Attachment 6

TRAFFIC IMPACT ANALYSIS
CHAPEL HILL NORTH MASTER PLAN
PROPOSED MODIFICATION

Chapel Hill, North Carolina

Executive Summary

prepared for:

The Town of Chapel Hill, NC

prepared by:

RS+H

Architects-Engineers-Planners, Inc.

June 2004

The Chapel Hill North Master Plan that was approved by the Town Council in 1990 proposed a mixed-use development at the intersection of Airport Road (NC 86) and Weaver Dairy Road. The plan authorized a total of 633,400 square feet of floor area on the 40-acre site including a minimum of 374,200 square feet of office development (60%); and a maximum of 259,200 square feet of retail use (40%). Phase 1 of the Master Plan was developed in 1991 with 102,713 square feet of office use and 147,807 square feet of retail use built and occupied. There is an additional 382,880 square feet of approved development that has not yet been built.

This proposed modification of the Chapel Hill North Master Plan maintains the total development size of 633,400 square feet but reallocates the space among retail, office and residential uses. The proposed modification of the Chapel Hill North Master plan proposes 232,500 square feet of office development, 160,900 square feet of retail development and 240,000 square feet of residential development. A summary of the proposed modification of the Chapel Hill North Master Plan is presented in Table 1 and illustrated in Figure 1.

Table 1:
Proposed Modification of the Chapel Hill North Master Plan

Land Use	Approved in 1990	Constructed and Occupied	Reminder in Phase I	Proposed Modification	Currently Proposed for Construction
	(sq ft)	*(sq ft)*	*(sq ft)*	*(sq ft)*	*(sq ft)*
Office	374,200	102,713	271,487	232,500	129,787
Retail	259,200	147,807	111,393	160,900	13,093
Residential				240,000	240,000
Total	**633,400**	**250,520**	**382,880**	**633,400**	**382,880**

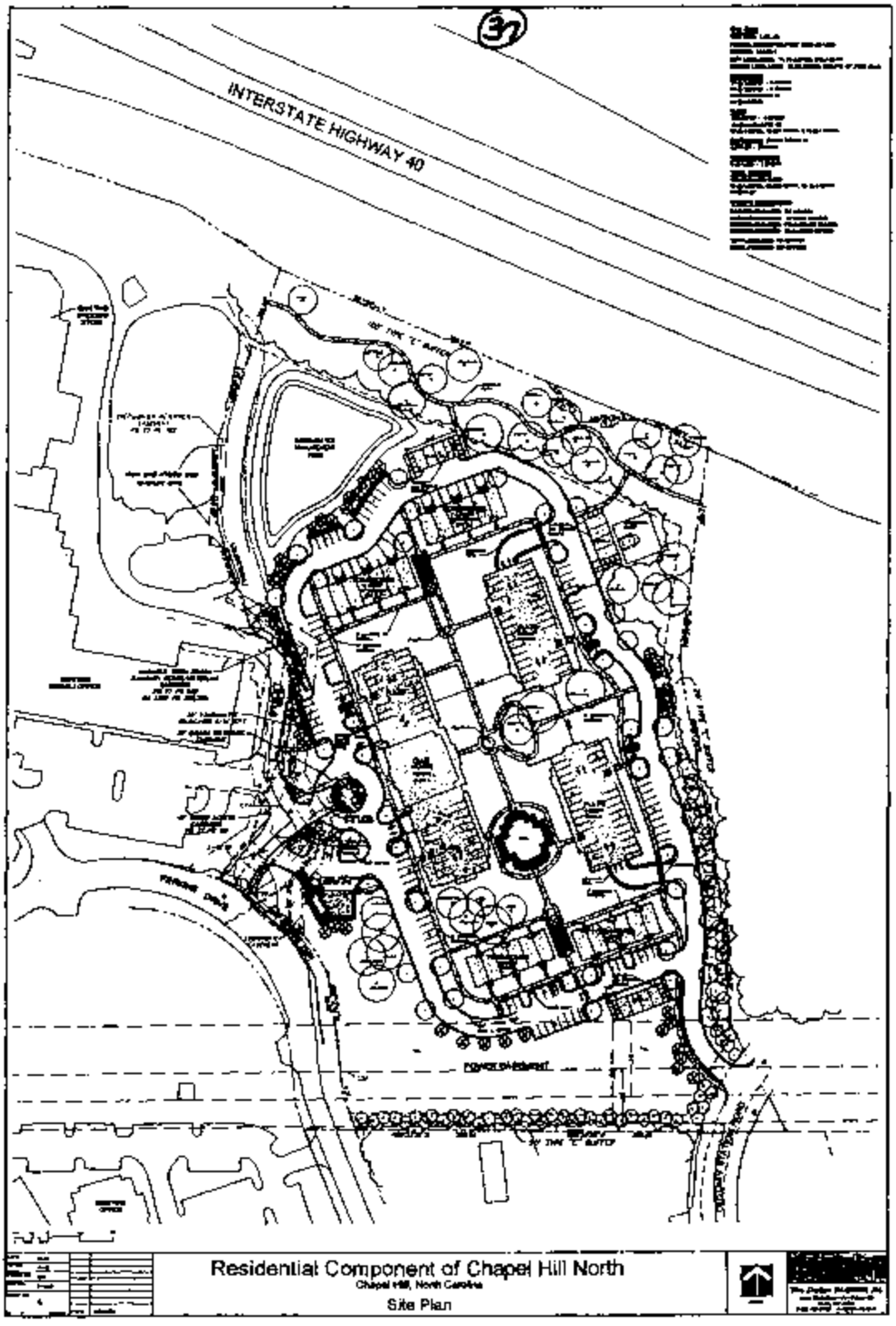
1) Project Overview

The undeveloped portion of the proposed modification of the Chapel Hill North Master Plan consists of 240,000 square feet of multi-family residential development, 129,787 square feet of office development and 13,093 square feet of retail development. The project is expected to be completed and fully occupied by 2007.

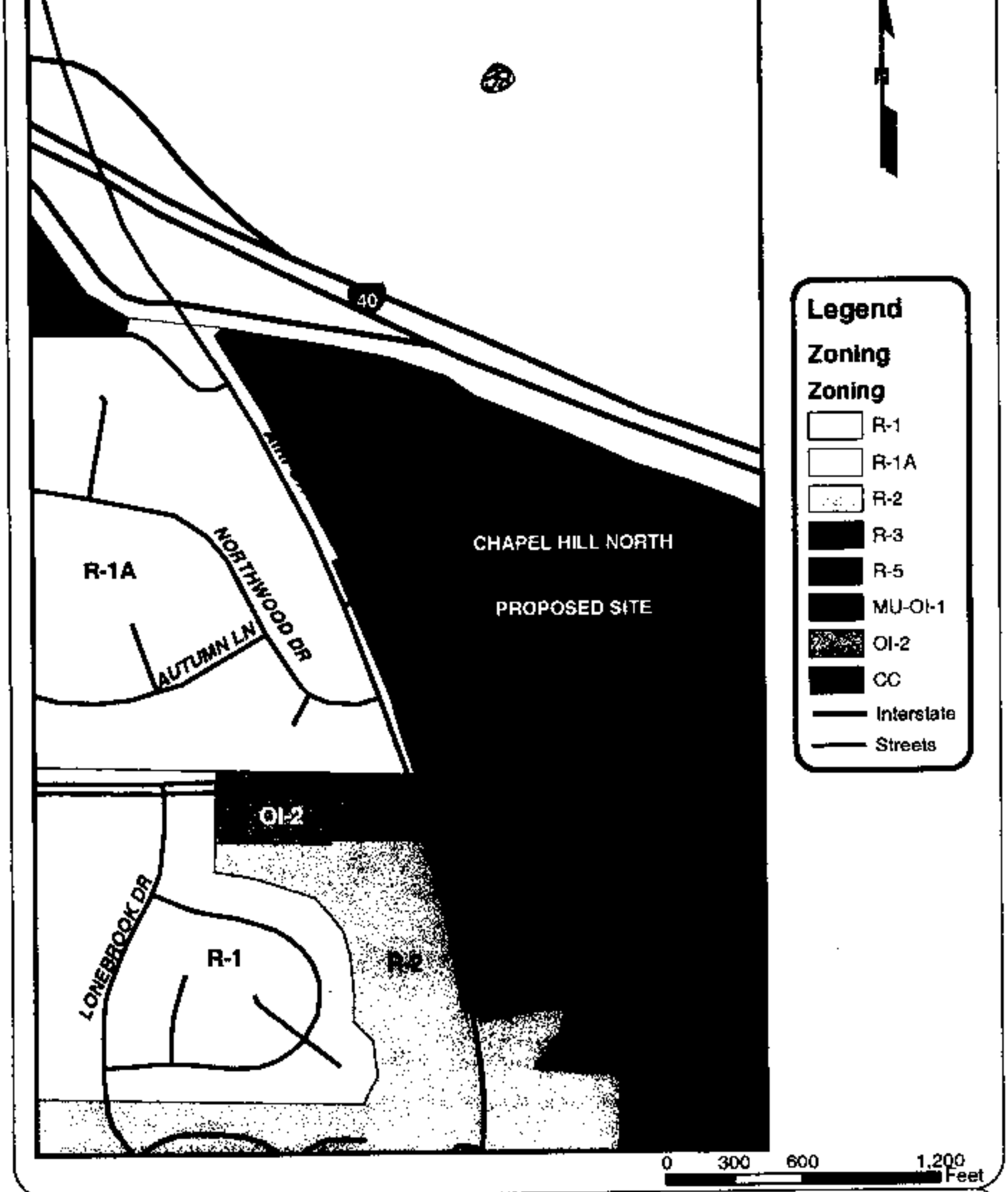
The site is located in the MU-01-1, 'Mixed-use office/institutional' zoning district as indicated in the Town of Chapel Hill zoning map. This district includes special land use intensity standards, specific permitted land use regulations and development thresholds. As proposed, the modification of the Chapel Hill North Master Plan would decrease the office ratio threshold below the zoning's specified minimum of 60% of the total project floor area. The size of the retail portion of the site would continue to meet zoning requirements and the proposed residential use is permitted under the MU-01-1 zoning (see Figure 2).

The undeveloped portion of the proposed mixed-use development is located on Perkins Road in the vicinity of the intersection of Airport Road with Weaver Dairy Road.

Figure 1:
Proposed Site Development



CHAPEL HILL NORTH TRAFFIC IMPACT STUDY TOWN OF CHAPEL HILL	RS+H	SITE PLAN PROPOSED MODIFICATION
RS&H ARCHITECTS-ENGINEERS-PLANNERS, INC CHARLOTTE, NORTH CAROLINA CORPORATE CERTIFICATE NO. F-0493.		FIGURE 1



CHAPEL HILL NORTH
TRAFFIC IMPACT STUDY
TOWN OF CHAPEL HILL

RS&H ARCHITECTS-ENGINEERS-PLANNERS INC.
CHARLOTTE, NORTH CAROLINA
CORPORATE CERTIFICATE NO. F-0493

RS&H

PROJECT LOCATION

FIGURE 2

2) Study Area

To determine the traffic impacts of the proposed site development on nearby roadways, traffic flow conditions were analyzed at the following intersections

- Airport Road at I-40 Westbound ramps (Signalized intersection)
- Airport Road at I-40 Eastbound ramps (Signalized intersection)
- Airport Road at Eubanks Road (signalized intersection)
- Airport Road at Chapel Hill North Shopping Center Drive (Unsignalized intersection)
- Airport Road at Perkins Drive (Signalized intersection)
- Airport Road at Weaver Dairy Road (Signalized intersection)
- Weaver Dairy Road at Perkins Drive (Unsignalized intersection)
- Weaver Dairy Road at Banks Drive (Unsignalized intersection)
- Weaver Dairy Road at Old University Station Road (Unsignalized intersection)

3) Site Traffic Generation

The proposed modification of the Chapel Hill North Master Plan will generate 13,166 vehicle trips per day, which is 3,130 vehicle trips per day fewer than the earlier Master Plan approved in 1990. Of the total trips generated by the proposed modification of the Chapel Hill North Master Plan, 669 vehicle trips will occur during the morning peak hour, 1144 vehicle trips during mid-day peak hour, and 1315 vehicle trips during the evening peak hour. This equates 147 fewer trips during the morning peak hour, 292 fewer trips during the mid-day peak hour and 357 fewer trips during the evening peak hour than the vehicle trips generated by the earlier approved Master Plan.

Since a portion of Chapel Hill North development is already built and occupied, only the traffic generated by the proposed additional development will be generated. The new development consists of 129,787 square feet of office space, 13,093 square feet of retail space and 190 multi-family residential units.

4) Access Analysis

The proposed site will have access via two new driveways, one on Perkins Drive and one on Old University Station Road. The proposed two-lane, two-way driveways should be sufficient to accommodate the site traffic as estimated for the proposed development.

5) Intersection Analysis

Sianal Warrant Analysis: A signal warrant analysis was performed at the unsignalized intersections of Weaver Dairy Road at Perkins Drive and Weaver Dairy Road at Banks Drive were analyzed to determine the need for a traffic signal at these locations. Of the eight signal warrants described in the Manual on Uniform Traffic Control Devices (MUTCD), the following two warrants were analyzed: Warrant 3: Peak Hour Vehicular Volume and Warrant 7: Crash Experience.

Weaver Dairy Road at Perkins Drive intersection:

Warrant 3: Peak Hour: The future build alternative traffic volumes for the intersection of Weaver Dairy Road and Perkins Drive were used to determine if this intersection meets the requirements for a traffic signal according to Warrant 3: Peak Hour. According to the MUTCD, the need for a traffic signal under the Peak Hour Warrant shall be considered if the minor street approach traffic volume is greater than 100 vph while the major street two-way volume is greater than 1500 vph. The 2007 Build Conditions traffic volumes show that the approach traffic volume on Perkins Drive during the evening peak hour is 264 vph

and the two-way volume on Weaver Dairy Road is 1522 vph. Based on this information, the conditions for Warrant 3: Peak Hour were met.

Warrant 7: Crash Experience: An analysis of Warrant 7 examined the accident history at the intersection of Weaver Dairy Road and Perkins Drive to determine if there were five or more accidents within a 12-month period that could be corrected by installation of a traffic signal. These "correctable" types of accidents consist mainly of turning accidents, but also include angle and running-off-the-road accidents.

The NCDOT accident records show only eight accidents at this intersection for the 44-month period from January 2000 through August 2003, a rate of two accidents per year. Based on this information, the conditions for Warrant 7 were not met.

Weaver Dairy Road at Banks Drive intersection:

Warrant 3: Peak Hour: The future build alternative traffic volumes for the intersection of Weaver Dairy Road and Banks Drive were used to determine if this intersection meets the requirements for a traffic signal according to Warrant 3: Peak Hour. According to the MUTCD, the need for a traffic signal under the Peak Hour Warrant shall be considered if the minor street approach traffic volume is greater than 115 vph while the major street two-way volume is greater than 1400 vph. The 2007 Build Conditions traffic volumes show that the approach traffic volume on Banks Drive during the evening peak hour is 175 vph and the two-way volume on Weaver Dairy Road is 1362 vph. Based on this information, the conditions for Warrant 3: Peak Hour were met.

Warrant 7: Crash Experience: An analysis of Warrant 7 examined the accident history at the intersection of Weaver Dairy Road and Perkins Drive to determine if there were five or more accidents within a 12-month period that could be corrected by installation of a traffic signal. These "correctable" types of accidents consist mainly of turning accidents, but also include angle and running-off-the-road accidents.

The NCDOT accident records show only four accidents at this intersection for the 44-month period from January 2000 through August 2003, a rate one accident per year. Based on this information, the conditions for Warrant 7 were not met.

Phasing Analysis: The intersections analyzed for this study have multi-phase signal controllers that can accommodate variations in traffic flow. According to this analysis, left-turning traffic demand on two approaches of the Airport Road and Weaver Dairy Road intersection continues to exceed their capacity. Re-timing the signal to reduce the green signal time for Airport Road through traffic by five seconds and increase the green time allocated to the other left-turning movements on Airport Road (southbound and northbound) would improve traffic flow.

With the proposed changes, all the left-turning movements at this intersection will flow at level of service E or better, an acceptable rate of traffic flow for left-turning traffic during the peak hour with one exception. The westbound left-turning traffic on Weaver Dairy Road will continue to experience long delays (level of service F) and demand will be at capacity (v/c ratio of 1.01) during the evening peak hour. The long delays are due to the relatively small amount of green signal time allocated to this movement. A v/c ratio of 1.0 is acceptable for left-turning movements during peak periods.

There are no improvements recommended for any of the other signalized intersections. A more detailed discussion of intersection improvements recommended for the intersection of Airport Road and Weaver Dairy Road is presented in Section I-Mitigation Measures of this report.

Accident Analysis: Accident data were obtained from the North Carolina Department of Transportation for the 44-month period (approximately 3 ½ years) from January 1, 2000 to August 31, 2003 for the locations most likely to be impacted by the proposed development. These locations include the following nine intersections and three roadway segments in the vicinity of the proposed development:

Intersections:
Airport Road at I-40 westbound ramps
Airport Road at I-40 eastbound ramps
Airport Road at Eubanks Road
Airport Road at Chapel Hill North Shopping Center Drive
Airport Road at Perkins Drive
Airport Road at Weaver Dairy Road
Weaver Dairy Road at Perkins Drive
Weaver Dairy Road at Banks Drive
Weaver Dairy Road at Old University Station Road

Roadway Segments:
Airport Road between Whitfiled Road to Westminster Drive
Weaver Dairy Road between Lonebrook Drive and Kingsberry Drive
Perkins Drive from Airport Road to Weaver Dairy Road

Table 2 presents the number of accidents by type in the study area.

Table 2:
Number of Accidents by Type
January 2000 - August 2003

	TOTAL	pear-end	Left-turn	Angle	Other*
Intersections					
Airport Road at I-40 westbound ramps	**20**	7	9	1	3
Airport Road at I-40 eastbound ramps	**19**	15		1	3
Airport Road at Eubanks Road	**18**	9	3	4	2
Airport Road at Chapel Hill North Shopping Center Drive	**2**				2
Airport Road at Perkins Drive	**7**	2	4		1
Airport Road at Weaver Dairy Road	**26**	12	9	3	2
Weaver Dairy Road at Perkins Drive	**11**	2	6	2	1
Weaver Dairy Road at Banks Drive	**6**	1	3	1	1
Weaver Dairy Road at Old University Station Road	**1**				1
Roadway Segments					
Airport Road between Whitfield Road and Westminster Drive	**120**	58	35	13	14
Weaver Dairy Road between Lonebrook Drive and Tymberlyne Road	**56**	17	21	8	10
Perkins Drive between Airport Road and Weaver Dairy Road	**16**	3	10	2	1

• *Other accidents include accidents caused by side-swipe, running-off the road, collisions with animal, parked vehicle, or pedestrian.*
Source: Collision Data, North Carolina Department of Transportation from January 1 2000 to August 31,2003

Overall, the accident data show that the travel conditions in the study area are fairly safe today except at the intersection of Airport Road with Weaver Dairy Road (120). The following is a brief summary of the accident conditions for the period from January 2000 through August 2003 at each of the nine intersections and the three roadway segments in the study area.

AirportRoad and I-40 westbound ramps

- The total number of accidents at this intersection is 20, a rate of five accidents per year.
- The highest number of accidents by type are rear-end collisions (7) and left-turning maneuvers (9).
- The primary causes of these accidents are the driver not allowing adequate stopping distance at the traffic signal and running red signals.

Airport Road and I-40 eastbound ramps

- The total number of accidents at this intersection is 19, a rate of five accidents per year.
- The highest number of accidents by type are rear-end accidents (15).
- The primary causes of these accidents are the driver not allowing adequate stopping distance at the traffic signal and running red signals.

Airport Road and Eubanks Road

- The total number of accidents at this intersection is 18, a rate of five accidents per year.
- The highest number of accidents by type are rear-end accidents (9), angle (4) and left-turning maneuvers (3).
- The primary causes of these accidents are the driver not allowing adequate stopping distance at the traffic signal and running red signals.

Airport Road and Chapel Hill North Shopping Center Drive

- The total number of accidents at this intersection is 2, a rate of fewer than one per year.
- The primary causes of these accidents are related to entering and exiting the shopping center driveway.
- The low accident rate indicates that currently there is no safety issue at the intersection of Airport Road with Chapel Hill North Shopping Center Drive.

Airport Road and Perkins Drive

- The total number of accidents at this intersection is 7, a rate of two accidents per year.
- The highest number of accidents by type are left-turning maneuvers (4) and rear-end accidents (2).
- The primary causes of these accidents are the driver running red signals.
- This low accident rate of less than two accidents per year indicates that the intersection operates safely under current conditions

Airport Road and Weaver Dairy Road

- The total number of accidents at this intersection is 26, a rate of seven accidents per year.
- The highest number of accidents by type are rear-end accidents (12), left-turning maneuvers (9) and angle (3).
- The primary causes of these accidents are the driver not allowing adequate stopping distance at the traffic signal and running red signals.
- The highest number of angle collisions (including left-turning collisions) indicates that the traffic signal at this intersection should be re-timed to provide more time for left-turning movements.

Weaver Dairy Road and Perkins Drive

- The total number of accidents at this intersection is 11, a rate of three accidents per year.
- The highest number of accidents by type are left-turning maneuvers (6), angle (2) and rear-end collisions (2).

- The primary cause of these accidents is left-turning maneuvers at the stop sign-controlled approach (southbound Perkins Drive).
- This low accident rate of less than three accidents per year indicates that the intersection operates safely under current conditions.

Weaver Dairy Road and Banks Drive

- The total number of accidents at this intersection is 6, a rate of two accidents per year.
- The highest number of accidents by type are left-turning maneuvers (3).
- This low accident rate of less than two accidents per year indicates that the intersection operates safely under current conditions

Weaver Dairy Road and Old University Station Road

- The total number of accidents at this intersection is 1, a rate of fewer than one per year.
- The primary cause of this accident is related to driveway maneuvers.
- The low accident rate indicates that currently there is no safety issue at the intersection of Weaver Diary Road at Old University Station Road.

Airport Road between Whitfield Road and Westminster Drive

- The total number of accidents for this segment is 126, which corresponds to a rate of 380 accidents per 100 million vehicle miles of travel per year. This crash rate is well below than the statewide average crash rate (552) for a four-lane, divided urban state highway with no control access.
- The highest number of accidents by type are rear-end accidents (58), left-turning maneuvers (35) and angle (13).
- The primary causes of these accidents are the drivers not allowing adequate stopping distance at the traffic signal and running red signals.
- The high number of angle collisions (including left-turning collisions) indicates that the traffic signals along Airport Road should be re-timed to provide more time for left-turning movements.

Weaver Dairy Road between Lonebrook Drive and Timberlyne Road

- The total number of accidents for this segment is 56, which corresponds to a rate of 15 accidents per year.
- The highest number of accidents by type are left-turning maneuvers (21), rear-end accidents (17), and angle (8).
- The primary causes of these accidents are the drivers not allowing adequate stopping distance.

Perkins Drive between Airport Road and Weaver Dairy Road

- The total number of accidents for this segment is 16, a rate of four accidents per year.
- The highest number of accidents by type are left-turning maneuvers (10).
- The primary causes of these accidents are the drivers not allowing adequate stopping distance.

Progression Analysis: The signals at the intersections along Airport Road were analyzed as isolated intersections using SYNCHRO. There are no signals on Weaver Dairy Road in the study area.

6) Peak Hour Intersection Level of Service

A comparison of the 2007 traffic flow conditions without the proposed project (the No Build Condition) to 2007 traffic flow conditions with the proposed project in place (the Build Condition) determines the impacts of the proposed project on the surrounding roadway network.

Airport Road at I-40 Westbound Ramps: Under the 2007 Build Condition, an analysis of the signalized intersection of Airport Road with I-40 westbound ramps indicates that the intersection as a whole will function at level of service C or better throughout the day, a good rate of traffic flow. There will be no significant changes from the current and the 2007 No Build traffic flow conditions at this intersection.

Airport Road at I-40 Eastbound Ramps: Under the 2007 Build Condition, an analysis of the signalized intersection of Airport Road with I-40 eastbound ramps indicates that the intersection as a whole will function at level of service B or better throughout the day, an excellent rate of traffic flow. There will be no significant changes from the current and the 2007 No Build traffic flow conditions at this intersection.

Airport Road at Eubanks Road: Under the 2007 Build Condition, an analysis of the signalized intersection of Airport Road with Eubanks Road indicates that the intersection as a whole will function at level of service C or better throughout the day, a good rate of traffic flow.

However, the left-turning traffic demand on Eubanks Road (eastbound) will continue to experience long delays (level of service E) during the morning and evening peak hours, but will flow at level of service D or better at other times of the day.

It appears from the Synchro analysis that the long delays for the left-turning movement on Eubanks Road are due to the long cycle length. Reducing the cycle length may affect the traffic flow conditions on Airport Road because the signals on Airport Road upstream and downstream of Eubanks Road are working as a coordinated network. It should also be noted that the Town Operations Center Traffic Impact Analysis report has recommended increasing the storage length for the eastbound left-turning movement. This would help to improve the traffic flow conditions on Eubanks Road without changing the cycle length.

Airport Road at Perkins Drive: Under the 2007 Build Condition, overall traffic demand will be at level of service B or better throughout the day, an excellent rate of traffic flow. An analysis of the signalized intersection of Airport Road with Perkins Drive indicates that the left-turning traffic demand on Perkins Drive (westbound) will continue to function at level of service E during all the time periods analyzed. However, because this delay is to left-turning vehicles, which are exiting the shopping center, it is considered an acceptable rate of traffic flow.

There will be no significant changes either from the current traffic flow conditions or the 2007 No Build traffic flow conditions in the overall intersection performance throughout the day.

Airport Road at Weaver Dairy Road: Under the 2007 Build Condition, an analysis of the signalized intersection of Airport Road with Weaver Dairy Road indicates that the overall intersection will flow at level of service D or better throughout the day.

However, as under the existing and the 2007 No Build Condition, traffic demand on several approaches at this intersection will continue to either approach or exceed capacity. The left-turning traffic demand on southbound Airport Road and westbound Weaver Dairy Road will continue to either approach or exceed capacity (level of service E of F) of those approaches during all the peak periods analyzed. The left-turning traffic demand on northbound Airport Road and eastbound Weaver Dairy Road will also continue to experience long delays (level of service E) during the morning and evening peak periods. Improvements at the intersection are clearly needed under the existing, 2007 No Build and 2007 Build Conditions.

Airport Road at Shopping Center Drive: Under the 2007 Build Condition at the intersection of Airport Road with Shopping Center Drive, traffic on the Shopping Center driveway will flow at level of service C or better throughout the day, a good rate of traffic flow.

Weaver Dairy Road at Perkins Drive: Under the 2007 Build Condition at the intersection of Perkins Drive and Weaver Dairy Road, the unsignalized capacity analysis indicates that the traffic demand on Perkins Drive will continue to experience long delays (level of service E or F) during all the time periods of the day analyzed.

With the increase in traffic demand on southbound Perkins Drive, the increase in delay over the 2007 No Build Conditions is 77 seconds during the evening peak period, 16 seconds during the midday peak period, and 3 seconds during the morning peak period. For Build conditions, the proposed project adds approximately 17 vehicles per hour exiting and 19 vehicle per hour entering Perkins Drive during the critical evening peak hour.

It should be noted that traffic turning either left or right onto Weaver Dairy Road from Perkins Drive should be able to take advantage of the gaps in the traffic stream created by the signals on Weaver Dairy Road on either side of the intersection. This intersection should be monitored to determine if delays to the traffic flow along Perkins Drive may warrant intersection improvements in the future.

Weaver Dairy Road at Banks Drive: Under the 2007 Build Condition at the intersection of Banks Drive and Weaver Dairy Road, the unsignalized capacity analysis indicates that right-turning traffic demand on Banks Drive will continue to operate at level of service B or better throughout the day. However, left-turning traffic on Banks Drive will continue to experience long delays (level of service E or F) during all the time periods of the day analyzed. This intersection should be monitored to determine if delays to the traffic flow along Banks Drive may warrant a traffic signal in the future.

Weaver Dairy Road at Old University Station Road: Under the 2007 Build Condition at the intersection of Weaver Dairy Road at Old University Station Road, traffic on Old University Station Road will flow at level of service D or better throughout the day, an acceptable rate of traffic flow for peak hour conditions.

7) Mitigation Measures/Recommendations

Regardless of whether the proposed project is built, improvements are required at the intersections of Airport Road at Weaver Dairy Road and Weaver Dairy Road at Perkins Drive.

Airport Road at Weaver Dairy Road: Under the Existing Conditions, 2007 No Build Conditions and 2007 Build Conditions, traffic demand on the southbound and northbound left-turning approaches will continue to either approach or exceed capacity. It is recommended that the green signal time for Airport Road through traffic be reduced by five seconds and reallocated to other left-turning movements on Airport Road (southbound and northbound).

This change in signal time will not significantly affect the through traffic demand on Airport Road and improves the travel and safety conditions for the left-turning traffic on Airport Road.

With the proposed changes, all the through movements at this intersection will flow at level of service D or better, with an exception of eastbound Weaver Dairy Road during the evening peak hour. The Traffic demand on eastbound Weaver Dairy Road continues to flow at level of service E during the evening peak period and level of service D or better throughout the day. However, during the critical evening peak hour, the analysis shows that the demand uses only 17 percent of the approach capacity (v/c ratio of 0.17).

All the left-turning movements at this intersection will flow at level of service E or better, an acceptable rate of traffic flow for left-turning traffic during the peak hour with one exception. The westbound left-turning traffic on Weaver Dairy Road will continue to experience long delays (level of service F) and demand will be at capacity (v/c ratio of 1.01) during the evening peak hour. The long delays are due to the relatively small amount of green signal time allocated to this movement. A v/c ratio of 1.0 is acceptable for left-turning movements during peak periods.

Weaver Dairy Road at Perkins Drive: Under the Existing Conditions, 2007 No Build Conditions and 2007 Build Conditions, traffic on southbound Perkins Drive experiences extremely long delays (level of service E or F). This study recommends the following two alternatives to resolve this issue:

Install a traffic signal at the intersection of Weaver Dairy Road at Perkins Drive, which will improve the traffic flow conditions for the traffic on the southbound Perkins Drive. However, the proposed traffic signal at this intersection may adversely affect the flow conditions along Weaver Dairy Road because the distance between the Airport Road/Weaver Dairy Road intersection and the Weaver Dairy Road/Perkins Drive intersection is only 500 feet. A signal warrant analysis summarized in Section 5-Intersection Analysis indicates that warrant 3: Peak Hour warrant would be met.

The second alternative is to re-align Perkins Drive to the intersection of Weaver Dairy Road at Banks Drive and install a traffic signal at this intersection. This alternative would better facilitate the traffic flow along Weaver Dairy Road, as the distance between the proposed signal at the intersection of Weaver Dairy Road/Banks Drive and the existing signal at the intersection of Airport Road/Weaver Dairy Road is approximately 750 feet. However, it is unclear how the right-of-way would be acquired on the north side of Weaver Dairy Road and who would be responsible for the roadway improvements.