

# **AUBREY'S RESTAURANT**

**Traffic Impact Study  
E Emory Road (S.R. 131)  
Knoxville, TN**

## **A Traffic Impact Study for the Proposed Aubrey's Restaurant**

Submitted to

### **Knoxville – Knox County Metropolitan Planning Commission**

Revised December 16, 2016  
November 10, 2016  
FMA Project No. 270.115

Submitted By:



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3	SIGNAL TIMING
4	INTERSECTION WORKSHEETS – BACKGROUND AM/PM PEAKS + FULL BUILDOUT

## REFERENCES

1. "Emory View Development Traffic Impact Study," Cannon & Cannon, Inc. Project No. 01253-0000, Revised August 1, 2016.
2. "Kroger Store – GA 670 and Retail Development Traffic Impact Study," CDM Smith Project No. 107296, Revised January 26, 2015.

## **Executive Summary**

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A proposed Aubrey's Restaurant is located in the Powell community on E Emory Road within the City of Knoxville. The project site is located on the south side of E Emory Road near the intersection of E Emory Road and Interstate 75. The restaurant development will consist of 7,250 square feet of floor area and a 1,685 square foot patio for a total combined 8,935 square feet. Construction is expected to take place this year. Full buildout was assumed to be the year 2020 as described in the referenced studies for the surrounding area developments.

The driveway for the proposed Aubrey's Restaurant will connect to the existing Kroger Driveways. Traffic for the proposed Aubrey's Restaurant is expected to enter and exit at the intersection of the Kroger signalized driveway and E Emory Road (S.R. 131). The proposed site layout is shown in Figure 2.

In order to maintain or provide an acceptable level-of-service for each of the intersections studied, some recommendations are presented.

### **Kroger Signalized Driveway @ E Emory Road**

The existing signal timing provided by Knox County was used in the LOS analysis. During the PM peak hour the intersection will operate at an overall LOS D. The northbound double left turn lane will operate at a LOS E and the westbound left turn lane will operate at a LOS D. FMA recommends that the signal timing be re-evaluated after the construction of the southbound intersection approach is complete along with the construction of the Emory View Development and the Aubrey's Restaurant.

### **Blueberry Road @ E Emory Road**

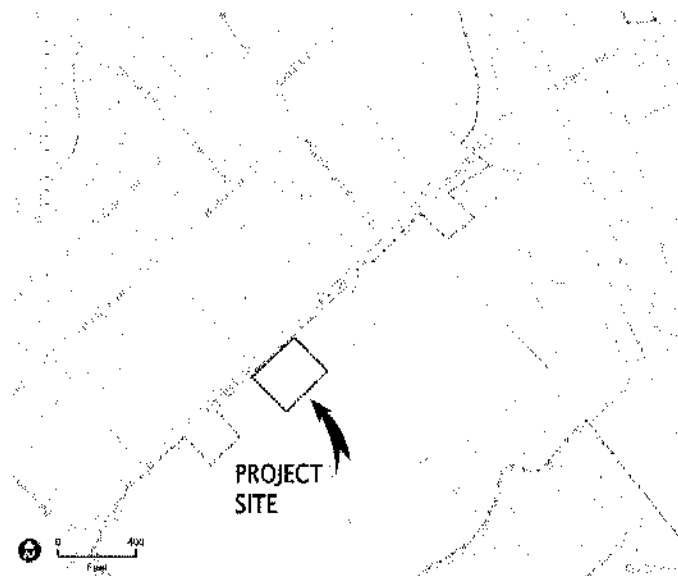
The Aubrey's Restaurant will result in a slight increase in through traffic on E Emory Road during the PM peak hour. The intersection will continue to operate at an acceptable average LOS C during the PM peak hour with the highest delay on the southbound approach at a LOS D after the completion of the Aubrey's Restaurant.

# 1 Introduction

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## 1.1 Project Description

This report provides a summary of a traffic impact study that was performed for the proposed Aubrey's Restaurant on E Emory Road in the Powell community and within the City of Knoxville limits. The existing Blueberry Road is owned and maintained by Knox County as well as the existing signals at Central Avenue Pike and E Emory Road and the Kroger Driveway and E Emory Road. E Emory Road is owned and maintained by the Tennessee Department of Transportation (TDOT). The project site is located on the south side of E Emory Road east of the intersection of E Emory Road and Interstate I-75. The location of the site is shown in Figure 1.



**Figure 1**  
Location Map – Not to Scale

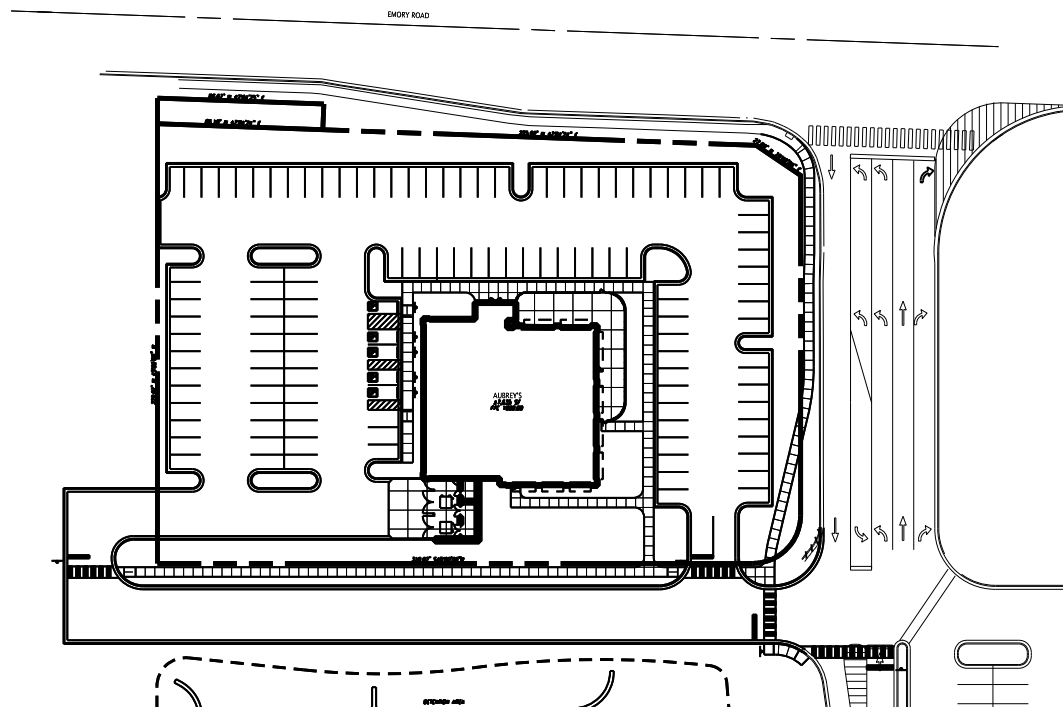
The proposed Aubrey's Restaurant will consist of 8,935 square feet of floor area including the 1,685 square foot patio. Full Buildout is expected to occur by the year 2020. The proposed site layout is shown in Figure 2.

The purpose of this study is to evaluate the impacts to the traffic conditions caused by the development of the proposed restaurant.



FIGURE 2

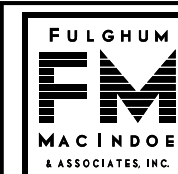
E EMORY RD (S.R. 131)



Project	270.115	Proj. Mgr.		Designed By	Drawn By	Reference	
Date	12/05/16		ISSUED FOR REVIEW				11/10/16
Scale	N.T.S.			REVISED PER MPC / KNOX COUNTY COMMENTS			
Sheet							
FIGURE 2 PAGE 5	No.	Revision/Issue					Date

SITE PLAN

AUBREY'S POWELL  
KNOXVILLE, TN



10330 HARDIN VALLEY ROAD  
SUITE 201  
KNOXVILLE, TN 37932  
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FAX: 865.690.6448  
www.fulghummacindoe.com

## **1.2 Existing Site Conditions**

The driveway for the proposed Aubrey's Restaurant will connect to the existing Kroger Driveways. Traffic for the proposed Aubrey's Restaurant is expected to enter and exit at the intersection of the existing Kroger signalized driveway and E Emory Road (S.R. 131).

E Emory Road (S.R. 131) is a five-lane road with a center two-way left turn lane. The Knoxville-Knox County Metropolitan Planning Commission classifies E Emory Road as a major arterial per the Major Road Plan. The posted speed limit on E Emory Road is 40 mph. The 2015 ADT at the TDOT count station on E Emory Rd was 18,301.

Blueberry Road is a local two-lane street and has a posted speed limit of 25 mph. The intersection of Blueberry Road and E Emory Road north of E Emory Road is stop controlled. Traffic entering and exiting the Kroger Development is controlled by a right turn lane on E Emory Road and a right-out only lane configuration and is lined up directly across from the intersection of Blueberry Road and E Emory Road.

## **2 Existing Traffic Volumes**

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Cannon & Cannon, Inc. conducted a four-hour turning movement count at the intersection of Blueberry Road and E Emory Road on Tuesday May 17, 2016. The count data is shown in the appendix of the Emory View Development Traffic Impact Study revised August 1, 2016. The AM peak hour occurred between 7:00 am and 8:00 am and the PM peak hour occurred between 4:45 pm and 5:45 pm.

## **3 Background Growth**

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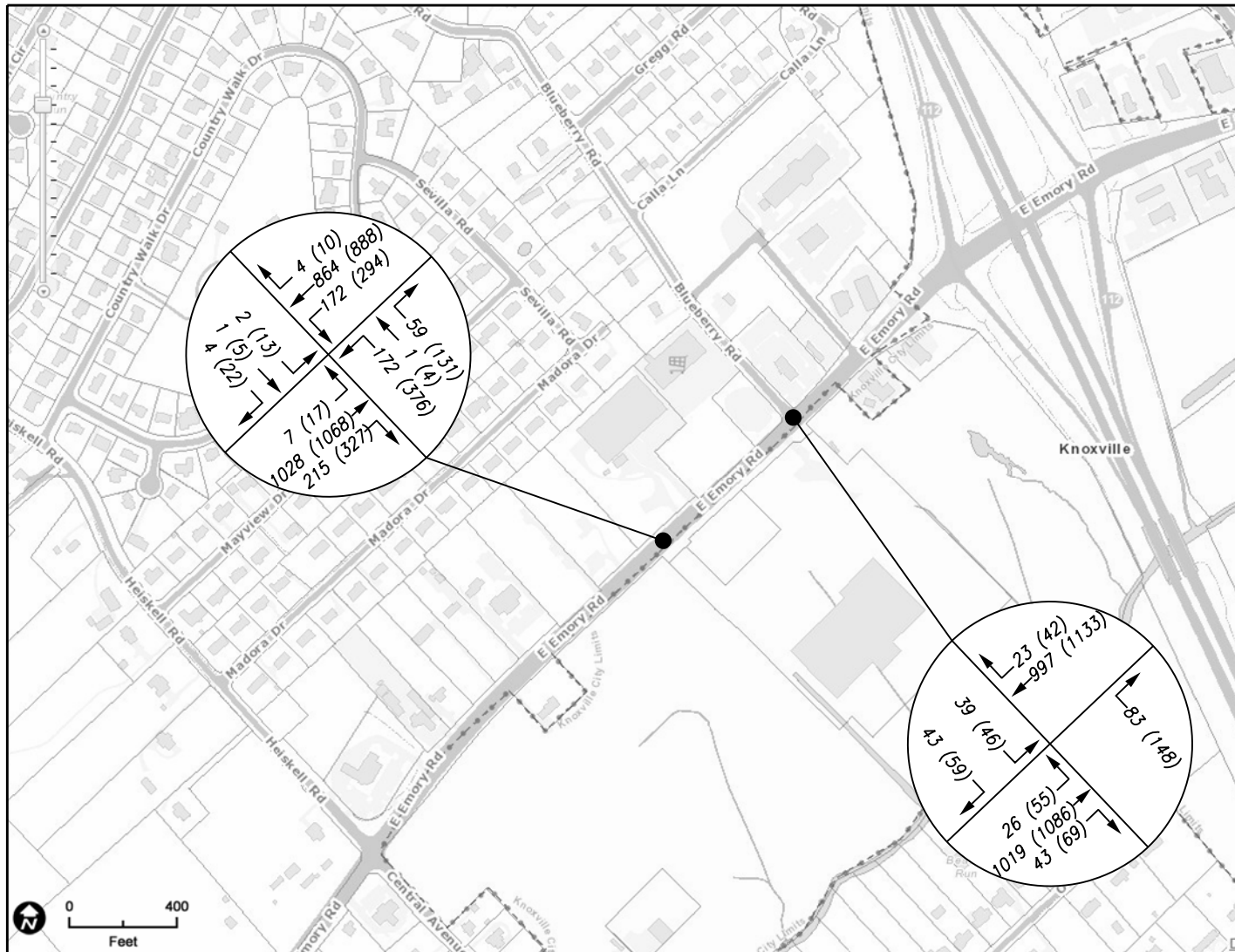
The Tennessee Department of Transportation (TDOT) maintains count station 000044 on E Emory Road (S.R. 131) east of the intersection of E Emory Road and Interstate 75.

In order to obtain accurate background traffic volumes it is necessary to combine two recent traffic studies done in the surrounding area. The Cannon & Cannon, Inc. "Emory View Development Traffic Impact Study" Revised August 1, 2016 and the CDM Smith "Kroger Store – GA 670 and Retail Development Traffic Impact Study" Revised January 26, 2015 both assumed a 2% growth rate based on the TDOT count station 000044 and an analysis year of 2020.

The background growth data for this study is taken from the Cannon & Cannon, Inc. "Emory View Development Traffic Impact Study" Revised August 1, 2016 Figure 9, "2020 Combined Traffic Data" and is included as Attachment 1.

Figure 3 shows the relevant Background Data for the signalized Kroger Driveway and the intersection of Blueberry Road and E Emory Road as it pertains to the proposed Aubrey's Restaurant.





### LEGEND:

← 5 (16)

TURNING MOVEMENT VOLUME AM (PM)

Project	270.115	Proj. Mgr.		Designed By		Drawn By		Reference	
Date	12/05/16	ISSUED FOR REVIEW							11/10/16
Scale	N.T.S.	REVISED PER MPC / KNOX COUNTY COMMENTS							12/05/16
Sheet									
FIGURE 3		No.	Revision/Issue					Date	
PAGE 8									

**2020 BACKGROUND  
PEAK HOUR TRAFFIC**

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## 4 Trip Generation and Trip Distribution

High-Turnover (Sit-Down) Restaurant or Land Use 932 was used to calculate site trips for the proposed Aubrey's Restaurant from *The Trip Generation, 9<sup>th</sup> Edition*, published by the Institute of Transportation Engineers. The average trip rate was used for the Peak Hour of Adjacent Street Traffic and the worksheets are included in Attachment 2.

The Aubrey's Restaurant is not open for business during the AM peak period; therefore the average trip rate for the AM peak period does not apply and only the PM peak hour is considered in this study.

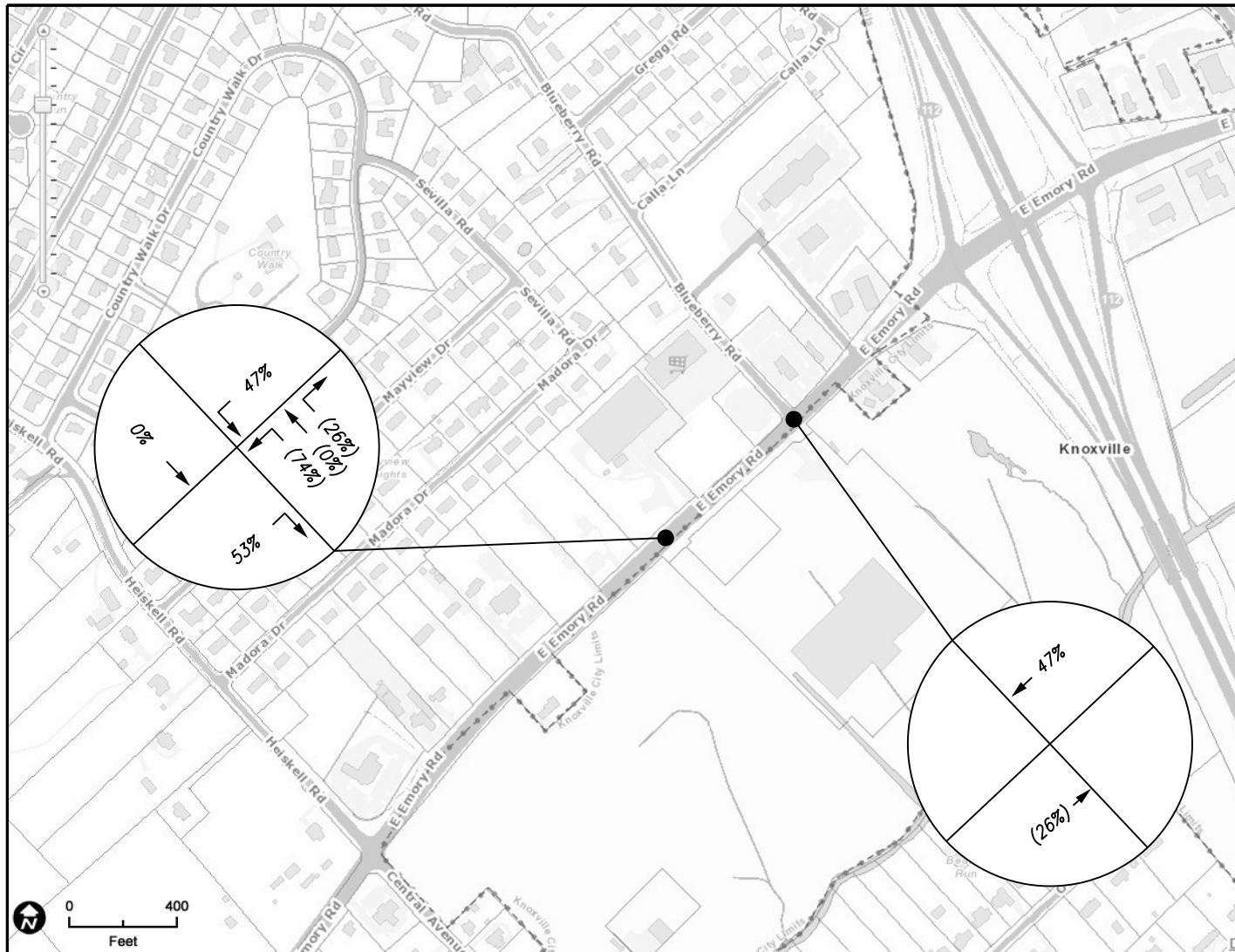
The total number of trips generated by the proposed Aubrey's Restaurant was estimated to be 1136 daily trips. During the PM peak hour the estimated trips are 88. A trip generation summary is shown in Table 4-1.

**Table 4-1**  
**Trip Generation Summary**

High-Turnover (Sit-Down) Restaurant (Land Use 932)					
	Total New Trips	% Entering	% Exiting	Number Entering	Number Exiting
Weekday	1136	50	50	568	568
P.M. Peak	88	60	40	53	35



The directional distribution of the traffic generated by the proposed Aubrey's Restaurant was determined using the traffic data from Figure 3, Background Peak Hour Traffic. The trip distribution for the PM peak hour for the Aubrey's Restaurant is shown in Figure 4.

Using the existing trip distribution the trips generated from the Aubrey's Restaurant are shown in Figure 5. Figure 6 shows the combined peak hour traffic from the background growth and the full build out of the Aubrey's Restaurant.



### LEGEND:

← 50% (50%) TRIP DISTRIBUTION ENTERING (EXITING)

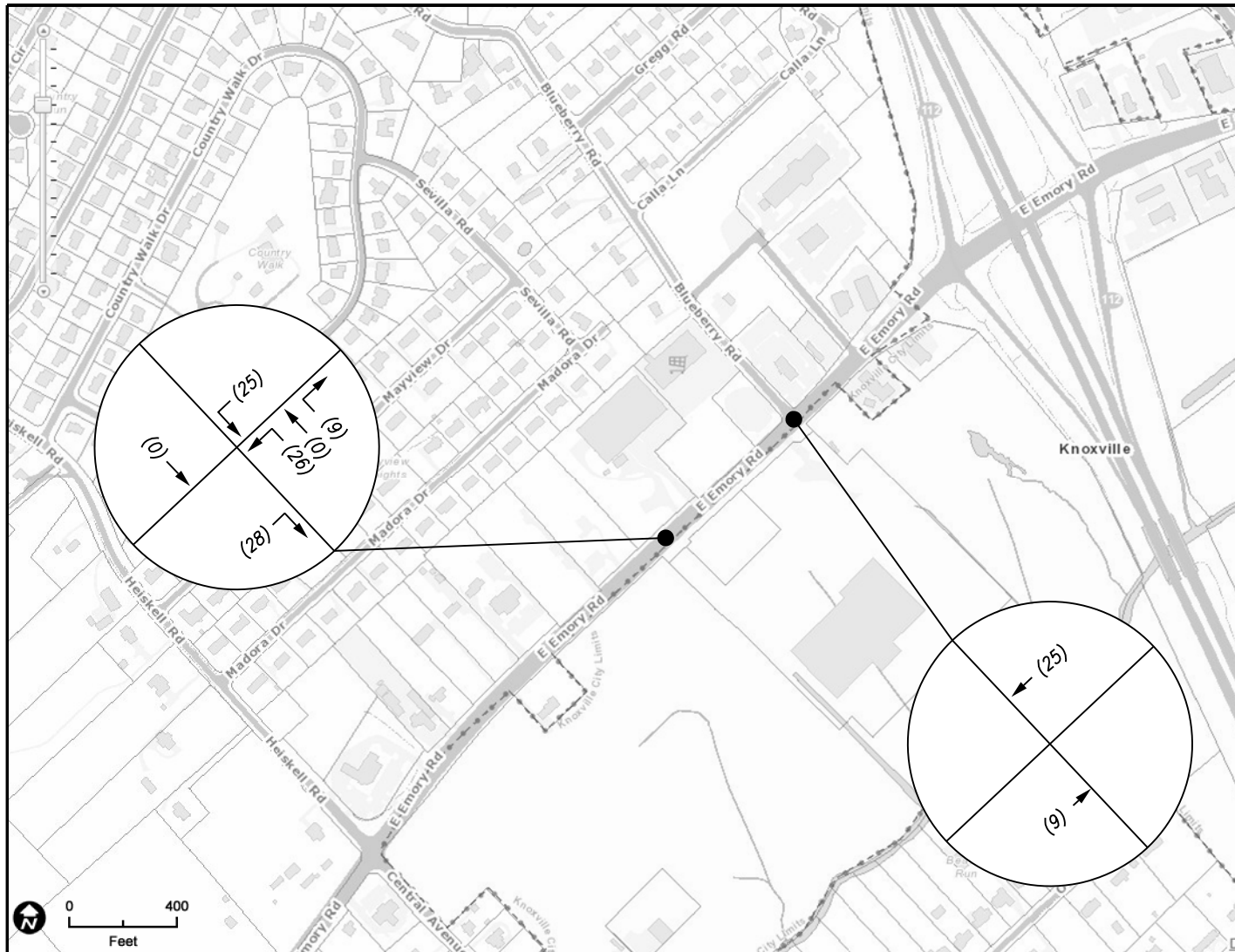
Project 270.115		Proj. Mgr.		Designed By		Drawn By		Reference			
Date 12/05/16				ISSUED FOR REVIEW						11/10/16	
Scale N.T.S.				REVISED PER MPC / KNOX COUNTY COMMENTS						12/05/16	
Sheet											
<b>FIGURE 4</b>											
PAGE 10											
No.		Revision/Issue								Date	

PM PEAK HOUR  
TRIP DISTRIBUTION

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### LEGEND:

← (25)

TURNING MOVEMENT VOLUME (PM)

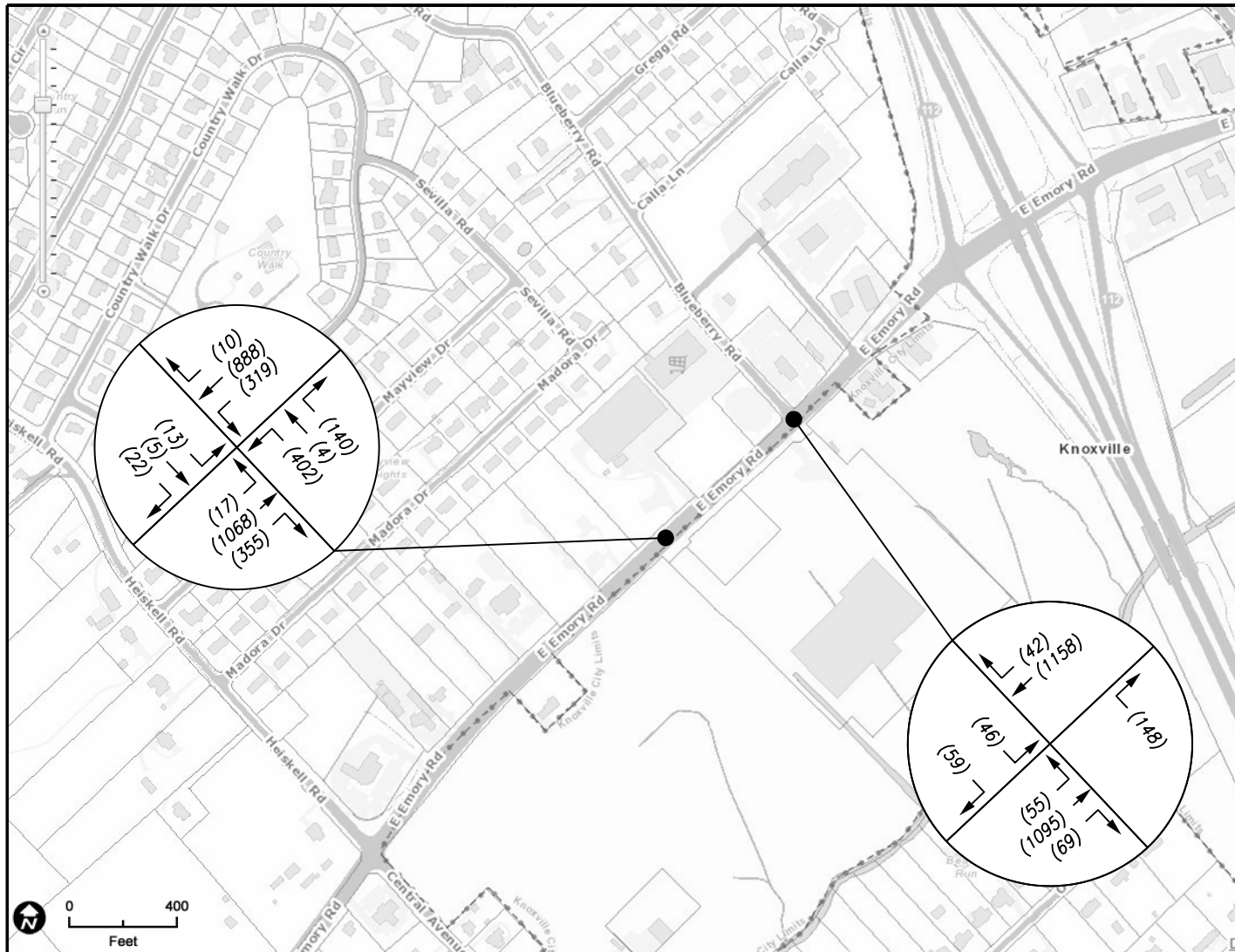
Project	270.115	Proj. Mgr.		Designed By	Drawn By	Reference
Date	12/05/16					
Scale	N.T.S.					
Sheet						
FIGURE 5						
PAGE 11						
No.		Revision/Issue				Date

**PEAK HOUR RESTAURANT  
TRAFFIC**

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### LEGEND:

← (25)

TURNING MOVEMENT VOLUME (PM)

Project	270.115	Proj. Mgr.		Designed By	Drawn By	Reference
Date	12/05/16					
Scale	N.T.S.					
Sheet						
FIGURE 6						
PAGE 12						
No.		Revision/Issue				Date

**2020 PEAK HOUR TRAFFIC  
FULL BUILDOUT**

**AUBREY'S POWELL  
KNOXVILLE, TN**



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## 5 Projected Capacity and Level of Service

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Unsignalized intersection capacity analyses were performed for the PM peak hour to evaluate the traffic conditions at the intersection of Blueberry Road and E Emory Road.

Signalized intersection capacity analyses were performed using the existing signal timing for the PM peak hour to evaluate the traffic conditions at the intersection of the Kroger Driveway and E Emory Road. The existing signal timing was provided by Knox County and is included in Attachment 3.

The results from the analyses are measured with a term "level of service" (LOS), which is based on the amount of delay experienced at the intersection. The LOS index ranges from LOS A, indicating excellent traffic conditions with minimal delay, to LOS F indicating very congested conditions with excessive delay. LOS D generally is considered the minimum acceptable condition in urban areas. Table 5-1 shows the results of the capacity analyses.

Table 5-1

Intersection Analysis  
Level of Service (LOS) Summary

Delay (sec)/LOS		
<b>Blueberry Road @ E Emory Road (Background + Kroger + Emory View 2020)*</b>		
AM Peak	EB L	11.2 / B
	NB	14.6 / B
	SB	25.9 / D
PM Peak	EB L	12.4 / B
	NB	17.0 / C
	SB	36.5 / E
<b>Kroger Driveway @ E Emory Road (Background + Kroger + Emory View 2020)*</b>		
AM Peak	Intersection	17.8 / B
PM Peak	Intersection	28.9 / C
<b>Blueberry Road @ E Emory Road (Background + Full Buildout 2020)</b>		
PM Peak	EB L	12.5 / B
	NB	15.2 / C
	SB	34.7 / D
<b>Kroger Driveway @ E Emory Road (Background + Full Buildout 2020)</b>		
PM Peak	Intersection	39.4 / D

\*LOS Reported in "Emory View Development Traffic Impact Study", Revised August 1, 2016.

## **6 Conclusions and Recommendations**

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### **6.1 Signalized Kroger Driveway @ E Emory Road**

The existing signal timing provided by Knox County was used in the LOS analysis. During the PM peak hour the intersection will operate at an overall LOS D. The northbound double left turn lane will operate at a LOS E and the westbound left turn lane will operate at a LOS D. FMA recommends that the signal timing be re-evaluated after the construction of the southbound intersection approach is complete along with the construction of the Emory View Development and the Aubrey's Restaurant.

### **6.2 Blueberry Road @ E Emory Road**

The Aubrey's Restaurant will result in a slight increase in through traffic on E Emory Road during the PM peak hour. The intersection will continue to operate at an acceptable average LOS C during the PM peak hour with the highest delay on the southbound approach at a LOS D after the completion of the Aubrey's Restaurant.



**Attachment 1**  
**Cannon & Cannon, Inc. "Emory View Development Traffic Impact Study"**  
**Revised August 1, 2016**  
**Figure 9 - 2020 Combined Traffic Data**

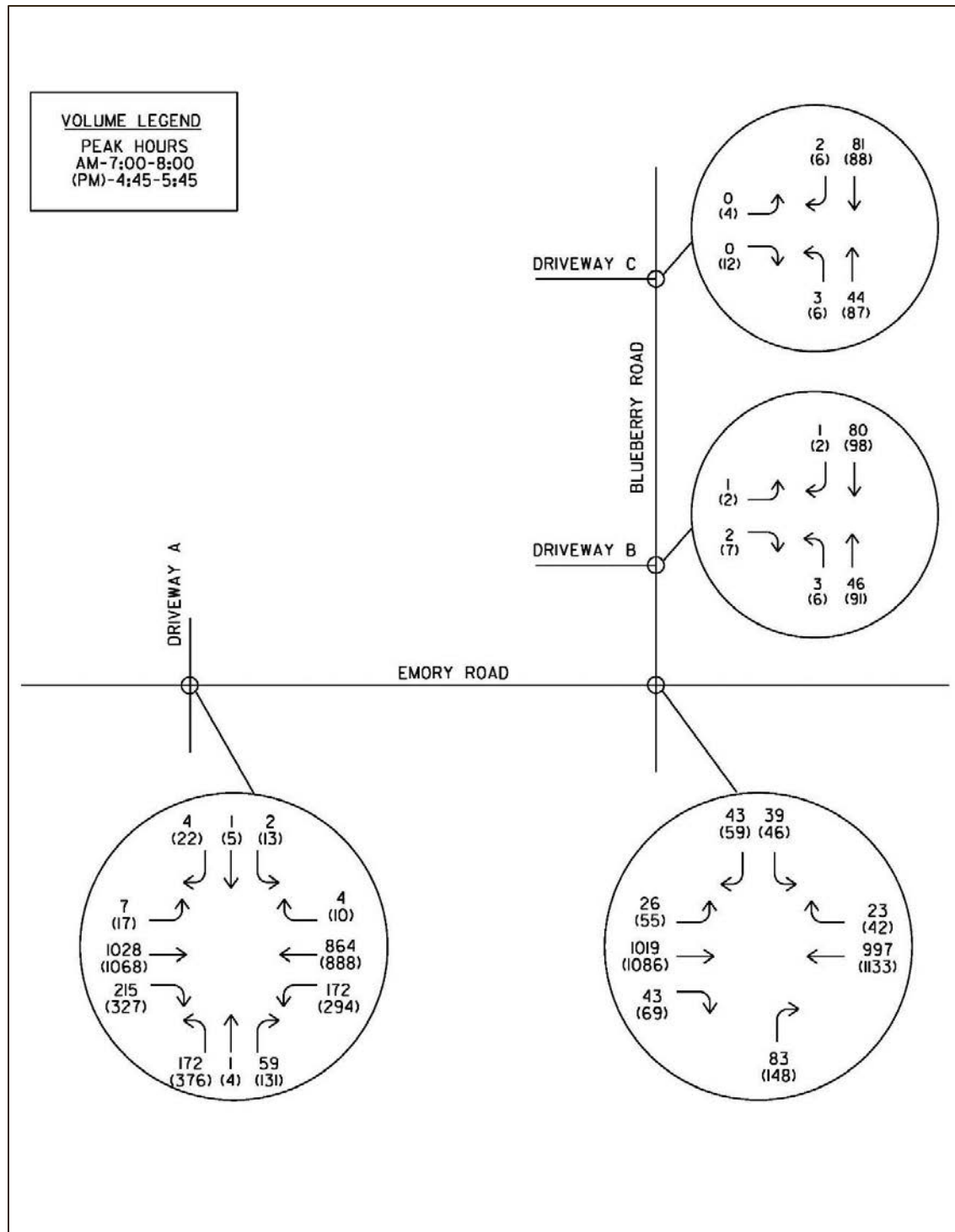


FIGURE 9  
 2020 COMBINED TRAFFIC DATA

**Attachment 2**  
**Trip Generation Worksheets**

# High-Turnover (Sit-Down) Restaurant (932)

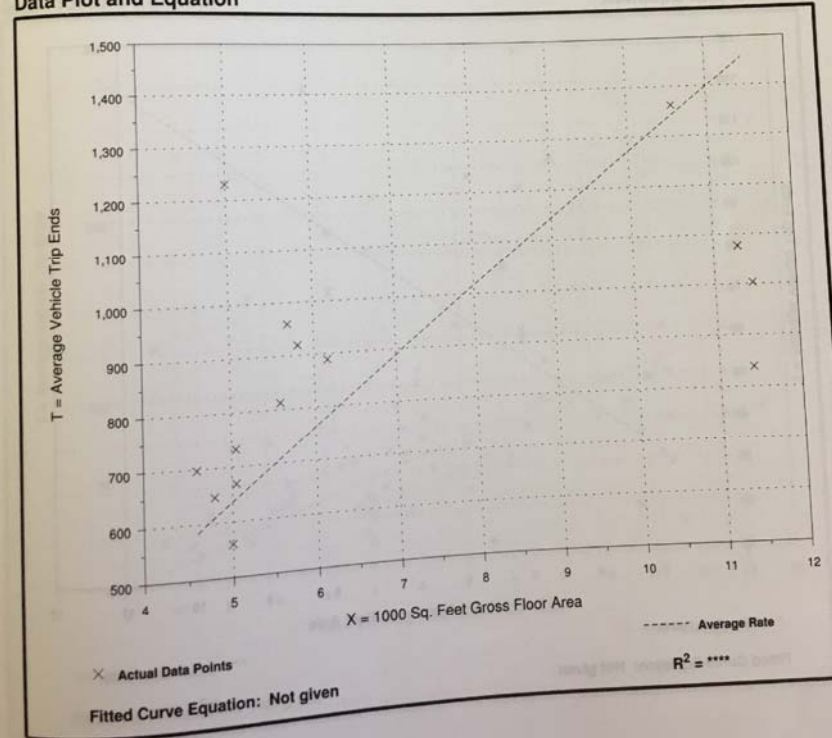
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area  
On a: Weekday

Number of Studies: 14  
Average 1000 Sq. Feet GFA: 7  
Directional Distribution: 50% entering, 50% exiting

## Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
127.15	73.51 - 246.00	41.77

## Data Plot and Equation



## High-Turnover (Sit-Down) Restaurant (932)

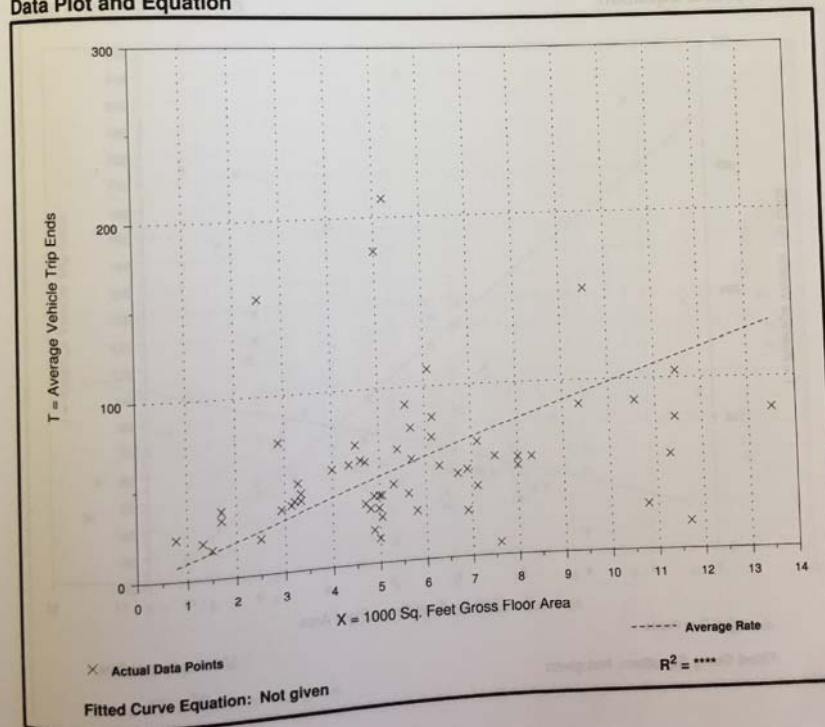
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area  
On a: Weekday,  
Peak Hour of Adjacent Street Traffic,  
One Hour Between 4 and 6 p.m.

Number of Studies: 60  
Average 1000 Sq. Feet GFA: 6  
Directional Distribution: 60% entering, 40% exiting

### Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
9.85	0.92 - 62.00	8.54

### Data Plot and Equation



**Attachment 3**  
**Signal Timing**

INTERSECTION:		Emory Road at Kroger's Drive										SIGNAL NO: 106				DAY PLAN EVENTS			
FUNCTION	Cycle	Splits (SECOND)								Phase				P	HH:MM	CKT	C/O/S		
		Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	Offset									
		WBLT	EBT	NBLT			WBT		NBT										
Movements																			
Coordination Splits (sec.)																			
Plan 1 (1/1/1)	125	22	70	33	0	0	92	0	33	43		1	00:00	FREE			1/1/1		
Plan 2 (2/1/1)	110	28	46	36	0	0	74	0	36	69		1	06:30				2/1/1		
Plan 3 (3/1/1)	130	32	64	34	0	0	96	0	34	59		1	10:30				3/1/1		
Plan 4 (4/1/1)	0	0	0	0	0	0	0	0	0	0		1	15:30				2/1/1		
Plan 5 (5/1/1)	0	0	0	0	0	0	0	0	0	0		1	18:45	FREE					
Plan 6 (6/1/1)	0	0	0	0	0	0	0	0	0	0		1	22:00	FREE					
												2	00:00	FREE					
												2	08:00	FREE			2/1/1		
												2	22:00	FREE					
												2	00:00	FREE					
Controller																			
Movements																			
Initial		6	15	5			15		5										
Extension		3.0	3.0	3.0			3.0		3.0										
Max 1		35	75	40			100		40										
Max 2																			
Yellow		4.0	4.5	4.0			4.5		4.0										
All Red		2.0	1.5	2.0			1.5		2.0										
Walk			7		7														
Flash Don't Walk			28		24														
Max/Min Recall																			
Coordinated Phases			X				X												
WEEKLY PROGRAM PLAN																			
PLAN		SUN	MON	TUE	WED	THU	FRI	SAT											
0		1	2	3	4	5	6	7											
1																			
2																			
3																			

Phase 1 Westbound left turn

Phase 2 Eastbound through

Phase 3 Northbound left turn (from Krogers)

Phase 4 Future

Phase 5 Future

Phase 6 Westbound through

Phase 7 Future

Phase 8 Northbound through (from Krogers)

**Attachment 4**  
**Intersection Worksheets**  
**Background PM Peak + Full Buildout**



TWO-WAY STOP CONTROL SUMMARY								
<b>General Information</b>				<b>Site Information</b>				
Analyst	ALK			Intersection	E Emory Rd @ Blueberry Rd			
Agency/Co.	FMA			Jurisdiction	Knox County			
Date Performed	12/1/2016			Analysis Year	2020			
Analysis Time Period	PM Full Buildout							
Project Description 270.115 - Aubrey's Powell								
East/West Street: E Emory Road ( SR131)				North/South Street: Blueberry Rd				
Intersection Orientation: East-West				Study Period (hrs): 0.25				
<b>Vehicle Volumes and Adjustments</b>								
<b>Major Street</b>	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	55	1095	69		1158	42		
Peak-Hour Factor, PHF	0.94	0.94	0.94	1.00	0.94	0.94		
Hourly Flow Rate, HFR (veh/h)	58	1164	73	0	1231	44		
Percent Heavy Vehicles	3	--	--	0	--	--		
Median Type	Two Way Left Turn Lane							
RT Channelized			0			0		
Lanes	1	2	1	0	2	0		
Configuration	L	T	R		T	TR		
Upstream Signal		0			0			
<b>Minor Street</b>	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)			148	46		59		
Peak-Hour Factor, PHF	1.00	1.00	0.94	0.94	1.00	0.94		
Hourly Flow Rate, HFR (veh/h)	0	0	157	48	0	62		
Percent Heavy Vehicles	0	0	3	3	0	3		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	1	0	0	0		
Configuration			R		LR			
<b>Delay, Queue Length, and Level of Service</b>								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L				R		LR	
v (veh/h)	58				157		110	
C (m) (veh/h)	535				508		228	
v/c	0.11				0.31		0.48	
95% queue length	0.36				1.30		2.40	
Control Delay (s/veh)	12.5				15.2		34.7	
LOS	B				C		D	
Approach Delay (s/veh)	--	--	15.2			34.7		
Approach LOS	--	--	C			D		

SHORT REPORT												
<b>General Information</b>						<b>Site Information</b>						
Analyst ALK Agency or Co. FMA Date Performed 12/1/2016 Time Period PM Full Buildout						Intersection Emory Rd @ Kroger Driveway Area Type All other areas Jurisdiction Knox County Analysis Year 2020						
<b>Volume and Timing Input</b>												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1	2	1	1	2	0	2	1	1	1	1	0
Lane Group	L	T	R	L	TR		L	T	R	L	TR	
Volume (vph)	17	1068	355	319	888	10	402	4	140	13	5	22
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup Lost Time	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Extension of Effective Green	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Arrival Type	3	3	3	3	3		3	3	3	3	3	
Unit Extension	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0	12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0	0	0	0	0		0	0	0	0	0	
Minimum Pedestrian Time		3.2			3.2			3.2			3.2	
Phasing	Excl. Left	EW Perm	03		04		NB Only		NS Perm		07 08	
Timing	G = 22.0	G = 40.0	G = 0.0		G =		G = 16.0		G = 8.0		G =	
	Y = 6	Y = 6	Y = 0		Y =		Y = 6		Y = 6		Y =	
Duration of Analysis (hrs) = 0.25									Cycle Length C = 110.0			
<b>Lane Group Capacity, Control Delay, and LOS Determination</b>												
	EB			WB			NB			SB		
Adjusted Flow Rate	18	1136	378	339	956		428	4	149	14	28	
Lane Group Capacity	450	1290	576	422	1288		500	508	432	102	119	
v/c Ratio	0.04	0.88	0.66	0.80	0.74		0.86	0.01	0.34	0.14	0.24	
Green Ratio	0.62	0.36	0.36	0.62	0.36		0.15	0.27	0.27	0.07	0.07	
Uniform Delay d <sub>1</sub>	11.5	32.8	29.3	30.4	30.5		45.9	29.2	32.1	47.8	48.1	
Delay Factor k	0.11	0.41	0.23	0.35	0.30		0.39	0.11	0.11	0.11	0.11	
Incremental Delay d <sub>2</sub>	0.0	7.4	2.7	10.8	2.4		13.7	0.0	0.5	0.6	1.0	
PF Factor	1.000	1.000	1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000	
Control Delay	11.6	40.1	32.0	41.1	32.9		59.6	29.2	32.6	48.4	49.1	
Lane Group LOS	B	D	C	D	C		E	C	C	D	D	
Approach Delay	37.8			35.0			52.4			48.9		
Approach LOS	D			D			D			D		
Intersection Delay	39.4			Intersection LOS						D		