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# The University of North Carolina at Chapel Hill

## Annual Development Plan Report on Transportation



December 2006

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### Introduction

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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 that accompanied the revised Development Plan Modification #3 application that was approved by the Town of Chapel Hill in December 2006.

### 1: Development Plan Overview

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#### 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 I,
- Residence Halls Phase II (Ram Village),
- Hooker Hall,
- Addition to the Medical Science Research Building, and
- Tompkins Chiller Plant and Thermal Storage Facility.

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

- Science Complex Phase II,
- Global Education Center,
- Student and Academic Services Building,
- Genetic Medicine,
- ITS-Manning,
- Manning Steam Plant,
- North Carolina Cancer Hospital,
- Physicians Office Building, and

- Other infrastructure projects.

In total, the Development Plan projects involve about 7.8 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 5.2 million square feet. However, some of the new floor area is required to address current space deficits and will not result in an increase in employees or student numbers.

### **Projects by Location**

Table 1.1 lists the projects in detail, and Figures 1.1a and 1.1b show their locations. The projects can be summarized as follows:

<u>Type of building</u>	<u>Square Footage</u>
Academic	1,965,626
Cultural	112,725
Housing	783,162
Infrastructure	306,000
Office	460,200
Parking	1,950,700
Research	787,400
Student Life	335,300
UNC Health Care	961,350
Athletics	145,000
Total	<u>7,807,463</u>

### **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 there. 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 3,970 existing spaces will be permanently closed, and around 5,550 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. These figures are estimates only, 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 480 commuter spaces and a decrease of about 340 resident student spaces.

### Impacts

The increase in commuter spaces is very low compared with expected population growth over the ten-year period of the plan. Employee numbers are forecast to grow by 27%, and student numbers by 15%. 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 1,600 employee spaces, about 200 commuting student spaces and about 500 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 is estimated to generate about 10,500 vehicle trips daily. A typical campus development of similar size, with unlimited parking and little or no transportation alternatives, would generate more than 30,000 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: University of North Carolina at Chapel Hill Development Plan**

Building	Building Type	Area Per Floor, gsf	Number of Floors	DP Square Footage + Mod. 3	Parking Spaces	Anticipated Construction Start Date	Anticipated Construction Completion
A-1	Academic	10,600	3	31,800		03/05	02/07
A-2	Academic	18,275	4	73,100		03/05	02/07
A-3	Academic	6,400	4	25,600		03/05	02/07
A-4	Academic	5,000	4	20,000		03/05	02/07
<b>A-5</b>	<b>Academic</b>	<b>13,800</b>	<b>4</b>	<b>55,200</b>		<b>03/05</b>	<b>02/07</b>
A-6	Academic	18,000	5	90,000		07/03	06/05
A-7	Academic	8,200	5	41,000		02/06	08/08
A-8	Academic	38,625	4	154,500		02/06	08/08
A-9	Academic	99,175	4	396,700		02/06	08/08
A-10	Academic	18,750	6	112,500		07/03	06/05
A-11	Academic	27,333	3	82,000		03/04	02/06
A-12	Academic	9,929	7	69,500		11/01	10/03
A-13	Academic	3,400	3	10,200		08/02	07/04
<b>A-14 Mod</b>	<b>Academic</b>	<b>14,165</b>	<b>6</b>	<b>259,990</b>		<b>08/07</b>	<b>08/09</b>
A-15	Academic	19,900	3	59,700		03/04	02/06
	Academic		0	-		03/04	02/06
A-16	Academic	7,700	3	23,100		03/04	02/06
A-17	Academic	13,300	4	53,200		06/02	12/03
A-18	Academic	234	4	936		08/04	03/04
A-19	Academic	1,600	1	1,600		03/05	03/06
<b>A-20 *</b>	<b>Academic</b>	<b>40,000</b>	<b>5</b>	<b>200,000</b>		<b>05/08</b>	<b>07/10</b>
<b>A-21</b>	<b>Academic</b>	<b>26,667</b>	<b>3</b>	<b>80,000</b>		<b>01/08</b>	<b>07/10</b>
<b>A-22</b>	<b>Academic</b>	<b>25,000</b>	<b>3</b>	<b>75,000</b>		<b>05/10</b>	<b>05/12</b>
<b>A-23 *</b>	<b>Academic</b>	<b>12,500</b>	<b>4</b>	<b>50,000</b>		<b>05/08</b>	<b>07/10</b>
	<b>Total Academic</b>			<b>1,965,626</b>			
C-1	Cultural	12,000	3	36,000		12/02	05/04
C-2	Cultural	6,600	4	26,400		05/02	11/03
C-3	Cultural	12,442	3	37,325		12/01	01/03
C-4	Cultural	1,500	2	3,000		11/02	02/04
C-5	Cultural	5,000	2	10,000		01/06	06/07
	<b>Total Cultural</b>			<b>112,725</b>			
*	Revised from June 8, 2006 Table 4						

Notes:

1. As of December 4, 2006 (Development Plan Modification No. 3)
2. Shaded items in italics indicate changes since the February 2006 TIA Update submittal.

Building	Building Type	Area Per Floor, gsf	Number of Floors	DP Square Footage + Mod. 3	Parking Spaces	Anticipated Construction Start Date	Anticipated Construction Completion
H-1	Housing	4,500	3	13,500		05/03	07/04
H-2	Housing	4,500	3	13,500		05/03	07/04
H-3	Housing	1,664	4	6,656		05/02	07/03
H-4	Housing	1,664	4	6,656		05/02	07/03
H-5	Housing	17,100	4	68,400		01/04	08/05
H-6	Housing	15,000	4	60,000		01/04	08/05
H-7	Housing	18,700	4	74,800		01/04	08/05
H-8	Housing	10,800	4	43,200		01/04	08/05
H-9	Housing	10,500	4	42,000		01/04	08/05
H-10	Housing	<i>Deleted</i>	3	<i>Deleted</i>			
H-11	Housing	<i>Deleted</i>	3	<i>Deleted</i>			
H-12	Housing	<i>Deleted</i>	3	<i>Deleted</i>			
H-13	Housing	20,167	3	60,500	53	08/03	08/04
H-14	Housing	20,167	3	60,500	53	08/03	08/04
H-15	Housing	19,400	3	58,200	52	08/03	08/04
H-16	Housing	19,800	3	59,400	51	08/03	08/04
H-17	Housing	19,800	3	59,400	51	08/03	08/04
H-18	Housing	14,800	3	44,400	39	08/03	08/04
H-19	Housing	14,800	3	44,400	39	08/03	08/04
H-20	Housing	12,533	3	37,600	28	08/03	08/04
H-21	Housing	10,017	3	30,050	21	08/03	08/04
	<b>Total Housing</b>			<b>783,162</b>	<b>387</b>	*	
I-1	Infrastructure	20,000		20,000		07/03	12/04
I-2	Infrastructure	28,900	4	115,600		08/03	12/05
I-3	Infrastructure	10,800	2	21,600		03/04	03/06
I-4	Infrastructure	<i>Not Used</i>		-			
<b>I-5 Mod</b>	<b>Infrastructure</b>	<b>33,600</b>	<b>3</b>	<b>100,800</b>		<b>01/08</b>	<b>07/10</b>
<b>I-6</b>	<b>Infrastructure</b>	<b>9,600</b>	<b>5</b>	<b>48,000</b>		<b>01/10</b>	<b>01/12</b>
<b>I-7</b>	<b>Infrastructure</b>	<b>Tank</b>		<b>N/A</b>		<b>05/10</b>	<b>05/12</b>
	<b>Total Infrastructure</b>			<b>306,000</b>			
O-1	Office	22,200	6	133,200		07/03	05/05
O-2	Office	15,000	2	30,000		11/02	05/06
O-3	Office	17,500	6	105,000		07/04	03/06
<b>O-4</b>	<b>Office</b>	<b>18,000</b>	<b>10</b>	<b>180,000</b>		<b>01/08</b>	<b>07/10</b>
<b>O-5</b>	<b>Office</b>	<b>4,000</b>	<b>3</b>	<b>12,000</b>		<b>05/10</b>	<b>05/12</b>
	<b>Total Office</b>			<b>460,200</b>			

Notes:

1. As of December 4, 2006 (Development Plan Modification No. 3)
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Building	Building Type	Area Per Floor, gsf	Number of Floors	DP Square Footage + Mod. 3	Parking Spaces	Anticipated Construction Start Date	Anticipated Construction Completion
P-1	Parking	58,000	2	115,500	-	12/04	05/06
P-2	Parking	Deleted	2	Deleted	Deleted	08/05	04/07
P-3	Parking	84,200	3	252,600	700	05/02	10/04
<b>P-4 Mod</b>	<b>Parking</b>	<b>37,500</b>	<b>6</b>	<b>225,000</b>	<b>710</b>	<b>12/05</b>	<b>01/07</b>
P-5	Parking	63,900	4	255,500	730	11/07	03/10
P-6	Parking	134,400	1	134,400	350	12/02	11/05
<b>P-7</b>	<b>Parking</b>	<b>Deleted</b>	<b>3</b>	<b>Deleted</b>	<b>Deleted</b>		
P-8	Parking	20,720	2	42,000	120	03/04	07/06
P-9	Parking	38,300	5	191,500	600	03/03	03/06
P-10	Parking	70,000	5	350,000	800	04/04	12/05
<b>P-11</b>	<b>Parking</b>	<b>96,000</b>	<b>3</b>	<b>288,000</b>	<b>990</b>	<b>05/09</b>	<b>05/11</b>
<b>P-12</b>	<b>Parking</b>	<b>48,100</b>	<b>2</b>	<b>96,200</b>	<b>230</b>	<b>05/09</b>	<b>05/11</b>
	<b>Total Parking</b>			<b>1,950,700</b>	<b>5,230</b>		

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

R-1	Research	21,800	5	109,000		07/07	07/10
R-2	Research	16,333	3	49,000		07/07	07/10
R-3	Research	24,800	3	74,400		07/07	07/10
R-4	Research	37,500	6	225,000		08/02	12/04
R-5	Research	82,500	4	330,000		05/08	05/10
	Total Research			787,400			
SL-1	Student Life	27,200	2	54,400		06/02	07/04
SL-2	Student Life	31,725	4	126,900		06/02	07/04
SL-3	Student Life	31,500	4	126,000		06/04	08/05
SL-4	Student Life	14,000	2	28,000		12/05	06/07
	Total Student Life			335,300			
UNCH-1	UNC Health Care	65,426	3	196,280		06/03	12/05
UNCH-2	UNC Health Care	42,897	8	343,180		12/07	12/10
UNCH-3	UNC Health Care	36,486	8	291,890		03/05	02/08
UNCH-4	UNC Health Care	26,000	5	130,000		03/06	07/07
	Total UNC Health Care			961,350			
ATH-1	Athletics	5,000	4	20,000		05/07	01/08
ATH-2	Athletics	25,000	5	125,000		11/08	09/10
	Total UNC Athletics			145,000			
Campus Total				7,807,463			

Notes:

1. As of December 4, 2006 (Development Plan Modification No. 3)
2. Shaded items in italics indicate changes since the February 2006 TIA Update submittal.

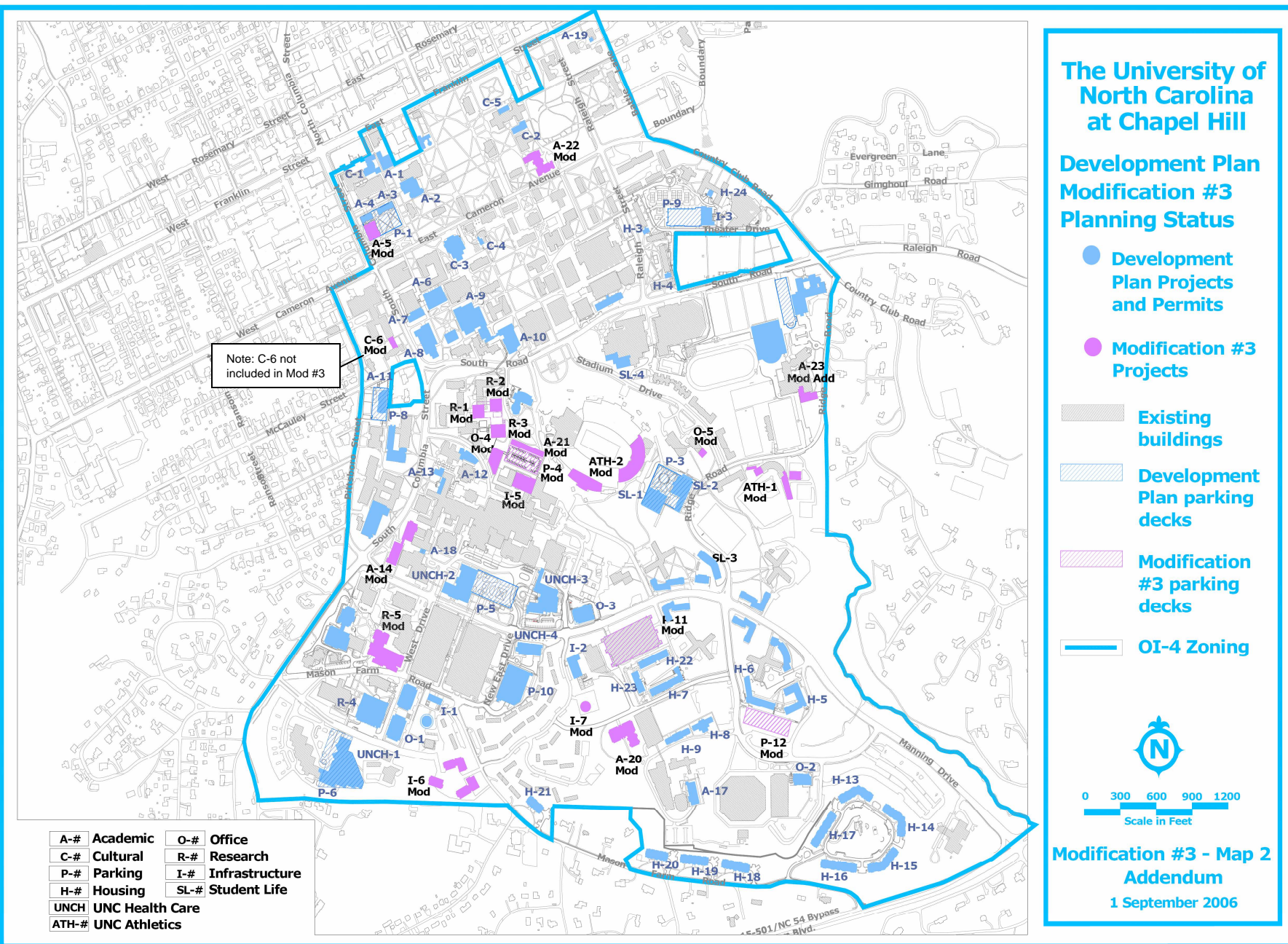


Figure 1.1a – Development Plan Modification #3 Projects

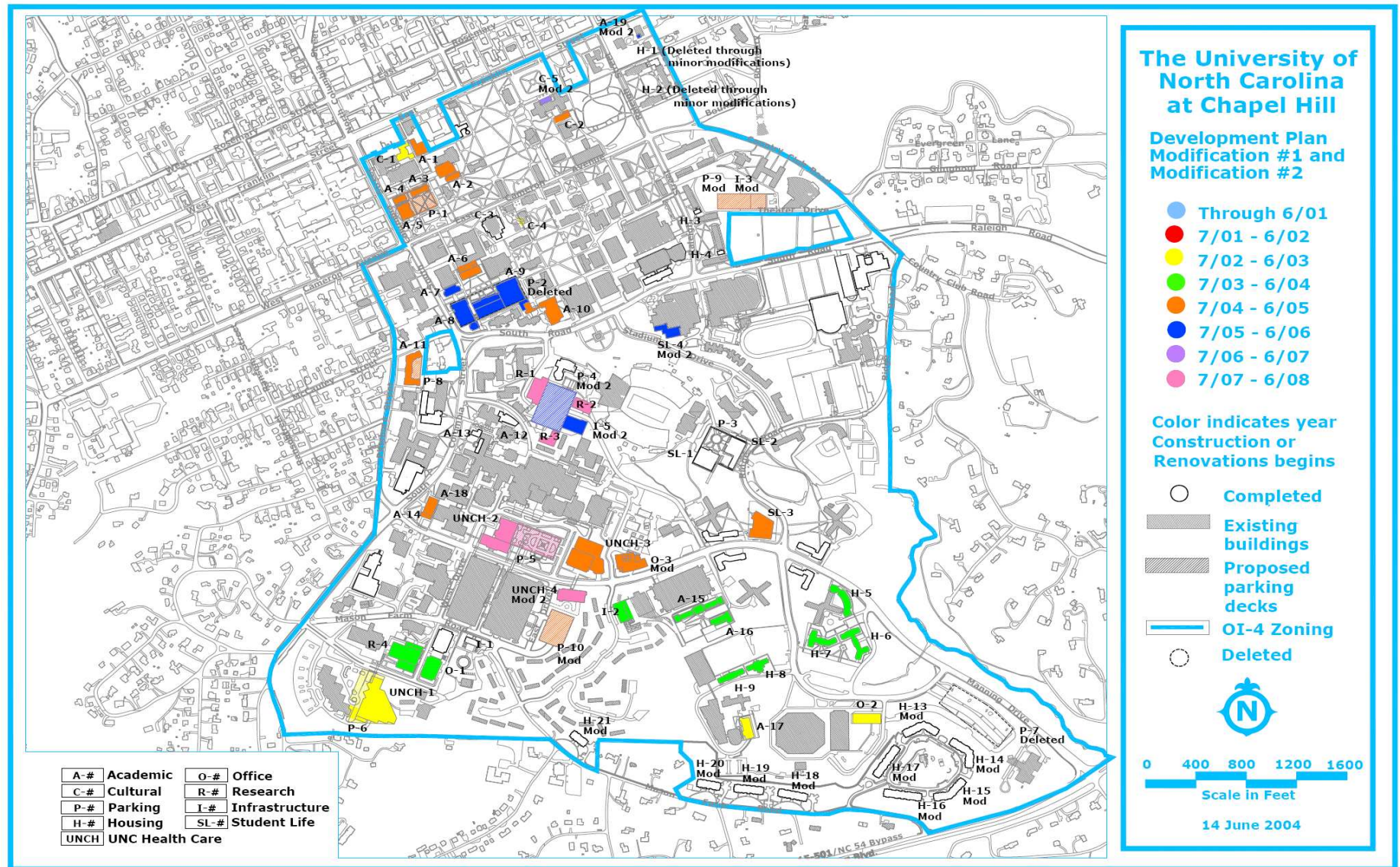


Figure 1.1b – Development Plan Projects

**Table 1.2: Parking Space Impacts**

Lot Name	Number of Spaces <sup>1,2</sup>							
	Parking Zone	Employee	Commuting Student	Resident Student	Student in Family Housing	Patient / Visitor	Other	Net Change
ACC (new structure)						198		198
Bell Tower (new structure) *	BG	251						251
Bowles	S11	-471	-157					-628
Cameron/Swain (Arts Common Deck - new structure)	ND1/NG1	-154				250		96
Cobb/Joyner (new structure and surface parking)		138	-33			9	5	119
Craige Surface	CD	-255		-37				-292
Dental School	S6	-51						-51
Glaxo / Housing Support / MFM / MRI	S6	-76						-76
Gravelly (NC H&C) (new structure)	CG	-135				730		595
Hanes						-48	16	-32
Hinton James	M			-250				-250
ITS		-29				-2	18	-13
Jackson Circle (new structure)		606	100	-54				652
Kenan/McColl Visitor Parking						-40		-40
McCauley Street (Global Education Deck - new structure)	W	-34						-34
Neurosciences	CG	-100						-100
North Medical Drive							-26	-26
Porthole	N2	-40						-40
Rams Head (new structure)	S5					303		303
Stadium Drive	S4							0
Sitterson	NG2	-135						-135
South Chiller	S6	-129						-129
Student Family Housing	MR/MR2				31			31
Wilson Library	N8	-41						-41
<b>New Projects in Modification #3:</b>								
Craige Deck Expansion *	CD	990						990
Tennis Court Deck *		231						231
<b>Subtotal</b>		<b>566</b>	<b>-90</b>	<b>-341</b>	<b>31</b>	<b>1,400</b>	<b>13</b>	<b>1,579</b>
Unassigned spaces <sup>3</sup>	*	0						0
<b>Total</b>								<b>1,579</b>

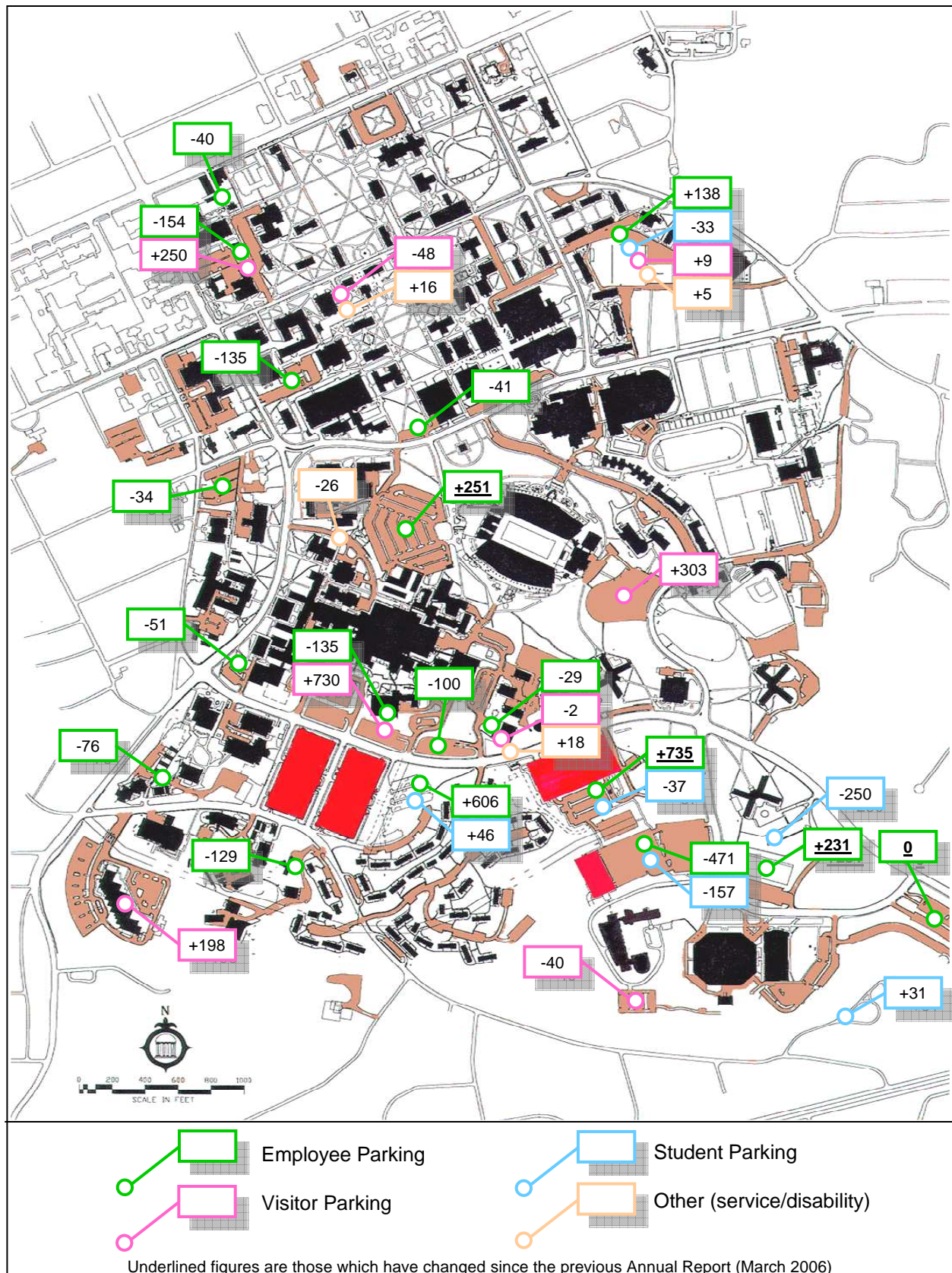
\* Items that have changed since the previous Annual Report (March 2006). Bell Tower was previously 1,141 and Unassigned Spaces were previously 331.

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 previously approved but not assigned to a specific location on the campus.

Source: Table 2-1 of Development Plan Modification #3 Revised TIA, October 2006

**Figure 1-2: Parking Impacts of Development Plan**



## **2: Development Plan Transportation Changes**

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### **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 2005/2006);
- No-Build conditions (the forecast conditions in 2010 if the Development Plan projects did not exist); and
- Build conditions (the forecast conditions in 2010 including the effects of the Development Plan projects).

The existing conditions were measured using traffic counts collected in Spring and Fall 2005 (with some locations recounted in Fall 2006) on days when the University was in session. Because similar analyses were undertaken in 2001 and 2003, 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 and 2005/2006, along with the No-Build and Build forecasts for 2010. Figure 2.1 illustrates the two forecasts for 2010.

Traffic volumes have generally remained stable or in some cases decreased since the 2003 counts, which in turn were lower than in 2001. One possible reason is the ongoing development and implementation of the University's Transportation Demand Management (TDM) program, including fare-free operation of Chapel Hill Transit.

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

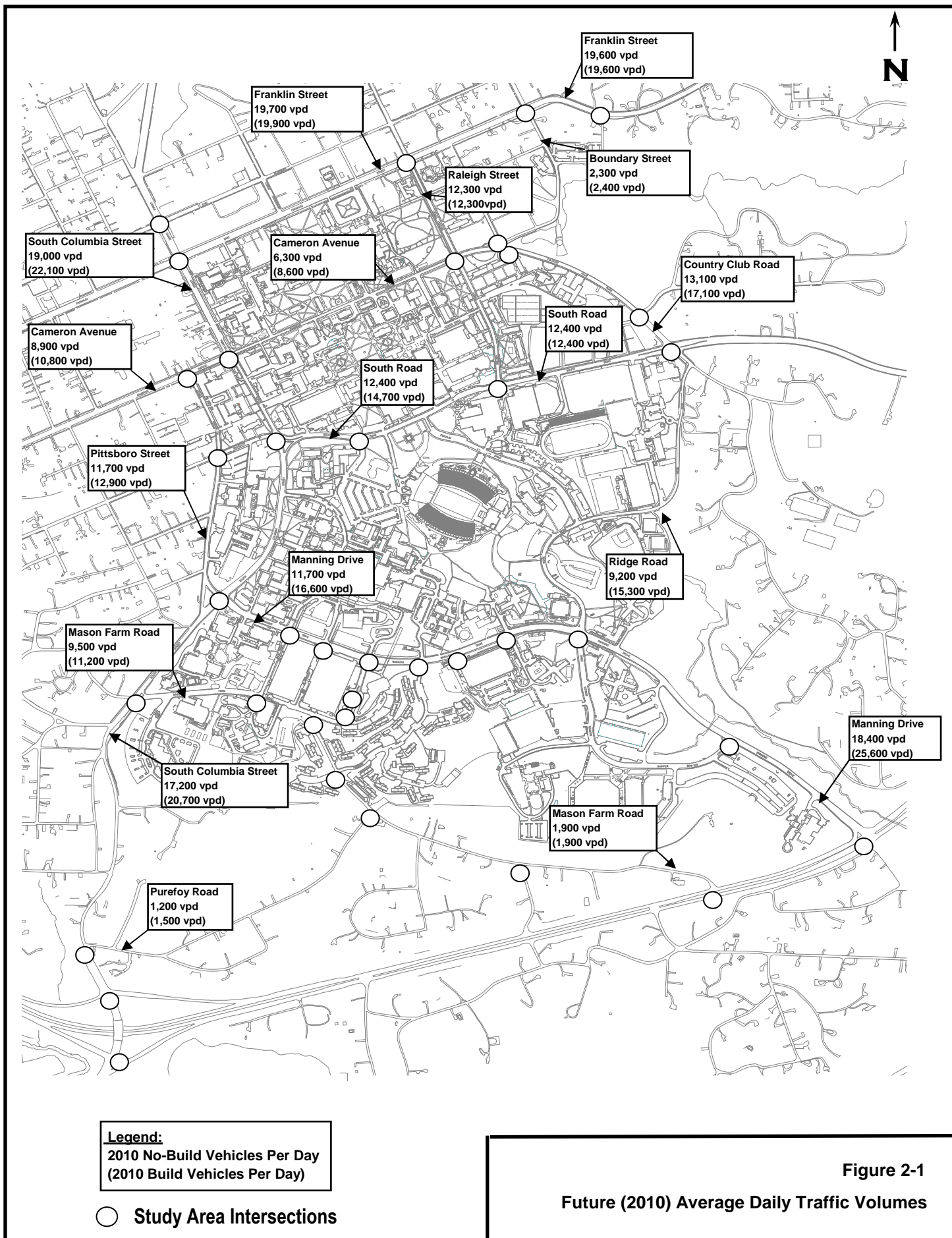
In the Build scenario, the further increase in traffic along most campus roads is expected to be minimal, although some intersections near proposed parking facilities will see particular turning movements increase noticeably. In some areas where parking is being eliminated, some turning movements will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

**Table 2.1: Existing and Future (2010) Traffic Volumes**

Link #	Roadway	2001 ADT	2005 ADT	2006 ADT	2001-2010 Annual Growth Rate	Projected 2010 No-Build ADT	Estimated 2010 Build ADT
1	S. Columbia St. (south of Franklin St.)	20,720	17,530	-	1.7%	19,000	22,100
2	Raleigh St. (south of Franklin St.)	14,470	13,080	12,030	0.6%	12,300	12,300
3	Cameron Ave. (west of Pittsboro St.)	9,820	8,510	-	0.9%	8,900	10,800
4	Cameron Ave. (east of S. Columbia St.)	9,070	6,430	6,010	1.2%	6,300	8,600
5	Country Club Rd. (north of South Rd.)	13,470	12,200	12,780	0.7%	13,100	17,100
6	South Rd. (east of Columbia St.)	10,460	11,400	-	1.7%	12,400	14,700
7	South Rd. (east of Raleigh St.)	9,840	12,890	11,500	2.0%	12,400	12,400
8	Pittsboro St. (south of McCauley St.)	10,960	10,920	-	1.4%	11,700	12,900
9	Manning Dr. (east of Columbia St.)	14,100	12,480	11,080	1.4%	11,700	16,600
10	Ridge Rd. (at Manning Dr.)	8,320	7,300	8,510	2.0%	9,200	15,300
11	S. Columbia St. (south of Mason Farm Rd.)	18,470	16,190	-	1.3%	17,200	20,700
12	Manning Dr. (east of Ridge Rd.)	17,260	17,880	17,760	0.9%	18,400	25,600
13	Franklin (west of Raleigh St.)	17,000	18,850	-	0.9%	19,700	19,900
14	Franklin (east of Boundary St.)	-	20,190	18,940	0.9%	19,600	19,600
15	Boundary (south of Franklin St.)	-	2,320	2,260	0.6%	2,300	2,400
16	Mason Farm Rd.(east of Columbia St.)*	7,700	3,400	8,770	2.0%	9,500	11,200
17	Mason Farm Rd. (north of Fordham Blvd.)*	1,360	1,830	-	0.4%	1,900	1,900
18	Purefoy Rd. (east of Columbia St.)*	970	1,130	-	0.4%	1,200	1,500

\* Year 2010 ADT estimated using calculated 2005 peak to daily ratio (K-factor).

Source: Table 4-9 of Development Plan Modification #3 Revised TIA, October 2006



**Figure 2-1**  
**Future (2010) 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 2003. At most intersections, the overall level of service is acceptable, although some minor street approaches are suffering some longer delays. The worst delays at an intersection immediately adjacent to the campus are at the Manning Drive / Fordham Boulevard intersection in the afternoon peak hour.

Although the LOS at some intersections on US 15-501 has improved since 2003, the US 15-501 / Europa Drive / Erwin Road intersection continues to be unacceptable during both peaks. Although minor improvements could be made at some locations, a recent Major Investment Study (MIS) concluded that the size of the problem along 15-501 requires a large-scale integrated multimodal solution.

A couple of unsignalized intersections are experiencing long delays on the minor approaches. However, the traffic volumes do not warrant signals.

### No-Build conditions

In the No-Build scenario (that is, without the Development Plan projects), the intersections with poor LOS performance in 2005 will continue to perform poorly in 2010. 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 E.
- US 15-501 / Ephesus Church Road / Eastgate Road: 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), three 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 F.
- US 15-501 / Ephesus Church Road / Eastgate Road: will continue to operate at LOS F in the P.M. peak hour.

**Table 2.3: Existing and Forecast Intersection Levels of Service**

ID #	Intersection	Control	Existing (2005)		No-Build (2010)		Build (2010)	
			AM	PM	AM	PM	AM	PM
1	Columbia Street/Rosemary Street	Signalized	C (WB-D)	C (WB-D)	C (WB-D)	C (WB-D)	C (WB-D)	C (WB-D)
2	Columbia Street/Franklin Street	Signalized	C (EB-D)	C (EB-D)	C (EB-D)	C (EB-D)	C (EB-D)	C (EB-D)
3	Franklin Street/Raleigh Street	Signalized	B (NB-C)	B (NB-C)	B (SB-C)	C (NB-C)	C (NB-F)	C (NB-D)
4	Merritt Mill Road/Cameron Avenue	Signalized	B (WB-C)	B (WB-C)	B (WB-D)	C (WB-C)	C (WB-E)	C (WB-D)
5	Cameron Avenue/Pittsboro Street	Signalized	B (EB-D)	B (EB-D)	B (EB-D)	B (EB-D)	B (EB-C)	A (EB-C)
6	Cameron Avenue/Columbia Street	Signalized	C (WB-D)	D (WB-E)	C (WB-D)	E (WB-F)	C (WB-E)	F (WB-F)
7	Cameron Avenue/Raleigh Street	Signalized	C (WB-E)	C (EB-E)	C (WB-D)	C (EB-E)	C (WB-D)	C (EB-D)
8	Pittsboro Street/McCauley Street	Signalized	B (WB-D)	B (EB-B)	B (WB-D)	B (EB-B)	B (WB-C)	C (EB-C)
9	Columbia Street/South Road	Signalized	C (WB-D)	C (EB-E)	C (EB-D)	C (EB-E)	C (EB-D)	D (EB-F)
10	Raleigh Street/South Road	Signalized	C (SB-F)	B (SB-C)	A (SB-C)	B (SB-D)	B (SB-D)	D (SB-F)
11	Country Club Road/South Road	Signalized	C (SB-D)	C (WB-D)	B (SB-D)	C (WB-D)	C (SB-D)	C (SB-D)
12	Columbia Street/Manning Drive	Signalized	D (EB-F)	B (EB-C)	C (EB-C)	C (EB-E)	C (EB-C)	C (EB-D)
13	Manning Drive/West Drive	Signalized	A (SB-D)	A (SB-D)	A (SB-D)	A (SB-D)	A (SB-D)	A (SB-D)
14	Manning Drive/East Drive	Signalized	A (NB-C)	B (NB-C)	B (NB-C)	B (NB-C)	B (NB-C)	C (NB-C)
15	Ridge Road/Manning Drive	Signalized	D (SB-F)	C (NB-D)	C (NB-D)	C (NB-D)	C (NB-D)	C (NB-D)
16	Mason Farm Road/Columbia Street	Signalized	B (WB-D)	D (WB-D)	B (WB-D)	D (NB-E)	C (WB-D)	F (NB-F)
17	Mason Farm Road/West Drive	Unsignalized	A (SB-C)	A (NB-C)	A (SB-C)	A (NB-C)	A (SB-C)	A (NB-C)
18	Mason Farm Road/East Drive	Unsignalized	B (EB-B)	B (EB-B)	B (EB-B)	B (EB-C)	B (EB-B)	B (EB-C)
19	Mason Farm Road/Purefoy Road	Unsignalized	A (NB-A)	A (SB-A)	A (NB-A)	A (SB-A)	A (NB-A)	A (SB-A)
20	Manning Drive/Skipper Bowles Drive	Unsignalized	A (EB-B)	B (EB-F)	A (EB-C)	C (EB-F)	A (EB-C)	E (EB-F)
21	Columbia Street/Purefoy Road	Unsignalized	F (WB-F)	A (WB-F)	F (WB-F)	A (WB-F)	F (WB-F)	F (WB-F)
22	Columbia Street/Fordham Boulevard (northern ramp)	Signalized	B (WB-D)	C (WB-D)	B (WB-D)	D (WB-D)	B (WB-D)	D (WB-E)
23	Columbia Street/Fordham Boulevard (southern ramp)	Signalized	C (EB-D)	B (EB-D)	C (EB-D)	B (EB-D)	C (EB-D)	B (EB-D)
24	Mason Farm Road/Fordham Boulevard	Unsignalized	A (SB-B)	A (SB-E)	A (SB-B)	A (SB-F)	A (SB-B)	A (SB-F)
25	Manning Drive/Fordham Boulevard	Signalized	C (NB-F)	F (WB-F)	D (SB-F)	F (WB-F)	D (SB-F)	F (WB-F)
26	Mason Farm Road/Oteys Road	Unsignalized	A (WB-A)	A (NB-A)	A (WB-A)	A (NB-A)	A (WB-A)	A (NB-A)
27	Franklin Street/Boundary Street	Signalized	A (SB-C)	A (SB-C)	A (SB-E)	C (SB-F)	A (SB-E)	C (SB-F)
28	Franklin Street/Park Place	Unsignalized	A (NB-B)	A (NB-B)	A (NB-B)	A (NB-B)	A (NB-B)	A (NB-C)
29	Battle Lane/Boundary Street	Unsignalized	A (WB-A)	B (NB-B)	A (WB-B)	B (NB-B)	A (WB-B)	B (NB-B)
30	Country Club Road/Battle Lane	Unsignalized	A (SB-C)	F (SB-F)	A (SB-D)	F (SB-F)	A (SB-D)	F (SB-F)
31	Country Club Road/Gimghoul Road	Signalized	A (WB-D)	A (WB-C)	A (WB-D)	A (WB-D)	A (WB-D)	A (WB-D)
32	Manning Drive/Hibbard Drive	Signalized	A (SB-D)	A (SB-D)	A (SB-D)	A (SB-D)	A (SB-D)	A (SB-D)
33	Manning Drive/Craige Drive	Signalized	A (SB-D)	B (SB-E)	A (SB-D)	B (SB-E)	A (SB-D)	C (SB-F)
34	East Drive/Jackson Circle/Dogwood Deck Entrance	Unsignalized	A (WB-C)	A (WB-E)	A (WB-C)	A (WB-E)	A (WB-C)	A (WB-E)
35	East Drive/Dogwood Deck Exit	Unsignalized	A (EB-B)	A (EB-C)	A (EB-B)	A (EB-C)	A (EB-B)	B (EB-C)
36	Mason Farm Road/Hibbard Drive	Unsignalized	A (EB-B)	A (EB-B)	A (EB-B)	A (EB-B)	A (EB-B)	A (EB-B)
37	South Road/Bell Tower Drive	Signalized	A (NB-D)	B (NB-D)	A (NB-D)	B (NB-D)	A (NB-D)	B (NB-D)
38	Manning Drive/Old East Drive	Signalized	C (WB-D)	C (WB-D)	C (WB-C)	C (WB-C)	B (WB-B)	B (WB-C)
39	Manning Drive/Craige Deck	Signalized/Unsignalized	B (NB-C)	C (EB-C)	A (NB-D)	A (NB-F)	A (NB-D)	F (NB-F)
101	US 15-501/Estes Drive	Signalized	C (WB-E)	C (WB-D)	C (WB-E)	D (EB-E)	C (WB-F)	D (EB-E)
102	US 15-501/Willow Drive	Signalized	A (WB-E)	C (EB-F)	B (WB-E)	B (EB-F)	B (WB-E)	B (EB-E)
103	US 15-501/Elliott Road	Signalized	A (EB-E)	C (EB-E)	A (EB-E)	B (EB-E)	A (EB-E)	B (EB-E)
104	US 15-501/Ephesus Church Road	Signalized	E (EB-F)	E (EB-F)	E (EB-F)	F (WB-F)	E (EB-F)	F (WB-F)
105	US 15-501/Europa Drive/Erwin Road	Signalized	E (SB-F)	F (WB-F)	F (SB-F)	F (EB-F)	F (NB-F)	F (EB-F)
106	US 15-501/Sage Road	Signalized	D (NB-F)	D (NB-F)	D (NB-F)	D (NB-F)	E (NB-F)	D (NB-F)
107	US 15-501/Eastowne Drive/BCBS	Signalized	B (NB-E)	B (SB-F)	B (NB-E)	C (SB-F)	B (NB-E)	C (SB-F)
108	US 15-501/Eastowne Drive/Lakeview Drive	Signalized	D (NB-F)	E (NB-F)	D (NB-F)	F (NB-F)	D (NB-F)	F (NB-F)
201	NC 54/Hamilton Road	Signalized	A (SB-D)	A (SB-E)	A (SB-D)	B (SB-E)	B (SB-D)	B (SB-E)
202	NC 54/Burning Tree Lane	Signalized	B (SB-E)	B (SB-E)	B (SB-E)	B (SB-E)	B (SB-E)	B (SB-E)
203	NC 54/Barbee Chapel Road Ext	Signalized	B (SB-E)	B (SB-E)	B (SB-E)	B (SB-E)	B (SB-E)	B (SB-E)
204	NC 54/Meadowmont Lane	Signalized	C (NB-D)	C (NB-D)	C (NB-D)	C (NB-D)	D (NB-D)	C (NB-D)
205	NC 54/Barbee Chapel Road	Signalized	D (NB-F)	C (NB-E)	E (NB-F)	C (NB-F)	E (NB-F)	C (NB-F)
301	US 15-501/Culbreth Road/Mt Carmel Church Road	Signalized	B (WB-D)	B (WB-D)	B (WB-D)	B (WB-D)	B (WB-D)	B (WB-D)
302	US 15-501/Bennett Road/Arlen Park Drive	Signalized	A (EB-E)	A (EB-E)	B (EB-E)	A (EB-E)	A (EB-E)	A (EB-E)
303	US 15-501/Main Street	Signalized	A (EB-E)	A (EB-D)	A (EB-E)	A (EB-D)	A (EB-E)	A (EB-D)

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

Source: Table 4-11 of Development Plan Modification #3 Revised TIA, October 2006

### **3: Development Plan Transportation Mitigation Measures and Recommendations**

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#### **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 now almost 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, could be useful.
- Cameron Avenue / Raleigh Street: Signal phasing changes are planned to improve traffic flow.
- Country Club Road / Battle Lane / Boundary Street: Bollards and chains have been strategically provided to control pedestrians in and around this intersection. If it is decided 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. This was accomplished with temporary equipment because of delivery delays; the permanent equipment will be installed when received.
- 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. Due to the recent changes in the parking allocation of the Development Plan, the University will 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.
- South Columbia Street, between Manning Drive and South Road: safety for cyclists and pedestrians would be improved by narrowing the pavement and widening and enhancing the sidewalks. This scheme is already in the planning stage.
- Manning Drive / Fordham Boulevard: Lighting and upgraded signals with pedestrian facilities have been stipulated for this intersection. Improvements to be completed within 12 months of approval of Modification #3 of the Development Plan.
- Manning Drive / Old Mason Farm Road: Lighting and upgraded signals with pedestrian facilities have been stipulated for this intersection. Improvements to

be completed within 12 months of approval of Modification #3 of the Development Plan.

- Mason Farm Road / East Drive: Signalization has been stipulated at this intersection. Improvements to be completed within 12 months of approval of Modification #3 of the Development Plan.
- Mason Farm Road / West Drive: Signalization has been stipulated at this intersection. Improvements to be completed within 12 months of approval of Modification #3 of the Development Plan.
- Ridge Road: Resurfacing has been stipulated along the length of the road. Other safety improvements have already been made near the Rams Head Center.

Some intersection improvements previously suggested by the University have not yet been approved for implementation. These are listed below.

- 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 improve the appearance of Manning Drive should be studied, to enhance pedestrian safety and aesthetics.
- Ridge Road: In addition to the improvements already implemented or stipulated, remodeling would improve sight distances at the driveway beside the practice field.

### **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 and in 2004, plus the current targets for 2010. 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 commuter survey provided a snapshot of progress part-way into the Development Plan, and the 2010 targets have been updated in the light of this experience. A new commuter survey will be carried out in Spring 2007.

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**

Mode	Employees			Commuting Students		
	2001 Existing Ratio	2004 Existing Ratio	2010 Projected Ratio	2001 Existing Ratio	2004 Existing Ratio	2010 Projected Ratio
Drive alone	0.72	0.61	0.54	0.33	0.19	0.23
Carpool/vanpool	0.06	0.05	0.08	0.08	0.07	0.08
Bus	0.06	0.08	0.12	0.21	0.34	0.33
Bicycle	0.03	0.02	0.03	0.09	0.05	0.08
Walk	0.02	0.02	0.02	0.12	0.14	0.12
Park-and-ride	0.07	0.15	0.17	0.12	0.16	0.11
Other	0.04	0.06	0.04	0.06	0.06	0.06

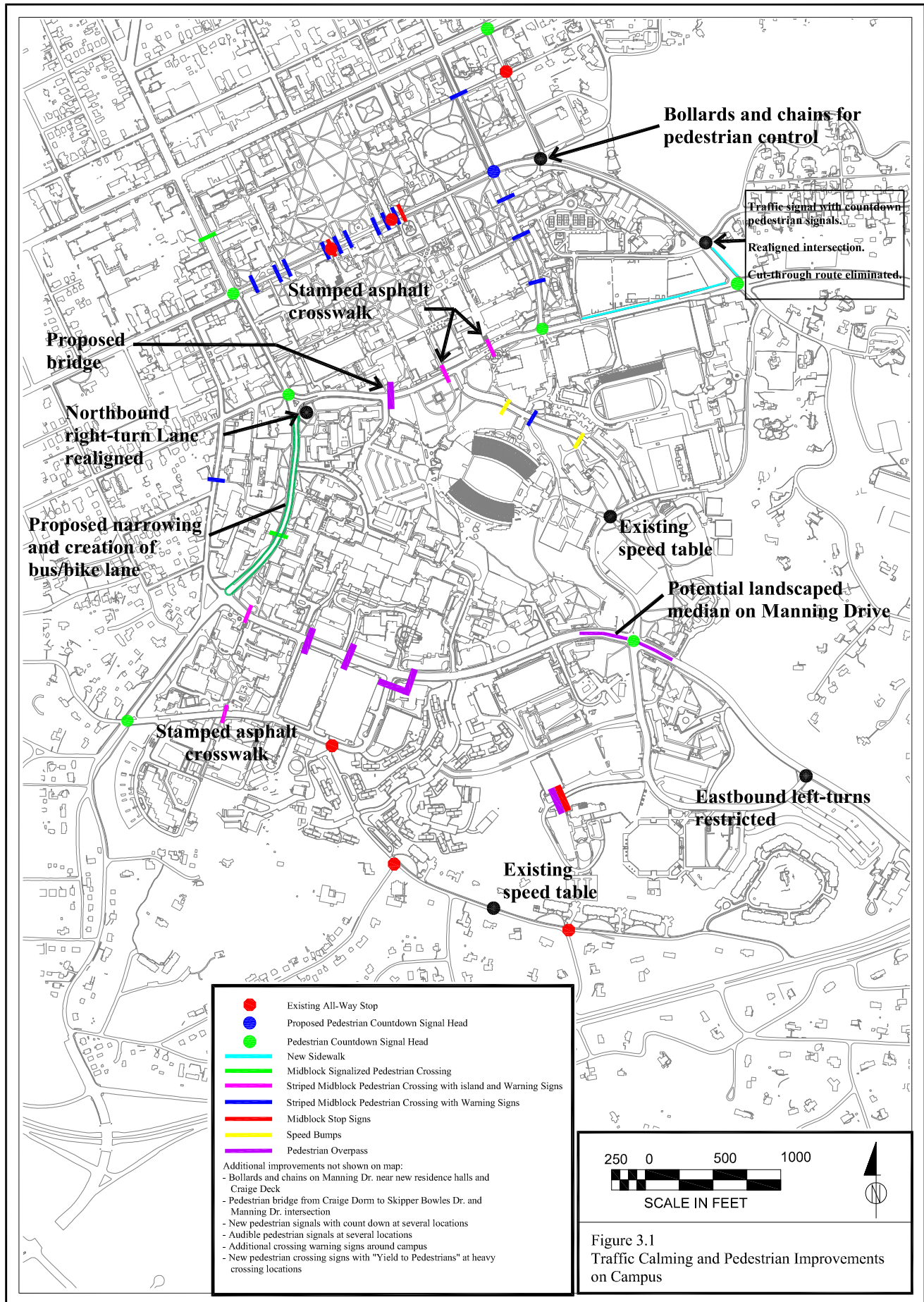
### Estimated Air Quality Impacts

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): 25 kg/day (6,220 kg/year)
- Volatile Organic Compounds (VOC): 13 kg/day (3,340 kg/year)
- Carbon Monoxide (CO): 252 kg/day (63,022 kg/year)

### Existing and Proposed Traffic Calming Measures On Campus

Figure 3.1 shows the recent and proposed traffic calming measures on campus, including 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. Further measures are proposed, including the narrowing of South Columbia Street (which will have major benefits for pedestrians and cyclists), pedestrian bridges at South Road and the Craige residence hall, and a range of other improvements across the campus.



## **Existing and Proposed Traffic Calming Measures in Adjacent Neighborhoods**

The Transportation Impact Analysis (TIA) guidelines agreed 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. Some of the streets already have traffic calming measures in place or planned. Other streets were recommended for further consideration.

The all-way stop controls identified in the Table have now been implemented. Some of the speed table locations have been revised in the light of discussions with residents. The University will continue the coordination efforts until the traffic calming is completed.

The University will design and implement the final plans at no cost to the Town. The Town will maintain the traffic calming devices on Town streets after implementation is complete.

**Table 3.2: Neighborhood Streets Considered for Traffic Calming Measures**

Street	Recommended for Further Consideration? Justification	Traffic Calming Measures	
		Existing or Planned	To Be Considered
Westwood Drive, Ransom Street, McCauley Street, and Vance Street	<b>Yes.</b> The Town of Chapel Hill reports citizen complaints of increased truck and University-related traffic. Peak hour traffic volumes at the intersection of S. Columbia Street at Mason Farm Road/Westwood Drive have continued to increase.	Improved sidewalks already being constructed.	All-way stops Improved pavement markings Speed tables
Oteys Road	<b>Yes.</b> The Town of Chapel Hill reports citizen complaints about increased traffic volumes. A.M. peak hour traffic has increased slightly since the 2004 TIA Update.	None	Speed table
Purefoy Road	<b>Yes.</b> The Town of Chapel Hill reports citizen complaints about increased traffic volumes. P.M. Peak hour traffic has increased slightly since the 2004 TIA Update.	None	Speed table
Mason Farm Road	<b>No.</b> Traffic calming measures have already been implemented or already planned.	All-way stops Speed table/hump	None
Ridge Road	<b>No.</b> Traffic calming measures have already been implemented.	Speed table	None
Laurel Hill Road	<b>No.</b> Alignment and cross-section of road is already a calming measure prohibiting high travel speeds and creating longer travel times than competing routes.	None	None
Gimghoul Road	<b>No.</b> Church property was sold and the church is being demolished. It is anticipated the property will be developed with a single family residence. As a result, the existing cut-through route connecting to South Road (NC 54) will be eliminated. Some measures are already planned for implementation in 2006.	New traffic signal Decreased corner radii at intersection with Country Club Road Stamped asphalt crosswalks Audible, countdown pedestrian signals	None
Raleigh Street	<b>No.</b> Traffic calming measures have already been implemented.	Marked crosswalks (with and without median signs) Speed table	None
Cameron Avenue	<b>No.</b> Traffic calming measures have already been implemented.	Marked crosswalks All-way stops	None
Battle Lane	<b>No.</b> Traffic calming measures have already been implemented.	On-street parking All-way stop	None
Boundary Street	<b>Yes.</b> Peak hour traffic has not increased since the 2004 Update, however, Boundary Street is most likely utilized by University-related traffic.	None	Speed table
Park Place	<b>No.</b> Peak hour traffic has not increased since the 2004 Update and traffic calming devices are not feasible on this street.	None	None