The University of North Carolina at Chapel Hill

Annual Development Plan Report on Transportation

December 2009

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Introduction

This is the annual brief summary report of the transportation impacts of the University's Development Plan. It has been prepared in accordance with the June 27, 2005 guidelines issued by the Town of Chapel Hill. It is based on the results of the most recent Transportation Impact Analysis (TIA), which was the TIA submitted to the Town of Chapel Hill in December 2009. The updated TIA also incorporates the results of the latest survey of University employee and student commuters performed in the spring of 2009.

1: Development Plan Overview

Overview of Development Plan Projects

The Development Plan projects continue to be implemented, with some now completed, some under construction and some in design. The main projects completed so far include:

- Rams Head Center
- Student Family Housing buildings
- Addition to Carrington Hall
- Addition to Cobb Residence Hall
- Additions to Memorial Hall
- Additions to Alexander, Connor, and Winston Residence Halls
- Jackson Circle Parking Deck
- North East Chiller and Parking Deck
- Science Complex Phase 1 (Caudill Laboratories and Chapman Hall)
- Residence Halls Phase II (Ram Village)
- Addition to the Medical Science Research Building (Bondurant Hall)
- Tomkins Chiller Plant and Thermal Storage Facility
- Student Academic Services Building
- Arts Common Phase 1
- FedEx Global Education Building
- ITS-Manning
- Renovation to Morrison Hall
- Williamson Building
- Genetic Medicine Building
- Physicians Office Building
- Manning Steam Plant
- Science Complex Phase II – Addition to Sitterson Hall (Frederick Brooks Hall)

In addition, the following projects were completed since the last Annual Report (December 2008):

- Addition to Boshamer Stadium
- North Carolina Cancer Hospital
- Addition to Carmichael Auditorium

Construction continues at a number of locations throughout the campus, including:

- Science Complex Phase II – New Venable
- Genome Science Building
- Dental Science Building
- Sports Medicine Building
- Other infrastructure projects

In total, the Development Plan projects involve about 7.9 million gross square feet of new buildings. This includes about 1.95 million square feet for parking decks and 306,000 square feet for infrastructure projects. About 235,000 gross square feet of existing buildings will be demolished. This means the net increase in occupiable floor area is about 5.6 million square feet.

Projects by Location

Table 1.1 lists the projects in detail, and Figure 1.1 shows their locations. The projects can be summarized as follows:

Type of building	Square Footage
Academic	1,818,486
Cultural	140,629
Housing	923,163
Infrastructure	312,382
Office	460,200
Parking	1,950,700
Research	800,400
Student Life	339,699
UNC Health Care	961,350
Athletics	210,970
Total	7,917,979

Parking Space Impacts

Existing Parking

In 2000-2001, there were about 14,200 parking spaces on the main campus. Then, like now, this was not enough for all the employees or students wanting to park on campus. There were about 8,000 spaces for about 13,000 Main Campus employees, or 0.61 spaces per Main Campus employee. The rate for students was much lower - less than 10 percent for both resident students and commuting students. No freshman is eligible for a permit on Main Campus, and no student living off-campus within a 2-mile radius of the Bell Tower is eligible.

Parking Changes

The Development Plan involves extensive changes to the parking supply. Around 4,061 existing spaces will be permanently closed, and around 5,640 new spaces will be provided, mostly in new structures. Some other spaces will be temporarily used for construction staging at various times.

The net effect is an approved increase of 1,579 spaces on campus when all the projects are completed. Table 1.2 and Figure 1.2 show these net changes. In some cases, the number of parking spaces by lot and user are estimates, as the final design of buildings and landscaping will determine how many surface spaces, if any, could be retained (particularly for service and disability spaces).

Visitor parking accounts for most of the net increase, reflecting the importance of accommodating visitors (particularly the growing number of hospital patients). However, there is expected to be a net increase of about 380 commuter spaces and a decrease of about 287 resident student spaces.

Impacts

The increase in commuter spaces is very low compared with expected population growth over the period of the plan. Employee numbers are forecast to grow by 31%, and student numbers by 18%. If resident and commuter parking were to continue to be provided at the existing (2000-2001) level, the overall increase would have been much greater than the approved 1,579.

The ‘shortfall’ (i.e. the difference between the amount of parking that would be required if parking continued to be provided at existing rates, and the amount that will actually be provided) is about 2,000 employee spaces, about 300 commuting student spaces and about 450 resident student spaces. The shortfall in commuter parking will be met by alternative modes, and the Development Plan includes a range of transportation initiatives to accommodate this. The shortfall in resident student parking will be met in storage lots off-campus. The needs of visitors will continue to be satisfied on-campus.

The amount of traffic that will be generated by the Development Plan is a function of the amount of parking that will be provided. The limited increase in parking will therefore limit the traffic impact. The increased parking (net increase of 1,579 spaces) is estimated to generate about 11,500 vehicle trips daily. A typical campus development of similar size, with unlimited parking and little or no transportation alternatives, would generate more than 34,000 trips daily. This means that the Development Plan projects will only generate about one-third of the trips that would be expected from a typical campus development of this size.

Table 1.1: Development Plan Projects

Building	Building Type	Gross Square Footage	Anticipated Construction Start Date	Anticipated Construction Completion
A-1	Academic	31,800	01/13	01/15
A-2	Academic	73,100	01/13	01/15
A-3	Academic	25,600	03/05	02/07
A-4	Academic	20,000	03/05	02/07
A-5	Academic	55,200	01/13	01/15
A-6	Academic	90,000	07/03	06/05
A-7	Academic	41,000	02/06	08/08
A-8	Academic	154,500	01/13	01/15
A-9	Academic	396,700	02/06	08/08
A-10	Academic	112,500	07/03	06/05
A-11	Academic	82,000	03/04	02/06
A-12	Academic	69,500	11/01	10/03
A-13	Academic	10,200	08/02	07/04
A-14 Mod	Academic	259,990	08/07	01/12
A-15	Deleted			
A-16	Deleted			
A-17	Academic	53,200	01/13	01/15
A-18	Academic	936	08/04	03/04
A-19	Academic	1,600	03/05	03/06
A-20 *	Academic	125,000	05/08	07/10
A-21	Academic	80,000	01/13	01/15
A-22	Academic	75,000	01/13	01/15
A-23 *	Academic	50,000	01/13	01/15
A-24	Academic	5,580	06/08	02/10
A-25	Academic	3,308	10/08	01/10
A-26	Academic	1,772	01/09	02/10
	Total Academic	1,818,486		
C-1	Cultural	36,000	01/13	01/15
C-2	Cultural	26,400	01/13	01/15
C-3	Cultural	37,325	12/01	01/03
C-4	Cultural	3,000	01/13	01/15
C-5 Mod	Cultural	22,904	01/11	06/13
C-6	Cultural	15,000	01/13	01/15
	Total Cultural	140,629		
H-1	Housing	Deleted		
H-2	Housing	Deleted		
H-3	Housing	6,656	05/02	07/03
H-4	Housing	6,656	05/02	07/03
H-5	Housing	68,400	01/04	08/05
H-6	Housing	60,000	01/04	08/05
H-7	Housing	74,800	01/04	08/05
H-8	Housing	43,200	01/13	01/15
H-9	Housing	42,000	01/13	01/15
H-10	Housing	Deleted		
H-11	Housing	Deleted		
H-12	Housing	Deleted		
H-13	Housing	60,500	08/03	08/04
H-14	Housing	60,500	08/03	08/04
H-15	Housing	58,200	08/03	08/04
H-16	Housing	59,400	08/03	08/04
H-17	Housing	59,400	08/03	08/04
H-18	Housing	44,400	08/03	08/04
H-19	Housing	44,400	08/03	08/04
H-20	Housing	37,800	08/03	08/04
H-21	Housing	30,050	08/03	08/04
H-22	Housing	79,601	01/04	08/05
H-23	Housing	79,600	01/04	08/05
H-24	Housing	7,800	01/04	08/05
	Total Housing	923,163	*	
I-1	Infrastructure	20,000	07/03	12/04

Table 1.1: Development Plan Projects (cont.)

Building	Building Type	Gross Square Footage	Anticipated Construction Start Date	Anticipated Construction Completion
I-2	Infrastructure	115,600	08/03	12/05
I-3	Infrastructure	21,600	03/04	03/06
I-4	Infrastructure	6,382	06/04	12/05
I-5 Mod	**Infrastructure**	**100,800**	**01/08**	**07/10**
I-6	**Infrastructure**	**48,000**	**01/13**	**01/15**
I-7	**Infrastructure**	**N/A**	**01/13**	**01/15**
	Total Infrastructure	**312,382**		
O-1	**Office**	**133,200**	**01/13**	**01/15**
O-2	Office	30,000	11/02	05/06
O-3	Office	105,000	07/04	03/06
O-4	**Office**	**180,000**	**01/13**	**01/15**
O-5	**Office**	**12,000**	**01/13**	**01/15**
	Total Office	**460,200**		
P-1	**Parking**	**115,500**	**01/13**	**01/15**
P-2	Parking	Deleted		
P-3	Parking	252,600	05/02	10/04
P-4 Mod	**Parking**	**225,000**	**03/07**	**08/10**
P-5	**Parking**	**255,500**	**01/13**	**01/15**
P-6	**Parking**	**134,400**	**01/13**	**01/15**
P-7	*Parking*	*Deleted*		
P-8	Parking	42,000	03/04	07/06
P-9	Parking	191,500	03/03	03/06
P-10	Parking	350,000	04/04	12/05
P-11	**Parking**	**288,000**	**01/13**	**01/15**
P-12	**Parking**	**96,200**	**01/13**	**01/15**
	Total Parking	**1,950,700**		

*This represents relocation of planned surface parking to spaces beneath the buildings.

R-1	**Research**	**109,000**	**07/07**	**07/10**
R-2	**Research**	**49,000**	**07/07**	**07/10**
R-3	**Research**	**74,400**	**07/07**	**07/10**
R-4	Research	225,000	08/02	12/04
R-5	**Research**	**343,000**	**06/09**	**05/10**
	Total Research	**800,400**		
SL-1	Student Life	54,400	06/02	07/04
SL-2	Student Life	126,900	06/02	07/04
SL-3	Student Life	126,000	06/04	08/05
SL-4	**Student Life**	**28,000**	**01/13**	**01/15**
MM	Student Life	4,399	06/05	03/06
	Total Student Life	**339,699**		
UNCH-1	**UNC Health Care**	**196,280**	**01/13**	**01/15**
UNCH-2	**UNC Health Care**	**343,180**	**01/13**	**01/15**
UNCH-3	UNC Health Care	291,890	03/05	**02/08**
UNCH-4	UNC Health Care	130,000	03/06	07/07
	Total UNC Health Care	**961,350**		
ATH-1	Athletics	41,181	05/07	01/08
ATH-2	**Athletics**	**125,000**	**03/10**	**09/12**
ATH-3	**Athletics**	**15,059**	**05/08**	**02/10**
ATH-4	**Athletics**	**19,194**	**01/08**	**08/09**
ATH-5	**Athletics**	**6,467**	**03/10**	**01/11**
ATH-6	**Athletics**	**4,069**	**01/10**	**10/10**
	Total UNC Athletics	**210,970**		
	Campus Total	**7,917,979**		

Figure 1.1: Development Plan Projects Map

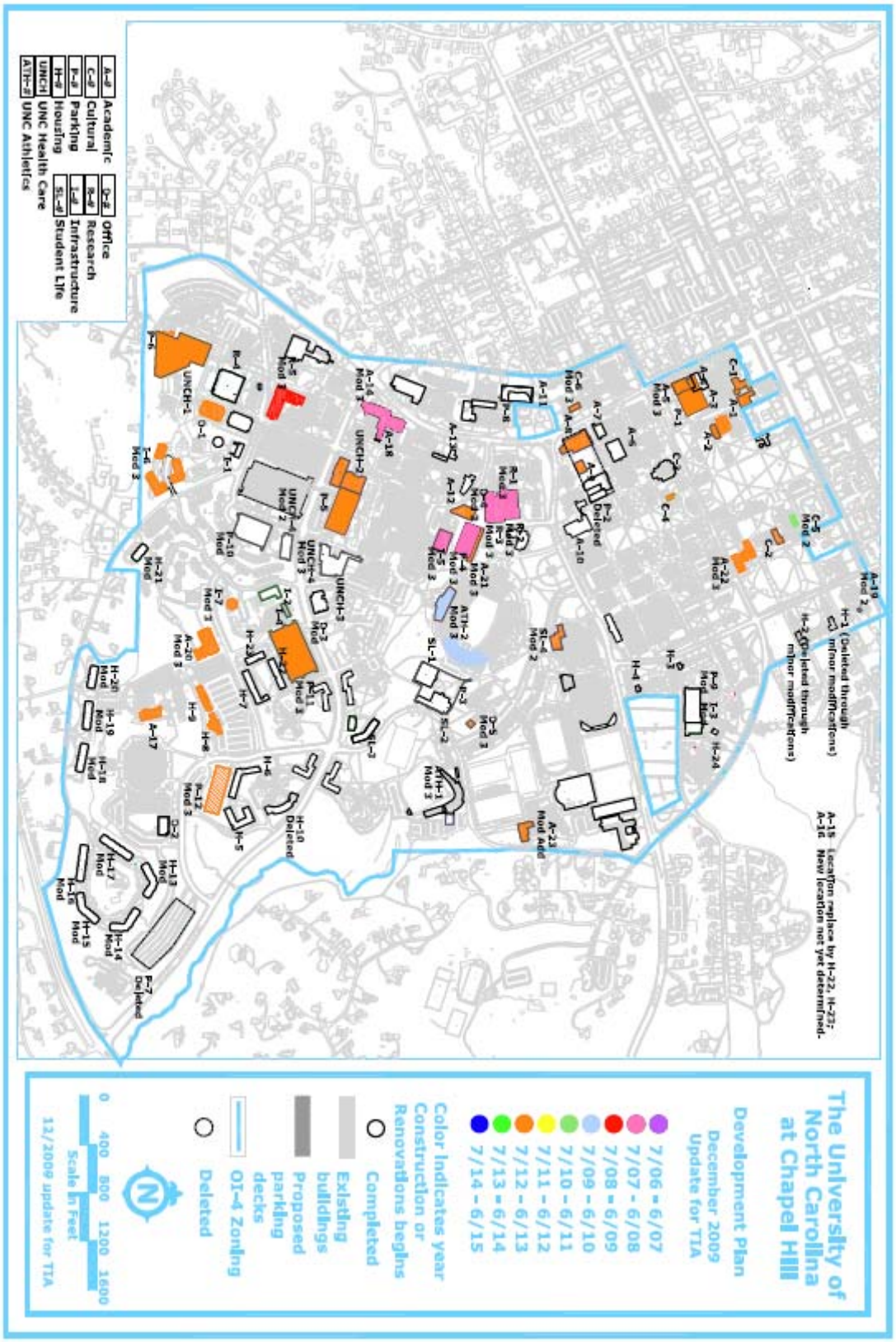


Table 1.2: Parking Space Impacts

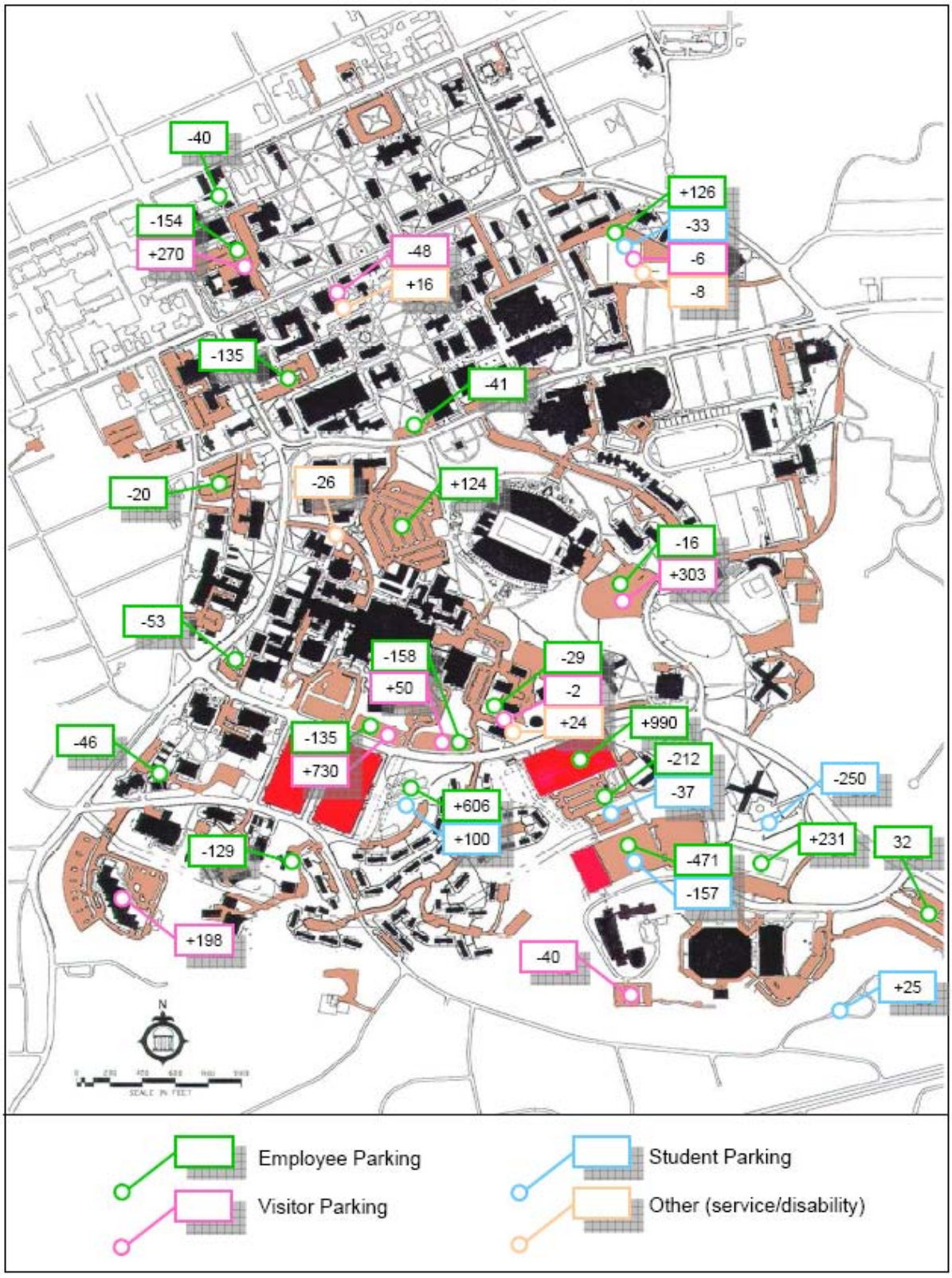
Lot / Project Name	Parking Zone	Number of Spaces[1,2] Employee	Commuting Student	Resident Student	Student in Family Housing	Visitor	Other	Net Change
ACC (new structure)						198		198
Bell Tower (new structure)	BG	124						124
Bowles	S11	-471	-157					-628
Cameron/Swain (Arts Common Deck - new structure)	ND1/NG1	-154				270		116
Cobb/Joyner (new structure and surface parking)		126	-33			-6	-8	79
Craige Surface	CD	-212		-37				-249
Craige Deck Expansion	CD	990						990
Dental School	S6	-53						-53
Glaxo / Housing Support / MFM / MRI	S6	-46						-46
Gravely (NC H&C) (new structure)	CG	-135				730		595
Hanes						-48	16	-32
Hinton James	M			-250				-250
ITS		-29				-2	24	-7
Jackson Deck (new structure)		606	100		-54			652
Kenan/McColl Visitor Parking						-40		-40
McCauley Street (Global Education Deck - new structure)	W	-20						-20
Neurosciences	CG	-158				50		-108
North Medical Drive							-26	-26
Porthole	N2	-40						-40
Rams Head (new structure)	S5	-16				303		287
Stadium Drive	S4							0
Sitterson	NG2	-135						-135
South Chiller	S6	-129						-129
Student Family Housing	MR/MR2				79			79
Tennis Court Deck (new structure)		231						231
Wilson Library	N8	-41						-41
Subtotal		**438**	**-90**	**-287**	**26**	**1,455**	**8**	**1,547**
Unassigned spaces [3]		32						32
Total								**1,579**

Notes:

1. Numbers are subject to change, depending on the final footprint of each project.
2. These numbers represent net changes only. For example, the Rams Head structure has 700 spaces, but 397 were displaced as a result of its construction. The net impact, which is shown in this table, is 303 spaces.
3. Spaces not assigned to a specific location on the campus and whose location(s) will be determined in future development plan modification requests. The total net change in parking is 32 spaces less than the approved 1,579 space increase, but the traffic assessment accounts for the entire 1,579 space net increase.

Source: Table 2-4 of Development Plan TIA, December 2009

Figure 1.2: Parking Impacts Map



2: Development Plan Transportation Changes

Overview of Traffic Analysis

The Development Plan's impact on roads on or near the campus, including 55 intersections, was analyzed using standard techniques for Traffic Impact Analysis. Three scenarios are considered:

- Existing conditions (the traffic levels in 2009);
- No-Build conditions (the forecast conditions in 2015 if the Development Plan projects did not exist); and
- Build conditions (the forecast conditions in 2015 including the effects of the Development Plan projects).

The existing conditions were measured using traffic counts collected in Fall 2009 on days when the University was in session. Because similar analyses were undertaken in 2001, 2003, 2005, and 2007, changes in traffic levels can be tracked.

The No-Build conditions are forecast by applying annual growth rates to the existing traffic levels. The Build conditions are forecast by taking the No-Build traffic levels and adding the trips due to Development Plan projects. These trips are estimated from the forecast parking changes (described above), using known trip rates per parking space.

Changes in Traffic Volumes

Table 2-1 shows the average daily traffic volumes (ADTs) in 2001, 2003, 2005, 2006, 2007, and 2009 along with the No-Build and Build forecasts for 2015. Figure 2.1 illustrates the two forecasts for 2015.

Traffic volumes have generally remained stable, or, in some cases, decreased, since the 2007 counts. One possible reason is the ongoing development and implementation of the University's Transportation Demand Management (TDM) program, including full subsidy of ridership on Triangle Transit and doubling of the vanpool subsidy. Construction on campus is another possible explanation for the downward trend in daily traffic volumes. Construction on campus has disrupted traffic patterns and has also resulted in a net loss in on-campus parking since 2001. Another possible explanation is the increase in on-campus housing for students.

In the No-Build scenario, background traffic growth is expected to produce increased volumes. This is normal for growing areas such as Chapel Hill.

In the Build scenario, the further increase in traffic along most campus roads is expected to be minimal, although some intersections near proposed parking facilities will see particular turning movements increase noticeably. In some areas where parking is being eliminated, some turning movements will decrease compared to the No-Build scenario. The largest increase in traffic volumes will be on Manning Drive.

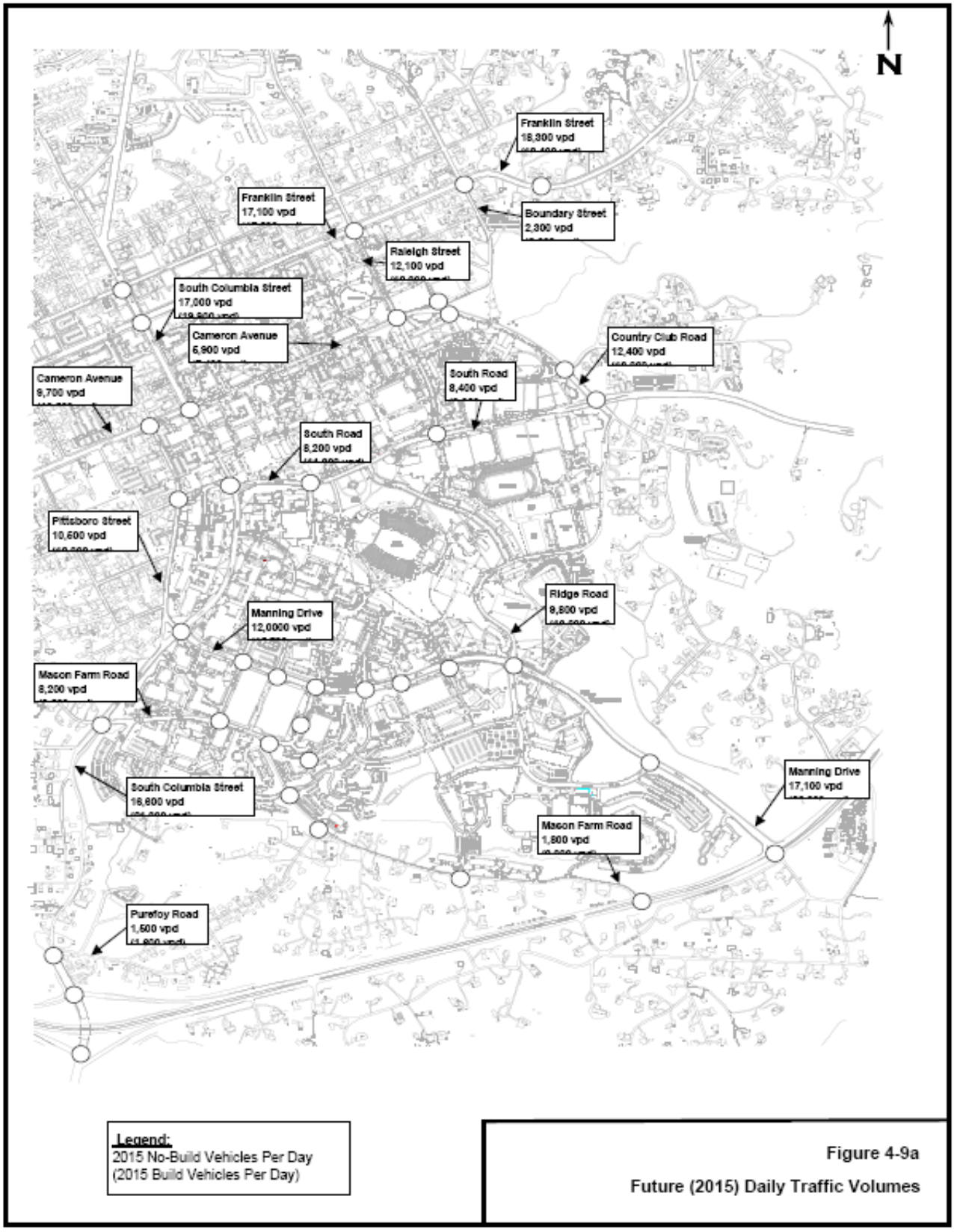
Table 2.1: Existing and Future (2015) Traffic Volumes

Link #	Roadway	2001 ADT	2003 ADT	2005 ADT	2006 ADT	2007 ADT	2009 ADT	2001-2015 Annual Growth Rate	Projected 2015 No-Build ADT	Projected 2015 Build ADT	2001-2009 AGR
1	S. Columbia St. (south of Franklin St.)	20,720	19,060	17,530	-	17,530	15,410	1.7%	17,000	19,900	-3.6%
2	Raleigh St. (south of Franklin St.)	14,470	10,710	13,080	13,080	11,020	11,710	0.6%	12,100	12,300	-2.6%
3	Cameron Ave. (west of Pittsboro St.)	9,820	8,300	8,510	-	7,630	9,260	0.9%	9,700	10,500	-0.7%
4	Cameron Ave. (east of S. Columbia St.) [1]	9,070	8,330	6,430	6,430	5,270	5,540	1.2%	5,900	7,400	-6.0%
5	Country Club Rd. (north of South Rd.)	13,470	14,080	12,200	12,200	12,990	11,960	0.7%	12,400	13,000	-1.5%
6	South Rd. (east of Columbia St.) [2]	10,460	8,840	11,400	-	8,400	7,430	1.7%	8,200	11,800	-4.2%
7	South Rd. (east of Raleigh St.) [2]	9,840	10,000	12,890	12,890	7,500	7,510	2.0%	8,400	9,300	-3.3%
8	Pittsboro St. (south of McCauley St.)	10,960	10,070	10,920	-	9,550	9,750	1.4%	10,500	12,000	-1.5%
9	Manning Dr. (east of Columbia St.)	14,100	13,220	12,480	12,480	11,070	11,060	1.4%	12,000	15,700	-3.0%
10	Ridge Rd. (at Manning Dr.)	8,320	7,870	7,300	7,300	7,910	8,730	2.0%	9,800	13,300	0.6%
11	S. Columbia St. (south of Mason Farm Rd.)	18,470	18,250	16,190	-	16,090	15,430	1.3%	16,600	21,300	-2.2%
12	Manning Dr. (east of Ridge Rd.)	17,260	14,680	17,880	17,880	15,680	16,150	0.9%	17,100	22,800	-0.8%
13	Franklin (west of Raleigh St.) [4]	17,000	19,260	18,850	-	19,320	16,250	0.9%	17,100	17,200	-0.6%
14	Franklin (east of Boundary St.) [4]	-	23,560	20,190	20,190	24,730	17,390	0.9%	18,300	18,400	-4.9%
15	Boundary (south of Franklin St.)	-	3,230	2,320	2,320	2,140	2,230	0.6%	2,300	2,600	-6.0%
16	Mason Farm Rd.(east of Columbia St.) [3]	7,700	8,230	3,400	3,400	8,390	7,330	2.0%	8,200	9,500	-0.6%
17	Mason Farm Rd. (north of Fordham Blvd.) [3]	1,360	770	1,830	-	1,820	1,770	0.4%	1,800	2,000	3.3%
18	Purefoy Rd. (east of Columbia St.) [3]	970	970	1,130	-	1,360	1,450	0.4%	1,500	1,600	5.2%
19	US 15-501 (west of Main St.)	-	-	-	-	17,840	17,080	2.0%	19,100	20,800	-2.2%
20	US 15-501 East of Culbreth Road	30,480	-	30,000	-	30,310	30,570	2.0%	34,200	37,100	0.0%
21	NC 54 west of Hamilton Road	45,400	-	44,000	-	47,940	43,470	2.0%	48,700	52,800	-0.5%
22	NC 54 east of East Barbee Chapel Hill Road	-	-	-	-	32,100	37,390	2.0%	41,900	44,500	7.9%

[1] Swain Lot was closed when data was collected.
[2] Bell Tower Lot was closed when data was collected.
[3] Year 2001 ADT estimated using calculated 2005 peak to daily ratio (K-factor).
[4] Recounted in December 2009

Source: Table 4-9 of Development Plan TIA, December 2009

Figure 2.1: Future (2015) Average Daily Traffic Volumes



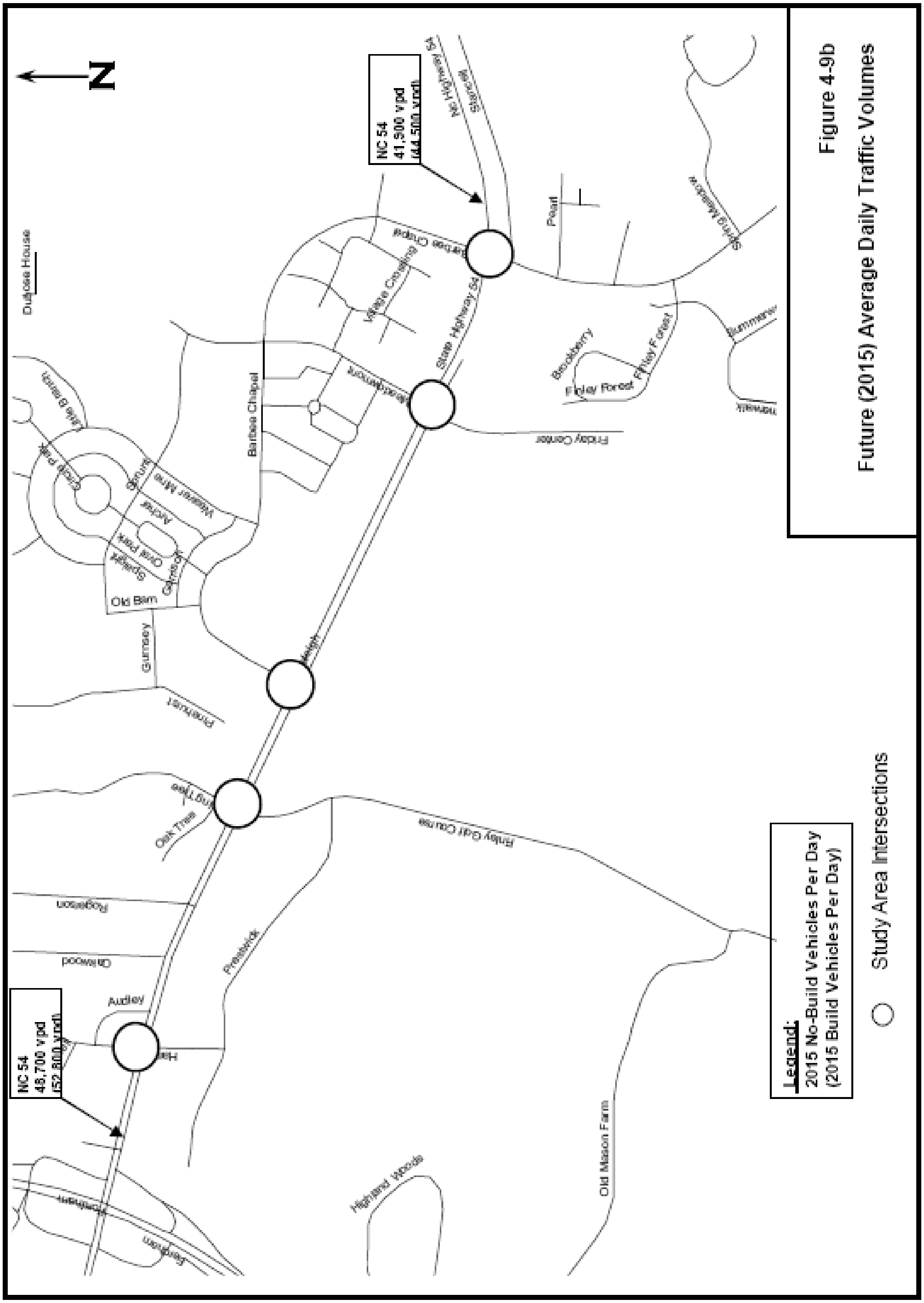
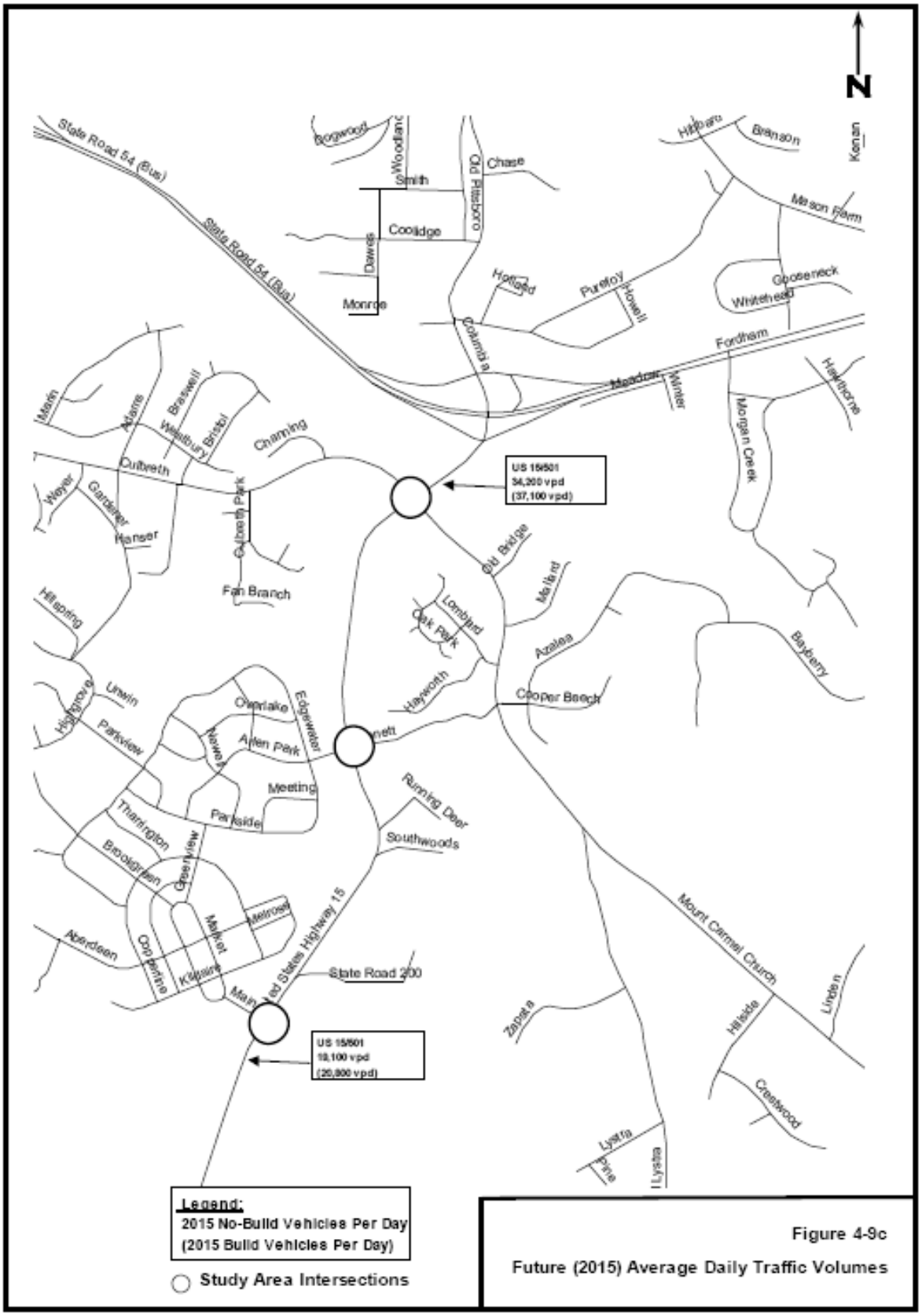


Figure 4-9b
Future (2015) Average Daily Traffic Volumes


N
State Road 54 (Bus)
State Road 54 (Bus)
Edgewood
Woodland
Smith
Old Fitzboro
Chase
Coolidge
Dawes
Monroe
Hatfield
Purdy
Howell
Columbia
Hilgard
Branaon
Kenan
Mason Farm
Gooseneck
Whitehead
Fordham
Hawthorne
Morgan Creek
Meador
Minter
Merin
Adams
Braswell
Westbury
Bristol
Channing
Outreth
Weyer
Gardener
Hanser
Outreth Park
Fan Branch
Hillspring
US 15/501
34,200 vpd
(37,100 vpd)
Elu Bridge
Mallard
Lombard
Oak Park
Azalea
Bayberry
Cooper Beech
Haworth
Highgrove
Unwin
Parkview
Overlake
Edgewater
Nowell
Allen Park
Meeting
Parkside
Running Deer
Southwoods
Thorrington
Brookglen
Greenview
Melrose
Market
Aberdeen
Copperline
Kilpatrick
Main
United States Highway 15
State Road 200
US 15/501
18,100 vpd
(20,800 vpd)
Mount Carmel Church
Linden
Hillside
Zapata
Creekwood
Lysita
Pine
Lysita
Legend:
2015 No-Build Vehicles Per Day
(2015 Build Vehicles Per Day)
Study Area Intersections
Figure 4-9c
Future (2015) Average Daily Traffic Volumes

Intersection Level of Service Analysis

Delays at intersections are measured in terms of the Level of Service (LOS) in the peak hour. LOS ranges from A through F, based on the average control delay (the delay due to signals, stop signs, etc.). Table 2-2 explains the LOS categories. In urban areas, level D or above is generally regarded as acceptable for signalized intersections. At unsignalized intersections, level E or above on the side street is generally regarded as acceptable, although it is recognized that side streets typically function at level F because the traffic volumes often do not warrant a traffic signal to assist the side street traffic.

Table 2-2: Level of Service Descriptions for Intersections

Level of Service	Description	Delay at a Signalized Intersection	Delay at an Unsignalized Intersection
A	Little or no delay	10 seconds or less	10 seconds or less
B	Short traffic delay	10-20 seconds	10-15 seconds
C	Average traffic delay	20-35 seconds	15-25 seconds
D	Long traffic delay	35-55 seconds	25-35 seconds
E	Very long traffic delay	55-80 seconds	35-50 seconds
F	Unacceptable delay	More than 80 seconds	More than 50 seconds

Table 2.3 summarizes the LOS at each intersection for each scenario. Each cell includes the overall LOS at the intersection and the LOS for the worst-performing approach.

Existing conditions

The levels of service at most intersections have remained the same or even improved since 2009. At most intersections, the overall level of service is acceptable, although some minor street approaches are suffering some longer delays.

The following sections discuss some of the intersections that are shown to be experiencing long peak period delays or that have been identified by the Town of Chapel Hill and/or the North Carolina Department of Transportation for pedestrian safety concerns.

Manning Drive at Fordham Boulevard
The University has provided new traffic signal timings for this intersection, yet this intersection continues to experience the worst delays of the intersections immediately adjacent to the campus. The University prepared traffic signal plans in coordination with staff of the Town of Chapel Hill and NCDOT to upgrades at this intersection as well as at the adjacent intersection of Old Mason Farm Road at Fordham Boulevard. The proposed upgrades include crosswalk markings, wheelchair ramps, countdown pedestrian signals, pedestrian push-buttons, a new, larger pedestrian refuge island, and warning signs with flashing beacons for approaching drivers on Fordham Boulevard. The intent of these improvements is to provide a safer environment for pedestrians crossing the streets at each intersection. The plans for these improvements have been completed and submitted to the Town for construction.

US 15-501 at Europa Drive/Erwin Road
At the time of data collection for the 2007 TIA Update, the intersection of US 15-501 at Europa Drive / Erwin Road was still operating as a conventional intersection. However, during January 2008, this intersection was converted to a superstreet, which, according to the staff of NCDOT, has improved traffic flow on 15-501. The superstreet section of US 15-501 at Europa Drive and Erwin Road was fully operational when traffic data was collected in the Fall of 2009.

The superstreet section is reporting improved levels of service. All of the individual intersections that make up the superstreet section are operating at LOS C or better.

The intersection of US 15-501 at Europa Drive/Erwin Road had reported the worst level of service in the 15-501 corridor prior to the conversion to a superstreet. NCDOT is continuing to adjust the traffic signal timings in this corridor to optimize traffic flow and is planning to perform an "after" study to assess the impacts of the superstreet on traffic operations in the corridor. The schedule and scope of the study have not been established.

Although the superstreet at this location has improved traffic flow in this section of the corridor, a Major Investment Study (MIS) concluded that the size of the problem along 15-501 requires a large-scale integrated multimodal solution.

South Columbia Street at Cameron Avenue
This intersection marks the north end of the South Columbia Street-Pittsboro Street one-way pair. It experiences a high volume of pedestrian and bicycle traffic and results in traffic queues along Cameron Avenue to Raleigh Street and South Columbia Street). The Town and NCDOT coordinated on a project to implement special traffic signal phasing at this intersection which includes a pedestrians-only phase. The intent of the new traffic signal phasing is to provide a safer environment for pedestrians crossing the streets at this intersection. The new phasing for this intersection was in operation during the collection of traffic data.

A couple of unsignalized intersections are experiencing long delays on the minor approaches. These intersections are discussed below:

South Columbia Street at Purefoy Road
Although the analysis indicates long delays for the Purefoy Road approach, the installation of a traffic signal is not recommended. The implementation of a traffic signal at this location would most likely result in increased traffic volumes on Purefoy Road, which is counter to the recently implemented traffic calming measures. A new traffic signal at this intersection would also be detrimental to the traffic operations on South Columbia Street due to the close proximity to the interchange of South Columbia Street and 15-501.

Country Club Road at Battle Lane/Boundary Street
This intersection was the subject of a special study during the analysis for Modification No. 1 of the UNC Development Plan. An outcome of that study was the implementation of measures to control the movement of pedestrians in the vicinity of this unsignalized intersection. Town staff has indicated that Town may wish to coordinate with the University to revisit the study of this intersection to determine the need for further upgrades. During discussions prior to the 2009 TIA update, staff of the Town expressed

a desire to accompany any further upgrades at this intersection with the addition of an exclusive westbound right-turn lane at the intersection of Country Club Road at Raleigh Street. Due to the complexity and constraints of this improvement (impacts on existing stone walls, adjacent property, and trees) it was determined that the assessment of these options be postponed. Those discussions are yet to be held.

No-Build conditions

In the No-Build scenario (that is, without the Development Plan projects), the intersections with poor LOS performance in 2009 will continue to perform poorly in 2015. In addition, the background traffic growth will make some other intersections perform poorly. In particular, the following intersections will deteriorate substantially:

- Cameron Avenue / South Columbia Street: deteriorates during the afternoon peak hour to LOS D.
- Manning Drive / Fordham Boulevard: deteriorates during the afternoon peak hour to LOS F.

Build conditions

Although the Development Plan has minimized the increase in parking, there will be traffic increases at some intersections. Under the Build conditions (that is, with the Development Plan projects), two intersections are expected to degrade further:

- Cameron Avenue at South Columbia Street: deteriorates during the afternoon peak period to LOS F.
- Mason Farm Road / Columbia Street: deteriorates even further in the afternoon peak period to LOS E. This is unchanged from the 2007 TIA Update.

Table 2.3: Existing and Forecast Intersection Levels of Service

ID #	Intersection	Control	No-Build (2015)		Build (2015)	
			AM	PM	AM	PM
1	Columbia Street/Rosemary Street	Signalized	C (WB-D)	D (WB-D)	C (WB-D)	D (WB-D)
2	Columbia Street/Franklin Street	Signalized	C (EB-D)	C (EB-D)	C (EB-D)	D (EB-D)
3	Franklin Street/Raleigh Street	Signalized	C (NB-E)	C (NB-D)	C (NB-E)	C (NB-D)
4	Merritt Mill Road/Cameron Avenue	Signalized	B (WB-E)	C (WB-D)	B (WB-E)	C (WB-D)
5	Cameron Avenue/Pittsboro Street	Signalized	B (EB-D)	B (EB-B)	B (EB-D)	B (EB-B)
6	Cameron Avenue/Columbia Street	Signalized	C (WB-D)	D (SB-F)	D (NB-F)	F (SB-F)
7	Cameron Avenue/Raleigh Street	Signalized	C (WB-D)	D (WB-D)	C (NB-D)	E (NB-F)
8	Pittsboro Street/McCauley Street	Signalized	B (EB-C)	B (WB-D)	B (WB-D)	C (WB-D)
9	Columbia Street/South Road	Signalized	B (EB-D)	C (EB-E)	B (WB-D)	C (EB-E)
10	Raleigh Street/South Road	Signalized	B (SB-C)	A (SB-B)	B (SB-C)	B (SB-C)
11	Country Club Road/South Road	Signalized	C (SB-D)	C (SB-D)	D (SB-D)	D (SB-D)
12	Columbia Street/Manning Drive	Signalized	C (EB-D)	C (EB-D)	C (EB-C)	C (EB-D)
13	Manning Drive/West Drive	Signalized	A (SB-D)	A (SB-D)	A (SB-D)	A (SB-D)
14	Manning Drive/East Drive	Signalized	A (NB-D)	B (NB-C)	B (NB-C)	C (NB-C)
15	Ridge Road/Manning Drive	Signalized	C (NB-D)	C (NB-D)	E (WB-E)	C (NB-D)
16	Mason Farm Road/Columbia Street	Signalized	B (WB-D)	C (WB-D)	B (WB-D)	E (WB-F)
17	Mason Farm Road/West Drive	Signalized	A (SB-C)	A (SB-D)	A (SB-C)	A (SB-D)
18	Mason Farm Road/East Drive	Unsignalized	B (EB-B)	B (EB-B)	C (EB-C)	B (EB-C)
19	Mason Farm Road/Purefoy Road	Unsignalized	A (EB-A)	A (SB-B)	A (EB-A)	B (SB-B)
20	Manning Drive/Skipper Bowles Drive	Unsignalized	A (NB-C)	B (NB-E)	A (NB-C)	C (NB-F)
21	Columbia Street/Purefoy Road	Unsignalized	A (WB-F)	A (WB-F)	F (WB-F)	E (WB-F)
22	Columbia Street/Fordham Boulevard WB Ramps	Signalized	B (WB-D)	D (WB-D)	B (WB-D)	D (WB-E)
23	Columbia Street/Fordham Boulevard EB Ramps	Signalized	B (EB-D)	B (EB-E)	B (EB-D)	B (EB-E)
24	Mason Farm Road/Fordham Boulevard	Unsignalized	A (SB-C)	A (SB-F)	A (SB-C)	A (SB-F)
25	Manning Drive/Fordham Boulevard	Signalized	F (SB-F)	F (NB-F)	F (SB-F)	F (NB-F)
26	Mason Farm Road/Cteys Road	Unsignalized	A (WB-A)	A (EB-A)	A (WB-A)	A (EB-A)
27	Franklin Street/Boundary Street	Signalized	A (SB-D)	B (SB-E)	A (SB-D)	B (SB-E)
28	Franklin Street/Park Place	Unsignalized	A (NB-A)	A (NB-B)	A (NB-B)	A (NB-C)
29	Battle Lane/Boundary Street	Unsignalized	A (WB-A)	B (NB-B)	A (WB-A)	B (NB-B)
30	Country Club Road/Battle Lane	Unsignalized	A (SB-D)	D (SB-F)	A (SB-D)	F (SB-F)
307	Country Club Road/Boundary Street	Unsignalized	A (SB-B)	A (SB-B)	A (SB-B)	A (SB-B)
31	Country Club Road/Glmghoul Road	Signalized	A (EB-D)	A (EB-D)	A (EB-D)	A (EB-D)
32	Manning Drive/Hibbard Drive	Signalized	A (SB-D)	A (SB-D)	A (SB-D)	A (SB-D)
33	Manning Drive/Craige Drive	Signalized	A (SB-D)	B (SB-D)	A (SB-D)	C (NB-D)
34	East Drive/Jackson Circle/Dogwood Deck Entrance	Unsignalized	A (WB-C)	A (WB-C)	A (WB-D)	A (WB-C)
35	East Drive/Dogwood Deck Exit	Unsignalized	A (EB-B)	B (EB-D)	A (EB-C)	C (EB-D)
36	Mason Farm Road/Hibbard Drive	Unsignalized	A (EB-B)	A (WB-B)	A (EB-B)	A (WB-B)
37	South Road/Bell Tower Drive	Signalized	A (EB-A)	A (WB-A)	A (NB-E)	B (NB-D)
38	Manning Drive/New East Drive	Signalized	C (EB-D)	B (SB-C)	C (EB-C)	B (WB-C)
39	Manning Drive/Craige Deck	Unsignalized	A (NB-E)	B (NB-F)	A (NB-F)	F (NB-F)
101	US 15-501/Estes Drive	Signalized	C (WB-E)	D (EB-F)	C (WB-E)	D (EB-F)
102	US 15-501/Willow Drive	Signalized	B (WB-E)	D (EB-F)	B (WB-E)	E (EB-F)
103	US 15-501/Elliot Road	Signalized	A (EB-E)	B (EB-E)	A (EB-E)	B (EB-E)
104	US 15-501/Ephesus Church Road	Signalized	D (EB-E)	E (EB-F)	D (WB-F)	F (EB-F)
105	US 15-501/Erwin Road	Signalized	B (SB-D)	C (SB-D)	B (SB-D)	C (SB-D)
106	US 15-501/Europa Drive	Signalized	A (NB-E)	B (NB-E)	A (NB-E)	B (NB-E)
107	US 15-501/Superstreet NB U-Turn	Signalized	B (NB-E)	C (NB-E)	B (NB-E)	C (NB-E)
108	US 15-501/Superstreet SB U-Turn	Signalized	A (SB-D)	E (SB-F)	B (SB-D)	F (SB-F)
109	US 15-501/Sage Road	Signalized	C (NB-E)	D (NB-F)	D (NB-F)	D (NB-F)
110	US 15-501/Eastowne Drive/BCBS	Signalized	B (SB-E)	B (SB-E)	B (SB-E)	B (SB-E)
111	US 15-501/Eastowne Drive/Lakeview Drive	Signalized	D (SB-F)	D (SB-F)	D (SB-F)	E (SB-F)
201	NC 54/Hamilton Road	Signalized	B (NB-E)	B (NB-E)	C (NB-E)	C (NB-E)
202	NC 54/Burning Tree Lane	Signalized	A (SB-F)	B (NB-E)	A (SB-F)	B (NB-E)
203	NC 54/Barbee Chapel Road Ext	Signalized	B (NB-E)	C (NB-E)	B (SB-E)	C (NB-E)
204	NC 54/Meadowmont Lane	Signalized	C (SB-E)	D (NB-F)	C (SB-E)	E (NB-F)
205	NC 54/Barbee Chapel Road (East)	Signalized	D (NB-F)	C (NB-E)	E (NB-F)	D (NB-F)
301	US 15-501/Culbreth Road/Mt Carmel Church Road	Signalized	D (WB-F)	C (EB-D)	E (WB-F)	C (EB-D)
302	US 15-501/Bennett Road/Arlen Park Drive	Signalized	A (EB-D)	A (EB-E)	A (EB-D)	A (EB-E)
303	US 15-501/Market Street	Signalized	B (EB-D)	C (EB-D)	B (EB-D)	C (EB-D)

Legend: X = overall intersection level of service (X) = worst movement level of service

Source: Table 4-11 of Development Plan TIA, December 2009

3: Development Plan Transportation Mitigation Measures and Recommendations

Overview of Mitigation Strategies and Measures

As the No-Build scenario showed, geometric improvements could be considered at several intersections even without the Development Plan. The list below describes the intersection improvements that have been approved and/or stipulated by the Town of Chapel Hill. Some of these have already been implemented.

- Columbia Street / South Road / McCauley Street: Improvements at this intersection are complete. The improvements included remodeling to improve pedestrian safety, as well as an exclusive left-turn lane on the McCauley Street approach that was accomplished through pavement marking changes without widening the road.
- South Road / Country Club Road: Improvements have already been made here without widening the road. A northbound right-turn lane has been added, and the southbound shared through-right lane has been converted to a shared left-through-right lane. In addition, realignment of the Ridge Road / County Club Road intersection, to give priority to Ridge Road, has been recommended as a long term option.
- Cameron Avenue / Raleigh Street: Signal phasing changes have been implemented to improve traffic flow. As discussed earlier, the Town has indicated the possibility of revisiting this intersection and considering the implementation of an exclusive westbound right-turn lane on Country Club Road.
- Country Club Road / Battle Lane / Boundary Street: Bollards and chains have been strategically provided to control pedestrians in and around this intersection, and a stamped asphalt pedestrian crossing was installed. If the Town and University determine that other improvements are necessary, the University will coordinate with the Town to design and implement the agreed upon improvements.
- Country Club Road / Gimghoul Road / Paul Green Theater Drive: A traffic signal including pedestrian countdown heads has been provided.
- Manning Drive / Skipper Bowles Drive: Based on peak period counts and the accident history at this location, turn restrictions have been implemented to prevent eastbound left-turns from Skipper Bowles Drive onto northbound Manning Drive during special events. Recent changes in the parking allocation of the Development Plan indicated the potential for an increase in the number of parking spaces accessible via Skipper Bowles Drive. It was noted in the 2007 Annual Report that the University would collect additional traffic volume data at this intersection to perform a more thorough analysis to determine if applicable warrants for the installation of a traffic signal are met. The proposed changes to the parking allocation, while still included in the Development Plan, have not been constructed therefore the additional signal warrant analysis has not been performed.
- South Columbia Street, between Manning Drive and South Road: The cross-section of this portion of South Columbia Street has been altered as stipulated to remove a vehicular travel lane and to add an exclusive bike lane and an exclusive bus lane. Construction of the accompanying streetscape features is

complete. A new pedestrian activated traffic signal at the intersection of South Columbia Street has not yet been constructed.

- Manning Drive / Fordham Boulevard: Lighting and upgraded signals with pedestrian facilities were stipulated for this intersection. The University has provided funding for the stipulated street lighting. The University prepared traffic signal upgrade plans in coordination with the Town and NCDOT for the stipulated traffic signal upgrades at this intersection to improve pedestrian safety. The completed plans have been submitted to the Town for construction.
- Manning Drive / Old Mason Farm Road: Lighting and upgraded signals with pedestrian facilities were stipulated for this intersection. The University has provided funding for the stipulated street lighting. The University prepared traffic signal upgrade plans in coordination with the Town and NCDOT for the stipulated traffic signal upgrades at this intersection to improve pedestrian safety. The completed plans have been submitted to the Town for construction.
- Mason Farm Road / East Drive: Signal plans have been approved by the Town of Chapel Hill. The completed plans have been submitted to the Town for construction.
- Mason Farm Road / West Drive: Signal plans were approved by the Town of Chapel Hill; however, the plans required revision to incorporate a geometric roadway change due to an adjacent building project. A temporary traffic signal has been constructed at this intersection due to the impacts of the adjacent building construction. The plans for the final signal installation, which includes metal poles with mastarms, will be constructed following the completed construction of the adjacent building.
- Ridge Road: Resurfacing has been stipulated along the length of the road. Other safety improvements have already been made near the Rams Head Center and other pedestrian safety enhancements are being constructed adjacent to Boshamer Stadium and will be complete by early January 2010.
- Manning Drive / Ridge Road: Although traffic delays are not an egregious problem here, there are speed and appearance issues. Measures to reduce and calm traffic and to enhance pedestrian safety should be studied. Measures to encourage pedestrians to cross at the intersection have been implemented.

Impacts to Date and Target Mode Splits

Table 3.1 shows the proportions of employees and students traveling to campus by each mode of transportation ('mode splits') in 2001, 2004, 2007, and 2009, plus the current targets for 2015. The latest commuter survey was carried out in Spring 2009. In 2001, the University was already performing well, with 28% of employees and 67% of students using alternative modes to reach the campus. The 2004, 2007 and 2009 commuter surveys provided a snapshot of progress part-way into the Development Plan, and the 2015 targets have been updated in light of this experience.

As expected, the proportion of both employees and students driving alone has fallen further since 2001. This is because (a) construction to date has resulted in a net loss of over 1,000 employee spaces, (b) the employee and student populations have increased, and (c) the University has invested heavily in improvements to alternative modes. Park-

and-ride has been particularly popular for employees, and Chapel Hill Transit (CHT) has been particularly popular for students. This is a successful result of investment in extensive park-and-ride lots with frequent shuttle services, and in fare-free transit and other service enhancements.

It appears that some employees living in Chapel Hill and Carrboro are choosing to drive to a park-and-ride lot rather than walk to a local CHT stop, in order to take advantage of the more frequent transit service. Also, geocoding data show that University employees are living further away from campus than in previous years, increasing the value of park-and-ride compared to CHT.

Table 3.1: Baseline, Current and Target Mode Splits

	Employees					Commuting Students				
Mode	2001 Existing Ratio	2004 Existing Ratio	2007 Existing Ratio	2009 Existing Ratio	New Projections	2001 Existing Ratio	2004 Existing Ratio	2007 Existing Ratio	2009 Existing Ratio	New Projections
Drive alone	0.72	0.61	0.56	0.49	0.56	0.33	0.19	0.18	0.17	0.22
Carpool/vanpool	0.06	0.05	0.06	0.07	0.08	0.08	0.07	0.08	0.03	0.08
Bus	0.06	0.08	0.10	0.13	0.15	0.21	0.34	0.35	0.39	0.35
Bicycle	0.03	0.02	0.03	0.04	0.03	0.09	0.05	0.06	0.11	0.08
Walk	0.02	0.02	0.03	0.03	0.02	0.12	0.14	0.14	0.12	0.11
Park-and-ride	0.07	0.15	0.16	0.17	0.11	0.12	0.16	0.10	0.14	0.11
Other	0.04	0.06	0.07	0.07	0.04	0.06	0.06	0.09	0.05	0.06

Estimated Air Quality Impacts

The strong use of alternative modes, compared to a typical development of this size, also has a benefit for air quality. The emission reductions, compared to a typical development, are estimated to be:

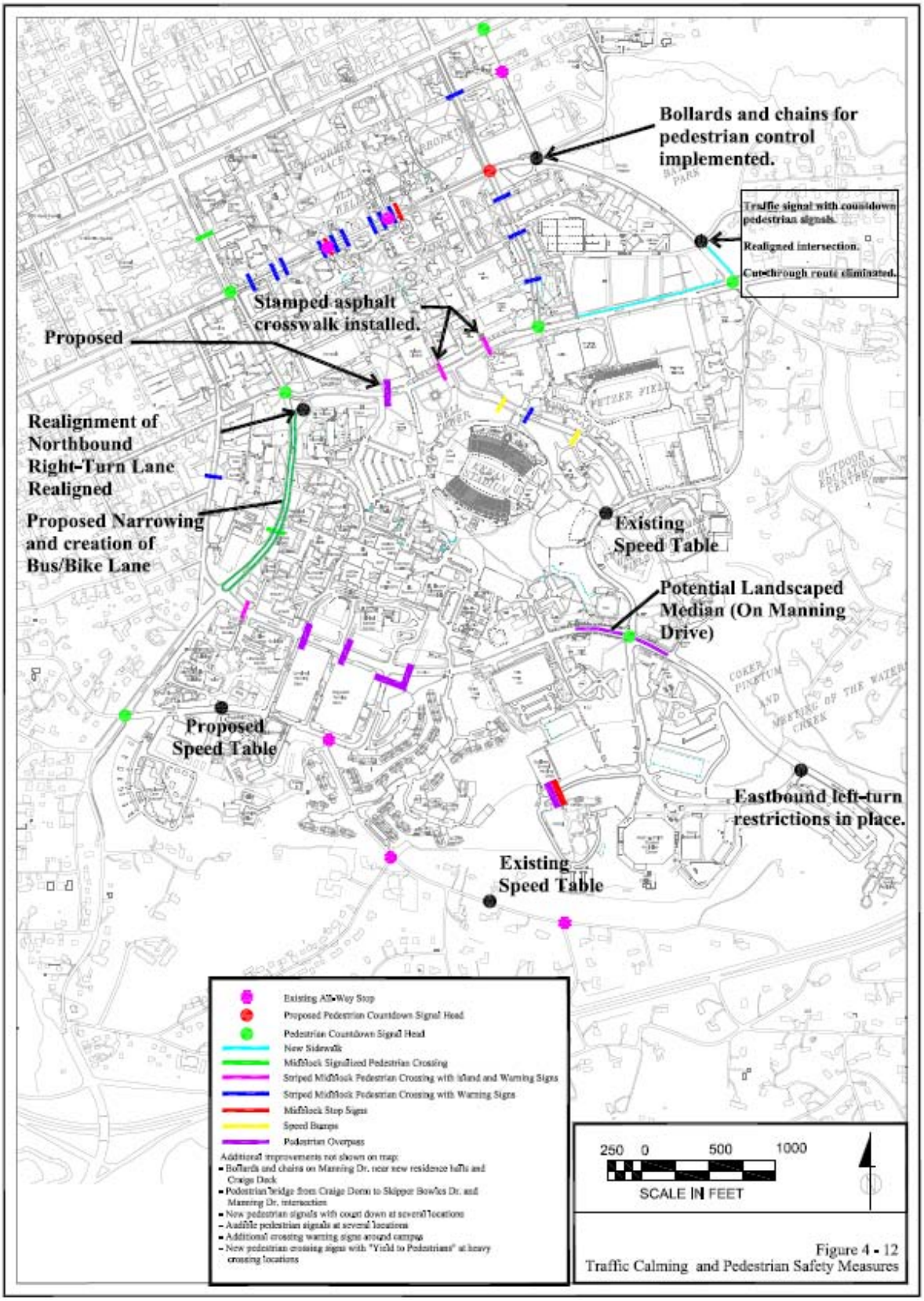
- Nitrous Oxides (NOx): 27 kg/day (6,643 kg/year)
- Volatile Organic Compounds (VOC): 18 kg/day (4,422 kg/year)
- Carbon Monoxide (CO): 404 kg/day (101,074 kg/year)

Methodology and data analyzed for estimating air quality impacts are explained in more detail in Section 3.5 of the December 2009 Development Plan TIA report.

Existing and Proposed Traffic Calming Measures On Campus

Figure 3.1 shows the recent traffic calming measures implemented on campus, as well as some potential long term projects. Some of the potential long term measures may include pedestrian and bicycle improvements. Recent improvements include new pedestrian countdown signal heads at several intersections, new sidewalks, and new mid-block pedestrian crossings using a variety of engineering treatments.

Figure 3.1: Traffic Calming and Pedestrian Improvements On Campus



Existing and Proposed Traffic Calming Measures in Adjacent Neighborhoods

The Transportation Impact Analysis (TIA) guidelines agreed to by the Town of Chapel Hill and the University in 2001 do not require the TIA to analyze traffic calming in adjacent neighborhoods. However, the University maintains an ongoing dialog with the Town about possible impacts and potential mitigation measures. Not only has the University agreed to provide traffic calming measures on campus, but the University has also agreed to provide traffic calming measures on streets in neighborhoods immediately adjacent to the campus. As part of this process, the University has been working with the Town's traffic engineering staff and with neighborhood residents.

Table 3.2 shows the streets that were considered for possible impacts and potential mitigation measures. The measures that were agreed upon have all been implemented as indicated in Table 3.2. The measures were designed and implemented at no cost to the Town. The Town will maintain the traffic calming devices on Town streets.

Town staff has indicated that the responses to the traffic calming devices have been positive and that no further requests for the installation of similar devices have been received.

Table 3.2: Neighborhood Streets Considered for Traffic Calming Measures

Street	Identified for Implementation?	Traffic Calming Measures	
		Status	Element
Westwood Drive, Ransom Street, McCauley Street, and Vance Street	No. Traffic calming measures have already been implemented.	Complete	All-way stops Improved pavement markings Speed tables
Oteys Road	No. Traffic calming measures have already been implemented.	Complete	Speed table
Purefoy Road	No. Traffic calming measures have already been implemented.	Complete	Speed tables and all-way stops
Mason Farm Road	No. Traffic calming measures have already been implemented.	N/A	N/A
Ridge Road	No. Traffic calming measures have already been implemented.	N/A	N/A
Laurel Hill Road	No. Alignment and cross-section of road is already a calming measure prohibiting high travel speeds and creating longer travel times than competing routes.	N/A	N/A
Gimghoul Road	No. Church property was sold and will be redeveloped as residential units. As a result, the cut-through route connecting to South Road (NC 54) was eliminated. The intersection of Gimghoul Road and Country Club Road has been signalized. Paul Green Theater Drive was relocated to align with Gimghoul Road.	Complete	New traffic signal Decreased corner radii at intersection with Country Club Road Stamped asphalt crosswalks Audible, countdown pedestrian signals
Raleigh Street	No. Traffic calming measures have already been implemented.	N/A	N/A
Cameron Avenue	No. Traffic calming measures have already been implemented.	N/A	N/A
Battle Lane	No. Traffic calming measures have already been implemented.	N/A	N/A
Boundary Street	Yes. Plans were completed and submitted to Town for implementation.	Complete	Speed table
Park Place	No. Traffic calming devices were deemed not feasible on this street.	N/A	N/A