

# **WOODSON TRAIL SUBDIVISION**

## ***Knoxville, Tennessee***

### **TRAFFIC IMPACT STUDY**

***Prepared for :***  
***BATSON, HIMES, NORVELL, & POE***

***Prepared By:***



ENGINEERS  
PLANNERS  
ECONOMISTS

Wilbur Smith Associates

**December 2006**

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**KNOX COUNTY, TENNESSEE**

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**Prepared for**

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Knoxville, Tennessee 37909**

**December 2006**

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**Project No. 100966**

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## **INTRODUCTION**

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Wilbur Smith Associates (WSA) is pleased to submit this report to address any traffic impact and access of a residential development located on Woodson Drive in south Knox County. The basis for this study required the collection of traffic data, generation of anticipated traffic volumes for the proposed site and development of projected traffic volumes for normal growth and from the potential site. Analyses of the resulting traffic projections were conducted to determine the capacity and levels of service for the site access to Woodson Drive. This study will evaluate the development's impact and determine if any mitigation measures are necessary to minimize the traffic impact including improved roadway geometrics and traffic control devices.

### **Project Description**

The proposed project is a residential development. The development is approximately 91 single-family attached and detached units on approximately 15 acres. The subdivision currently has approval for 50 units with an application for another 41 units. The site access is to Woodson Drive from a proposed residential street. Figure 1 shows the proposed site plan.

### **Site Location**

The location of the proposed residential development is south of Woodson Drive and east of Alcoa Highway (U.S. 129) and Spring Creek Road in south Knoxville, Tennessee. Figure 2 illustrates the site location relative to local and regional access.

# SITE PLAN

## Woodson Trail Subdivision



Figure 1

# VICINITY MAP

## Woodson Trail Subdivision

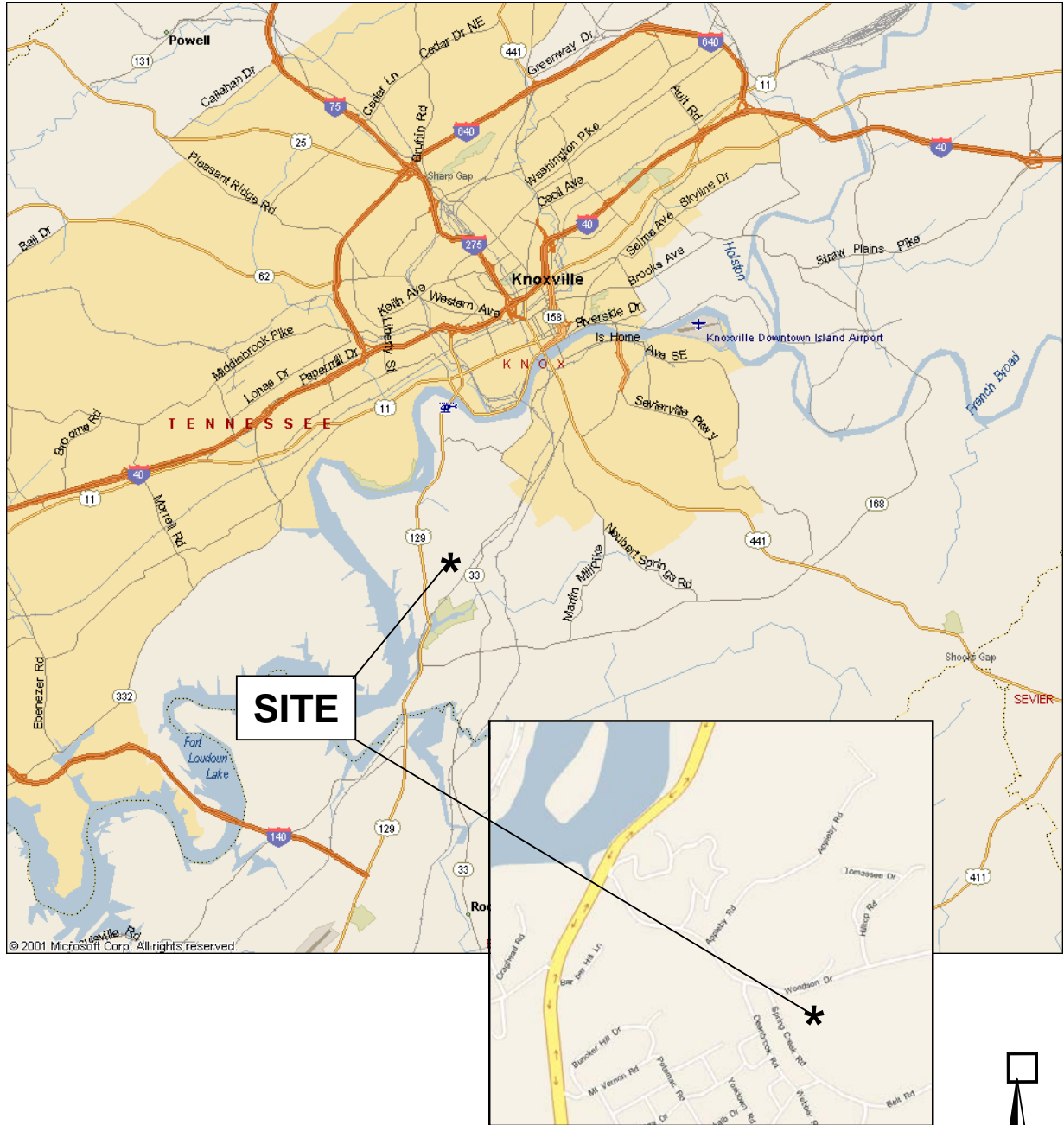


Figure 2

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## **LOCAL AND REGIONAL ACCESS**

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### **Local Access**

The proposed local access is to Woodson Drive. The adjacent street facility is approximately 20-feet in width and is classified a minor collector extending between Alcoa Highway (U.S. 129) and Maryville Highway (S.R. 33). Woodson Drive has an approximate 2006 average daily traffic (ADT) of 1,470.

### **Regional Access**

Regional access to this site is from Maryville Pike (S.R. 33) and Chapman Highway (U.S. 441) to the east and Alcoa Highway (U.S. 129) to the west which extends north to Interstate 40 and south to the Maryville accessing U.S. 411, U.S. 321, and Pellissippi Parkway (I-140).

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. Interstate 75 provides north- and southbound connecting with neighboring states of Kentucky and Georgia, through Chattanooga, respectively.



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## **EXISTING TRAFFIC CONDITIONS**

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### **Existing Traffic Control and Speed**

Street approaches to Woodson Drive in the project vicinity are STOP controlled. The posted speed limit for Woodson Drive is 40mph.

### **Existing Traffic Volumes**

WSA conducted a 24-hour mechanical count on Woodson Drive at the proposed residential street intersection in late November 2006. The AM and PM peak hours are found between 7:45a.m. to 8:45a.m. and 4:45p.m. to 5:45p.m. Figure 3 illustrates the AM and PM peak-hour traffic volumes at the proposed intersection location of the proposed residential street.

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## **BACKGROUND TRAFFIC CONDITIONS**

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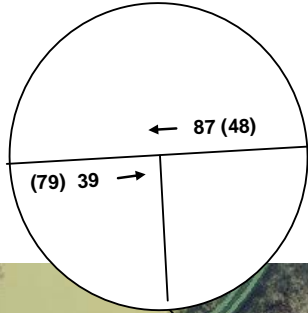
Background traffic is traffic that can be anticipated regardless of the proposed development. Traffic within the study area should continue to grow due to other development as well as the continued growth through the study area. This background traffic is projected for the purpose of establishing a baseline.

### **Background Traffic Volumes**

Historical traffic data is reviewed to determine traffic growth trends in the study area. Using the MPC count station on Woodson Drive, the growth appears to range between from a rate of 5-percent to as much as 20-percent over the past few years. For the purpose of this study, background traffic volumes were developed assuming an annual compounded growth rate of 15-percent. Background traffic is projected for the year 2010, a 74.9-percent growth in the adjacent street traffic volume. Build-out of the site is planned in the next few years. Actual bailout, however, will depend largely on the housing market.

Figure 4 presents the resulting Year 2010 AM and PM peak-hour traffic volumes without the proposed development.

# 2006 TRAFFIC Woodson Trail Subdivision



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0 1069ft

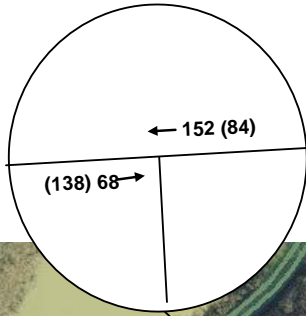
**LEGEND**  
**XXX AM PEAK**  
**(XXX) PM PEAK**



**Figure 3**

# 2010 BACKGROUND TRAFFIC

## Woodson Trail Subdivision



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**LEGEND**  
 XXX AM PEAK  
 (XXX) PM PEAK



**Figure 5**

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## PROJECT IMPACTS

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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 91 single-family units. From the trip generation calculations, the proposed site may generate approximately 950 daily trips. Table 1 presents the trip generation of this proposed site.

**TABLE 1. TRIP GENERATION**

Land Use	Land-Use Code	Units	Daily Trips	AM Peak-Hour Trips		PM Peak-Hour Trips	
				Enter	Exit	Enter	Exit
Single-Family	210	91	953	18	55	63	35

Reference: **Trip Generation, 7th Edition**

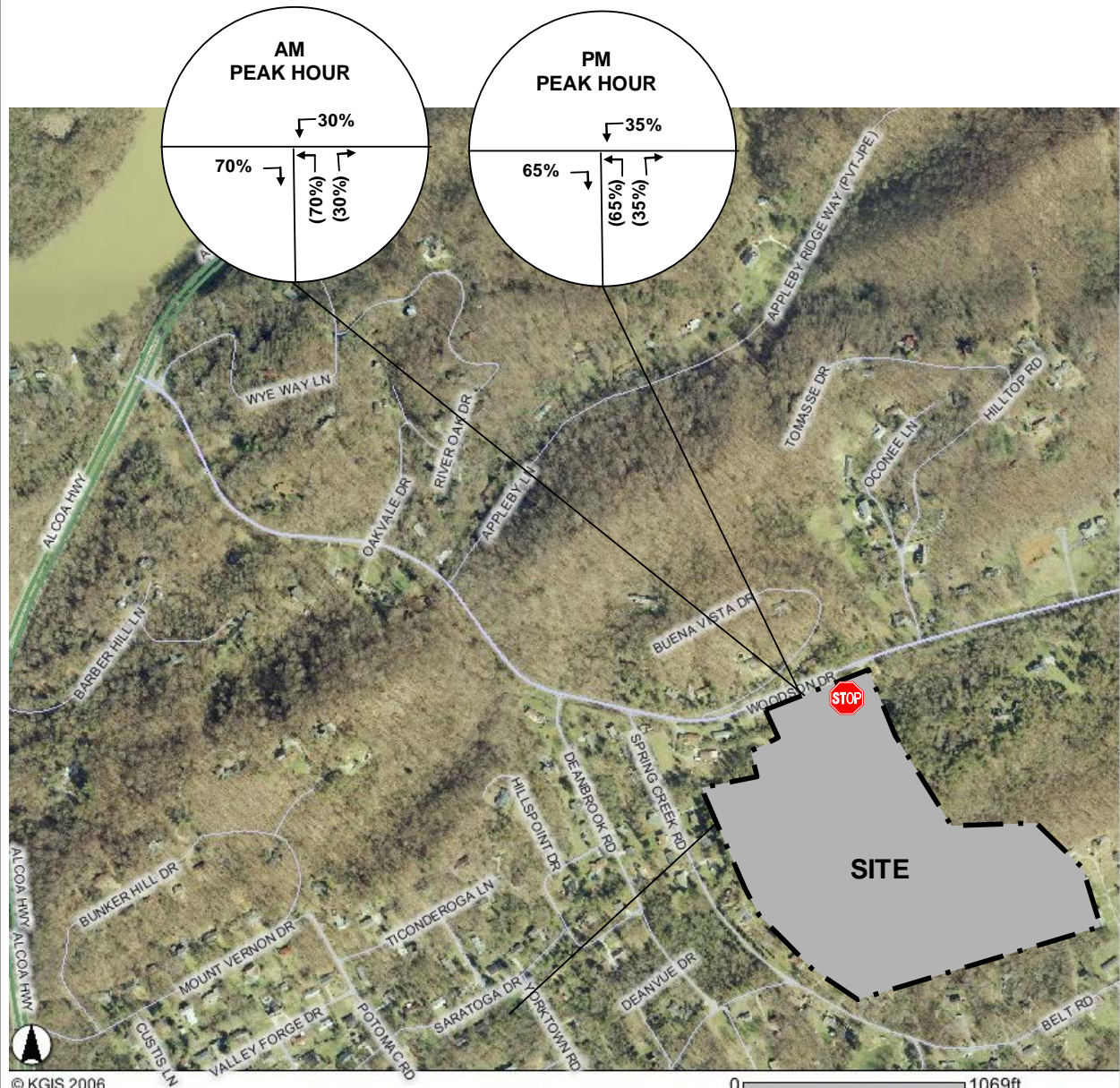
### Trip Distribution and Assignment

Using the mechanical count conducted for Woodson Drive, residential development characteristics, and the local and regional roadway network, generated trips are distributed to the adjacent street with 70-percent distributed to the west and 30-percent to the east during the AM peak hour. For the PM peak hour, 65-percent distributed to the west and 35-percent to the east. Figure 5 illustrates this distribution and assignment.

### Project Traffic Volumes

By multiplying the trips generated by the distribution percentages, the project traffic volumes are determined. Figure 6 illustrates the resulting project traffic volumes associated with the proposed project.

# DISTRIBUTION AND ASSIGNMENT Woodson Trail Subdivision



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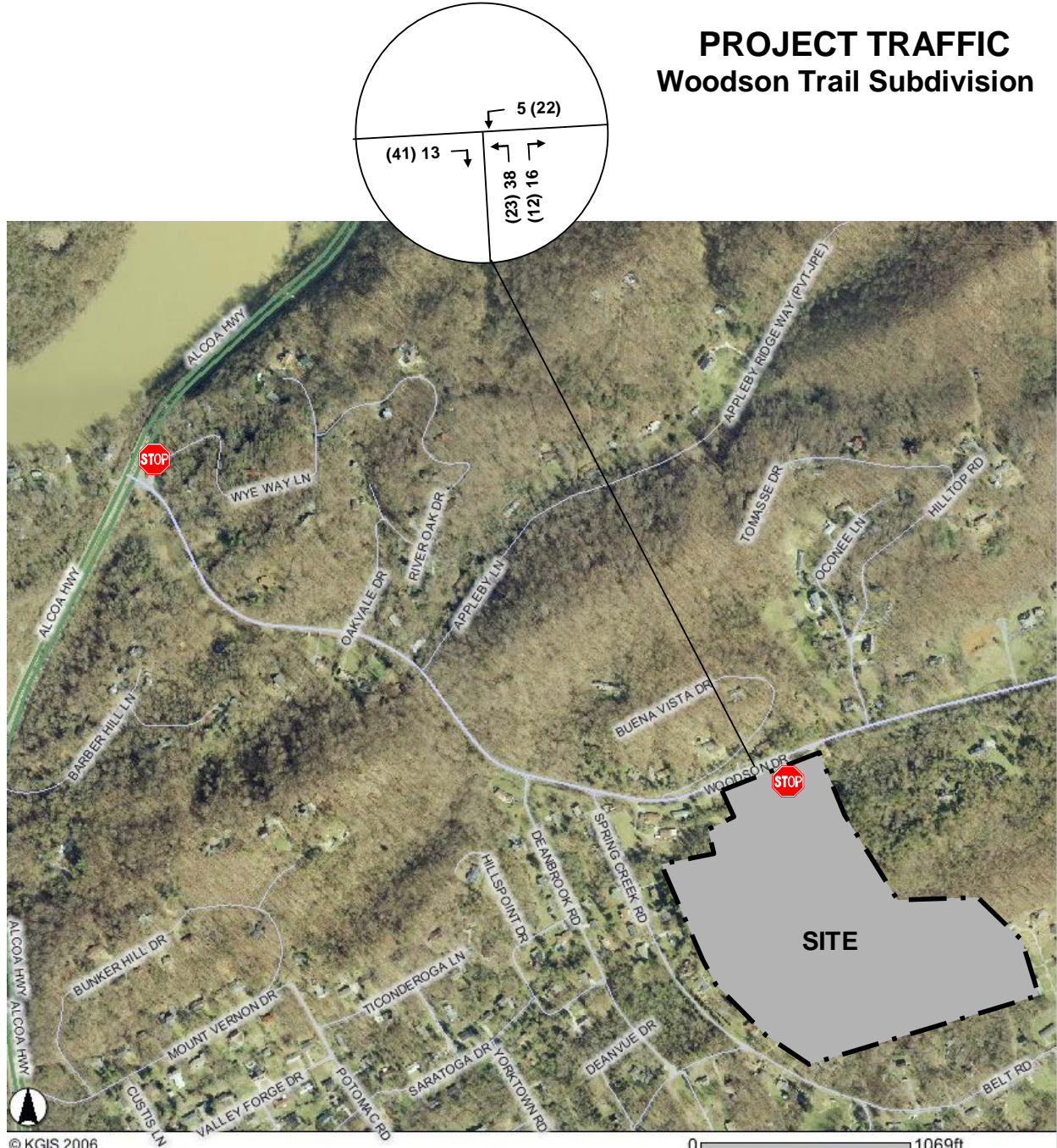
0 1069ft

**LEGEND**  
XXX AM ENTERING TRIPS  
(XXX) PM EXITING TRIPS



**Figure 6**

# PROJECT TRAFFIC Woodson Trail Subdivision



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0 1069ft

**LEGEND**  
 XXX AM PEAK  
 (XXX) PM PEAK



**Figure 7**

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## **Total Projected Traffic Volumes**

Background and project traffic volumes were added together to develop post-development traffic volumes for the year 2010. Figure 7 illustrates this 2010 projection. Using these projections, mitigation measures including traffic control devices and roadway and intersection geometry can be evaluated. The requirements of left- and right-turn lanes were evaluated using the criteria adopted by the MPC.

## **Auxiliary Lane Evaluation**

Using the Knox County policy for turn lane requirements, found in the Knox County's **Access Control and Driveway Design Policy**, projected traffic volumes for the proposed street were evaluated for the need to provide auxiliary lanes. The Knox County policy for left-turn lanes is based on the **Highway Research Record** report titled, *Volume Warrants for Left-turn Storage Lanes at Unsignalized Grade Intersections*, by M.D. Harmelink, and an extrapolation of that report by Knox County. The evaluation indicates that left- or right- turn lanes are not necessary. The left-turn volume of 22 is minimal with an opposing traffic volume of 179. A left-turning volume of less than 30vph would not require a left-turn lane. The right-turn volume from Woodson Drive to the proposed street is 41vph and the advancing through traffic flow is less than 150vph; therefore, a right-turn lane is not warranted using the Knox County criteria.

## **Projected Capacity and Level of Service**

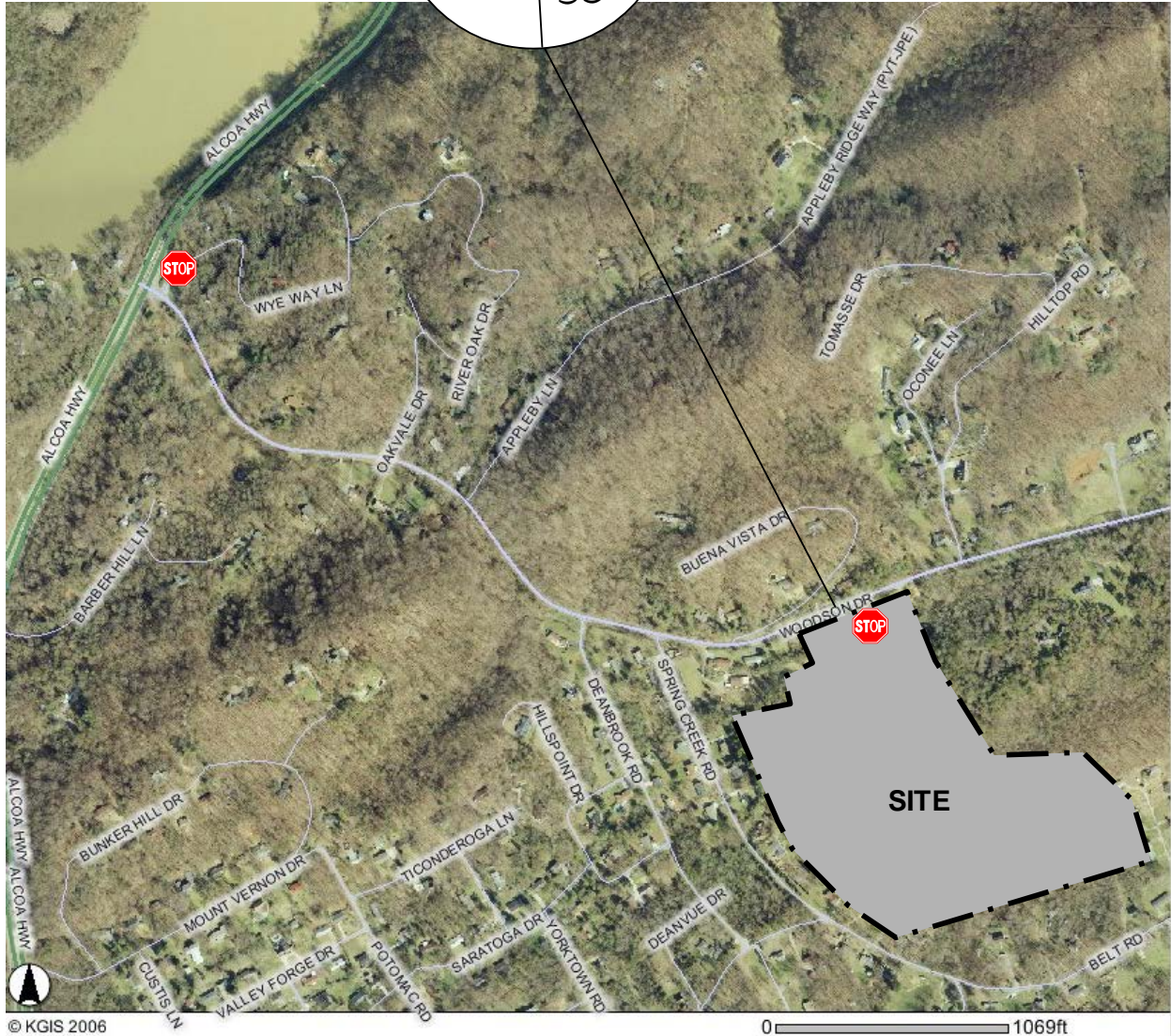
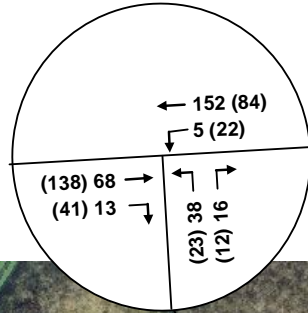
In order to evaluate the current operations of the traffic control devices, capacity and level of service were calculated using the **2000 Highway Capacity Manual, Special Report 209** published by the Transportation Research Board (TRB). Unsignalized intersections are evaluated based on estimated intersection delays, which may be related to levels 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 traffic signals. An unsignalized LOS of F exceeds an estimated delay 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 2.

# 2010 PROJECTED TRAFFIC

## Woodson Trail Subdivision



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0 1069ft

**LEGEND**  
 XXX AM PEAK  
 (XXX) PM PEAK



Figure 8



**TABLE 2. LEVEL OF SERVICE (LOS) DESCRIPTION  
FOR TWO-WAY STOP INTERSECTIONS**

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

**SOURCE:** Highway Capacity Manual, TRB Special Report 209

The development of the site has an insignificant impact on the proposed intersection with Woodson Drive. The projected capacity and LOS for the proposed residential street intersection with Woodson Drive and development of 91 single-family units is presented in Table 3. Results conclude that the study intersections would operate at a very acceptable level of service for projected traffic volumes.

**TABLE 3. 2010 PROJECTED TRAFFIC  
CAPACITY AND LEVEL OF SERVICE**

Intersection	Traffic Control	Peak	V/C	Delay	LOS
Woodson Drive & Woodson Trail	STOP	AM	0.07	9.9	A
	NB	PM	0.05	10.2	B

**NOTE:** Delay estimated in seconds.

**Sight Distance**

The project is proposed to access Woodson Drive, which has a posted speed limit of 40mph. Sight distance was measured using the criteria published by the American Association of State Highway and Transportation Officials (AASHTO). Measured sight-distance for the proposed residential street at Woodson Drive was measured to be approximately 480 feet to the east and west.

The speed limit of 40mph requires a minimum sight-distance of 305 feet to meet the minimum stopping sight-distance for AASHTO and 400 feet to meet the adopted Knox County minimum

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corner sight-distance standard. Therefore, the measured sight-distance is more than adequate for safe egress from the proposed development.

## RECOMMENDATIONS

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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 access to insure that safe sight distance is maintained.
- Use a minimum intersection radius of 30-foot for the efficient and safe ingress and egress of the site.
- Post STOP signs (R1-1) at the proposed residential street at Woodson Drive.
- 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 Engineering and Public Works Department.

## CONCLUSION

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The study of this proposed residential development evaluated the projected traffic conditions. Background traffic was determined using a 15-percent annual compounded growth rate until the horizon year 2010. Traffic associated with the proposed project was then generated and distributed to the proposed site access. Using the identified turning movements for the projected traffic conditions, unsignalized and signalized capacity and level of service analyses were conducted using the **2000 Highway Capacity Manual**. Unsignalized levels of service are found to be acceptable for the projected traffic conditions. The evaluation of the sight-distance for the proposed intersection is found to exceed that required for a 40mph. An evaluation for the requirement of left- and right-turn lanes using the Knox County policy determined that auxiliary turn lanes would not be necessary for the projected traffic volume. Therefore, with the recommendations of this report, the efficient and safe flow of traffic should be maintained with the development of the proposed subdivision.

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## APPENDIX

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Trip Generation

HCS Unsignalized Analyses

Knox County Turn Lane Volume Thresholds

Traffic Count Data

