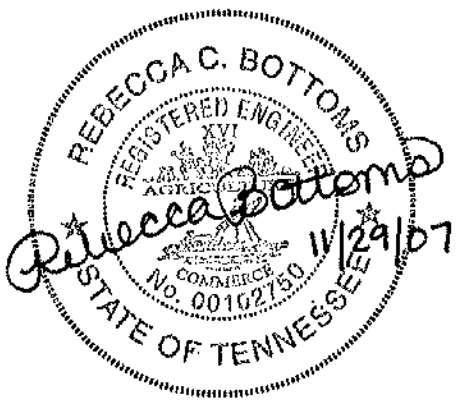
Traffic Impact Study

Hardin Valley Road / Conrad Site
Knoxville, Tennessee

CCI Project File No. 00621-0002

November 9, 2007
(Revised November 29, 2007)



Prepared for:

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Figures and Tables

EXECUTIVE SUMMARY

This report provides a summary of a traffic impact study that was performed for a proposed mixed-use development to be located in west Knox County, Tennessee. The project site is on the southern side of Hardin Valley Road and approximately 670 feet west of Westcott Boulevard.

This report revises a previous report dated November 9, 2007. The report was revised due to the elimination of a proposed secondary right-in/right-out site access located to the west of the main site access.

The development plan for this project proposes a mixed-use project containing office, retail, and residential uses. The site access is proposed via a new roadway to be located at an existing median opening on Hardin Valley Road. Based on the trip generation estimates from the proposed site, a Level I traffic impact study is required.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the project site. Of particular interest was the intersection of Hardin Valley Road with the proposed site entrance. Appropriate intersection evaluations were conducted at this location for existing and future conditions in order to determine the anticipated impacts, and to establish recommended measures to mitigate these impacts. These evaluations included intersection capacity analyses, turn lane assessments, traffic signal warrant assessments, corner sight distance reviews and others as appropriate.

The primary conclusion of this study is that the traffic generated from the proposed development will have a significant impact on traffic operations at the intersection of Hardin Valley Road and the site entrance. Capacity analyses of this intersection found that it is anticipated to incur peak hour levels-of-service of "F" once the proposed development is constructed and generating traffic, unless improvements are constructed. Therefore, geometric and traffic control improvements were identified that will successfully mitigate the traffic impact of the proposed development upon this intersection, resulting in levels-of-service of no worse than "B". The following listing is a summary of the recommendations that resulted from this study:

1. Provide a 75 foot eastbound right-turn storage lane with a 180 foot deceleration bay taper on Hardin Valley Road at the proposed site entrance.

2. Provide two twelve-foot northbound egress lanes from the development at the proposed site entrance, one striped as a shared left/through lane and the other as a right-turn lane.

3. Install a full actuated traffic signal at the intersection of Hardin Valley Road and the site entrance. In addition, signal coordination with the existing signal at Hardin Valley Road and Westcott Boulevard should be provided. The signal should be installed and operational at the time that approximately 60 percent of the projected project traffic (from both this site and the planned development on the north side of Hardin Valley Road) is generated.

INTRODUCTION AND PURPOSE OF STUDY

This report provides a summary of a traffic impact study that was performed for a proposed mixed-use development to be located in west Knox County, Tennessee. The project site is on the southern side of Hardin Valley Road and approximately 670 feet west of Westcott Boulevard. FIGURE 1 is a project location map identifying the project site in relation to the major roadways in the vicinity of the proposed development.

The development plan for this project proposes a mixed-use project containing office, retail, and residential uses. The site access is proposed via a new roadway to be located at an existing median opening on Hardin Valley Road. FIGURE 2 is a Site Development Plan which details the proposed site configuration. Based on the trip generation estimates from the proposed site, a Level 1 traffic impact study is required.

The purpose of this study was the evaluation of the traffic operational and safety impacts of the proposed development upon roadways in the vicinity of the project site. Of particular interest was the intersection of Hardin Valley Road with the proposed site entrance. Appropriate intersection evaluations were conducted at this location for existing and future conditions in order to determine the anticipated impacts, and to establish recommended measures to mitigate these impacts. These evaluations included intersection capacity analyses, turn lane assessments traffic signal warrant assessments, corner sight distance reviews and others as appropriate.

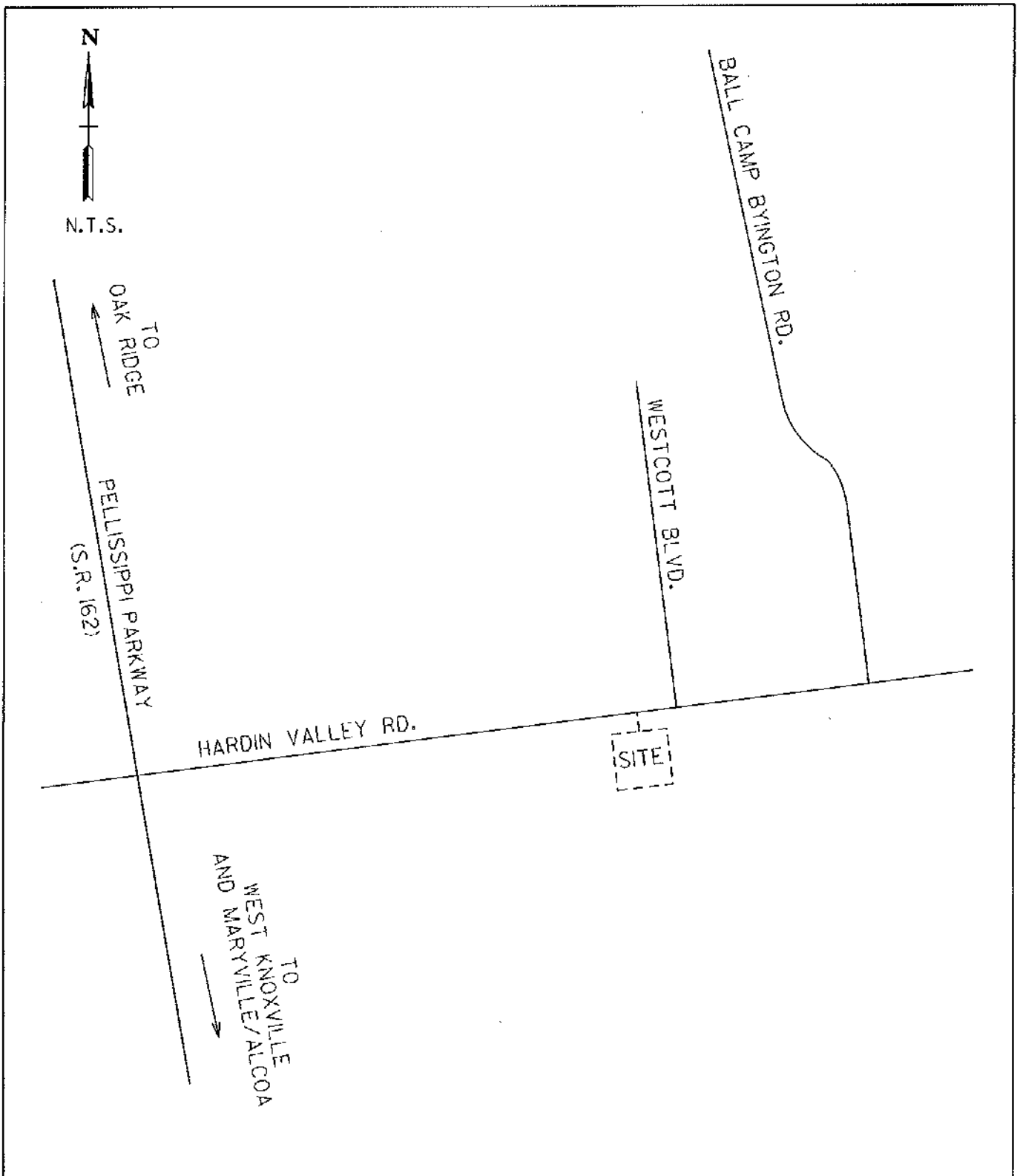

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FIGURE 1
PROJECT LOCATION MAP

HARDIN VALLEY ROAD AT CONRAD SITE
TRAFFIC IMPACT STUDY

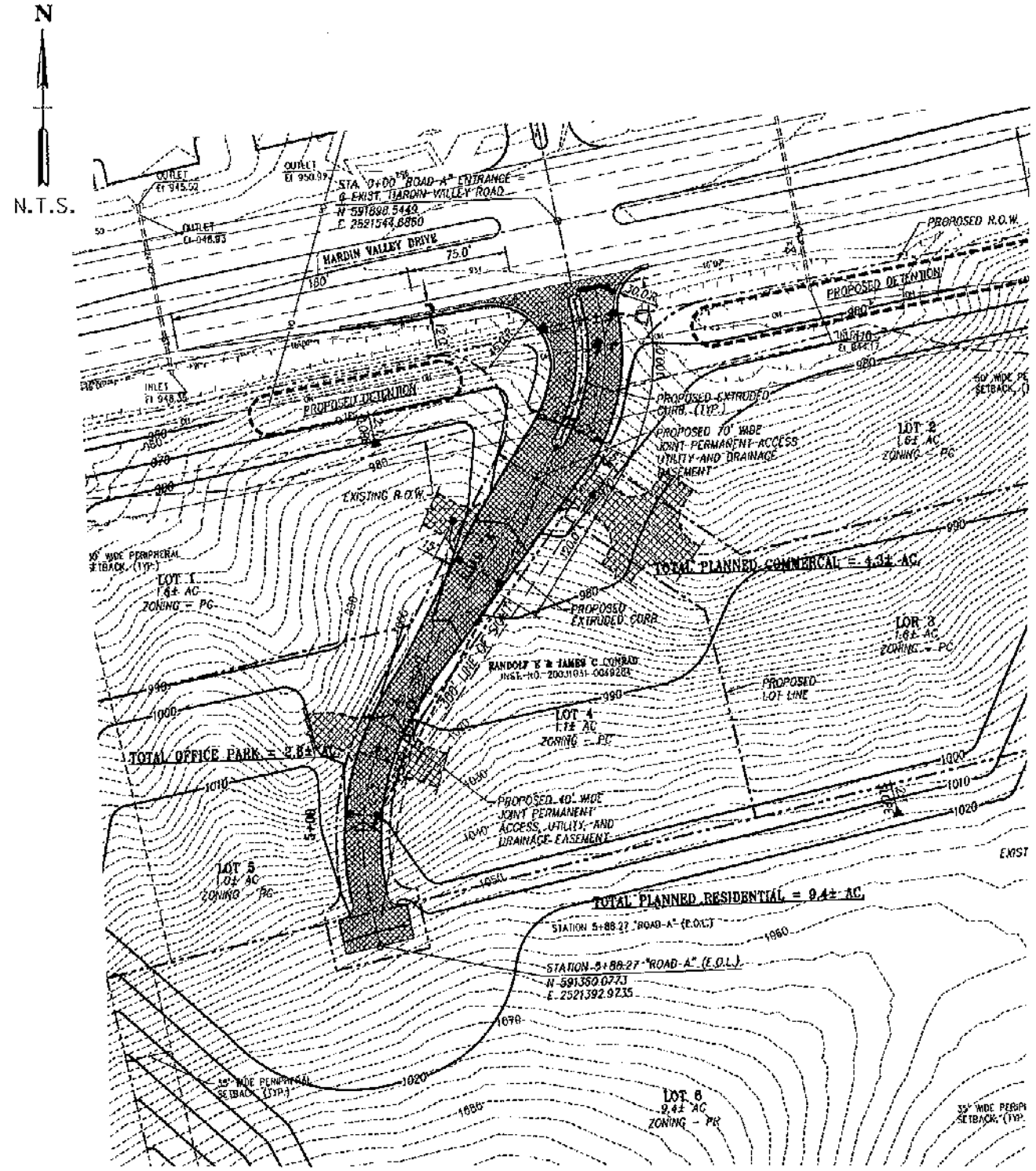

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FIGURE 2
SITE PLAN

HARDIN VALLEY ROAD AT CONRAD SITE
TRAFFIC IMPACT STUDY

Existing Roadway Conditions

Hardin Valley Road, in the vicinity of the development, is a four-lane divided Arterial facility maintained by Knox County. The roadway consists of four twelve foot travel lanes, two in each direction, with left-turn storage lanes provided at a majority of the intersections in the study area. The speed limit on Hardin Valley Road is posted as 45 mph. The existing intersection of Hardin Valley Road with Westcott Boulevard, located just east of the proposed site, is currently signalized.

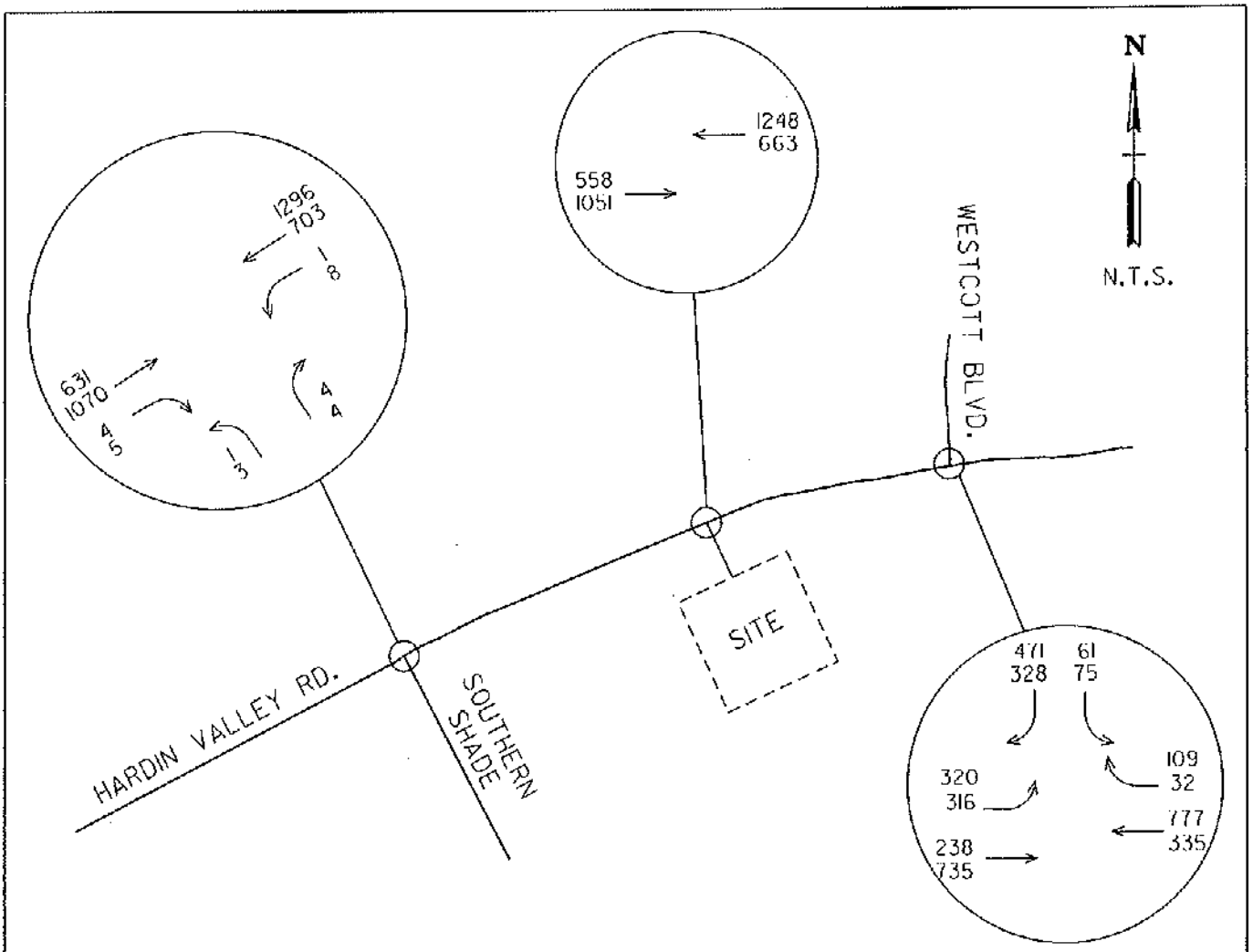
Existing Traffic Data.

Existing traffic data was gathered for this study. The Tennessee Department of Transportation (TDOT) collects average daily traffic data (ADT) annually on Hardin Valley Road. One count station was found near the project site that was felt to have particular relevance for this study. The most currently available data from this count station is contained in TABLE 1.

TABLE 1
AVERAGE DAILY TRAFFIC DATA

Count Year	Count Station/Location Station T 84 Hardin Valley Road West of Pellissippi Pkwy
2002	7,179
2003	7,533
2004	7,761
2005	8,457
2006	8,804
2007	9,379

In addition to the available ADT data, an intersection turning movement traffic count was performed specifically for this project. This count was conducted at the intersection of Hardin Valley Road at Southern Shade Boulevard for the A.M. and P.M. peak traffic hours. These existing traffic counts are summarized on FIGURE 3, and the raw data traffic count summary sheets are contained in the APPENDIX.



VOLUME LEGEND

TOP NUMBER - AM PEAK HOUR
BOTTOM NUMBER - PM PEAK HOUR

THE DATA SHOWN ARE THE RAW TRAFFIC COUNT DATA TIMES A FACTOR TO ADJUST TO AN AVERAGE WEEKDAY VOLUME. SEE APPENDIX FOR RAW COUNT DATA AND FACTOR TABLE. (FACTORS DEVELOPED BY THE UNIVERSITY OF TENNESSEE TRANSPORTATION RESEARCH CENTER).

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FIGURE 3
EXISTING TRAFFIC VOLUMES (2007)

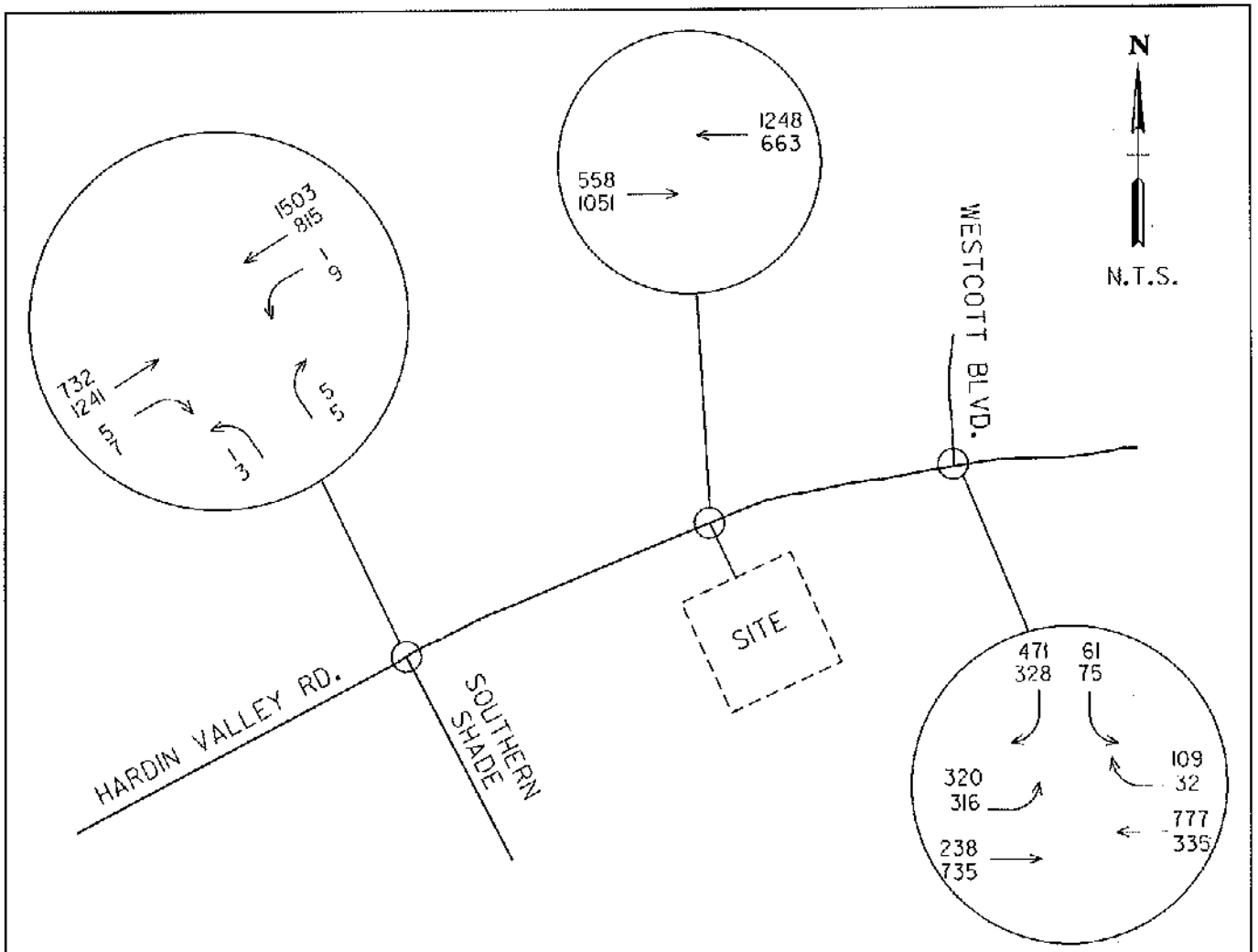
HARDIN VALLEY ROAD AT CONRAD SITE
TRAFFIC IMPACT STUDY

Existing Capacity Analyses / Levels-of-Service

Capacity analyses utilizing the 2007 existing volumes were not conducted for the proposed site access since the intersection does not currently exist with development traffic. Intersection capacity analyses for the proposed site entrance will be conducted under year 2010 combined conditions.

Background Traffic Growth

The proposed development will be constructed in one phase with completion anticipated by 2010. Therefore, year 2010 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 2010, it was necessary to establish an annual growth rate for existing traffic. The TDOT ADT values previously discussed, as well as knowledge of the area were used to determine an approximate annual growth rate. Based on the available data, a background annual growth rate of five percent was assumed. FIGURE 4 contains the background traffic volumes that would result from a five percent annual growth from year 2007, when the counts were conducted, to year 2010.



VOLUME LEGEND

TOP NUMBER - AM PEAK HOUR
BOTTOM NUMBER - PM PEAK HOUR
INCLUDES 5% ANNUAL GROWTH RATE
FROM EXISTING TO YEAR 2010.

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FIGURE 4
BACKGROUND TRAFFIC VOLUMES (2010)

HARDIN VALLEY ROAD AT CONRAD SITE
TRAFFIC IMPACT STUDY

Trip Generation

In order to estimate the expected traffic volumes to be generated by 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 data for the morning and evening 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 the APPENDIX.

TABLE 2
TRIP GENERATION SUMMARY

Land Use	ITE Code	Size	Weekday (trips/day)	AM Peak (trips/hour)	PM Peak (trips/hour)
Townhomes	KNOX	41 units	428	23	38
Entering Trips			214	5	21
Exiting Trips			214	18	17
General Office	710	34,560 sf	588	80	117
Entering Trips			294	70	20
Exiting Trips			294	10	97
Specialty Retail Center	814	8,640 sf	381	-	42
Entering Trips			190	-	18
Exiting Trips			191	-	24
Drive-In Bank	912	5,700 sf	1,405	70	261
Entering Trips			703	39	130
Exiting Trips			702	31	131
TOTALS			2,802	173	458
Entering Trips			1,401	114	189
Exiting Trips			1,401	59	269

To account for anticipated internal trips between the proposed site uses the Trip Generation Handbook (ITE) was consulted. Tables 7.1 and 7.2 of the Handbook provide estimated internal capture rates for trip origins and destinations within a multi-use development. The P.M. trips for the proposed development were reduced, as appropriate, to account for likely internal trips occurring within the site. The resulting peak hour generated trips are summarized in TABLE 2A. ITE tables and worksheets are provided in the APPENDIX.

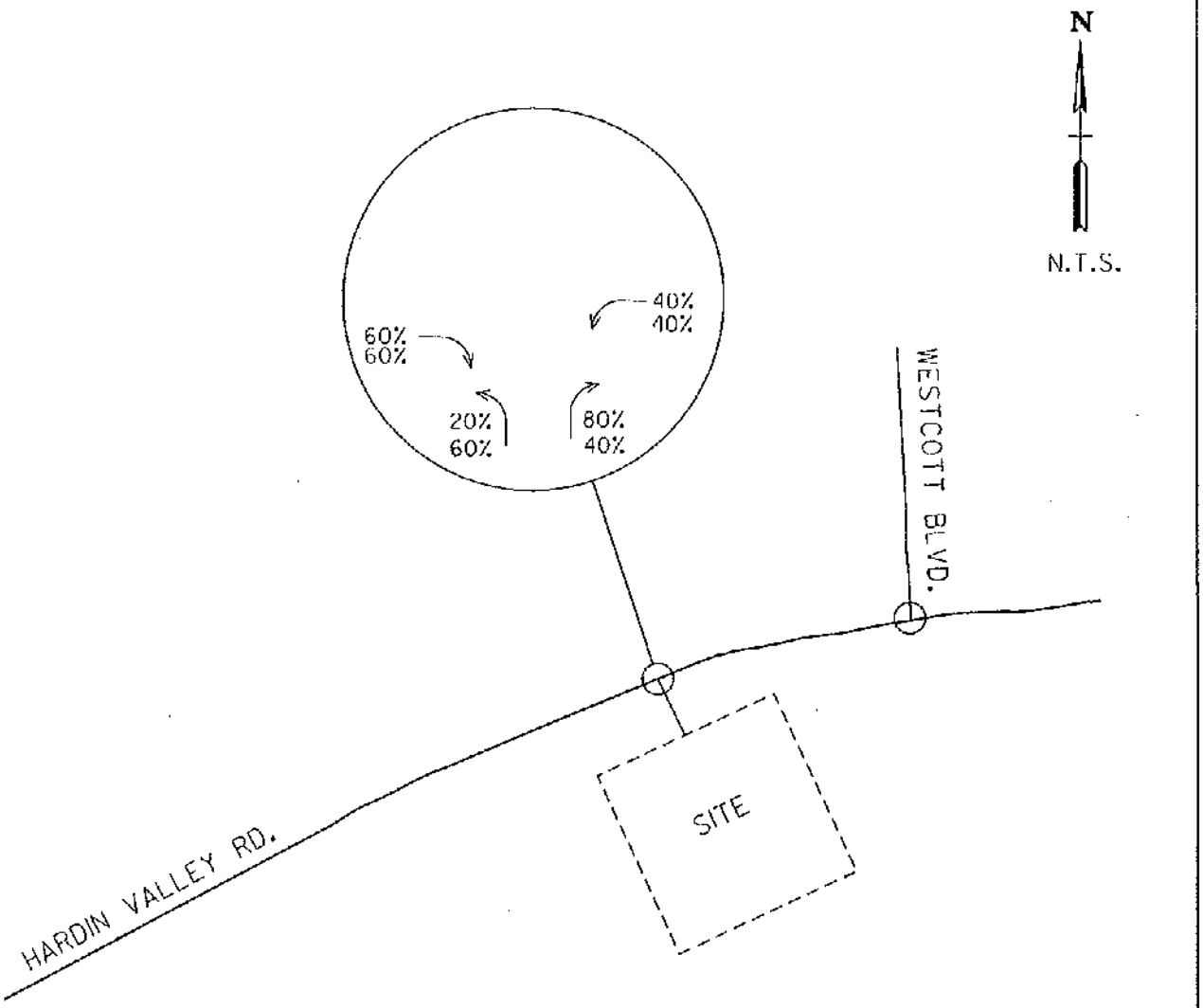
TABLE 2A TRIP GENERATION SUMMARY W/ INTERNAL TRIP REDUCTIONS			
	AM Peak (trips/hour)	Mid-day Peak (trips/hour)	PM Peak (trips/hour)
Entering Trips	114	0	164
Exiting Trips	59	0	244
TOTAL TRIPS	173	0	408

Trip Distribution and Assignment

FIGURE 5 provides a summary of the trip distribution patterns assumed for the study intersection. These patterns were based on the existing traffic patterns derived from the traffic counts, as well as knowledge of the area. FIGURE 6 shows the generated trips as assigned to the study intersection in accordance with these distribution patterns. A proposed development, located on the north side of Hardin Valley Road at this intersection, is anticipated to be constructed and also generating traffic at the same time as the Conrad site development. This additional development, Hardin Valley Office Park, is a proposed mixed-use development consisting of commercial (59,000 square feet) and office / medical office (56,200 square feet) uses. Additional information about this development can be found in a separate traffic impact study entitled "Hardin Valley Office Park" prepared for Reveiz and Company. FIGURE 6A shows the generated trip assignments including both the Conrad site development and the Hardin Valley Office Park trips. FIGURE 7 shows the combined year 2010 build-out volumes reflecting the existing traffic, the background traffic growth, and the newly generated traffic from the proposed Conrad site development and the proposed Hardin Valley Office Park development.

Future Capacity Analyses / Levels-of-Service

See EVALUATIONS section of report.



LEGEND

TOP NUMBER - AM PEAK HOUR
BOTTOM NUMBER - PM PEAK HOUR

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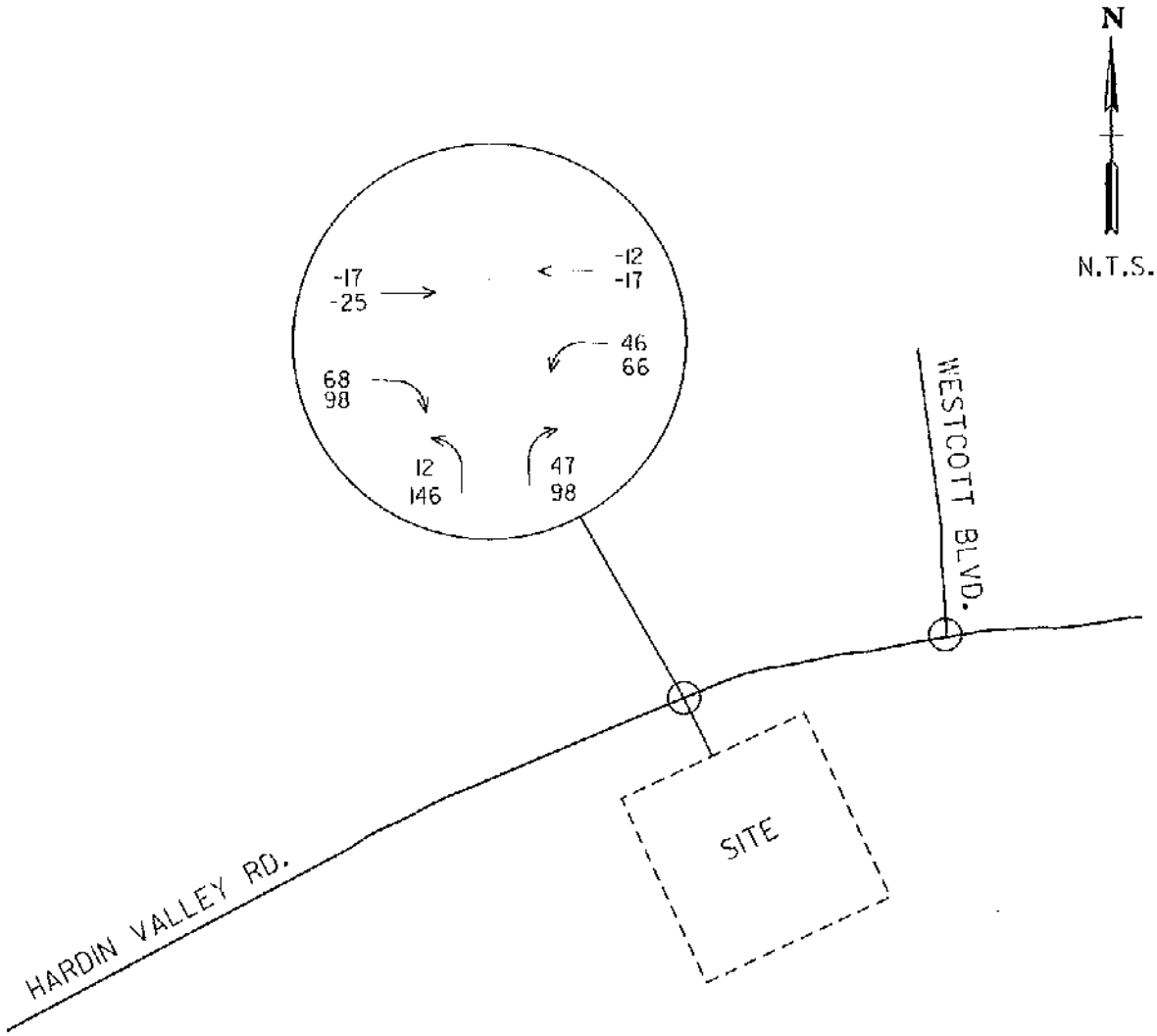
FIGURE 5
TRIP DISTRIBUTION

HARDIN VALLEY ROAD AT CONRAD SITE
TRAFFIC IMPACT STUDY



VOLUME LEGEND

TOP NUMBER - AM PEAK HOUR
BOTTOM NUMBER - PM PEAK HOUR

INCLUDES INTERNAL TRIPS AND PASSBY TRIPS ADJUSTMENT.

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FIGURE 6
TRIP ASSIGNMENTS

HARDIN VALLEY ROAD AT CONRAD SITE
TRAFFIC IMPACT STUDY

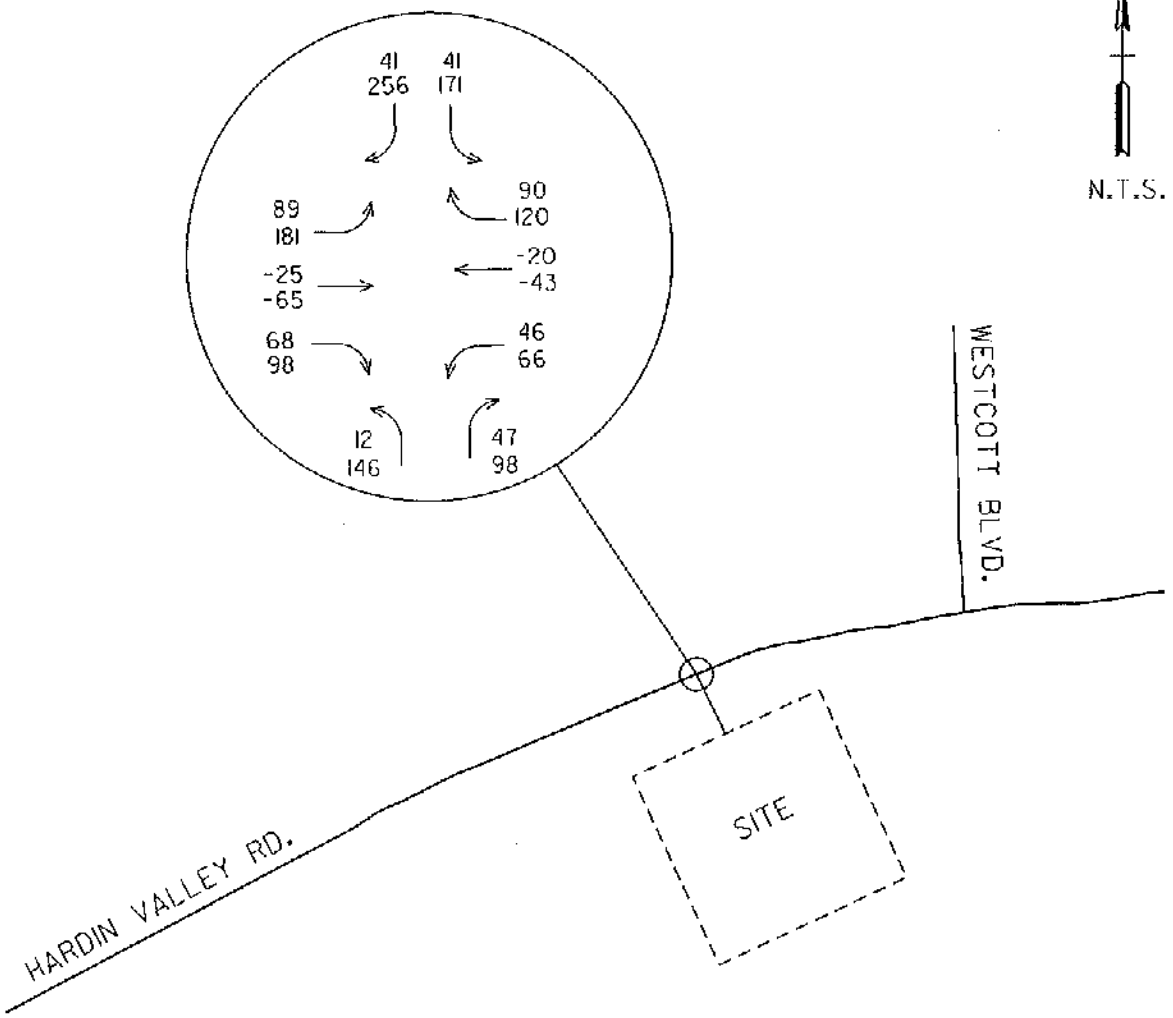

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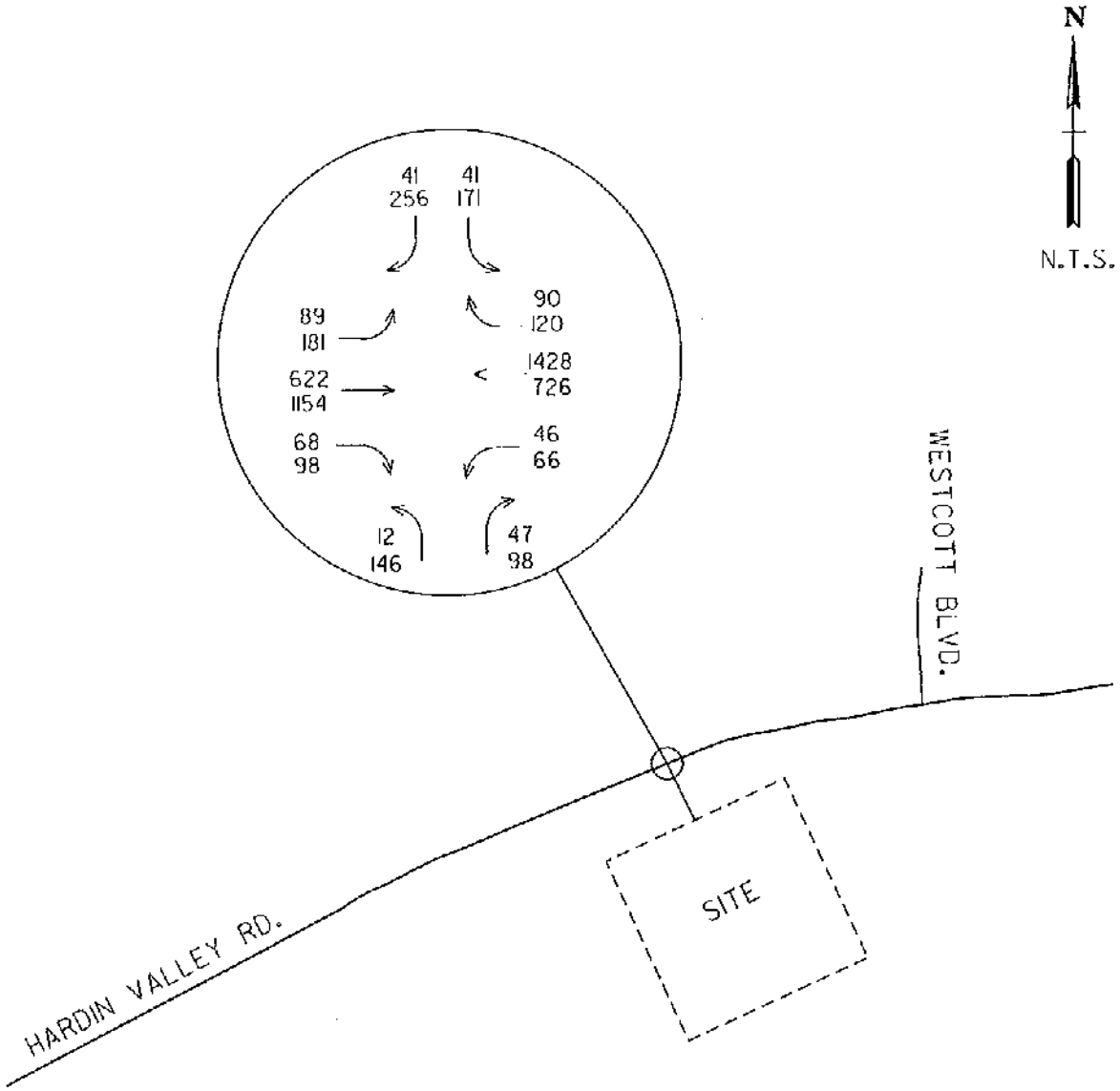
FIGURE 6A

TRIP ASSIGNMENTS W/ ADJACENT DEVELOPMENT

HARDIN VALLEY ROAD AT CONRAD SITE
TRAFFIC IMPACT STUDY



VOLUME LEGEND

TOP NUMBER - AM PEAK HOUR
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FIGURE 7
COMBINED TRAFFIC VOLUMES (2010)

HARDIN VALLEY ROAD AT CONRAD SITE
TRAFFIC IMPACT STUDY

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Intersection Capacity Analyses

TABLE 3 summarizes the results of all intersection capacity analyses conducted for this study. Detailed computer print-out summaries are contained in the APPENDIX, along with an information sheet describing the utilized procedures entitled, "Capacity and Level-of-Service Concepts."

TABLE 3

SUMMARY OF INTERSECTION CAPACITY ANALYSES

Intersection	Time Period	2007 Existing (LOS/Delay/ICU)	Year 2010 Background[3] (LOS/Delay/ICU)	Year 2010 Combined (LOS/Delay/ICU)
Hardin Valley Rd. at Main Site Entrance.	A.M.	-	-	F 75.3
SIDE ST. STOP CONTROL[1]	P.M.	-	-	F *
Hardin Valley Rd. at Main Site Entrance.	A.M.	-	-	B 10.0 65.3
SIGNALIZED CONTROL[2]	P.M.	-	-	B 13.9 68.9

Results are structured as follows for type of analyses:

[1]SIDE ST. STOP CONTROL- Level-of-Service and Average Vehicular Delay (seconds) for side street approach.

[2]SIGNALIZED CONTROL- Level-of-Service, Average Vehicular Delay (seconds) and Intersection Capacity Utilization Percent (ICU) for full intersection.

See APPENDIX for detailed computed print-out summaries and discussion of Capacity and Level-of-Service concepts.

* Calculated delay is significantly in excess of 5 minutes

Traffic Signal Warrant Analyses at Site Entrance

The intersection of Hardin Valley Road and the proposed site entrance was evaluated for possible justification for signalization utilizing the traffic signal warrants from the Manual on Uniform Traffic Control Devices. The traffic signal warrants from the Manual on Uniform Traffic Control Devices are extremely important to the justification of any traffic signal for installation. In fact, in order to comply with state law in Tennessee, one or more of these warrants must be satisfied in order for a traffic signal to be legally installed. This evaluation was based on the Year 2010 projected traffic conditions, shown on FIGURE 7. The northbound, Conrad Site, volumes were used as the side street volumes in the warrant analysis. The intersection met the Peak Hour Volume Warrant (Warrant No. 3) for two of the three hours that were studied. In addition, the two P.M. hours that were studied also satisfied two hours of the Four Hour Warrant (Warrant No. 2). It is anticipated that the site entrance would also meet the Four Hour Warrant if additional P.M. hours were analyzed. The results of this assessment are contained in TABLE 4 below. Computer printout summaries are contained in the APPENDIX

TABLE 4 TRAFFIC SIGNAL WARRANT SUMMARY					
Intersection	Volume Warrant – Required No. of Hours Satisfied (Yes/No)				
	1A (8 hr.)	1B (8 hr.)	Comb. (8 hr.)	2 (4 hr.)	3 (Peak hr.)
Hardin Valley Rd at Site Entrance	No	No	No	Likely	Yes

In terms of timing, it is anticipated that the signal would be warranted at such time as approximately 60% of the projected trips are generated by either development located at this intersection.

Intersection Geometry at Site Entrance

The proposed site access roadway is located at an existing median opening on Hardin Valley Road approximately 670 feet to the west of Westcott Boulevard. The site entrance is planned as a three-lane median divided roadway consisting of one southbound lane and two northbound lanes with a raised median separating the northbound and southbound lanes. The northbound existing lanes are to be configured as a shared left-turn/through lane and a right-turn lane with 100 feet of storage.

An eastbound right-turn lane on Hardin Valley Road at the main site entrance was found to be warranted under P.M. peak hour conditions. This assessment is based on volume thresholds from the Knox County "Access Control and Driveway Design Policy" contained in the APPENDIX. A seventy-five foot right-turn lane will be provided at the proposed site entrance on Hardin Valley Road. A westbound left-turn lane currently exists on Hardin Valley Road at the proposed site entrance. The existing 110 feet of storage is sufficient to serve the site. Exiting and proposed turn lane storage lengths are shown in TABLE 5. Turn lane volumes with resulting estimated queue lengths are also shown in TABLE 5.

TABLE 5

TURN LANE STORAGE SUMMARY

2010 Combined Conditions

Intersection Name/Turn Lane	Turn Volume (vph) *	Exist/Proposed Storage (ft)	Synchro 50% Queue (ft) *	Synchro 95% Queue (ft) *
Hardin Valley/Main Site Entrance				
Eastbound Left Turn	181	110	32	64
Eastbound Right Turn	98	75	2	20
Westbound Left Turn	66	110	21	58
Westbound Right Turn	120	150	0	27
Northbound Left Turn/Through	146	-	73	133
Northbound Right Turn	98	100	14	51
Southbound Left Turn	171	-	87	153
Southbound Right Turn	256	150	2	58

* Turn volumes and queues in this table were taken for the worst-case peak hour for each turn movement.

Corner Sight Distance at Site Entrance

Field reviews indicated that adequate corner sight distance exists along Hardin Valley Road at the proposed site entrance location. The recommended sight distance for this situation is 450 feet based on the posted speed limit of 45 m.p.h. The observed sight distance is well in excess of 600 feet both to the east and to the west of the site entrance location.

CONCLUSIONS AND RECOMMENDATIONS

The primary conclusion of this study is that the traffic generated from the proposed development will have a significant impact on traffic operations at the intersection of Hardin Valley Road and the site entrance. Capacity analyses of this intersection found that it is anticipated to incur peak hour levels-of-service of "F" once the proposed development is constructed and generating traffic, unless improvements are constructed. Therefore, geometric and traffic control improvements were identified that will successfully mitigate the traffic impact of the proposed development upon this intersection, resulting in levels-of-service of no worse than "B". The following listing is a summary of the recommendations that resulted from this study:

1. Provide a 75 foot eastbound right-turn storage lane with a 180 foot deceleration bay taper on Hardin Valley Road at the proposed site entrance as shown in FIGURE 8.

2. Provide two twelve-foot northbound egress lanes from the development at the proposed site entrance, one striped as a shared left/through lane and the other as a right-turn lane.

3. Install a full actuated traffic signal at the intersection of Hardin Valley Road and the site entrance. In addition, signal coordination with the existing signal at Hardin Valley Road and Westcott Boulevard should be provided. The signal should be installed and operational at the time that approximately 60 percent of the projected project traffic (from both this site and the planned development on the north side of Hardin Valley Road) is generated.

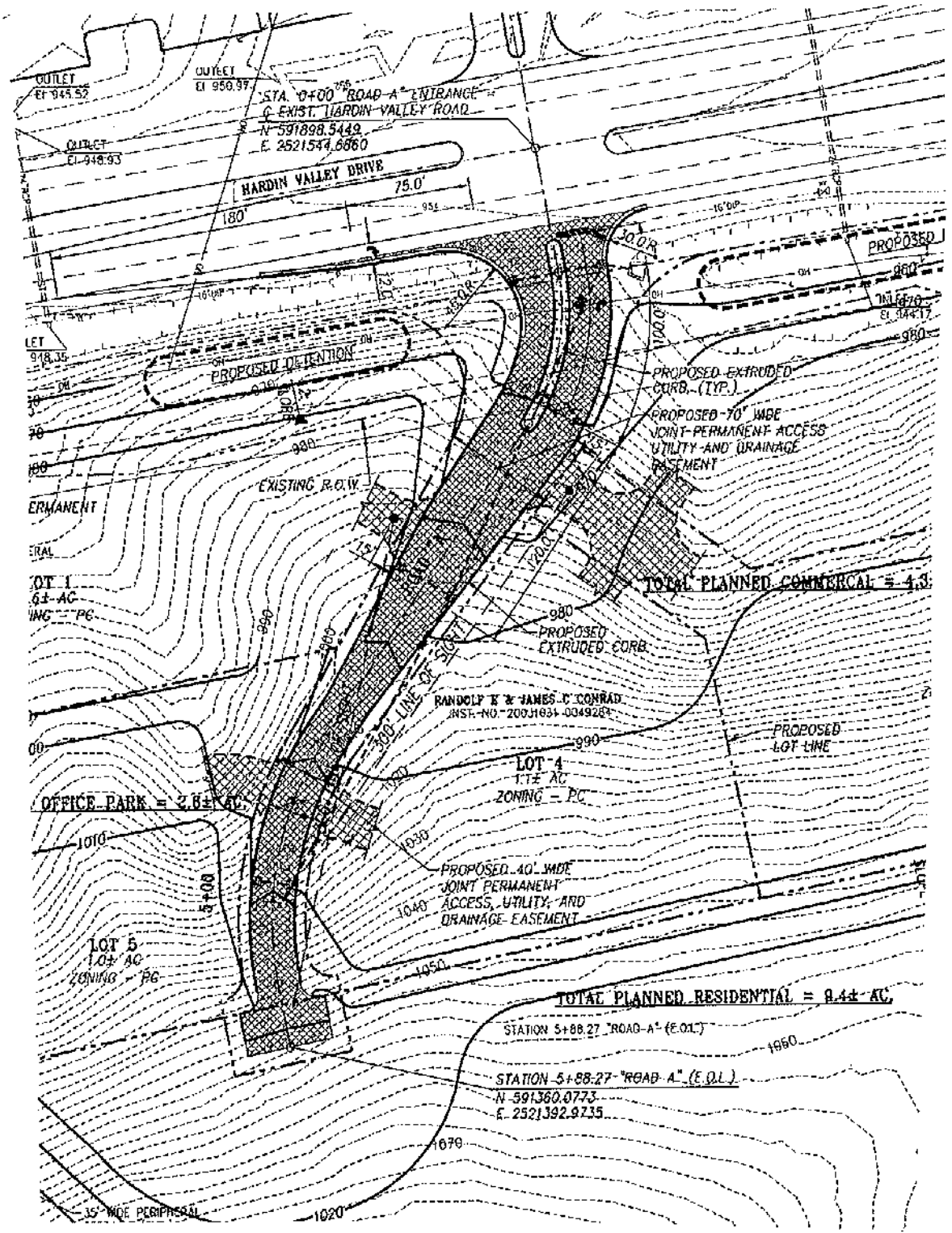

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FIGURE 8

RECOMMENDED IMPROVEMENTS

HARDIN VALLEY ROAD AT CONRAD SITE
TRAFFIC IMPACT STUDY

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APPENDIX

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.

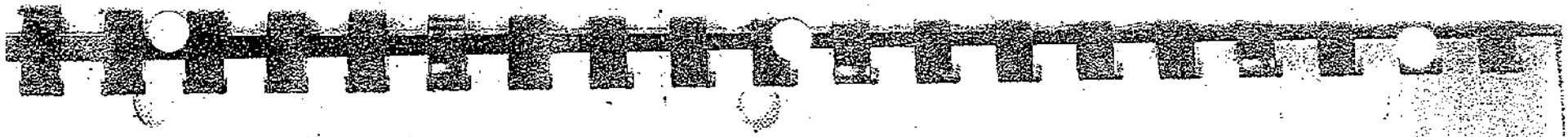
The Federal Highway Administration has published the Year 2000 Highway Capacity Manual (HCM2000), which establishes theoretical techniques to quantify the capacity conditions on all types of roadways, intersections, ramps, pedestrian facilities, etc. A basic concept that is applicable to most of these 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.

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.



TRAFFIC VOLUME ADJUSTMENT FACTORS TO BE USED WITH "TRAFFIC SIGNAL WARRANT ANALYSIS – VOLUME WARRANTS" [1]

Prepared and Distributed by the Tennessee Transportation Assistance Program

TABLE A

Month/Day of Week Urban Area Adjustment Factors [2] – Average Day

(Multiply actual count by given factor to obtain estimated average day volumes for a similar time period [3])

	January	February	March	April	May	June	July	August	September	October	November	December
Sunday	1.60	1.49	1.40	1.37	1.34	1.33	1.30	1.32	1.35	1.36	1.37	1.46
Monday	1.04	1.00	0.97	0.94	0.93	0.91	0.92	0.93	0.94	0.96	0.98	1.03
Tuesday	1.00	0.99	0.95	0.94	0.93	0.91	0.91	0.92	0.93	0.94	0.96	0.97
Wednesday	1.01	0.99	0.95	0.92	0.92	0.90	0.91	0.92	0.93	0.94	0.95	0.94
Thursday	0.99	0.97	0.93	0.90	0.89	0.88	0.89	0.90	0.90	0.92	0.93	0.93
Friday	0.91	0.89	0.87	0.85	0.83	0.81	0.84	0.83	0.83	0.86	0.92	0.88
Saturday	1.22	1.15	1.09	1.11	1.10	1.04	1.06	1.07	1.11	1.11	1.16	1.15

TABLE B

Month/Day of Week Urban Area Adjustment Factors [2] – Average Weekday

(Multiply actual count by given factor to obtain estimated average weekday volumes for a similar time period [3])

	January	February	March	April	May	June	July	August	September	October	November	December
Monday	1.13	1.08	1.05	1.02	1.01	0.99	1.00	1.01	1.02	1.03	1.06	1.12
Tuesday	1.08	1.07	1.03	1.02	1.01	0.99	0.99	1.00	1.01	1.02	1.04	1.06
Wednesday	1.09	1.07	1.03	1.00	1.00	0.98	0.99	1.00	1.01	1.02	1.03	1.02
Thursday	1.07	1.05	1.01	0.98	0.96	0.95	0.96	0.98	0.98	1.00	1.01	1.01
Friday	0.99	0.96	0.94	0.92	0.90	0.88	0.91	0.90	0.90	0.93	1.00	0.93

TABLE C

Month/Day of Week Urban Area Adjustment Factors [2] – Average Friday

(Multiply actual count by given factor to obtain estimated average Friday volumes for a similar time period [3])

	January	February	March	April	May	June	July	August	September	October	November	December
Monday	1.21	1.17	1.13	1.10	1.09	1.05	1.07	1.09	1.10	1.14	1.14	1.20
Tuesday	1.17	1.16	1.11	1.10	1.09	1.05	1.06	1.07	1.09	1.10	1.12	1.13
Wednesday	1.18	1.16	1.11	1.07	1.07	1.05	1.05	1.07	1.09	1.10	1.11	1.10
Thursday	1.16	1.13	1.09	1.05	1.04	1.03	1.04	1.05	1.05	1.07	1.09	1.09
Friday	1.05	1.04	1.02	0.99	0.97	0.95	0.96	0.97	0.97	1.00	1.07	1.00

Notes: 1. "Traffic Signal Warrant Analysis – Volume Warrants" is a Lotus® 1–2–3® template distributed by the *Tennessee Transportation Assistance Program (TTAP)*.

2. Factors should be applied to State Highway and major street volumes only. They should not be applied to volumes on driveways (shopping centers, etc.) or minor streets.

3. Counts made on holidays should not be used as a basis for estimating average day, average weekday or average Friday volumes.

Source: TABLE A – Tennessee Department of Transportation (based on 1988 through 1992 data)

TABLEs B & C – Developed by T. Casey Sullivan, P.E. based on TABLE A data

Cannon & Cannon Inc.
Consulting Engineers - Field Surveyors
9724 Kingston Pike, Suite 1100
Knoxville,TN. 37922

Intersection: Hardin Valley @ Southern S
Date: 10-10-07
nted By: DB/BH
Weather: Clear

File Name : hardin valley_southern shade_10_10_07
Site Code : 00000000
Start Date : 10/10/2007
Page No : 1

1.01

Groups Printed- Unshifted

	SOUTHERN SHADE BLVD From North					HARDIN VALLEY ROAD From East					SOUTHERN SHADE BLVD From South					HARDIN VALLEY ROAD From West					
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	0	0	0	0	0	1	213	0	0	214	5	0	1	0	6	0	132	0	0	132	352
07:15 AM	0	0	0	0	0	0	286	1	0	287	2	0	1	0	3	0	144	1	0	145	415
07:30 AM	0	0	1	0	1	0	332	0	0	332	0	0	2	0	2	0	165	1	0	166	501
07:45 AM	0	0	0	0	0	0	306	0	0	306	0	0	1	0	1	0	197	0	0	197	504
Total	0	0	1	0	1	1	1117	1	0	1119	7	0	5	0	12	0	638	2	0	640	1772
08:00 AM	0	0	0	0	0	1	315	0	0	316	0	0	1	0	1	0	154	2	0	156	473
08:15 AM	0	0	0	0	0	0	330	0	0	330	1	0	0	0	1	0	109	1	0	110	441
08:30 AM	0	0	0	0	0	0	221	1	0	222	0	0	3	0	3	0	148	0	0	148	373
08:45 AM	0	0	0	0	0	1	193	0	0	194	2	0	3	0	5	0	155	0	0	155	354
Total	0	0	0	0	0	2	1059	1	0	1062	3	0	7	0	10	0	566	3	0	569	1641
04:00 PM	0	0	0	0	0	0	194	0	0	194	0	0	0	0	0	1	181	1	0	183	377
04:15 PM	0	0	0	0	0	0	156	0	0	156	0	0	0	0	0	0	196	3	0	199	355
04:30 PM	0	0	0	0	0	1	176	0	0	177	1	0	1	0	2	0	208	1	0	209	388
04:45 PM	0	0	0	0	0	2	155	0	0	157	1	0	0	0	1	0	219	0	0	219	377
Total	0	0	0	0	0	3	681	0	0	684	2	0	1	0	3	1	804	5	0	810	1497
05:00 PM	0	0	0	0	0	2	161	0	0	163	1	0	3	0	4	0	313	0	0	313	480
05:15 PM	0	0	1	0	1	1	181	0	0	182	1	0	1	0	2	2	279	1	0	282	467
05:30 PM	0	0	0	0	0	0	177	1	0	178	0	0	0	0	0	1	256	1	0	258	436
05:45 PM	0	0	0	0	0	5	177	1	0	183	1	0	0	0	1	2	211	3	0	216	400
Total	0	0	1	0	1	8	696	2	0	706	3	0	4	0	7	5	1059	5	0	1069	1783
Grand Total	0	0	2	0	2	14	3553	4	0	3571	15	0	17	0	32	6	3067	15	0	3088	6693
Approch %	0.0	0.0	100.0	0.0		0.4	99.5	0.1	0.0		46.9	0.0	53.1	0.0		0.2	99.3	0.5	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.2	53.1	0.1	0.0	53.4	0.2	0.0	0.3	0.0	0.5	0.1	45.8	0.2	0.0	46.1	

Cannon & Cannon Inc.
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Intersection: Hardin Valley @ Southern S
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Weather: Clear

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Site Code : 00000000
Start Date : 10/10/2007
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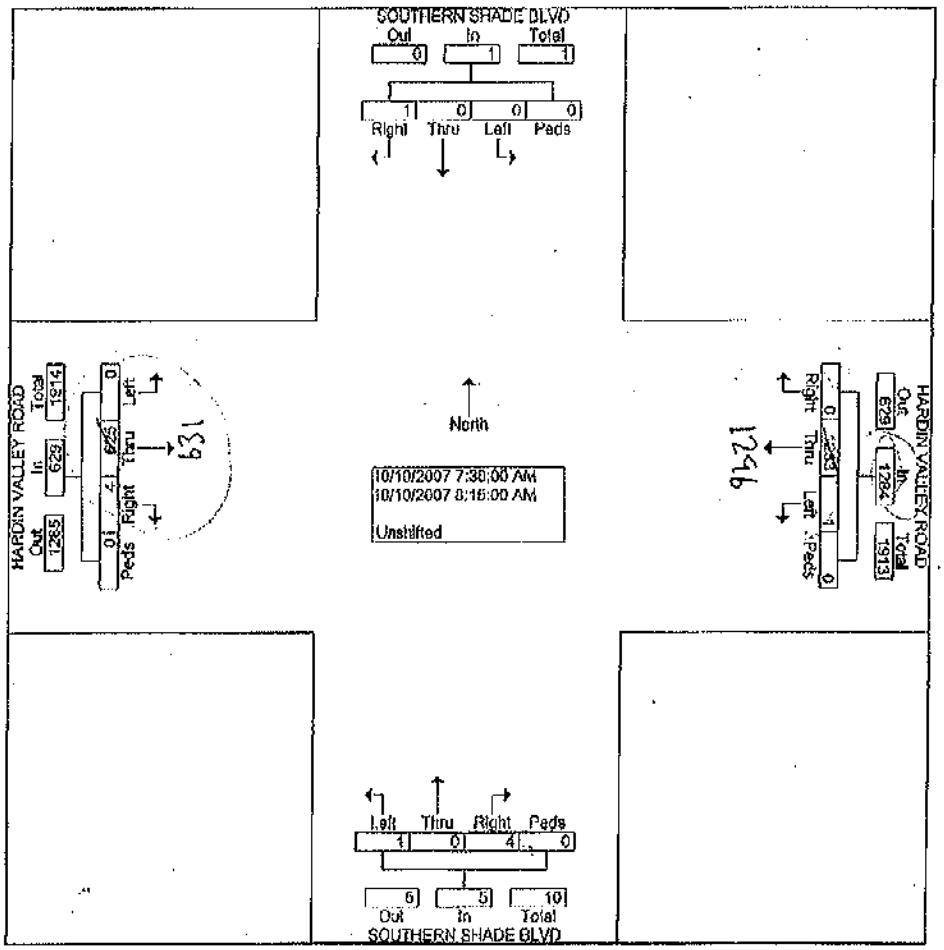
	SOUTHERN SHADE BLVD From North					HARDIN VALLEY ROAD From East					SOUTHERN SHADE BLVD From South					HARDIN VALLEY ROAD From West					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Intersection	07:30 AM																				
Volume	0	0	1	0	1	1	1283	0	0	1284	1	0	4	0	5	0	625	4	0	629	1919
Percent	0.0	0.0	100.0	0.0		0.1	99.9	0.0	0.0		20.0	0.0	80.0	0.0		0.0	99.4	0.6	0.0		
07:45 Volume	0	0	0	0	0	0	306	0	0	306	0	0	1	0	1	0	197	0	0	197	504
Peak Factor																					0.952
High Int.	07:30 AM					07:30 AM					07:30 AM					07:45 AM					
Volume	0	0	1	0	1	0	332	0	0	332	0	0	2	0	2	0	197	0	0	197	
Peak Factor					0.250					0.967					0.625					0.798	



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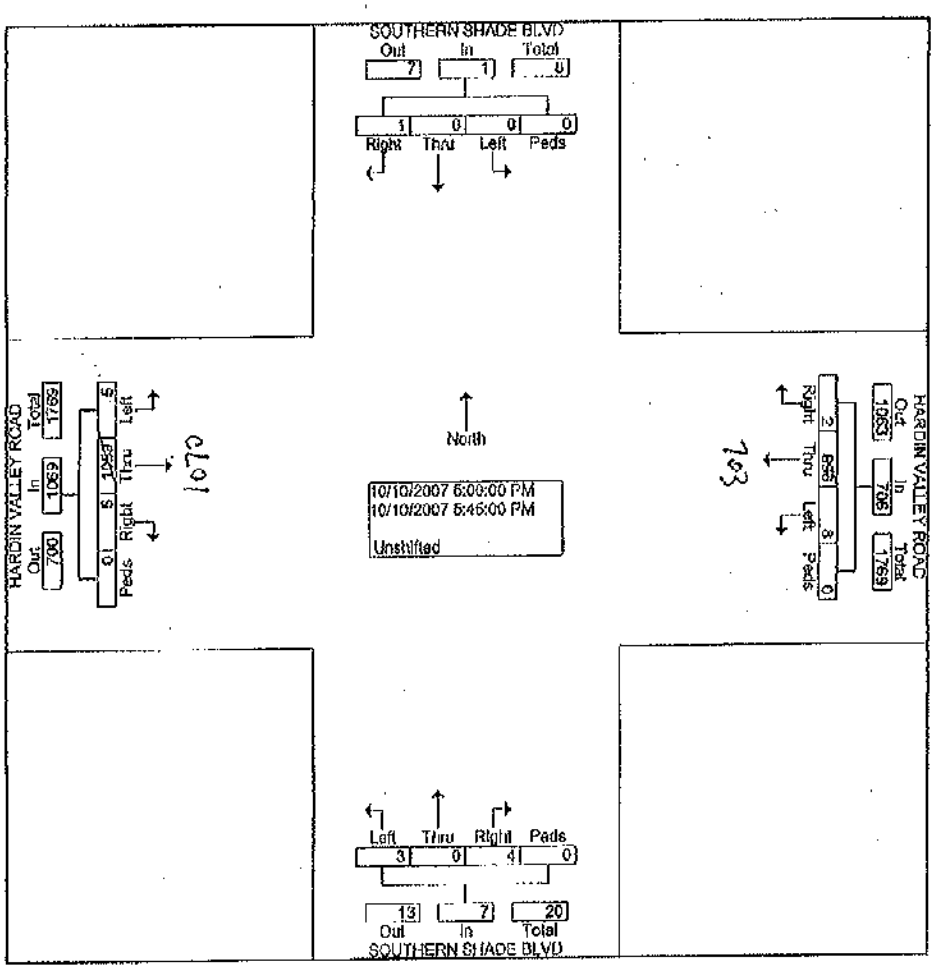
	SOUTHERN SHADE BLVD From North					HARDIN VALLEY ROAD From East					SOUTHERN SHADE BLVD From South					HARDIN VALLEY ROAD From West					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	0	0	1	0	1	8	696	2	0	706	3	0	4	0	7	5	1059	5	0	1069	1783
Percent	0.0	0.0	100.0	0.0		1.1	98.6	0.3	0.0		42.9	0.0	57.1	0.0		0.5	99.1	0.5	0.0		
05:00 Volume	0	0	0	0	0	2	161	0	0	163	1	0	3	0	4	0	313	0	0	313	480
Peak Factor																					0.929
High Int.	05:15 PM					05:45 PM					05:00 PM					05:00 PM					
Volume	0	0	1	0	1	5	177	1	0	183	1	0	3	0	4	0	313	0	0	313	
Peak Factor					0.250					0.964					0.438					0.854	



Traffic Stations

Rec	Station Number	County	Location	Year	Annual Average Daily Count	Remarks	Route Number	Route Name
1	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	2007	9378		01277	1277
2	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	2006	8004		01277	1277
3	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	2005	8457		01277	1277
4	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	2004	7761	EST	01277	1277
5	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	2003	7533	EST	01277	1277
6	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	2002	7179	EST	01277	1277
7	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	2001	7019	EST	01277	1277
8	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	2000	7620	DIFF MONTH	01277	1277
9	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1999	6667		01277	1277
10	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1998	6137		01277	1277
11	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1997	5820		01277	1277
12	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1996	5589		01277	1277
13	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1995	6037		01277	1277
14	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1994	6800	ACTUAL = 4621	01277	1277
15	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1993	6929		01277	1277
16	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1992	6651		01277	1277
17	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1991	5473		01277	1277
18	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1990	5568	NEW SCHOOL	01277	1277
19	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1989	2089		01277	1277
20	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1988	3436		01277	1277
21	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1987	4427	NEW FACTORY	01277	1277
22	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1986	3372		01277	1277
23	000084	Knox	VALLEY RD- NEAR ANDERSON CO LINE	1985	2171		01277	1277

h e ffc e e b e h

Trip Generation Summary

Hardin Valley - Conrad

		Weekday	AM	PM
912	Bank 5,100 sf.	1,405	70	261
710	Office 34,560sf	588	80	117
814	Retail 8,640 sf.	381	—	42
KNOX	Townhomes 41 units	428	23	38
		2802	173	458

6 @ 7200 = 43,200

80% 3/4 Office = 34,560

20% 1/4 Retail = 18,640

#912 Drive-In Bank 5,700 sf

Weekday: 246.49 x 5.7 = 1405 50/50 r^2=.59

AM : 12.34 x 5.7 = 70. 56/44 r^2=N/A

PM : 45.74 x 5.7 = 261 50/50 r^2=N/A

#710 Gen. Office Bldg 34,560 sf

Weekday: $Ln(T) = (.77)[Ln(34.56)] + 3.65$ T = 588. 50/50 r^2=.8

AM : $Ln(T) = (.80)[Ln(34.56)] + 1.55$ T = 80 88/12 r^2=.8

PM : $T = 1.12(34.56) + 78.81 = 117$ 17/83 r^2=.8

#814 Specialty Retail 18,640 sf

Weekday: (44.32)(8.6) = 381 50/50 r^2=.69

AM : not given

PM : $T = 2.40(8.6) + 21.48 = 42$ 44/56 r^2=.98

KNOX Condos 41 units

Weekday: $T = 15.193(41)^{.899} = 428$ 50/50 r^2=.88

AM : $T = 0.758(41)^{.924} = 23$ 22/78 r^2=.75

PM : $T = .669(41) + 10.069 = 38$ 55/45 r^2=.79

Generated Trips

Before Internal Trip Reduction

10/30/07

A. M.

	Entering		Exiting		Total
	%	trips	%	trips	trips
Bank # 912	56%	39	44%	31	70
Office #710	88%	70	12%	10	80
Retail #814	–	–	–	–	–
Residential KNOX	22%	5	78%	18	23
		114		59	173

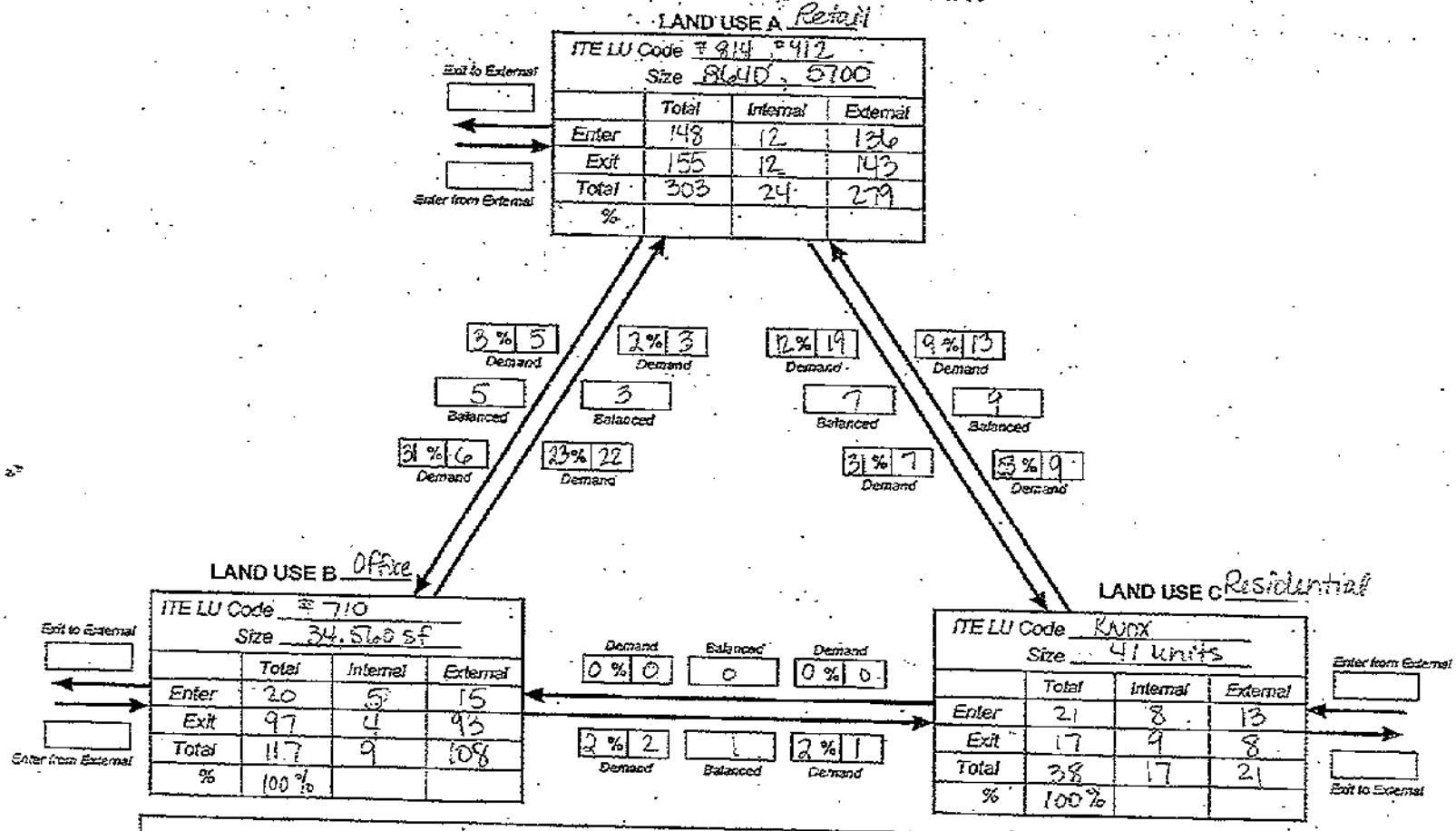
P. M.

	Entering		Exiting		Total
	%	trips	%	trips	trips
Bank #912	50%	130	50%	131	261
Office #710	17%	20	83%	97	117
Retail #814	44%	18	56%	24	42
Residential KNOX	55%	21	45%	17	38
		189		269	458

Analyst RCB
Date 10/29/07

MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt Hardin Valley - Conrad Site
Time Period PM - Peak



Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter	136	15	13	164
Exit	143	93	8	244
Total	279	108	21	408
Single-Use Trip Gen. Est.	303	117	38	458

Source: Kaku Associates, Inc.

INTERNAL CAPTURE
30 11%

Table 7.1 Unconstrained Internal Capture Rates for Trip Origins within a Multi-Use Development

		WEEKDAY		
		MIDDAY PEAK HOUR	p.m. PEAK HOUR OF ADJACENT STREET TRAFFIC	DAILY
from OFFICE	to Office	2%	1%	2%
	to Retail	20%	23%	22%
	to Residential	0%	2%	2%
from RETAIL	to Office	3%	3%	3%
	to Retail	29%	20%	30%
	to Residential	7%	12%	11%
from RESIDENTIAL	to Office	N/A	N/A	N/A
	to Retail	34%	53%	38%
	to Residential	N/A	N/A	N/A

Caution: The estimated typical internal capture rates presented in this table rely directly on data collected at a limited number of multi-use sites in Florida. While ITE recognizes the limitations of these data, they represent the only known credible data on multi-use internal capture rates and are provided as illustrative of typical rates. ***If local data on internal capture rates by paired land uses can be obtained, the local data may be given preference.***

N/A—Not Available; logic indicates there is some interaction between these two land uses; however, the limited data sample on which this table is based did not record any interaction.

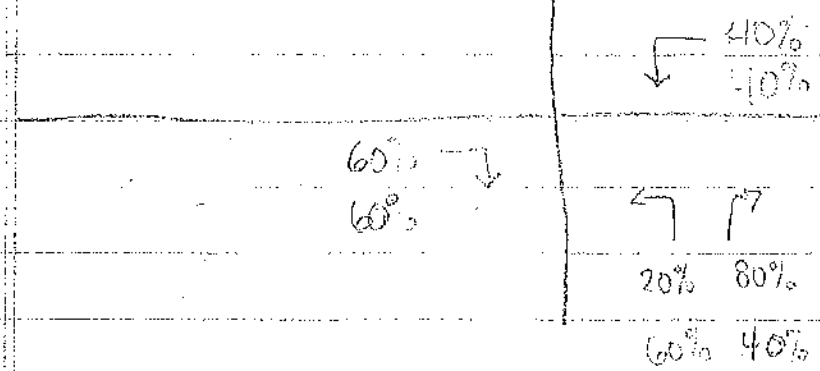
Table 7.2 Unconstrained Internal Capture Rates for Trip Destinations Within a Multi-Use Development

		WEEKDAY		
		MIDDAY PEAK HOUR	P.M. PEAK HOUR OF ADJACENT STREET TRAFFIC	DAILY
to OFFICE	from Office	6%	6%	2%
	from Retail	38%	31%	15%
	from Residential	0%	0%	N/A
to RETAIL	from Office	4%	2%	4%
	from Retail	31%	20%	28%
	from Residential	6%	9%	9%
to RESIDENTIAL	from Office	0%	2%	3%
	from Retail	37%	31%	33%
	from Residential	N/A	N/A	N/A

Caution: The estimated typical internal capture rates presented in this table rely directly on data collected at a limited number of multi-use sites in Florida. While ITE recognizes the limitations of these data, they represent the only known credible data on multi-use internal capture rates and are provided as illustrative of typical rates. ***If local data on internal capture rates by paired land uses can be obtained, the local data may be given preference.***

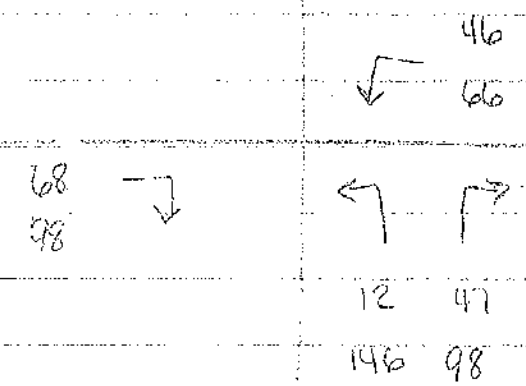
N/A—Not Available; logic indicates there is some interaction between these two land uses; however, the limited data sample on which this table is based did not record any interaction.

Assumed Trip Distribution.

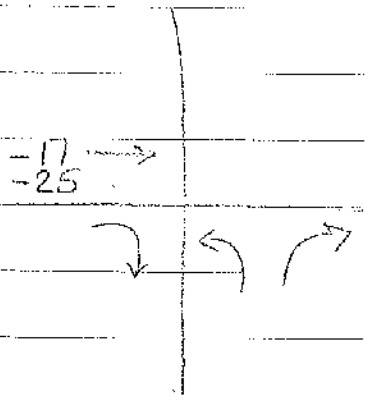


Preliminary Trip Assignments

	AM	PM
Entering	114	164
Exiting	59	244
	173	408

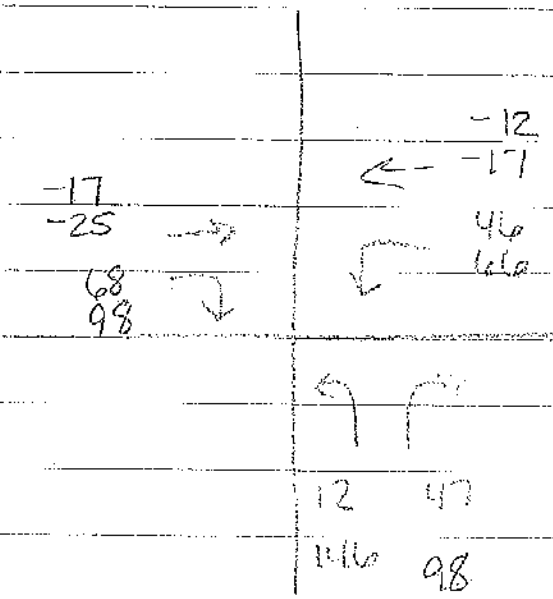


Passing Trip Assignments 25%



68 98
x.25 x.25
17 25

Final Trip Assignments



TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	RCB	Intersection	Hardin Valley Rd / Site Entran
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	Knox Co
Date Performed	11/26/07	Analysis Year	2010 Combined
Analysis Time Period	AM		

Project Description: 00621-0002 Hardin Valley Rd at Conrad Site TIS (revised)

East/West Street: Hardin Valley Rd | North/South Street: Main Site Entrance

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	89	622	68	46	1428	90
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Hourly Flow Rate, HFR (veh/h)	97	683	74	50	1569	98
Percent Heavy Vehicles	2	--	--	0	--	--
Median Type	Raised curb					
RT Channelized			0			0
Lanes	1	2	0	1	2	0
Configuration	L	T	TR	L	T	TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	12	0	47	41	0	41
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Hourly Flow Rate, HFR (veh/h)	13	0	51	45	0	45
Percent Heavy Vehicles	0	0	0	0	0	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	1	0	1	1
Configuration	LT		R	LT		R

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	LT		R	LT		R
v (veh/h)	97	50	13		51	45		45
C (m) (veh/h)	382	863	98		625	67		311
v/c	0.25	0.06	0.13		0.08	0.67		0.14
95% queue length	0.99	0.18	0.44		0.27	2.96		0.50
Control Delay (s/veh)	17.6	9.4	47.3		11.3	132.2		18.5
LOS	C	A	E		B	F		C
Approach Delay (s/veh)	--	--	18.6			75.3		
Approach LOS	--	--	C			F		

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	RCB	Intersection	Hardin Valley Rd / Site Entran
Agency/Co.	Cannon & Cannon, Inc.	Jurisdiction	Knox Co
Date Performed	11/26/07	Analysis Year	2010 Combined
Analysis Time Period	PM		

Project Description: 00621-0002 Hardin Valley Rd at Conrad Site TIS (revised)

East/West Street: Hardin Valley Rd | North/South Street: Main Site Entrance

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	181	1154	98	66	726	120
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Hourly Flow Rate, HFR (veh/h)	198	1268	107	72	797	131
Percent Heavy Vehicles	2	--	--	0	--	--
Median Type	Raised curb					
RT Channelized			0			0
Lanes	1	2	0	1	2	0
Configuration	L	T	TR	L	T	TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	146	0	98	171	0	256
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Hourly Flow Rate, HFR (veh/h)	160	0	107	187	0	281
Percent Heavy Vehicles	0	0	0	0	0	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	1	0	1	1
Configuration	LT		R	LT		R

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	LT		R	LT		R
v (veh/h)	198	72	160		107	187		281
C (m) (veh/h)	733	505	0		393	50		545
v/c	0.27	0.14			0.27	3.74		0.52
95% queue length	1.09	0.49			1.09	20.54		2.93
Control Delay (s/veh)	11.7	13.3			17.6	1401		18.4
LOS	B	B	F		C	F		C
Approach Delay (s/veh)	--	--				571.1		
Approach LOS	--	--				F		

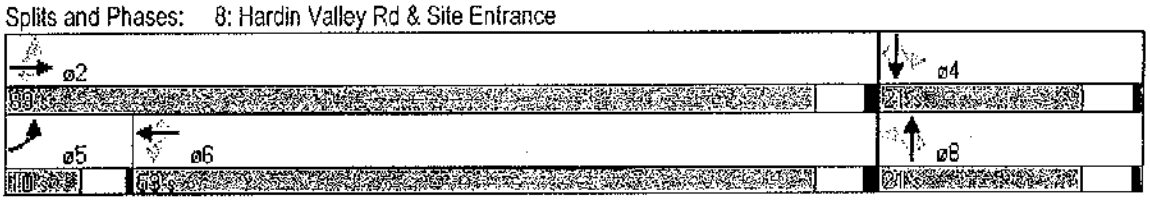
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	622	68	46	1428	90	12	0	47	41	0	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		100	110		150	0		0	0		0
Storage Lanes	1		1	1		1	0		1	0		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950				0.950			0.950	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	1770	1583	0	1770	1583
Flt Permitted	0.112			0.395				0.728			0.749	
Satd. Flow (perm)	209	3539	1583	736	3539	1583	0	1356	1583	0	1395	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			74			84			51			45
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		3665			580			279			456	
Travel Time (s)		55.5			8.8			6.3			10.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	97	676	74	50	1552	98	13	0	51	45	0	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	676	74	50	1552	98	0	13	51	0	45	45
Turn Type	pm+pt		Perm	Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases	5	2			6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	6	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	4.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	8.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	10.0	69.0	69.0	59.0	59.0	59.0	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (%)	11.1%	76.7%	76.7%	65.6%	65.6%	65.6%	23.3%	23.3%	23.3%	23.3%	23.3%	23.3%
Maximum Green (s)	6.0	64.0	64.0	54.0	54.0	54.0	16.0	16.0	16.0	16.0	16.0	16.0
Yellow Time (s)	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	74.5	74.5	74.5	65.6	65.6	65.6		9.1	9.1		9.1	9.1
Actuated g/C Ratio	0.83	0.83	0.83	0.73	0.73	0.73		0.10	0.10		0.10	0.10
v/c Ratio	0.33	0.23	0.06	0.09	0.60	0.08		0.09	0.25		0.32	0.22
Control Delay	5.2	2.5	0.8	5.1	12.6	2.2		37.3	14.0		43.2	14.1
Queue Delay	0.0	0.0	0.0	0.0	0.6	0.0		0.0	0.0		0.0	0.0
Total Delay	5.2	2.5	0.8	5.1	13.2	2.2		37.3	14.0		43.2	14.1
LOS	A	A	A	A	B	A		D	B		D	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		2.7			12.3			18.8			28.7	
Approach LOS		A			B			B			C	
Queue Length 50th (ft)	8	37	0	8	417	7		7	0		24	0
Queue Length 95th (ft)	20	64	8	m14	516	m14		24	32		56	31
Internal Link Dist (ft)		3585			500			199			376	
Turn Bay Length (ft)	110		100	110		150						
Base Capacity (vph)	292	2929	1323	537	2581	1177		241	323		248	318
Starvation Cap Reductn	0	0	0	0	573	0		0	0		0	0
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	0
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	0
Reduced v/c Ratio	0.33	0.23	0.06	0.09	0.77	0.08		0.05	0.16		0.18	0.14

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 10.0 Intersection LOS: B
Intersection Capacity Utilization 65.3% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Hardin Valley Rd & Site Entrance



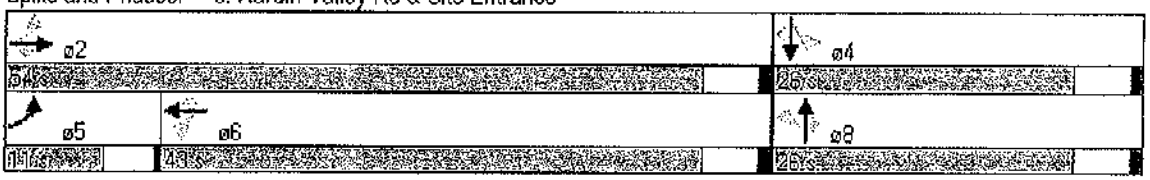
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	181	1154	98	66	726	120	146	0	98	171	0	256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	110		100	110		150	0		0	0		0
Storage Lanes	1		1	1		1	0		1	0		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950				0.950			0.950	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	1770	1583	0	1770	1583
Flt Permitted	0.273			0.222				0.553			0.612	
Satd. Flow (perm)	509	3539	1583	414	3539	1583	0	1030	1583	0	1140	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			94			130			71			272
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		3665			580			279			456	
Travel Time (s)		55.5			8.8			6.3			10.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	197	1254	107	72	789	130	159	0	107	186	0	278
Shared Lane Traffic (%)												
Lane Group Flow (vph)	197	1254	107	72	789	130	0	159	107	0	186	278
Turn Type	pm+pt		Perm	Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases	5	2			6			8			4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phase	5	2	2	6	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	4.0	10.0	10.0	10.0	10.0	10.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	8.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	11.0	54.0	54.0	43.0	43.0	43.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	13.8%	67.5%	67.5%	53.8%	53.8%	53.8%	32.5%	32.5%	32.5%	32.5%	32.5%	32.5%
Maximum Green (s)	7.0	49.0	49.0	38.0	38.0	38.0	21.0	21.0	21.0	21.0	21.0	21.0
Yellow Time (s)	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	None
Walk Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0	0	0	0	0
Act Effct Green (s)	54.2	53.2	53.2	41.8	41.8	41.8		16.8	16.8		16.8	16.8
Actuated g/C Ratio	0.68	0.66	0.66	0.52	0.52	0.52		0.21	0.21		0.21	0.21
v/c Ratio	0.43	0.53	0.10	0.33	0.43	0.15		0.74	0.28		0.78	0.51
Control Delay	8.4	8.7	2.1	18.6	13.4	2.8		48.8	12.1		51.0	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	8.4	8.7	2.1	18.6	13.4	2.8		48.8	12.1		51.0	7.2
LOS	A	A	A	B	B	A		D	B		D	A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		8.2			12.4			34.0			24.7	
Approach LOS		A			B			C			C	
Queue Length 50th (ft)	32	154	2	21	128	0		73	14		87	2
Queue Length 95th (ft)	64	233	20	58	180	27		133	51		#153	58
Internal Link Dist (ft)		3585			500			199			376	
Turn Bay Length (ft)	110		100	110		150						
Base Capacity (vph)	464	2354	1084	216	1849	889		270	468		299	616
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	0
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	0
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	0
Reduced v/c Ratio	0.42	0.53	0.10	0.33	0.43	0.15		0.59	0.23		0.62	0.45

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 13.9 Intersection LOS: B
Intersection Capacity Utilization 68.9% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Hardin Valley Rd & Site Entrance



TRAFFIC SIGNAL WARRANT ANALYSIS - VOLUME WARRANTS

Intersection : Hardin Valley / Conrad Site Access
City or County : Knoxville MPO
State : Tennessee
Date of Count: Year 2010 Combined
Day of Week of Count: Average Weekday

Are warranting volumes to be adjusted for speeds or built up area? . . . . . Yes
Adjustment factor for day of week and month of year of count 1.00
Number of Lanes: Major Street . . . 2 Minor Street . . . 2

Time Beginning	Major Street Actual Volume App #1	App #2	Total	Adjusted Total Volume	Minor Street Actual Volume	Adjusted Total Volume
6:00 am	0	0	0	0	0	0
7:00	711	1474	2185	2185	12	12
8:00	0	0	0	0	0	0
9:00 am	0	0	0	0	0	0
10:00	0	0	0	0	0	0
11:00	0	0	0	0	0	0
12:00 noon	0	0	0	0	0	0
1:00	0	0	0	0	0	0
2:00	0	0	0	0	0	0
3:00 pm	0	0	0	0	0	0
4:00	1148	489	1637	1637	139	139
5:00	1360	792	2152	2152	146	146
6:00 pm	0	0	0	0	0	0
7:00	0	0	0	0	0	0
8:00	0	0	0	0	0	0

Note: . No adjustment made
– Where more than one minor approach exists use the higher approach volume
. Number of hours shown is the minimum meeting the MUTCD requirements. Additional hours outside of the count period may meet the MUTCD specified volume levels.

Warrant #1A (8 Hr. - Min. Vol.) Percent of Warrant Major	Minor
0	0
520	9
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
390	59
512	104
0	0
0	0
0	0
Warranting Volumes 420	140
Total Hours Meeting Warrant = 1 . Warrant Met No	

Warrant #1B (8 Hr. - Interruption) Percent of Warrant Major	Minor
0	0
347	17
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
250	199
342	209
0	0
0	0
0	0
Warranting Volumes 630	70
Total Hours Meeting Warrant = 2 . Warrant Met No	

Combination (Warrants 1A & 1B) Percent of Warrant Major	Minor
0	0
434	11
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
325	124
427	130
0	0
0	0
0	0
Warranting Volumes 504	112
Total Hours Meeting Warrant = 2 . Warrant Met No	

Warrant #2 (Four Hour Vols.) Warrant Volume	Percent of Warrant
0	-----
80	16
0	-----
0	-----
0	-----
0	-----
0	-----
0	-----
0	-----
0	-----
80	174
80	183
0	-----
0	-----
0	-----
Warranting Volumes From MUTCD Fig. 4-8	
Total Hours Meeting Warrant = 2 . Warrant Met No	

Warrant #3 (Peak Hour Vols.) Warrant Volume	Percent of Warrant
0	-----
100	12
0	-----
0	-----
0	-----
0	-----
0	-----
0	-----
0	-----
100	139
100	145
0	-----
0	-----
0	-----
Warranting Volumes From MUTCD Fig. 4-8	
Total Hours Meeting Warrant = 2 . Warrant Met Yes	

----- Major Street volume is so low that no Minor Street warrant exists

Comments: (include any information which may be useful to the reviewer)

Major street volume project for Year 2010.
Minor street volume from Trip Generation, Conrad Site only.
Minor street right turn volumes excluded.

Analysis Prepared by: CANNON AND CANNON, INC.
RCB
Date: 10/31/07
Time: 14:02

Developed by: T. Darcy Sullivan, P.E.
Distributed by: Tennessee Transportation Assistance Program (TTAP)
VC/R1

		Entering	Exiting	
	5pm	164	244	
5pm	% of day	10.3%	11.0%	ITE Handbook
4pm	% of day	9.7%	10.4%	pg. 5 Table 2.1
	4pm	154	231	

$\frac{164}{10.3} = \frac{x}{9.7}$ $\qquad$ $\frac{244}{11.0} = \frac{x}{10.4}$

$x = \frac{164(9.7)}{10.3}$ $\qquad$ $x = \frac{244(10.4)}{11}$

$x = 154$ $\qquad$ $x = 231$

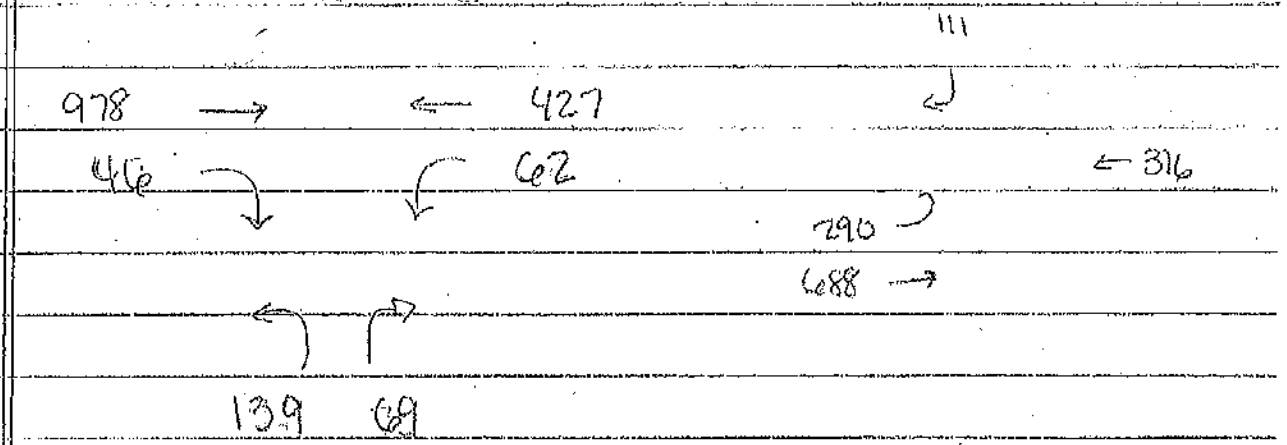


TABLE 6A

LEFT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 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	200 175	140 120	100 85	75 65	60 55	50 45
200 - 249 250 - 299	150 130	100 85	75 65	60 55	50 45	40 35
300 - 349 350 - 399	110 95	75 65	60 55	50 45	40 35	30 25
400 - 449 450 - 499	80 70	60 55	50 45	40 35	30 25	25 20
500 - 549 550 - 599	60 50	50 45	40 35	30 25	25 20	20 20
600 - 649 650 - 699	45 40	40 35	30 30	25 20	20 20	20 20
700 - 749 750 or More	35 35	35 35	25 25	20 20	20 15	15 15

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

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

AM VOL WAR | PM VOL WAR

WB LT : 46 20 | 66 20

89 → 181

422 ÷ 2 = 211 →
1179 ÷ 2 = 590 →

45
49 ↓

↑ 90
120

← 1428 ÷ 2 = 714
← 726 ÷ 2 = 363

↓ 46
66

met thresholds both AM & PM.

TABLE 6B

RIGHT-TURN LANE VOLUME THRESHOLDS
FOR TWO-LANE ROADWAYS WITH A PREVAILING SPEED OF 46 TO 55 MPH

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
Fewer Than 25					X	AM
25 - 49						
50 - 99						
100 - 149						Yes
150 - 199						
200 - 249					Yes	Yes
250 - 299				Yes	Yes	Yes
300 - 349			Yes	Yes	Yes	Yes
350 - 399			Yes	Yes	Yes	Yes
400 - 449		Yes	Yes	Yes	Yes	Yes
450 - 499		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

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	350 - 399	400 - 449	450 - 499	500 - 549	550 - 600	+ / > 600
Fewer Than 25				Yes	PM Yes	Yes
25 - 49			Yes	Yes	Yes	Yes
50 - 99						
100 - 149	Yes	Yes	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.

meets PM threshold