Traffic Impact Study

Cagle Property Development
Copper Ridge Road
Knox County, Tennessee

00545-0007

September 21, 2006

Prepared for:
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EXECUTIVE SUMMARY

This report provides a summary of the traffic impact study that was performed for a proposed residential development to be located off Copper Ridge Road in Northwest Knox County. The project site is approximately one-half mile north of Emory Road (State Route 131) on the east side of Copper Ridge Road. The current plans for this proposed development provide for a maximum of 149 single family dwelling units at full build-out. The project entrance will be a new three-leg intersection on Copper Ridge Road located approximately one-half mile north of Emory Road.

A primary conclusion of this study is that the traffic generated by the proposed development will result in significant impacts on traffic operational conditions in the project area, especially at the intersection of Emory Road and Copper Ridge Road. The resulting recommendation is that consideration should be given to implementing possible improvements to the intersection of Emory Road and Copper Ridge Road, with the following issues being considered in determining improvement scope and responsibility:

1. An eastbound left-turn lane will be justified during both A.M. and P.M. peak hour traffic conditions as a result of this development. Such a lane is currently justified during existing P.M. peak hour conditions.
2. The southbound capacity analyses of unimproved year 2011 conditions identified level-of-service "E" conditions for only one peak hour, and with a value of only slightly worse than level-of-service "D" conditions. This provides very marginal justification for an additional southbound approach lane.
3. This entire stretch of Emory Road is generally without turn lanes, including other similar intersections which may possess similar or worse operational conditions.
4. Existing roadway right-of-way on both Emory Road and Copper Ridge Road at this intersection appear to be on the order of 50 feet, and are not under the control of the project developer.

Other traffic related issues evaluated for this project included corner sight distance for the proposed subdivision access roadway intersection with Copper Ridge Road, and the general width and condition of Copper Ridge Road between Emory Road and the project site. These evaluations concluded that corner sight distance requirements will be satisfied, and that although Copper Ridge Road is narrow, its width does meet or exceed the eighteen foot minimum required by Knox County.

INTRODUCTION AND PURPOSE OF STUDY

This report provides a summary of the traffic impact study that was performed for a proposed residential development to be located off Copper Ridge Road in Northwest Knox County. The project site is approximately one-half mile north of Emory Road (State Route 131) on the east side of Copper Ridge Road. FIGURE 1 is a location map that identifies the project site in relation to the roadways in the vicinity of the proposed development.

The current plans for this proposed subdivision development provide for a maximum of 149 single family dwelling units at full build-out. FIGURE 2 is a schematic drawing detailing the general configuration, primary access location, and evaluation areas for this project. The development entrance will be a new three-leg intersection on Copper Ridge Road located approximately one-half mile north of Emory Road.

The purpose of this study was the evaluation of the traffic operational and safety impact of the proposed development upon the adjacent portion of Copper Ridge Road. Of particular interest was the intersection of the site entrance roadway with Copper Ridge Road, as well as the intersection of Copper Ridge Road and Emory Road. This evaluation was performed assuming full build-out of all units of the subdivision, with existing and background growth conditions also evaluated for purposes of comparison.

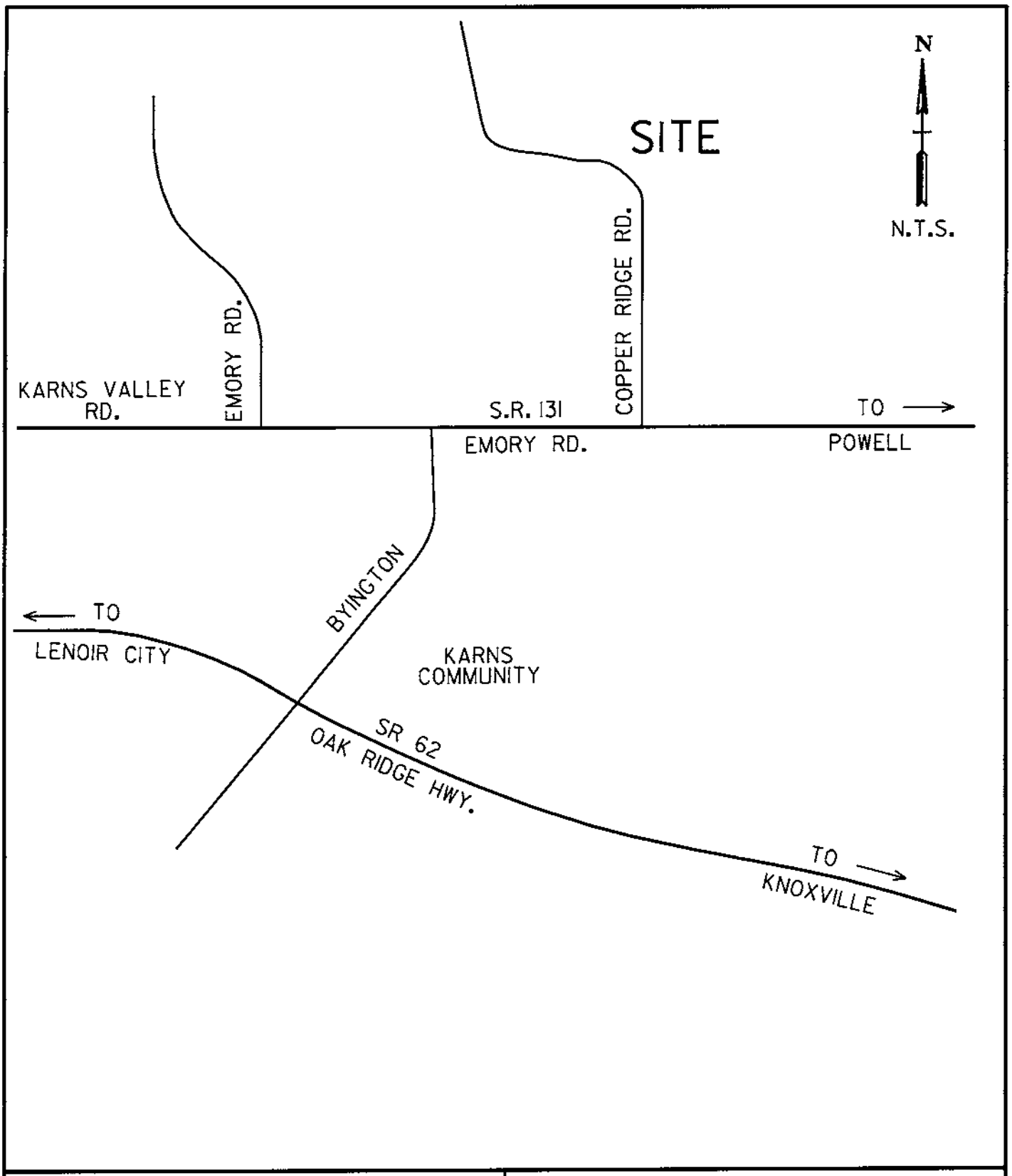

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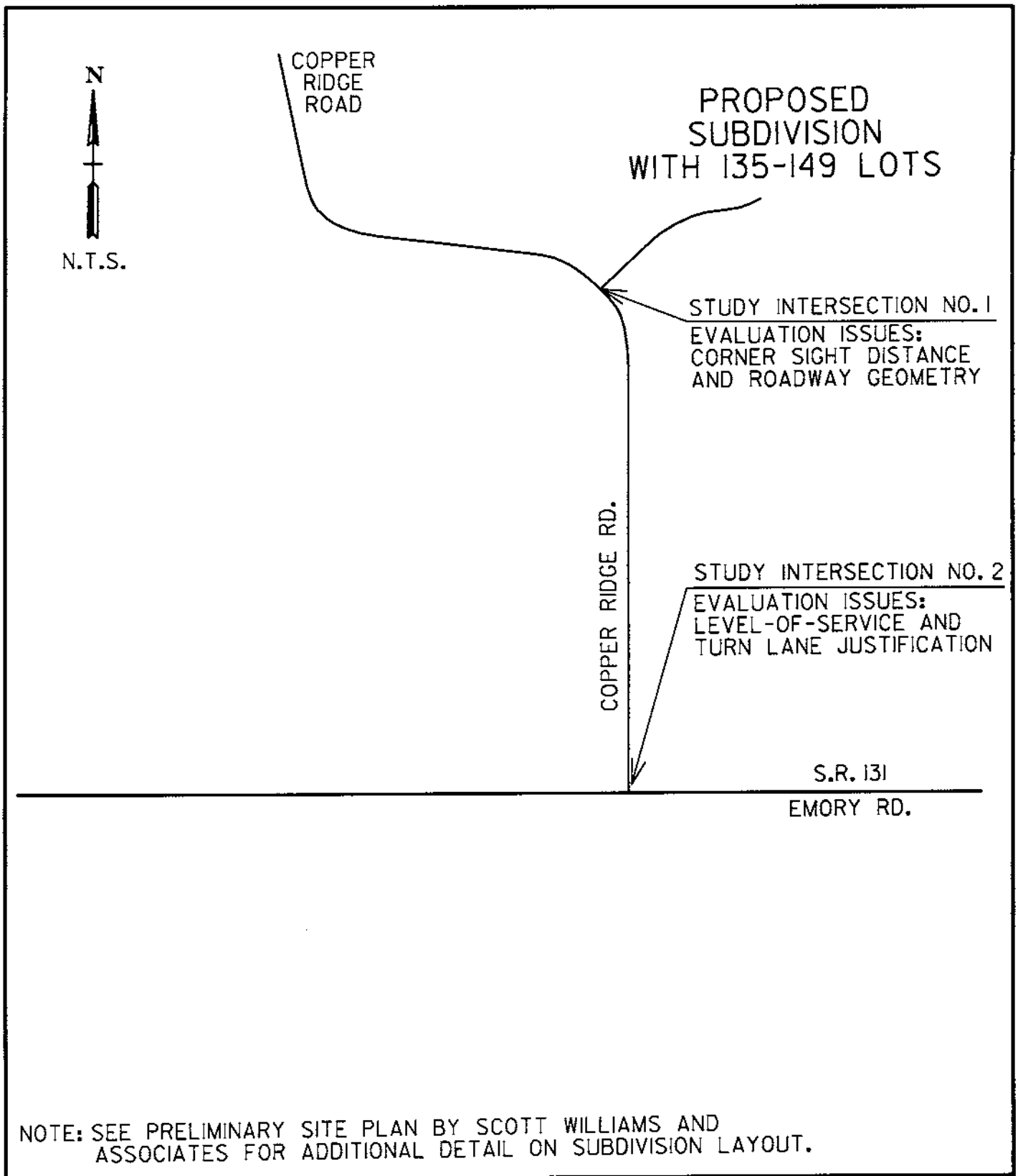
FIGURE 1
SITE LOCATION MAP

CAGLE PROPERTY DEVELOPMENT
TRAFFIC IMPACT STUDY



NOTE: SEE PRELIMINARY SITE PLAN BY SCOTT WILLIAMS AND ASSOCIATES FOR ADDITIONAL DETAIL ON SUBDIVISION LAYOUT.

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FIGURE 2
SITE ACCESS AND EVALUATION SCHEMATIC

CAGLE PROPERTY DEVELOPMENT
TRAFFIC IMPACT STUDY

Existing Roadway Conditions

Copper Ridge Road is a Local access roadway that is maintained by Knox County. The roadway pavement is approximately 20 feet in width, and is striped with a center double yellow line delineating two traffic lanes of approximately 8.5 to 9.0 feet. Minimal shoulders are located beyond the white pavement edgelines. The study section of Copper Ridge Road was constructed under older design standards, and thus possesses significant horizontal curvature and non-standard roadside ditches. The speed limit is not currently posted.

Existing Traffic Data

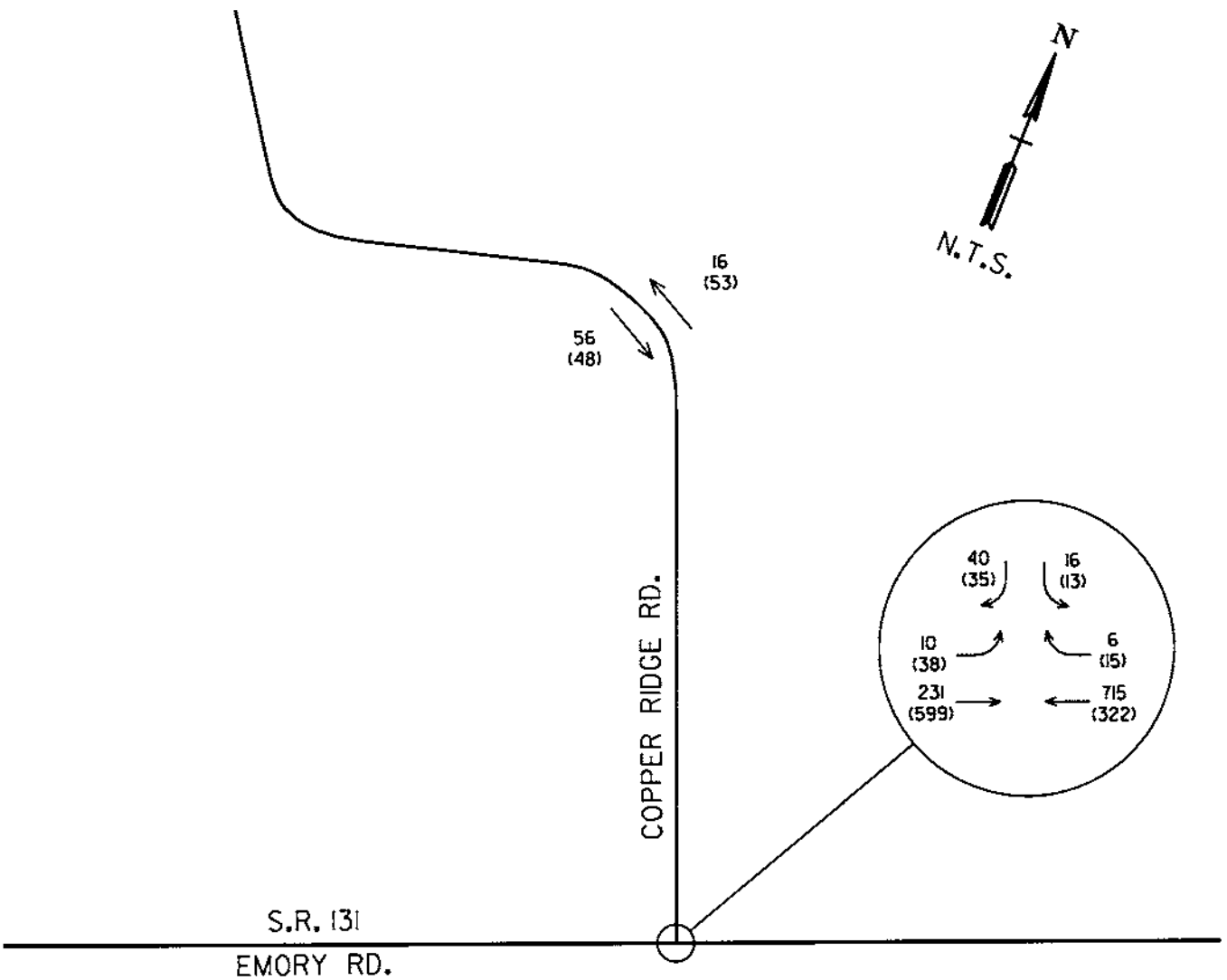
A traffic count station for collecting average daily traffic data (ADT) is located on Emory Road approximately three miles east of Copper Ridge Road. The most recent data from this station was provided by the Tennessee Department of Transportation, with resulting ADTs shown in TABLE 1.

TABLE 1
AVERAGE DAILY TRAFFIC COUNT SUMMARY

Count Year	EMORY ROAD WEST OF RIDGE FIELD DRIVE (TDOT STA. 047)
2006	8,872
2005	9,140
2004	8,467
2003	8,368
2002	7,948
2001	7,419

In order to collect more refined data, and to establish a basis for trip distribution patterns, turning movement traffic counts were collected at the existing three-leg intersection of Emory Road and Copper Ridge Road. These counts were conducted during the A.M. and P.M. peak traffic hours. Raw data count summaries are contained in the APPENDIX.

In addition to helping establish trip distribution patterns, these turning movement counts were used to establish the existing-background traffic volumes for this study, as displayed on FIGURE 3. These volumes are the count data adjusted to an average weekday basis using adjustment factors developed by the University of Tennessee Transportation Research Center (See APPENDIX).



LEGEND

XX - AM PEAK
(YY) - PM PEAK

NOTE:
THE DATA SHOWN ARE THE RAW TRAFFIC COUNT DATA TIMES A FACTOR TO ADJUST TO AN AVERAGE WEEKDAY VOLUME FROM COUNTS TAKEN IN SEPTEMBER. SEE APPENDIX FOR RAW COUNT DATA AND FACTOR TABLE. (FACTORS DEVELOPED BY THE UNIVERSITY OF TENNESSEE TRANSPORTAION RESEARCH CENTER).

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FIGURE 3
EXISTING BACKGROUND TRAFFIC DATA

CAGLE PROPERTY DEVELOPMENT
TRAFFIC IMPACT STUDY

Existing Level-of-Service Evaluation

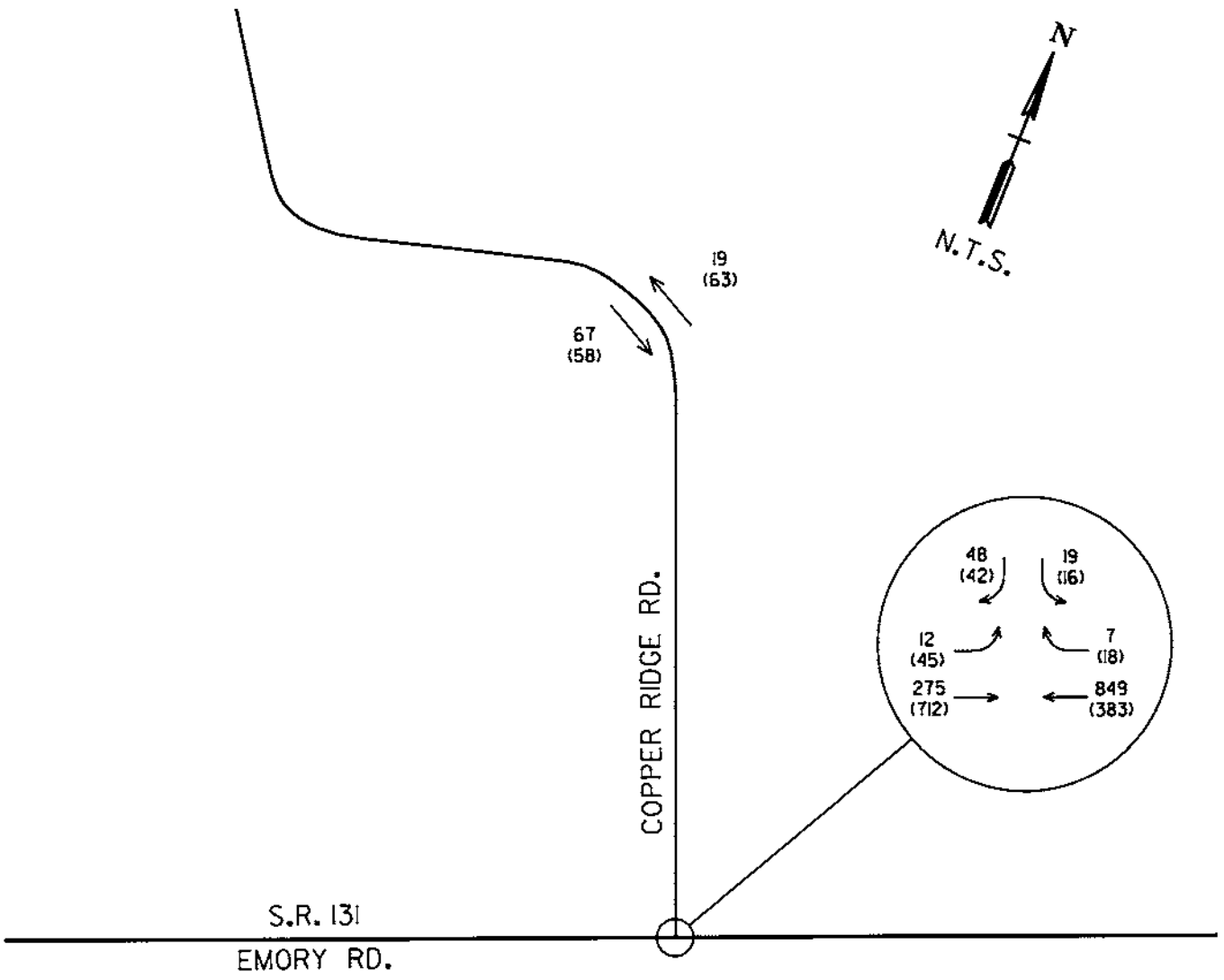
Intersection Capacity Analyses employing the methods of the Highway Capacity Manual (HCM 2000) were used to evaluate the intersection of Emory Road and Copper Ridge Road for the existing roadway and traffic conditions. This intersection was chosen as the most critical of the two study intersections from a capacity and level-of-service perspective. The results indicate that Emory Road traffic movements are currently operating at level-of-service "A" during both peak hours with Copper Ridge Road turning movements operating at a level-of-service "C" during the AM peak and "B" during the PM peak. These results are summarized in detail on the "Two Way Stop Control Summary" printouts contained in the APPENDIX. Also see the APPENDIX for a discussion of Intersection Capacity and Level of Service Concepts.

Background Traffic Growth

The anticipated time for full build-out of the Copper Ridge Road Development is estimated as 5 years, with the project beginning in 2006. Therefore, year 2011 was established as the appropriate design/analysis year for this study. In order to determine traffic volumes resulting solely from background traffic growth to year 2011, it was necessary to establish an annual growth rate for existing traffic. The ADT values given previously in TABLE 1, along with engineering judgment, were used to arrive at a rate of 3.5 percent for this development. FIGURE 4 contains the background traffic volumes that would result from this 3.5 percent annual growth to year 2011.

Background Level of Service Evaluation

Intersection Capacity Analyses employing the methods of the Highway Capacity Manual (HCM 2000) were used to evaluate the study intersection of Emory Road and Copper Ridge Road for the background (2011) traffic conditions, shown on FIGURE 4. The results indicate that Emory Road traffic movements would be expected to operate at level-of-service "A" during both peak hours and Copper Ridge Road movements would operate at a level-of-service "C" during both peak hours, if the proposed development is not constructed. These results are summarized in detail on the "Two-Way Stop Control Summary" printouts contained in the APPENDIX. Also see the APPENDIX for a discussion of intersection capacity and level-of-service concepts.



LEGEND

XX - AM PEAK
(YY) - PM PEAK

PROJECTION BASED ON 3.5% ANNUAL GROWTH. FULL BUILDOUT IN 2011.

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FIGURE 4
BACKGROUND TRAFFIC DATA (YEAR 2011)

CAGLE PROPERTY DEVELOPMENT
TRAFFIC IMPACT STUDY

Trip Generation

In order to estimate the expected traffic volumes to be generated by full build-out of the proposed development, the data and procedures of *Trip Generation, Seventh Edition* (Institute of Transportation Engineers, 2003) were utilized. The generated traffic volumes were determined based on the total weekday morning, and evening peak hour of adjacent street traffic trip generation rates for single-family detached housing (Land Use Code 210, Volume 2, pages 268 to 271). As noted earlier in this report, the anticipated maximum number of units upon full build-out is 149, which was used to determine the number of new trips generated. TABLE 2 summarizes the number and directional split of entering and exiting trips for the proposed development.

TABLE 2

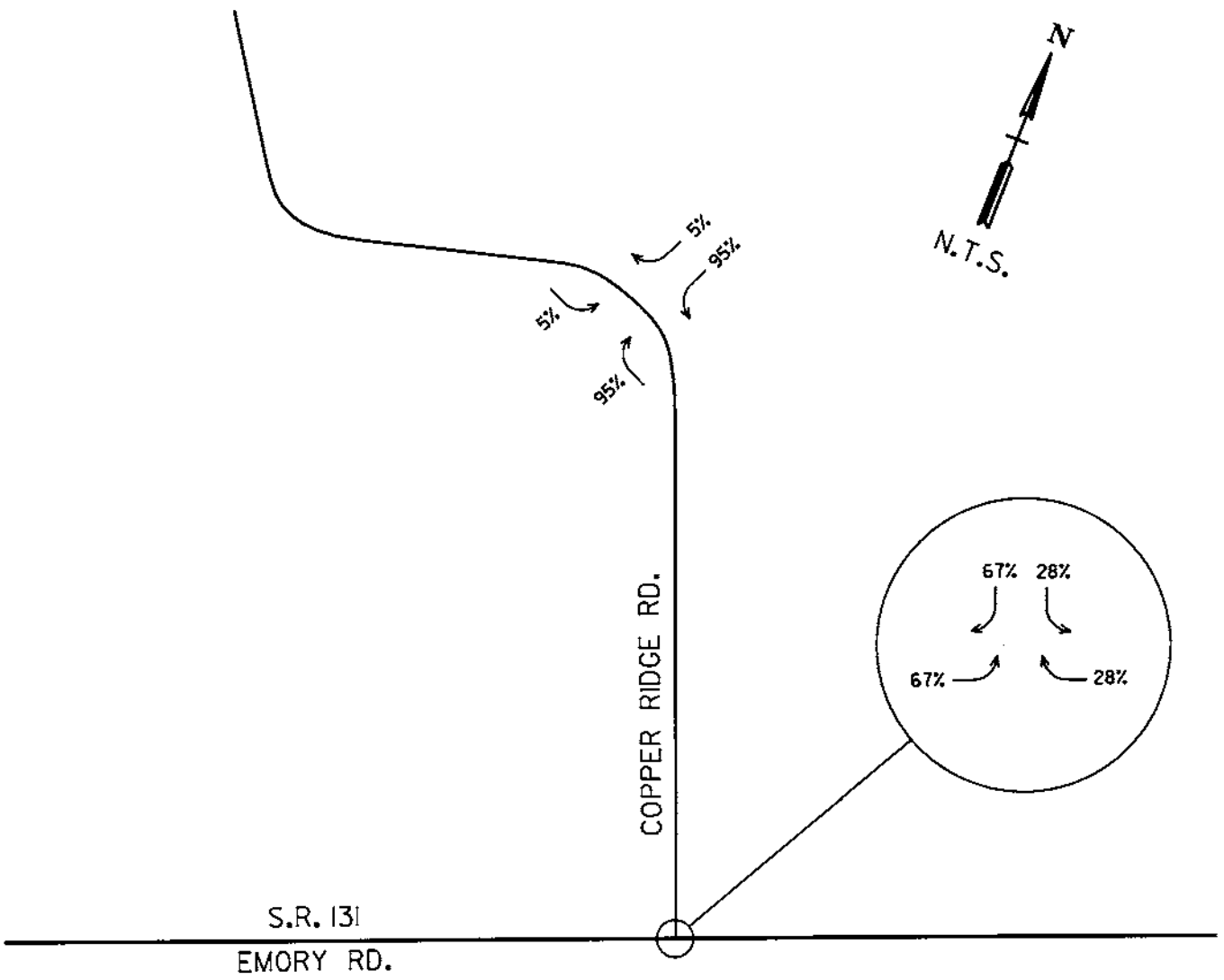
TRIP GENERATION SUMMARY

(RATES FOR SINGLE FAMILY DETACHED HOUSING – I.T.E. CODE 210)

SINGLE FAMILY DETACHED HOUSING – 88 UNITS					
	Total New Trips	% Entering	% Exiting	Number Entering	Number Exiting
Weekday	1426	50%	50%	713	713
A.M. Peak	112	25%	75%	28	84
P.M. Peak	151	63%	37%	95	56

Trip Distribution

FIGURE 5 provides a summary of the trip distribution patterns developed for the study intersections, which were derived from the existing traffic patterns. In addition, FIGURE 6 provides the generated traffic volumes as assigned to the local roadway network in accordance with these distribution patterns. FIGURE 7 shows the combined year 2011 volumes reflecting the existing traffic, the background traffic growth, and the newly generated traffic from the Copper Ridge Road Development. These are the volumes used in the analysis of full build-out conditions.



LEGEND

XX % - TRIP DISTRIBUTION PERCENT FOR A.M. AND P.M. PEAKS

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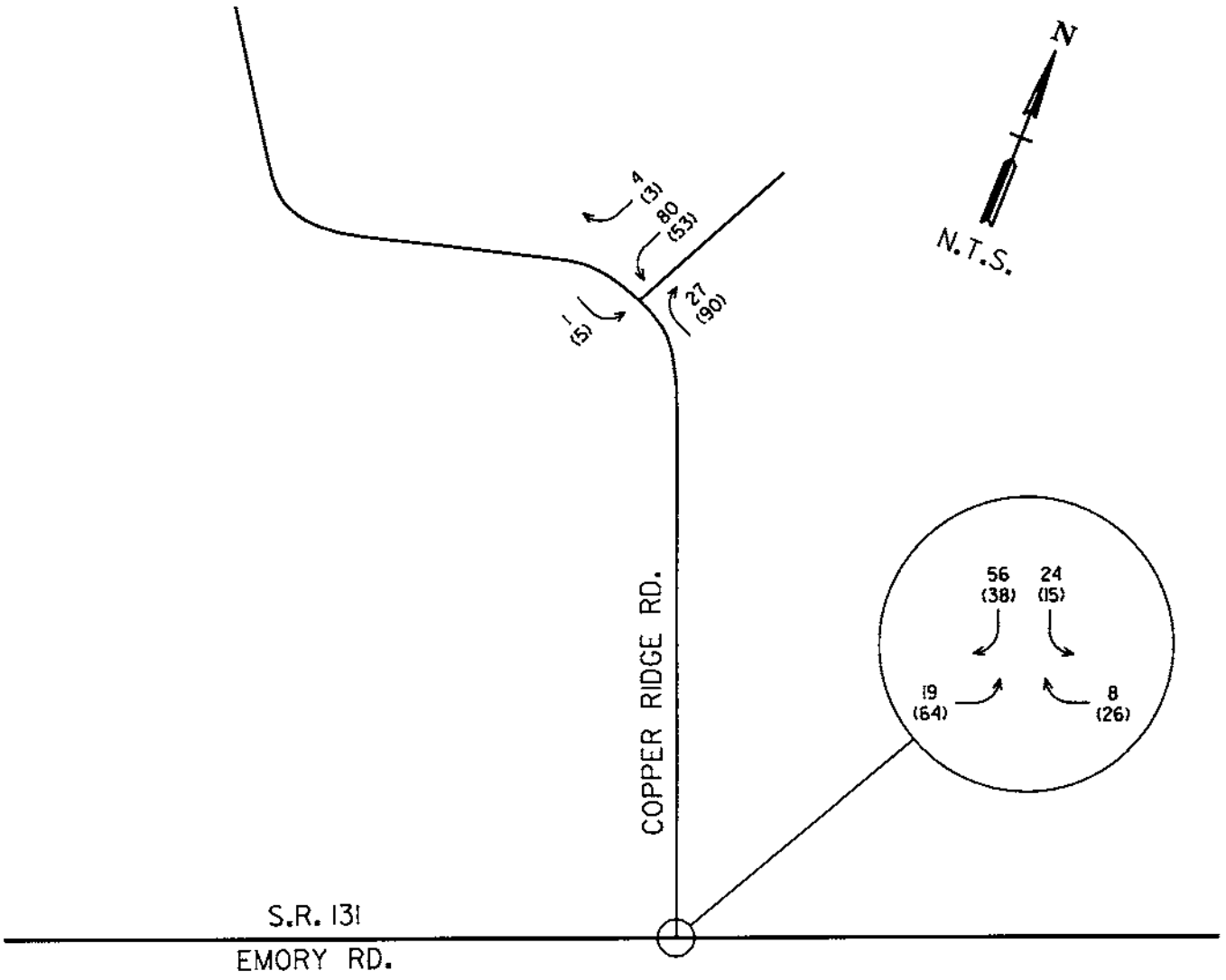
FIGURE 5
TRIP DISTRIBUTION PERCENTAGES

CAGLE PROPERTY DEVELOPMENT
TRAFFIC IMPACT STUDY



LEGEND

XX - A.M. TRIPS
(XX) - P.M. TRIPS

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FIGURE 6
TRIP ASSIGNMENT

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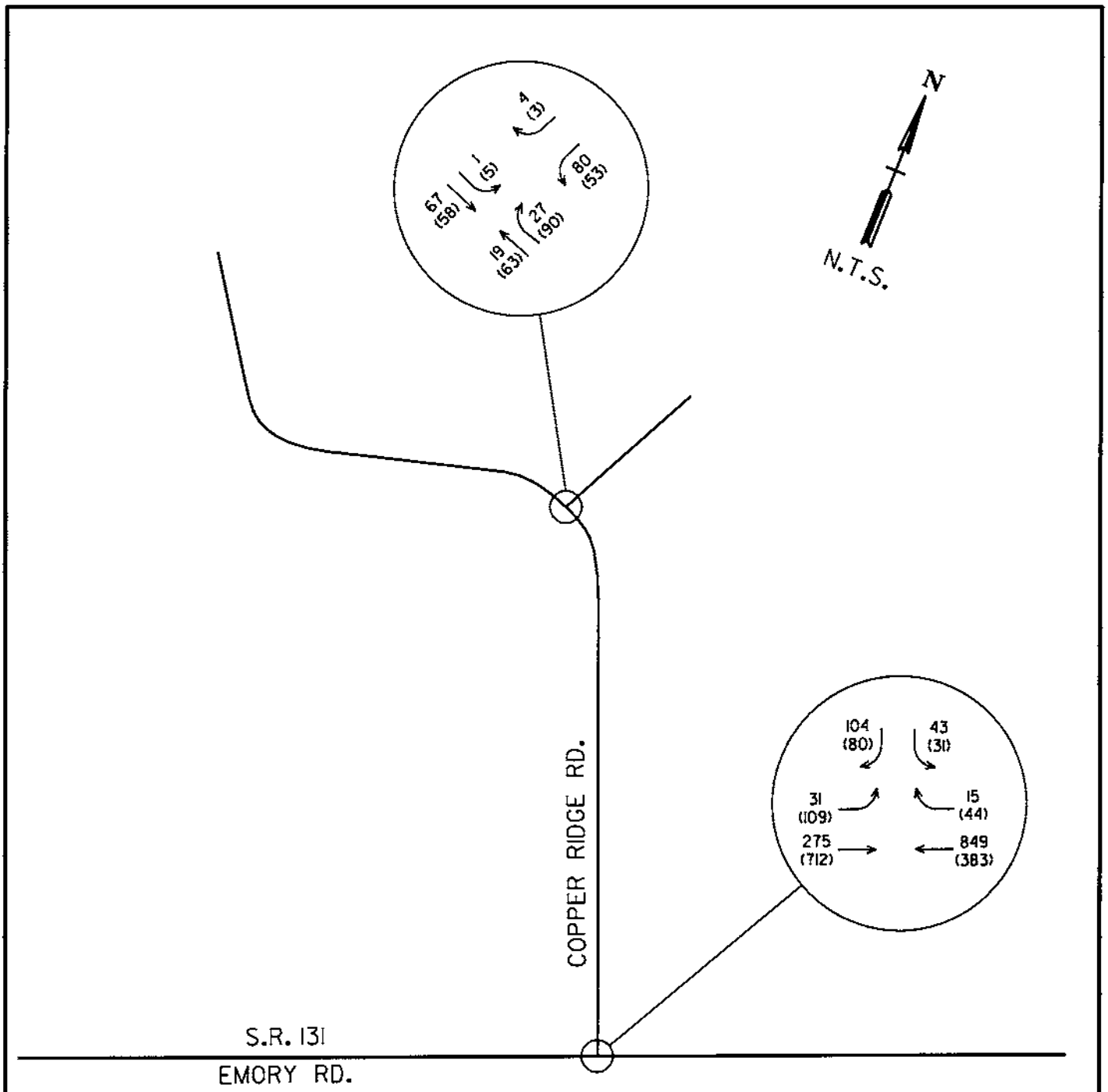
TRAFFIC IMPACT STUDY



VOLUME LEGEND

XX - A.M. VOLUMES
(XX) - P.M. VOLUMES

NOTE: VOLUMES SHOWN ARE PROJECTED FOR BUILD-OUT VOLUMES FOR YEAR 2011.

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FIGURE 7
COMBINED VOLUMES FOR ANALYSIS (YEAR 2011)

CAGLE PROPERTY DEVELOPMENT
TRAFFIC IMPACT STUDY

Proposed Level-of-Service Evaluation

Intersection Capacity Analyses employing the methods of the Highway Capacity Manual were used to evaluate the intersection of Emory Road and Copper Ridge Road, for the year 2011 combined traffic volume conditions (FIGURE 7). The results indicate that with existing intersection turn lane geometry, all traffic movements will be expected to operate at levels-of-service no worse than "C" during both peak hours, with the exception of the southbound movements which will operate at level-of-service "E" during the P.M. peak hours. These results are summarized in detail on the "Two-Way Stop Control Summary" printouts contained in the APPENDIX. Also see the next section for some additional discussion, including analyses of some possible intersection improvements. The APPENDIX may also be referenced for a discussion of intersection capacity and level-of-service concepts.

Intersection Sight Distance and Other Issues

A field review was conducted to identify any sight distance problems, geometric problems or other issues of concern that could impact the proposed development. The results of this review are summarized below:

1) Intersection Corner Sight Distance:

   The proposed project development entrance on Copper Ridge Road was evaluated for corner sight distance. This evaluation was based on an assumed 30 mph speed limit for Copper Ridge Road, which though not currently posted, would appear to be the appropriate value. Based on this assumed limit, the required minimum sight distance in accordance with Knox County regulations would be 300 feet. Field reviews indicate that this requirement will be met at this intersection, as available sight distance was measured as approximately 385 feet looking north and over 450 feet looking south.

2) Auxiliary Lanes for Proposed Development Intersection:

   Turn lane warrant analyses were conducted for the intersection of Emory Road and Copper Ridge Road under proposed development conditions. These analyses employed Tables 5A and 5B from the Knox County Access Control and Driveway Design Policy, which are based on turn lane warrants developed by Harmelink. The results were that an eastbound left-turn lane on Emory Road at Copper Ridge Road is expected to be warranted during both peak traffic hours. As a basis of comparison, existing traffic conditions were also analyzed, with the result that the eastbound left-turn lane currently satisfies warranting conditions for the P.M. peak. Copies of Tables 5A and 5B are located in the APPENDIX for review.

CONCLUSIONS AND RECOMMENDATIONS

A primary conclusion of this study is that the traffic generated by the proposed development will result in significant impacts on traffic operational conditions in the project area. Of particular concern is the existing intersection of Emory Road and Copper Ridge Road, through which the vast majority of traffic to this development will travel. The issues at this location include the fact that an eastbound left-turn lane will be clearly warranted during both A.M. and P.M. peak traffic hours, and during the P.M. peak hour the southbound traffic will experience level-of-service "E" operation. TABLE 3 summarizes all intersection capacity evaluations conducted for this study, including three possible improvement alternative scenarios.

TABLE 3
CAPACITY ANALYSES SUMMARY

EVALUATION CONDITION	LEVEL-OF-SERVICE (AVG. DELAY)	
	Southbound	Eastbound
Existing Background (2006) – AM	C (17.8)	A (9.3)
Existing Background (2006) - PM	B (13.4)	A (8.0)
Future Background (2011) – AM	C (22.8)	A (9.9)
Future Background (2011) – PM	C (15.6)	A (8.2)
Combined w/ Existing Lanes – AM	E (38.4)	B (10.1)
Combined w/ Existing Lanes – PM	C (21.0)	A (8.5)
Combined w/ EBLT Lane – AM	E (38.4)	B (10.1)
Combined w/ EBLT Lane – PM	C (21.0)	A (8.5)
Combined w/ SBRT Lane – AM	D (25.0+)*	B (10.1)
Combined w/ SBRT Lane – PM	C (18.0)*	A (8.5)
Combined w/ EBLT & SBRT – AM	D (25.0+)*	B (10.1)
Combined w/ EBLT & SBRT – PM	C (18.0)*	A (8.5)

* Southbound Breakdown by Lane:
AM – Left-turn lane – D(33.2), Right-turn lane – C(21.7)
PM – Left-turn lane – E(35.4), Right-turn lane – B(11.4)

The above issues and evaluations indicate that consideration should be given to possible improvements to the intersection of Emory Road and Copper Ridge Road. This study indicated that some justification exists for both an eastbound left-turn lane and a southbound second approach lane. It is recommended that the following factors be considered when determining the scope of actual improvements to be required and how responsibility for the improvements is to be assigned:

1. Although an eastbound left-turn lane is anticipated to be justified under full project build-out traffic conditions, it is noteworthy that such a lane is currently justified during existing P.M. peak hour conditions.
2. The southbound capacity analyses of unimproved full build-out conditions identified level-of-service "E" operation for only one peak hour, and with a value of only slightly worse than level-of-service "D" (LOS "D" is 35.0 sec. and below).
3. The entire stretch of Emory Road in the project area is generally without turn lanes, including other similar intersections which may possess similar or worse operational conditions.
4. Existing roadway right-of-way on both Emory Road and Copper Ridge Road at this intersection appear to be on the order of 50 feet, and are not under the control of the project developer.

Other traffic related issues evaluated for this project included corner sight distance for the proposed subdivision access roadway intersection with Copper Ridge Road, and the general width and condition of Copper Ridge Road between Emory Road and the project site. These evaluations concluded that corner sight distance requirements will be exceeded, and that although Copper Ridge Road is narrow, its width does not meet or exceed the eighteen feet minimum required by Knox County.

APPENDIX

Intersection Capacity and Level of Service Concepts

In a general sense, a roadway is similar to a pipeline or other material-carrying conduit in that it has a certain capacity for the amount of material (vehicles) that it can efficiently carry. As the number of vehicles in a given time period gradually increases, the quality of traffic flow gradually decreases. On roadway sections this results in increasing turbulence in the traffic stream, and at intersections it results in increasing stops and delay. As the volumes begin to approach the capacity of the facility, these problems rapidly magnify, with resulting serious levels of congestions, stops, delay, excess fuel consumption, pollutant emissions, etc.

The Federal Highway Administration has published the Year 2000 Highway Capacity Manual (HCM2000), which establishes theoretical techniques to quantify the capacity conditions on all types of roadways, intersections, ramps, pedestrian facilities, etc. A basic concept that is applicable to most of these techniques is the idea of level of service (LOS). This concept establishes a rating system that quantifies the quality of traffic flow, as perceived by motorists and/or passengers. The general system is similar to a school grade scale, and is outlined as follows:

Level of Service(LOS)	General Quality of Traffic Flow	Description of Corresponding Conditions
A	Excellent	Roadways – Free flow, high maneuverability Intersections – Very few stops, very low delay
B	Very Good	Roadways – Free flow, slightly lower maneuverability Intersections – Minor stops, low delay
C	Good	Roadways – Stable flow, restricted maneuverability Intersections – Significant stops, significant delay
D	Fair	Roadways – Marginally stable flow, congestion seriously restricts maneuverability Intersections – High stops, long but tolerable delay
E	Poor	Roadways – Unstable flow*, lower operating speeds, congestion severely restricts maneuverability Intersections – All vehicles stop, very long queues and very long intolerable delay
F	Very Poor	Roadways – Forced flow, stoppages may be lengthy, congestion severely restricts maneuverability Intersections – All vehicles stop, extensive queues and extremely long intolerable delay

*Unstable flow is such that minor fluctuations or disruptions can result in rapid degradation to LOS F.

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Intersection: Emory Rd @ Copper Ridge
Date: 8/31/06
Weather: rainy
Counted By: SQ

File Name : 00545-0007 - emory copper_ridge
Site Code : 05450007
Start Date : 08/31/2006
Page No : 1

Groups Printed- Unshifted

	COPPER RIDGE Southbound					EMORY Westbound					COPPER RIDGE Northbound					EMORY Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00 AM	2	0	11	0	13	0	161	1	0	162	0	0	0	0	0	1	46	0	0	47	222
07:15 AM	3	0	10	0	13	0	209	1	0	210	0	0	0	0	0	1	57	0	0	58	281
07:30 AM	6	0	9	0	15	0	195	2	0	197	0	0	0	0	0	5	62	0	0	67	279
07:45 AM	5	0	11	0	16	0	164	2	0	166	0	0	0	0	0	3	70	0	0	73	255
Total	16	0	41	0	57	0	729	6	0	735	0	0	0	0	0	10	235	0	0	245	1037
08:00 AM	4	0	9	0	13	0	139	1	0	140	0	0	0	0	0	2	48	0	0	50	203
08:15 AM	2	0	6	0	8	0	104	0	0	104	0	0	0	0	0	3	57	0	0	60	172
08:30 AM	1	0	8	0	9	0	121	1	0	122	0	0	0	0	0	2	46	1	0	49	180
08:45 AM	2	0	7	0	9	0	79	0	0	79	0	0	0	0	0	5	44	0	0	49	137
Total	9	0	30	0	39	0	443	2	0	445	0	0	0	0	0	12	195	1	0	208	692
---BREAK---																					
04:00 PM	2	0	6	0	8	0	67	3	0	70	0	0	0	0	0	8	127	0	0	135	213
04:15 PM	4	0	4	0	8	0	64	3	0	67	0	0	0	0	0	17	128	0	0	145	220
04:30 PM	3	0	5	0	8	0	61	6	0	67	0	0	0	0	0	8	119	0	0	127	202
04:45 PM	3	0	2	0	5	0	46	6	0	52	0	0	0	0	0	12	139	0	0	151	208
Total	12	0	17	0	29	0	238	18	0	256	0	0	0	0	0	45	513	0	0	558	843
05:00 PM	1	0	8	0	9	0	64	1	0	65	0	0	0	0	0	10	160	0	0	170	244
05:15 PM	0	0	9	0	9	0	71	3	0	74	0	0	0	0	0	10	173	0	0	183	266
05:30 PM	9	0	5	0	14	0	92	7	0	99	0	0	0	0	0	12	142	0	0	154	267
05:45 PM	3	0	14	0	17	0	101	4	0	105	0	0	0	0	0	7	136	0	0	143	265
Total	13	0	36	0	49	0	328	15	0	343	0	0	0	0	0	39	611	0	0	650	1042
Grand Total	50	0	124	0	174	0	1738	41	0	1779	0	0	0	0	0	106	1554	1	0	1661	3614
Apprch %	28.7	0.0	71.3	0.0		0.0	97.7	2.3	0.0		0.0	0.0	0.0	0.0		6.4	93.6	0.1	0.0		
Total %	1.4	0.0	3.4	0.0	4.8	0.0	48.1	1.1	0.0	49.2	0.0	0.0	0.0	0.0	0.0	2.9	43.0	0.0	0.0	46.0	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: AM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2006 Existing
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	10	231			715	6
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	10	251			777	6
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	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				16		40
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				17		43
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
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)	10						60	
C(m) (vph)	844						341	
v/c	0.01						0.18	
95% queue length	0.04						0.63	
Control Delay	9.3						17.8	
LOS	A						C	
Approach Delay							17.8	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: PM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2006 Existing
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	38	599			322	15
Peak-Hour Factor, PHF	0.98	0.98			0.98	0.98
Hourly Flow Rate, HFR	38	611			328	15
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	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				13		35
Peak Hour Factor, PHF				0.98		0.98
Hourly Flow Rate, HFR				13		35
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
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)	38						48	
C(m) (vph)	1227						479	
v/c	0.03						0.10	
95% queue length	0.10						0.33	
Control Delay	8.0						13.4	
LOS	A						B	
Approach Delay							13.4	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: AM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Background w/out Dev.
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	12	275			849	7
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	13	298			922	7
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	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				19		48
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				20		52
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
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)	13						72	
C(m) (vph)	744						273	
v/c	0.02						0.26	
95% queue length	0.05						1.03	
Control Delay	9.9						22.8	
LOS	A						C	
Approach Delay							22.8	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: PM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Background w/out Dev.
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	45	712			383	18
Peak-Hour Factor, PHF	0.98	0.98			0.98	0.98
Hourly Flow Rate, HFR	45	726			390	18
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	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				16		42
Peak Hour Factor, PHF				0.98		0.98
Hourly Flow Rate, HFR				16		42
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
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)	45						58	
C(m) (vph)	1162						396	
v/c	0.04						0.15	
95% queue length	0.12						0.51	
Control Delay	8.2						15.6	
LOS	A						C	
Approach Delay							15.6	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: AM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Combined Volumes
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007 w/ Existing Lanes
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	31	275			849	15
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	33	298			922	16
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	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				43		104
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				46		113
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
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)	33						159	
C(m) (vph)	739						260	
v/c	0.04						0.61	
95% queue length	0.14						3.66	
Control Delay	10.1						38.4	
LOS	B						E	
Approach Delay							38.4	
Approach LOS							E	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: PM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Combined Volumes
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007 w/Existing Lanes
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	109	712			383	44
Peak-Hour Factor, PHF	0.98	0.98			0.98	0.98
Hourly Flow Rate, HFR	111	726			390	44
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	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				31		80
Peak Hour Factor, PHF				0.98		0.98
Hourly Flow Rate, HFR				31		81
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
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)	111						112	
C(m) (vph)	1136						336	
v/c	0.10						0.33	
95% queue length	0.32						1.43	
Control Delay	8.5						21.0	
LOS	A						C	
Approach Delay							21.0	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: AM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Combined Volumes
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007 w/EBLT Lane
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	31	275			849	15
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	33	298			922	16
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	1	1			1	0
Configuration	L	T				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				43		104
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				46		113
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
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	L						LR	
v (vph)	33						159	
C(m) (vph)	739						260	
v/c	0.04						0.61	
95% queue length	0.14						3.66	
Control Delay	10.1						38.4	
LOS	B						E	
Approach Delay							38.4	
Approach LOS							E	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: PM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Combined Volumes
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007 w/EBLT Lane
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	109	712			383	44
Peak-Hour Factor, PHF	0.98	0.98			0.98	0.98
Hourly Flow Rate, HFR	111	726			390	44
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	1	1			1	0
Configuration	L	T				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				31		80
Peak Hour Factor, PHF				0.98		0.98
Hourly Flow Rate, HFR				31		81
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
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	L						LR	
v (vph)	111						112	
C(m) (vph)	1136						336	
v/c	0.10						0.33	
95% queue length	0.32						1.43	
Control Delay	8.5						21.0	
LOS	A						C	
Approach Delay							21.0	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: AM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Combined Volumes
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007 w/EBLT and SBRT lanes
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	31	275			849	15
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	33	298			922	16
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	1	1			1	0
Configuration	L	T				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				43		104
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				46		113
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L					L		R
v (vph)	33					46		113
C(m) (vph)	739					173		327
v/c	0.04					0.27		0.35
95% queue length	0.14					1.02		1.50
Control Delay	10.1					33.2		21.7
LOS	B					D		C
Approach Delay							25.0+	
Approach LOS							D	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: PM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Combined Volumes
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007 w/ EBLT and SBRT lanes
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	109	712			383	44
Peak-Hour Factor, PHF	0.98	0.98			0.98	0.98
Hourly Flow Rate, HFR	111	726			390	44
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	1	1			1	0
Configuration	L	T				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				31		80
Peak Hour Factor, PHF				0.98		0.98
Hourly Flow Rate, HFR				31		81
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L					L		R
v (vph)	111					31		81
C(m) (vph)	1136					149		644
v/c	0.10					0.21		0.13
95% queue length	0.32					0.75		0.43
Control Delay	8.5					35.4		11.4
LOS	A					E		B
Approach Delay							18.0	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: AM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Combined Volumes
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	31	275			849	15
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	33	298			922	16
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	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				43		104
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				46		113
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	33					46		113
C(m) (vph)	739					173		327
v/c	0.04					0.27		0.35
95% queue length	0.14					1.02		1.50
Control Delay	10.1					33.2		21.7
LOS	B					D		C
Approach Delay							25.0+	
Approach LOS							D	

HCS+: Unsignalized Intersections Release 5.2

TWO-WAY STOP CONTROL SUMMARY

Analyst: RCB
Agency/Co.: Cannon & Cannon
Date Performed: 9/11/2006
Analysis Time Period: PM
Intersection: Emory Rd at Copper Ridge Rd
Jurisdiction: Knox County
Units: U. S. Customary
Analysis Year: 2011 Combined Volumes
Project ID: Cagle Property / Copper Ridge Road TIS - 545-0007
East/West Street: Emory Rd
North/South Street: Copper Ridge Rd
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	109	712			383	44
Peak-Hour Factor, PHF	0.98	0.98			0.98	0.98
Hourly Flow Rate, HFR	111	726			390	44
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	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				31		80
Peak Hour Factor, PHF				0.98		0.98
Hourly Flow Rate, HFR				31		81
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	111					31		81
C(m) (vph)	1136					149		644
v/c	0.10					0.21		0.13
95% queue length	0.32					0.75		0.43
Control Delay	8.5					35.4		11.4
LOS	A					E		B
Approach Delay							18.0	
Approach LOS							C	

SR 131 (Emory Road) at Copper Ridge Road
Eastbound Left-turn Lane Warrant Assessment

TABLE 5A

LEFT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

(If the left-turn volume exceeds the table value a left -turn lane is needed)

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149 150 - 199	250 200	180 140	140 105	110 90	80 70	70 60
200 - 249 250 - 299	160 130	115 100	85 75	75 65	65 60	55 50
300 - 349 350 - 399	110 100	90 80	70 65	60 55	55 50	45 40
400 - 449 450 - 499	90 80	70 65	60 55	50 45	45 40	35 30
500 - 549 550 - 599	70 65	60 55	45 40	35 35	35 30	25 25
600 - 649 650 - 699	60 55	45 35	35 35	30 30	25 25	25 20
700 - 749 750 or More	50 45	35 35	(30) 1 25	25 (25) 3	20 20	20 20

OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	=/ > 600
100 - 149 150 - 199	70 60	60 55	50 45	45 40	40 35	35 30
200 - 249 250 - 299	55 50	50 45	40 35	35 30	30 30	30 30
300 - 349 350 - 399	45 40	40 35	35 30	30 25	(25) 2 25	25 20
400 - 449 450 - 499	35 30	30 25	30 25	25 20	20 20	(20) 4 20
500 - 549 550 - 599	25 25	25 20	20 20	20 20	20 20	15 15
600 - 649 650 - 699	25 20	20 20	20 20	20 20	20 20	15 15
700 - 749 750 or More	20 20	20 20	20 20	15 15	15 15	15 15

* Or through volume only if a right-turn lane exists

1 - Existing (2006) A.M. Peak - Volume = 10, Required = 30 - Not Warranted

2 - Existing (2006) P.M. Peak - Volume = 38, Required = 25 - Warranted

3 - Combined (2011) A.M. Peak - Volume = 31, Required = 25 - Warranted

4 - Combined (2011) P.M. Peak - Volume = 109, Required = 20 - Warranted

SR 131 (Emory Rd.) at Copper Ridge Road
Westbound Right-turn Lane Warrant Assessment

TABLE 5B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25 25 - 49 50 - 99						*
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25 25 - 49 50 - 99				Yes	Yes Yes	* Yes Yes
100 - 149 150 - 199		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
200 - 249 250 - 299	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
300 - 349 350 - 399	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

* Or through volume only if a left-turn lane exists.

* The above based on Combined (2011) Traffic (Full build-out)

Conclusion - Westbound Right-turn lane NOT Warranted.