

# ***KNOX ESTATES SUBDIVISION*** ***Knoxville, Tennessee***

## **Traffic Impact Study**



*Prepared For:*  
***KNOX ESTATES LLC***

*Prepared By:*



**Wilbur Smith Associates**

**March 2004**

**KNOX ESTATES**  
KNOXVILLE, TENNESSEE

**TRAFFIC IMPACT STUDY**

**Prepared for**

**Knox Estates LLC  
201 Howard Street  
Greenwood, MS 38930**

**March 2004**

**Prepared by**

**WILBUR SMITH ASSOCIATES  
1100 Marion Street  
Suite 200  
Knoxville, Tennessee 37921**

# TABLE OF CONTENTS

Introduction.....	1
Project Description.....	1
Site Location.....	1
Local and Regional Access.....	1
Local Access.....	1
Regional Access.....	4
Existing Traffic Conditions.....	4
Existing Traffic Control.....	4
Existing Traffic Volumes.....	4
Existing Capacity and Level of Service.....	6
Background Traffic Conditions.....	7
Background Traffic Volumes.....	7
Background Capacity and Level of Service.....	7
Development Impacts.....	7
Trip Generation.....	9
Trip Distribution and Assignment.....	9
Project Traffic Volumes.....	9
Total Projected Traffic Volumes.....	9
Projected Capacity and Level of Service.....	13
Sight Distance.....	13
Recommendations.....	14
Conclusion.....	14

## APPENDIX

- Trip Generation
- Capacity and LOS Analysis
- Traffic Counts

## LIST OF FIGURES

Figure 1- Site Plan.....	2
Figure 2- Vicinity Map.....	3
Figure 3-2004 Existing Traffic .....	5
Figure 4-2007 Background Traffic.....	8
Figure 5- Trip Distribution.....	10
Figure 6- Project Trips.....	11
Figure 7- 2007 Projected Traffic.....	12

## LIST OF TABLES

Table 1- Unsignalized LOS Description.....	6
Table 2- 2004 Existing Level of Service.....	6
Table 3- 2007 Background Level of Service.....	7
Table 4- Trip Generation .....	9
Table 5- 2007 Projected Level of Service.....	13

## **INTRODUCTION**

---

This traffic impact study was commissioned to address the impact of a proposed residential development within the City Knoxville. The study of this development required collection of traffic data, generation of anticipated traffic volumes from the proposed site, development of future traffic volumes from both normal growth and the site, analysis of resulting traffic conditions, and development of measures necessary to mitigate traffic impacts of normal traffic growth and the proposed development. Methods and procedures utilized in the study are those required for a Level 1 traffic impact study as adopted by the Knoxville/Knox County Metropolitan Planning Commission.

### **Project Description**

The proposed project is a residential development between Buffat Mill Road and McIntyre Road. The site is approximately 54.7 acres with a RP residential zoning. The development of the property will initially subdivide the property for 72 single-family units. Figure 1 is the proposed site plan. Access to the site will be from a proposed street intersecting McIntyre Road on the southern boundary.

### **Site Location**

The site is in the City of Knoxville, northeast of the Knoxville central business district (CBD). The location of the site is south of Buffat Mill Road. Interstate 640 borders the proposed site to the east. Figure 2 illustrates this location relative to local and regional access.

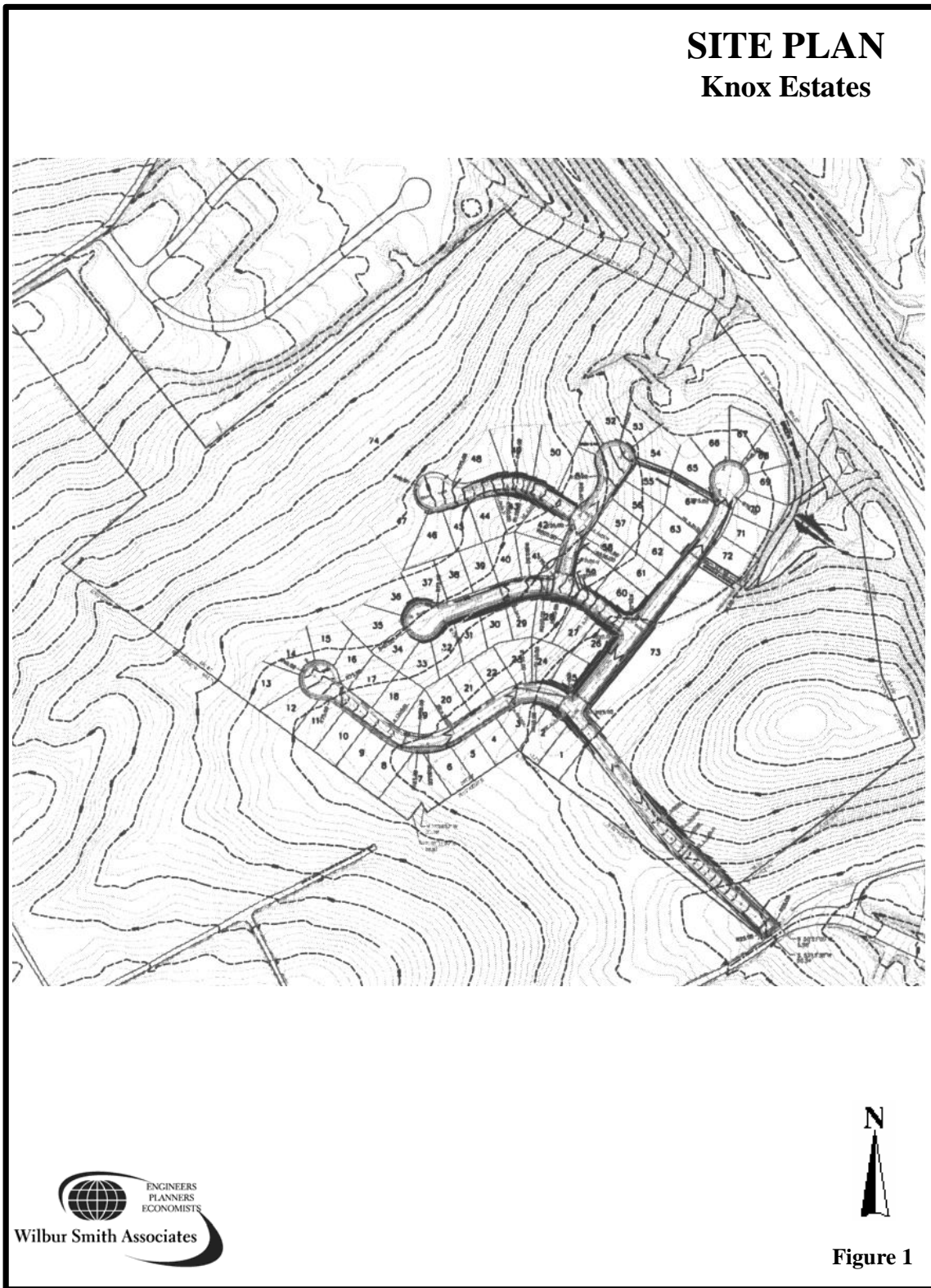
## **LOCAL AND REGIONAL ACCESS**

---

### **Local Access**

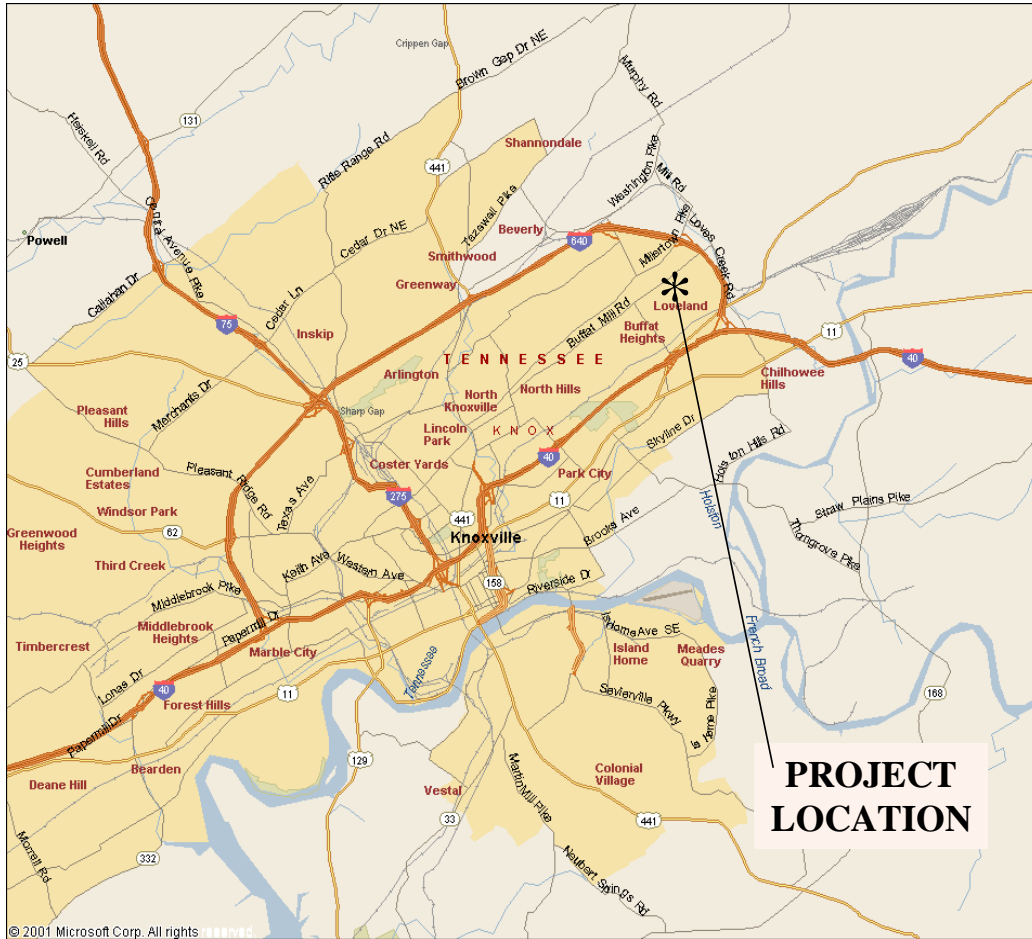
Local access to this site is proposed street access to McIntyre Road. Adjacent to the proposed site, McIntyre Road is a 21-foot, 2-lane roadway with an east and west orientation extending through Springhill Road and Loves Creek Road. The width of McIntyre Road between the site and Loves Creek Road is 45-foot consisting of wide shoulders and two 12-foot lanes. McIntyre Road is a local street. Loves Creek Road, east of the site, is a 23-foot wide north and south collector facility with an ADT of 5,810 and 7,530 in the year 2002 north and south of Buffat Mill Road, respectively. Loves Creek Road extends north to Millertown Pike and

south to Rutledge Pike, opposite Chilhowee Drive. Springhill Road is another north and south collector



# PROJECT VICINITY

## Knox Estates



© 2001 Microsoft Corp. All rights reserved.



Figure 2



street west of the site. Springhill Road provides a connection between Millertown Pike and Rutledge Pike. Its ADTs are 2,140 and 2,570 north and south of Buffat Mill Road, respectively.

### **Regional Access**

Regional access is by Millertown Pike and Rutledge Pike (S.R. 1), and the interstate system including Interstates 40 and 640. The interstates are accessible from Millertown Pike to I -640, north of the site, and from Rutledge Pike to I-40, south of the site. Millertown Pike is a northeast and southwest two-lane arterial becoming a multiple lanes through the I-640 interchange and adjacent to Knoxville Center. Millertown Pike has an ADT near Springhill Road of 5,910. Rutledge Pike is a multi-lane arterial with an ADT of approximately 20,850.

Interstate 640 connects to I-40 east and west of the Knoxville CBD and intersects I-75, west of the site. An ADT of 47,820 travels I-640 adjacent to the site. Interstate 40 is an east and west facility extending between Nashville, Tennessee and Asheville, North Carolina. The approximate 2002 ADT for I-40/75 west of I-640 is 150,020. To the east of I-640, I-40 has an ADT of 102,750. Interstate 75 extends north to Lexington, Kentucky, and to the west, I-75 turns south to Chattanooga, Tennessee. Interstate 75 becomes I-275 south of I-640 with a 2002 ADT of 62,920. North of I-640, I-75 has a 2002 ADT of 77,220.

## **EXISTING TRAFFIC CONDITIONS**

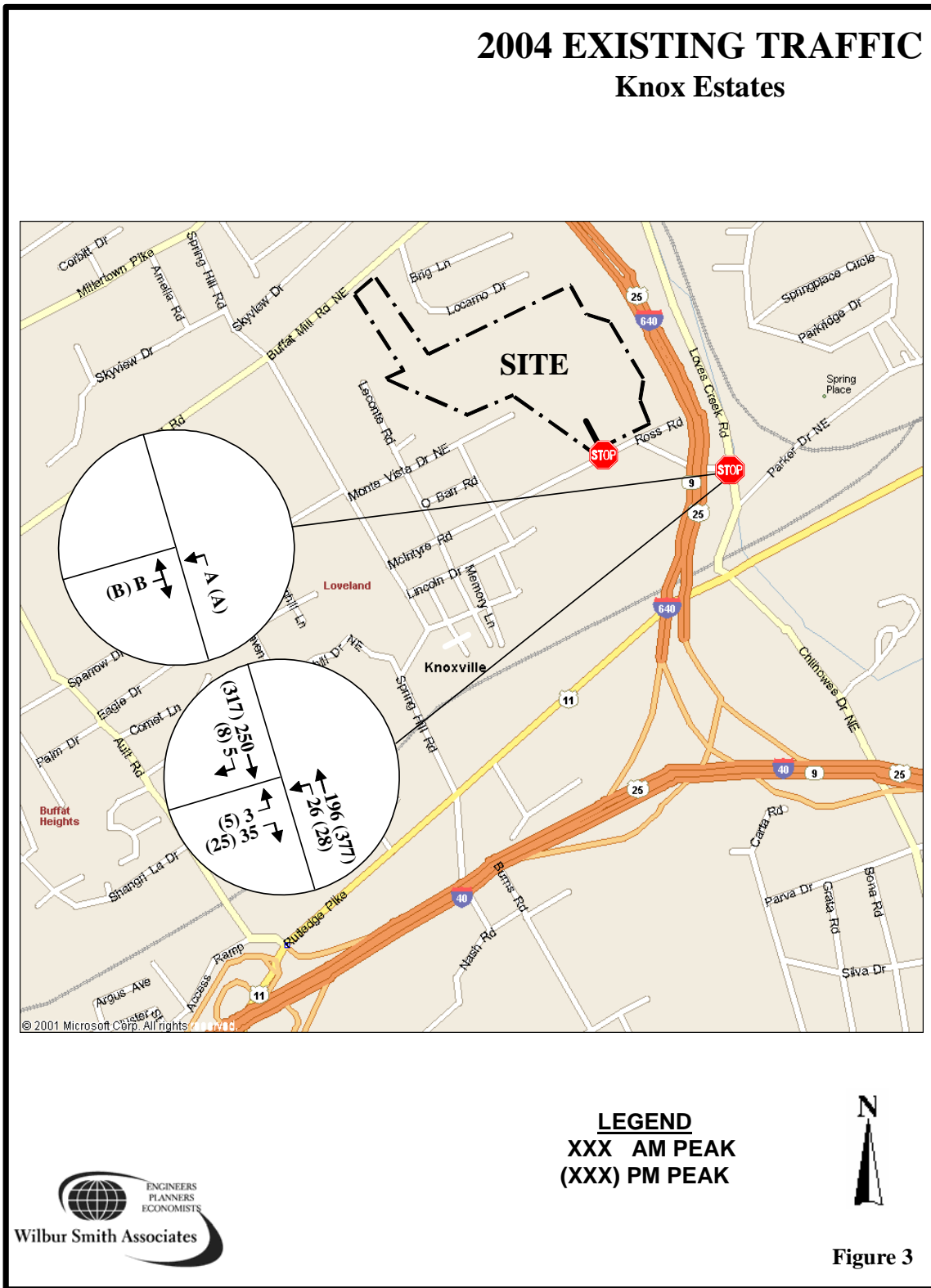
---

### **Existing Traffic Control**

Currently traffic control within the study vicinity is stop control for intersections with McIntyre Road. McIntyre Road is STOP controlled at Springhill Road and Loves Creek Road. McIntyre Road has a posted speed limit of 30mph. Signalized intersections are provided for Spring Hill Road at Rutledge Pike and Loves Creek Road at Millertown Pike. The interstate interchanges on Millertown Pike and Rutledge Pike are signalized.

### **Existing Traffic Volumes**

This traffic study conducted peak-hour counts between 7:00-9:00AM and 4:00-6:00PM for the intersection of McIntyre Road and Loves Creek Road. Figure 3 illustrates the peak-hour traffic. Using the peak hour traffic count, the estimated average weekday traffic (AWT) for McIntyre Road adjacent to the site is 850.



**Existing Capacity and Level of Service**

In order to evaluate the 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. Signalized and 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. LOS A is the best, and LOS F is failing.

Unsignalized intersection has an estimated delay less than 10 seconds for a LOS A. Delays between 15 and 25 seconds result in a LOS C. LOS F exceeds estimated delays of 50 seconds. For urban arterials, minor approaches may frequently experience levels of service E. A LOS C is typically the accepted standard for rural conditions. Levels of service and associated delays for unsignalized intersections are presented in Tables 2.

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

LOS	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: 2000 Highway Capacity Manual, TRB Special Report 209

The analyses for the existing conditions were determined to be acceptable with the LOS found to be a B for the McIntyre Road approach to Loves Creek Road. Table 2 presents the LOS analyses and is illustrated in the existing traffic volume figure.

**TABLE-2  
2004 EXISTING  
LEVELS OF SERVICE**

INTERSECTION	CONTROL	V/C	AM PEAK DELAY	LOS	V/C	PM PEAK DELAY	LOS
Loves Creek Rd &	STOP	0.06	10.2	B	0.06	11.5	B

McIntyre Road

Note: Average vehicle control delay estimated in seconds.

**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 and continued growth of Knoxville and Knox County. This traffic must be developed and analyzed for the purpose of establishing a baseline. Plans currently only include the development of 72 single-family units; therefore, for the purpose of this study, build-out traffic was projected for the horizon year of 2007.

**Background Traffic Volumes**

In the vicinity of the proposed site, significant development is occurring. A previous study conducted by WSA for the Knoxville Center area, which includes this site, utilized a 7-percent annual growth rate. For the purpose of this study, this same rate of growth is used. Therefore, the existing traffic is increased by a total of 22.5-percent for 2007 background traffic and is illustrated in Figure 4.

**Background Capacity and Level of Service**

Traffic analyses conducted for background conditions found the levels of service unchanged from 2004 existing traffic conditions and are summarized in Table 3.

**TABLE-3  
2007 BACKGROUND  
LEVELS OF SERVICE**

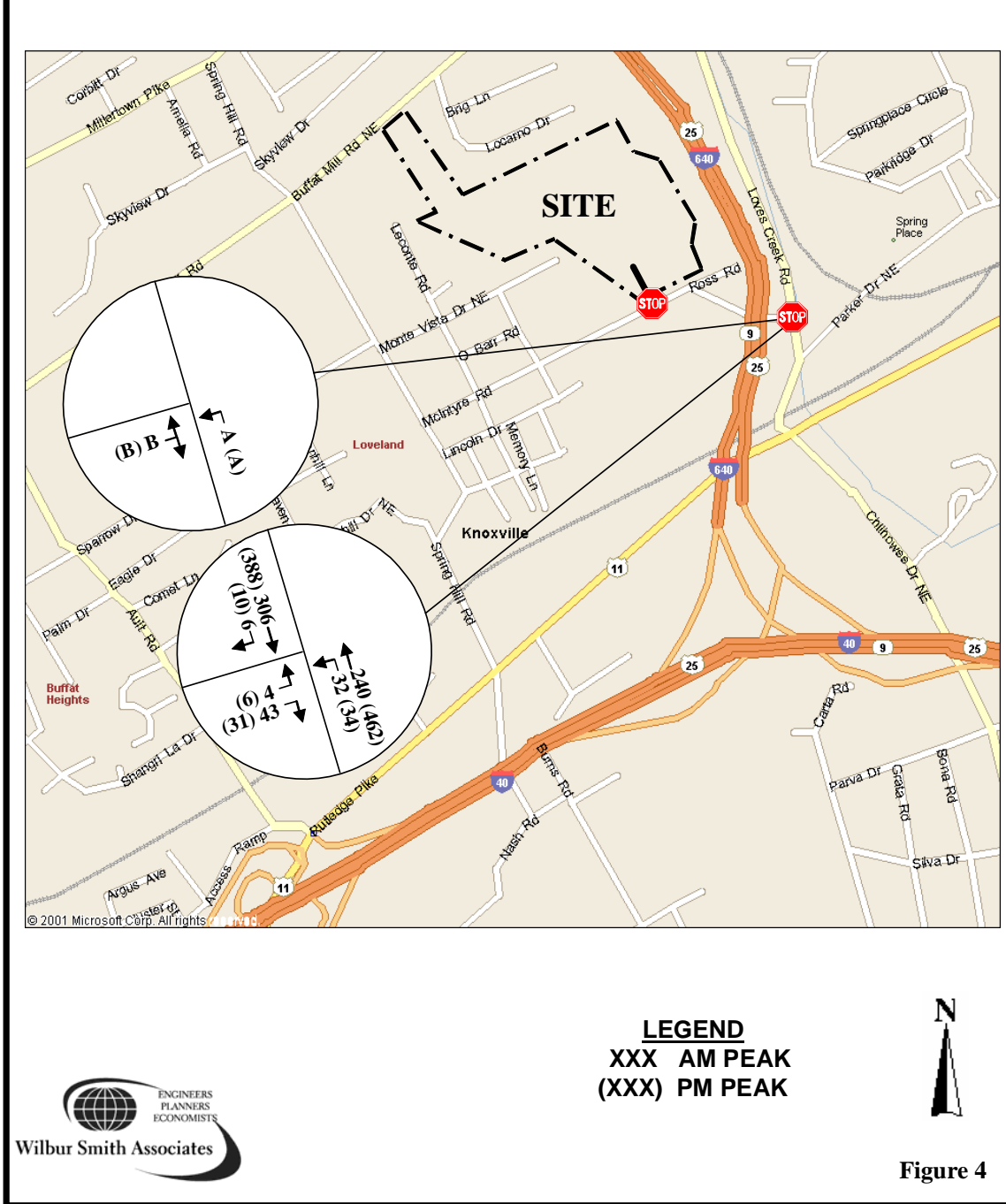
INTERSECTION	CONTROL	V/C	AM PEAK DELAY	LOS	V/C	PM PEAK DELAY	LOS
Loves Creek Rd & McIntyre Road	STOP	0.08	10.9	B	0.08	12.7	B

Note: Average vehicle control delay estimated in seconds.

**DEVELOPMENT IMPACTS**

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

## 2007 BACKGROUND TRAFFIC Knox Estates



### **Trip Generation**

Project traffic for the single-family units was determined using the publication, **Trip Generation, 7th Edition**. The **Trip Generation** 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. From the trip generation calculations, the proposed site, with a 72 single-family unit development, may generate approximately 770 daily trips. Table 1 presents the trip generation of this proposed site.

**TABLE-4**

**TRIP GENERATION**

<b>LAND USE</b>	<b>L.U.C.</b>	<b>Units</b>	<b>DAILY TRIPS</b>	<b>AM PEAK ENTER</b>	<b>AM PEAK EXIT</b>	<b>PM PEAK ENTER</b>	<b>PM PEAK EXIT</b>
Single Family	210	72	769	15	45	51	29

### **Trip Distribution and Assignment**

Using the traffic count data in the project vicinity, the trip distribution assumes approximately 45-percent of the residential trips will turn to the west towards Springhill Road, and 55-percent to the east towards Loves Creek Road. At the intersection with Loves Creek Road, it is assumed that 45-percent would turn south. Figure 5 illustrates this distribution and assignment.

### **Project Traffic Volumes**

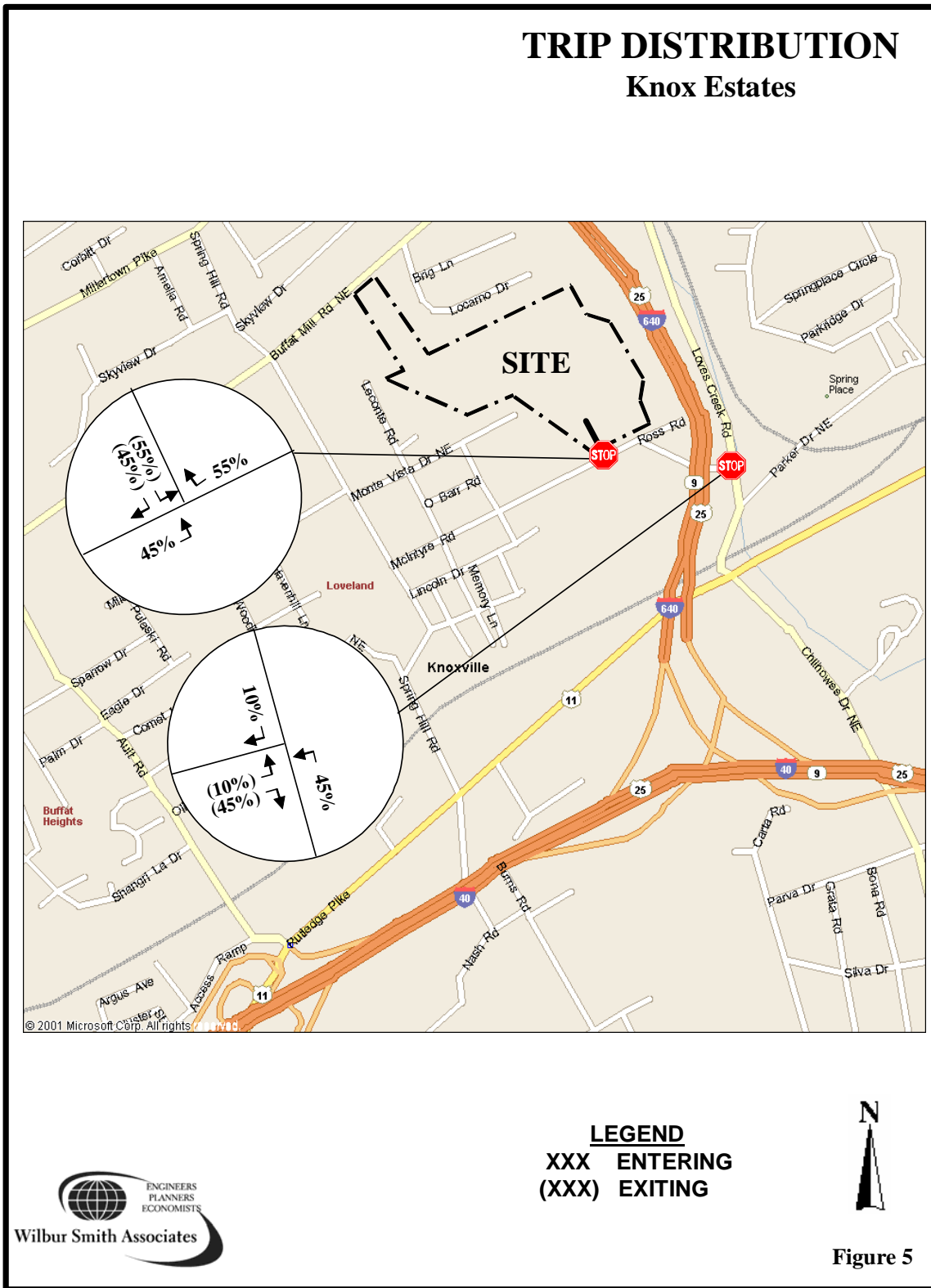
By multiplying the trips generated by the distribution percentages, the project traffic volumes were determined. Figure 6 illustrates the resulting project traffic volumes associated with the proposed project.

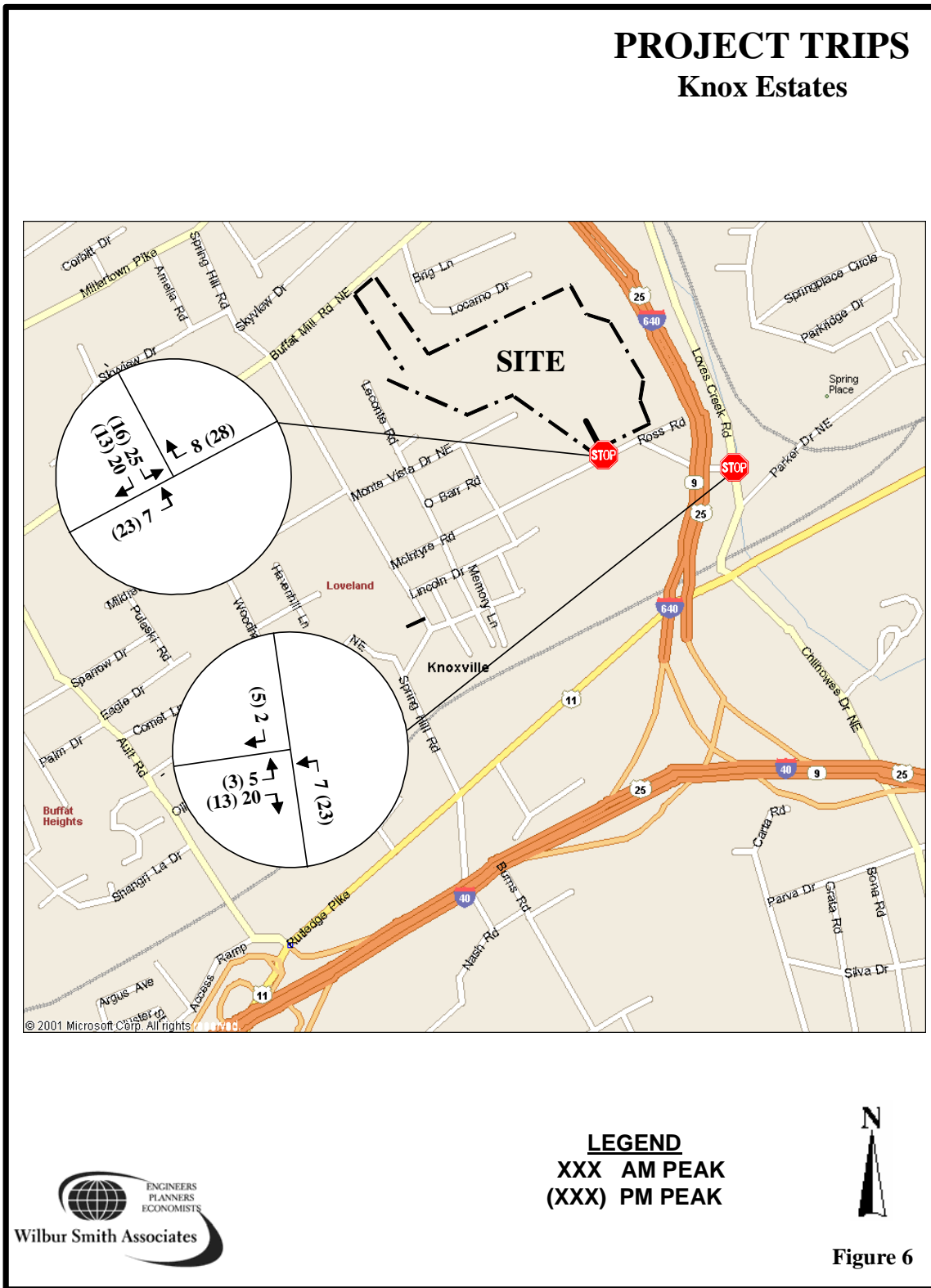
### **Total Projected Traffic Volumes**

Background and project traffic volumes were added together to develop post-development traffic volumes for the year 2007. Figure 7 illustrates this 2007 projection. Using this projection, mitigation measures including traffic control devices and geometry of the roadway and intersection can be evaluated. Using the Knox County criteria for turn lanes, the

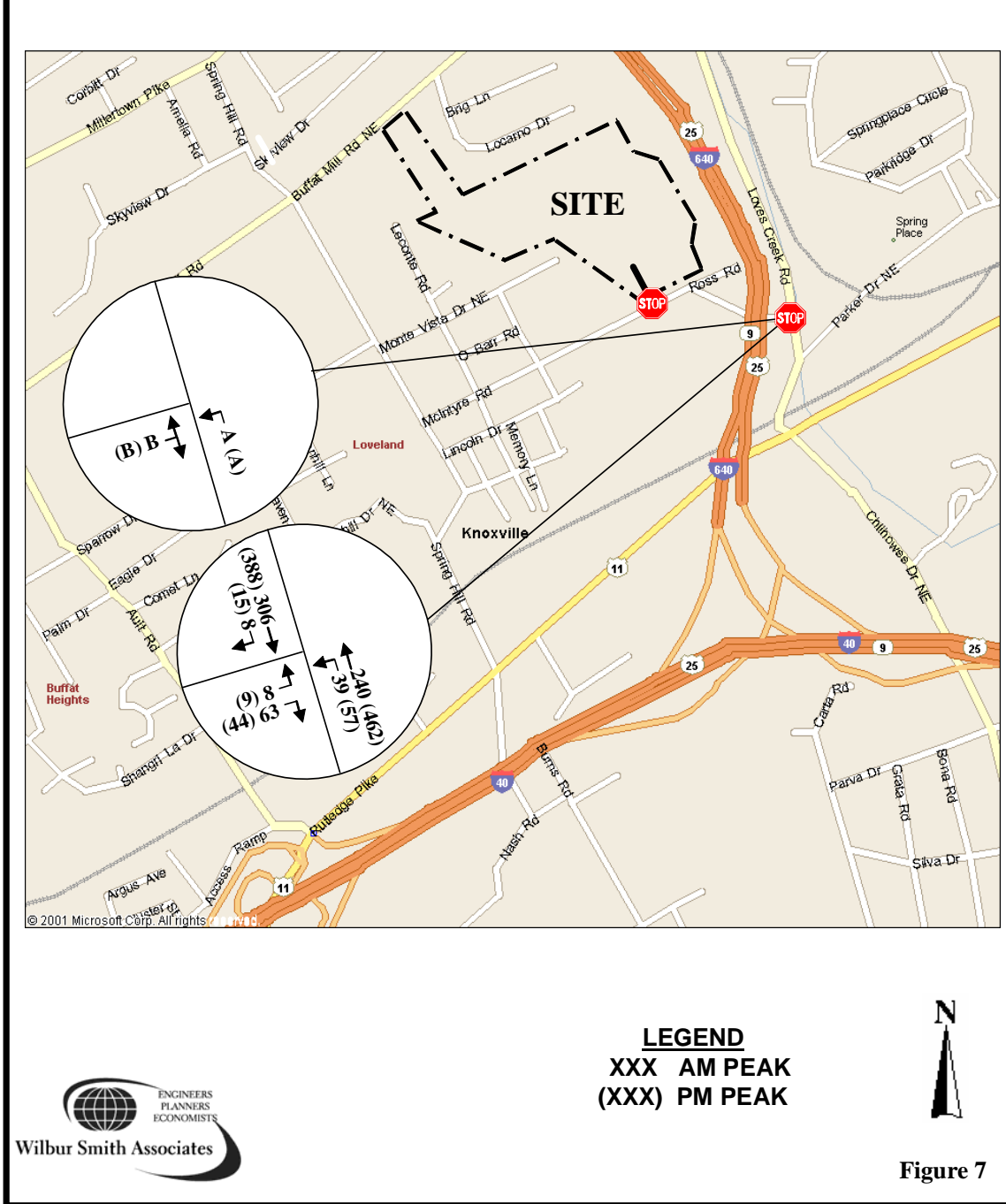
projected traffic indicated the requirement for a northbound left-turn lane on Loves Creek Road







## 2007 PROJECTED TRAFFIC Knox Estates



at McIntyre Road. The northbound left-turn volume of 57 exceeds the threshold volume of 45 vph. The southbound right-turn volume of 15 vehicles did not indicate any requirement of a turn lane.

**Projected Capacity and Level of Service**

With the proposed development, the increased traffic has a minimal increase in the estimated approach delays on McIntyre Road at Loves Creek Road. However, the LOS is unchanged from both the existing and background traffic conditions. Table 5 presents the results of the analyses conducted.

**TABLE-5  
2007 PROJECTED  
LEVELS OF SERVICE**

<b>INTERSECTION</b>	<b>CONTROL</b>	<b>V/C</b>	<b>AM PEAK DELAY</b>	<b>LOS</b>	<b>PM PEAK V/C</b>	<b>DELAY</b>	<b>LOS</b>
Loves Creek Rd & McIntyre Road	STOP	0.12	11.3	B	0.12	13.4	B

Note: Average vehicle control delay estimated in seconds.

**Sight Distance**

The project access is proposed to McIntyre Road. The road's speed limit is posted for 30mph. Measured sight distance for the access street is approximately 425 feet to the east (left) and 225 feet to the west (right). The restricted sight distance to the right is due to a blind spot created by a wooden utility pole. A vehicle positioned a few feet further than or nearer to the distance of 15 feet from the travelway would have a sight distance of 285 feet at which point the bush located near the roadway blocks the view of oncoming traffic. The required distance for a 30 MPH posted roadway is 200 feet to meet the minimum stopping sight-distance for American Association of State Highway and Transportation Officials (AASHTO) and 300 feet to meet the Knox County minimum corner sight-distance standard. The proposed site access, therefore, meets the minimum stopping sight-distance and virtually meets the County's corner sight-distance criteria. The removal of a bush would provide the sight distance needed to fully meet the County's criteria

## 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 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 the proposed street access with a STOP sign (R1-1) at McIntyre 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 Public Works Department.
- ◆ Provide a 75-foot minimum northbound left-turn lane on Loves Creek Road at McIntyre Road.

## CONCLUSION

---

The study of this proposed residential development evaluated the projected traffic conditions for the intersection of McIntyre Road and Loves Creek Road. This development currently plans only 72 single-family units. Background traffic was determined using a 7-percent annual compounded growth rate until the year 2007. 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 capacity and level of service analyses were conducted using the **2000 Highway Capacity Manual**. Unsignalized levels of service were found to be acceptable for the intersection of McIntyre Road and Loves Creek Road for the future year studied. A minimum LOS B may be experienced for the McIntyre Road approach to Loves Creek Road during the peak hours for projected traffic conditions. Site access is found to be acceptable with adequate sight-distance.

The proposed development does not have an unacceptable impact on the adjacent street. With the recommendations of this report, the efficient and safe flow of traffic should be maintained.

## **APPENDIX**

**TRIP GENERATION  
CAPACITY AND LOS ANALYSES  
TRAFFIC COUNTS  
LEFT-TURN LANE EVALUATION**

