TRAFFIC IMPACT STUDY

DOMINION DEVELOPMENT MULTIFAMILY MIXED-USE

6404-6410 DEANE HILL DRIVE
KNOXVILLE, TENNESSEE

CCI PROJECT NO 00686-0001

REVISION I

PREPARED FOR

Sanders Pace Architecture
514 W. Jackson Avenue,
Suite 102
Knoxville, TN 37902

SUBMITTED BY

CANNON & CANNON INC
CONSULTING ENGINEERS
FIELD SURVEYORS

JULY 26
REVISION 1
2017

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EXECUTIVE SUMMARY

This report provides a summary of a traffic impact study that was performed for a proposed mixed-use development to be located on the south side of Deane Hill Drive and just east of the intersection of Deane Hill Drive and Gerald R. Ford Street in Knoxville. The conceptual development plan for this project proposes 105 apartments and a 3000 square foot restaurant on the ground floor at the front of the building. A total of 178 parking spaces will be provided, including 141 for the apartments and 37 for the restaurant. The restaurant spaces will be located on the front of the site, with the apartment spaces located to the rear and side of the building. Access to and from Deane Hill Drive will involve one driveway on the front of the site serving the restaurant and two driveways along the east side of the site. These two driveways will provide access to an existing north-south driveway that is shared with the existing building and site located to the immediate east. This north-south driveway then intersects Deane Hill Drive near the northeast corner of the site.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the immediate vicinity of the site. Of particular interest were the two driveway access points onto Deane Hill Drive and the adjacent intersection of Deane Hill Drive with Gerald R. Ford Street. Appropriate evaluations were conducted at these locations for existing and future conditions, with and without traffic volumes generated from the proposed development, in order to determine the anticipated impacts and to establish recommended mitigation measures.

The primary conclusion of this study is that the traffic generated from the proposed multifamily mixed-use development will not have a significant negative impact on any of the three study intersections. This conclusion is primarily due to the fact that the levels-of-service and average delays at all study intersections will remain within good and acceptable values even under fully developed conditions. In addition, intersection turn lane criteria will likely not be satisfied at the study intersections. Regarding intersection corner sight distance, the required distances are achievable at the two proposed site driveways onto Deane Hill Drive. The following listing is a summary of the recommendations that resulted from this study:

1. Reposition the existing business sign on the east side of the shared south (apartment) driveway in order to improve sight distance looking to the east. If this is not feasible, then the tree on the west side of the driveway should be removed. Also, existing brush on the extreme west side of the site should be removed back from Deane Hill Drive in order to improve sight distance looking to the west from the proposed restaurant driveway.
2. Maintain intersection corner sight distances at the proposed site entrance driveways by insuring any new site landscaping, site signage or other features are properly placed such that sight distance is not restricted.

Note Regarding Timing of Turning Movement Traffic Counts:
The turning movement traffic counts were conducted during June 2017, at a time when local schools were not in session. It is recommended that the counts and the resulting analyses of this report be accepted for the reasons outlined in the Conclusions and Recommendations section (see page 16).

INTRODUCTION & PURPOSE OF STUDY

This report provides a summary of a traffic impact study that was performed for a proposed mixed-use development with apartments and a restaurant to be located on the south side of Deane Hill Drive and just east of the intersection of Deane Hill Drive and Gerald R. Ford Street, in Knoxville. FIGURE 1 is a location map identifying the major roadways in the vicinity of the site.

FIGURE 1
LOCATION MAP

The conceptual development plan for this mixed-use project proposes 105 apartments and a 3000 square foot restaurant on the ground floor at the front of the building. A total of 178 parking spaces will be provided, including 141 for the apartments and 37 for the restaurant. The restaurant spaces will be located on the front of the site, with the apartment spaces located to the rear and side of the building. Access to and from Deane Hill Drive will involve one driveway on the front of the site serving the restaurant and two driveways along the east side of the site. These two driveways will provide access to an existing north-south driveway that is shared with the existing building and site located to the immediate east. This north-south driveway then intersects Deane Hill Drive near the northeast corner of the site. FIGURE 2 is a conceptual site plan illustrating the proposed site.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the immediate vicinity of the site. Of particular interest were the two driveway access points onto Deane Hill Drive and the adjacent intersection of Deane Hill Drive with Gerald R. Ford Street. Appropriate evaluations were conducted at these locations for existing and future conditions, with and without traffic volumes generated from the proposed development, in order to determine the anticipated impacts and to establish recommended measures to mitigate these impacts.

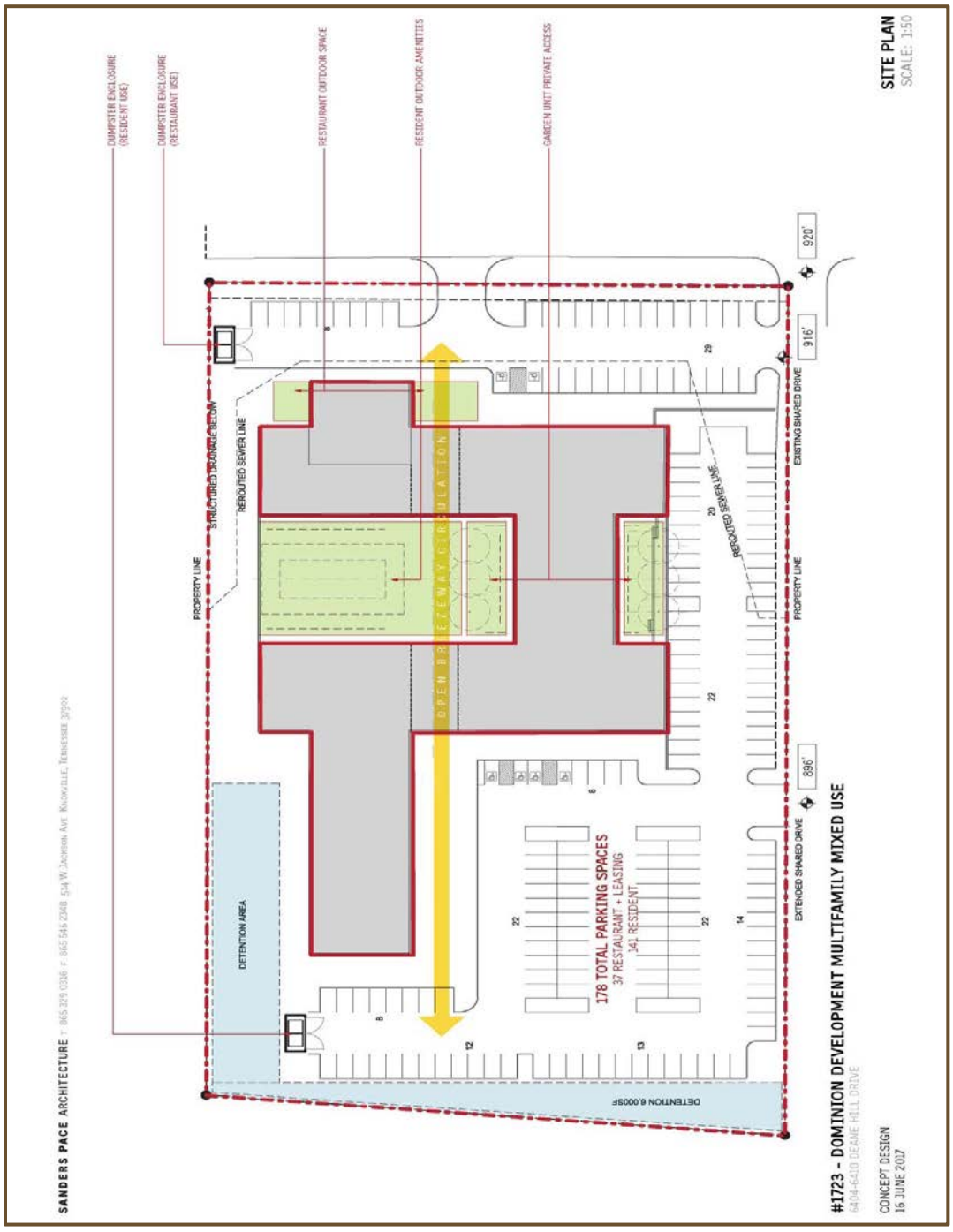


FIGURE 2
CONCEPTUAL SITE PLAN

EXISTING CONDITIONS

EXISTING ROADWAY CONDITIONS

Deane Hill Drive and the nearby Gerald R. Ford Street are both two-lane roadways with one lane in each direction. The two pavements are approximately 23 to 24 feet in width, with the lanes striped with a width of approximately 11 feet each. The remaining pavement provides a very narrow and varying width shoulder. Some curb exists, especially on Gerald R. Ford Street and on Deane Hill Drive to the east, with most of the remaining pavement lacking curb and possessing roadside ditch drainage.

The speed limit along Deane Hill Drive is posted as 40 mph, while Gerald R. Ford Street is unposted. This is likely because it is a very short street with a stop sign on its south end at Deane Hill Drive and a traffic signal on its north end at Kingston Pike. Deane Hill Drive does not stop for Gerald R. Ford Street or for any intersection in the immediate vicinity.

EXISTING SITE CONDITIONS

The proposed project site is located in the southeast quadrant of the intersection of Deane Hill Drive and Gerald R. Ford Street. It is bounded on the north, east and west sides by light industrial, office and commercial uses, with the main line of the Norfolk Southern railroad bordering to the immediate south. A large industrial/business park lies beyond the railroad further to the south. FIGURE 3 shows the project site in relation to the immediate surrounding development.

FIGURE 3
EXISTING SITE CONDITIONS

EXISTING TRAFFIC DATA

Existing traffic data was gathered for this study. The Tennessee Department of Transportation (TDOT) and Knoxville-Knox County Metropolitan Planning Commission (MPC) collect annual average daily traffic (AADT) data annually on roadways in the study area. No count stations were found on Deane Hill Drive in very close proximity to the project site, but two stations were found that were felt to have some relevance for this study. The most currently available data from these count stations are contained in TABLE 1.

TABLE 1
ANNUAL AVERAGE DAILY TRAFFIC COUNT SUMMARY

COUNT YEAR	TDOT STA 263 SR 332 S. OF KINGSTON PK	MPC STATION DEANE HILL E. OF MORRELL
2016	17,763	not available
2015	17,134	7,400
2014	16,964	not available
2013	18,151	not available
2012	17,795	not available
2011	18,727	not available
2010	17,676	not available

In addition to the available AADT data in the table above, peak hour turning movement type traffic counts were performed at three locations on Deane Hill Drive; at the intersection with Gerald R. Ford Street, at the shared driveway located to the immediate east of the project site, and at the Northside driveway that will align with the proposed site driveway to serve the restaurant. The 2017 base year existing traffic data is summarized on FIGURE 4, and the raw data traffic count summary sheets are contained in APPENDIX A.

EXISTING CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses employing the methods of the Highway Capacity Manual (HCM2010) were conducted for the existing study intersection of Deane Hill Drive and Gerald R. Ford Street. These analyses utilized the 2017 existing traffic volumes, existing intersection traffic control, and existing lane configurations. The results indicate that the intersection is operating at very good levels-of-service (LOS). The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in APPENDIX C. Also contained in APPENDIX C is a section entitled "Capacity and Level of Service Concepts", which provides a description of the utilized procedures.

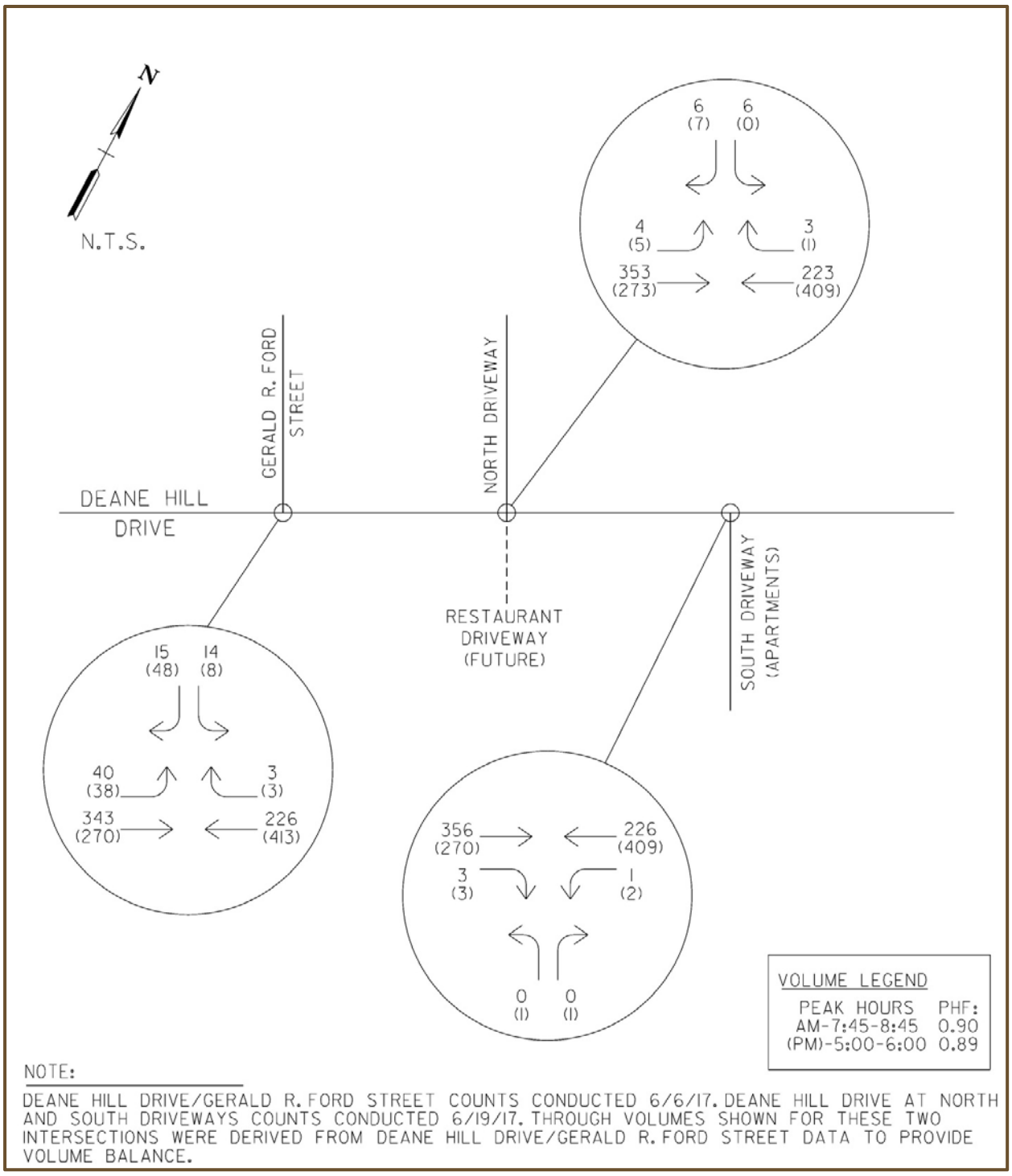


FIGURE 4
EXISTING TRAFFIC VOLUMES (2017)

4.0 BACKGROUND CONDITIONS

BACKGROUND TRAFFIC GROWTH

The mixed-use development is anticipated to be constructed in one general phase with anticipated completion and occupancy taking less than two years. For purposes of evaluation, a three year period starting in 2017 was selected as the design/evaluation year for this study. In order to determine traffic volumes resulting solely from background traffic growth to year 2020, it was necessary to establish an annual growth rate for existing traffic. Because the last few years of AADT data has exhibited inconsistent growth patterns, increasing some years and decreasing in others, an annual growth rate of 1.5% was assumed. FIGURE 5 contains the background traffic volumes that would result from a 1.5% annual growth rate from year 2017 to 2020, and therefore represent Year 2020 background growth conditions without traffic related to the proposed development.

BACKGROUND CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses as described in the Existing Conditions section of this report were conducted utilizing the Year 2020 background volumes shown in FIGURE 5, and the existing intersection traffic control and lane configurations. These analyses continue to indicate that the existing study intersection will operate at very good levels-of-service (LOS) under anticipated Year 2020 Background conditions. The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in APPENDIX C.

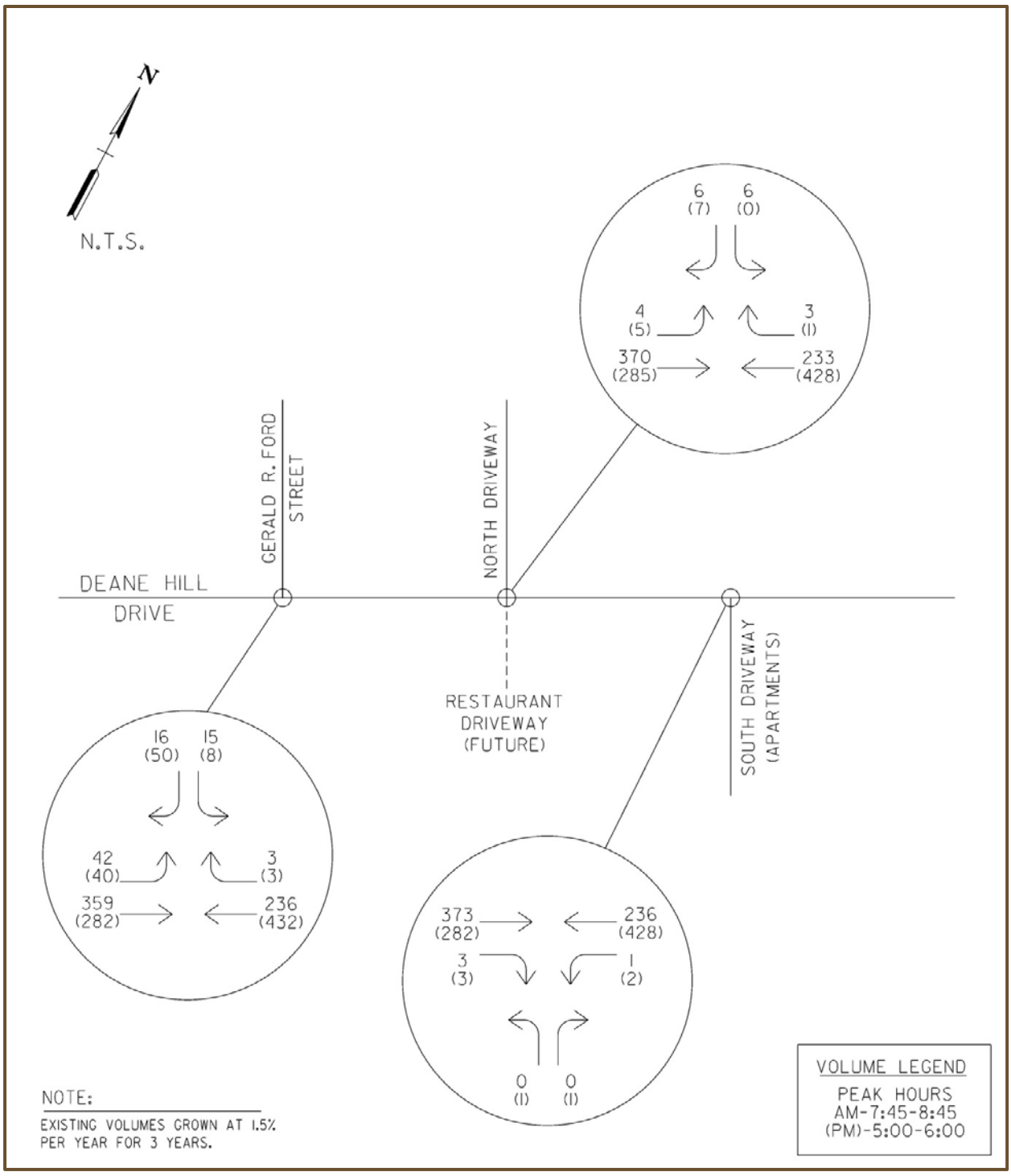


FIGURE 5
BACKGROUND TRAFFIC VOLUMES (2020)

5.0 FUTURE CONDITIONS

TRIP GENERATION

In order to estimate the expected traffic volumes to be generated by the proposed development, the procedures recommended by the Institute of Transportation Engineers (ITE) were utilized. Special trip generation rates developed by Knox MPC for apartments, which have previously been used in this area, were utilized for the apartment generation. As far as the restaurant, trip generation rates from ITE Land Use Code 932, High Turnover (Sit Down) Restaurant were utilized. The generated traffic volumes were determined based on the data for the A.M. and P.M. peak hours of adjacent street traffic. See TABLE 2 for a summary of the traffic generated for this project. More detailed information is contained in APPENDIX B.

TABLE 2
TRIP GENERATION SUMMARY

LAND USE RATES SOURCE	SIZE	TRIP TYPE	WEEKDAY (TRIPS/DAY)	AM PEAK HOUR (TRIPS/HR)	PM PEAK HOUR (TRIPS/HR)
Apartments Knox MPC Special Rates	105 units	Total Trips Entering Exiting	996 498 (50%) 498 (50%)	56 12 (22%) 44 (78%)	80 44 (55%) 36 (45%)
Restaurant ITE Code 932 High Turnover (Sit Down) Rest.	3000 sf	Total Trips Entering Exiting	382 191 (50%) 191 (50%)	32 18 (55%) 14 (45%)	30 18 (60%) 12 (40%)
Total Trips (Both Uses)			1378	88	110

TRIP DISTRIBUTION AND ASSIGNMENT

FIGURES 6 and 7 provide summaries of the trip distribution patterns and resulting trip assignment that has been assumed for the study intersections. These patterns were based on the existing traffic patterns derived from the traffic counts, as well as knowledge of the area.

FUTURE TRAFFIC

Future projected traffic volumes were developed by adding the generated and assigned trips shown in FIGURES 6 and 7 to the FIGURE 5 (background volumes). These combined year 2020 volumes reflect the existing traffic, the background traffic growth, the newly generated traffic from the proposed apartment and restaurant development. FIGURE 8 thus represents the 2020 combined traffic data used in the analysis of the future project conditions.

FUTURE CAPACITY ANALYSES / LEVELS-OF-SERVICE

Capacity analyses as described in the Existing Conditions section of this report were conducted for 2020 full project build-out conditions utilizing the Year 2020 combined volumes shown in FIGURE 8, with existing intersection traffic control and lanes for all three study intersections. These analyses indicate that all study intersections are anticipated to operate at very good levels-of-service (LOS). The EVALUATIONS section of this report may be referenced for tabular summaries of these analyses, while more detailed summaries are presented on the computer printouts contained in APPENDIX C.

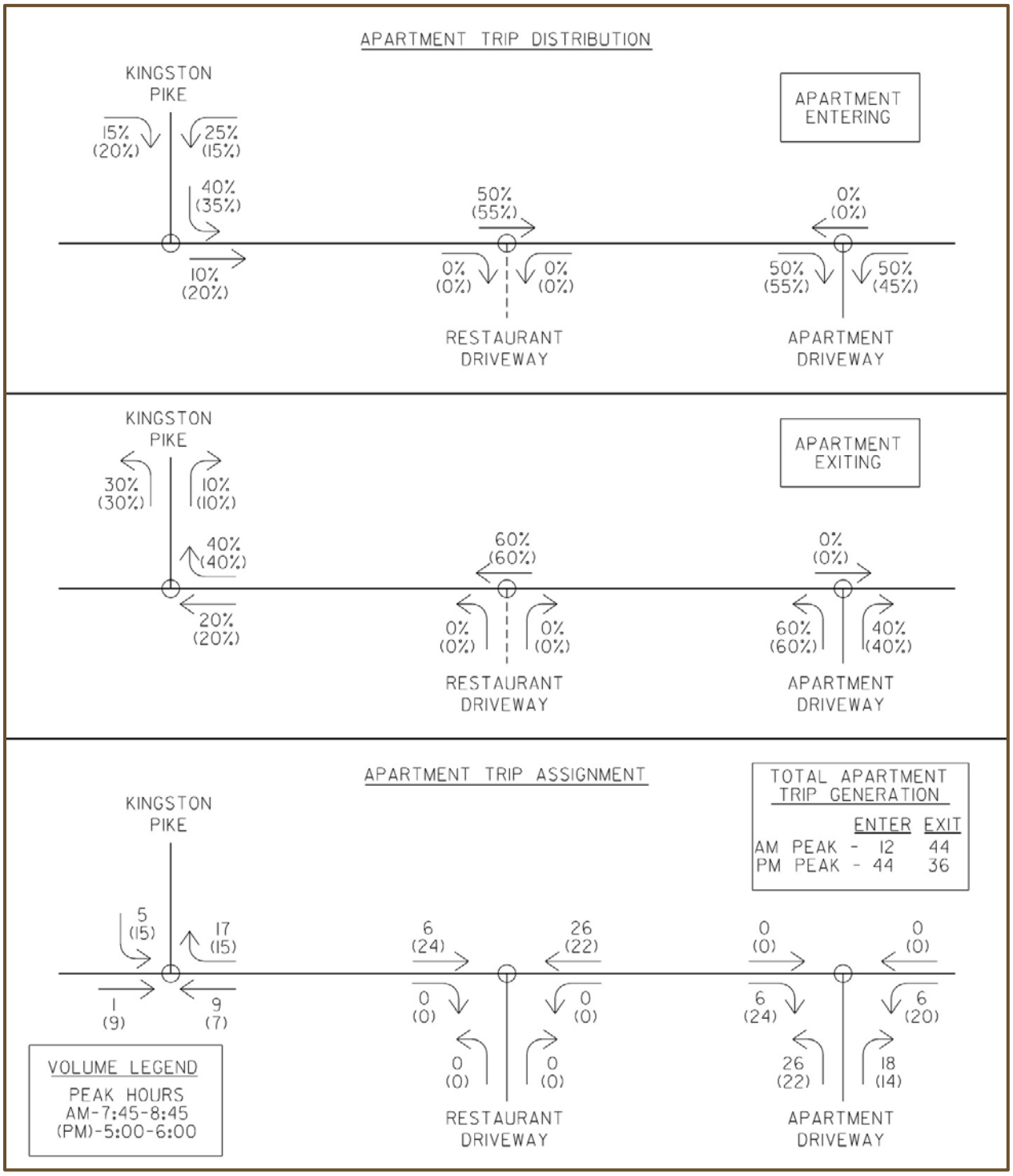


FIGURE 6
APARTMENT TRIP DISTRIBUTION AND ASSIGNMENT

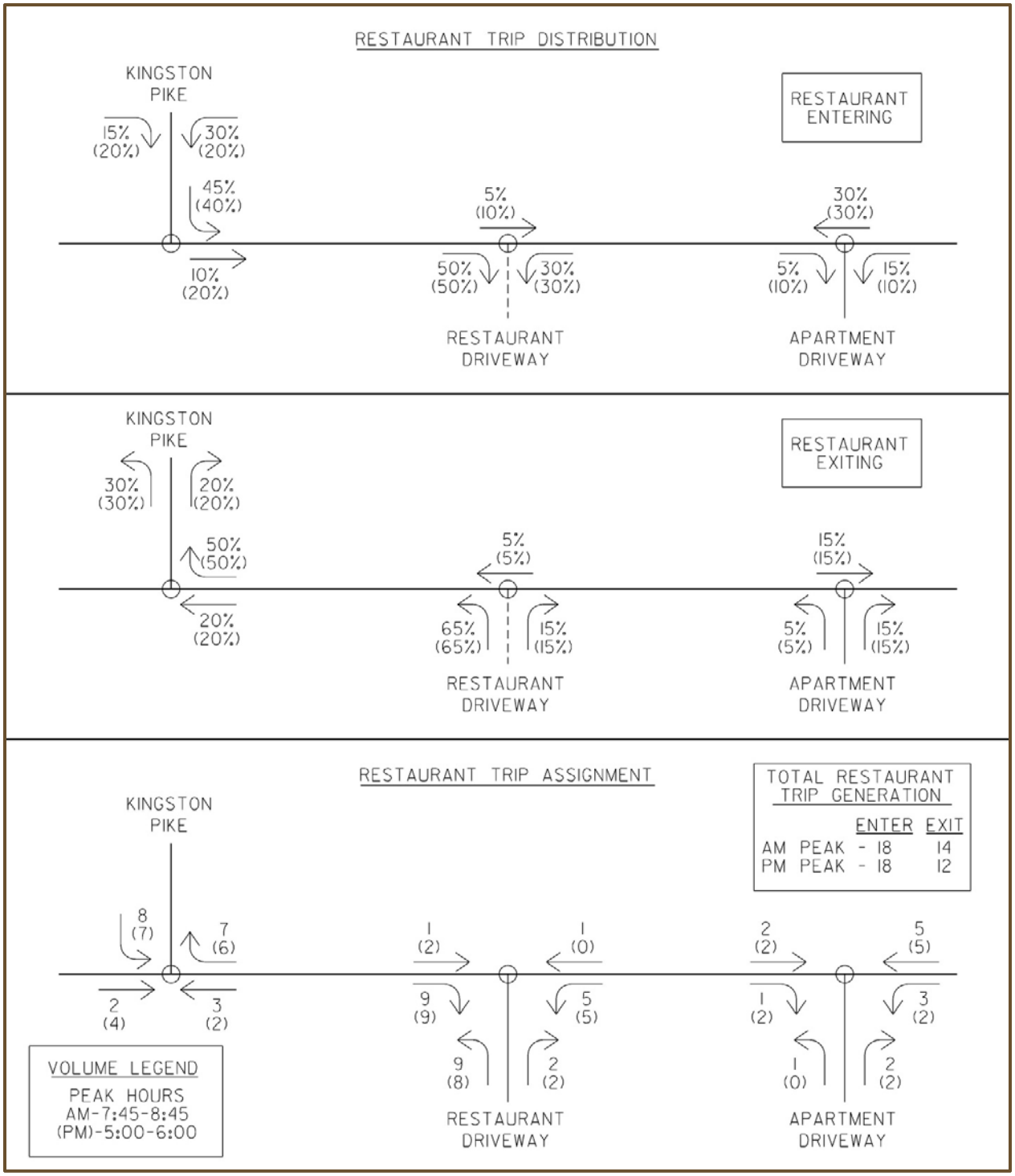


FIGURE 7
RESTAURANT TRIP DISTRIBUTION AND ASSIGNMENT

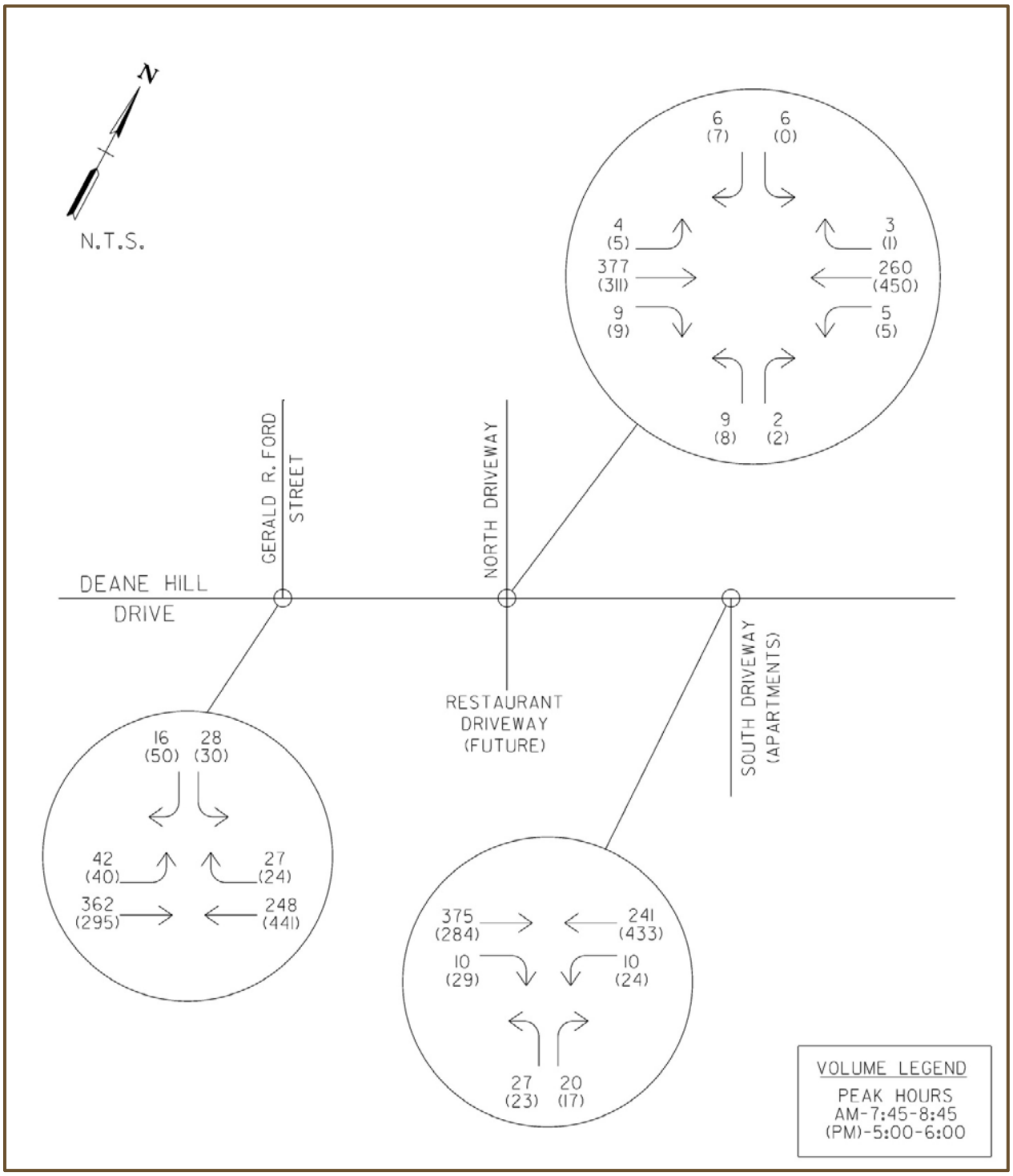


FIGURE 8
COMBINED TRAFFIC VOLUMES (2020)

6.0 EVALUATIONS

INTERSECTION CAPACITY ANALYSES

As discussed in the preceding sections of this report, capacity analyses employing the methods of the Highway Capacity Manual (HCM) were conducted for the study intersections. These analyses were performed for existing, background, and anticipated combined traffic conditions, utilizing existing roadway geometry and traffic control. A summary of the capacity analyses results for the Year 2017 Existing Conditions, Year 2020 Background Conditions and Year 2020 Combined Conditions is shown in TABLE 3.

TABLE 3
CAPACITY ANALYSIS SUMMARY

STUDY INTERSECTION	PEAK TIME PERIOD	EXISTING (2017) (LOS/DELAY)	BACKGROUND (2020) (LOS/DELAY)	COMBINED (2020) (LOS/DELAY)
Deane Hill Drive and Gerald R. Ford Street	A.M.	B 12.5	B 12.8	C 15.8
	P.M.	B 12.4	B 12.7	C 17.9
Deane Hill Drive and Existing Driveway Serving Apartments (Near Northeast Corner of Site)	A.M.	-	-	B 14.7
	P.M.	-	-	C 16.6
Deane Hill Drive and Proposed Driveway Serving Restaurant (Just West of Center of Site)	A.M.	-	-	C 15.5
	P.M.	-	-	C 17.9

SIDE STREET STOP CONTROL – Level-of-Service and Average Vehicular Delay (seconds) for side street movements utilizing HCM methodology.
See APPENDIX for detailed computer print-out summaries and discussion of concepts.

As shown in TABLE 3, the levels-of-service (LOS) for all three study intersections is anticipated to be good and acceptable (LOS C or better) for all conditions, including full project build-out combined conditions. Where a LOS is anticipated to change, the increase in average delay for the critical movements is expected to be relatively small. Thus, the traffic operational impacts resulting from the proposed project are anticipated to be relatively minor, with no apparent need for roadway or intersection improvements.

SITE DRIVEWAY LOCATION AND SIGHT DISTANCE

The two site driveway intersections onto Deane Hill Drive are located where sight distance in excess of the required 400 feet will be achievable. Issues are currently present at both locations, however, which are discussed below:

1. Existing South Driveway to serve apartments (Eastside of site)-
   Looking right, existing sight distance is approximately 430 feet. Looking left, existing sight distance exceeds 500 feet. A tree's trunk located on the left side and a small business sign on the right do create an issue when stopped at the standard 15 foot visibility position. This could be corrected by relocating the business sign either to the east or back away from the road. Cutting the tree would also correct the issue, but would not be necessary if the sign were relocated.

2. Proposed North Driveway to serve restaurant (middle of site)-
   Looking right, existing sight distance will exceed 500 feet. Looking left, existing sight distance will be approximately 320 feet. Cutting back some brush from the road, on the west side of the site, would increase sight distance to well over 500 feet.

TURN LANE JUSTIFICATION

Right and Left-turn lane volume thresholds were evaluated to determine if any new turning lanes are justified. The summary sheets contained in APPENDIX B confirm that no new turn lanes are anticipated to be justified by this criteria.

7.0 CONCLUSIONS & RECOMMENDATIONS

The primary conclusion of this study is that the traffic generated from the proposed mixed-use development will not have a significant negative impact on any of the three study intersections. This conclusion is primarily due to the fact that the levels-of-service and average delays at all study intersections will remain within good and acceptable values even under fully developed conditions. In addition, intersection turn lane criteria will likely not be satisfied at the study intersections. Regarding intersection corner sight distance, the required distances are achievable at the two proposed site driveways onto Deane Hill. Drive. The following listing is a summary of the recommendations that resulted from this study:

1. Reposition the existing business sign on the east side of the shared south (apartment) driveway in order to improve sight distance looking to the east. If this is not feasible, then the tree on the west side of the driveway should be removed. Also, existing brush on the extreme west side of the site should be removed back from Deane Hill Drive in order to improve sight distance looking to the west from the proposed restaurant driveway.

2. Maintain intersection corner sight distances at the proposed site entrance driveways by insuring any new site landscaping, site signage or other features are properly placed such that sight distance is not restricted.

Note Regarding Timing of Turning Movement Traffic Counts:
The turning movement traffic counts were conducted during June 2017, at a time when local schools were not in session. It is recommended that the counts and the resulting analyses of this report be accepted for the reasons outlined below:

1. Capacity analyses results for the combined traffic volume conditions exhibit LOS "B" and low LOS "C" operation. It is extremely unlikely that school traffic would be sufficient to create unacceptable levels-of-service conditions (LOS "E" or "F").

2. North and South driveway "combined" turning volumes will not change as a result of school traffic. These values are low enough that it is extremely unlikely that school traffic increases to through traffic would be sufficient to result in a turn lane volume threshold being satisfied.

3. The only possible turn lane volume threshold that could be caused to be met by school traffic is the eastbound left-turn at the Deane Hill Drive and Gerald R. Ford Street intersection. This would not be due to the proposed project, as it contributes no traffic to the eastbound left-turn movement, and only very small volumes to the intersection overall. Thus the proposed project would in no way be a causative factor justifying this turn lane.

8.0 APPENDIX

APPENDIX A | TRAFFIC DATA

APPENDIX B | TRIP GENERATION AND DISTRIBUTION

APPENDIX C | CAPACITY ANALYSES

APPENDIX A | TRAFFIC DATA

Traffic History

Station #	County	Location	Route #
000263	Knox	SOUTH OF KINGSTON PIKE	SR332

Record	Year	AADT
1	2015	17134
2	2014	16964
3	2013	18151
4	2012	17795
5	2011	18727
6	2010	17676
7	2009	16500
8	2008	17747
9	2007	18765
10	2006	17709
11	2005	19070
12	2004	19941
13	2003	18979
14	2002	19272
15	2001	20240
16	2000	18956
17	1999	20105
18	1998	20872
19	1997	20344
20	1996	20605
21	1995	19457
22	1994	17380
23	1993	22683
24	1992	20200
25	1991	19923
26	1990	18168
27	1989	19922
28	1988	18649
29	1987	19187
30	1986	18851
31	1985	19782

Primary St	Deane Hill Dr
Cross Stree	E of Morrell Rd
2001	9219
2002	
2003	10339
2004	
2005	9606
2006	
2007	7651
2008	
2009	7006
2010	
2011	
2012	
2013	
2014	
2015	7400

ITM Peak Hour Summary

Prepared by:

National Data & Surveying Services

Gerald R. Ford St and Deane Hill Dr , Knoxville

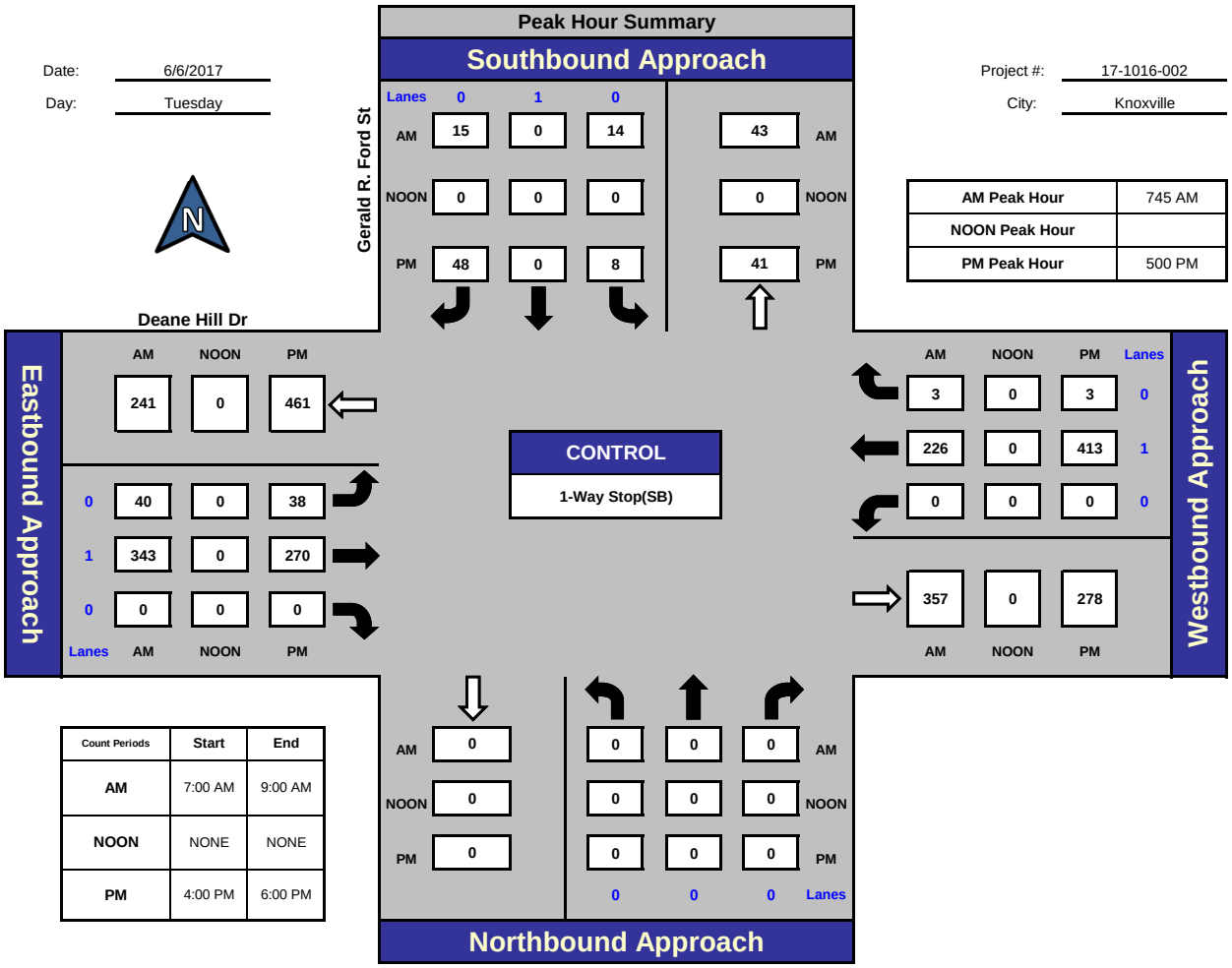
Date: 6/6/2017

Day: Tuesday

Project #: 17-1016-002

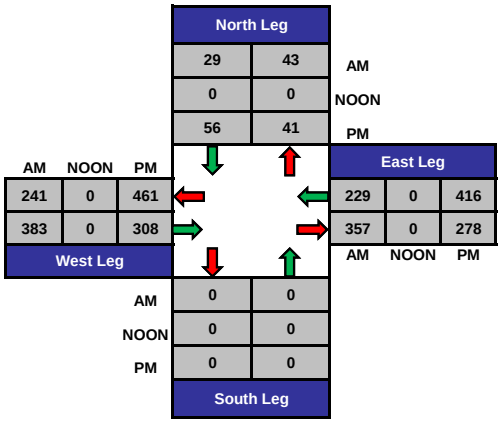
City: Knoxville

AM Peak Hour	745 AM
NOON Peak Hour	
PM Peak Hour	500 PM

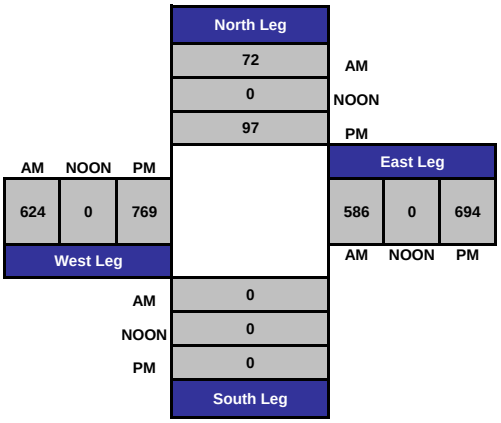


Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON	NONE	NONE
PM	4:00 PM	6:00 PM

Total Ins & Outs



Total Volume Per Leg



Project ID: 17-1016-002
Location: Gerald R. Ford St & Deane Hill Dr
City: Knoxville

Day: Tuesday
Date: 6/6/2017

Peak Start Times	
AM	7:00 AM
MD	12:00 AM
PM	4:00 PM

Groups Printed - Cars, PU, Vans - Heavy Trucks

	Gerald R. Ford St Southbound					Deane Hill Dr Westbound					Gerald R. Ford St Northbound					Deane Hill Dr Eastbound					
Start Time	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Int. Total
7:00 AM	2	0	2	0	4	0	28	0	0	28	0	0	0	0	0	0	36	1	0	37	69
7:15 AM	4	0	2	0	6	0	42	0	0	42	0	0	0	0	0	0	53	5	0	58	106
7:30 AM	4	0	1	0	5	2	33	0	0	35	0	0	0	0	0	0	56	3	0	59	99
7:45 AM	4	0	2	0	6	1	55	0	0	56	0	0	0	0	0	0	97	10	0	107	169
Total	14	0	7	0	21	3	158	0	0	161	0	0	0	0	0	0	242	19	0	261	443
8:00 AM	6	0	5	0	11	2	69	0	0	71	0	0	0	0	0	0	83	13	0	96	178
8:15 AM	3	0	2	0	5	0	46	0	0	46	0	0	0	0	0	0	83	8	0	91	142
8:30 AM	2	0	5	0	7	0	56	0	0	56	0	0	0	0	0	0	80	9	0	89	152
8:45 AM	4	0	5	0	9	2	53	0	0	55	0	0	0	0	0	0	96	7	0	103	167
Total	15	0	17	0	32	4	224	0	0	228	0	0	0	0	0	0	342	37	0	379	639
BREAK																					
4:00 PM	6	0	0	0	6	1	58	0	0	59	0	0	0	0	0	0	60	13	0	73	138
4:15 PM	7	0	3	0	10	1	87	0	0	88	0	0	0	0	0	0	62	7	0	69	167
4:30 PM	10	0	3	0	13	1	82	0	0	83	0	0	0	0	0	0	83	4	0	87	183
4:45 PM	9	0	1	0	10	4	77	0	0	81	0	0	0	0	0	0	58	3	0	61	152
Total	32	0	7	0	39	7	304	0	0	311	0	0	0	0	0	0	263	27	0	290	640
5:00 PM	18	0	3	0	21	2	102	0	0	104	0	0	0	0	0	0	82	11	0	93	218
5:15 PM	13	0	3	0	16	0	113	0	0	113	0	0	0	0	0	0	66	11	0	77	206
5:30 PM	11	0	0	0	11	0	96	0	0	96	0	0	0	0	0	0	63	6	0	69	176
5:45 PM	6	0	2	0	8	1	102	0	0	103	0	0	0	0	0	0	59	10	0	69	180
Total	48	0	8	0	56	3	413	0	0	416	0	0	0	0	0	0	270	38	0	308	780
Grand Total	109	0	39	0	148	17	1099	0	0	1116	0	0	0	0	0	0	1117	121	0	1238	2502
Apprch %	73.6	0.0	26.4	0.0		1.5	98.5	0.0	0.0		0.0	0.0	0.0	0.0		0.0	90.2	9.8	0.0		
Total %	4.4	0.0	1.6	0.0	5.9	0.7	43.9	0.0	0.0	44.6	0.0	0.0	0.0	0.0	0.0	0.0	44.6	4.8	0.0	49.5	
Cars, PU, Vans	109	0	39	0	148	17	1099	0	0	1116	0	0	0	0	0	0	1117	121	0	1238	2502
% Cars, PU, Vans	100.0	0.0	100.0	0.0	100.0	100.0	100.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	100.0	100.0
Heavy Trucks	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0
%Heavy Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Project ID: 17-1016-002
Location: Gerald R. Ford St & Deane H
City: Knoxville

PEAK HOURS

Day: Tuesday
Date: 6/6/2017

AM

	Gerald R. Ford St Southbound				Deane Hill Dr Westbound				Gerald R. Ford St Northbound				Deane Hill Dr Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis from 07:00 AM to 09:00 AM																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
7:45 AM	4	0	2	6	1	55	0	56	0	0	0	0	0	97	10	107	169
8:00 AM	6	0	5	11	2	69	0	71	0	0	0	0	0	83	13	96	178
8:15 AM	3	0	2	5	0	46	0	46	0	0	0	0	0	83	8	91	142
8:30 AM	2	0	5	7	0	56	0	56	0	0	0	0	0	80	9	89	152
Total Volume	15	0	14	29	3	226	0	229	0	0	0	0	0	343	40	383	641
% App. Total	51.7	0.0	48.3	100	1.3	98.7	0.0	100	0.0	0.0	0.0	0	0.0	89.6	10.4	100	
PHF				0.659				0.806				0.000				0.895	
Cars, PU, Vans	15	0	14	29	3	226	0	229	0	0	0	0	0	343	40	383	641
% Cars, PU, Vans	100.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
%Heavy Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PM

	Gerald R. Ford St Southbound				Deane Hill Dr Westbound				Gerald R. Ford St Northbound				Deane Hill Dr Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis from 04:00 PM to 06:00 PM																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
5:00 PM	18	0	3	21	2	102	0	104	0	0	0	0	0	82	11	93	218
5:15 PM	13	0	3	16	0	113	0	113	0	0	0	0	0	66	11	77	206
5:30 PM	11	0	0	11	0	96	0	96	0	0	0	0	0	63	6	69	176
5:45 PM	6	0	2	8	1	102	0	103	0	0	0	0	0	59	10	69	180
Total Volume	48	0	8	56	3	413	0	416	0	0	0	0	0	270	38	308	780
% App. Total	85.7	0.0	14.3	100	0.7	99.3	0.0	100	0.0	0.0	0.0	0	0.0	87.7	12.3	100	
PHF				0.667				0.920				0.000				0.828	
Cars, PU, Vans	48	0	8	56	3	413	0	416	0	0	0	0	0	270	38	308	780
% Cars, PU, Vans	100.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
%Heavy Trucks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

NORTH / SOUTH DRIVEWAY COUNTS - AM PEAK

Cannon & Cannon, Inc.
Consulting Engineers - Field Surveyors
8550 Kingston Pike
Knoxville, TN 37919

CCI Project Name: Deane Hill TIS
CCI Project Number: 686-0001
Intersection: Deane Hill @ Driveway
Counted By: CCI

File Name : Deane Hill_Driveway_am_6-20-17
Site Code : 00000001
Start Date : 6/20/2017
Page No : 1

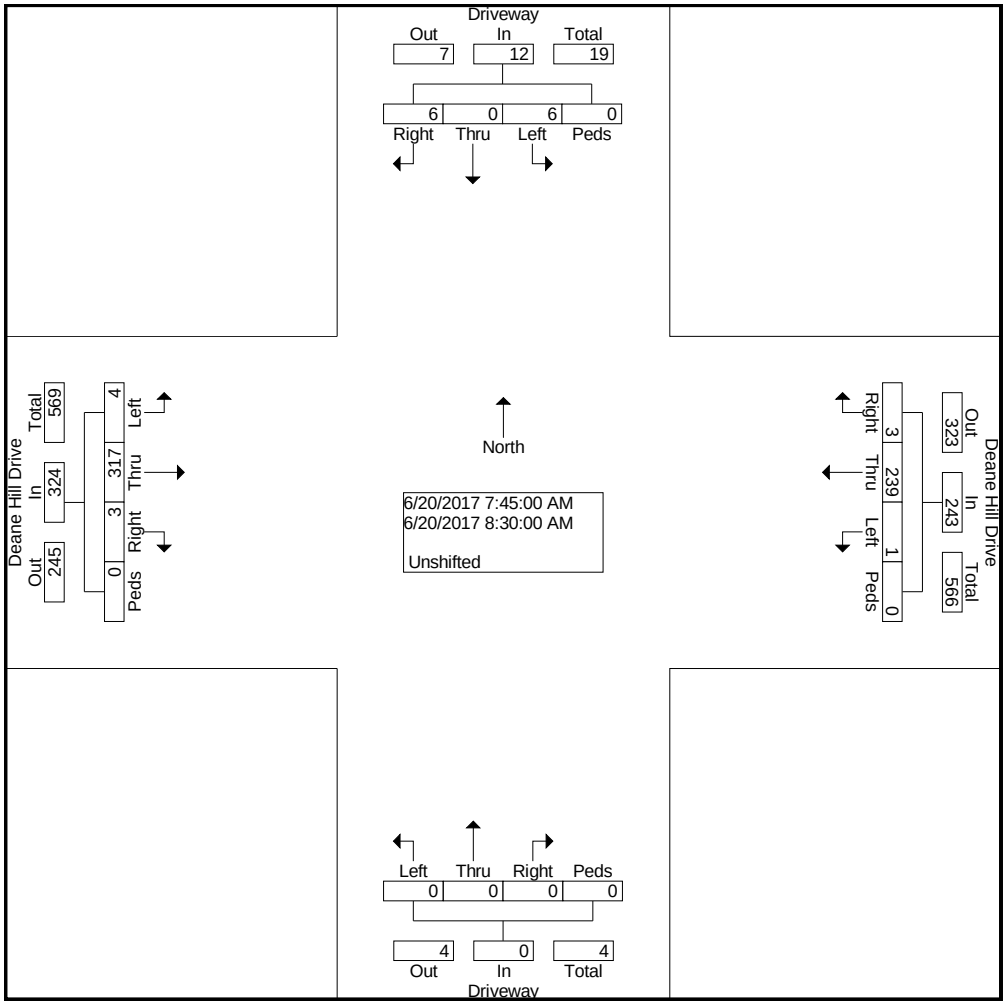
Groups Printed- Unshifted

	Driveway Southbound					Deane Hill Drive Westbound					Driveway Northbound					Deane Hill Drive 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		
07:45 AM	0	0	0	0	0	0	66	2	0	68	0	0	0	0	0	2	103	1	0	106	174
Total	0	0	0	0	0	0	66	2	0	68	0	0	0	0	0	2	103	1	0	106	174
08:00 AM	1	0	1	0	2	1	55	1	0	57	0	0	0	0	0	1	86	0	0	87	146
08:15 AM	2	0	2	0	4	0	55	0	0	55	0	0	0	0	0	1	63	2	0	66	125
08:30 AM	3	0	3	0	6	0	63	0	0	63	0	0	0	0	0	0	65	0	0	65	134
Grand Total	6	0	6	0	12	1	239	3	0	243	0	0	0	0	0	4	317	3	0	324	579
Apprch %	50.0	0.0	50.0	0.0		0.4	98.4	1.2	0.0		0.0	0.0	0.0	0.0		1.2	97.8	0.9	0.0		
Total %	1.0	0.0	1.0	0.0	2.1	0.2	41.3	0.5	0.0	42.0	0.0	0.0	0.0	0.0	0.0	0.7	54.7	0.5	0.0	56.0	

Cannon & Cannon, Inc.
Consulting Engineers - Field Surveyors
8550 Kingston Pike
Knoxville, TN 37919

File Name : Deane Hill_Driveway_am_6-20-17
Site Code : 00000001
Start Date : 6/20/2017

	Driveway Southbound					Deane Hill Drive Westbound					Driveway Northbound					Deane Hill Drive 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
Peak Hour From 07:45 AM to 08:30 AM - Peak 1 of 1																					
Intersection	07:45 AM																				
Volume	6	0	6	0	12	1	239	3	0	243	0	0	0	0	0	4	317	3	0	324	579
Percent	50.0	0.0	50.0	0.0		0.4	98.4	1.2	0.0		0.0	0.0	0.0	0.0		1.2	97.8	0.9	0.0		
07:45 Volume	0	0	0	0	0	0	66	2	0	68	0	0	0	0	0	2	103	1	0	106	174
Peak Factor																					0.832
High Int.	08:30 AM					07:45 AM					7:30:00 AM					07:45 AM					
Volume	3	0	3	0	6	0	66	2	0	68	0	0	0	0	0	2	103	1	0	106	
Peak Factor					0.500					0.893										0.764	



NORTH/SOUTH DRIVEWAY COUNTS - PM PEAK

Cannon & Cannon, Inc.
Consulting Engineers - Field Surveyors
8550 Kingston Pike
Knoxville, TN 37919

CCI Project Name: Deane Hill TIS
CCI Project Number: 686-0001
Intersection: Deane Hill @ Driveway
Counted By: CCI

File Name : Deane Hill_Driveway_pm_6-19-17
Site Code : 00000001
Start Date : 6/19/2017
Page No : 1

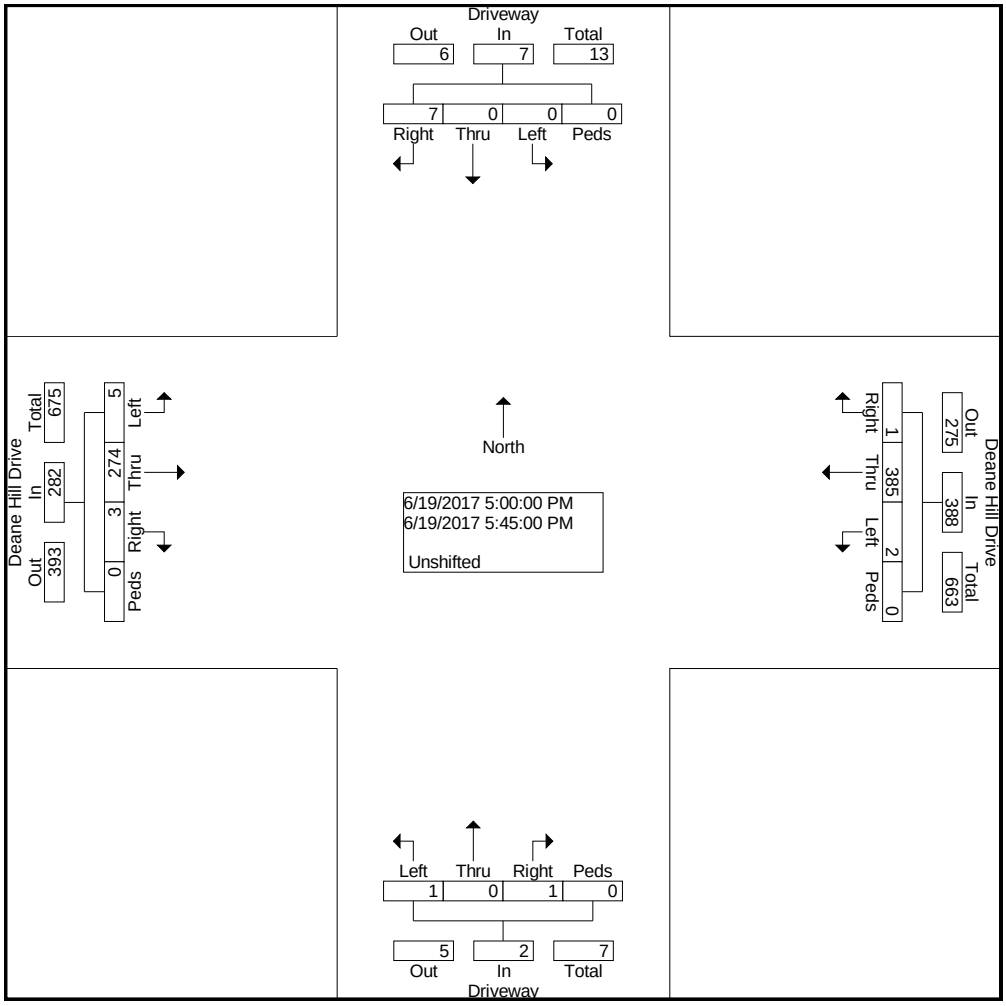
Groups Printed- Unshifted

	Driveway Southbound					Deane Hill Drive Westbound					Driveway Northbound					Deane Hill Drive 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		
05:00 PM	0	0	4	0	4	0	100	1	0	101	0	0	0	0	0	2	90	0	0	92	197
05:15 PM	0	0	2	0	2	0	93	0	0	93	0	0	0	0	0	1	72	1	0	74	169
05:30 PM	0	0	0	0	0	1	118	0	0	119	1	0	1	0	2	1	59	1	0	61	182
05:45 PM	0	0	1	0	1	1	74	0	0	75	0	0	0	0	0	1	53	1	0	55	131
Total	0	0	7	0	7	2	385	1	0	388	1	0	1	0	2	5	274	3	0	282	679
Grand Total	0	0	7	0	7	2	385	1	0	388	1	0	1	0	2	5	274	3	0	282	679
Apprch %	0.0	0.0	100.0	0.0		0.5	99.2	0.3	0.0		50.0	0.0	50.0	0.0		1.8	97.2	1.1	0.0		
Total %	0.0	0.0	1.0	0.0	1.0	0.3	56.7	0.1	0.0	57.1	0.1	0.0	0.1	0.0	0.3	0.7	40.4	0.4	0.0	41.5	

Cannon & Cannon, Inc.
Consulting Engineers - Field Surveyors
8550 Kingston Pike
Knoxville, TN 37919

File Name : Deane Hill_Driveway_pm_6-19-17
Site Code : 00000001
Start Date : 6/19/2017

	Driveway Southbound					Deane Hill Drive Westbound					Driveway Northbound					Deane Hill Drive 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
Peak Hour From 05:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	0	0	7	0	7	2	385	1	0	388	1	0	1	0	2	5	274	3	0	282	679
Percent	0.0	0.0	100.0	0.0		0.5	99.2	0.3	0.0		50.0	0.0	50.0	0.0		1.8	97.2	1.1	0.0		
05:00 Volume	0	0	4	0	4	0	100	1	0	101	0	0	0	0	0	2	90	0	0	92	197
Peak Factor																					0.862
High Int.	05:00 PM					05:30 PM					05:30 PM					05:00 PM					
Volume	0	0	4	0	4	1	118	0	0	119	1	0	1	0	2	2	90	0	0	92	
Peak Factor					0.438					0.815					0.250					0.766	



APPENDIX B | TRIP GENERATION AND DISTRIBUTION

TRIP GENERATION

Deane-Hill Mixed-Use (CCI Project No. 00686-0001)

Knoxville MPC
APARTMENT

105 Dwelling Units

WEEKDAY

T = 15.193(X)^0.899
T = 996

50%	ENTERING =	498	trips
50%	EXITING =	498	trips
		996	trips

AM PEAK

T = 0.758(X)^0.924
T = 56

22%	ENTERING =	12.32	trips
78%	EXITING =	43.68	trips
		56	trips

MID-DAY PEAK (AM Peak of the Generator)

T = NO RATE GIVEN FOR MID-DAY
T =

0%	ENTERING =	0	trips
0%	EXITING =	0	trips
		0	trips

PM PEAK

T = 0.669(X) + 10.069
T = 80

55%	ENTERING =	44	trips
45%	EXITING =	36	trips
		80	trips

Local Apartment
Trip Generation Study

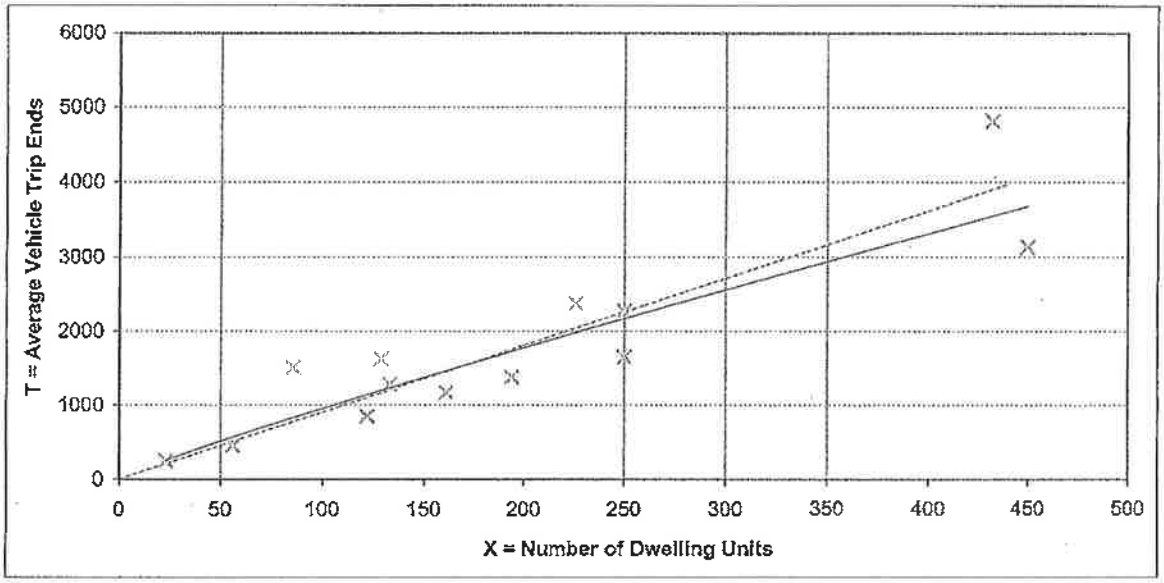
Average Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Number of Studies: 13
Average Number of Dwelling Units: 193
Directional Distribution: 50% entering, 50% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
9.03	6.59 - 17.41	2.47

Data Plot and Equation



X Actual Data Points ——— Fitted Curve ····· Average Rate

Fitted Curve Equation: $T = 15.193(X)^{0.899}$ $R^2 = 0.88$

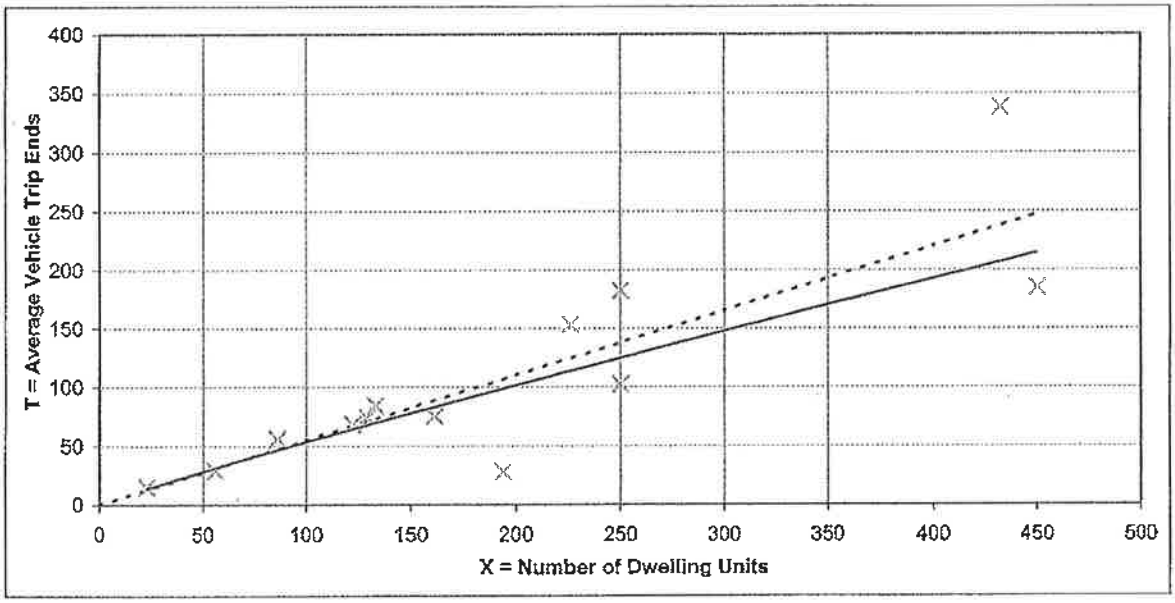
Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 7 and 9 a.m.**
Number of Studies:	13
Average Number of Dwelling Units:	193
Directional Distribution:	22% entering, 78% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.55	0.14 - 0.78	0.18

Data Plot and Equation



X Actual Data Points ——— Fitted Curve ····· Average Rate

Fitted Curve Equation: $T = 0.758(X)^{0.924}$ $R^2 = 0.75$

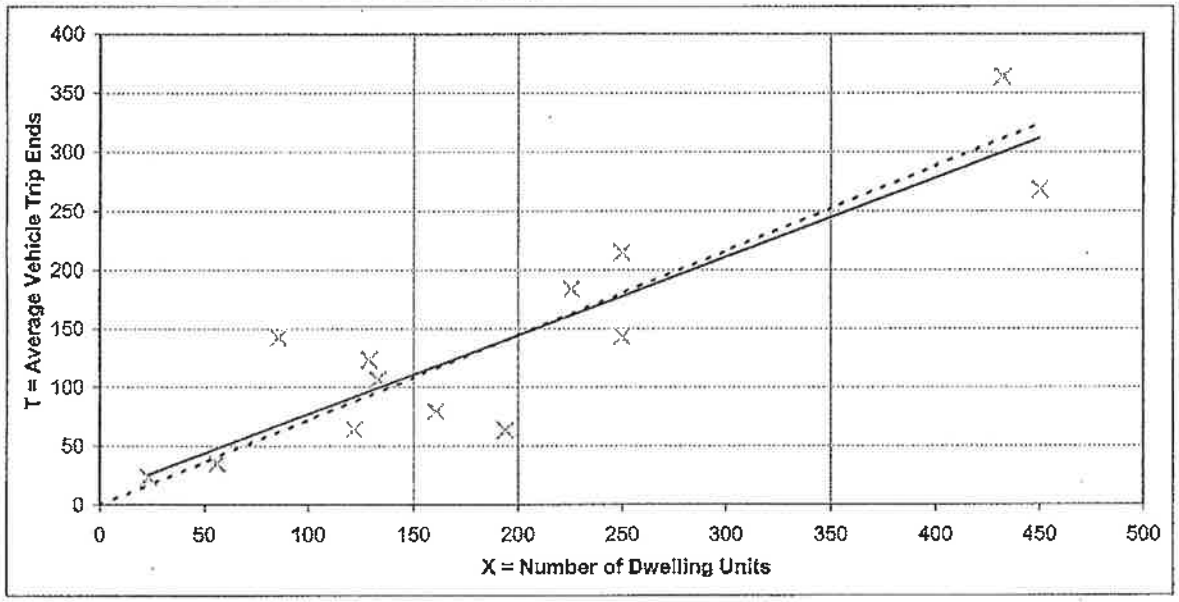
Local Apartment
Trip Generation Study

Average Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,** **Peak Hour of Adjacent Street Traffic,** **One Hour Between 4 and 6 p.m.**
Number of Studies:	13
Average Number of Dwelling Units:	193
Directional Distribution:	55% entering, 45% exiting

Trip Generation Per Dwelling Unit

Average Rate	Ranges of Rates	Standard Deviation
0.72	0.32 - 1.66	0.25

Data Plot and Equation



X Actual Data Points ——— Fitted Curve ····· Average Rate

Fitted Curve Equation: T = 0.669(X) + 10.069 **R^2 = 0.79**

TRIP GENERATION

Deane Hill Mixed-Use (CCI Project No. 00686-0001)

ITE TRIP GENERATION (932)
HIGH TURNOVER (SIT DOWN) RESTAURANT

3 1,000 Sq. Feet Gross Floor Area

WEEKDAY

T = X * 127.15
T = 382

50%	ENTERING =	191 trips
50%	EXITING =	191 trips
		382 trips

AM PEAK

T = X * 10.81
T = 32

55%	ENTERING =	17.6 trips
45%	EXITING =	14.4 trips
		32 trips

MID-DAY PEAK (AM Peak of the Generator)

T = X * 13.33
T = 40

53%	ENTERING =	21.2 trips
47%	EXITING =	18.8 trips
		40 trips

PM PEAK

T = X * 9.85
T = 30

60%	ENTERING =	18 trips
40%	EXITING =	12 trips
		30 trips

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

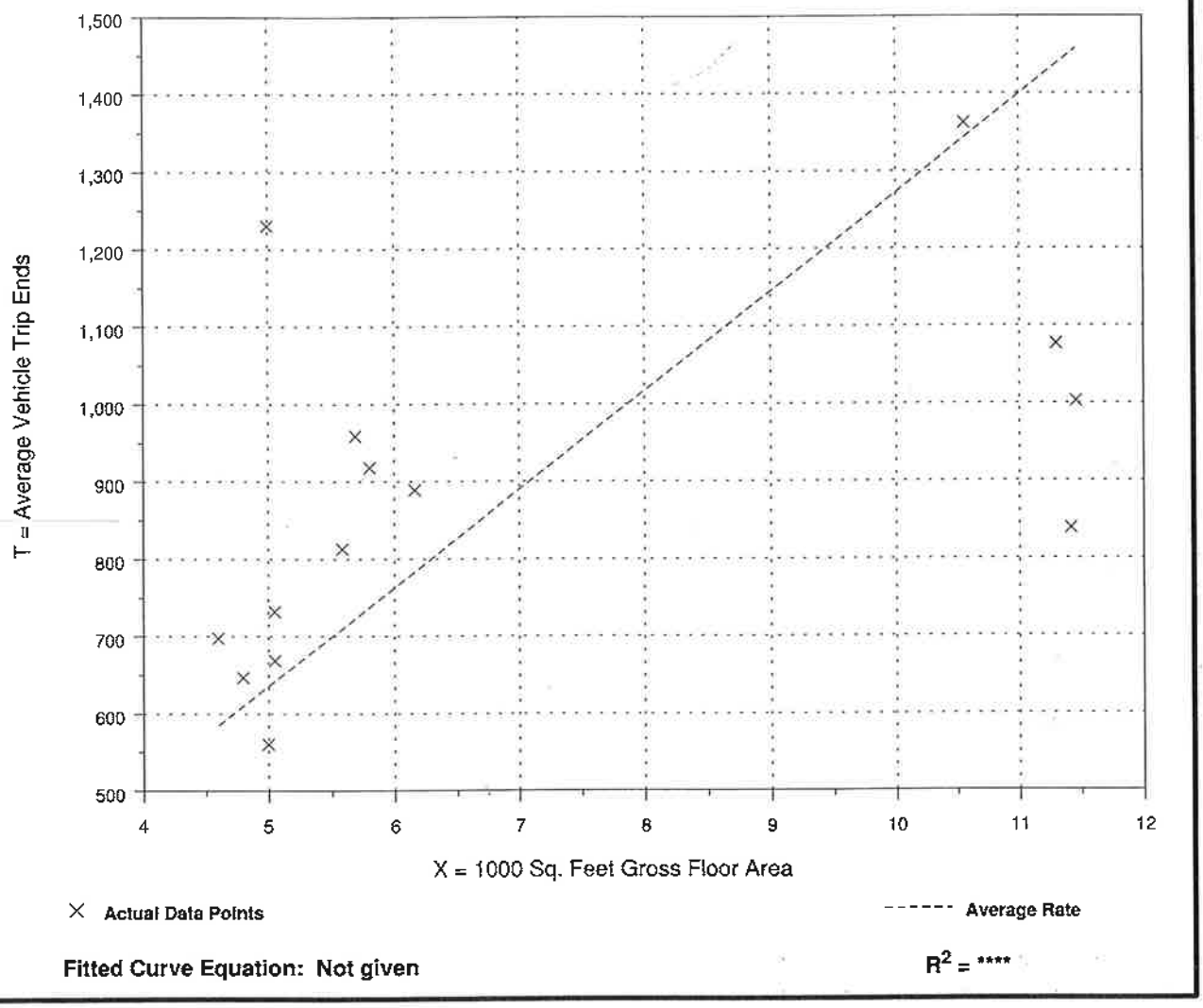
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area
On a: Weekday

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



Fitted Curve Equation: Not given

R^2 = ****

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

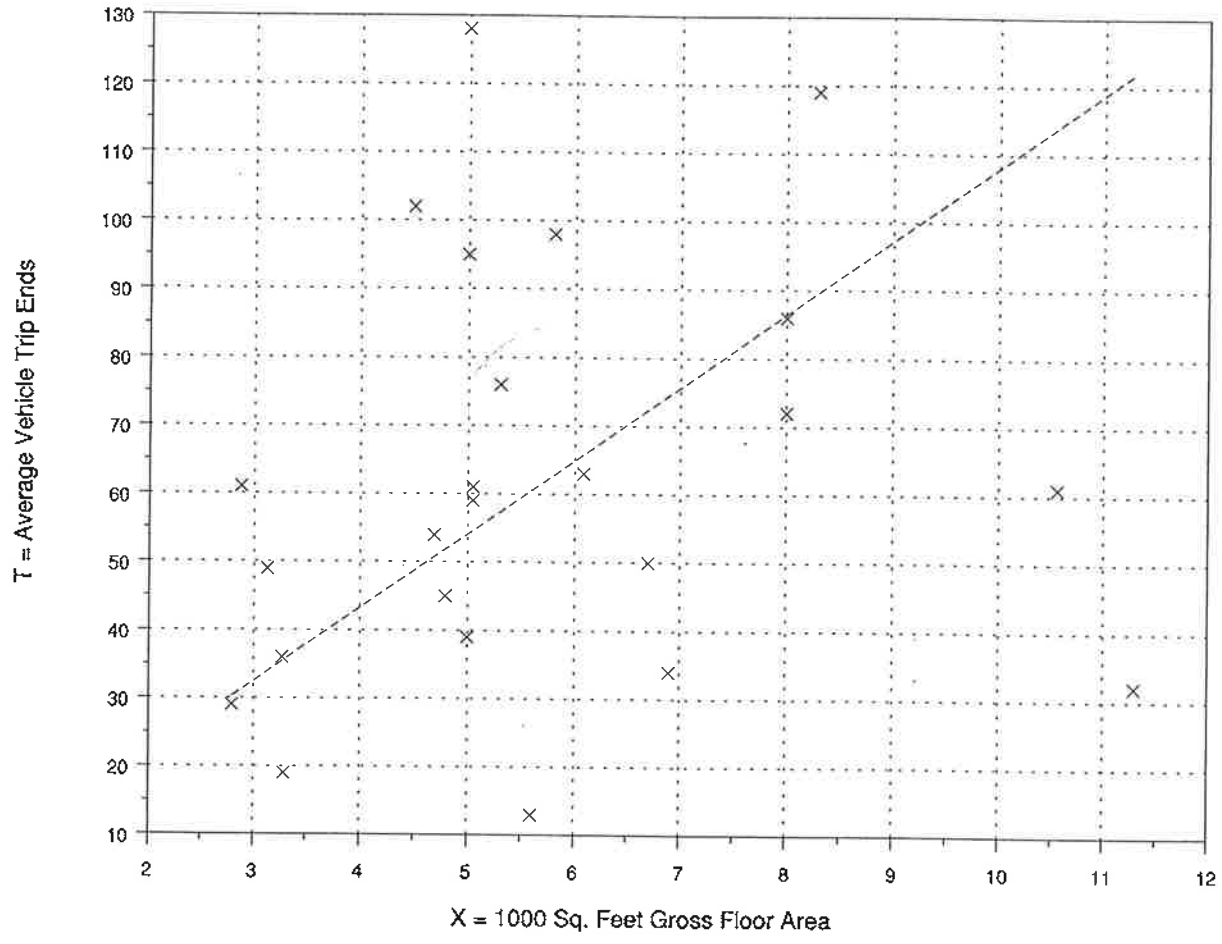
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 24
Average 1000 Sq. Feet GFA: 6
Directional Distribution: 55% entering, 45% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
10.81	2.32 - 25.60	6.59

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

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

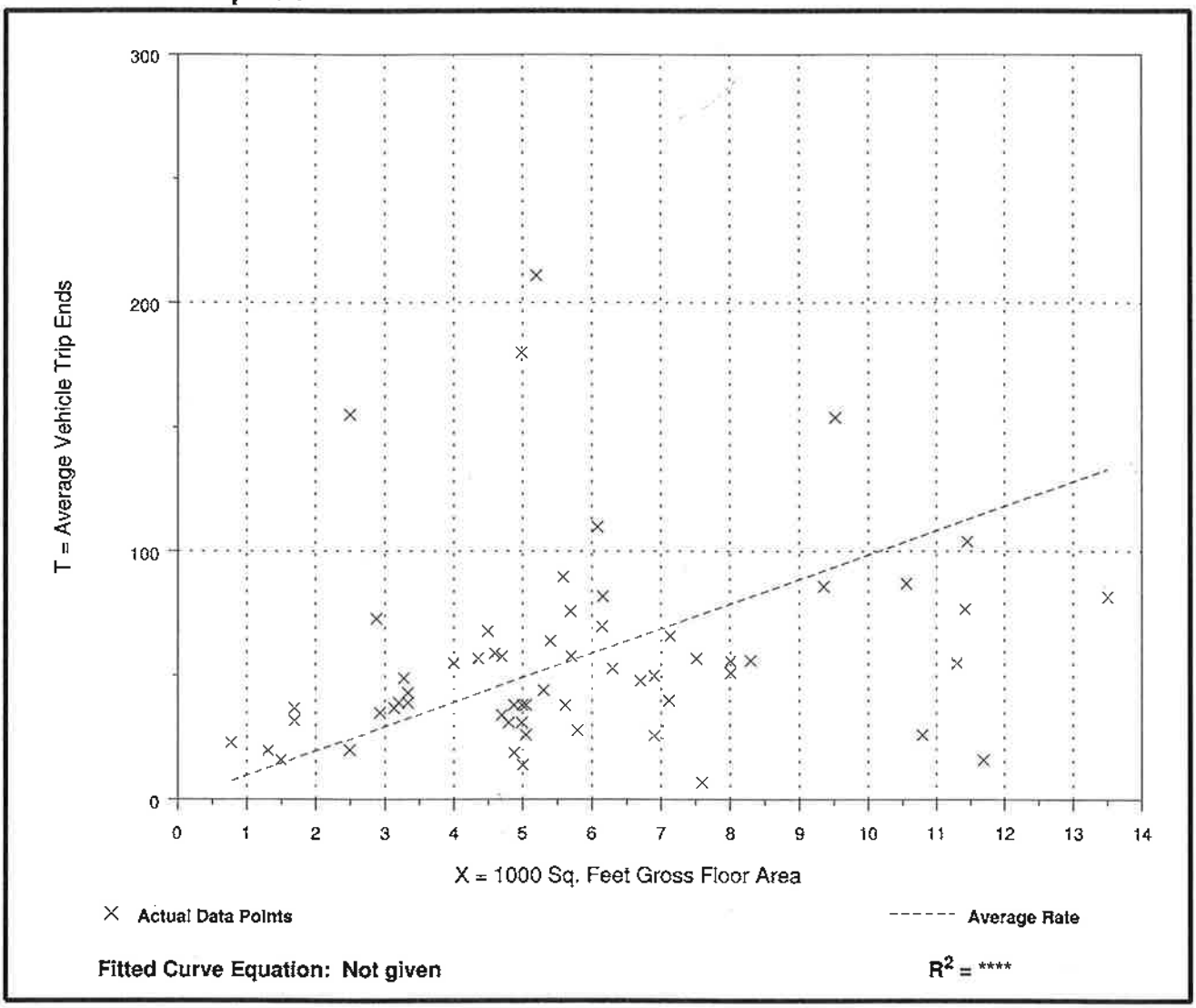
Average Vehicle Trip Ends vs: **1000 Sq. Feet Gross Floor Area**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

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



Fitted Curve Equation: Not given

R^2 = ****

APPENDIX C | CAPACITY ANALYSES

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 congestion, stops, delay, excess fuel consumption, pollutant emissions, etc.

The Transportation Research Board has published the Year 2010 Highway Capacity Manual (HCM2010), 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.

LOS CRITERIA: SIGNALIZED & UNSIGNALIZED INTERSECTIONS

LOS	CONTROL DELAY (S/VEH)		
	SIGNALIZED	UNSIGNALIZED	ROUNDABOUT
A	≤10	≤10	≤10
B	>10-20	>10-15	>10-15
C	>20-35	>15-25	>15-25
D	>35-55	>25-35	>25-35
E	>55-80	>35-50	>35-50
F	>80	>50	>50

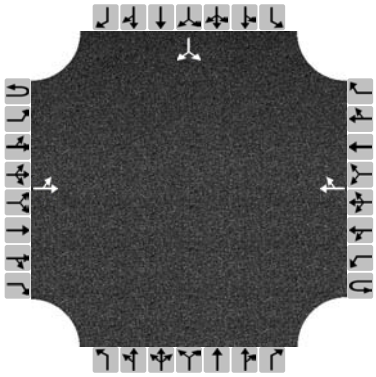
Another measure of intersection capacity that is often used in the evaluation of intersection operations is the volume to capacity (V/C) ratio. This ratio is defined as "the ratio of flow rate to capacity", and is a good measure of how much of an intersection's available capacity has been used up by the analysis volumes. Conversely, it also provides an indication of the reserve capacity available for future growth in traffic volumes.

The Intersection Capacity Utilization (ICU) is another measure that expresses a value similar to the V/C ratio. Specifically, the ICU method "sums the amount of the time required to serve all movements at saturation for a given cycle length and divides by that reference cycle length." The ICU is considered a more accurate measure of volume to capacity conditions for a signalized intersection, primarily because it accounts for the effects of the signal timing on intersection capacity.

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	ALC	Intersection	Deane Hill / Gerald Ford
Agency/Co.	Cannon & Cannon Inc.	Jurisdiction	City of Knoxville
Date Performed	6/12/2017	East/West Street	Deane Hill Drive
Analysis Year	2017	North/South Street	Gerald R. Ford
Time Analyzed	AM Peak - Existing	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Deane Hill Mixed Use TIS		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration		LT						TR							LR	
Volume (veh/h)		40	343				226	3						14		15
Percent Heavy Vehicles		3												3		3
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

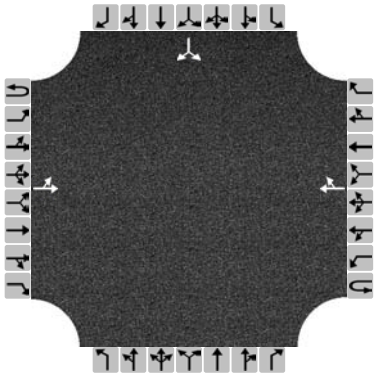
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		425													33	
Capacity		1304													516	
v/c Ratio		0.33													0.06	
95% Queue Length		0.1													0.2	
Control Delay (s/veh)		7.9													12.5	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	1.1												12.5			
Approach LOS	A												B			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	ALC	Intersection	Deane Hill / Gerald Ford
Agency/Co.	Cannon & Cannon Inc.	Jurisdiction	City of Knoxville
Date Performed	6/12/2017	East/West Street	Deane Hill Drive
Analysis Year	2017	North/South Street	Gerald R. Ford
Time Analyzed	PM Peak - Existing	Peak Hour Factor	0.94
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Deane Hill Mixed Use TIS		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration		LT						TR							LR	
Volume (veh/h)		38	270				413	3						8		48
Percent Heavy Vehicles		3												3		3
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		327													60	
Capacity		1112													547	
v/c Ratio		0.29													0.11	
95% Queue Length		0.1													0.4	
Control Delay (s/veh)		8.4													12.4	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	1.3												12.4			
Approach LOS	A												B			

HCS 2010 Two-Way Stop Control Summary Report

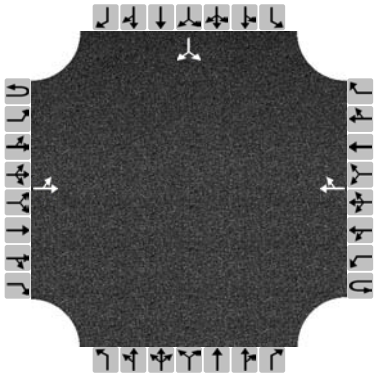
General Information

Analyst	ALC
Agency/Co.	Cannon & Cannon Inc.
Date Performed	6/12/2017
Analysis Year	2020
Time Analyzed	AM Peak - Background
Intersection Orientation	East-West
Project Description	Deane Hill Mixed Use TIS

Site Information

Intersection	Deane Hill / Gerald Ford
Jurisdiction	City of Knoxville
East/West Street	Deane Hill Drive
North/South Street	Gerald R. Ford
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration		LT						TR							LR	
Volume (veh/h)		42	359				236	3						15		16
Percent Heavy Vehicles		3												3		3
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		446													35	
Capacity		1292													497	
v/c Ratio		0.35													0.07	
95% Queue Length		0.1													0.2	
Control Delay (s/veh)		7.9													12.8	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	1.2												12.8			
Approach LOS	A												B			

HCS 2010 Two-Way Stop Control Summary Report

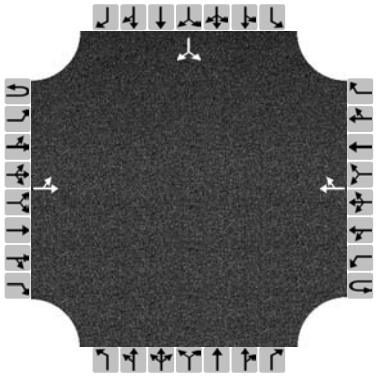
General Information

Analyst	ALC
Agency/Co.	Cannon & Cannon Inc.
Date Performed	6/12/2017
Analysis Year	2020
Time Analyzed	PM Peak - Background
Intersection Orientation	East-West
Project Description	Deane Hill Mixed Use TIS

Site Information

Intersection	Deane Hill / Gerald Ford
Jurisdiction	City of Knoxville
East/West Street	Deane Hill Drive
North/South Street	Gerald R. Ford
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration		LT						TR							LR	
Volume (veh/h)		40	282				432	3						8		50
Percent Heavy Vehicles		3												3		3
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		343													62	
Capacity		1092													529	
v/c Ratio		0.31													0.12	
95% Queue Length		0.1													0.4	
Control Delay (s/veh)		8.4													12.7	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	1.4												12.7			
Approach LOS	A												B			

HCS 2010 Two-Way Stop Control Summary Report

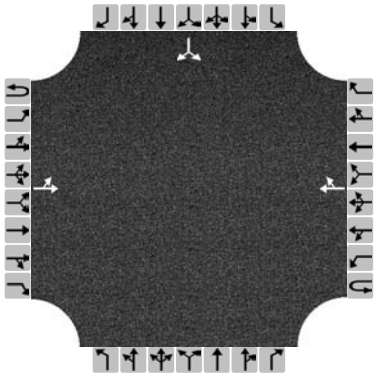
General Information

Analyst	ALC
Agency/Co.	Cannon & Cannon Inc.
Date Performed	6/12/2017
Analysis Year	2020
Time Analyzed	AM Peak - Combined
Intersection Orientation	East-West
Project Description	Deane Hill Mixed Use TIS

Site Information

Intersection	Deane Hill / Gerald Ford
Jurisdiction	City of Knoxville
East/West Street	Deane Hill Drive
North/South Street	Gerald R. Ford St.
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration		LT						TR							LR	
Volume (veh/h)		42	362				248	27						28		16
Percent Heavy Vehicles		3												3		3
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		449													49	
Capacity		1248													381	
v/c Ratio		0.36													0.13	
95% Queue Length		0.1													0.4	
Control Delay (s/veh)		8.0													15.8	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	1.2												15.8			
Approach LOS	A												C			

HCS 2010 Two-Way Stop Control Summary Report

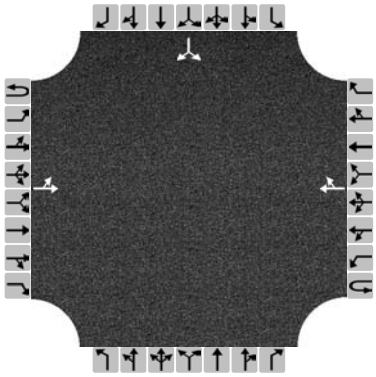
General Information

Analyst	ALC
Agency/Co.	Cannon & Cannon Inc.
Date Performed	6/20/2017
Analysis Year	2020
Time Analyzed	PM Peak - Combined
Intersection Orientation	East-West
Project Description	Deane Hill Mixed Use TIS

Site Information

Intersection	Deane Hill / Gerald Ford
Jurisdiction	City of Knoxville
East/West Street	Deane Hill Drive
North/South Street	Gerald R. Ford St.
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration		LT						TR							LR	
Volume (veh/h)		40	295				441	24						30		50
Percent Heavy Vehicles		3												3		3
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

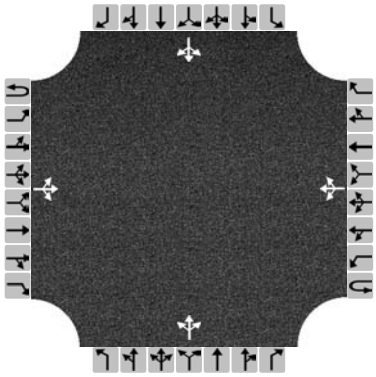
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		376													90	
Capacity		1037													369	
v/c Ratio		0.36													0.24	
95% Queue Length		0.1													0.9	
Control Delay (s/veh)		8.6													17.9	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	1.4												17.9			
Approach LOS	A												C			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	ALC	Intersection	Deane Hill / Rest. Drive
Agency/Co.	Cannon & Cannon Inc.	Jurisdiction	City of Knoxville
Date Performed	6/12/2017	East/West Street	Deane Hill Drive
Analysis Year	2020	North/South Street	Restaurant Drive
Time Analyzed	AM Peak - Combined	Peak Hour Factor	0.90
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Deane Hill Mixed Use TIS		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	377	9		5	260	3		9	0	2		6	0	6
Percent Heavy Vehicles		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		4				6					12				14	
Capacity		1263				1124					355				457	
v/c Ratio		0.00				0.01					0.03				0.03	
95% Queue Length		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		7.9				8.2					15.5				13.1	
Level of Service (LOS)		A				A					C				B	
Approach Delay (s/veh)	0.1				0.2				15.5				13.1			
Approach LOS	A				A				C				B			

HCS 2010 Two-Way Stop Control Summary Report

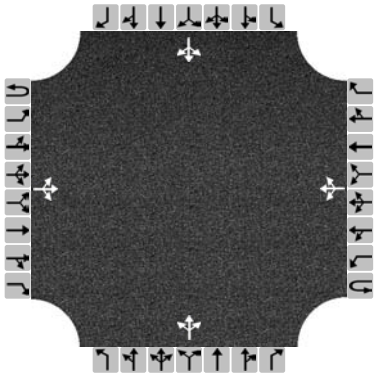
General Information

Analyst	ALC
Agency/Co.	Cannon & Cannon Inc.
Date Performed	6/20/2017
Analysis Year	2020
Time Analyzed	PM Peak - Combined
Intersection Orientation	East-West
Project Description	Deane Hill Mixed Use TIS

Site Information

Intersection	Deane Hill / Rest. Drive
Jurisdiction	City of Knoxville
East/West Street	Deane Hill Drive
North/South Street	Restaurant Drive
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		5	311	9		5	450	1		8	0	2		0	0	7
Percent Heavy Vehicles		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		6				6					11				8	
Capacity		1052				1193					290				564	
v/c Ratio		0.01				0.01					0.04				0.01	
95% Queue Length		0.0				0.0					0.1				0.0	
Control Delay (s/veh)		8.4				8.0					17.9				11.5	
Level of Service (LOS)		A				A					C				B	
Approach Delay (s/veh)	0.2				0.1				17.9				11.5			
Approach LOS	A				A				C				B			

HCS 2010 Two-Way Stop Control Summary Report

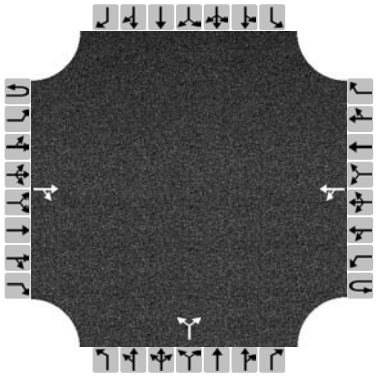
General Information

Analyst	ALC
Agency/Co.	Cannon & Cannon Inc.
Date Performed	6/12/2017
Analysis Year	2020
Time Analyzed	AM Peak - Combined
Intersection Orientation	East-West
Project Description	Deane Hill Mixed Use TIS

Site Information

Intersection	Deane Hill / Apt. Drive
Jurisdiction	City of Knoxville
East/West Street	Deane Hill Drive
North/South Street	Apartment Drive
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			375	10		10	241			27		20				
Percent Heavy Vehicles						3				3		3				
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						279					52					
Capacity						1125					425					
v/c Ratio						0.25					0.12					
95% Queue Length						0.0					0.4					
Control Delay (s/veh)						8.2					14.7					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					0.4				14.7							
Approach LOS					A				B							

HCS 2010 Two-Way Stop Control Summary Report

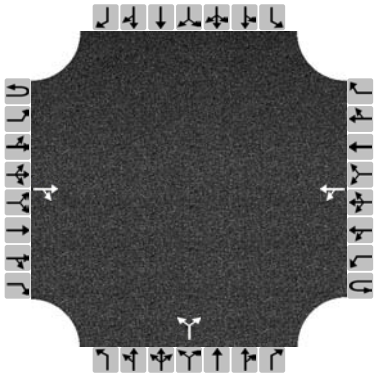
General Information

Analyst	ALC
Agency/Co.	Cannon & Cannon Inc.
Date Performed	6/20/2017
Analysis Year	2020
Time Analyzed	PM Peak - Combined
Intersection Orientation	East-West
Project Description	Deane Hill Mixed Use TIS

Site Information

Intersection	Deane Hill / Apt. Drive
Jurisdiction	City of Knoxville
East/West Street	Deane Hill Drive
North/South Street	Apartment Drive
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			284	29		24	433			23		17				
Percent Heavy Vehicles						3				3		3				
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Undivided															
Median Storage																

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)						514					45					
Capacity						1200					356					
v/c Ratio						0.43					0.13					
95% Queue Length						0.1					0.4					
Control Delay (s/veh)						8.1					16.6					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					0.7				16.6							
Approach LOS					A				C							

TABLE 5B KNOX COUNTY RIGHT-TURN LANE VOLUME THRESHOLDS FOR 2-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH	Project No: 00686-0001 Project Name: Dean Hill Notes: Mixed Use Development

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			X 1	X 4		
50 - 99						
100 - 149						
150 - 199						
200 - 249						Yes
250 - 299					Yes	Yes
300 - 349				Yes	Yes	Yes
350 - 399			Yes	Yes	Yes	Yes
400 - 449			Yes	Yes	Yes	Yes
450 - 499		Yes	Yes	Yes	Yes	Yes
500 - 549		Yes	Yes	Yes	Yes	Yes
550 - 599	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 - 599	= / > 600
Fewer Than 25	X 3	X 2				
25 - 49					Yes	Yes
50 - 99				Yes	Yes	Yes
100 - 149			Yes	Yes	Yes	Yes
150 - 199		Yes	Yes	Yes	Yes	Yes
200 - 249	Yes	Yes	Yes	Yes	Yes	Yes
250 - 299	Yes	Yes	Yes	Yes	Yes	Yes
300 - 349	Yes	Yes	Yes	Yes	Yes	Yes
350 - 399	Yes	Yes	Yes	Yes	Yes	Yes
400 - 449	Yes	Yes	Yes	Yes	Yes	Yes
450 - 499	Yes	Yes	Yes	Yes	Yes	Yes
500 - 549	Yes	Yes	Yes	Yes	Yes	Yes
550 - 599	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

	Intersection	Time Period	Through Volume	Right-Turn Volume	Right-Turn Lane Warranted (Yes / No)
1	G.R. Ford	AM	248	27	NO
2	G.R. Ford	PM	441	24	NO
3	Apt. Drive	AM	375	10	NO
4	Apt. Drive	PM	284	29	NO

Source: Knox County Department of Engineering and Public Works "Access Control and Driveway Design Policy"

TABLE 5A KNOX COUNTY LEFT-TURN LANE VOLUME THRESHOLDS FOR 2-LANE ROADWAYS WITH A PREVAILING SPEED OF 36 TO 45 MPH	Project No: 00686-0001 Project Name: Deane Hill Notes: Mixed Use Development

(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	AM 200 - 249	PM 250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
AM 350 - 399	100	80	(65) 3	55	50	40
400 - 449	90	70	60	50	45	35
PM 450 - 499	80	65	55	(45) 2	40	30
500 - 549	70	60	45	35	35	25
550 - 599	65	55	40	35	30	25
600 - 649	60	45	35	30	25	25
650 - 699	55	35	35	30	25	20
700 - 749	50	35	30	25	20	20
750 or More	45	35	25	25	20	20

OPPOSING VOLUME	AM PM THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 599	= / > 600
100 - 149	70	60	50	45	40	35
150 - 199	60	55	45	40	35	30
200 - 249	55	50	40	35	30	30
AM 250 - 299	(50) 1	45	35	30	30	30
PM 300 - 349	45	(40) 4	35	30	25	25
350 - 399	40	35	30	25	25	20
400 - 449	35	30	30	25	20	20
450 - 499	30	25	25	20	20	20
500 - 549	25	25	20	20	20	15
550 - 599	25	20	20	20	20	15
600 - 649	25	20	20	20	20	15
650 - 699	20	20	20	20	20	15
700 - 749	20	20	20	15	15	15
750 or More	20	20	20	15	15	15

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

	Intersection	Time Period	Opposing Volume	Through Volume	Left-Turn Volume	Warrant Threshold	Left-Turn Lane Warranted (Yes / No)
1	G.R. Ford	AM	275	362	42	50	NO
2	G.R. Ford	PM	465	295	40	45	NO
3	Apt. Drive	AM	385	241	10	65	NO
4	Apt. Drive	PM	313	433	24	40	NO

Source: Knox County Department of Engineering and Public Works "Access Control and Driveway Design Policy"