

Culver's Traffic Impact Study

Ranson Road and Oldham Parkway
Lee's Summit, Missouri



Prepared for:
Engineering Solutions

Prepared by TranSystems
December 2019



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

**Re: Culver's Traffic Impact Study
Ranson Road and Oldham Parkway
Lee's Summit, Missouri**

Dear Mr. Schlicht:

In response to your request and authorization, TranSystems has completed a traffic impact study for the proposed fast-food restaurant and commercial building to be generally located in the southwest corner of the Ranson Road and Oldham Parkway 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.

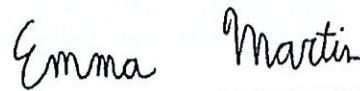
Included in this study is a discussion of the anticipated impact of the proposed development on the adjacent street network and identified improvements to mitigate deficiencies for the following scenarios:

- ▶ Existing Conditions
- ▶ Existing plus Phase I Development Conditions
- ▶ Existing plus Phase I & 2 Development Conditions

We trust that the enclosed information proves beneficial to you, the City of Lee's Summit, and the Missouri Department of Transportation (MoDOT) 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

By: 
Emma Martin, E.I.T.

EHM:JJW/em/PI01190329
Enclosure

Introduction

TranSystems has completed a traffic impact study for the proposed fast-food restaurant and commercial building development to be located generally in the southwest corner of Ranson Road and Oldham 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 a 4,338 square foot Culver's fast food restaurant with a drive through and an approximately 5,600 square foot commercial building. Access for Culver's will be provided from one existing driveway on Oldham Parkway, shared with First Federal Bank. An additional site drive will be built along Oldham Parkway, approximately 375 feet west of Ranson Road, to access the commercial building. The fast food restaurant will be constructed first, and is considered the Phase I portion of the proposed development. The current site development plan 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 of a typical weekday.

- ▶ Ranson Road and Oldham Parkway
- ▶ Site Driveways

Traffic Counts

The turning-movement traffic volume counts at the study intersection were obtained from the Lee's Summit Senior Living Community Traffic Impact Study, dated November 13, 2018. The turning movement counts were collected for 24 hours on October 24, 2018 and October 25, 2018. The A.M. peak hour occurred between 7:30 A.M. and 8:30 A.M., while the P.M. peak hour occurred between 4:45 P.M. and 5:45 P.M. The Lee's Summit Senior Living Community development was approved, therefore the existing peak hour traffic volumes used for this study include development trips from the Senior Living Community. The existing lane configuration and peak hour traffic volumes have been illustrated on **Figure A-3**.

Surrounding Land Uses and Street Network

The development site is located within a commercial area. The development site is bounded on the north by Oldham Parkway and on the east by Ranson Road. A bank, that the proposed site will share a driveway with, is on the west side. A residential neighborhood is located to the south of the site. US-50 Highway is just north of the site, with an interchange at Ranson Road.

The segment of Ranson Road that is adjacent to the proposed development site is classified by MoDOT as a minor arterial street. North of Oldham Parkway, Ranson Road is a four-lane divided street with curbs and gutters along each side of the street. Ranson Road is a two-lane divided street with paved shoulders on the south side of Oldham Parkway. The speed limit is 40 mph in the vicinity of the site, however the speed limit increases to 45 mph just south of the intersection with Oldham Parkway. The intersection of Ranson Road and Oldham Parkway has southbound left- and right-turn lanes and a short northbound left-turn lane. The intersection is stop-controlled for the side street movements.

Oldham Parkway is classified by the City of Lee's Summit as a commercial collector street. It is a two-lane street with gravel shoulders. The posted speed limit is 40 mph. There are a number of commercial driveways on the street to the west of the proposed site.

The existing driveway (Site Drive I) into the bank on Oldham Parkway is located approximately 700 feet west of Ranson Road. There are no turn lanes at the existing driveway or any of the commercial driveways along this segment of Oldham Parkway.

Analysis

The scope of analysis for the assessment of the proposed development's impact on the surrounding transportation system is largely based 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 for the development scenarios using the Institute of Transportation Engineer's Trip Generation, 10th Edition. **Table 1** shows the expected trips to be generated by the proposed development. Since a variety of land uses are possible for the commercial portion of the development, all of the commercial square footage was evaluated using the shopping center land use category. Addition information regarding trip generation is included in **Appendix B**.

Table 1 Trip Generation									
Land Use	Intensity	ITE Code	Average Weekday	A.M. Peak Hour			P.M. Peak Hour		
				Total	In	Out	Total	In	Out
<i>Phase 1 Land Uses</i>									
Fast Food Restaurant	4,338 sf	934	2,043	175	89	86	142	74	68
<i>Phase 2 Land Uses</i>									
Shopping Center	5,632 sf	820	213	6	4	2	22	11	11
Total Full Development Trips			2,256	181	93	88	164	84	80

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 and engineering judgment. The detailed distribution patterns through the study intersections are shown in **Appendix B**.

Table 2 Trip Distribution	
Direction To/From	Percentage
East on Oldham Parkway	15%
North on Ranson Road	70%
South on Ranson Road	15%
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 Phase I Development Conditions
- ▶ Existing plus Full Development Conditions

The study intersections were evaluated using the Synchro traffic analysis software package. 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. Control delay is measured in seconds per vehicle. **Table 3** shows the upper limit of delay associated with each level of service for signalized and unsignalized intersections.

Table 3 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 LOS measurements apply 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.

Unsignalized intersections, in contrast, 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.

The LOS rating deemed acceptable varies by community, facility type and traffic control device. The City of Lee's Summit has designated LOS C as the minimum desirable standard for signalized intersections. However, at unsignalized intersections LOS D, E, or even F are often 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.

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.

Traffic queues were 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 were 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 Existing Conditions intersection analyses were obtained from the Lee's Summit Senior Living Community Traffic Impact Study. The study intersection was evaluated with the lane configurations, traffic volumes, and traffic control devices shown on **Figure A-3**, which include development trips from the Senior Living Community.

The results in the study indicate that all movements operate at an acceptable level of service during the A.M. peak hour. The northbound and southbound left-turn movements operate at LOS A, and the eastbound and westbound movements operate at LOS C. The northbound and southbound left-turn movements also operate at LOS A during the P.M. peak hour. However, the eastbound approach operates at LOS F and the westbound approach operates at LOS E. The eastbound queue length is indicated to be 18 vehicles. The study indicates that a traffic signal is current warranted at the Ranson Road and Oldham Parkway intersection.

Existing plus Phase I Development Conditions

Lee's Summit Access Management Code (AMC) provides guidance on turn lane requirements, throat lengths, and spacing of intersections and driveways. The throat length of Site Drive I is approximately 70 feet. The AMC states a minimum throat length of 100 feet is required, however the length is constrained due to the existing bank driveway. The driveway spacing from Ranson Road is adequate.

Based upon a previous agreement with the City of Lee's Summit and the Missouri Department of Transportation, a traffic signal will be installed at Ranson Road and Oldham Parkway in conjunction with the proposed development. The AMC requires all intersections controlled by a traffic signal to have left-turn lanes. Therefore, an eastbound left-turn lane should be constructed at the intersection of Ranson Road and Oldham Parkway with a minimum storage length of 250 feet of storage plus appropriate taper.

The traffic volumes projected at Site Drive I exceed the AMC's minimum threshold for a westbound left-turn lane, but do not warrant an eastbound right-turn lane. To meet the requirements of the AMC, a westbound left-turn lane should be constructed with a minimum storage length of 150 feet plus appropriate taper. It is worth noting that this would be the only left turn lane along this section of Oldham Parkway even though there are other commercial driveways just to the west of the site.

The Missouri Department of Transportation's (MoDOT) Engineering Policy Guide (EPG) provides guidance on turn lane requirements. According to the EPG, a northbound left-turn lane is warranted on Ranson Road at Oldham Parkway. There is a existing northbound left-turn that only provides 50 feet of storage. This storage length will accommodate short queues, however it does not allow for any deceleration to occur outside the through lane. Therefore, the northbound left-turn lane should be lengthened to provide a minimum storage length of 150 feet plus appropriate taper.

The results of the Existing plus Phase I Development Conditions intersection analyses are summarized in **Table 4**. This study scenario assessed the street system with the addition of traffic generated by the Phase I portion of the proposed development, and the aforementioned improvements. The study intersection was 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 4 Intersection Operational Analysis Existing plus Phase I Development Conditions					
Intersection	Movement	A.M. Peak Hour		P.M. Peak Hour	
		LOS¹	Delay²	LOS¹	Delay²
Ranson Road and Oldham Parkway					
	<i>Traffic Signal</i>	B	11.9	B	16.3
Oldham Parkway and Site Drive I					
	<i>Westbound Left-Turn</i>	A	7.5	A	8.0
	<i>Northbound</i>	A	9.7	B	11.1

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

As shown in **Table 4**, all movements at the study intersections are anticipated to operate at acceptable levels of service. Given the relatively low to moderate traffic volumes projected at Site Drive A, the addition of a westbound left-turn lane has no impact on the levels of service

The results of the queue analysis are shown in **Figure A-5** in **Appendix A**. The eastbound left-turn movement at Ranson Road and Oldham Parkway is projected to have a 95th percentile queue length of 83 feet in the A.M. peak hour and 239 feet in the P.M. peak hour, which would be contained within the 250 foot storage length of the turn lane. The 95th percentile queue length for the southbound through movement is projected to be 220 feet in the A.M. peak hour and 451 feet during the P.M. peak hour. At times during the P.M. peak hour, southbound queues are projected to extend through the eastbound US-50 Highway ramps intersection. The traffic signals at the Ranson Road intersections should be interconnected and coordinated to provide progression for through traffic and reduce queues between intersections.

Existing plus Full Development Conditions

Site Drive 2 has an adequate throat length of 75 feet and is spaced appropriately from both Site Drive 1 and Ranson Road, per the AMC. No turn lanes are necessary to accommodate Phase 2 traffic due to the low volume of traffic projected at the driveway. The volumes are below the minimum threshold indicated in the AMC.

The results of the Existing plus Full Development Conditions intersection analyses are summarized in **Table 5**. This study scenario assessed the street system with the addition of traffic generated by both phases of the proposed development, and the aforementioned improvements. The study intersection was evaluated with the lane configurations, traffic volumes, and traffic control devices shown on **Figure A-6**. The results of the queue analysis are shown in **Figure A-7** in **Appendix A**. The Synchro output files are included in **Appendix C**.

Table 5 Intersection Operational Analysis Existing plus Phase Full Development Conditions					
Intersection	Movement	A.M. Peak Hour		P.M. Peak Hour	
		LOS ¹	Delay ²	LOS ¹	Delay ²
Ranson Road and Oldham Parkway	<i>Traffic Signal</i>	B	11.9	B	16.5
Oldham Parkway and Site Drive 1	<i>Westbound Left-Turn</i>	A	7.5	A	8.0
	<i>Northbound</i>	A	9.7	B	11.1
Oldham Parkway and Site Drive 2	<i>Westbound Left-Turn</i>	A	7.5	A	8.0
	<i>Northbound</i>	A	9.1	B	10.9

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

As shown in **Table 5**, all movements at the study intersections are anticipated to operate at acceptable levels of service. The additional traffic from the Phase 2 portion of the proposed development is projected to have a nominal impact on the levels of service and projected queue lengths.

Summary

TranSystems has completed a traffic impact study for the proposed fast-food restaurant and commercial building development to be located generally in the southwest corner of Ranson Road and Oldham 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.

In the existing scenario, the existing unsignalized intersection of Ranson Road and Oldham Parkway does not operate at an acceptable level of service during the P.M. peak hour. The traffic impact study for the Lee's Summit Senior Living Community indicated that a traffic signal is warranted. Based upon a previous agreement with the City of Lee's Summit and the Missouri Department of Transportation, a traffic signal will be installed with the proposed development.

The following improvements are identified to mitigate the addition of traffic from the Phase I portion of the proposed development.

Oldham Parkway and Ranson Road

- ▶ Install a traffic signal at the intersection. Interconnect the signal and coordinate the signal timings with the existing signal at Ranson Road and the eastbound US-50 Highway ramps.
- ▶ Lengthen the northbound left-turn lane to provide a minimum storage length of 150 feet plus appropriate taper.

Oldham Parkway and Site Drive I

- ▶ Construct a westbound left-turn lane to provide a minimum storage length of 150 feet plus appropriate taper.

It is worth noting that the westbound left-turn lane at Site Drive I is a requirement of the City's Access Management Code. The turn lane will not improve the levels of service projected at the intersection, and there are no turn lanes at any other commercial driveways along this section of Oldham Parkway.

No improvements were identified to mitigate the addition of traffic from the Phase 2 portion of the proposed development.