	C	C	23.0	C	C	26.4
			WB	A			A			B		
			SB	E			E			E		
51	Fordham Blvd (US 15-501) & I-40 WB Ramps	Traffic Signal	EB	C	E	67.0	C	F	88.1	B	D	43.7
			WB	F			F			D		
			NB	D			D			F		
52	Weaver Dairy Rd & Kingston Dr/ McClamroch Cir	Traffic Signal	EB	A	A	7.3	A	A	7.4	A	A	7.4
			WB	A			A			A		
			NB	B			B			B		
			SB	B			B			B		

Table 5-10: 2030 (TIA Phase 2) PM Peak Hour Level-of-Service Comparison (#1 to #18)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2030 NO-BUILD			2030 BUILD			2030 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
1	MLK Blvd (NC 86) & Whitfield Rd	Traffic Signal	WB	E	C	25.5	E	E	76.9	F	D	52.8
			NB	B			F			D		
			SB	A			B			A		
2	MLK Blvd (NC 86) & I-40 WB Ramps	Traffic Signal	WB	F	E	58.1	F	E	63.1	F	D	51.6
			NB	B			B			C		
			SB	D			D			E		
3	MLK Blvd (NC 86) & I-40 EB Ramps	Traffic Signal	EB	F	D	42.9	F	F	105.7	F	D	49.2
			NB	D			F			D		
			SB	C			C			A		
4	MLK Blvd (NC 86) & Eubanks Rd	Traffic Signal	EB	E	C	20.4	F	D	53.1	E	C	24.4
			NB	B			C			B		
			SB	B			B			B		
5	MLK Blvd (NC 86) & Perkins Dr	Traffic Signal	WB	E	C	26.7	E	C	28.2	E	C	26.5
			NB	B			B			C		
			SB	C			C			B		
6	MLK Blvd (NC 86) & Weaver Dairy Rd	Traffic Signal	EB	E	F	142.8	E	F	184.6	E	F	129.5
			WB	F			F			F		
			NB	F			F			F		
			SB	F			F			C		
7	MLK Blvd (NC 86) & Westminster Dr	Traffic Signal	WB	F	B	14.6	F	C	20.2	F	B	19.1
			NB	B			C			A		
			SB	A			A			A		
8	MLK Blvd (NC 86) & Homestead Rd	Traffic Signal	EB	D	D	39.2	D	F	98.4	D	D	50.1
			WB	E			E			E		
			NB	C			D			D		
			SB	D			F			D		
9	MLK Blvd (NC 86) & Northfield Dr	Traffic Signal	EB	E	B	11.5	E	C	23.6	E	B	20.0
			NB	A			C			C		
			SB	B			C			A		
10	MLK Blvd (NC 86) & Piney Mountain Rd/ Municipal Dr	Traffic Signal	EB	E	B	16.4	F	F	106.2	F	C	32.1
			WB	E			E			F		
			NB	B			F			B		
			SB	A			C			B		
11	MLK Blvd (NC 86) & Estes Dr	Traffic Signal	EB	F	F	128.6	F	F	226.5	F	F	95.5
			WB	F			F			F		
			NB	F			F			E		
			SB	F			F			D		
12	MLK Blvd (NC 86) & Airport Dr	Stop Sign	EB	F	-	-	F	-	-	D	C	29.2
			NB	-			-			C		
			SB	-			-			C		
13	MLK Blvd (NC 86) & Hillsborough St/ Umstead Dr	Traffic Signal	EB	D	C	31.0	D	C	33.7	E	C	29.0
			WB	F			F			F		
			NB	C			C			C		
			SB	B			B			A		
14	Columbia St (NC 86) & Rosemary St	Traffic Signal	EB	F	F	88.4	F	F	134.3	F	F	134.3
			WB	F			F			F		
			NB	D			F			F		
			SB	E			F			F		
15	Columbia St (NC 86) & Franklin St	Traffic Signal	EB	E	F	97.5	E	F	123.7	E	F	123.7
			WB	D			D			D		
			NB	F			F			F		
			SB	F			F			F		
16	Columbia St (NC 86) & Cameron Ave	Traffic Signal	EB	C	F	268.8	C	F	303.9	C	F	303.9
			WB	D			D			D		
			NB	F			F			F		
			SB	F			F			F		
18	Columbia St (NC 86) & South Rd/ McCauley Street	Traffic Signal	EB	E	D	53.6	E	D	53.8	D	D	53.5
			WB	E			E			E		
			NB	D			D			D		

Table 5-11: 2030 (TIA Phase 2) PM Peak Hour Level-of-Service Comparison (#19 to #36)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2030 NO-BUILD			2030 BUILD			2030 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
19	Pittsboro St (NC 86) & McCauley St	Traffic Signal	EB	C	D	46.9	C	E	55.2	C	D	52.6
			WB	E			E			F		
			SB	D			E			D		
20	Columbia St (NC 86) & Manning Dr/ Pittsboro St	Traffic Signal	EB	D	C	32.5	D	C	33.6	D	C	33.9
			WB	C			C			C		
			NB	D			D			D		
21	Columbia St (NC 86) & Mason Farm Rd/ Westwood Dr	Traffic Signal	EB	C	F	183.7	C	F	202.8	C	F	202.8
			WB	F			F			F		
			NB	F			F			F		
			SB	F			F			F		
22	Columbia St (NC 86) & Fordham Blvd (NC 54) WB Ramps	Traffic Signal	WB	F	F	100.8	F	F	108.4	F	F	108.4
			NB	D			D			D		
			SB	E			F			F		
23	Columbia St (US 15-501) & Fordham Blvd (NC 54) EB Ramps	Traffic Signal	EB	E	C	29.1	F	D	42.3	F	D	42.3
			NB	C			C			C		
			SB	C			C			C		
24	Columbia St (US 15-501) & Mt Carmel Church Rd / Culbreth Rd	Traffic Signal	EB	D	D	48.7	D	E	59.0	D	D	52.8
			WB	C			D			D		
			NB	E			F			E		
			SB	D			D			D		
25	Homestead Rd & Weaver Dairy Rd	Stop Sign	EB	-	-	-	-	-	-	C	C	20.7
			WB	-			-			B		
			SB	F			F			C		
26	Homestead Rd & Seawell School Rd	Traffic Signal	EB	C	B	13.4	E	C	23.8	B	A	9.7
			WB	A			A			A		
			NB	B			B			B		
27	Homestead Rd & Rogers Rd	Stop Sign	EB	F	-	-	F	-	-	B	B	12.8
			NB	-			-			B		
			SB	-			-			B		
28	Homestead Rd & High School Rd	Traffic Signal	WB	B	A	9.2	B	A	9.6	B	A	9.4
			NB	B			B			B		
			SB	A			A			A		
29	Homestead Rd/ Dairyland Rd & Old NC 86	Traffic Signal	EB	C	D	37.8	C	D	38.3	D	C	26.2
			WB	B			B			C		
			NB	B			B			B		
			SB	F			F			D		
31	Estes Dr Ext & Airport Dr	Stop Sign/ Traffic Signal	EB	-	-	-	F	F	385.7	B	C	26.9
			WB	-			F			B		
			NB	F			E			D		
			SB	-			F			D		
32	Estes Dr Ext & Seawell School Rd	Traffic Signal	EB	A	E	74.0	A	F	200.4	B	D	45.5
			WB	F			F			E		
			SB	B			C			E		
33	Estes Dr Ext & Greensboro St	Traffic Signal	WB	B	C	31.6	B	F	83.1	D	D	46.5
			NB	C			B			D		
			SB	D			F			D		
35	NC 54 & Main St	Traffic Signal	EB	B	C	27.9	B	C	30.2	B	C	30.0
			WB	C			C			C		
			NB	D			D			D		
			SB	D			D			D		

Table 5-12: 2030 (TIA Phase 2) PM Peak Hour Level-of-Service Comparison (#37 to #52)

INT #	INTERSECTION	INTERSECTION CONTROL TYPE	APP	2030 NO-BUILD			2030 BUILD			2030 BUILD WITH MITIGATION		
				Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)	Approach LOS	Overall LOS	Overall Delay (s)
37	Greensboro St & Weaver St	Traffic Signal	EB	C	F	84.3	C	F	150.4	D	F	122.7
			WB	E			E			F		
			NB	F			F			F		
			SB	E			F			F		
38	Greensboro St & Main St	Traffic Signal	EB	D	D	52.0	D	F	114.8	F	D	44.3
			WB	C			C			C		
			NB	C			D			C		
			SB	F			F			C		
39	Greensboro St & Merritt Mill Rd/ NC 54 WB Ramp	Traffic Signal	WB	C	D	39.6	C	D	43.2	C	D	43.2
			NB	D			C			C		
			SB	D			E			E		
42	Estes Dr & Caswell Rd	Traffic Signal	EB	A	F	129.8	E	F	302.3	C	D	42.1
			WB	F			F			D		
			NB	B			B			E		
			SB	B			B			E		
43	Estes Dr & Franklin St	Traffic Signal	EB	F	F	196.2	F	F	305.2	F	F	153.6
			WB	F			F			F		
			NB	F			F			F		
			SB	F			F			E		
44	Franklin St & Elliott Rd	Traffic Signal	EB	F	F	115.4	F	F	170.4	F	F	140.1
			WB	D			E			E		
			NB	F			F			F		
			SB	D			D			E		
45	Franklin St & Ephesus Church Rd	Traffic Signal	EB	C	D	41.0	E	E	64.4	D	D	52.7
			WB	B			B			D		
			NB	F			F			F		
46	Fordham Blvd (US 15-501) & Erwin Rd/Europa Dr	Traffic Signal (Super Street)	EB	A	C	22.7	A	C	23.6	A	C	23.6
			WB	B			B			B		
			NB	F			F			F		
			SB	E			E			E		
	US 15-501 & South U-Turn	Traffic Signal (Super Street)	EB	F	F	263.9	F	F	307.6	F	F	307.6
			SB	D			D			D		
	US 15-501 & North U-Turn	Traffic Signal (Super Street)	WB	F	F	130.1	F	F	130.8	F	F	126.5
			NB	E			E			E		
47	Fordham Blvd (US 15-501) & Sage Rd/Scarlet Dr	Traffic Signal	EB	F	F	155.5	F	F	196.4	F	F	108.0
			WB	F			F			F		
			NB	F			F			F		
			SB	E			E			F		
48	Fordham Blvd (US 15-501) & Eastowne Dr/BSBC Dr	Traffic Signal	EB	F	F	82.8	F	F	123.3	F	F	116.1
			WB	D			E			E		
			NB	E			E			E		
			SB	F			F			F		
49	Fordham Blvd (US 15-501) & Eastowne Dr/ Lakeview Dr	Traffic Signal	EB	C	F	161.6	D	F	165.7	D	F	166.1
			WB	C			D			D		
			NB	E			E			E		
			SB	F			F			F		
50	Fordham Blvd (US 15-501) & I-40 EB Ramps	Traffic Signal	EB	F	E	70.9	F	F	88.2	F	E	76.3
			WB	D			D			E		
			SB	E			E			F		
51	Fordham Blvd (US 15-501) & I-40 WB Ramps	Traffic Signal	EB	E	F	129.5	F	F	153.4	C	F	92.2
			WB	F			F			F		
			NB	D			D			F		
52	Weaver Dairy Rd & Kingston Dr/ McClamroch Cir	Traffic Signal	EB	B	C	25.6	B	C	27.3	B	C	27.3
			WB	D			D			D		
			NB	B			B			B		
			SB	B			B			B		

5.1.3 Traffic Mitigation Findings

2015 (TIA Phase 1) Findings

The analysis results for the year 2015 baseline Build scenario for Phase 1 of the Carolina North development reveal that potential improvements will be needed in order to mitigate the traffic impacts caused by vehicular site traffic.

The potential mitigation measures that would meet the Town of Chapel Hill traffic impact analysis guidelines, and accommodate the projected site traffic for the year 2015 (TIA Phase 1) are as follows:

- The Martin Luther King, Jr. Boulevard (NC 86) corridor from Whitfield Road to Hillsborough Street/Umstead Drive will require retiming and optimization of offsets

- Intersections along Martin Luther King, Jr. Boulevard at Weaver Dairy Road, Piney Mountain Road/Municipal Drive, and Estes Drive will need geometric improvements consisting of the addition of turn lanes

- Intersections along Estes Drive at Caswell Street and Franklin Street would improve operations if cycle lengths were increased to 150 seconds

- The second Carolina North access point on Estes Drive Extension should be constructed at the intersection with Airport Road and a traffic signal should be installed to promote transit operations through the site.

- Two two-way STOP controlled intersection of Homestead Road & Rogers Road will require further data collection and a check against the MUTCD Warrants to determine if signalization is needed.

- The sensitivity analysis revealed that changes to the parking supply (Early phase and Constrained -10% scenarios) would have no impact to the 2015 potential mitigation measures and that the improvements listed would be the same needed under each of the scenarios.

2030 (TIA Phase 2) Findings

The analysis results for the year 2030 (TIA Phase 2) baseline Build scenario for Phase 2 of the Carolina North development reveal that potential improvements will be needed in order to mitigate the traffic impacts caused by vehicular site traffic.

Priority improvements to accommodate the projected site traffic are as follows:

- The Martin Luther King, Jr. Boulevard (NC 86) corridor from Whitfield Road to Hillsborough Street/Umstead Drive will need retiming and optimization of offsets

- Widen Estes Drive Extension from east of Martin Luther King, Jr. Boulevard (NC 86) to N. Greensboro Street to a four-lane cross-section with turn lanes where possible

- Five intersections along Martin Luther King, Jr. Boulevard will need geometric improvements consisting of the addition of turn lane(s) between Eubanks Road and N. Estes Drive.

- A new traffic signal will be needed at the intersection of Martin Luther King, Jr. Boulevard & Airport Drive

Other improvements that will be needed in order to meet the Town of Chapel Hill traffic impact analysis guidelines are as follows:

- New traffic signals are likely needed on Homestead Road at intersections with Weaver Dairy Road and Rogers Road

- Intersections along Estes Drive at Caswell Street and Franklin Street will need geometric improvements consisting of the addition of a turn lane or restriping

- Sixteen intersections throughout the study area would improve operations if cycle lengths were increased and/or splits and offsets were optimized

- The sensitivity analysis revealed that changes to the parking supply (Constrained -10% and Constrained -20% scenarios) would have an impact at the intersection of Martin Luther King, Jr. Boulevard & Weaver Dairy Road. It was determined that the southbound right-turn lane at the intersection of Martin Luther King, Jr. Boulevard & Weaver Dairy Road would no longer be needed following a 10 percent or 20 percent reduction in parking. The remaining 2030 potential mitigation measures would be the same needed under each of the scenarios.

5.2 Potential Traffic Calming Measures

A concern raised by a number of residents in different neighborhoods is the potential for cut-through and higher speed traffic generated by Carolina North on local and neighborhood streets. A recent survey of Town residents regarding these issues was conducted and the results of that survey have been reviewed. Additionally, the trip generation and distribution for Carolina North have been reviewed to identify cut-through routes that may be susceptible to cut-through traffic. Surrounding routes through neighborhoods that carried one percent or more of the site traffic were chosen. These routes and potential traffic calming measures are described below and highlighted in Figure 5-3. Further exploration of traffic calming concepts should be explored with local neighborhoods.

5.2.1 Piney Mountain Road

Piney Mountain Road is located directly opposite the main site access road from Martin Luther King, Jr. Boulevard (NC 86). The road continues northeast through residential areas and makes connections to Weaver Dairy Road via other streets approximately one mile east of the Martin Luther King, Jr. Boulevard (NC 86) intersection. Approximately two percent of site generated traffic is expected to use Piney Mountain Road. The majority of these trips are expected to be made by residents in the areas served by the road accessing the Carolina North site. The approximate project-generated traffic volumes expected to use Piney Mountain Road are summarized below.

- 2015 (TIA Phase 1): 15 peak hour vehicle trips
- 2030 (TIA Phase 2): 50 peak hour vehicle trips

It should be noted that the potential parking supply alternatives for the site have little impact on these project-generated volumes.

Potential traffic calming measures could be explored on Piney Mountain Road to address existing speed concerns and the potential impact of additional Carolina North generated traffic. The road is relatively wide with few driveway connections. Further investigation of traffic calming on this road could include the following measures:

- Roundabout intersection treatments where topography and site conditions allow. Candidate locations could include:
  - Old Forest Creek Drive, and/or
  - Eastwood Road.
- Properly-designed speed humps periodically along the corridor.
- Restriping to provide bicycle lanes and the removal of a center two-way left turn lane
- Relocation of sidewalks from the curb line to increase the buffer between traffic and pedestrian walkways.

5.2.2 Hillsborough Street (Chapel Hill)

Hillsborough Street links downtown Chapel Hill with Martin Luther King, Jr. Boulevard (NC 86) to the south of the Carolina North site. The roadway is a significant link in the local transportation system which has long-standing concerns about vehicle speed and pedestrian accommodation. The approximate project-generated traffic volumes on Hillsborough Street are summarized below:

- 2015 (TIA Phase 1): 5 - 10 peak hour vehicle trips
- 2030 (TIA Phase 2): 30 - 35 peak hour vehicle trips

It should be noted that the potential parking supply alternatives for the site have little impact on these project-generated volumes. Given the curvature and terrain along Hillsborough Street, controlling speed is an important traffic calming objective. A number of strategies could be explored for implementation on this street including:

- Speed tables, cushions or raised crosswalks
- Lane narrowing/bicycle lane striping
- Sidewalk improvements
- Pedestrian crossing islands
- Dynamic speed (radar detection) signage
- Increased crosswalks and warning signage
- Signal-controlled crossings (if warranted)
- New signal control
- Roundabout installation,.
- The engineering, cost and operational feasibility of these measures could be reviewed and an appropriate traffic calming program implemented on this street.

5.2.3 Seawell School Road

Seawell School Road is a connector that passes through a residential area near Estes Drive and passes the high school complex before connecting with Homestead Road. Speed concerns are prevalent at the northern and southern ends of the road, near the residential neighborhoods and the schools. The roadway is expected to carry a small number of Carolina North vehicles and may experience additional cut-through traffic since it provides an alternative north-south route to Martin Luther King, Jr. Boulevard (NC 86). Given the curvature and terrain along Seawell School Road, controlling speed is an important traffic calming objective. A number of strategies could be explored for implementation on this street including:

- Speed tables, cushions or raised crosswalks near the schools
- Lane narrowing/bicycle lane striping near developed areas
- Sidewalk improvements near developed areas
- Dynamic speed (radar detection) signage

- Roundabout installation at High School Road or at residential road intersections.
- The engineering, cost and operational feasibility of these measures could be reviewed and an appropriate traffic calming program implemented on this street.

5.2.4 North Elliott Road/Curtis Road/Caswell Road

Caswell Road is a residential street that loops south of Estes Drive and then connects to Curtis Road north of Estes Drive. Curtis Road connects Caswell Road to North Lakeshore Drive. Caswell Road, Curtis Road, and North Elliott Road are projected to carry some project-generated traffic between Estes Drive and Franklin Street. The approximate project-generated traffic volumes expected to use Piney Mountain Road are summarized below.

- 2015 (TIA Phase 1): 25 peak hour vehicle trips
- 2030 (TIA Phase 2): 100 peak hour vehicle trips

It should be noted that the potential parking supply alternatives for the site have little impact on these project-generated volumes.

Potential traffic calming measures could be explored on these roads to address existing speed concerns and the potential impact of additional Carolina North generated traffic. The roadways have many driveway connections. Further investigation of traffic calming on this road could include the following measures:

- Roundabout intersection treatments where topography and site conditions allow. Candidate locations could include:
  - North Elliott Road at Old Oxford Road,
  - North Elliott Road at Michaux Road,
  - North Elliott Road at Audubon Road, and/or
  - North Elliott Road at Curtis Road
- Properly-designed speed humps periodically along the corridor.
- Striping to define narrow travel lanes
- Alternating one-way segments could be considered as a more aggressive measure to eliminate use of these roads as through-streets

5.2.5 North Lakeshore Drive

North Lakeshore Drive connects Estes Drive via Curtis Road and Caswell Road to Weaver Dairy Road via Honeysuckle Road and Sedgefield Road, passing through residential neighborhoods. North Lakeshore Road is not expected to carry significant project-generated traffic volumes beyond North Elliott Road; however, several residents identified concerns about traffic speed and cut through traffic on this road. The roadway has significant curvature, which should help to control speeds. According to the survey

results, there is mixed opinion about the viability of speed humps on this road given past experience. Potential traffic calming measures on this road could include:

- Roundabout intersection treatments where topography and site conditions allow. Candidate locations could include:
  - South Lakeshore Drive,
  - Arlington Street, and/or
  - Shadylawn Road.
- Properly-designed speed humps periodically along the corridor.
- Striping of the roadway to provide narrow lanes and center-line designation.

5.2.6 Barclay Road

Barclay Road is located just to the south of the Carolina North site. The roadway is not expected to carry significant project-generated traffic volumes; however, many residents have indicated concerns about speed and cut-through traffic on this roadway. The roadway has two narrow carriageways, separated by a planted median with a very straight alignment. In order to address speed concerns on this roadway, the following traffic calming measures could be explored:

- Roundabout intersection treatments where topography and site conditions allow. Candidate locations could include:
  - Bradley Road, and/or
  - Weiner Street
- Properly-designed speed humps periodically along the corridor
- Alignment changes using the median area to introduce some curvature into this linear roadway

5.2.7 Northwood Road

Northwood Road is located near the Martin Luther King, Jr. Boulevard (NC 86) intersection with Eubanks Road. The roadway is not expected to carry significant project-generated traffic volumes; however, it could serve as a by-pass route from Eubanks Road to Martin Luther King, Jr. Boulevard (NC 86) should congestion increase in this area. The roadway has significant curvature, which should help to control speeds. Additional measures that could be considered include:

- Roundabout intersection treatments where topography and site conditions allow. Candidate locations could include:
  - Groomsbridge Court, and/or
  - Hunter Hill Road
- Properly-designed speed humps periodically along the corridor
- Striping to define narrow travel lanes
- Peak period turn restrictions and/or one-way westbound circulation could also be considered as more aggressive traffic calming measures for this roadway

5.2.8 Hogan Woods Circle Drive/Lake Hogan Farm Road

Hogan Woods Circle is a residential loop road beginning on Lake Hogan Farm Road and ending on Commons Way. The road does not make any through connections and will not carry new project-generated trips, other than neighborhood residents who are traveling to Carolina North. Lake Hogan Farm Road is the principal access to a new, large residential neighborhood and makes through connections to Old Chapel Hill-Hillsborough Road. It is unlikely to attract significant through traffic given the curvilinear design and indirect routing of the road. Tallyho Trail
Tallyho Trail is a residential road beginning on Rogers Road. The road does not make any through connections and will not carry new project-generated trips, other than neighborhood residents who are traveling to Carolina North.

5.3 Potential Transit Mitigation Measures

The transit demand for the Carolina North project requires new transit services and modifications to existing transit services. As with the existing transit services in Chapel Hill, the elements of the transit service will be a mix of service that is integrated into the community transit system, and some services, such as park-and-ride shuttles, that will essentially be dedicated to the project.

Route capacity is one component of the transit system's ability to serve Carolina North. In addition to the capacity of the system, one must consider the suitability of the current route structure to serve Carolina North. The majority of the existing system is designed to connect areas to the downtown and University campus. As a result, transfers will be required for many local riders to access Carolina North. This system structure suggests that more significant changes will be needed once Carolina North achieves a scale warranting more direct service. It should be noted that the potential transit mitigation measures 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.

5.3.1 Park-and-Ride Potential Mitigation

The existing park-and-ride system is expected to reach capacity even without the additional demand from the Carolina North project. The Carolina North development is likely to need around 400 to 500 for the 2015 (TIA Phase 1) Scenario and 1,500 to 1,600 park-and-ride spaces for the 2030 (TIA Phase 2) Scenario. This analysis assumes that these additional park-and-ride users will all be accommodate on at the Eubanks and Southern Village lots and delivered to the Carolina North site via the NS Route. However, these park-and-ride spaces could be provided in a number of other locations as envisioned in the draft *Chapel Hill-Carrboro Long Range Transit Plan*. These other locations would need to be connected to the site with a dedicated express route between the park-and-ride location and Carolina North. Additional regional transit service may be a substitute for park-and-ride spaces.

As previously stated, the completion of the Main Campus Development Plan includes additional parking structures that will free up park-and-ride spaces that are now occupied by Main Campus employees. The availability of additional park-and-ride spaces could potentially offset the future demand from Carolina North for more spaces. Moreover, the potential need for additional buses, many of which are specifically to serve the increased park-and-ride use, could also be correspondingly reduced. Given the uncertainty of the timing of future projects on the Main Campus and at Carolina North, the availability and need for more park-and-ride spaces should be continually monitored before additional facilities are built or buses to serve them are purchased.

5.3.2 Local Transit Service Potential Mitigation

The Carolina North project will add riders to the local transit system and there are some impacts on the existing users of the transit system that should be mitigated.

- There will be substantial numbers of transit riders at Carolina North, and, for them to be able to conveniently use the system, it will be necessary to divert some existing bus routes into the campus. This will add to the length of these bus routes, perhaps five or 10 minutes each loop, and in some cases additional vehicles will need to be operated to maintain current headways. Overall, approximately 16 new buses are project to be needed, of which 13 are due to Carolina North during Phase 2 of Carolina North in the year 2030.
- Increased traffic, both related to the project and ambient background traffic will cause additional travel-time delays along sections of Martin Luther King, Jr. Boulevard (NC 86) beyond that which already exists. These increased delays will adversely impact the efficacy of the transit routes operating along Martin Luther King, Jr. Boulevard (NC 86). Signal priority for buses and dedicated bus lanes, as have planned in the Martin Luther King, Jr. Boulevard (NC 86). A signal modernization project would help maintain effective bus operations in the near term, as early as Phase 1 in the year 2015. In the longer term, a system of dedicated lanes will further help to maintain the efficiency of bus operations and quality of service for transit passengers.

5.3.3 2015 (TIA Phase 1) Potential Frequency and Fleet Requirements

Table 5-13 shows both the headway and the number of buses required to operate each route in the Existing scenario, 2015 No-Build scenario, and 2015 Build (TIA Phase 1) scenario. In Phase 1 of the Build Scenario, 21 buses are required on the six bus routes that provide service in the vicinity of Carolina North. Of the 21 buses, none are required to support additional ridership generated specifically by Carolina North.

Table 5-13 also shows the headway required to operate each route in the 2009 Existing, 2015 No-Build, and 2015 Build scenarios, if existing vehicle capacities routes and headways are maintained. No headway improvements are required by 2015.

Additional fleet requirements to support a longer route associated with increased travel time through town or due to diversion into the project site is not reflected in these estimates.

Please note: a volume to capacity threshold of 80 percent was established that triggers the need for additional transit service. That is if over 80 percent of the seated and standing capacity of a vehicle is filled during peak hours, then new service is needed.

Table 5-13: Phase 1 (Base)

Route	Headway			Vehicles		
	Existing	No-Build	Build	Existing	No-Build	Build
A	30	30	30	3	3	3
G	26	26	26	4	4	4
HS	30	30	30	2	2	2
NS	10	10	10	7	7	7
NU	18	18	18	2	2	2
T	30	20	20	2	3	3
Total				**20**	**21**	**21**

5.3.4 2030 (TIA Phase 2) Potential Frequency and Fleet Requirements

Table 5-14 shows both the headway and the number of buses required to operate each route in the 2009 Existing scenario, 2030 No-Build scenario, and 2030 (TIA Phase 2) Build scenario.

In order to meet 2030 (TIA Phase 2) No-Build ridership, frequency needs to be increased on Route NS and Route T. These headway reductions require an addition of three (3) vehicles to the fleet serving these routes. In addition, spare vehicles would be required to support each of these routes.

To support 2030 (TIA Phase 2) Build condition ridership, additional service is needed. Headways are reduced further on the A, G, NS, NU, and T. The most significant service expansions are on the G and the NS. The headway reductions require an addition of 13 vehicles to the fleet serving these routes beyond those required to serve the No-Build. In addition, spare vehicles would be required to support each of these routes. Additional operating funds will also be needed to provide this expanded service.

Please note: a volume to capacity threshold of 80 percent was established that triggers the need for additional transit service. That is if over 80 percent of the seated and standing capacity of a vehicle is filled during peak hours, then new service is needed.

Table 5-14: Phase 2 (Base)

Route	Headway			Vehicles		
	Existing	No-Build	Build	Existing	No-Build	Build
A	30	30	18	3	3	5
G	26	26	18	4	4	6
HS	30	30	30	2	2	2
NS	10	8	5	7	9	15
NU	18	18	12	2	2	3
T	30	20	12	2	3	5
Total				**20**	**23**	**36**

5.4 Potential Pedestrian Facility Mitigation Measures

An evaluation of the pedestrian system was conducted within a ½ mile of the three proposed primary access points of the Carolina North site. This study area includes the following major roadway corridors:

- Martin Luther King, Jr. Boulevard from Homestead Road (NC 86) to Franklin Street
- Estes Drive from Seawell School Road to Caswell Road
- Seawell School Road from Estes Drive to Homestead Road
- 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

In addition, the project team reviewed several studies that were conducted in the vicinity of the Carolina North site. These included the 2004 *NC86/ Airport Road Pedestrian and Bicycle Safety and Mobility Study* conducted by the University of North Carolina Highway Safety Research Center; and a 2007 follow-up to that study *NC 86 / Martin Luther King, Jr. Boulevard and Town-Wide Pedestrian Safety Evaluation Study,* conducted by Lappas and Havener, PA and Ramey Kemp and Associates, Inc. The latter study made recommendations for improvements based on the findings of the earlier report. (This analysis presents an overview of potential improvements; refer to the 2007 report for detailed drawings of improvements for Martin Luther King, Jr. Boulevard). 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 gaining wider acceptance in other localities. It is used in this study solely to identify locations that may require improvements to mitigate impacts generated by Carolina North, and is not intended to identify improvements that will be required as part of the development.

Based on observations of the project team and the available literature, the lack of continuous sidewalks and limited crossing locations were identified as major deficiencies in the existing pedestrian system. These deficiencies affect the mobility and safety of current and future pedestrians in the corridor. There are several potential mitigation measures to the pedestrian facilities that would be needed to allow pedestrians reasonable access to the Carolina North development. These include general facility improvements as well as site specific improvements as shown in Figure 5-4. The levels-of-service calculated for the pedestrian facilities after mitigation are illustrated in Figure 5-5.

5.4.1 General Mitigation Measures

- ADA-compliant pedestrian facilities, including curb ramps
- Construct/improve sidewalks with minimum four foot minimum planting strip where possible and wider where conditions permit
- Improve lighting, particularly at intersections, (warranted) mid-block crossings, and other high-use pedestrian areas.

- Improve transit stops, including shelters, benches, and paved waiting areas.
- The 2007 study presented several possible design alternatives for Martin Luther King, Jr. Boulevard (NC 86). If implemented, the design should be consistent throughout the pedestrian corridor surrounding the development, whenever possible. Meeting user expectations through consistent design can help to avoid potential conflicts.

5.4.2 Site Specific Mitigation Measures

Martin Luther King, Jr. Boulevard (NC 86)

2. 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 (Based on the analysis, it is desirable to match existing sidewalk width south of Airport Drive and provide a minimum of 6' to 12' planting strips).

- 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.
- 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.
- Narrow curb-radii at intersections to 25 feet maximum where feasible to slow turning cars and shorten-pedestrian crossing distances.
- 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.
- 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.
- Add transit stops in the vicinity of the pedestrian access points.

Estes Drive

- 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 (Based on the analysis, it is desirable to provide a 5' minimum sidewalk width and a 4' minimum planting strip width).
- Add transit stops in the vicinity of the pedestrian access points to Carolina North.

Seawell School Road

- Provide continuous sidewalk along Seawell School Road from Estes Drive to Homestead Road on both sides of the roadway (Based on the analysis, it is

desirable to provide a 5' minimum sidewalk width and a 4' minimum planting strip width).

Homestead Road

- Provide continuous sidewalk along Homestead Road from Martin Luther King, Jr. Boulevard (NC 86) to Seawell School Road on both sides of the roadway (Based on the analysis, it is desirable to provide a 5' minimum sidewalk width and a 4' to 8' minimum planting strip width).

Airport Drive

- Provide continuous sidewalk along Airport Drive from Martin Luther King, Jr. Boulevard (NC 86) to Estes Drive on both sides of the roadway (Based on the analysis, it is desirable to provide a 5' minimum sidewalk width and a 4' minimum planting strip width).

While some of these potential mitigation measures could be implemented within a short time frame, others require additional study and/or approval from NCDOT. The installation of sidewalks or the upgrade and modification of existing sidewalks listed above was determined based on existing roadway and sidewalk accommodations and future traffic projections. While project traffic from the Caroline North development will have an impact on the pedestrian LOS, the development itself does not drive the need for these potential mitigation measures alone. Improvements throughout the study area will likely involve pedestrian accommodations and these potential mitigation measures are to serve as a guide for the desired cross-sections where possible.

5.4.3 Future Pedestrian Crossing Considerations

The Martin Luther King, Jr. Boulevard (NC 86) corridor was studied to determine if any additional pedestrian crossings should be considered. It was found that with the proposed pedestrian crossing upgrades at the intersections of Martin Luther King, Jr. Boulevard & Estes Drive and Martin Luther King Jr. Boulevard & Piney Mountain Road/Municipal Drive and the proposed refuge island at the Shadowood Apartments, no additional pedestrian crossings are needed at this time. These three crossing locations will span the entire development frontage along Martin Luther King, Jr. Boulevard under Phase 1 and Phase 2.

It was found that future consideration for a pedestrian crossing refuge island should be given at Timber Hollow Drive to the north of Piney Mountain Road and Municipal Drive. Depending on the final design of pedestrian connections between the site and Martin Luther King, Jr. Boulevard, pedestrians on the east side of the roadway coming from the north may want to cross prior to the Piney Mountain Road/Municipal Drive intersection. In addition, pedestrian crossing refuge islands should also be considered on Estes Drive where any site pedestrian connection is provided outside of the site driveway at Airport Drive.

5.5 Potential Bicycle Facility Mitigation Measures

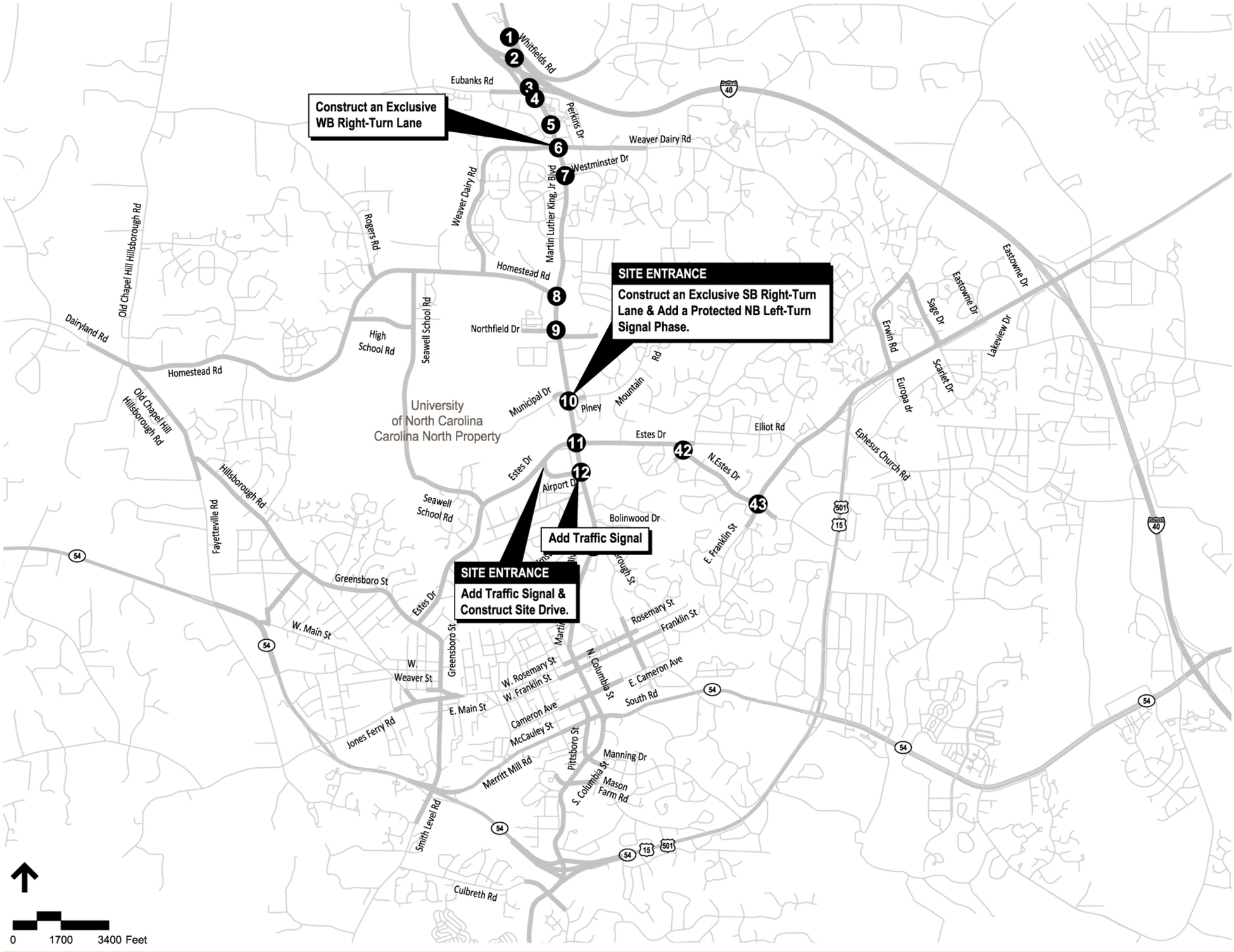
An evaluation of the bicycle facilities within ½ mile of the proposed access points of the Carolina North was also conducted. The lack of continuous designated bike lanes was identified as a deficiency with the existing bicycle facilities. The primary improvement needed in the study area is to stripe four- to five-foot (exclusive of the width of the gutter) bike lanes on both sides of the roadway in the following corridors as shown in Figure 5-6:

- Martin Luther King, Jr. Boulevard from Homestead Road (NC 86) to Franklin Street
- Estes Drive from Seawell School Road to Caswell Road
- Seawell School Road from Estes Drive to Homestead Road
- 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

As previously noted, the 2007 study presented several possible design alternatives for Martin Luther King, Jr. Boulevard that included bike lanes. If implemented, the design should be consistent throughout the bicycle corridor surrounding the development, whenever possible.

Again, it should be noted that the bicycle LOS methodology is not an adopted method of the Town of Chapel Hill and these potential mitigation measures may or may not be required. The installation of bike lanes listed above was determined based on existing roadway accommodations and future traffic projections. The need to provide adequate bicycle accommodations and achieve an acceptable bicycle level-of-service in the study area is a general need based on the requirements of both existing and future users in the vicinity of the site. While project traffic from the Caroline North development will have an impact on the bicycle LOS, the development itself does not drive the need for these potential mitigation measures alone. Improvements throughout the study area will likely involve bicycle accommodations and these potential mitigation measures are to serve as a guide for the desired cross-sections where possible. It is not necessary to widen each of these roadways just to install bike lanes, but any road construction in the study area should make every effort to incorporate the potential mitigation measures listed above.

The levels-of-service calculated for the bicycle facilities after mitigation measures are installed are illustrated in Figure 5-7.



Legend

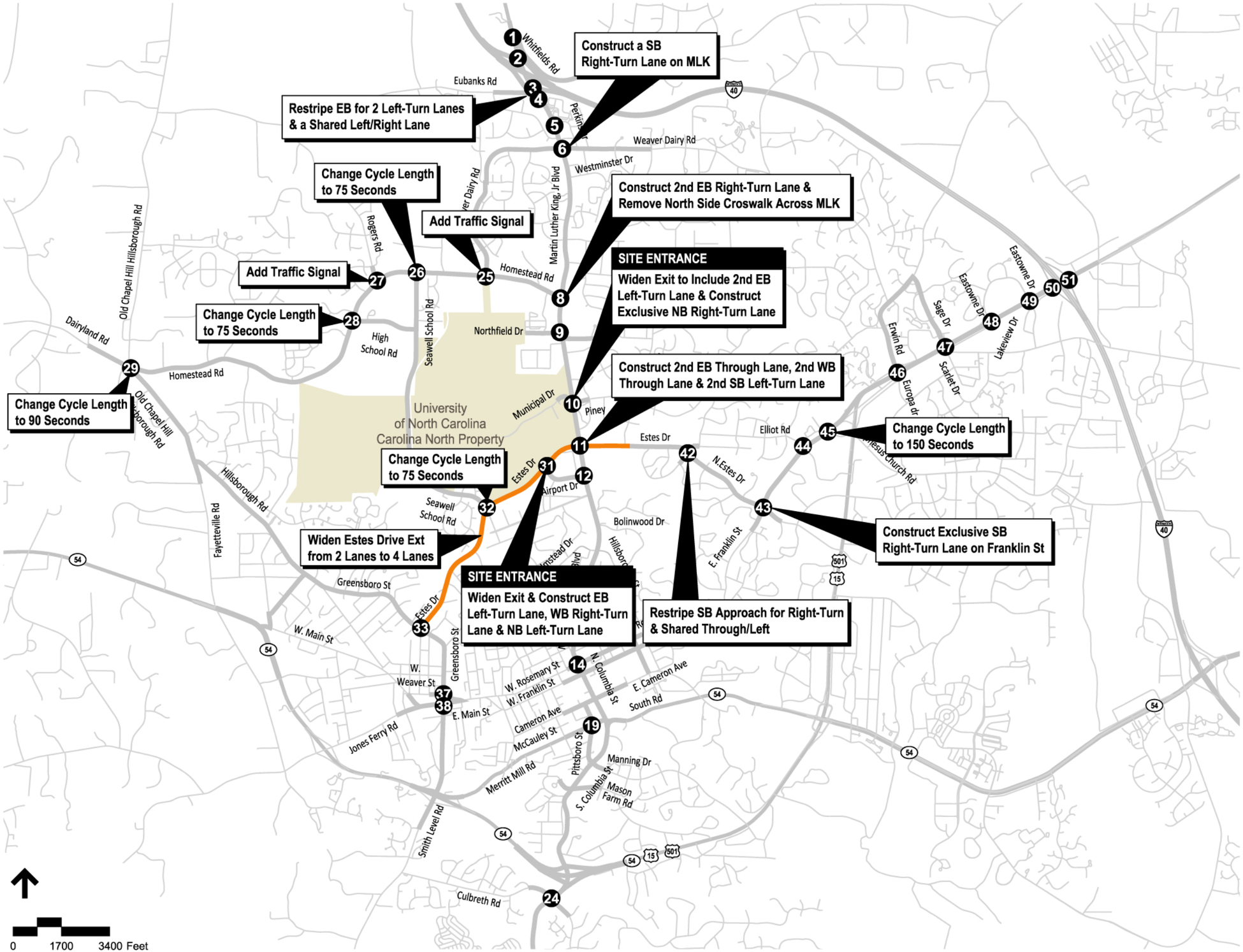
(#) Signal Timing Improvements

CAROLINA NORTH TIA
Chapel Hill, North Carolina

Figure 5-1
2015 (TIA Phase 1) Potential Traffic Mitigation Measures

Chapel Hill, North Carolina

Vanasse Hangen Brustlin, Inc.

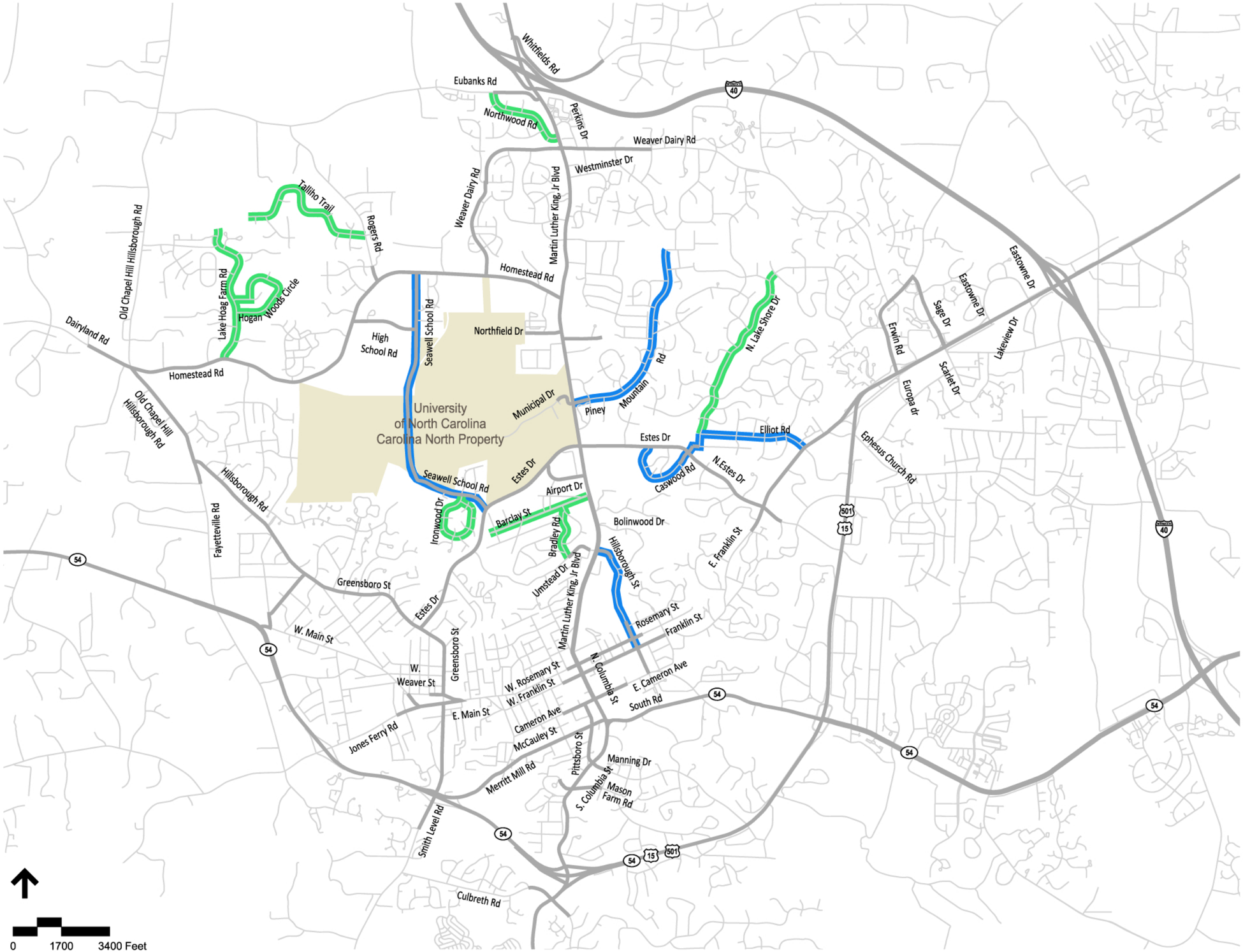


CAROLINA NORTH TIA
Chapel Hill, North Carolina

Figure 5-2
2030 (TIA Phase 2) Potential Traffic Mitigation Measures

Chapel Hill, North Carolina

Vanasse Hangen Brustlin, Inc.



Legend

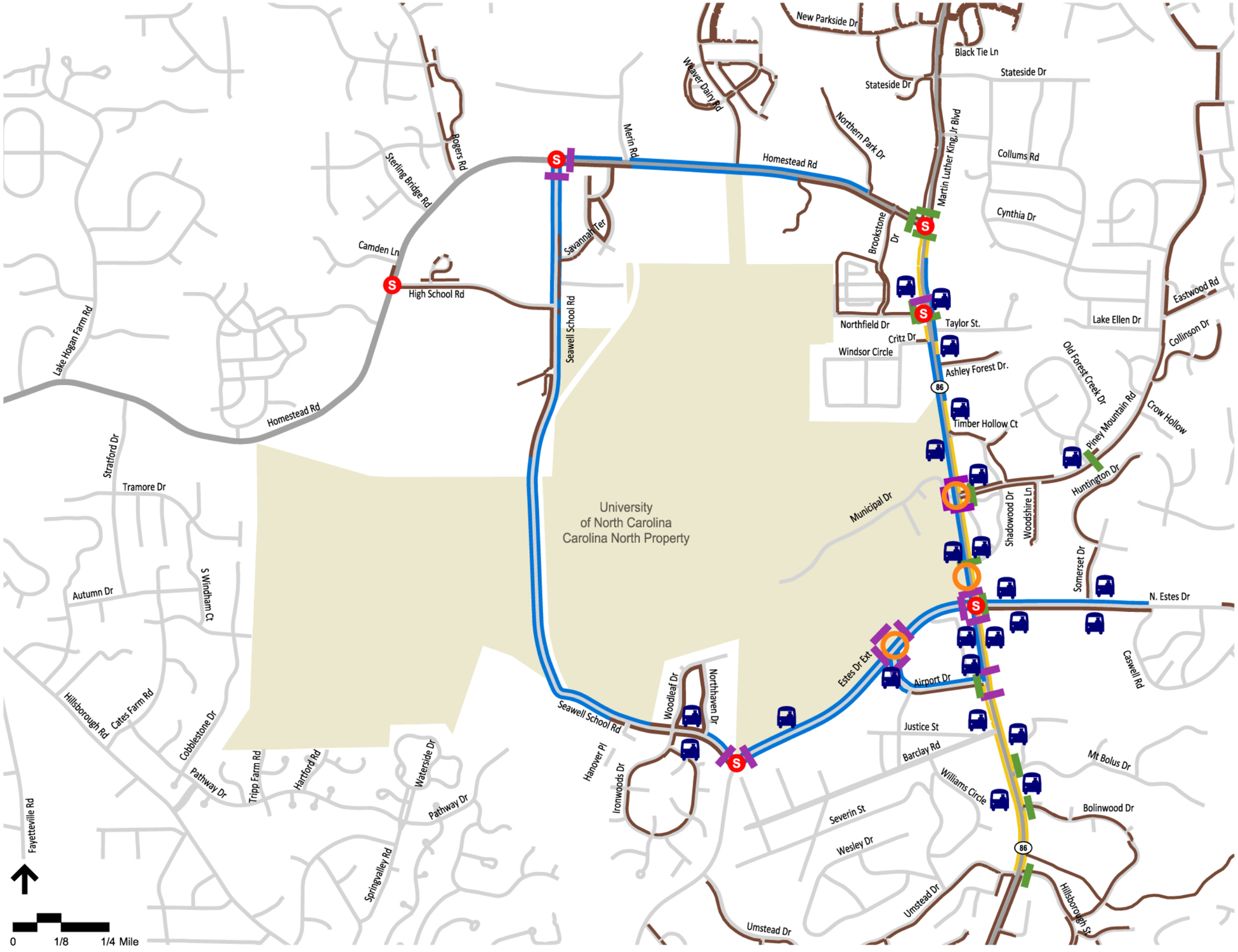
- Roads Identified for Potential Traffic Calming
- Roads Projected to Carry Traffic Generated by Carolina North

CAROLINA NORTH TIA
Chapel Hill, North Carolina

Figure 5-3
Potential Traffic Calming Measures

Chapel Hill, North Carolina

VHB *Vanasse Hangen Brustlin, Inc.*



Legend

- Signalized Intersections
- Existing Sidewalk
- Recommended New Sidewalk
- Recommended Reconstruction of Existing Sidewalk
- Existing Crosswalk
- Recommended New Crosswalk
- Access Points
- Existing Bus Stop

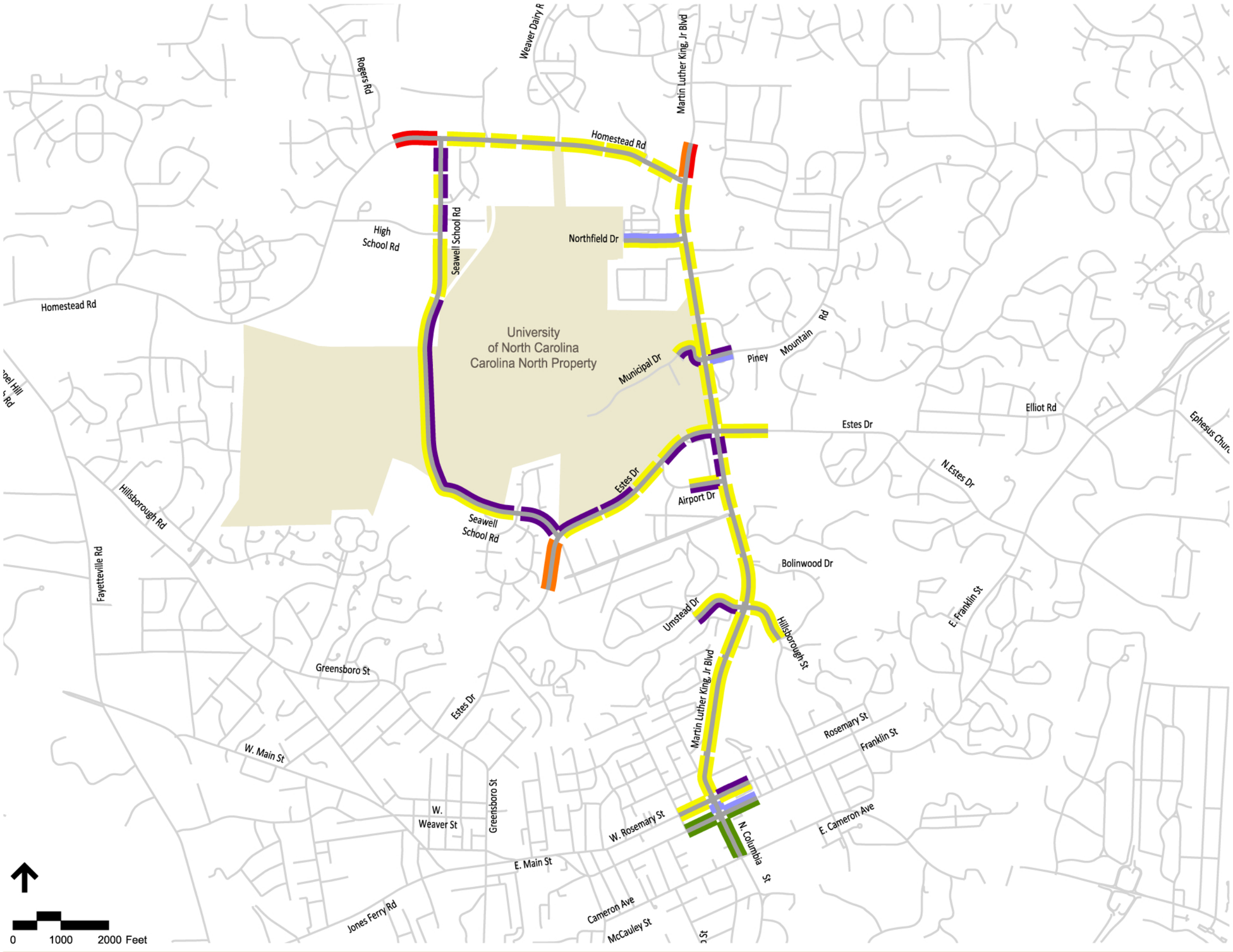
Note: Recommendations are the outcome of the LOS analysis, and do not necessarily reflect the improvements committed by the Carolina North development.

CAROLINA NORTH TIA
Chapel Hill, North Carolina

Figure 5-4
Potential Pedestrian Facility Mitigation Measures

Chapel Hill, North Carolina

VHB *Vanasse Hangen Brustlin, Inc.*

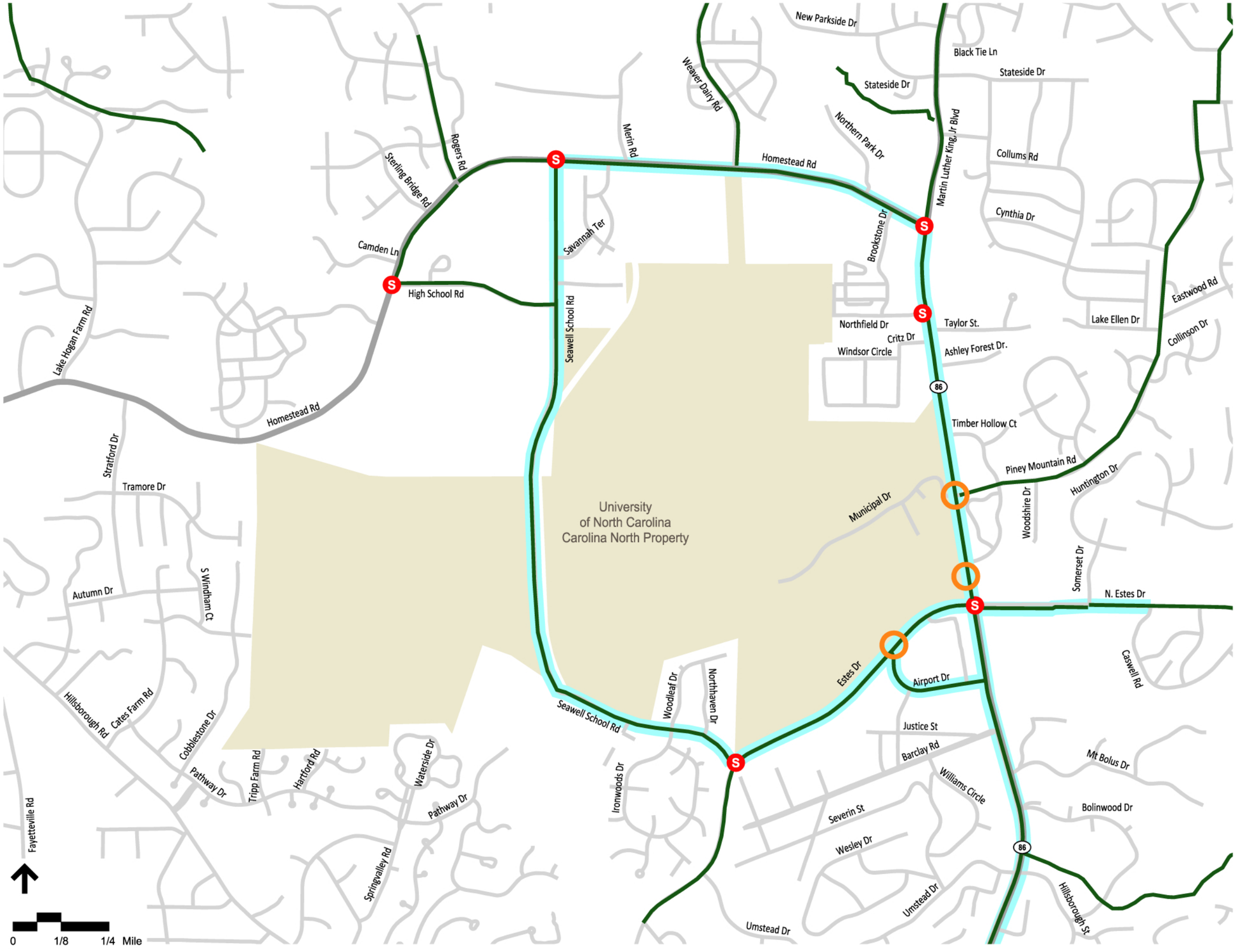


CAROLINA NORTH TIA
Chapel Hill, North Carolina

Figure 5-5
2030 (TIA Phase 2) Build Pedestrian Levels-of-Service (with Mitigation)

Chapel Hill, North Carolina

VHB *Vanasse Hangen Brustlin, Inc.*



Legend

- Study Area Intersections
- Existing Bicycle Network
- Recommended New Bicycle Lanes
- Access Points

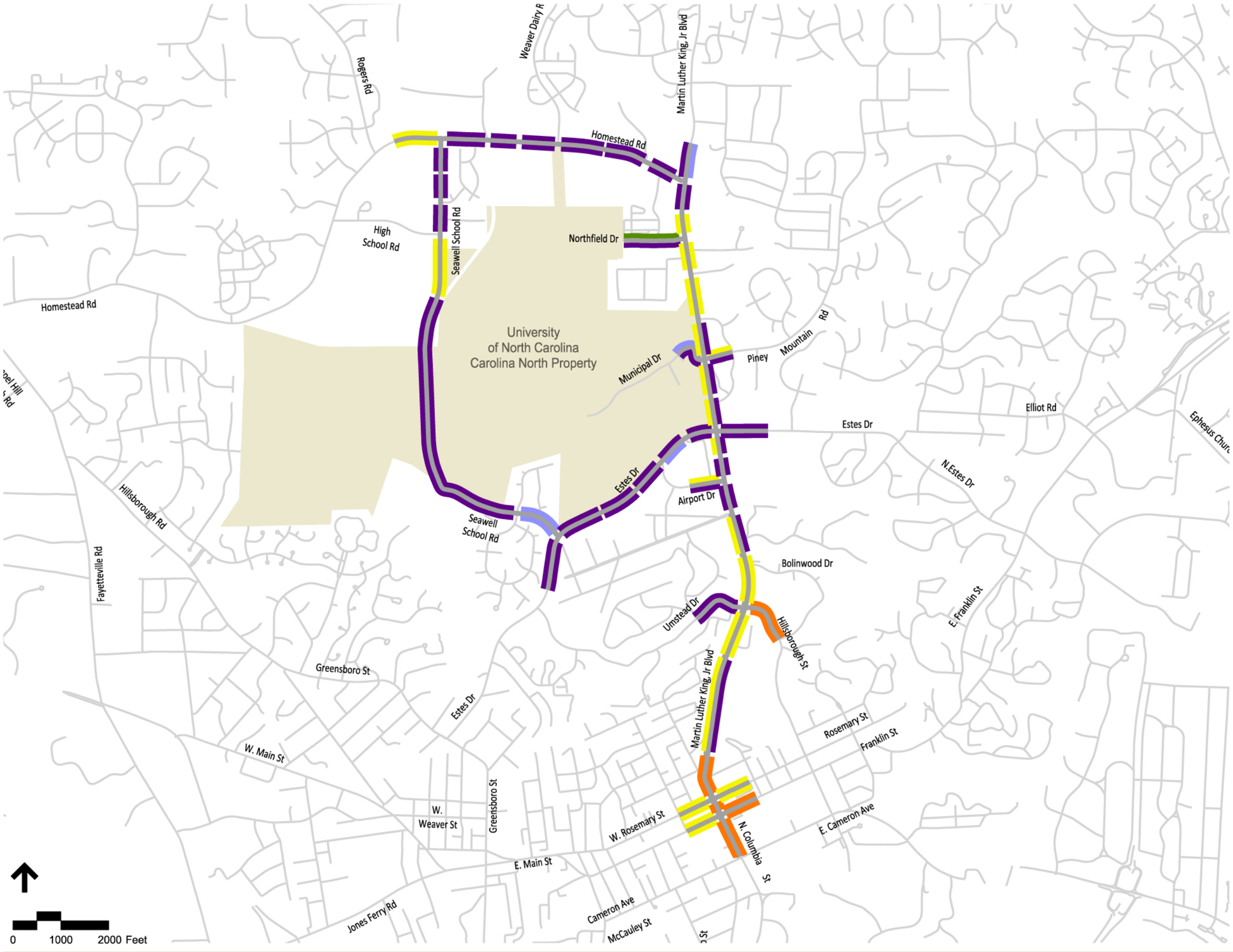
Note: Recommendations are the outcome of the LOS analysis, and do not necessarily reflect the improvements committed by the Carolina North development.

CAROLINA NORTH TIA
Chapel Hill, North Carolina

Figure 5-6
Potential Bicycle Facility Mitigation Measures

Chapel Hill, North Carolina

Vanasse Hangen Brustlin, Inc.



CAROLINA NORTH TIA
Chapel Hill, North Carolina

Figure 5-7
2030 (TIA Phase 2) Build Bicycle Levels-of-Service (with Mitigation)

Chapel Hill, North Carolina

Vanasse Hangen Brustlin, Inc.