WOOD CREEK SOUTH SUBDIVISION DEVELOPMENT

Knox County, Tennessee

TRAFFIC IMPACT STUDY

Prepared For:
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MAY 2006

WOOD CREEK SOUTH SUBDIVISION

KNOX COUNTY, TENNESSEE

TRAFFIC IMPACT STUDY

Prepared for

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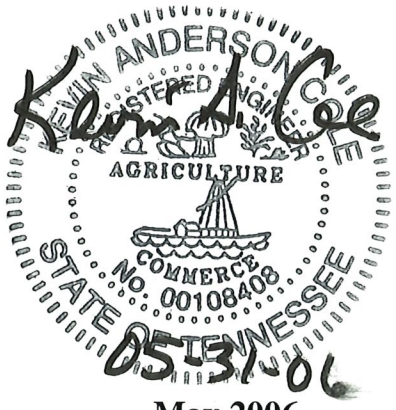

May 2006

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Project Number 100063

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Wilbur Smith Associates (WSA) is pleased to submit this report to address the impact and access of a proposed residential development located on Tipton Station Road in Southeast Knox County. The basis for this study required the collection of traffic data, generation of anticipated traffic volumes from the proposed site and development of projected traffic volumes from normal growth and from the potential site. Analysis of the resulting traffic projections was conducted to determine the capacity and levels of service for the site accesses. This study will develop measures necessary to mitigate traffic impacts including improved roadway geometrics and traffic control devices within the environs of the proposed residential development.

According to the Knoxville-Knox County Metropolitan Planning Commission's Administrative Rules and Procedures, the proposed residential development site is identified for a Level 1 Traffic Impact Study. WSA discussed with Knox County Department of Engineering and Public Works and MPC to define the study area and address specific concerns relative to the proposed residential development. Therefore, this study will address the anticipated traffic impacts of the proposed residential development site accesses on Tipton Station Road.

Project Description

The proposed project is a 205 lot single family residential development on approximately 52 acres. This tract is bounded by Twin Creek Subdivision to the west, Southside Baptist Church to the north, Tipton Station Road to the south, and various single family residences which connect to Coatney Road. This site has two proposed access. Road "A" connects to Tipton Station Road opposite Saddlegate Road. Road "C" connects to Tipton Station Road approximately 550 feet east of Road "A". Figure 1 shows the proposed site plan.

Site Location

The location of the proposed residential development is on Tipton Station Road in southeast Knox County. The site is near Sevier and Blount Counties. The proposed development is located west of Coatney Road and east of Twin Creek Road. Figure 2 illustrates the site location relative to local and regional access.

SITE PLAN
Wood Creek South Subdivision Development
Knox County, TN

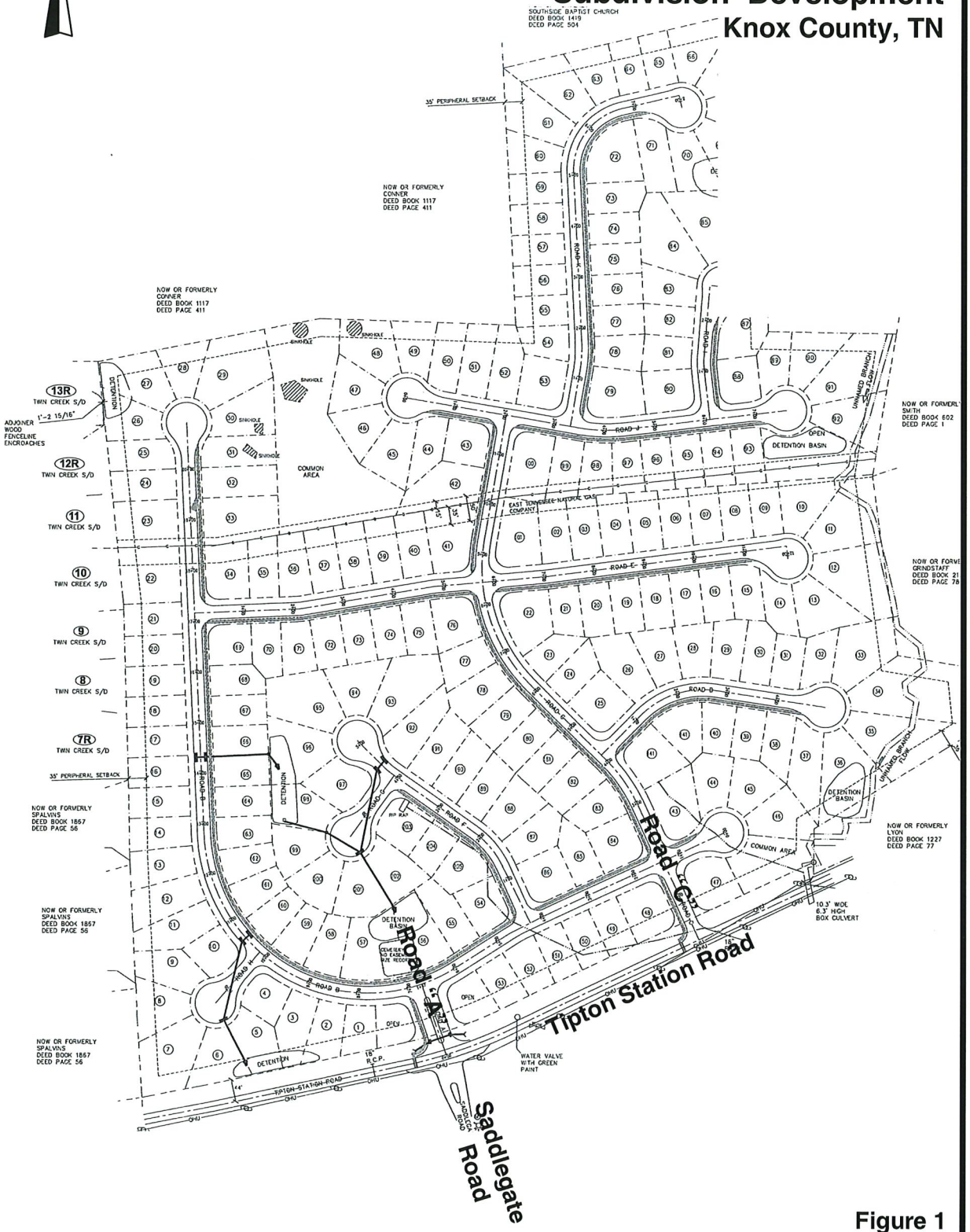


Figure 1

VICINITY MAP
Knox County, TN

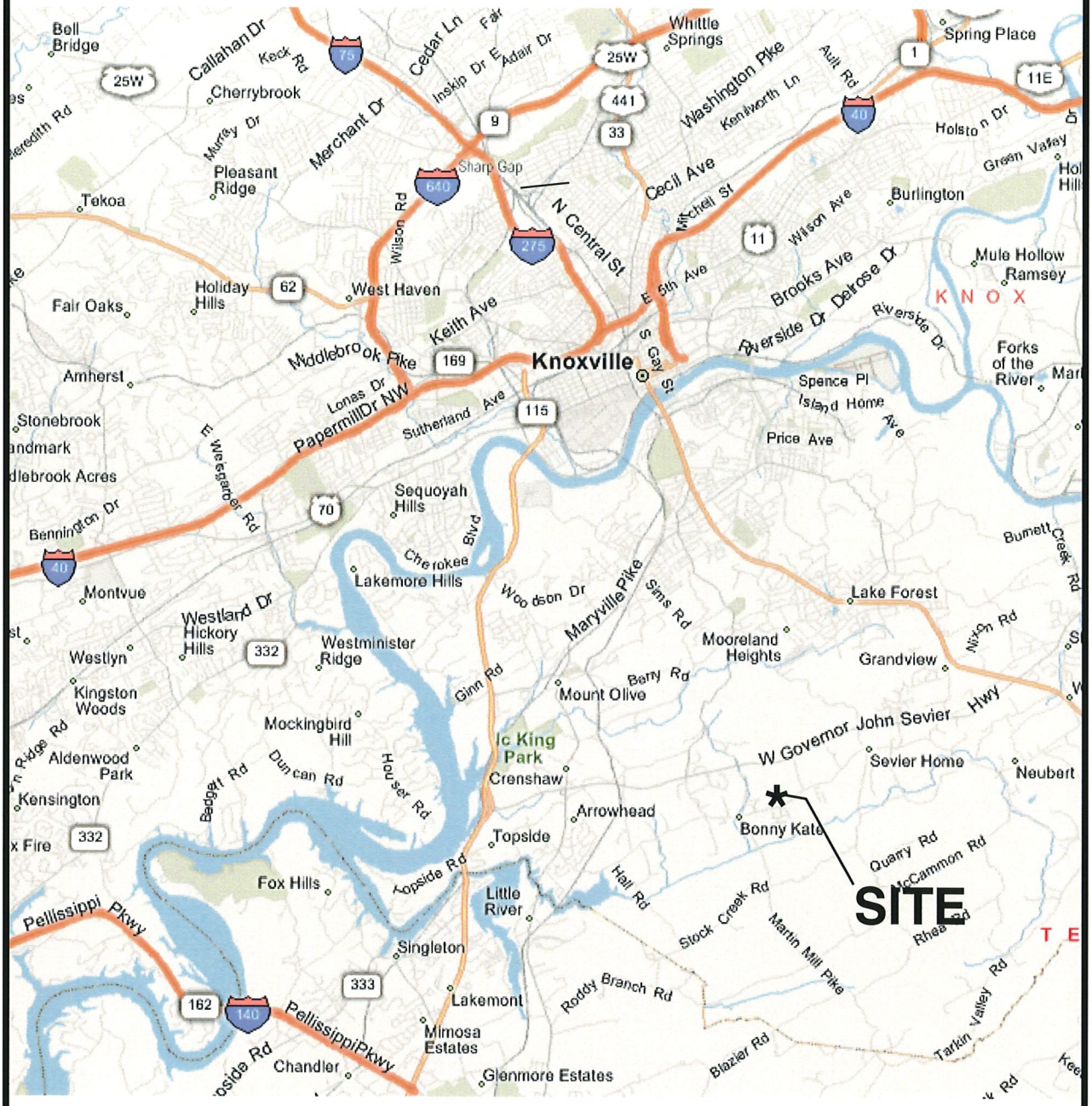


Figure 2

LOCAL AND REGIONAL ACCESS

Local Access

Tipton Station Road provides local access for the site and connects to Martin Mill Pike which in turn intersects the regional arterial of W. Governor John Sevier Highway (S.R. 168) to the north. Tipton Station Road is a 20-foot wide, 2-lane roadway which is classified as a major collector.

Regional Access

Governor John Sevier Highway extends between Interstate 40 east of the Knoxville CBD and Alcoa Highway (U.S. 129) south of Knoxville. Alcoa Highway is a 4-lane divided major arterial extending from I-40 (west of the Knoxville CBD) to Blount County. Governor John Sevier Highway (S.R. 168) also intersects Chapman Highway to the east. Chapman Highway (U.S. 441) is classified as a major arterial and extends northwest into the Knoxville CBD and southeast towards the Sevier County line and Sevierville. Chapman Highway is a 4-lane raod with shoulders that intersects Tipton Station Road. U.S. 441 (Chapman Highway) intersects Interstate 40 in the Knoxville CBD.

Interstate 40 provides significant east and west regional access throughout Tennessee. To the east, Interstate 40 connects to Interstate 81, which extends into the Tri-Cities area of Tennessee and Virginia. Westbound Interstate 40 connects to Interstate 75, providing north- and southbound connections into neighboring states such as Kentucky and Georgia, respectively. Interstate 40 provides significant east and west regional access throughout Tennessee.

EXISTING TRAFFIC CONDITIONS

Existing Traffic Control

The Saddlegate Road approach to Tipton Station Road is stop controlled. All approaches to the intersection are single lanes. The posted speed limit on Tipton Station Road is 40-mph. Figure 3 shows the existing laneage and traffic control.

TRAFFIC CONTROL & GEOMETRICS
Wood Creek South Subdivision Development
Knox County, TN

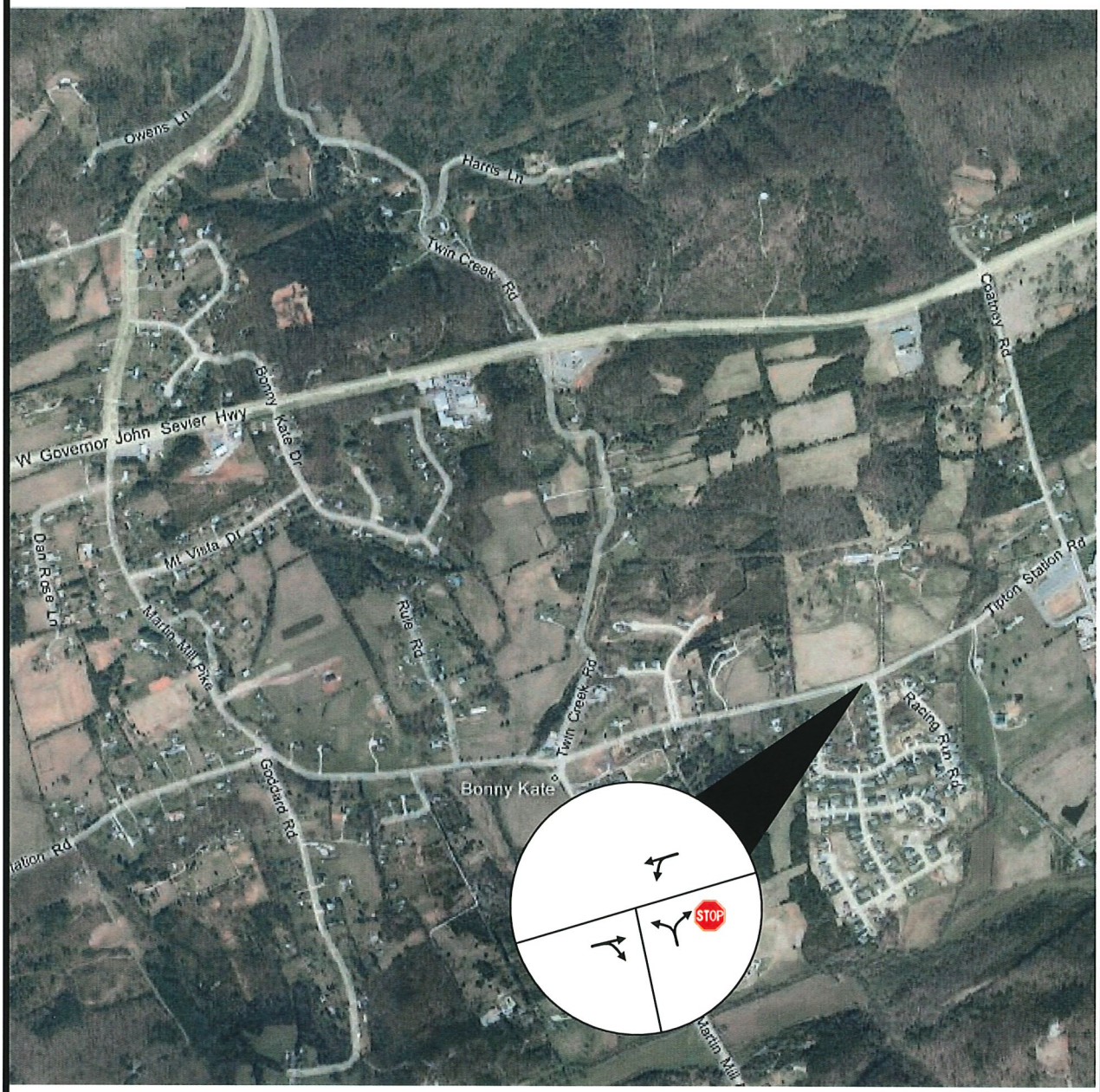


Figure 3

Existing Traffic Volumes

Peak-hour turning movement counts (TMC) were conducted by WSA in March of 2006 for the intersection of Tipton Station Road and Saddlegate Road. The peak hours were measured to be 7:30 AM to 8:30 AM and 5:00 PM to 6:00 PM. Figure 4 illustrates the resulting intersection turning movements for the AM and PM peak hours.

Existing Capacity and Level of Service

In order to evaluate the current operations of the traffic control devices, capacity and level of service were calculated using the **2000 Highway Capacity Manual, Special Report 209** published by the Transportation Research Board (TRB). Unsignalized intersections are evaluated based on estimated intersection delays, which may be related to level of service (LOS).

Level of service and capacity are the measurements of an intersection's ability to accommodate traffic volumes. Levels of service for intersections range from A to F. A LOS A is the best, and LOS F is failing.

Unsignalized intersections levels of service have lower thresholds of delays than do signalized intersections. A LOS of F exceeds estimated delays of 50 seconds. For urban arterials, minor approaches may frequently experience levels of service E. A full level of service description for unsignalized intersections is presented in Table 1.

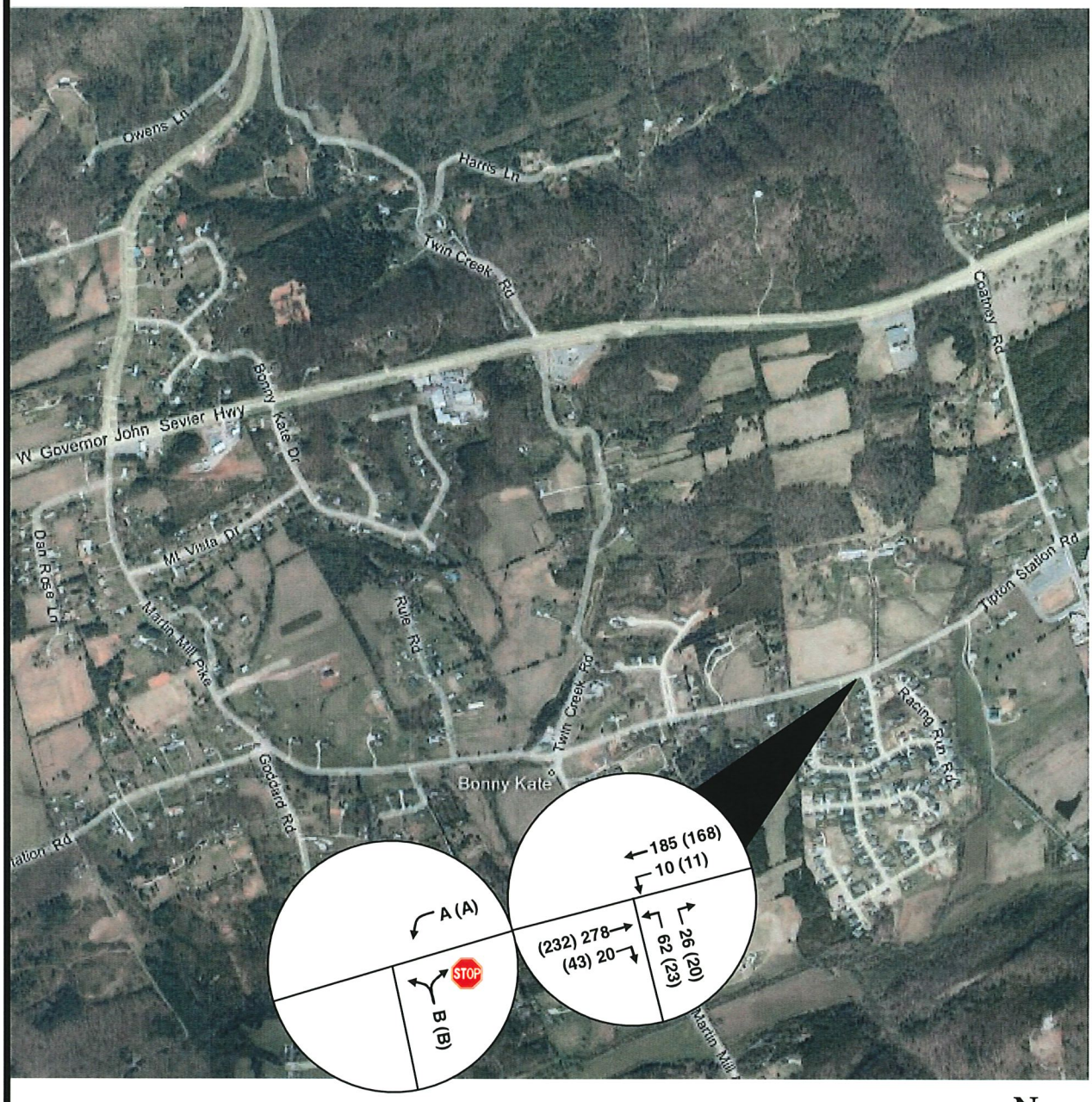
TABLE 1
LEVEL OF SERVICE (LOS) DESCRIPTION
FOR TWO-WAY STOP INTERSECTIONS

Level of Service	Average Control Delay per Vehicle (seconds)		
A		≤ 10.0	
B	> 10.0	and	≤ 15.0
C	> 15.0	and	≤ 25.0
D	> 25.0	and	≤ 35.0
E	> 35.0	and	≤ 50.0
F		> 50.0	

SOURCE: Highway Capacity Manual, TRB Special Report 209

Analyses were conducted using the Synchro Software, developed by Trafficware. Figure 4 displays the very acceptable LOS's for the study intersection.

2006 EXISTING TRAFFIC
Wood Creek South Subdivision Development
Knox County, TN



LEGEND

XXX AM PEAK
(XXX) PM PEAK
X AM LOS
(X) PM LOS

N

Figure 4

BACKGROUND TRAFFIC CONDITIONS

Background traffic is traffic that can be anticipated regardless of the proposed development. Traffic within the study area should continue to grow due to other developments as well as the continued growth within the surrounding area. This background traffic must be analyzed and evaluated for the purpose of establishing a baseline. In addition, the background traffic reflects the historical traffic volumes in the area of the proposed development.

Background Traffic Volumes

An average growth rate was determined using historical ADT traffic data from the Tennessee Department of Transportation (TDOT) count station #108 on Martin Mill Pike near the Blount County line. This roadway seems to have similar characteristics to Tipton Station Road. The count data covers the period from 1985 to 2005. It indicated that a yearly average of 2.0 percent could be expected for the area. The expected completion of the proposed residential development is to be before 2011. Therefore using a 2.0 percent annual growth rate, the study intersection reflects a 10-percent growth. Figure 5 illustrates the traffic volumes with the appropriately applied growth factor.

Background Capacity and Level of Service

Analysis was performed with the grown traffic volumes and is displayed in Figure 5. The levels of service are measured to be acceptable for the unsignalized study intersection. The exiting Saddlegate Road traffic is expected to experience a LOS C and B in the AM and PM peak hours, respectively.

2011 BACKGROUND TRAFFIC
Wood Creek South
Subdivision Development
Knox County, TN

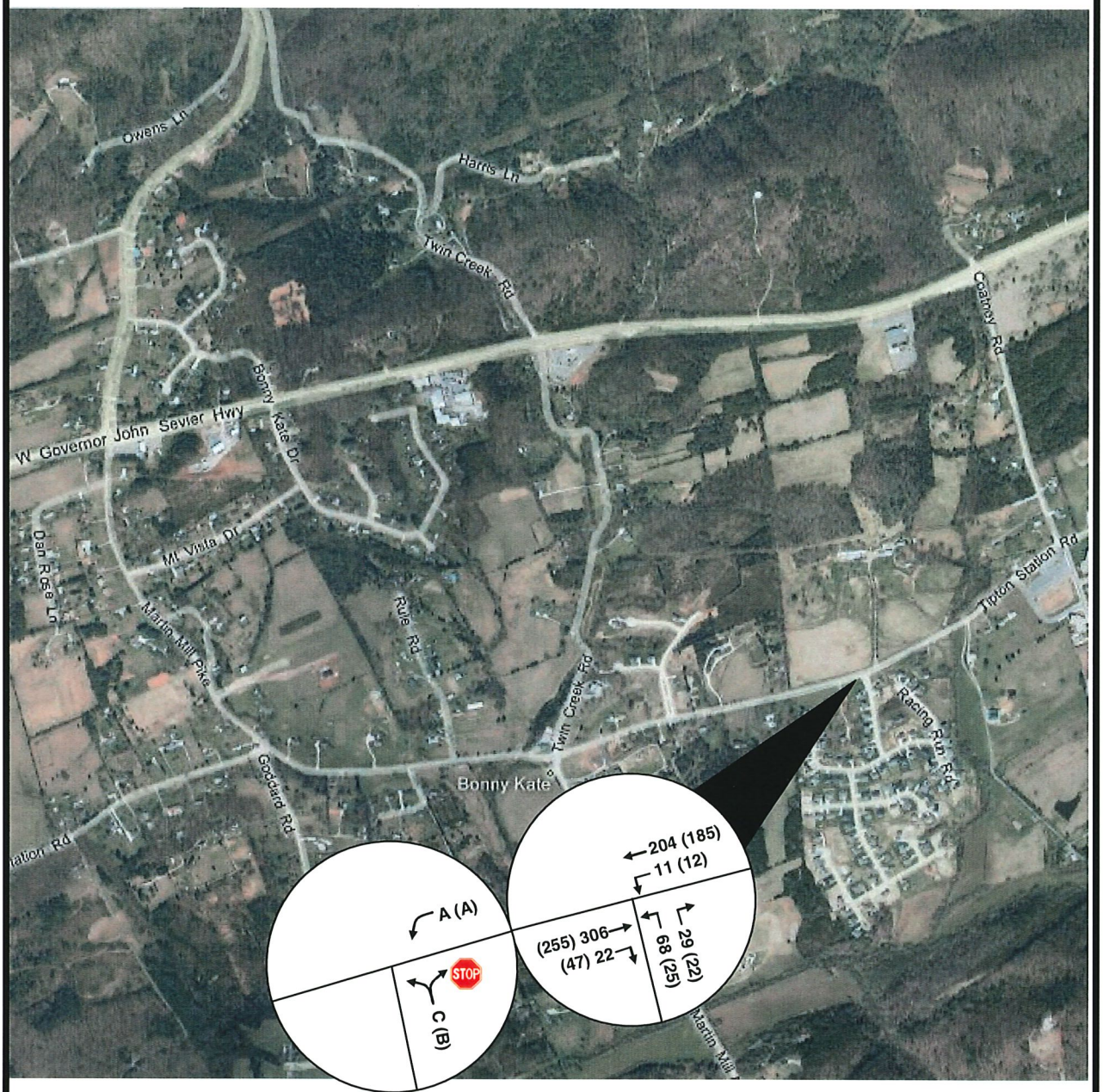


Figure 5

PROJECT IMPACTS

Project conditions are developed by generating traffic based on the proposed land uses, distributing the trips to the transportation network, and again conducting analyses for capacity and level of service.

Trip Generation

Project traffic was determined using the publication, **Trip Generation, 7th Edition**. This reference is published by the Institute of Transportation Engineers (ITE) and represents national data collected for many different land uses including industrial, residential, and commercial uses. **Trip Generation** is an essential tool in calculating the traffic, which may be generated by a proposed development. The study will generate traffic for approximately 52 acres for Planned Residential. This development is a total of 205 single-family units. From the trip generation calculations, the proposed site may generate approximately 2,010 daily trips. Table 2 presents the trip generation of this proposed site.

TABLE 2

TRIP GENERATION

LAND USE	L.U.C.	UNITS	DAILY TRIPS	AM PEAK ENTER	AM PEAK EXIT	PM PEAK ENTER	PM PEAK EXIT
Road "A"				12	38	43	25
Road "C"				25	78	86	51
Single Family	210	205	2,012 ✓	37 ✓	116 ✓	129 ✓	76 ✓

Trip Distribution and Assignment

Using the turning-movement counts for the study intersections, trips are distributed to the adjacent streets with 60-percent of the generated trips distributed west and 40-percent assigned east on Tipton Station Road. Upon reviewing the proposed site plan, for study purposes a boundary was assumed to establish the units that would use Road "A" and Road "C". It was assumed that 67-percent on the units located on northeast of the development would utilize Road "C" and the remaining 33-percent would utilize Road "A". Figure 6 illustrates the traffic distribution.

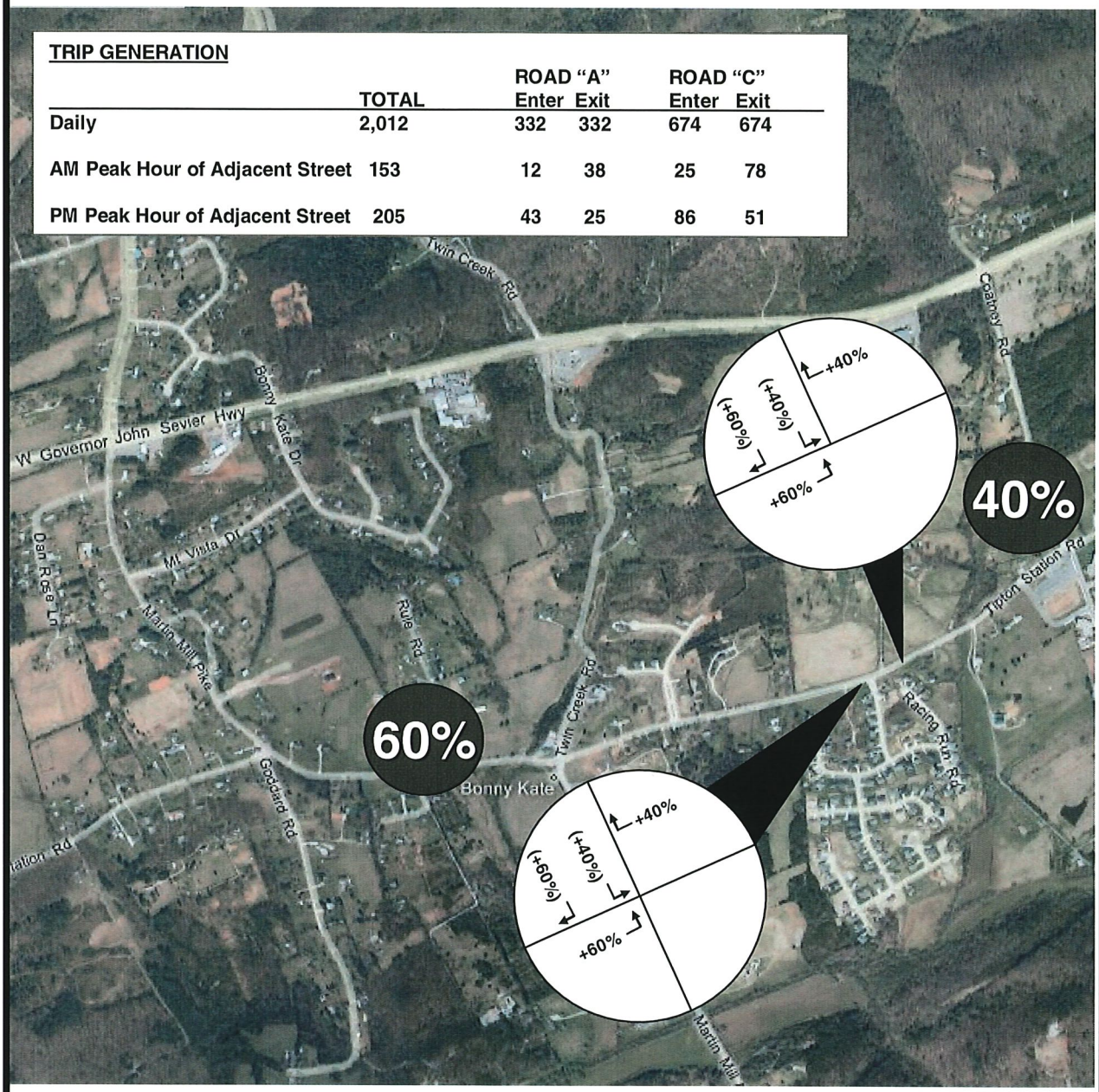
Project Traffic Volumes

By multiplying the trips generated by the distribution percentages, the project traffic volumes were determined. Figure 7 illustrates the resulting project traffic volumes associated with the proposed project.

TRIP DISTRIBUTION
Wood Creek South Subdivision Development Knox County, TN

TRIP GENERATION

	TOTAL	ROAD "A" Enter	ROAD "A" Exit	ROAD "C" Enter	ROAD "C" Exit
Daily	2,012	332	332	674	674
AM Peak Hour of Adjacent Street	153	12	38	25	78
PM Peak Hour of Adjacent Street	205	43	25	86	51



LEGEND
XXX ENTERING TRIPS
(XXX) EXITING TRIPS

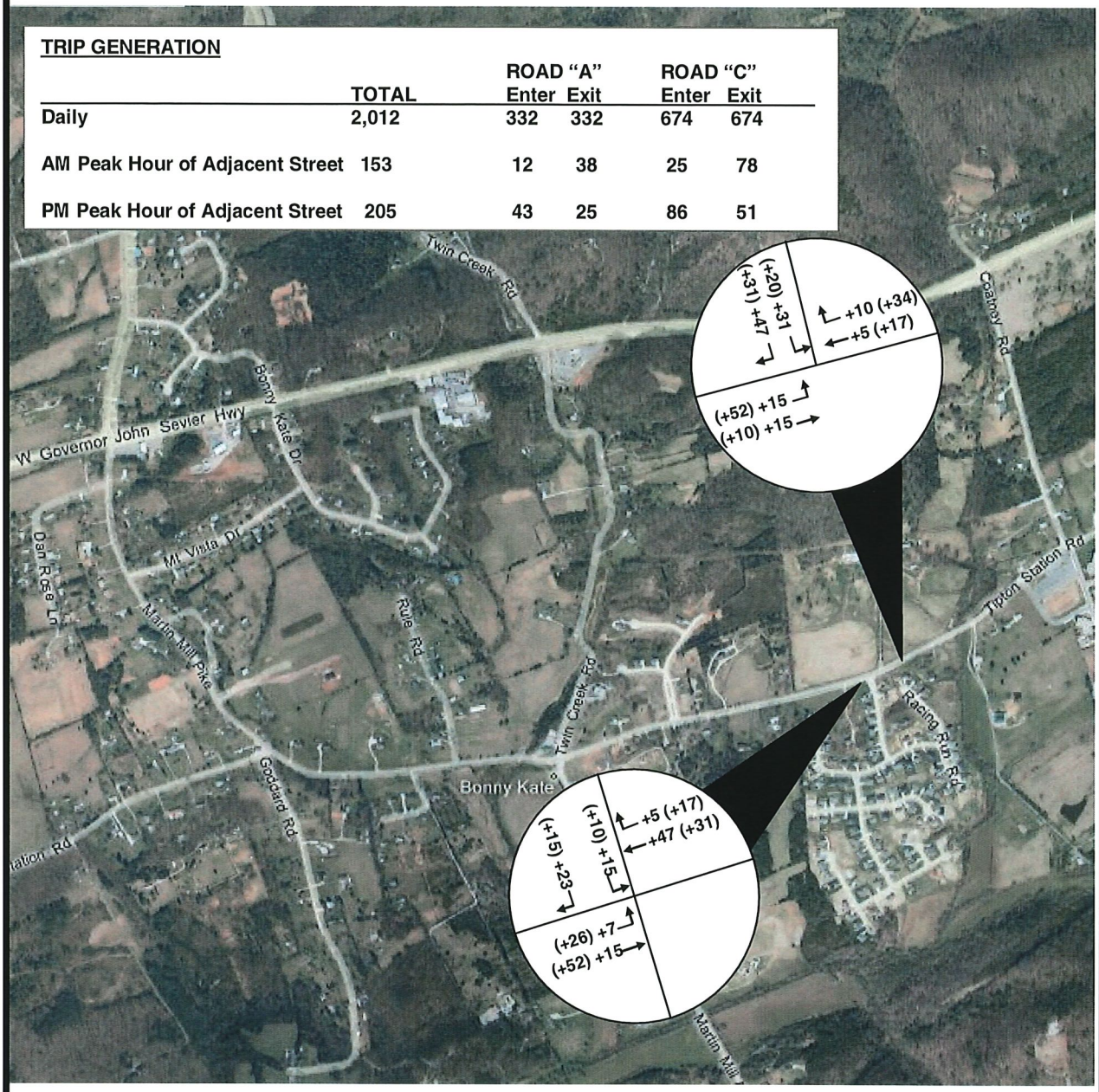
N

Figure 6

PROJECT TRIPS
Wood Creek South Subdivision Development Knox County, TN

TRIP GENERATION

	TOTAL	ROAD "A" Enter	ROAD "A" Exit	ROAD "C" Enter	ROAD "C" Exit
Daily	2,012	332	332	674	674
AM Peak Hour of Adjacent Street	153	12	38	25	78
PM Peak Hour of Adjacent Street	205	43	25	86	51



LEGEND
XXX AM PEAK
(XXX) PM PEAK

N

Figure 7

Total Projected Traffic Volumes

Background and project traffic volumes were added together to develop post-development traffic volumes for the year 2011. Figure 8 illustrates this 2011 projection. Using this projection, mitigation measures including traffic control devices and roadway and intersection geometry can be evaluated.

Projected Capacity and Level of Service

The development traffic from the site was analyzed to project the impact the unsignalized intersections. The resulting LOS analyses are shown in Figure 8. Both study-area intersections will operate at a very acceptable LOS with the development fully built out.

Sight Distance

The project is proposed to access Tipton Station Road opposite an existing subdivision street at Road "A" and a new connection at Road "C". Tipton Station Road is posted 40-mph for the section adjacent the proposed site. Measured sight distance at the proposed Road "A" intersection with Saddlegate Road is approximately 600 feet looking left and right. The measurements for Road "C" are approximately 480 feet and 600 feet looking left and right, respectively. The required distance is 305 feet to meet the minimum stopping sight-distance for American Association of State Highway and Transportation Officials (AASHTO) and 400 feet to meet the Knox County Minimum Corner Sight-distance Standard. The proposed site accesses, therefore, meet both criteria to be acceptable for safe operations.

Auxiliary Lane Evaluation

Knox County's Access Control and Driveway Design Policy was used to evaluate the need for auxiliary lanes at the proposed site access intersections of Road "A" and Road "C". The worksheets are provided in the Appendix.

Tipton Station Road is a two-lane roadway with minimal shoulders. Based on Knox County's criteria for turn lanes for two-lane roadways with a prevailing speed of 36 mph to 45 mph, a left-turn lane is not warranted with full build out of the project in 2011 during the AM and PM peak hours at either Road "A" or Road "C". Also, right-turn lanes are not warranted during the AM and PM peak hour with full build out conditions. Using the capacity and LOS analyses, the intersection operated at acceptable levels of service and within the intersection's capacity, suggesting that additional lanes are not required.

2011 PROJECTED TRAFFIC
Wood Creek South Subdivision Development Knox County, TN

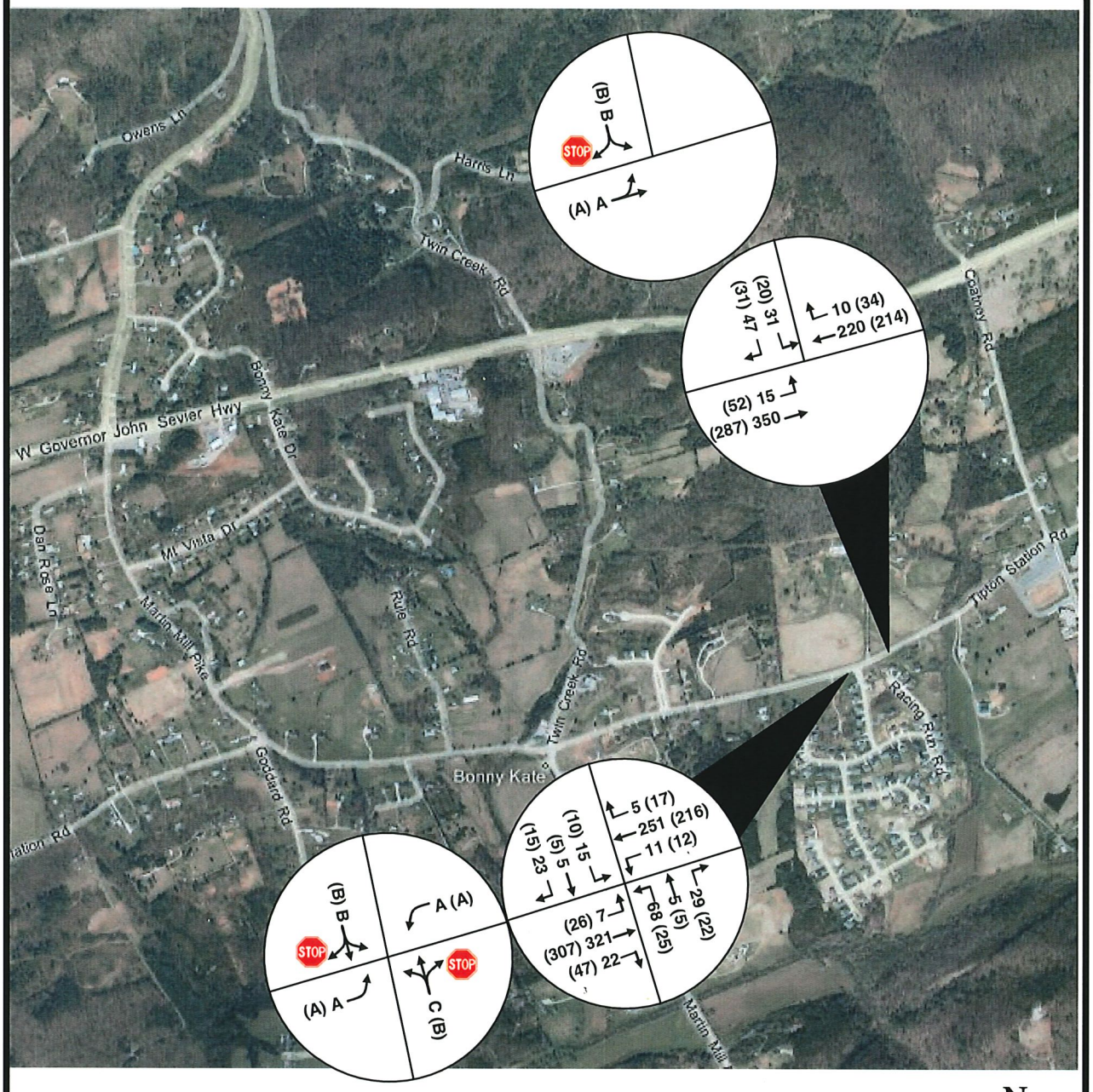


Figure 8

RECOMMENDATIONS

The analyses conducted and the review of the traffic volumes identified the following recommendations:

- Minimize landscaping, using low growing vegetation, and signing at the proposed street accesses to insure that safe sight distance is maintained.
- Use a minimum intersection radius of 25-foot for the efficient and safe ingress and egress of the site.
- Post the proposed streets with a STOP sign (R1-1) at Tipton Station Road.
- Intersection design should conform to the recommended standards and practices of the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, and the Knox County Department of Engineering and Public Works.

CONCLUSION

The study of this proposed residential development evaluated the projected traffic conditions. Background traffic was determined using a 2.0-percent annual growth rate until the year 2011. Traffic associated with the proposed project was then generated and distributed to the proposed site accesses. Using the identified turning movements for the projected traffic conditions, unsignalized capacity and level of service analyses were conducted using the **2000 Highway Capacity Manual**. Unsignalized levels of service were found to be very acceptable for the existing traffic conditions and would further continue to be very acceptable in 2011 with and without the proposed development for the intersection of Road "A" and Road "C" at Tipton Station Road. The sight distances for Road "A" and Road "C" will be adequate based on field measurements for a posted 40-mph speed limit. With the recommendations of this report, the efficient and safe flow of traffic should be maintained.

APPENDIX

Historical ADT's

Trip Generation

HCS Unsignalized Analyses

Traffic Counts

Auxiliary Lane Evaluations

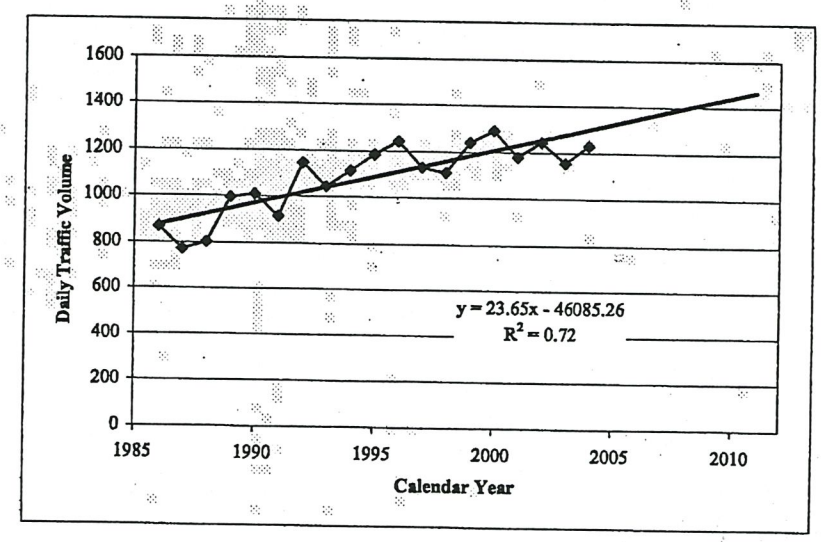
2003-2005 Traffic Counts for Knox County

Station	Street	Location	2003	2004	2005
C136	Taliwa Ct	E of Chapman Hwy	735		1,142
M343	Tarklin Valley Rd	W of Spangler Rd		430	
M344	Tarwater Rd	S of Tipton Station Rd		90	
C164	Taylor Rd	E of Woodlawn Pk	1,732		1,567
C378	Tazewell Pk	S of Jacksboro Pk		19,730	
C383	Tazewell Pk	E of Shannondale Rd		12,432	
C384	Tazewell Pk	E of Murphy Rd		15,048	
T006	Tazewell Pk	S of Twin Oak Ln	8,169	8,373	8,129
T054	Tazewell Pk	E of Felix Rd	15,638	15,949	16,039
T205	Tazewell Pk	At Union Co Line	5,590	5,999	5,941
T283	Tazewell Pk	N of Luttrell Rd	13,282	13,889	14,358
M216	Tell Mynatt Rd	E of Tell Mynatt Rd		670	
C232	Tennessee Ave	E of Western Ave	3,284		3,064
C239	Tennessee Ave	E of Burnside St	2,778		2,389
T319	Texas Ave	N of Western Ave	7,449	7,965	7,833
M214	Texas Valley Rd	E of Maynardville Pk		900	
C046	The Gallery	S of Kingston Pk	2,871		3,303
C471	Third Creek Rd	N of Middlebrook Pk N		4,989	
M202	Thomas Weaver Rd	W of Loyston Rd		410	
M218	Thompson School Rd	N of Emory Rd		2,620	
M039	Thorngrove Pk	100' E of Huckleberry Springs	600		941
M041	Thorngrove Pk	E of Boyd Bridge Rd	1,840		2,438
T098	Thorngrove Pk	N of Kodak Rd	915	955	1,012
C416	Tillery Dr	W of Central Ave Pk		4,686	
C438	Tillery Dr	N of Bradshaw Garden Dr		2,512	
C441	Tillery Dr	N of Wilson Rd		1,935	
M046	Tipton Station Rd	W of Burleson Rd	4,410	4,840	4,747
M047	Tipton Station Rd	100' W of Haws Rd	2,140	2,620	2,465
M377	Tipton Station Rd	E of Maryville Pk		1,490	
C081	Tobler Ln	S of Sutherland Ave	3,490		3,473
C231	Toms St	N of Beaumont Ave	2,083		2,056
M264	Tooles Bend Rd	S of Northshore Dr	1,370		1,420
M050	Topside Rd	100' W of Woodview Dr	590	590	
M073	Turkey Creek Rd	W of Concord Rd	4,910	3,100	5,761
T305	Turkey Creek Rd	E of Loudon Co Line	1,441	1,484	1,629

Station #	County	Location	Route #	Route Nam	Station Out
108	Knox	MARTIN PK-NEAR BLOUNT CO LINE	2410	2410 N	

Remarks	Year	Adj. Ave. Daily Traffi	Linear Regression	Diff.	Annual Increase
	1985	722	860		
	1986	867	880	20	2.3%
	1987	771	910	30	3.4%
	1988	801	930	20	2.2%
	1989	994	950	20	2.2%
	1990	1008	980	30	3.2%
	1991	914	1000	20	2.0%
	1992	1146	1030	30	3.0%
	1993	1043	1050	20	1.9%
	1994	1114	1070	20	1.9%
	1995	1185	1100	30	2.8%
	1996	1242	1120	20	1.8%
	1997	1131	1140	20	1.8%
	1998	1110	1170	30	2.6%
	1999	1240	1190	20	1.7%
	2000	1292	1210	20	1.7%
	2001	1179	1240	30	2.5%
	2002	1244	1260	20	1.6%
	2003	1156	1290	30	2.4%
	2004	1230	1310	20	1.6%
	2005	1243	1330	20	1.5%

Historical Growth 2.73%
Forecast Growth 1.94%



Year	Linear Regression	Diff.	Annual Increase
2006	1340	10	2.3%
2007	1370	30	2.2%
2008	1390	20	1.5%
2009	1420	30	2.2%
2010	1440	20	1.4%
2011	1470	30	2.1%

Assumed
339 68 units access Road A
672 137 " " " C

Single-Family Detached Housing
(210)

X = 205 units
T = 2012 trips

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

Road A
332 ENTER 332 EXIT

Road C
ENTER EXIT
674 674

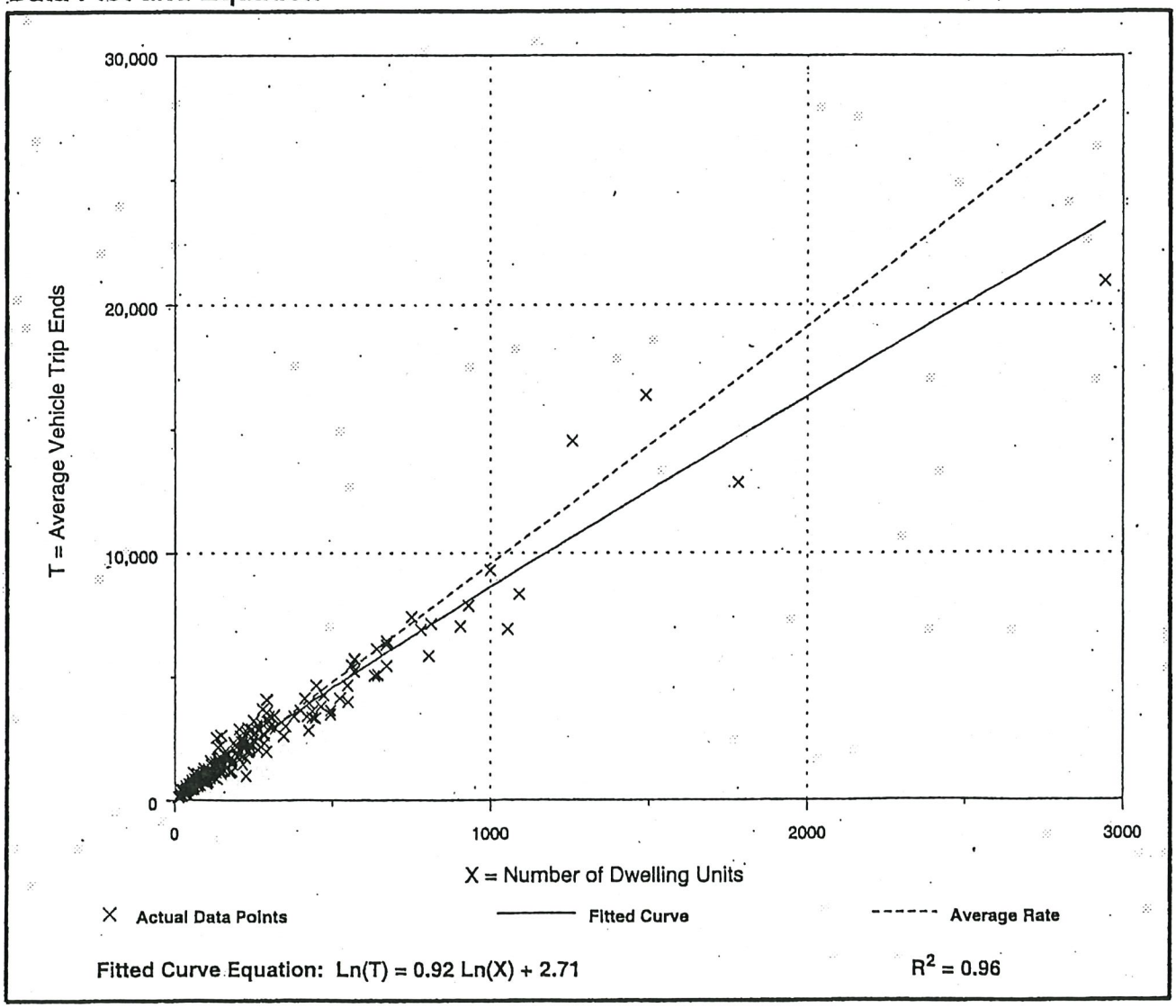
2012

Number of Studies: 350
Avg. Number of Dwelling Units: 197
Directional Distribution: 50% entering, 50% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.57	4.31 - 21.85	3.69

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 2.71

$R^2 = 0.96$

Single-Family Detached Housing
(210)

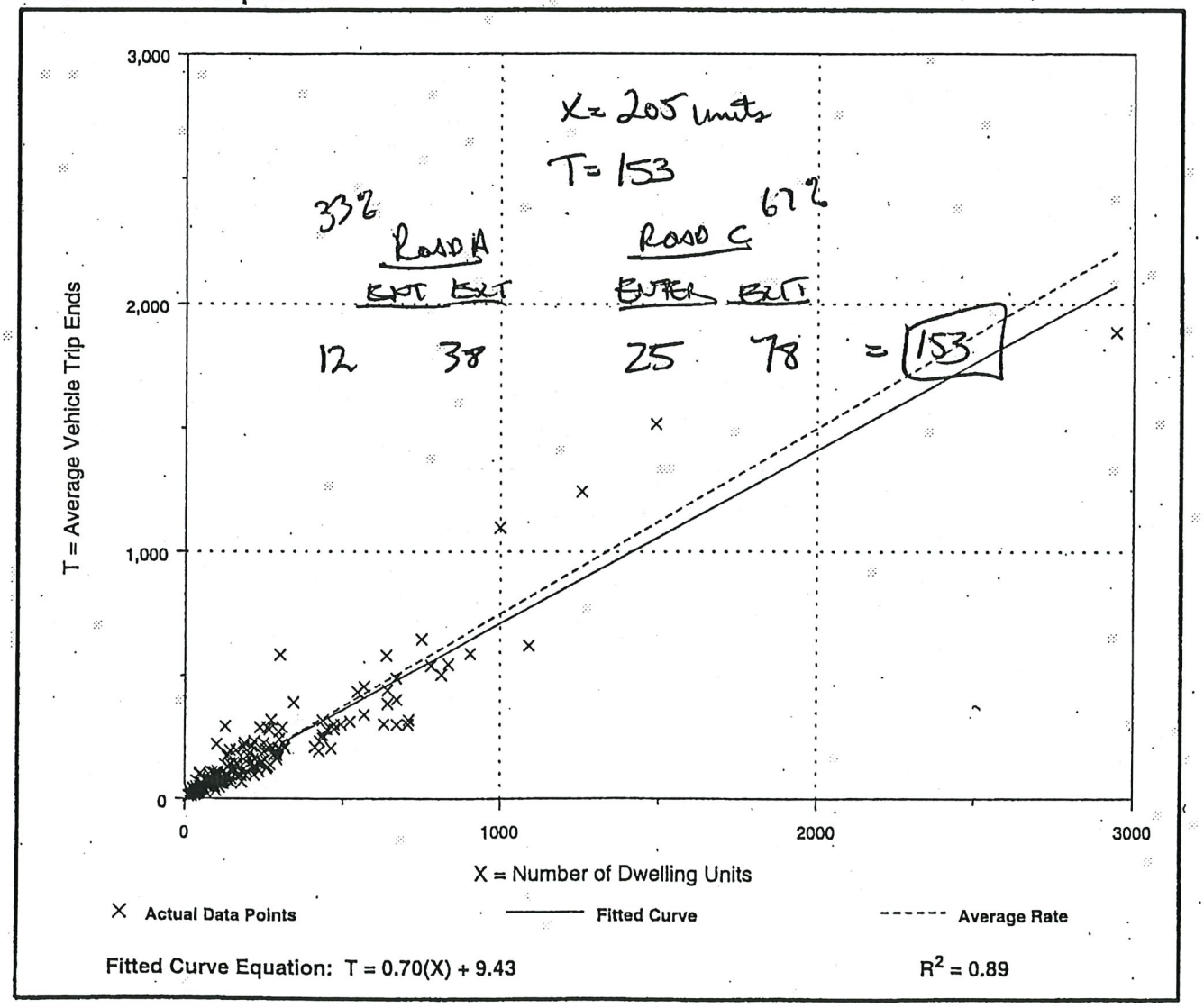
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 274
Avg. Number of Dwelling Units: 201
Directional Distribution: 25% entering, 75% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.75	0.33 - 2.27	0.90

Data Plot and Equation



Single-Family Detached Housing
(210)

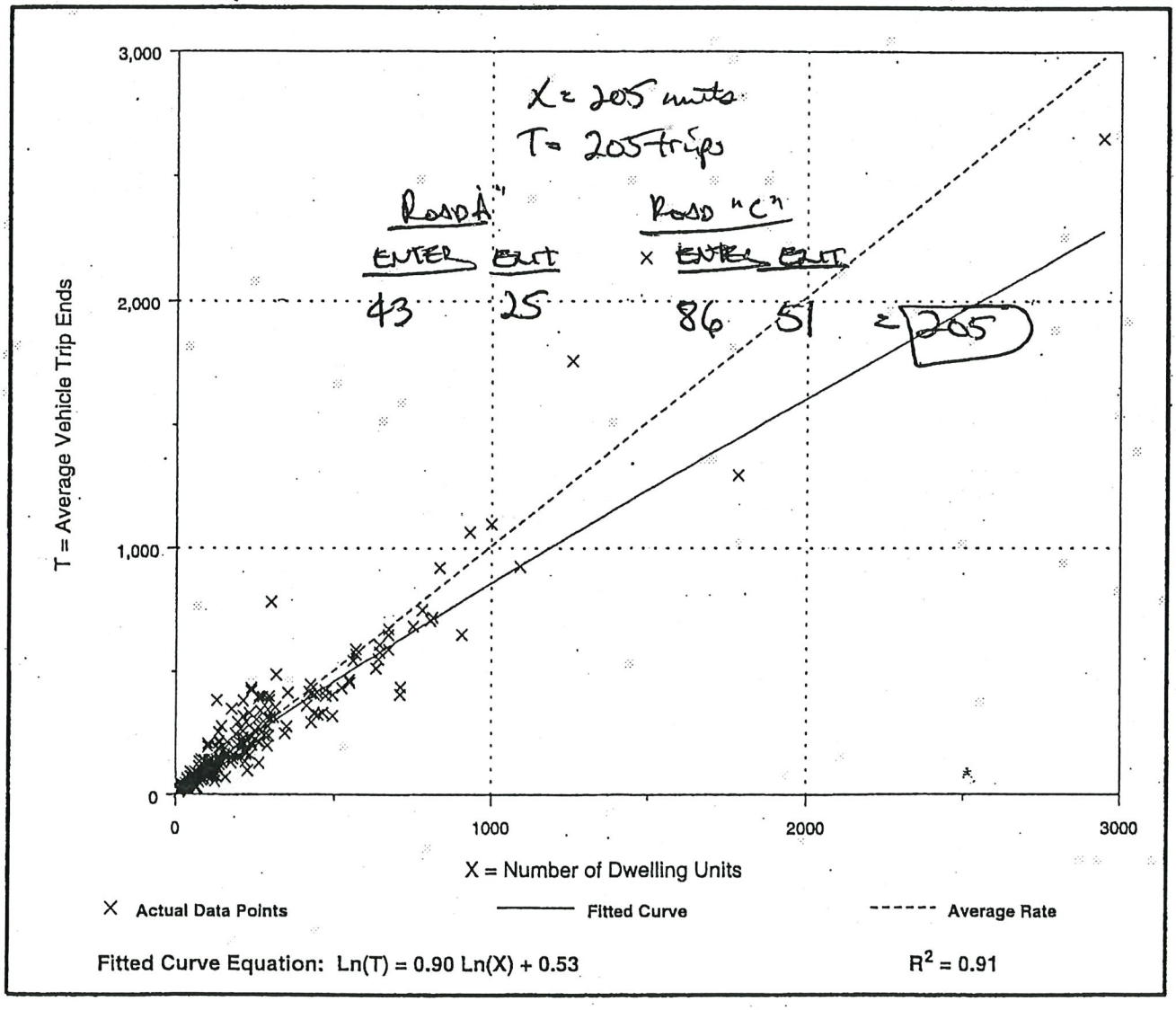
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 302
Avg. Number of Dwelling Units: 214
Directional Distribution: 63% entering, 37% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.01	0.42 - 2.98	1.05

Data Plot and Equation



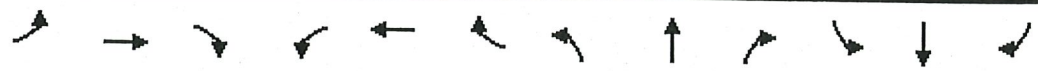
Fitted Curve Equation: Ln(T) = 0.90 Ln(X) + 0.53

R^2 = 0.91

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	278	20	10	185	0	62	0	26	0	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	309	22	11	206	0	69	0	29	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	206			331			548	548	320	577	559	206
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	206			331			548	548	320	577	559	206
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			84	100	96	100	100	100
cM capacity (veh/h)	1366			1228			444	440	721	408	434	835

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	331	217	98	0
Volume Left	0	11	69	0
Volume Right	22	0	29	0
cSH	1366	1228	501	1700
Volume to Capacity	0.00	0.01	0.20	0.00
Queue Length 95th (ft)	0	1	18	0
Control Delay (s)	0.0	0.5	13.9	0.0
Lane LOS		A	B	A
Approach Delay (s)	0.0	0.5	13.9	0.0
Approach LOS			B	A

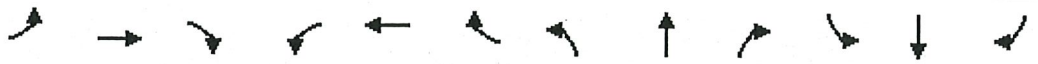
Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	29.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	232	43	11	168	0	23	0	20	0	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	258	48	12	187	0	26	0	22	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	187			306			493	493	282	515	517	187
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	187			306			493	493	282	515	517	187
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			95	100	97	100	100	100
cM capacity (veh/h)	1388			1255			483	473	757	453	458	855

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	306	199	48	0
Volume Left	0	12	26	0
Volume Right	48	0	22	0
cSH	1388	1255	581	1700
Volume to Capacity	0.00	0.01	0.08	0.00
Queue Length 95th (ft)	0	1	7	0
Control Delay (s)	0.0	0.6	11.8	0.0
Lane LOS		A	B	A
Approach Delay (s)	0.0	0.6	11.8	0.0
Approach LOS			B	A

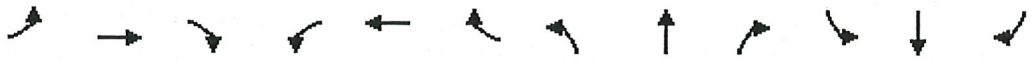
Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	27.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	306	22	11	204	0	68	0	29	0	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	340	24	12	227	0	76	0	32	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	227			364			603	603	352	636	616	227
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	227			364			603	603	352	636	616	227
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			81	100	95	100	100	100
cM capacity (veh/h)	1342			1194			408	409	691	370	402	813

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	364	239	108	0
Volume Left	0	12	76	0
Volume Right	24	0	32	0
cSH	1342	1194	465	1700
Volume to Capacity	0.00	0.01	0.23	0.00
Queue Length 95th (ft)	0	1	22	0
Control Delay (s)	0.0	0.5	15.1	0.0
Lane LOS		A	C	A
Approach Delay (s)	0.0	0.5	15.1	0.0
Approach LOS			C	A

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	255	47	12	185	0	25	0	22	0	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	283	52	13	206	0	28	0	24	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	206			336			542	542	309	566	568	206
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	206			336			542	542	309	566	568	206
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			94	100	97	100	100	100
cM capacity (veh/h)	1366			1224			448	443	731	417	428	835

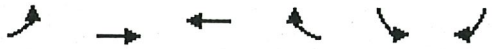
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	336	219	52	0
Volume Left	0	13	28	0
Volume Right	52	0	24	0
cSH	1366	1224	547	1700
Volume to Capacity	0.00	0.01	0.10	0.00
Queue Length 95th (ft)	0	1	8	0
Control Delay (s)	0.0	0.6	12.3	0.0
Lane LOS		A	B	A
Approach Delay (s)	0.0	0.6	12.3	0.0
Approach LOS			B	A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	29.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	7	321	22	11	251	5	68	5	29	15	5	23
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	8	357	24	12	279	6	76	6	32	17	6	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	284			381			719	693	369	726	703	282
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	284			381			719	693	369	726	703	282
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			77	98	95	95	98	97
cM capacity (veh/h)	1278			1177			324	361	677	316	356	757

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	389	297	113	48
Volume Left	8	12	76	17
Volume Right	24	6	32	26
cSH	1278	1177	383	468
Volume to Capacity	0.01	0.01	0.30	0.10
Queue Length 95th (ft)	0	1	30	8
Control Delay (s)	0.2	0.4	18.3	13.6
Lane LOS	A	A	C	B
Approach Delay (s)	0.2	0.4	18.3	13.6
Approach LOS			C	B

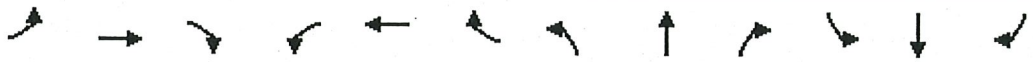
Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	15	350	220	10	31	47
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	17	389	244	11	34	52
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	256				672	250
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	256				672	250
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				92	93
cM capacity (veh/h)	1309				416	789

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	406	256	87
Volume Left	17	0	34
Volume Right	0	11	52
cSH	1309	1700	581
Volume to Capacity	0.01	0.15	0.15
Queue Length 95th (ft)	1	0	13
Control Delay (s)	0.4	0.0	12.3
Lane LOS	A		B
Approach Delay (s)	0.4	0.0	12.3
Approach LOS			B

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	26	307	47	12	216	17	25	5	22	10	5	15
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	29	341	52	13	240	19	28	6	24	11	6	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	259			393			721	711	367	728	727	249
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	259			393			721	711	367	728	727	249
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			99			91	98	96	96	98	98
cM capacity (veh/h)	1306			1165			323	346	678	314	339	789

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	422	272	58	33
Volume Left	29	13	28	11
Volume Right	52	19	24	17
cSH	1306	1165	418	457
Volume to Capacity	0.02	0.01	0.14	0.07
Queue Length 95th (ft)	2	1	12	6
Control Delay (s)	0.7	0.5	15.0	13.5
Lane LOS	A	A	B	B
Approach Delay (s)	0.7	0.5	15.0	13.5
Approach LOS			B	B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	52	287	214	34	20	31
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	58	319	238	38	22	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	276				691	257
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	276				691	257
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				94	96
cM capacity (veh/h)	1287				392	782

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	377	276	57
Volume Left	58	0	22
Volume Right	0	38	34
cSH	1287	1700	562
Volume to Capacity	0.04	0.16	0.10
Queue Length 95th (ft)	4	0	8
Control Delay (s)	1.6	0.0	12.1
Lane LOS	A		B
Approach Delay (s)	1.6	0.0	12.1
Approach LOS			B

Intersection Summary			
Average Delay		1.8	
Intersection Capacity Utilization		44.6%	ICU Level of Service A
Analysis Period (min)		15	

Wilbur Smith Associates
1100 Marion Street Suite 200
Knoxville, TN 37921

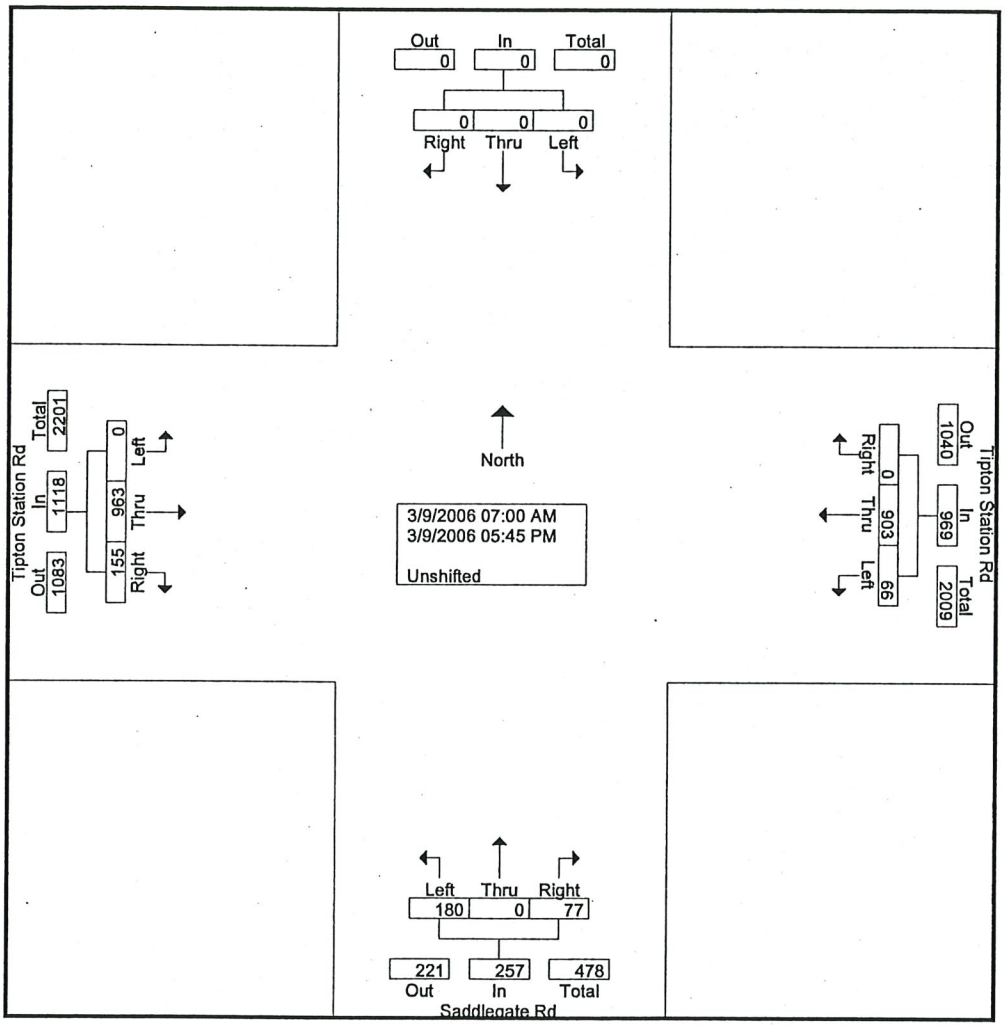
File Name : Tipton Sta w Saddlegate
Site Code : 00001111
Start Date : 3/9/2006
Page No : 1

Groups Printed- Unshifted

	Southbound				Tipton Station Rd Westbound				Saddlegate Rd Northbound				Tipton Station Rd Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	0	0	0	0	1	20	0	21	10	0	1	11	0	15	2	17	49
07:15 AM	0	0	0	0	1	61	0	62	20	0	2	22	0	28	3	31	115
07:30 AM	0	0	0	0	3	79	0	82	25	0	5	30	0	46	8	54	166
07:45 AM	0	0	0	0	1	28	0	29	14	0	5	19	0	53	4	57	105
Total	0	0	0	0	6	188	0	194	69	0	13	82	0	142	17	159	435
08:00 AM	0	0	0	0	4	28	0	32	15	0	5	20	0	50	3	53	105
08:15 AM	0	0	0	0	2	50	0	52	8	0	11	19	0	129	5	134	205
08:30 AM	0	0	0	0	1	42	0	43	13	0	1	14	0	37	4	41	98
08:45 AM	0	0	0	0	3	24	0	27	7	0	2	9	0	14	1	15	51
Total	0	0	0	0	10	144	0	154	43	0	19	62	0	230	13	243	459
02:00 PM	0	0	0	0	1	15	0	16	2	0	0	2	0	14	3	17	35
02:15 PM	0	0	0	0	2	18	0	20	3	0	1	4	0	9	2	11	35
02:30 PM	0	0	0	0	2	21	0	23	2	0	1	3	0	11	4	15	41
02:45 PM	0	0	0	0	1	26	0	27	6	0	2	8	0	21	10	31	66
Total	0	0	0	0	6	80	0	86	13	0	4	17	0	55	19	74	177
03:00 PM	0	0	0	0	2	17	0	19	5	0	2	7	0	36	12	48	74
03:15 PM	0	0	0	0	3	17	0	20	2	0	0	2	0	21	8	29	51
03:30 PM	0	0	0	0	5	30	0	35	4	0	5	9	0	42	6	48	92
03:45 PM	0	0	0	0	10	134	0	144	4	0	2	6	0	45	8	53	203
Total	0	0	0	0	20	198	0	218	15	0	9	24	0	144	34	178	420
04:00 PM	0	0	0	0	5	32	0	37	7	0	5	12	0	40	4	44	93
04:15 PM	0	0	0	0	1	35	0	36	7	0	0	7	0	30	6	36	79
04:30 PM	0	0	0	0	4	26	0	30	0	0	2	2	0	35	3	38	70
04:45 PM	0	0	0	0	3	32	0	35	3	0	5	8	0	55	16	71	114
Total	0	0	0	0	13	125	0	138	17	0	12	29	0	160	29	189	356
05:00 PM	0	0	0	0	5	35	0	40	6	0	9	15	0	51	8	59	114
05:15 PM	0	0	0	0	4	42	0	46	4	0	3	7	0	66	12	78	131
05:30 PM	0	0	0	0	2	55	0	57	7	0	1	8	0	62	9	71	136
05:45 PM	0	0	0	0	0	36	0	36	6	0	7	13	0	53	14	67	116
Total	0	0	0	0	11	168	0	179	23	0	20	43	0	232	43	275	497
Grand Total	0	0	0	0	66	903	0	969	180	0	77	257	0	963	155	1118	2344
Apprch %	0	0	0		6.8	93.2	0		70	0	30		0	86.1	13.9		
Total %	0	0	0	0	2.8	38.5	0	41.3	7.7	0	3.3	11	0	41.1	6.6	47.7	

Wilbur Smith Associates
1100 Marion Street Suite 200
Knoxville, TN 37921

File Name : Tipton Sta w Saddlegate
Site Code : 00001111
Start Date : 3/9/2006
Page No : 2



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1100 Marion Street Suite 200
Knoxville, TN 37921

File Name : Tipton Sta w Saddlegate
Site Code : 00001111
Start Date : 3/9/2006
Page No : 3

	Southbound				Tipton Station Rd Westbound				Saddlegate Rd Northbound				Tipton Station Rd Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	0	0	0	3	**79**	0	**82**	**25**	0	5	**30**	0	46	**8**	54	166
07:45 AM	0	0	0	0	1	28	0	29	14	0	5	19	0	53	4	57	105
08:00 AM	0	0	0	0	**4**	28	0	32	15	0	5	20	0	50	3	53	105
08:15 AM	0	0	0	0	2	50	0	52	8	0	**11**	19	0	**129**	5	**134**	**205**
Total Volume	0	0	0	0	10	185	0	195	62	0	26	88	0	278	20	298	581
% App. Total	0	0	0		5.1	94.9	0		70.5	0	29.5		0	93.3	6.7		
PHF	.000	.000	.000	.000	.625	.585	.000	.595	.620	.000	.591	.733	.000	.539	.625	.556	.709
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 10:00 AM																	
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0		0	0	0		0	0	0		0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Peak Hour Analysis From 02:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	0	0	0	**5**	35	0	40	6	0	**9**	**15**	0	51	8	59	114
05:15 PM	0	0	0	0	4	42	0	46	4	0	3	7	0	**66**	12	**78**	131
05:30 PM	0	0	0	0	2	**55**	0	**57**	**7**	0	1	8	0	62	9	71	**136**
05:45 PM	0	0	0	0	0	36	0	36	6	0	7	13	0	53	**14**	67	116
Total Volume	0	0	0	0	11	168	0	179	23	0	20	43	0	232	43	275	497
% App. Total	0	0	0		6.1	93.9	0		53.5	0	46.5		0	84.4	15.6		
PHF	.000	.000	.000	.000	.550	.764	.000	.785	.821	.000	.556	.717	.000	.879	.768	.881	.914

LEFT-TURN WARRANTS ARE NOT MET FOR EITHER ROAD "A" OR "C".

TABLE 5A

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

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

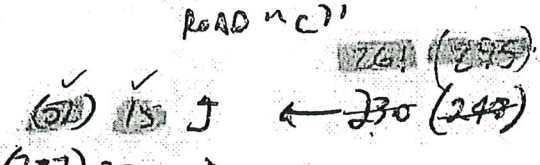
OPPOSING VOLUME	THROUGH VOLUME PLUS RIGHT-TURN VOLUME *					
	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399
100 - 149	250	180	140	110	80	70
150 - 199	200	140	105	90	70	60
200 - 249	160	115	85	75	65	55
250 - 299	130	100	75	65	60	50
300 - 349	110	90	70	60	55	45
350 - 399	100	80	65	55	50	40
400 - 449	90	70	60	50	45	35
450 - 499	80	65	55	45	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	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
250 - 299	50	45	35	30	30	30
300 - 349	45	40	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

ROAD "A"

ROAD "C"



RIGHT-TURN LANE WARRANTS ARE NOT MET

TABLE 5B

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

RIGHT-TURN VOLUME	THROUGH VOLUME PLUS LEFT-TURN VOLUME *					
	<100	100 - 199	200 - 249	250 - 299	300 - 349	350 - 399
~~Fewer Than 25~~ ~~25 - 49~~ ~~50 - 99~~			NO NO NO	NO		
100 - 149 150 - 199						
200 - 249 250 - 299					Yes	Yes Yes
300 - 349 350 - 399			Yes	Yes Yes	Yes Yes	Yes Yes
400 - 449 450 - 499		Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
500 - 549 550 - 599	Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
600 or More	Yes	Yes	Yes	Yes	Yes	Yes

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

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

ROAD "A"

← 5(17)

← ~~251~~ (~~216~~)
235 (232)
A-7

ROAD "C)

← 10 (34)

← ~~220~~ (214)
261 261