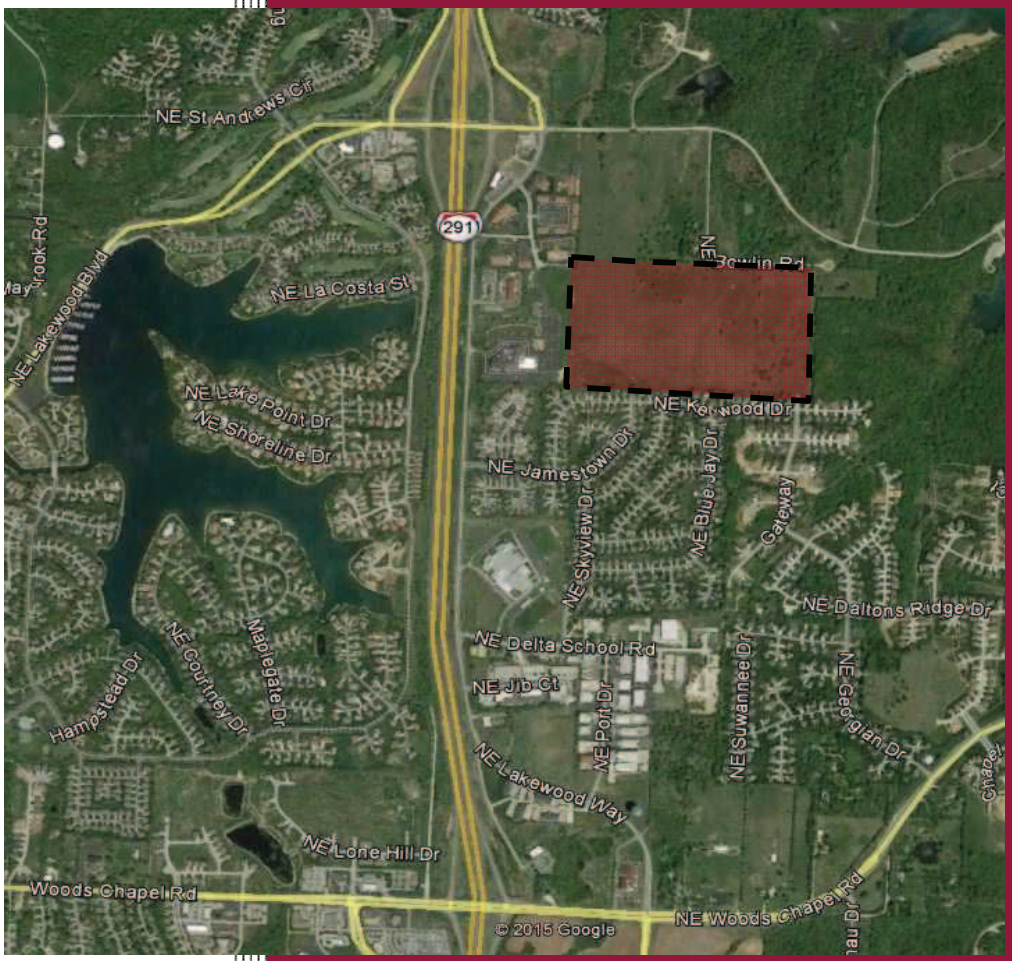
Monticello Lots 1 – 160 Traffic Impact Study

Lakewood Way and Bowlin Road
Lee's Summit, Missouri



Prepared for:

Engineering Solutions

Prepared by:

TranSystems

June 2015

TranSystems

EXPERIENCE | Transportation

TranSystems
2400 Pershing Road
Suite 400
Kansas City, MO 64108
Tel 816 329 8600
Fax 816 329 8601
www.transystems.com

June 15, 2015

Mr. Matthew J. Schlicht, PLS, PE
Engineering Solutions
50 SE 30th Street
Lee's Summit, MO 64082

RE: Monticello Lots 1 - 160 Traffic Impact Study
Kansas City, Missouri

Dear Mr. Schlicht:

In response to your request and authorization, TranSystems has completed a traffic impact study for the proposed single-family residential development to be located generally to the south and east of the Bowlin Road and Lakewood Way intersection in Lee's Summit, Missouri. The purpose of this study was to assess the impact of the proposed development on the surrounding transportation system.

Included in this study is a discussion of the anticipated impacts of the proposed development on the adjacent street network for the following analysis scenarios:

- Existing Conditions
- Existing plus Proposed Development Conditions

We trust that the enclosed information proves beneficial to you and the City of Lee's Summit in this phase of the development process. We appreciate the opportunity to be of service to you and will be available to review this study at your convenience.

Sincerely,
TRANSYSTEMS

By:_____
Jeffrey J. Wilke, PE, PTOE

JJW/jw:P101150184
Enclosure

Introduction

TranSystems has completed this traffic impact study for the proposed single-family residential development to be located generally to the south and east of the Bowlin Road and Lakewood Way intersection in Lee's Summit, Missouri. The purpose of this study was to assess the impact of the proposed development on the surrounding transportation system. The location of the project relative to the major streets in the area is shown on ***Figure A-1*** in ***Appendix A***.

In addition to a description of the proposed development and the surrounding transportation infrastructure, this study includes trip generation estimates, trip distribution estimates, capacity analyses, and a summary of findings. The scope of this study was developed in conjunction with City of Lee's Summit staff.

Proposed Development Plan

The proposed plan includes 160 lots for single-family homes. The primary access point for the development will be from Bowlin Road on the north side of the development site. Two access points are to be provided on the south side of the development, connecting to the existing neighborhoods at Jamestown Drive and at Gateway Drive. A copy of the proposed site plan for the development is included on ***Figure A-2*** for reference.

Study Area

To assess the impacts of the proposed redevelopment, the intersections listed below were identified for study during the A.M. and P.M. peak hours of a typical weekday.

- Lakewood Way and Bowlin Road
- Lakewood Way and Jamestown Drive

Surrounding Land Uses and Street Network

The development site currently consists of undeveloped land used for agriculture. One residence and several outbuildings are located immediately north of the site along the west side of Bowlin Road. There are several different land uses surrounding the site. To the north and east of the site the adjacent land is undeveloped. Much of this land is owned by the Corps of Engineers in the vicinity of Blue Springs Lake. To the south of the site are several existing neighborhoods of single-family homes. To the west of the site are a church and some small office buildings, which are accessed from Lakewood Way.

Bowlin Road has several distinctly different segments in the study area. Adjacent to the development site, Bowlin Road runs north/south and is a 14-foot wide roadway without shoulders. Currently, this segment of the road is a dead end, providing access to the single residence and agricultural land. Approximately one-quarter mile north of the site, Bowlin Road changes alignment at a stop controlled tee-intersection. Bowlin Road continues as the west leg of the intersection, while the east leg of the intersection is a gated access drive to the Blue Springs Lake marina. This east/west segment of Bowlin Road has a wider 22-foot cross section with turf slopes to ditches. At the Lakewood Way intersection, Bowlin Road widens for additional lanes and provides access to I-470 at a diamond interchange.

Lakewood Way serves as a frontage road along the east side of I-470. Lakewood Way is primarily a two-lane roadway with left-turn lanes at intersections and turf slopes to ditches. Near the Bowlin Road intersection, Lakewood Way widens for various turn lanes and has curbs and gutters.

Traffic Counts

Turning-movement traffic volume counts were collected at the study intersections on Tuesday, May 12, 2015 and Wednesday, May 13, 2015. Peak period counts were collected at each intersection from 7:00 to 9:00 A.M. and from 4:00 to 6:00 P.M. Based on the data, the A.M. peak hour occurs between 7:30 and 8:30 A.M. and the P.M. peak hour occurs between 5:00 and 6:00 P.M. The existing lane configurations, traffic control devices, and peak hour traffic volumes have been illustrated on ***Figure A-3***.

Intersection Sight Distance

Intersection sight distance is provided at intersections to allow the drivers of stopped vehicles to depart from their approach and enter or cross the major road. Intersection sight distances were measured at Bowlin Road intersection with the Blue Springs Lake marina access drive, to the north of the development site. Measurements were made based on criteria in A Policy on Geometric Design of Highways and Streets, 2011 Edition (also referred to as the AASHTO Green Book), which is published by the American Association of State Highway and Transportation Officials. ***Table 1*** shows the measured and recommended intersection sight distances.

The Green Book recommends a sight distance of 280 feet be provided at each stop controlled side street or driveway when looking along an uncontrolled road with a speed limit of 25 mph. While vehicle speed data is not known, it is likely that vehicle speeds at the marina access drive exceed the posted 25 mph speed limit given the downhill grade. At 30 mph, the recommended sight distance increases to 335 feet.

Table 1
Intersection Sight Distance
Bowlin Road and marina access drive

Intersection	Direction Looking Along Uncontrolled Street	Measured Sight Distance (Feet)	Recommended Sight Distance (Feet) for 25 mph	Recommended Sight Distance (Feet) for 30 mph
Bowlin Road and Blue Springs Lake marina access drive	East	240	280	335
	West	>500		

As indicated in the table above, the measured sight distance looking to the east was found to be less than the recommended sight distance. This sight distance is limited by the horizontal curvature of the marina access drive in conjunction with several trees and brush on the embankment along the south side of the drive.

Analysis

The scope of analysis for the assessment of the proposed development's impact on the surrounding transportation system is based in large part on the recommended practices of the Institute of Transportation Engineers (ITE), as outlined in their Traffic Engineering Handbook. ITE is a nationally-recognized organization of transportation professionals with members from both private and public sectors. The analysis of the proposed development's impact included development of trip generation and trip distribution estimates as well as a traffic operations assessment for each study scenario. Each of the analysis methodologies and findings are described below in the subsequent sections.

Trip Generation

Trip generation estimates were prepared for the proposed development using the Institute of Transportation Engineer's Trip Generation, 9th Edition. ***Table 2*** shows the expected trips to be generated by the proposed development.

Table 2
Trip Generation

Land Use	Intensity	ITE Code	Average Weekday	A.M. Peak Hour			P.M. Peak Hour		
				Total	In	Out	Total	In	Out
Single Family Detached Housing	160 du	210	1,619	122	31	91	161	102	59

Trip Distribution

The estimated trips generated by the proposed development were distributed onto the street system based on the trip distributions summarized in ***Table 3***. These distributions are based on existing traffic counts and engineering judgment. The detailed distribution patterns through the study intersections are shown in ***Appendix B***.

Table 3
Trip Distribution

Direction To/From	Percentage
North on Lakewood Way	15%
South on Lakewood Way	15%
West on Bowlin Road	70%
Total	**100%**

Traffic Operation Assessment

An assessment of the A.M. and P.M. peak hour traffic operations was made for the scenarios listed below:

- Existing Conditions
- Existing plus Development Conditions

The study intersections were evaluated using the Synchro software package on the basis of the methodologies outlined in the Highway Capacity Manual (HCM), 2000 Edition, which is published by the Transportation Research Board. The operating conditions at an intersection are graded by the "level of service" experienced by drivers. Level of service (LOS) describes the quality of traffic operating conditions and is rated from "A" to "F". LOS A represents the most desirable condition with free-flow movement of traffic with minimal delays. LOS F generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in the average delay per stopped vehicle. Delay is measured in seconds per vehicle. ***Table 4*** shows the upper limit of delay associated with each level of service for signalized and unsignalized intersections.

Table 4
Intersection Level of Service Delay Thresholds

Level of Service (LOS)	Signalized	Unsignalized
A	≤ 10 Seconds	≤ 10 Seconds
B	≤ 20 Seconds	≤ 15 Seconds
C	≤ 35 Seconds	≤ 25 Seconds
D	≤ 55 Seconds	≤ 35 Seconds
E	≤ 80 Seconds	≤ 50 Seconds
F	> 80 Seconds	> 50 Seconds

While one of the primary measurements of traffic operations, LOS, applies to both signalized and unsignalized intersections, there are significant differences between how these intersections operate and how they are evaluated. LOS for signalized intersections reflects the operation of the intersection as a whole. While the individual movements may operate with varying LOS ratings, that is largely a function of the signal timings and how the intersection is operating relative to other signals in the vicinity.

Unsignalized intersections, in contrast, are evaluated based on the movement grouping which are required to yield to other traffic. Typically, these are the left turns off of the major street and the side-street approaches for two-way stop-controlled intersections. Lower LOS ratings (D, E and F) do not, in themselves, indicate significant difficulties or the need for additional improvements. Many times there are convenient alternative paths to avoid the longer delays. Other times, the volumes on the unsignalized approaches are relatively minor when compared to the major street traffic.

The LOS rating deemed acceptable varies by community, facility type and traffic control device. In Lee's Summit, LOS C has been identified as the minimum desirable goal for signalized intersections. At unsignalized intersections LOS C and above are often accepted for low to moderate traffic volumes where the installation of a traffic signal is not warranted by the conditions at the intersection or location has been deemed undesirable for signalization for other reasons, e.g. the close proximity of an existing traffic signal or the presence of a convenient alternative path.

Existing Conditions

The results of the Existing Conditions scenario intersection analyses are summarized in ***Table 5***. The study intersections were evaluated with the lane configurations, traffic volumes, and traffic control devices shown on ***Figure A-3***. The Synchro output files are included in ***Appendix C***.

Table 5
Intersection Operational Analysis
Existing Conditions

Intersection	A.M. Peak Hour		P.M. Peak Hour	
Movement	LOS[1]	Delay[2]	LOS[1]	Delay[2]
Lakewood Way and Bowlin Road				
Traffic Signal	*B*	*14.3*	*B*	*19.8*
Lakewood Way and Jamestown Drive				
Westbound Left-turn	*C*	*15.3*	*C*	*21.9*
Westbound Right-turn	*B*	*10.8*	*B*	*11.4*
Southbound Left-turn	*A*	*8.0*	*A*	*8.8*

1 – Level of Service
2 – Delay in seconds per vehicle

As shown in the table, all movements at the study intersections currently operate within acceptable levels of service.

Existing plus Development Conditions

The results of the Existing plus Development Conditions scenario intersection analyses are summarized in ***Table 6***. This study scenario considered the addition of traffic from the proposed development. The study intersections were evaluated with the lane configurations, traffic volumes, and traffic control devices shown on ***Figure A-4***. The Synchro output files are included in ***Appendix C***.

Table 6
Intersection Operational Analysis
Existing plus Development Conditions

Intersection	A.M. Peak Hour		P.M. Peak Hour	
Movement	LOS[1]	Delay[2]	LOS[1]	Delay[2]
Lakewood Way and Bowlin Road				
Traffic Signal	*B*	*19.0*	*C*	*24.4*
Lakewood Way and Jamestown Drive				
Westbound Left-turn	*C*	*21.5*	*C*	*23.8*
Westbound Right-turn	*B*	*12.1*	*B*	*11.6*
Southbound Left-turn	*A*	*8.3*	*A*	*8.9*

1 – Level of Service
2 – Delay in seconds per vehicle

As shown in the table, all movements at the study intersections are projected operate within acceptable levels of service with the addition of development traffic. Nominal increases in queue lengths are

projected in this scenario. All projected queues can be contained within the storage length of the existing turn lanes.

To accommodate development traffic, the narrow segment of Bowlin Road north of the development site should be widened to allow for two continuous lanes of traffic. Additionally, improvements should be made to provide adequate sight distance for northbound drivers on Bowlin Road when looking to the east at the intersection with the Blue Springs Lake marina access drive. Some of the trees and brush will need to be cleared along the south side of the marina access drive.

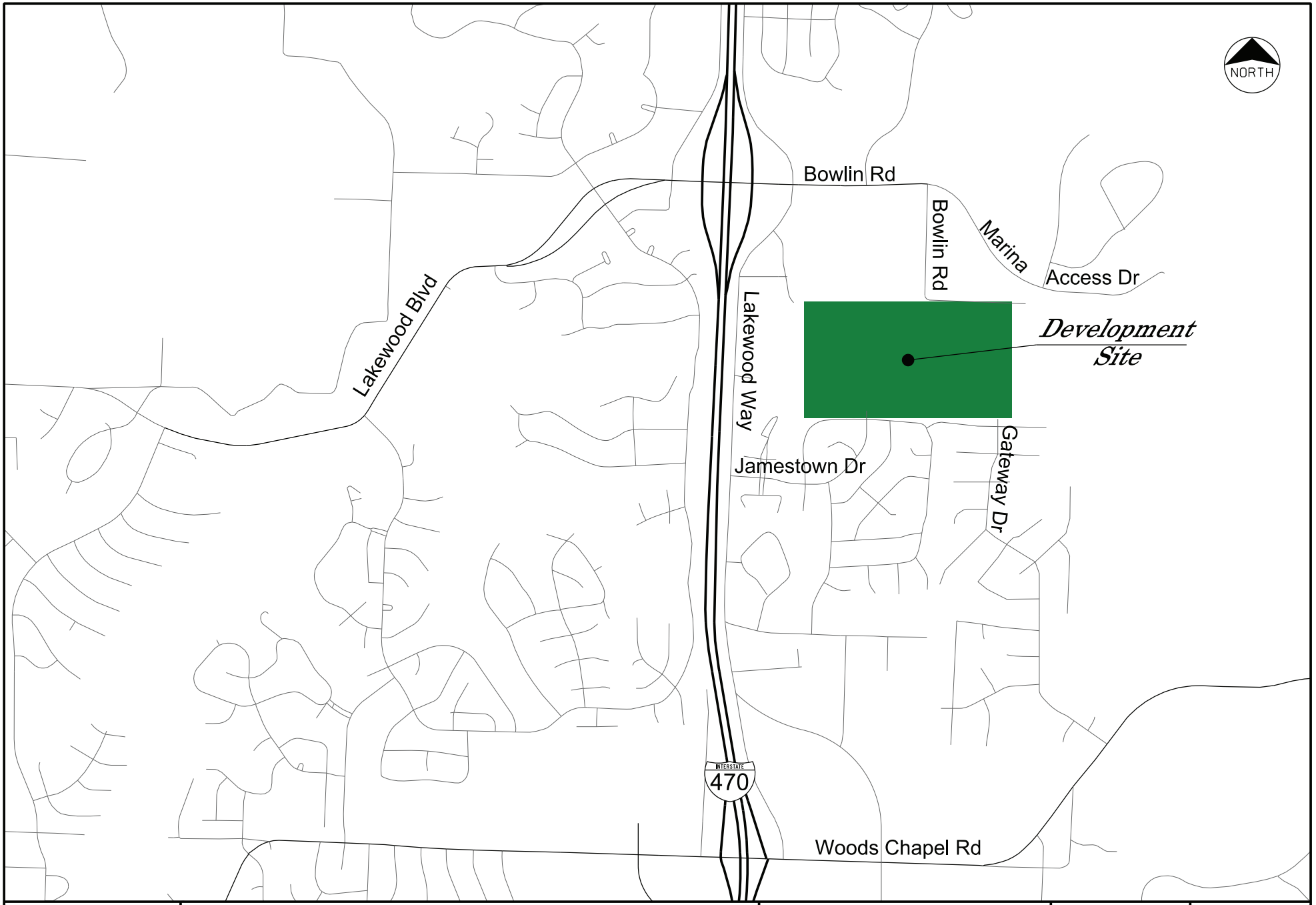
Summary

TranSystems has completed this traffic impact study for the proposed single-family residential development to be located generally to the south and east of the Bowlin Road and Lakewood Way intersection in Lee's Summit, Missouri. The purpose of this study was to assess the impact of the proposed development on the surrounding transportation system.

The following improvements were identified for the Existing plus Development scenario:

- Widen the narrow segment of Bowlin Road north of the development site to allow for two continuous lanes of traffic.
- Clear trees and brush to provide adequate sight distance for northbound drivers on Bowlin Road when looking to the east at the intersection with the Blue Springs Lake marina access drive.

Appendix A - Figures



TranSystems	LOCATION MAP	Monticello Traffic Impact Study Lee's Summit, Missouri	June 2015 No Scale	Figure A-1

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TranSystems	SITE PLAN	Monticello Traffic Impact Study Lee's Summit, Missouri	June 2015 No Scale	Figure A-2

LANE CONFIGURATIONS

A.M. PEAK HOUR
TRAFFIC VOLUMES

P.M. PEAK HOUR
TRAFFIC VOLUMES

Legend

- Traffic Signal
- Stop Sign
- Lane Configuration
- 123 Total Hourly Volume

EXISTING LANE CONFIGURATIONS
AND TRAFFIC VOLUMES

Monticello
Traffic Impact Study
Lee's Summit, Missouri

June 2015

No Scale

Figure A-3

TranSystems

LANE CONFIGURATIONS

A.M. PEAK HOUR
TRAFFIC VOLUMES

P.M. PEAK HOUR
TRAFFIC VOLUMES

EXISTING PLUS DEVELOPMENT
LANE CONFIGURATIONS AND TRAFFIC VOLUMES

Monticello
Traffic Impact Study
Lee's Summit, Missouri

June 2015 | No Scale

Figure A-4

TranSystems

Appendix B - Trip Generation and Distribution

See attached worksheets.

Monticello Traffic Impact Study
Lees Summit, Missouri
Trip Generation

Land Use	Intensity	ITE Code	Daily	A.M. Peak Hour					P.M. Peak Hour				
				Total	% In	% Out	In	Out	Total	% In	% Out	In	Out
Single-Family Residential	160 units	210	1,619	122	25%	75%	31	91	161	63%	37%	102	59
Total Development Trips			***1,619***	***122***			***31***	***91***	***161***			***102***	***59***