Kimley-Horn
and Associates, Inc.

P.O. Box 33068
Raleigh, North Carolina
27636-3068

September 18, 2002

Mr. Dale McKeel
Transportation Planner
Town of Carrboro Planning Department
301 West Main Street
Carrboro, NC 27510

Re: Bolin Creek Co-Housing Development Traffic Impact Study

Dear Mr. McKeel:

Kimley-Horn and Associates has reviewed the information provided by the Town and provides the following response to the points under "Item 1. Traffic Impact Analysis" from the memorandum dated July 18, 2002.

First point

We have reviewed the Town's updated traffic volume counts conducted in August and September 2002 and compared them with the original counts conducted in December 2001. It was noted that the highest overall AM and PM peak-hour volumes between the four days in 2002 occurred on September 12th. The following table compares the Town's highest 2002 peak-hour counts to the original 2001 peak-hour counts.

Peak-Hour Traffic Volume Comparison (Vehicles by Direction)

	Hanna Street				Greensboro Street			
	NB		SB		NB/WB		SB/EB	
	AM	PM	AM	PM	AM	PM	AM	PM
Original 2001 TIA Peak-Hour Volume	4	14	8	9	187	535	480	236
Updated 2002 Peak-Hour Volume (Highest of four days)	2	12	6	9	170	523	432	301

Based on the updated information, the counts conducted in 2001 are higher overall than those conducted in 2002. It is also important to note that the original 2001 mainline volumes have not been adjusted (increased) for growth in the

TEL 919 677 2000
FAX 919 677 2050

comparison, but have been compared directly with the counts conducted more than eight months later. Based on the updated information, we believe that the traffic counts conducted in December 2001 are a reasonable and accurate representation of typical peak-hour volumes conducted during the normal school year.

Second point

The trip generation was revised to reflect the rates established in the updated count at the entrance to Arcadia. Based on the new information, the trip generation adjustments to the original TIA would appear as follows.

ITE Traffic Generation Comparison (Vehicles)

Land Use	24 Hour		AM Peak Hour		PM Peak Hour	
	In	Out	In	Out	In	Out
47 Co-Housing Units (original TIA rates from December 2001 count of Arcadia)	145	145	10	18	15	15
47 Co-Housing Units (updated rates from March 2002 count of Arcadia + two homes)	247	238	12	28	32	18

We have updated the analysis of the unsignalized intersection of Greensboro Street at Hanna Street accounting for the increased trip rate of the development. Based on the new analyses (see attached), the minor street delays reported in Section 8.0 of the TIA have not changed.

Third point

Average daily traffic (ADT) volumes reported in Section 3.2 of the TIA were estimated assuming the AM and PM peak-hour combined volumes account for 20-percent of the daily traffic.

Fourth point

The 1990 version of the AASHTO Green Book methods were used in calculating sight distances. The 1984 version noted was an error in the text, although the use of the 1984 version would not change our findings. The 2001 version was not available to us at the time of the submittal, but a review of the updated 2001 AASHTO design guidelines showed that the intersection location was adequate for a 40 mph design speed on Greensboro Street with respect to sight distance.

Fifth point

We understand that the land planner is more appropriate to address issues pertaining to pedestrians, bicycles, and the community as a whole.

Sixth point

Acceleration lanes are not currently proposed or requested by NCDOT. It is believed that acceleration lanes, once thought to be helpful to drivers by allowing them time to "get up to speed", are largely underutilized and actually create safety concerns with merging traffic when they are used. Deceleration lanes are typically recommended if projected volumes warrant them. Based on current NCDOT guidelines, right-turn lanes are not warranted below 40 peak-hour vehicles on the mainline. We are below the threshold in our updated analysis. The Hanna Street approach does not experience long delays in the build-out scenario, and therefore stopped vehicles will be served adequately with the existing single-lane approach on the minor street.

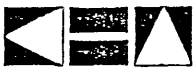
Seventh point

We do not believe that the volume of traffic projected for Hanna Street will be of the level requiring further traffic calming measures. Typically, traffic calming is implemented to affect drivers using neighborhood streets as alternate routes. Hanna Street will only serve local residential traffic and does not provide opportunities for cut-through traffic. The proposed development will be entirely residential.

Due to the size and residential character of the development along Hanna Street itself, sidewalks are not recommended. It is expected that sidewalks would do as much to destroy the character of the small residential street as they would to provide any incremental safety improvements. The proposed site is not expected to generate sufficient pedestrian traffic or automobile traffic that would warrant sidewalks along Hanna Street.

Eighth point

The proposed development traffic was generated based on a similar count and updated with new information from the Town. The TIA does not propose any additional roadway or safety improvements since the existing geometry is sufficient to serve the site build-out. It is expected that the land planner will address the traffic connections within the co-housing development itself and all pedestrian/bicycle issues. The co-housing development will at the very least share the access to Hanna Street, a residential street providing convenient access to transit, pedestrian, and bicycle facilities along Greensboro Street.



Kimley-Horn
and Associates, Inc.

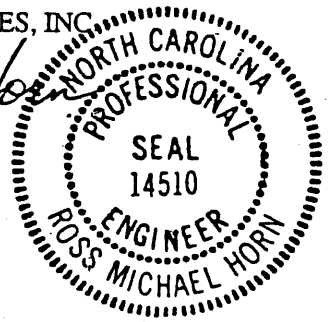
Note: It is our understanding that the current development plan has changed to provide for a maximum build-out of 46 units (one less unit than in the original plan). This reduction in planned density results in approximately a two-percent reduction in development trips.

If you have any further questions or comments please do not hesitate to call me at 677-2062.

Very truly yours,

KIMLEY-HORN AND ASSOCIATES, INC.

R. Michael Horn



R. Michael Horn. P.E.
Principal

RMH:rhd

H-5

NEW RATE FOR TRIPS
B-13-02

HCS2000: Unsignalized Intersections Release 4.1b

TWO-WAY STOP CONTROL SUMMARY

Analyst: RHD
Agency/Co.: KHA
Date Performed: 12/11/01
Analysis Time Period: 7:45 am
Intersection: Greensboro St at Hanna St
Jurisdiction: Carrboro
Units: U. S. Customary
Analysis Year: 2003
Project ID: 012233000
East/West Street: Greensboro Street
North/South Street: Hanna Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	3	501			195	13
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	3	556			216	14
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				29		7
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				32		7
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	3						39	
C(m) (vph)	1338						400	
v/c	0.00						0.10	
95% queue length	0.01						0.32	
Control Delay	7.7						15.0-	
LOS	A						B	
Approach Delay							15.0-	
Approach LOS							B	

HCS2000: Unsignalized Intersections Release 4.1b

Kimley-Horn and Associates, Inc.

P.O. Box 33068

NEW RATE FOR TRIPS 8-13-02

HCS2000: Unsignalized Intersections Release 4.1b

TWO-WAY STOP CONTROL SUMMARY

Analyst: RHD
Agency/Co.: KHA
Date Performed: 12/11/01
Analysis Time Period: 4:45 pm
Intersection: Greensboro St at Hanna St
Jurisdiction: Carrboro
Units: U. S. Customary
Analysis Year: 2003
Project ID: 012233000
East/West Street: Greensboro Street
North/South Street: Hanna Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	11	294			558	35
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	12	326			620	38
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				23		4
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				25		4
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	12						29	
C(m) (vph)	930						287	
v/c	0.01						0.10	
95% queue length	0.04						0.33	
Control Delay	8.9						18.9	
LOS	A						C	
Approach Delay							18.9	
Approach LOS							C	

Kimley-Horn and Associates, Inc.

P.O. Box 33068

H-7

Traffic Impact Analysis

Bolin Creek Co-Housing Development Carrboro, NC

Prepared for:
Mr. Paul Piersma

Kimley-Horn
and Associates, Inc.

Traffic Impact Analysis

for

Bolin Creek Co-Housing Development

Carrboro, North Carolina

Prepared for:

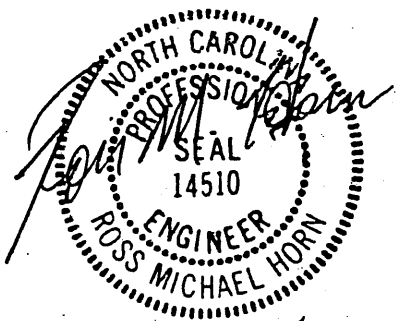
Mr. Paul Piersma
Durham, North Carolina

Prepared by:

Kimley-Horn and Associates, Inc.
P.O. Box 33068
Raleigh, North Carolina 27636-3068
919-677-2000

012233000

December 2001



12-18-01

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1.0 Executive Summary

The proposed *Bolin Creek Co-Housing Development* is located on approximately 8 acres at the end of Hanna Street (north of Greensboro Street) in Carrboro, North Carolina. As currently envisioned, the proposed site will consist of 47 residential co-housing units. The development is anticipated to be complete (built-out) in the year 2003.

This Traffic Impact Analysis (TIA) has been performed to determine the future impact of the development on the adjacent roadway network. The posted speed limit on Greensboro Street is 35 mph with a posted 30 mph warning sign in advance of Hanna Street. The sight distance for vehicles turning at the Hanna Street/Greensboro Street intersection was field measured and determined to be adequate up to 45 mph. In addition, capacity analyses resulted in acceptable levels of service during both the AM and PM peak hours for 2001 existing and 2003 build-out conditions at the intersection. Short AM peak-hour minor-street delays and moderate PM peak-hour minor-street delays are experienced today and are expected to continue through 2003. Due to the adequacy of the existing roadway network, no additional improvements are necessary to provide safe and efficient operation at the intersection of Greensboro Street and Hanna Street upon build-out of the *Bolin Creek Co-Housing Development.*

2.0 Introduction

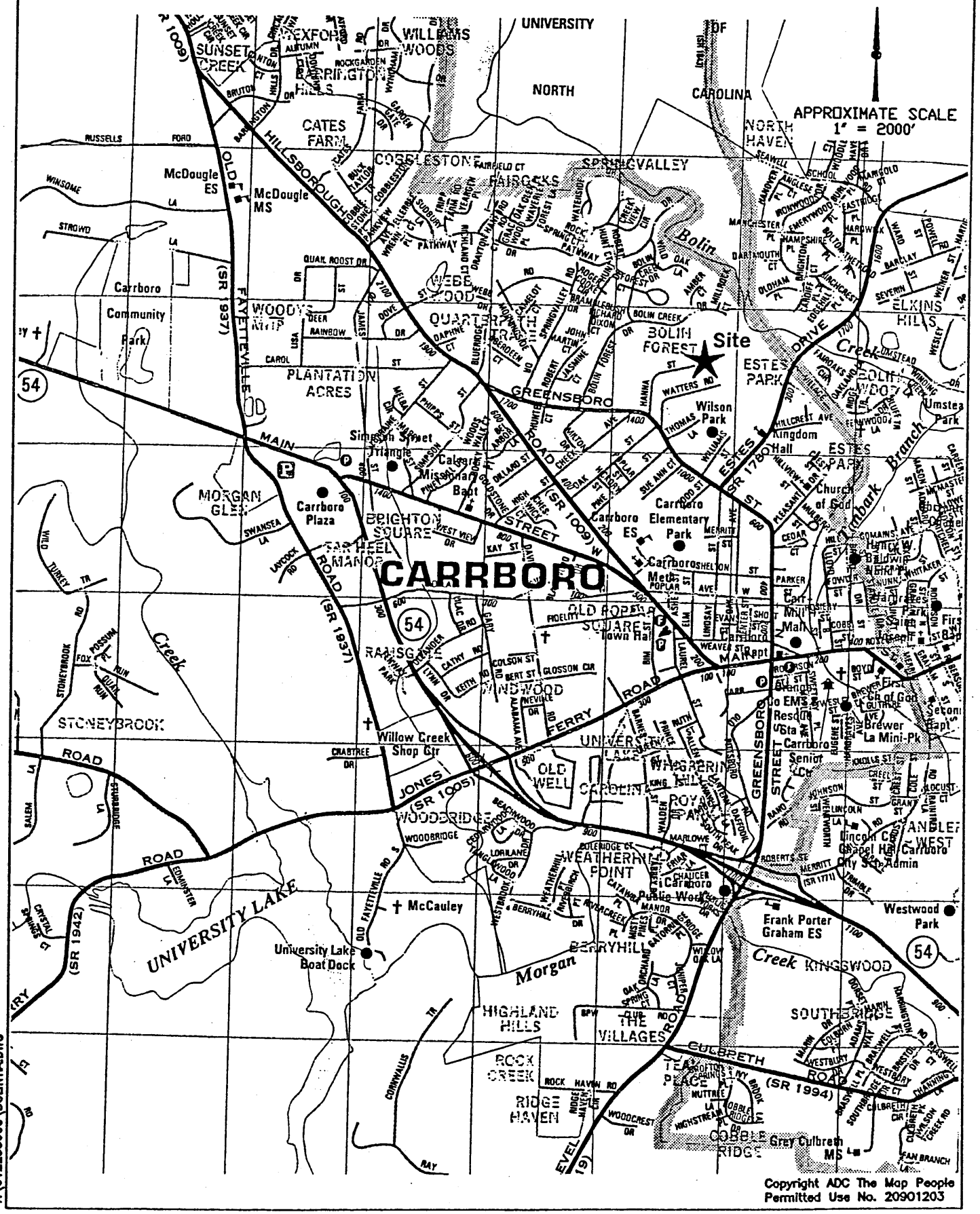
The proposed *Bolin Creek Co-Housing Development* is located on approximately 8 acres at the end of Hanna Street (north of Greensboro Street) in Carrboro, North Carolina. As currently envisioned, the proposed site will consist of 47 residential co-housing units. The development is anticipated to be complete (built-out) in the year 2003.

Kimley-Horn and Associates, Inc. was retained to determine the potential external traffic impacts of this development, and to identify roadway improvements that may be required to accommodate these impacts. This report presents trip generation, distribution, traffic analyses, and recommendations for transportation improvements required to meet anticipated traffic demands. This report examines existing conditions and 2003 (build-out) conditions.

3.0 Inventory

3.1 Study Area

The unsignalized intersection operations of Greensboro Street at Hanna Street were studied as part of the Traffic Impact Analysis. Figure 1 depicts the Site Location and Figure 2 depicts the proposed project Site Plan.



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Kimley-Horn and Associates, Inc.

BOLIN CREEK
CO-HOUSING DEVELOPMENT
CARRBORO, N.C.

SITE LOCATION

FIGURE
1

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Kimley-Horn and Associates, Inc.	BOLIN CREEK CO-HOUSING DEVELOPMENT CARRBORO, N.C.	SITE PLAN	FIGURE 2

3.2 Existing Conditions

The proposed project is located in northern Carrboro, and the surrounding land uses are mainly single family residential units. Roads in the immediate vicinity of the site include Greensboro Street and Hanna Street. Public bus service is provided on Greensboro Street.

Greensboro Street is a two-lane arterial in the project vicinity with a 2001 average daily traffic volume (ADT) of approximately 7,400 vpd vehicles per day (vpd). The road is posted at 35 miles per hour (mph) with a warning sign for 30 mph in advance of the Hanna Street intersection. Bike lanes and concrete curbs border both sides of Greensboro Street and a paved pedestrian walkway is located along the north side of the road.

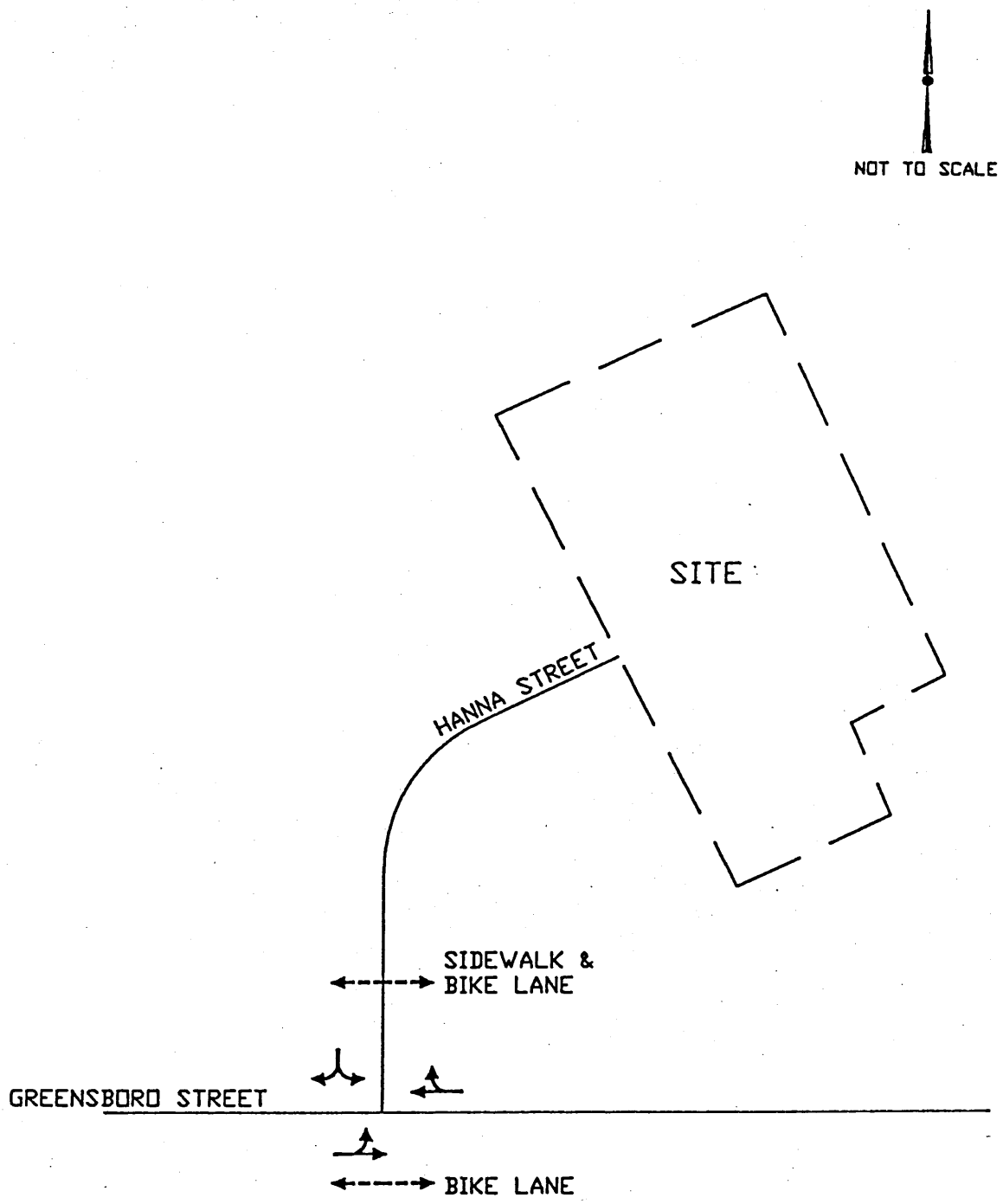
Hanna Street is a 20-foot wide paved residential cul-de-sac with grass shoulders. It is classified as a sub-collector and is posted at 25 mph with a single 69-degree, 236-foot radius horizontal curve midway along its length. This centerline radius satisfies current NCDOT construction standards that require a 230-foot minimum for a design speed of 30 mph (*Subdivision Roads: Minimum Construction Standards*, NCDOT, January 2000, p.26). The 2001 ADT on Hanna Street is approximately 180 vpd. The existing roadway laneage is shown on Figure 3.

Hanna Street intersects Greensboro Street in a curve; therefore, the sight distance of vehicles waiting on the side street to exit left or right and for vehicles turning left entering from the mainline was measured. Table 1 summarizes the field measurements and roadway design criteria.

Table 1 Sight Distance for Turning Vehicles at the Hanna Street Intersection			
	Left-turn Out	Right-turn Out	Left-turn In
Measured Sight Distance	507'	424'	335'
AASHTO Design Speed Based on Stopping Sight Distance*	55 mph	50 mph	45 mph

**A Policy on Geometric Design of Highways and Streets*, AASHTO 1984; p. 801 Tables IX-10 and IX-11

Based on AASHTO criteria, vehicles traveling up to 45 miles-per-hour would have adequate stopping distance prior to a conflict with any turning vehicle at Hanna Street.



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Kimley-Horn and Associates, Inc.

BOLIN CREEK
CO-HOUSING DEVELOPMENT
CARRBORO, N.C.

EXISTING ROADWAY
LANEAGE

FIGURE
3

4.0 Traffic Generation

The traffic generation potential and characteristics of the proposed residential development was determined by counting the traffic volumes entering and exiting the 32 units of the nearby Arcadia Co-Housing Development. Table 2 summarizes the estimated traffic generation for the proposed Bolin Creek Co-Housing Development utilizing the traffic generation from the Arcadia Co-Housing Development.

Table 2
Traffic Generation
(Vehicles)

Land Use	24 Hour*		AM Peak (Rate = 0.59 trips/unit and split = 37/63)		PM Peak (Rate = 0.63 trips/unit and split = 50/50)	
	In	Out	In	Out	In	Out
47 Co-Housing Units	145	145	10	18	15	15

*AM and PM peak-hour assumed to account for 20% of ADT

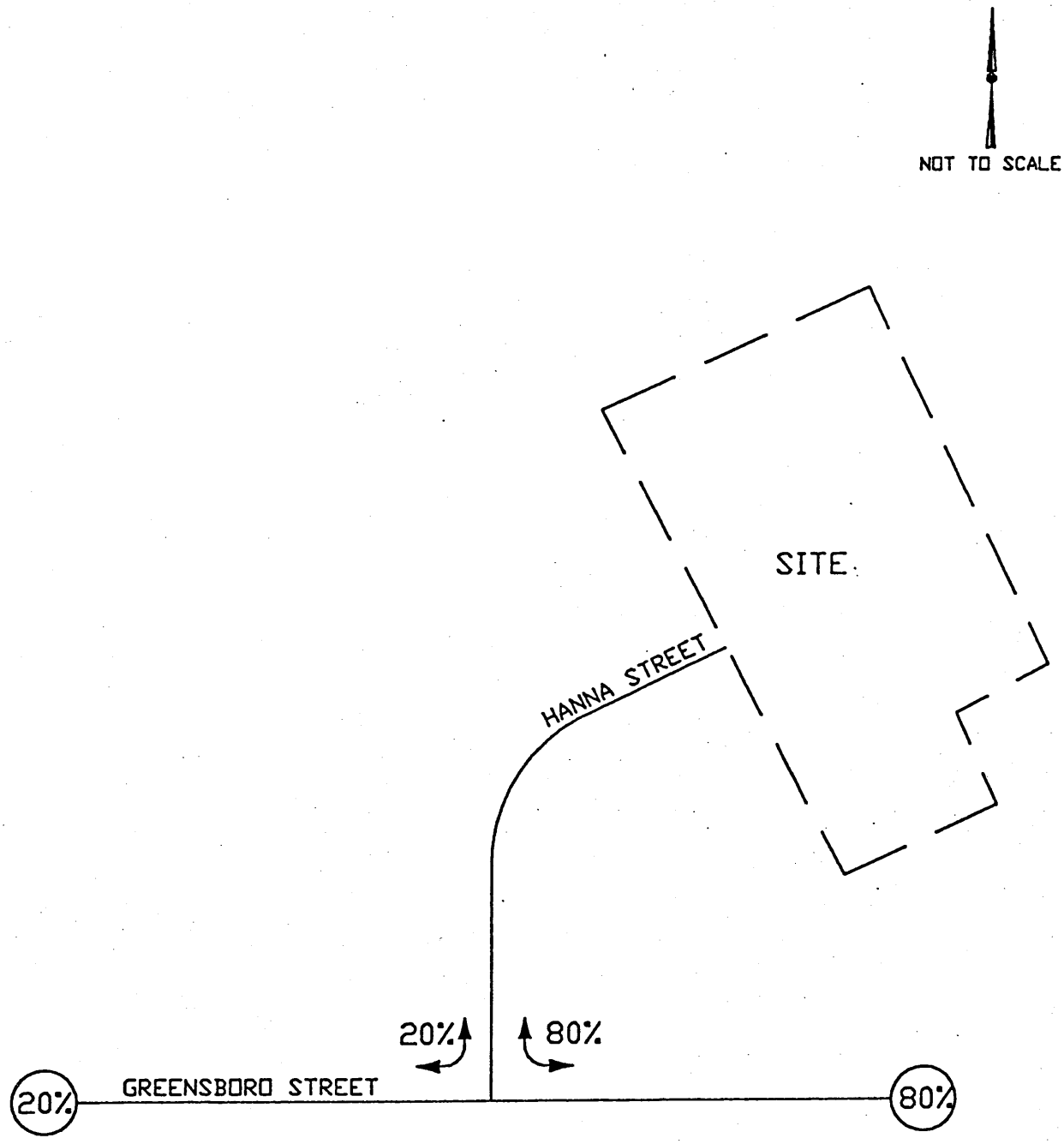
Table 2 shows the proposed development has the potential to generate 145 trips in and 145 trips out each day.

5.0 Traffic Distribution

The proposed generated trips were assigned to the surrounding roadway network. The directional distribution and assignment was based on a review of the existing distribution at Hanna Street.

- 20% to/from Greensboro Street to the west
- 80% to/from Greensboro Street to the east

The site trip distribution is shown in Figure 4.



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Kimley-Horn and Associates, Inc.	BOLIN CREEK CO-HOUSING DEVELOPMENT CARRBORO, N.C.	SITE TRIP DISTRIBUTION/ASSIGNMENT	FIGURE 4

6.0 Projected Traffic Volumes

6.1 Existing Traffic

AM and PM peak-hour turning movement counts were performed for the following intersections:

- Greensboro Street at Hanna Street – (count performed on December 10-11, 2001)
- Circadian Way at Arcadia Co-Housing Development – (count performed on December 11-12, 2001)

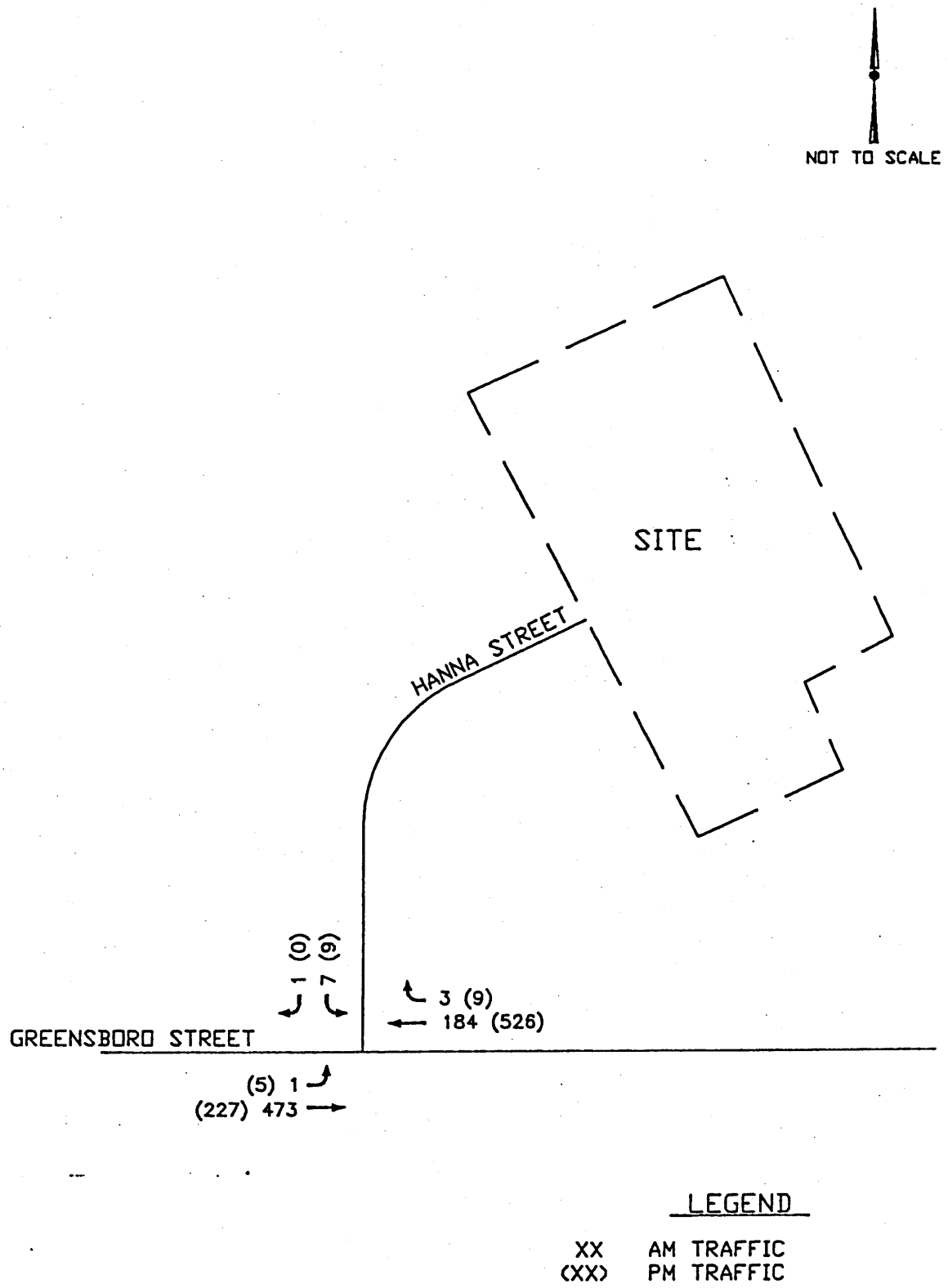
The existing 2001 AM and PM peak-hour traffic volumes at the study intersection of Greensboro Street at Hanna Street are shown in Figure 5. The traffic count at Circadian Way was used to develop the trip generation rates used in Table 2.

6.2 Historical Traffic Growth

Historical traffic growth is the increase in traffic volumes due to usage increases and non-specific growth throughout the area. A three-percent per year growth rate was applied to traffic on Greensboro Street based upon discussions with the North Carolina Department of Transportation

6.3 Total Traffic

To obtain total 2003 build-out traffic volumes, *Bolin Creek Co-Housing Development* project traffic was assigned to the road network then added to the existing and background traffic volumes. The AM and PM peak-hour turning movements for the studied drives and intersections were then calculated and analyzed for the 2003 build-out year.



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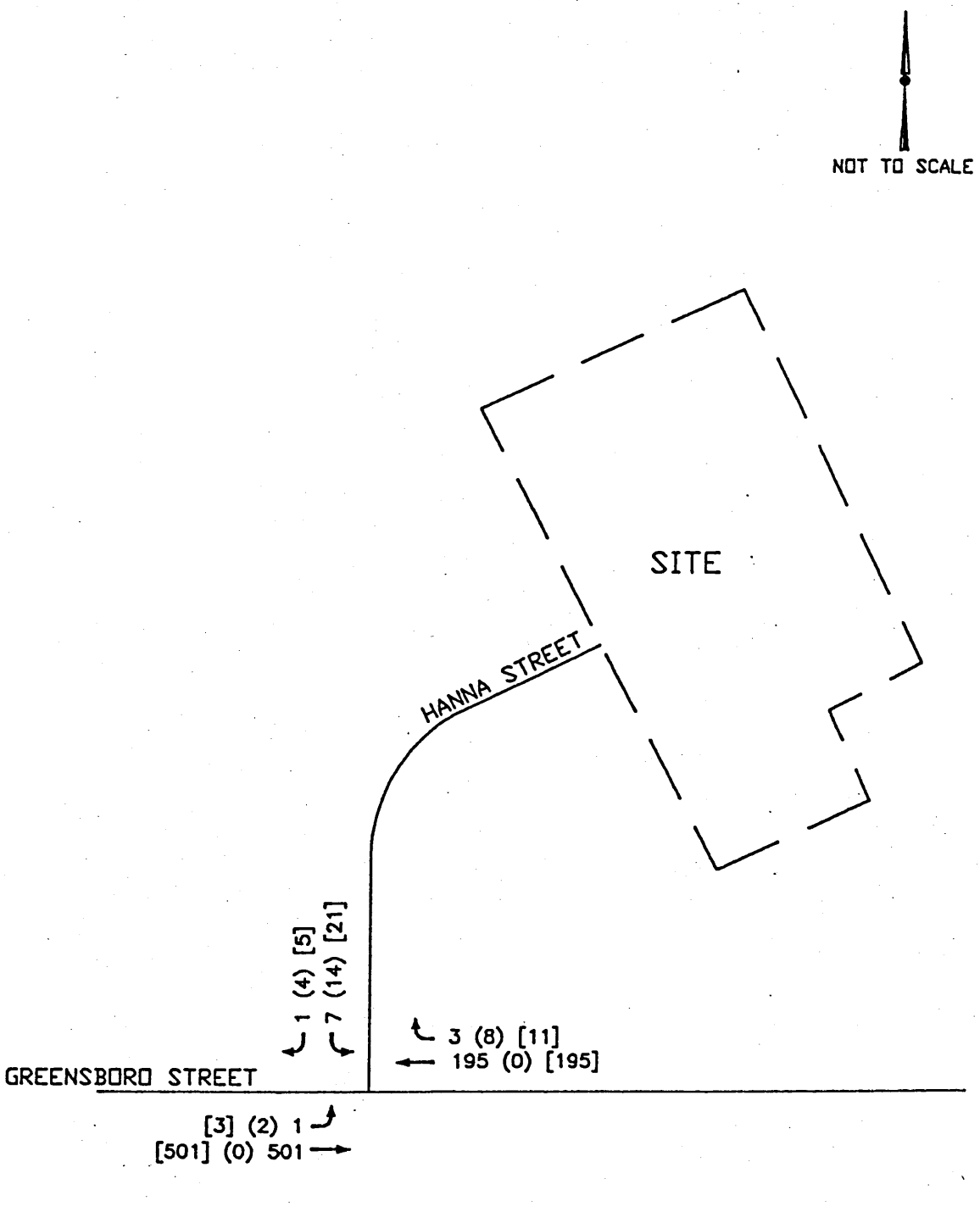
Kimley-Horn and Associates, Inc.	BOLIN CREEK CO-HOUSING DEVELOPMENT CARRBORO, N.C.	2001 EXISTING PEAK-HOUR TRAFFIC VOLUMES	FIGURE 5

7.0 Site Access and Traffic Assignment

Hanna Street will provide exclusive access to the proposed development. Figure 6 shows the projected 2003 AM peak-hour total traffic volumes and Figure 7 shows the projected 2003 PM peak-hour total traffic volumes.



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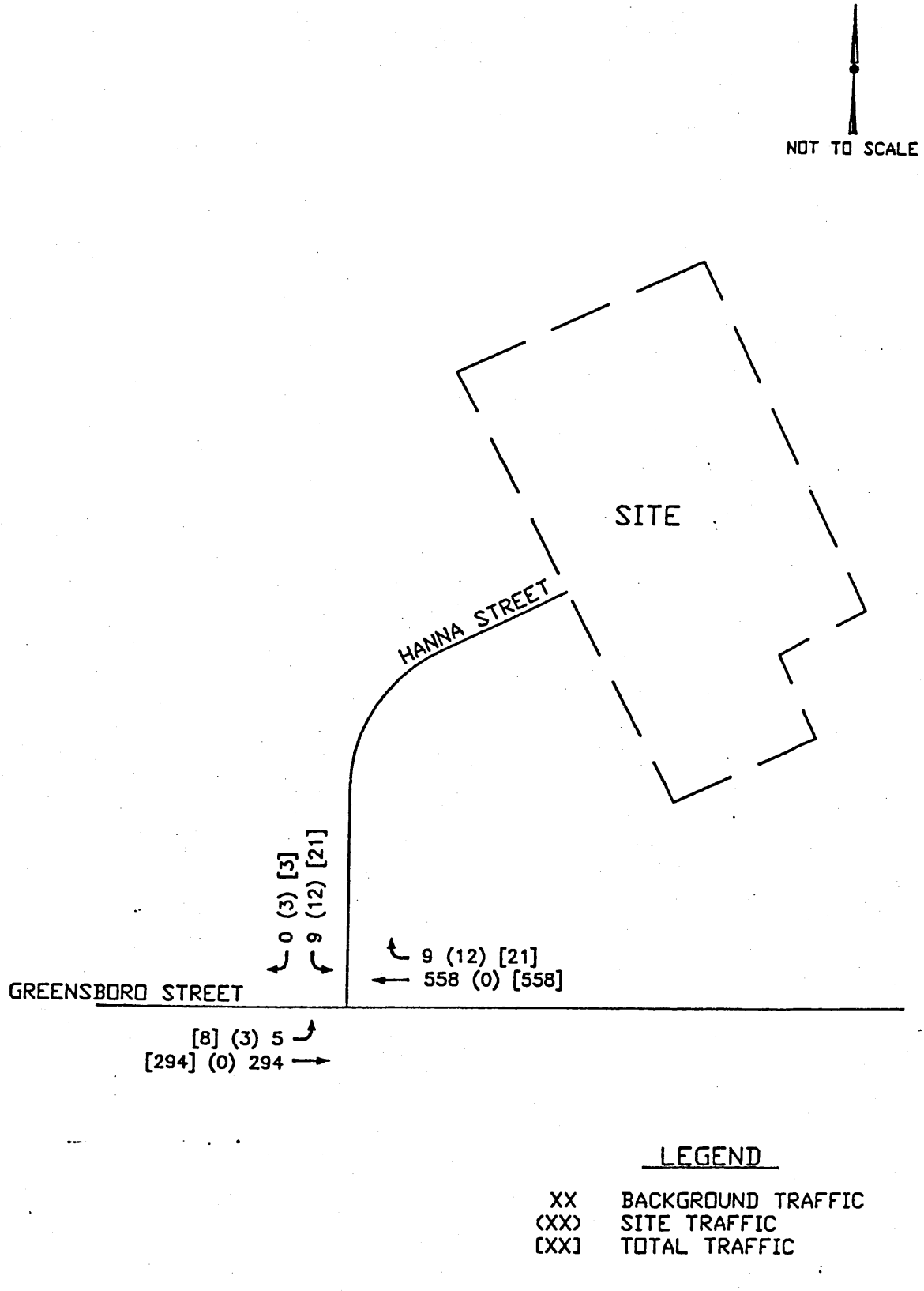
Kimley-Horn and Associates, Inc.	BOLIN CREEK CO-HOUSING DEVELOPMENT CARRBORO, N.C.	PROJECTED 2003 AM PEAK-HOUR TRAFFIC VOLUMES	FIGURE 6



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Kimley-Horn and Associates, Inc.

BOLIN CREEK
CO-HOUSING DEVELOPMENT
CARRBORO, N.C.

PROJECTED 2003 PM
PEAK-HOUR TRAFFIC VOLUMES

FIGURE
7

8.0 Capacity Analysis

Capacity analyses (see Appendix) were performed for AM and PM peak traffic hours for the 2001 existing conditions and 2003 build-out conditions using methodologies contained in the *Highway Capacity Manual* (TRB, HCM 2000) to determine the operating characteristics of the adjacent road network and the impacts of the proposed project. All capacity analyses were performed in *Highway Capacity Software* (McTrans, HCS2000 Release 4.1a).

Capacity is defined as the maximum number of vehicles that can pass over a particular road segment or through a particular intersection within a set time duration. Capacity is described by Level-of-Service (LOS) for the operating characteristics of a road segment or intersection. LOS is defined as a qualitative measure that describes operational conditions and motorist perceptions within a traffic stream. The *Highway Capacity Manual* defines six levels of service, LOS A through LOS F, with A being the best and F being the worst. LOS D is most frequently used as the minimum design standard for signalized intersections.

Both the AM and PM peak-hours were analyzed for the intersection of Greensboro Street at Hanna Street. All capacity analyses are included in the Appendix and are briefly summarized in Table 3.

Table 3
Level-of-Service Comparison
Greensboro Street at Hanna Street

Condition	AM Peak LOS (Delay)	PM Peak LOS (Delay)
2001 Existing Conditions	Short Minor-Street Delays	Moderate Minor-Street Delays
2003 Build-Out Conditions	Short Minor-Street Delays LOS A-B.	Moderate Minor-Street Delays

LOS C-D

LOS A-LOS B = short delay, LOS C-LOS D = moderate delay, LOS E-LOS F = long delay

Analyses indicate that the unsignalized intersection of Greensboro Street at Hanna Street will operate with short minor-street delays during the AM peak hour and moderate minor-street delays during the PM peak hour for 2001 existing conditions. For 2003 build-out conditions, analyses indicate that the unsignalized intersection will continue to operate with short minor-street delays during the AM peak hour and moderate minor-street delays during the PM peak hour.

Appendix

2001 Existing

HCM2000 Capacity Analyses

TWO-WAY STOP CONTROL SUMMARY

Analyst:	RHD
Agency/Co.:	KHA
Date Performed:	12/11/01
Analysis Time Period:	7:45 am
Intersection:	Greensboro St at Hanna St
Jurisdiction:	Carrboro
Units: U. S. Customary	
Analysis Year:	2001
Project ID:	012233000
East/West Street:	Greensboro Street
North/South Street:	Hanna Street
Intersection Orientation:	EW
Study period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	473			184	3
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	1	525			204	3
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				7		1
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				7		1
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	1						8	
C(m) (vph)	1364						416	
v/c	0.00						0.02	
95% queue length	0.00						0.06	
Control Delay	7.6						13.8	
LOS	A						B	
Approach Delay							13.8	
Approach LOS							B	

2003 Build-Out

HCM2000 Capacity Analyses

TWO-WAY STOP CONTROL SUMMARY

Analyst:	RHD
Agency/Co.:	KHA
Date Performed:	12/11/01
Analysis Time Period:	7:45 am
Intersection:	Greensboro St at Hanna St
Jurisdiction:	Carrboro
Units: U. S. Customary	
Analysis Year:	2003
Project ID: 012233000	
East/West Street:	Greensboro Street
North/South Street:	Hanna Street
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	501			195	11
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	3	556			216	12
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				21		5
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				23		5
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	3						28	
C(m) (vph)	1340						401	
v/c	0.00						0.07	
95% queue length	0.01						0.22	
Control Delay	7.7						14.7	
LOS	A						B	
Approach Delay							14.7	
Approach LOS							B	

H-32

TWO-WAY STOP CONTROL SUMMARY

Analyst:	RHD
Agency/Co.:	KHA
Date Performed:	12/11/01
Analysis Time Period:	4:45 pm
Intersection:	Greensboro St at Hanna St
Jurisdiction:	Carrboro
Units: U. S. Customary	
Analysis Year:	2003
Project ID: 012233000	
East/West Street:	Greensboro Street
North/South Street:	Hanna Street
Intersection Orientation: EW	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	8	294			558	21
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	8	326			620	23
Percent Heavy Vehicles	2	--	--		--	--
Median Type	Undivided					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				21		3
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				23		3
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?					No	
Storage						
RT Channelized?						
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	8						26	
C(m) (vph)	942						291	
v/c	0.01						0.09	
95% queue length	0.03						0.29	
Control Delay	8.9						18.6	
LOS	A						C	
Approach Delay							18.6	
Approach LOS							C	

MEMORANDUM

TO: Roy Williford

FROM: Michael B. Brough MBB

RE: Hanna Ridge Development

DATE: June 10, 1999

A number of issues were raised by the staff in connection with our review of the above referenced project. The questions and my responses follow.

1. *Can the permit be denied because Hanna Street is not constructed according to subcollector street standards?* No. The street classification system and definitions set forth in Section 15-210 apply to streets constructed *within* new subdivisions. Thus, the fact that Hanna Street is not constructed in accordance with the standards required of new subcollector streets (or, for that matter, new local streets) has no direct bearing on whether the permit should be issued.

2. *Can the developer be required to improve Hanna Street?* A developer can only be required to construct on-site or off-site improvements only to the extent that the need for those improvements is directly related to that development. Thus, the developer in this case could not be required to bear the total cost of constructing improvements to Hanna Street. Since the town does not have an impact fee system in place, the only way that the developer could be required to participate in the cost of general improvements to Hanna Street would be if the town were to use the special assessment procedure to recoup part of the cost of such improvements from all benefited property owners (an approach which no one has suggested).

3. *Could the permit be denied on the basis of public safety problems?* As you know, Section 15-54(c) allows the Board to deny a permit that otherwise the meets the standards of the ordinance if it concludes that, if completed as proposed, "the development, more probably than not...[w]ill materially endanger the public health or safety." The determination must be based upon competent evidence produced at the public hearing, and the burden of proof is on those who would urge this position. In other words, it is not enough for opponents merely to raise a question or concern; there must be actual evidence in the record that would justify such a finding.

4. *Can the permit be denied if the Board finds, based on competent evidence at the hearing, that the street as it presently exists presents a danger to public safety?* The answer to this question is not an unqualified yes or no. In my judgment, even assuming a legitimate conclusion can be reached that a street as it exists is dangerous, the owner of property that abuts such street cannot be denied all development possibilities for the property on the basis that "one more car" would make the existing situation that much worse. On the other hand, I am not persuaded that a developer under the assumed conditions necessarily has a legal right to develop

the property to the maximum density allowed under the land use ordinance . The difficulty comes in deciding how much development can be allowed, consistent with the public safety. There is no bright line test, but as a general principle, it seems to me that the greater the hazard, and the clearer the evidence is that a public safety problem exists, the more density might be restricted below that which is otherwise permissible under the ordinance.

Perhaps an illustration may make this more understandable. You recall that, when the development possibilities for the Hanna Ridge property were first discussed, a question arose as to whether Watters Road could be used to access this property, and if so, whether the developer could be required to bring this road up to town standards. Assuming the property abuts or has access to this street, I responded, consistent with the viewpoint expressed above, that the developer could not be required to improve Watters Road as a condition of development approval. On the other had, I noted that, having lived on this road for a number of years, I was personally familiar with the fact that it is unpaved, that it contains a curve that approaches 90 degrees, that at this curve the road is approximately 12 feet in width, that a tree is located at the road's edge on the inside of that curve, and that the curve is, if not "blind," at least sight restricted. Under these circumstance, I advised that the Board could easily find that the development of the tract in question with more than a few houses would be inconsistent with the public safety if all the traffic had to use Watters Road.

I do not know what the evidence will show with respect to Hanna street, and I therefore offer no opinion on whether the evidence would support a denial of the particular permit requested.

NORTH CAROLINA

ORANGE COUNTY

TOWN OF CARRBORO

CONDITIONAL USE PERMIT GRANTED

On the date(s) listed below, the Board of Aldermen of the Town of Carrboro met and held a public hearing to consider the following application:

APPLICANT: Andrews & Associates, Inc.
OWNER: Andrews & Associates (Home Town Equity)
PROPERTY LOCATION (Street Address): 130 Hanna Street
TAX MAP, BLOCK, LOT(S): 7.30..12
PROPOSED USED OF PROPERTY: Residential – An Architecturally Integrated Subdivision of Townhomes and Single-Family Detached Lots
CARRBORO LAND USE ORDINANCE USE CATEGORY: 1.321 and 1.110
MEETING DATES: June 22, August 17 and September 7, 1999

Having heard all the evidence and arguments presented at the hearing, the Board finds that the application is complete, that the application complies with all of the applicable requirements of the Carrboro Land Use Ordinance for the development proposed, and that therefore the application to make use of the above described property for the purpose indicated is hereby approved, subject to all applicable provisions of the Land Use Ordinance and the following conditions:

The applicant shall complete the development strictly in accordance with the plans submitted to and approved by this Board, a copy of which is filed in the Carrboro Town Hall. Any deviations from or changes in these plans must be pointed out specifically to the administrator in writing and specific written approval obtained as provided in Section 15-64 of the Land Use Ordinance.

If any of the conditions affixed hereto or any part thereof shall be held invalid or void, then this permit shall be void and of no effect.

1. The proposed stormwater detention basin be eliminated and the resultant 'saved' area be incorporated into the undisturbed open space area required for the site, to the extent practicable. Some of the area currently used for the stormwater detention basin may be needed for erosion control measures.

2. That the developer design and construct an integral pour sidewalk within the existing right-of-way on the low side of Hanna Street, extending from the Hanna Ridge development to Greensboro Street, subject to the understanding that, upon completion, the Town will reimburse the developer fifty percent of the direct cost incurred by the developer in the design and construction of this sidewalk. The design of the sidewalk shall be subject to review and approval by the Town and the design and construction of the sidewalk shall be completed prior to final plat approval for Hanna Ridge.

3. That the lighting plan for the Hanna Ridge project be designed with light fixtures no taller than 15' and that the 0.2 foot-candle illumination contour is adhered to at the property line per Section 15-243 of the LUO.

4. That the proposed sewer outfall line and easement be relocated towards the west (towards the existing 30' storm drainage easement) to the greatest extent allowable by town and OWASA policies including having the two overlap in order to reduce clearing of trees along these easements.

5. That to the extent practicable, the amount of parking be increased so that the resultant equation requires two and one-half (2 1/2) parking spaces per one (1) townhome unit and that any resultant increase in vehicular surface area be shaded per Section 15-317 of the LUO. It is further recommended that the proposed additional parking spaces be located along the private road so that they face the interior of the site and not be located in the vicinity of the proposed stormwater detention basin area.

6. That the developer provide a stub-out to the east to the "Adams' Tract" for possible future use as a second route of access to Hanna Ridge residents.

7. That the two lots facing Watters Road (Lots B and C) be combined with just one house being constructed on this new lot.

8. That the proposed waterline loop from Watters Road be retained on an easement to be located to the western edge of the property or at such location as is agreed to by the adjacent property owners, OWASA and the developers.

9. That proposed townhome units 25-28 be reduced to two, single-family units.

10. That the town's Public Works Department approve the selection of shade trees (in accordance with Appendix E of the Carrboro Land Use Ordinance) for the parking areas as an alternative to honey locusts.

11. That the developers reimburse the Town for 50% of the direct cost of the installation by the Town of two speed humps on Hanna Street prior to final plat approval.

12. That crosswalks be placed from the townhomes to the dumpster locations. The crosswalks must include curb cuts for handicapped access to sidewalks.

13. That construction traffic be limited based on school bus operation hours when school is in session should school schedules coincide with construction.

14. That the applicant provide facilities for recycling within, or by, the two dumpster areas.

15. That the applicant install a landscape screen of a height to diminish the brightness of taillights as seen from Bolin Forest, all in accordance with the town's land use ordinance.

16. That pedestrian access be dedicated to the town across the northernmost side of the property.

This permit shall automatically expire within two years of the date of issuance if the use has not commenced or less than 10 percent (10%) of total cost of construction has been completed or there has been non-compliance with any other requirements of Section 15-62 of the Carrboro Land Use Ordinance.

All street construction on those streets proposed for acceptance by the Town of Carrboro shall be certified by an engineer. Engineering certification is the inspection by the developer's engineer of the street's subgrade, base material, asphalt paving, sidewalks and curb and gutter, when used. The developer's engineer shall be responsible for reviewing all compaction tests that are required for streets to be dedicated to the town. The developer's engineer shall certify that all work has been constructed to the town's construction specifications.

If this permit authorizes development on a tract of land in excess of one acre, nothing authorized by the permit may be done until the property owner properly executes and returns to the Town of Carrboro the attached acknowledgment of the issuance of this permit so that the town may have it recorded in the Orange County Registry.

ATTACHMENT "K"

Sungate Design Group, P.A. ENGINEERING • LANDSCAPE ARCHITECTURE • ENVIRONMENTAL

915 Jones Franklin Road • Raleigh, NC 27606 • Phone 919.859.2243 • Fax 919.859.6258

May 14, 2003

Mr. Marty Roupe
Zoning Division
Town of Carrboro
301 West Main Street
Carrboro, NC 27510

Re: Revised Estimates – Hanna Street Sidewalk

Mr. Roupe,

We have completed the revised estimates you requested for Hanna Street. The estimates are not based on field survey data and there are no costs included for right-of-way.

Curb & Gutter with Concrete Sidewalk

	High Side	Low Side
Total	No Estimate	$111,128

Integral Curb & Concrete Sidewalk

	High Side	Low Side
Total	No Estimate	$101,236

If you have any questions or need further information, please contact me.

Sincerely,

William M. Hines, PE

Hanna Street - Estimate for Sidewalk 5/14/2003

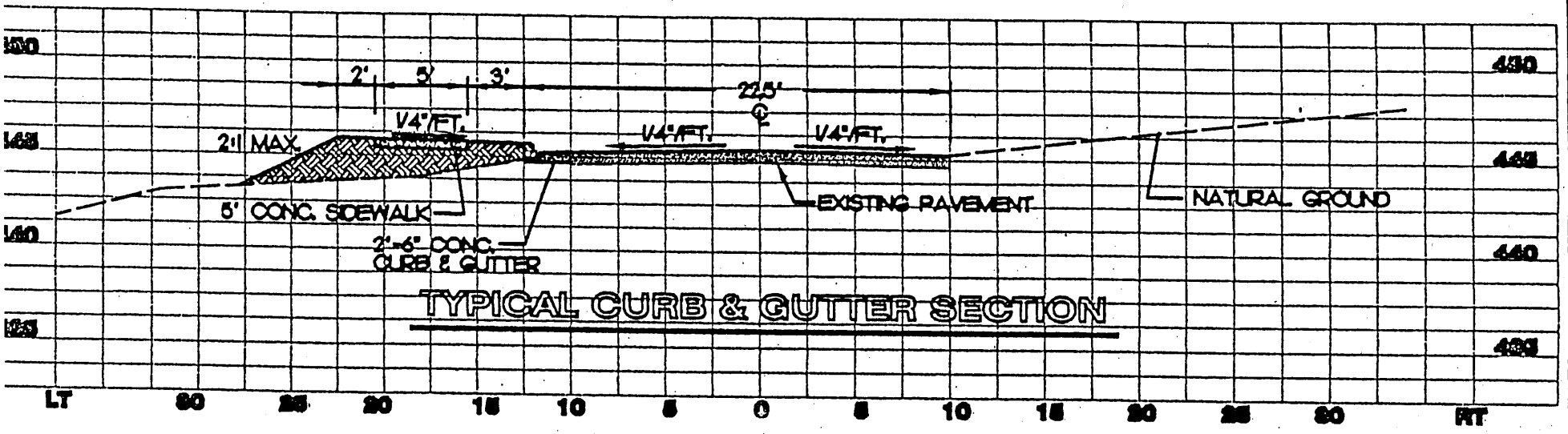
C&G on low side with a 5' Sidewalk

Item	Quantity	Unit	Unit Price	Amount
30-inch Curb & Gutter	1100	LF	$10.50	$11,550.00
4-inch Sidewalk	611	SY	$25.00	$15,275.00
Concrete Retaining Wall	200	LF	$77.75	$15,550.00
Seeding & Mulching	7	MSF	$50.00	$350.00
Incidental Stone	52	TON	$25.90	$1,346.80
Speed Humps w/ Signs	2	EA	$2,500.00	$5,000.00
Catch Basins	2	EA	$2,000.00	$4,000.00
15-inch RCP	100	LF	$24.75	$2,475.00
Riprap Apron	4	TON	$28.80	$115.20
I-2 for Resurfacing	217	TON	$48.10	$10,437.70
Borrow Material	493	CY	$11.10	$5,472.30
Silt Fence	950	LF	$2.00	$1,900.00
Surveying	10	MD	$350.00	$3,500.00
Subtotal				$76,972.00
Add Mobilization (5%)				$80,820.60
Add Engineering (10%)				$88,902.66
Add Contingency (25%)				$111,128.33
Total				**$111,128.33**

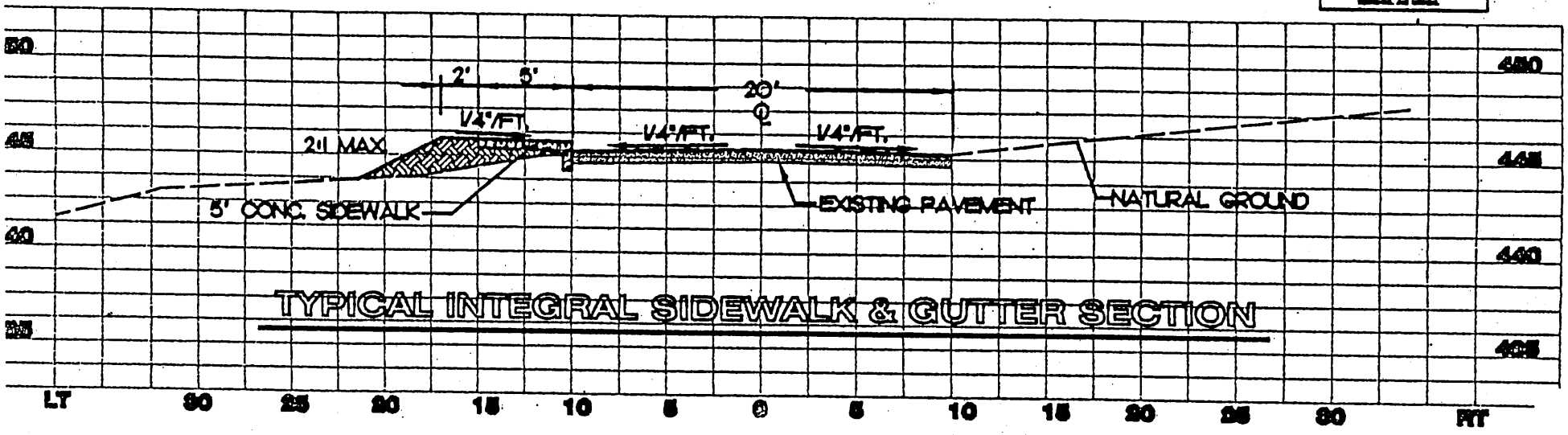
Hanna Street - Estimate for Sidewalk 5/14/2003

Integral Curb & Sidewalk on low side

Item	Quantity	Unit	Unit Price	Amount
Integral Curb & Sidewalk	1100	LF	$25.00	$27,500.00
Concrete Retaining Wall	150	LF	$77.75	$11,662.50
Seeding & Mulching	4	MSF	$50.00	$200.00
Speed Humps w/ Signs	2	EA	$2,500.00	$5,000.00
Catch Basins	2	EA	$2,000.00	$4,000.00
15-inch RCP	100	LF	$24.75	$2,475.00
Riprap Apron	4	TON	$28.80	$115.20
I-2 for Resurfacing	217	TON	$48.10	$10,437.70
Borrow Material	300	CY	$11.10	$3,330.00
Silt Fence	950	LF	$2.00	$1,900.00
Surveying	10	MD	$350.00	$3,500.00
Subtotal				$70,120.40
Add Mobilization (5%)				$73,626.42
Add Engineering (10%)				$80,989.06
Add Contingency (25%)				$101,236.33
Total				**$101,236.33**



TYPICAL CURB & GUTTER SECTION



TYPICAL INTEGRAL SIDEWALK & GUTTER SECTION

					HANNA ROAD CARRBORO, NC	TYPICAL SECTIONS		#

ATTACHMENT "K"

Pacifica Bicycle/Transportation Survey Results

There were 30 responses from 29 households (1 on the waiting list, 28 with deposits.)

Method:
I took the survey data and made the following modifications:
-Changed responses to numbers when possible. For example, if someone put "1-2" cars, I changed it to 1.5 cars. 2 trips per week was changed to 0.286 trips per day.
- Used given numbers when uncertainty expressed. "2?" became 2, etc.
- One household had two responses. I converted it to one response, assuming the larger number when there was conflict.
- I used my judgment to make some data consistent (e.g. one person said they would travel by bike (1 trip/day) and store a bike outside, but left number of bikes blank. I made this 1.) I did not change any values that were "intentional" regardless of inconsistencies. So a 0 would remain zero no matter what.

Calculation:
- I summed the responses (number of adults, number of trips, number of cars) and scaled up from the 29 households to 46 households by multiplying by 46/29.

So the numbers shown are estimates scaled to 46 households:

Results:
Question 1: Expected number of:

Adults:	73
Children 0-5:	8
Children 6-10:	3
Children 11-16:	2

Question 2: Expected trips per day by:

Car:	57
Bicycle:	31
Bus:	13
Motorcycle:	0
Walking:	25

Question 3: Expected number of:

cars:	64
adult bikes:	85
children's bikes:	11
motorcycles:	2
Shoes:	5 pair to something less than Imelda

Question 4a: Do you expect to store anything else in the parking area?

yes:	10
no:	27
no response:	9

4b: What?
utility trailer, engine block, sea kayak, canoe/kayak, sailboat, boat (future), tools

January 17, 2003

We, the future residents of Pacifica, concur that the proposed 1.5 spaces per household plus the unmarked parallel spaces on the access road will accommodate our vehicles for the following reasons:

- Approximately 1/3 of the households have only one adult.
- The considerable bicycle accommodations will make it easier to have and maintain quality bicycles and will promote a culture of bicycle riders.
- The major shopping areas are only a ten-minute walk from the proposed neighborhood.
- There is a bus line on North Greensboro Street, a few minutes walk away.
- We actively promote alternatives to automobile transportation.

We support the sidewalk proposed for Hanna Street, and mentioned on the web site, and would like to pay for it but find that the cost is in direct conflict with our desire to provide affordable housing. The sidewalk would marginally benefit us since it is quicker in most cases to walk down Watters Road. There are many streets in Carrboro that do not have sidewalks and as far as we know there is not a public policy for the town to remedy this which would indicate that the public at large does not consider this a health and safety priority. It is not clear how many homes will be approved for this site after the public hearing process. Therefore, we feel our interest in affordable housing outweighs the desire to upgrade the public infrastructure on Hanna Street. Should the final project costs prove able to accommodate both affordability and the sidewalk we will agree to pay for some reasonable portion of the cost.

NAME	SIGNATURE
Tom Zito	
ANA ARAUJO	
Stephen Jenks	
JOSEPH LoBUGLIO	
Denise Caignon	
Andrea Treimel	
Paul Piersma	
Amy Piersma	
Stephen Treimel	
Gerald Surh	
Magda Corredor	
Anne Everitt	
JASON MORNINGSTAR	
Ronni Zuckerman	

Pacifica Proposed 46 Unit Residential Subdivision
Conditional Use Permit Application
Supporting/Supplemental Information

Date of Fourth Revision: March 10, 2003

Carrboro Collaborative Development Association, Inc.
Contact: Giles Blunden 967-8505

Property Owner
Green Equity, LLC
Contact: Paul Piersma 402-0043

9. Tree Removal Justification Information (section 15-316)

There are several existing trees of 'significant' size (> 18") on the site that will need to be removed to accommodate the proposed construction.

64 trees 18" or more in diameter will be removed from the site for the following reasons

- The site is entirely wooded and it would not be possible to develop the site to the potential allowed by the LUO with out removing trees.
- The majority of the trees being removed are pines. They become a liability in a cluster arrangement once the immediate surrounding forest is removed due to their height and tendency to gather ice in an ice storm. The pines will be harvested and milled into timber and the stumps will be ground on site and used as mulch in the landscape
- 5 trees are being removed to provide solar access to the proposed homes
- 14 trees are being removed to provide required storm water management structures
- A significant number of trees less than 18" in diameter are being removed to provide for a required playing field
    - In order to save as many of the hardwoods on the steep slopes a conscious decision was made to cluster the homes together and remove the pine trees.

OWASA

ORANGE WATER & SEWER AUTHORITY

Quality Service Since 1977

March 27, 2003

Ms. Jane L. Tuohey
Carrboro Zoning Division
301 West Main Street
Carrboro, NC 27510

Re: Pacifica CUP #4

Dear Ms. Tuohey:

Submitted plans for the above named project, dated March 10, 2003, have been received and reviewed by this office with no further comment.

Construction Drawings with water and sewer profiles will need to be submitted for further review and comment. Please be advised that OWASA approval of construction drawings for this project will be conditional on the Owners of this project obtaining a permit from NCDENR/DEH Public Water Supply Section to construct and operate the proposed private water system on this site.

Should you have any questions or concerns, feel free to contact me at 919 968-4421 ext. 249. **This letter is to advise of revisions needed to the submitted plan set and / or needed documents for approval and in no way indicates approval of any project.**

Sincerely,

Ted Blake
Engineering Assistant

c: Todd Spencer – OWASA
Jane L. Tuohey – Carrboro Zoning Division
Chris Peterson – Carrboro Public Works
Robert Joyner – Civil Engineert
Giles Blunden – Blunden-Piesse Architects
Joanna Massey – Carrboro Collaborative

Pacifica Proposed 46 Unit Residential Subdivision
Conditional Use Permit Application
Supporting/Supplemental Information

Date of Fourth Revision: March 10, 2003

Carrboro Collaborative Development Association, Inc.
Contact: Giles Blunden 967-8505

Property Owner
Green Equity, LLC
Contact: Paul Piersma 402-0043

10. "Truth in Drainage Statement" relating to impacts on upstream/downstream properties as a result of the project (see section 15-263 for additional information)

TRUTH IN DRAINAGE STATEMENT

STORMWATER VOLUME:
THE TOTAL SITE IS 8.279 ACRES / 360,600 SQUARE FEET. THE EXISTING IMPERVIOUS AREA ON THE SITE IS 3,733 SQUARE FEET. THE TOTAL PROPOSED IMPERVIOUS AREA (ROOFS, BUILDINGS, ROADS, WALKS, ETC) IS 112,267 SQUARE FEET (102,267 SQUARE FEET OF ACTUAL PROPOSED IMPERVIOUS SURFACE AND 10,000 SQUARE FEET VOLUNTARILY INCORPORATED FOR ADDITIONAL FUTURE HOMEOWNER IMPROVEMENTS). THIS IS AN INCREASE IN IMPERVIOUS AREA OF 31.1 %.

THE PRE-DEVELOPMENT FLOW FOR THE SITE IS 3.44 CFS. THE UNMITIGATED POST DEVELOPMENT FLOW RATE IS 26.25 CFS. DUE TO THE LOCATION OF THE PROPERTY NEAR THE CONFLUENCE OF THE DRY GULCH DRAINAGE BASIN (A TRIBUTARY OF BOLIN CREEK) AND BOLIN CREEK ITSELF, DETAINING THE POST-DEVELOPMENT FLOW USING A DETENTION POND WOULD SLIGHTLY INCREASE THE DRY GULCH PEAK FLOWS IN THE EXISTING STREAM CHANNEL. IT WAS THEREFORE RECOMMENDED TO PROVIDE ONLY WATER QUALITY TREATMENT TO THIS SITE (SEE PACIFICA DETENTION BASIN IMPACT ANALYSIS). THE ABOVE FLOW RATES ARE CALCULATED FOR THE 10-YEAR STORM EVENT.

WATER QUALITY:
IN PARTNERSHIP WITH NC STATE UNIVERSITY AND THE NC DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES, DIVISION OF WATER QUALITY 319 PROGRAM, VARIOUS INNOVATIVE TECHNIQUES WILL BE USED ON THIS SITE THAT ARE ANTICIPATED TO MEET THE REQUIRED 85% TSS REMOVAL FOR THIS SITE PER NCDENR BEST MANAGEMENT PRACTICE REQUIREMENTS IN ADDITION TO OTHER NON-REGULATED BENEFITS. PLANNED TREATMENTS TO BE USED INCLUDE BIORETENTION, CISTERNS, FILTER STRIPS AND LEVEL SPREADERS, GRASSED SWALES, SOIL RENOVATION, AND NATIVE PLANTS. ADDITIONAL WATER QUALITY BENEFITS ANTICIPATED FROM THE USE OF THESE TREATMENTS INCLUDE GREATER REMOVAL OF NITROGEN AND TSS, BUT ALSO INCREASED INFILTRATION AND TIME OF CONCENTRATION FOR RAINFALL THAT MOST CLOSELY RESEMBLES THE PRE-DEVELOPMENT SITE WATER BUDGET. THE PERFORMANCE OF THESE TREATMENTS WILL BE MONITORED USING FLOW-WEIGHTED SAMPLING FOR NUTRIENTS AND SEDIMENT, HYDROLOGIC MONITORING, SEDIMENT TRANSPORT MODELING, AS WELL AS THE QUANTIFICATION OF WATER USE, RAINFALL/ RUNOFF, CAPTURE AND REUSE,

AND RE-INFILTRATION RATES. FOR QUESTIONS REGARDING THE ROLES AND RESPONSIBILITIES OF THE UNIVERSITY WITH REGARDS TO THIS EFFORT PLEASE CONTACT NANCY WHITE AT 515-4678.

WATER QUALITY NOTE:
ALL WATER QUALITY DEVICES (BIORETENTION AND RAIN CATCHMENTS) ARE PART OF THE RESEARCH PROJECT, DIRECTED BY NANCY WHITE, MLA, PHD, COLLEGE OF DESIGN, NC STATE UNIVERSITY, AND TO BE FUNDED THROUGH NCDENR, DIVISION OF WATER QUALITY 319 PROGRAM. SEALING ENGINEER IS NOT A PART OF THE RESEARCH PROJECT OR DESIGN OF THESE SYSTEMS AND IS NOT RESPONSIBLE FOR THIS PORTION OF THE PROJECT. WATER QUALITY DESIGN CALCULATIONS AND JUSTIFICATIONS ARE BEING PRESENTED IN A SEPARATE DOCUMENT.