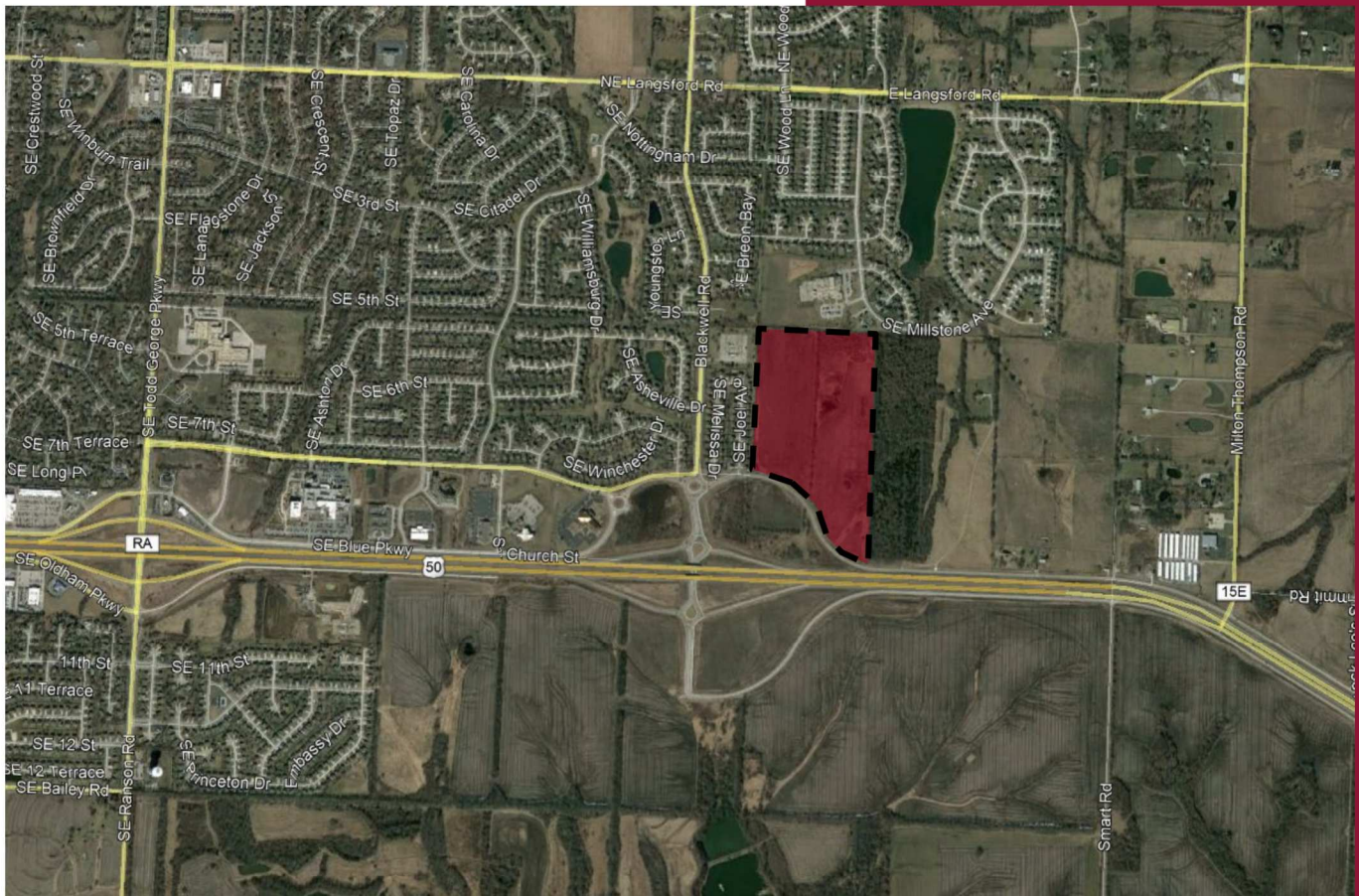


Blue Parkway Development Traffic Impact Study

Blackwell Road and Blue Parkway
Lee's Summit, Missouri



Prepared for:
Griffin Riley Property Group.

Prepared by TranSystems
July 2021



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July 21, 2021

Mr. Jake Loveless
Griffin Riley Property Group
21 SE 29th Terrace
Lee's Summit, MO 64082

**RE: Blue Parkway Development Traffic Impact Study
Blackwell Road and Blue Parkway
Lee's Summit, Missouri**

Dear Mr. Loveless:

In response to your request and authorization, TranSystems has completed a traffic impact study for the proposed residential and commercial development to be located generally to the north and east of the US-50 Highway and Blackwell Road interchange along Blue Parkway 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 impact of the proposed development on the adjacent street network and identified improvements to mitigate deficiencies for the following scenarios:

- ▶ Existing Conditions
- ▶ Existing plus Development Conditions
- ▶ Future 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/P101210245
Enclosure

Introduction

TranSystems has completed a traffic impact study for the proposed residential and commercial development to be located generally to the north and east of the US-50 Highway and Blackwell Road interchange along Blue Parkway 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 development site relative to the major streets in the area is shown on **Figure A-1** in **Appendix A**.

This study also contains a description of the proposed development and the surrounding transportation infrastructure along with trip generation estimates, trip distribution estimates, capacity analyses, and a summary of the findings.

Proposed Development Plan

The proposed development consists of both residential and commercial land uses. A 42,500 square foot retail building is proposed in the southwest portion of the site. North of the retail building, there are 80 lots for single-family homes. To the east of the single-family homes there are 118 attached homes that are planned to be senior housing for residents age 55 and over. In the southeast corner of the site a 252-unit apartment complex is proposed.

Access to the development will primarily be provided from Blue Parkway. The retail building will have one site driveway onto Blue Parkway (referred to as Site Drive A), roughly 850 feet east of Blackwell Road. The apartments will be access from a site driveway on Blue Parkway (Site Drive B), located approximately 700 feet west of the property line.

A new collector street will be constructed through the development, extending northeast from Blue Parkway to the west property line. The collector street will separate the apartment complex from the senior housing. A roundabout will be constructed at the intersection of the proposed collector street with Blue Parkway. Access to the residential portions of the development will be provided from the collector street. Several public and private streets are proposed along the collector, each spaced at least 200 feet apart. A second driveway to the apartment complex (Site Drive C) will also be provided from the collector street at the intersection 425 feet north of the roundabout. A copy of the proposed site plan showing the proposed access points is included on **Figure A-2** in **Appendix A** for reference.

Study Area

To assess the impacts of the proposed development, the intersections listed below were identified for study during the A.M. and P.M. periods.

- ▶ Blackwell Road and Blue Parkway
- ▶ Site Driveways

Surrounding Land Uses and Street Network

The development site currently consists of undeveloped land used for agricultural purposes. There are several different land uses surrounding the site. To the east of the site, much of the adjacent land is

undeveloped, with a few single-family residences on large lots. Directly to the north of the site is Highland Park Elementary School. The school is accessed from Millstone Avenue, which is a residential collector street within the Summit Mill subdivision of single-family homes. To the west of the site is the Asbury Park subdivision of single-family homes which is accessed from Blue Parkway. North of Asbury Park is a substation for the electrical utility company and Canterbury Park. A short paved trail runs adjacent to the north edge of the site, connecting the park to Highland Park Elementary School. The south side of the site is bounded by Blue Parkway. There are roughly 17 acres of undeveloped land south of Blue Parkway in the northeast corner of the US-50 Highway and Blackwell Road interchange.

The proposed development site is located to the north and east of the US-50 Highway and Blackwell Road interchange. The diamond interchange has multi-lane roundabouts at each ramp terminal. There is also a multi-lane roundabout north of the interchange on Blackwell Road at the intersection with Blue Parkway.

Blackwell Road is classified as minor arterial street with curbs and gutters and continuous street lighting. The posted speed limit is 35 mph. In the interchange area Blackwell Road is a four-lane divided street. There is a shared-use path along the east side of the street and a sidewalk on the west side. To the north of the roundabout at Blue Parkway, the street section changes. The shared-use path on the east side of the street reduces to a sidewalk, the raised median ends, and the street is striped as a three-lane roadway with a center two-way left-turn lane and paved shoulders on each side.

Blue Parkway is the frontage road that runs along the north side of US-50 Highway. The roadway is classified as a commercial collector street with a posted speed limit of 40 mph. Blue Parkway is a two-lane roadway with six-foot wide paved shoulders. East of Blackwell Road, there are reverse curves in the roadway that change the alignment of the road to provide separation between Blue Parkway and the interchange ramps. The development site is adjacent to the reverse curves. West of the development site, the paved shoulders on Blue Parkway transition to curbs and gutters on the approach to the roundabout intersection at Blackwell Road. The road widens for two westbound lanes at the roundabout, one being a dedicated left-turn lane and the other lane allowing all movements.

Traffic Counts

Turning-movement traffic volume counts were collected at the study intersection of Blackwell Road and Shenandoah Drive on Thursday, March 15, 2018 for a previous traffic impact study. The turning movement counts were collected from 7:00 to 9:00 A.M. and from 4:00 to 6:00 P.M. The A.M. peak hour for all intersections occurred between 7:30 and 8:30 A.M., while the P.M. peak hour occurred between 4:45 and 5:45 P.M.

As a part of the previous study, 24-hour traffic counts were recorded along Blackwell Road and Blue Parkway from March 13, 2018 through March 15, 2018. Machine traffic volume counters were placed on Blackwell Road north of the Blue Parkway intersection, and on Blue Parkway adjacent to the development site. Based on these counts, the daily traffic volume on Blackwell Road to the north of Blue

Parkway was 4,670 vehicles. The daily traffic volume on Blue Parkway adjacent to the development site was 1,700 vehicles.

Since the counts were collected in 2018, some annual background growth was assumed to calibrate the counts to current conditions for 2021. Background growth was assumed at a rate of two-percent per year to approximate existing conditions. The existing lane configurations, traffic control devices, and peak hour traffic volumes are illustrated on **Figures A-3** through **A-5**.

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 in the subsequent sections.

Trip Generation

Trip generation estimates were prepared using the Institute of Transportation Engineer's Trip Generation, 10th Edition. Trips for the attached senior housing units and the apartment complex were both estimated using the Multifamily Housing (Low-Rise) land use code. **Table I** shows the expected trips to be generated by the proposed development.

Table I
Proposed Development 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 Homes	80 du	210	847	62	16	46	83	53	30
Multifamily Housing (Low-Rise)	118 du	220	852	56	13	43	69	44	25
Multifamily Housing (Low-Rise)	252 du	220	1,865	115	27	88	135	86	49
Shopping Center	42,500 sf	820	3,360	174	108	66	289	139	150
<i>Subtotal Development Trips</i>			<i>6,924</i>	<i>407</i>	<i>164</i>	<i>243</i>	<i>576</i>	<i>322</i>	<i>254</i>
<i>Pass By Trips (20% of PM Shopping Center)</i>			<i>—</i>	<i>—</i>	<i>—</i>	<i>—</i>	<i>58</i>	<i>29</i>	<i>29</i>
Total New Development Trips			6,924	407	164	243	518	293	225

Pass-by traffic occurs when drivers stop at the proposed development while in route to their final destination. Pass-by traffic is common for retail land uses. A pass-by percentage of 20% was applied to the shopping center trips during the P.M. peak hour only. This rate corresponds to the 15th percentile

of pass-by rates listed in the ITE Trip Generation Handbook. No pass-by percentage is provided for A.M. peak hour shopping center trips in the handbook.

Trip Distribution

The estimated trips generated by the proposed development were distributed onto the street system based on the trip distributions summarized in **Table 2**. These distributions are based on existing traffic patterns, access to the highway system, and engineering judgment. The detailed distribution patterns through the study intersections are shown in **Appendix B**.

Table 2 Trip Distribution	
Direction To/From	Percentage
North on Blackwell Road	20%
South on Blackwell Road (to/from US-50)	60%
West on Shenandoah Drive	15%
East on Shenandoah Drive	5%
Total	100%

Traffic Operation Assessment

An assessment of traffic operations was made for the scenarios listed below. These scenarios allowed for comparison of the before and after impacts of the proposed development on the street network.

- ▶ Existing Conditions
- ▶ Existing plus Development Conditions
- ▶ Future Conditions

The study intersections were evaluated using the Synchro and Sidra traffic analysis software packages. Synchro was used for the stop controlled intersections, and Sidra was used for roundabouts. Calculations were performed based on the methodologies outlined in the Highway Capacity Manual (HCM), 6th 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 least congested condition with free-flow movement of traffic and 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 3** on the subsequent page shows the upper limit of delay associated with each level of service for unsignalized intersections.

Unsignalized intersections are evaluated based on the movement groupings 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. At unsignalized intersections lower LOS ratings (D, E and F)

do not, in themselves, indicate the need for additional improvements. Many times there are convenient alternative routes to avoid the longer delays. Other times the volumes on the unsignalized approaches are relatively minor when compared to the major street traffic, and improvements such as traffic signal installation may increase the average delay to all users of the intersection.

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

The decision to install a traffic signal, which is often considered when lower LOS ratings are projected, should be based on engineering studies and the warrants for traffic signal installation as outlined in the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD). Signals are typically not recommended in locations where there are convenient alternative paths, or if the installation of a traffic signal would have negative impacts on the surrounding transportation system.

The LOS rating deemed acceptable varies by community, facility type and traffic control device. Lee's Summit has identified LOS C as the minimum desirable goal. However, at unsignalized intersections LOS D, E, or even F may be considered acceptable for low to moderate traffic volumes where the installation of a traffic signal is not warranted by the conditions at the intersection, or the location has been deemed undesirable for signalization.

In addition to delay (and the corresponding Level of Service), a secondary means of evaluation is often utilized to assess the overall capacity of the intersection or unsignalized movement. This evaluation is a ratio of volume to capacity (v/c) that reflects, regardless of delay, the ability to accommodate existing or projected traffic volumes over the course of a peak hour. A v/c ratio of 1.00 reflects the capacity of a signalized intersection or stop controlled movement. At roundabouts, a v/c ratio of 0.85 is considered the threshold for stable operation on an approach leg.

Traffic queues are also evaluated as part of the analyses. Long traffic queues which extend beyond the amount of storage available, either between intersections or within turn lanes, can have significant impacts on operations. The projected vehicular queues are analyzed to ensure the analyses are reflective of the physical constraints of the study intersections and to identify if additional storage is needed for turn lanes.

Existing Conditions

The results of the Existing Conditions intersection analyses are summarized below in **Table 4**. The study intersection was evaluated with the lane configurations, traffic volumes, and traffic control devices shown on **Figures A-3** through **Figure A-5**. The Sidra output files are included in **Appendix C**. The 95th percentile queues for each peak hour are illustrated on **Figure A-6**.

Table 4 Intersection Operational Analysis Existing Conditions							
Intersection	Movement	A.M. Peak Hour			P.M. Peak Hour		
		LOS ¹	Delay ²	v/c ³	LOS ¹	Delay ²	v/c ³
Blackwell Road and Blue Parkway							
	Northbound	A	3.6	0.13	A	5.0	0.28
	Westbound	A	3.6	0.05	A	4.6	0.08
	Southbound	A	4.0	0.11	A	4.0	0.11
	Eastbound	A	4.0	0.06	A	4.5	0.12

- 1 – Level of Service
- 2 – Delay in seconds per vehicle
- 3 – Volume-to-Capacity Ratio

As shown in the table, all approaches to the study intersection of Blackwell Road and Blue Parkway currently operate at excellent levels of service during the peak hours with minimal delay. The 95th percentile queues on each approach are minimal, with no more than two vehicles in any lane.

Existing plus Development Conditions

The proposed development includes several new streets and driveways. A new collector street is proposed through the development, extending north and east from Blue Parkway. The City's Thoroughfare Master Plan depicts a commercial collector street in this same general location as indicated in orange on **Figure 1**. As the commercial collector street continues east, it becomes a residential collector street, which is indicated by the yellow line. Since the surrounding land uses proposed with this project would all be residential, the proposed collector street would actually function as a residential collector for its entire length.

There are several new street and driveway connections proposed along the collector street. These connections are all spaced at more than 200 feet apart. This meets the minimum connection spacing standards provided in the Lee's Summit Access Management Code (AMC) for a



Figure 1 – Thoroughfare Master Plan

residential collector type street. As residential access points, left- or right-turn lanes are not required at any of the intersections along the proposed collector street, according to the AMC.

The first intersection north of Blue Parkway (Site Drive C) along the collector street is spaced more than 400 feet from Blue Parkway. This is ample distance away from the proposed roundabout intersection. A single-lane roundabout is proposed at this intersection for consistency with the Blue Parkway corridor and adjacent interchange.

As a commercial collector street, all proposed site driveways along Blue Parkway meet the minimum connection spacing requirements of the AMC. Left-turn lanes are required on Blue Parkway at Site Drive A and Site Drive B. The left-turn lanes should have a minimum storage length of 150 feet, plus an appropriate taper. Right-turn lanes are not necessary at either site driveway intersection.

The results of the existing plus development conditions intersection analyses are summarized below in **Table 5**. This study scenario assessed the street system with the addition of traffic generated by the proposed development. The study intersections were evaluated with the lane configurations, traffic volumes, and traffic control devices shown on **Figures A-7** through **A-9**. The Synchro and Sidra output files are included in **Appendix C**. The 95th percentile queues projected for each peak hour are illustrated on **Figure A-10**.

Table 5
Intersection Operational Analysis
Existing plus Development Conditions

Intersection	Movement	A.M. Peak Hour			P.M. Peak Hour		
		LOS ¹	Delay ²	v/c ³	LOS ¹	Delay ²	v/c ³
Blackwell Road and Blue Parkway	Northbound	A	3.9	0.14	A	6.1	0.31
	Westbound	A	4.6	0.16	A	5.9	0.20
	Southbound	A	5.0	0.15	A	5.1	0.16
	Eastbound	A	5.1	0.11	A	6.1	0.20
Blue Parkway and Site Drive A	Eastbound Left-Turn	A	8.1	0.09	A	7.9	0.10
	Southbound	B	10.5	0.10	B	11.9	0.24
Blue Parkway and proposed collector street	Westbound	A	3.8	0.12	A	4.1	0.12
	Southbound	A	4.2	0.12	A	3.7	0.78
	Eastbound	A	3.4	0.08	A	4.6	0.23
Blue Parkway and Site Drive B	Eastbound Left-Turn	A	7.4	0.01	A	7.5	0.03
	Southbound	A	9.0	0.05	A	9.0	0.03
proposed collector street and Site Drive C	Eastbound	A	9.0	0.06	A	9.2	0.05
	Westbound	A	9.9	0.07	B	10.4	0.05

1 – Level of Service
 2 – Delay in seconds per vehicle
 3 – Volume-to-Capacity Ratio

As shown in **Table 5**, all study intersections are projected to operate at very good levels of service (LOS A and B) during the peak hours with the addition of development traffic. All queues are projected to be no more than two vehicles in length for any lane.

Future Conditions

This study scenario assessed the street system with the additional traffic generated by the proposed development, development assumptions for adjacent undeveloped parcels, and background traffic growth on the surrounding street network. It was assumed that undeveloped land south of the site between the westbound US-50 exit ramp and Blue Parkway would be developed in the future scenario. For a conservative estimate of trips, it was assumed that 20 percent of the land would be developable, resulting in 150,000 square feet of shopping center land uses. The 150-acre undeveloped property east of the site was assumed to be single-family residences at a density of three houses per acre.

Trip generation estimates for the future developments were prepared in the same manner as the proposed development, using the Institute of Transportation Engineer's Trip Generation, 10th Edition. Trip generation estimates for future developments are included in **Appendix B**. These future development trips were assumed to use the same general trip distribution patterns as shown in **Table 2**. All of the shopping center trips from the south of the site were distributed through the proposed roundabout intersection to access that site. The trips for the future residential development were split between the proposed collector street and Blue Parkway.

Background growth of two-percent per year was applied over the 20-year planning horizon to the existing conditions traffic volumes on Blackwell Road and on Blue Parkway. This growth factor is based on review of traffic volumes and projections shown in the Access Justification Report for the US-50 and Blackwell Road interchange project, and comparison to the counts collected. The future projections traffic volumes are assumed to represent conditions in the year 2041.

The results of the future conditions intersection analyses are summarized on the following page in **Table 6**. The study intersections were evaluated with the lane configurations, traffic volumes, and traffic control devices shown on **Figures A-11** through **Figure A-13**. The Sidra output files are included in **Appendix C**. The 95th percentile queues projected for each peak hour are illustrated on **Figure A-14**.

The table indicates that delays are projected to increase at the study intersections in the future. However, all study intersections are projected to operate within the thresholds for acceptable levels of service during the peak hours. Queues are projected to increase at the Blackwell Road and Blue Parkway roundabout. During the P.M. peak hour, the 95th percentile queue is approximately three vehicles in both of the westbound lanes. The northbound right-turn queue is projected to be roughly 200 feet during the P.M. peak hour, which will not impact the roundabout at the US-50 interchange.

The single-lane roundabout on Blue Parkway at the proposed collector street is projected to operate acceptably in the future. Queue lengths are projected to be 142 feet in the eastbound direction during

the P.M. peak hour. The addition of an eastbound right-turn lane to accommodate shopping center traffic would reduce the queue length on the eastbound approach.

Table 6
Intersection Operational Analysis
Future Conditions

Intersection	Movement	A.M. Peak Hour			P.M. Peak Hour		
		LOS ¹	Delay ²	v/c ³	LOS ¹	Delay ²	v/c ³
Blackwell Road and Blue Parkway	<i>Northbound</i>	A	5.5	0.27	B	13.5	0.68
	<i>Westbound</i>	A	7.2	0.36	B	11.4	0.48
	<i>Southbound</i>	A	8.7	0.31	A	9.2	0.35
	<i>Eastbound</i>	A	8.9	0.26	B	14.0	0.50
Blue Parkway and Site Drive A	<i>Eastbound Left-Turn</i>	A	9.4	0.12	A	9.2	0.14
	<i>Southbound</i>	C	15.2	0.17	D	28.4	0.52
Blue Parkway and proposed collector street	<i>Northbound</i>	A	4.2	0.09	A	9.7	0.41
	<i>Westbound</i>	A	6.2	0.31	A	8.3	0.35
	<i>Southbound</i>	A	7.8	0.32	A	6.4	0.21
	<i>Eastbound</i>	A	5.2	0.28	A	9.8	0.60
Blue Parkway and Site Drive B	<i>Eastbound Left-Turn</i>	A	7.9	0.01	A	7.9	0.04
	<i>Southbound</i>	B	10.3	0.07	B	10.1	0.04
proposed collector street and Site Drive C	<i>Eastbound</i>	A	9.8	0.07	B	10.1	0.06
	<i>Westbound</i>	B	11.5	0.09	B	12.8	0.07

1 – Level of Service

2 – Delay in seconds per vehicle

3 – Volume-to-Capacity Ratio

Site Drive A is to be stop sign controlled at the intersection with Blue Parkway. In the future, the stop controlled southbound approach is projected to operate at LOS C and LOS D during the peak hours. While LOS D is generally not desirable, the delays will only impact traffic exiting the private driveway. It would be appropriate to construct Site Drive A with two exiting lanes to allow right-turn traffic to bypass vehicles that are queued while waiting to turn left.

Summary

TranSystems has completed a traffic impact study for the proposed residential and commercial development to be located generally to the north and east of the US-50 Highway and Blackwell Road interchange along Blue Parkway 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 proposed development consists of single-family residential, multifamily residential, and commercial land uses. As part of the project, a new collector street is proposed to be constructed through the site

from Blue Parkway. The site will be accessed from two new driveways on Blue Parkway and from other new streets and driveways along the proposed collector street.

The following improvements are identified in accordance with the Lee's Summit Access Management Code, and to provide acceptable operations at the study intersections.

Blue Parkway and Site Drive A

- ▶ Construct an eastbound left-turn lane with a minimum storage length of 150 feet, plus an appropriate taper.
- ▶ Construct Site Drive A with two southbound lanes exiting the site.

Blue Parkway and Site Drive B

- ▶ Construct an eastbound left-turn lane with a minimum storage length of 150 feet, plus an appropriate taper.

Blue Parkway and proposed collector street

- ▶ Construct a single-lane roundabout.

With the aforementioned improvements, all intersections are projected to operate at acceptable levels of service with the addition of development traffic.