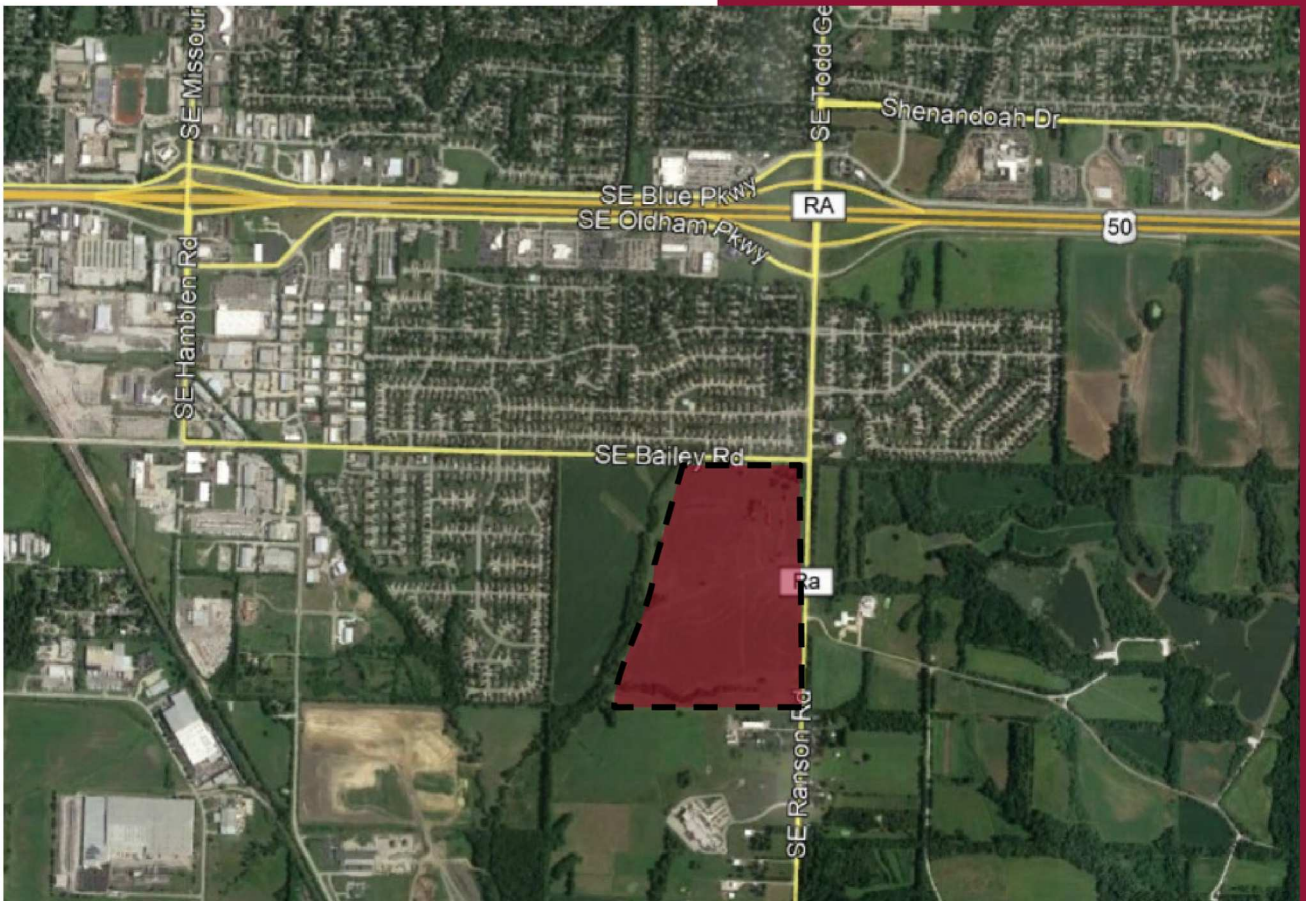


Bailey Farms Traffic Impact Study

Ranson Road and Bailey Road
Lee's Summit, Missouri



Prepared for:
Clayton Properties Group, Inc.

Prepared by TranSystems
February 2021



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February 15, 2021

Mr. Bradley Kempf
Clayton Properties Group, Inc.
DBA Summit Homes
120 SE 30th St
Lee's Summit, MO 64082

**Re: Bailey Farms Traffic Impact Study
Ranson Road and Bailey Road
Lee's Summit, Missouri**

Dear Mr. Kempf:

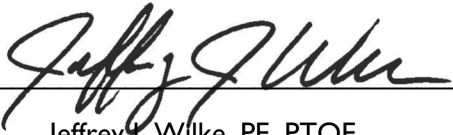
In response to your request and authorization, TranSystems has completed a traffic impact study for the proposed residential development generally located in the southwest corner of Ranson Road and Bailey Road in Lee's Summit, Missouri. The purpose of this study was to assess the impact of the proposed development on the surrounding transportation system.

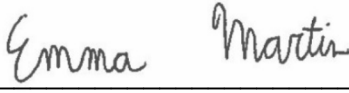
Included in this study is a discussion of the anticipated impact of the proposed development on the adjacent street network and identified improvements to mitigate deficiencies for the following scenarios:

- ▶ Existing plus Approved Development Conditions
- ▶ Existing plus Approved plus Proposed Development Conditions

We trust that the enclosed information proves beneficial to you, the Missouri Department of Transportation, 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

By: 
Emma Martin, EIT

EHM:JJW/ehm/PI01200378
Enclosure

Introduction

TranSystems has completed a traffic impact study for the proposed residential development generally located in the southwest corner of Ranson Road and Bailey Road 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.

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. peak periods.

- ▶ Ranson Road/Todd George Parkway and US-50 westbound ramps
- ▶ Ranson Road/Todd George Parkway and US-50 eastbound ramps
- ▶ Ranson Road and Oldham Parkway
- ▶ Ranson Road and Bailey Road
- ▶ Bailey Road and Hamblen Road/Century Drive (east intersection)
- ▶ Bailey Road and Hamblen Road (west intersection)
- ▶ Site Driveways

Surrounding Street Network and Land Uses

The development site is located on undeveloped land that is currently used for agricultural purposes. The land immediately to the west of the site is currently being developed as a new middle school and athletic fields for the Lee's Summit School District. To the west of the school site is a subdivision of single-family homes. The north side of the site is bounded by Bailey Road. There is a subdivision of single-family homes on the north side of Bailey Road across from the site. The east side of the site is bounded by Ranson Road, and the James A. Reed Memorial Wildlife Area is located on the east side of Ranson Road. The south side of the site is bounded by Bailey Park and one large lot residence. South of the park is Sunset Valley Elementary School.

Ranson Road is a part of the state highway system as Route RA. According to the Missouri Department of Transportation (MoDOT) Functional Classification Map, Ranson Road is classified as a minor arterial roadway north of Bailey Road. South of Bailey Road, it is classified as a major collector roadway. Adjacent to the development site, Ranson Road is a two-lane roadway with aggregate and turf shoulders. There are no sidewalks along the roadway adjacent to the site. North of Bailey Road there is a sidewalk along the west side of Ranson Road and a shared use path along the east side. The posted speed limit is 45 mph adjacent to the site.

Ranson Road provides access to the regional highway system from a diamond interchange with US-50 Highway. At the interchange, the roadway widens to four-lanes with left-turn lanes and a raised median. There are curbs and gutters and sidewalk along each side of the roadway. North of US-50 Highway, Ranson Road becomes Todd George Parkway.

Bailey Road is classified as a minor arterial roadway, according to the Lee's Summit Thoroughfare Master Plan. There are curbs and gutters along both sides of the road. The roadway is marked for two through lanes and shoulders along each side of the road. The posted speed limit is 35 mph. Adjacent to the development site there is sidewalk along the north side of Bailey Road, but not along the south side. Farther to the west adjacent to the existing residential subdivisions there is sidewalk on the south side of Bailey Road.

Traffic Counts

The turning-movement traffic volume counts at the study intersections were obtained from the traffic impact study for the middle school development, dated May 2020. Due to the on-going COVID-19 pandemic, no new counts were collected for this study. The study for the middle school considered the impacts of the pandemic on traffic volumes and the traffic counts were adjusted accordingly. Turning movements were not collected at the existing intersections that align with proposed access points to the site. Turning movements at Bailey Road at Brownfield Drive and at Ranson Road and the James A. Reed driveway were estimated.

Approved Developments

Several development projects have been approved by the City in recent years in the vicinity of the site. Traffic impact studies were prepared for each of these developments, which include development trips and improvement recommendations. Additional information about these developments is provided in the following paragraphs. The locations of these developments are included on **Figure A-1** in **Appendix A**.

The Princeton Senior Living facility is being constructed on Oldham Parkway, east of Ranson Road. It is projected to generate a very low volume of traffic. As such, no improvements are associated with this development.

Culver's fast-food restaurant was recently opened on Oldham Parkway west of Ranson Road. In conjunction with the Culver's development a traffic signal was installed at the Ranson Road and Oldham Parkway intersection. An eastbound left-turn lane was also constructed at the intersection.

The Lee's Summit R7 School District is constructing a new middle school and athletic fields south of Bailey Road, to the west of the proposed development site. Access to the middle school will primarily be provided from Bailey Road. A secondary access to the school will be provided by extending Cape Drive east through the southern portion of the middle school site. That will provide a connection to the residential subdivision to the west. The traffic impact study for the middle school did not consider the

impacts of traffic using Cape Drive to access the site. All development traffic was distributed through the Bailey Road access points.

The traffic impact study for the middle school identified several improvements in the surrounding area. As part of the development Bailey Road will be widened for left-turn lanes adjacent to the middle school driveways. A traffic signal will be constructed at the Ranson Road and Bailey Road intersection as well as turn lanes. Southbound and eastbound right-turn lanes are to be constructed, as well as a northbound left-turn lane. A northbound right-turn lane was also recommended on Ranson Road at the US-50 Highway eastbound ramps intersection. Traffic signal installation and turn lane improvements were recommended at the Bailey Road and Hamblen Road/Century Drive intersection.

Proposed Development Plan

The proposed development consists of 219 single family homes and 64 attached villa units. The site is split into northern and southern sections by a stream corridor that runs through the site. The northern section will have 116 single-family homes with varying lot sizes and the attached villas. There will be 103 single-family homes with larger lot sizes in the south section of the site. The proposed development plan is included on **Figure A-2** in **Appendix A** for reference.

Access will be provided from two new street connections. The first new connection will be a north/south collector street that will run through the development site. This collector street will intersect Bailey Road as the south leg of the existing intersection with Brownfield Drive, approximately 625 feet west of Ranson Road. The second new street connection will be the extension of Cape Drive in the southern portion of the site. Cape Drive will be extended east to intersect Ranson Road at the existing driveway to the James A. Reed Memorial Wildlife Area, which is roughly 1,650 feet south of Bailey Road.

The Lee's Summit Thoroughfare Master Plan indicates that several residential collector streets are to be constructed through the development site. The extension of Cape Drive through the southern portion of the site is in accordance with the Thoroughfare Master Plan. The plan also shows a north/south collector street extending south of Bailey Road, then turning east to intersect Ranson Road. The extension of Brownfield Drive south through the site generally follows the alignment in the plan, except it does not continue south of the site. Since the land south of the site includes Bailey Park, it seems unlikely that a collector street would need to be extended south through park property to connect to Ranson Road. Cape Drive will serve as the connection to Ranson Road.

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. **Table 1** shows the expected trips to be generated by the proposed development. The single-family detached homes land use was used for the trip generation for the entire site even though there are 64 attached villa units. The 10th Edition does not include a separate land use for duplexes, so the single-family detached homes land use was used to provide a conservative trip generation estimate. Additional information related to 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
Single-Family Detached Homes	283 units	210	2,708	206	52	154	276	174	102

Trip Distribution

The estimated trips generated by the proposed development were distributed onto the surrounding street network based on the trip distributions summarized in **Table 2**. These distributions are based on existing travel patterns, previous studies within the surrounding area, and engineering judgment. Detailed distributions through the study intersections are included in **Appendix B**.

Table 2 Trip Distribution	
Direction To/From	Percentage
North on Hamblen Road	10%
North on Todd George Parkway	15%
South on Ranson Road	10%
West on Bailey Road	15%
East on US-50 Highway	10%
West on US-50 Highway	40%
Total	100%

Traffic Operation Assessment

An assessment of traffic operations was made for the scenarios listed below.

- ▶ Existing plus Approved Development Conditions
- ▶ Existing plus Approved plus Proposed 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.

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 a traffic signal installation may increase the average delay to all users of the intersection.

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 for signalized intersections. 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.

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 plus Approved Development Conditions

The results of the Existing plus Approved Development Conditions intersection analyses are summarized in **Table 5**. The study intersections were evaluated with the lane configurations, traffic volumes, and traffic control devices shown on **Figures A-3** through **A-5**. These traffic volumes include development trips from other approved developments in the area, including the proposed middle school. The improvements recommended for those developments are also included in the analyses. The queue analysis results are provided in **Figures A-6** and **A-7**. The Synchro output files are included in **Appendix C**.

Table 5					
Intersection Operational Analysis					
Existing plus Approved Development Conditions					
Intersection	Movement	A.M. Peak Hour		P.M. Peak Hour	
		LOS¹	Delay²	LOS¹	Delay²
Ranson Road and US-50 Westbound Ramps	<i>Traffic Signal</i>	D	38.6	B	19.9
Ranson Road and US-50 Eastbound Ramps	<i>Traffic Signal</i>	C	20.1	C	23.9
Ranson Road and Oldham Parkway	<i>Traffic Signal</i>	A	8.4	B	18.2
Ranson Road and Bailey Road	<i>Traffic Signal</i>	B	13.8	B	16.7
Ranson Road and James A. Reed driveway	<i>Westbound</i>	B	10.8	B	12.0
	<i>Southbound Left-Turn</i>	A	8.0	A	8.1
Bailey Road and Brownfield Drive	<i>Southbound</i>	C	16.3	B	12.2
	<i>Eastbound Left-Turn</i>	A	8.7	A	7.9
Bailey Road and Hamblen Road/Century Dr.	<i>Traffic Signal</i>	A	7.9	B	13.6
Bailey Road and Hamblen	<i>Traffic Signal</i>	B	14.0	C	20.4

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

The results in the table indicate that all but one of the study intersections are projected to operate at acceptable levels of service during both peak hours in this scenario. The intersection of Ranson Road and US-50 westbound ramps is projected to operate at a LOS D during the A.M. peak hour, with a lengthy

queue of nearly 500' for the westbound left-turn movement. Similar results were documented in the traffic impact study for the middle school. Although this queue is projected to be long, it is contained within the length of the ramp.

Some longer queues are also projected on Ranson Road at the US-50 interchange that will extend back through the adjacent frontage Road intersections of Oldham Parkway and Blue Parkway. These two signalized frontage road intersections are closely spaced, within 300 feet of the signalized ramp intersections. This provides minimal queue storage between intersections.

Access Management

Lee's Summit Access Management Code (AMC) provides guidance on turn lane requirements, throat lengths, and spacing of intersections and driveways for city streets. The MoDOT Engineering Policy Guide (EPG) provides similar requirements for the state highway system. These requirements are described in the following paragraphs.

The proposed access points to the developments on Bailey Road and along Ranson Road align with existing streets, therefore no new intersections will be created for the proposed development. The location of the access point on Bailey Road at Brownfield Drive exceeds the 400-foot minimum separation requirements per the AMC. The access point on Ranson Road at Cape Drive exceeds the 660- to 1,320-foot guidance per the EPG. A cursory review of sight lines indicated that sight distances are adequate from each of the proposed access points.

The throat lengths at both site driveways are roughly 150 feet. These throat lengths exceed the driveway throat depth required by the AMC. The throat lengths also exceed the 95th percentile queue lengths projected at the intersections.

According to the AMC, a westbound left-turn lane is warranted on Bailey Road at Brownfield Drive, but an eastbound right-turn is not warranted. The westbound left-turn lane should have a minimum storage length of 200 feet plus appropriate taper. It should be noted that Bailey Road is being widened to the east and west of the Brownfield Drive intersection in conjunction with the middle school development. The construction of the turn lanes has not started as of the date of this study. Given the need for widening in multiple locations along Bailey Road, it is recommended to coordinate with the middle school development to widen Bailey Road for a center two-way left-turn lane from Ranson Road to the middle school driveways.

A northbound left-turn lane would be beneficial on Brownfield Drive at the Bailey Road intersection. The left-turn lane would allow northbound right-turn traffic to bypass northbound left-turn traffic, which will experience longer delays, especially during the time period before school is in session at the middle school. The northbound left-turn lane should have a minimum storage length of 100 feet plus appropriate taper.

The EPG has minimum volume thresholds for when turn lanes are warranted. Turn lane warrant analysis for the Ranson Road and Cape Drive intersection is provided in **Appendix D**. The warrant analysis

indicates that a southbound right-turn lane is warranted, but a northbound left-turn lane is not warranted at the intersection. The southbound right-turn lane should have a minimum storage length of 200 feet plus appropriate taper.

Existing plus Approved plus Proposed Development Conditions

The results of the Existing plus Approved plus Proposed Development Conditions intersection analyses are summarized in **Table 6**. The study intersections were evaluated with the lane configurations, traffic volumes, and traffic control devices shown on **Figures A-8** through **A-10**. This includes the aforementioned turn lane improvements. The signal timings and cycle lengths from the previous scenario were maintained. The queue analysis results are provided in **Figures A-11** and **A-12**. The Synchro output files are included in **Appendix C**.

Table 6
Intersection Operational Analysis
Existing plus Approved plus Proposed Development Conditions

Intersection	Movement	A.M. Peak Hour		P.M. Peak Hour	
		LOS ¹	Delay ²	LOS ¹	Delay ²
Ranson Road and US-50 Westbound Ramps	<i>Traffic Signal</i>	D	41.1	C	21.7
Ranson Road and US-50 Eastbound Ramps	<i>Traffic Signal</i>	C	21.0	C	24.0
Ranson Road and Oldham Parkway	<i>Traffic Signal</i>	A	8.5	B	17.8
Ranson Road and Bailey Road	<i>Traffic Signal</i>	B	14.9	B	17.3
Ranson Road and James A. Reed driveway/ Cape Drive	<i>Eastbound</i>	B	14.2	C	21.4
	<i>Westbound</i>	B	11.1	B	13.0
	<i>Northbound Left-Turn</i>	A	7.7	A	8.6
	<i>Southbound Left-Turn</i>	A	8.0	A	8.1
Bailey Road and Brownfield Drive	<i>Northbound Left-Turn</i>	D	32.3	D	26.8
	<i>Northbound Shared Right-Turn/Through</i>	B	11.8	B	12.4
	<i>Southbound</i>	C	21.0	C	15.9
	<i>Eastbound Left-Turn</i>	A	8.8	A	7.9
	<i>Westbound Left-Turn</i>	A	8.4	A	8.9
Bailey Road and Hamblen Road/Century Dr.	<i>Traffic Signal</i>	A	7.8	B	16.1
Bailey Road and Hamblen Road	<i>Traffic Signal</i>	B	13.9	C	21.1

1 – Level of Service

2 – Delay in seconds per vehicle

The results of the analysis indicate that most intersections are projected to operate acceptably with the addition of the development traffic. As in the previous scenario, LOS D conditions and lengthy queues are projected during the A.M. peak hour on the US-50 westbound ramp at Ranson Road. The proposed

development is projected to add a nominal amount of traffic to the westbound left-turn movement which will have a minimal impact on the queue length. Several of the queue lengths on Ranson Road near the US-50 interchange are projected to increase. These queues may extend through the adjacent closely spaced frontage road intersections, which is also projected to occur in the previous scenario.

The northbound left-turn movement at the Bailey Road and Brownfield Drive intersection is projected to operate at LOS D during both peak hours. By providing a separate turn lane for this movement, northbound right-turn traffic will be able to bypass any queued left-turn traffic.

Extending Cape Drive to Ranson Road will provide another route to access the middle school. The traffic impact study for the middle school did not consider any traffic using Cape Drive to access the school. During times before and after school is in session, a significant volume of traffic and congestion is anticipated when drivers drop-off or pick-up students. This operation usually generates long queues on school sites.

Providing another access to the middle school could impact the routes drivers use to enter and exit the site. There is potential that school traffic may use Cape Drive to avoid congestion and long queues on the school site. Traffic on the school site should be planned to circulate in a manner that does not allow drivers to enter or exit the queue for student pick-up and drop-off from Cape Drive. This may require gates or other devices on the school site to reinforce the intended routing of traffic.

Summary

TranSystems has completed a traffic impact study for the proposed residential development generally located in the southwest corner of Ranson Road and Bailey Road 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 Bailey Farms development will include 283 residences. Access to the development will be provided from the south side of the Bailey Road and Brownfield Drive intersection. Access will also be provided from an extension of Cape Drive east of the middle school site to Ranson Road.

Several developments have been approved in recent years in the vicinity of the site. This includes the Princeton Senior Living facility, Culver's, and the Lee's Summit Middle School. The recommended improvements and development trips from these projects were included in the analysis scenarios for this study.

Several improvements were identified to mitigate the impact of development traffic and to comply with Lee's Summit and MoDOT access management guidelines. These improvements include the following:

- ▶ Construct a westbound left-turn lane on Bailey Road at Brownfield Drive with a minimum storage length of 200 feet plus appropriate taper. Alternatively, Bailey Road could be widened for a two-

way left-turn lane from Ranson Road to the middle school site. This would require coordination with the improvements required for the middle school project.

- ▶ Construct a northbound left-turn lane on Brownfield Drive at Bailey Road with a minimum storage length of 100 feet plus appropriate taper.
- ▶ Construct a southbound right-turn lane on Ranson Road at Cape Drive with a minimum storage length of 200 feet plus appropriate taper.

With the identified improvements, the study intersections are projected to operate at acceptable levels of service during both peak hours with the addition of development traffic. The only exception is the Ranson Road and US-50 Highway westbound ramps. During the A.M. peak hour, long queues and delays are projected on the ramp. This same situation was identified in the traffic impact study for the middle school. The proposed development will have a minimal impact on the westbound ramp.

Some longer queues are also projected on Ranson Road at the US-50 interchange that will extend back through the adjacent frontage Road intersections of Oldham Parkway and Blue Parkway. These two signalized frontage road intersections are closely spaced to the ramps, which provides minimal queue storage between intersections.

Extending Cape Drive to Ranson Road will provide another route to access the middle school. There is potential that school traffic may use Cape Drive to avoid congestion and long queues on the school site. Traffic on the school site should be planned to circulate in a manner that does not allow drivers to enter or exit the queue for student pick-up and drop-off from Cape Drive. This may require gates or other devices on the school site to reinforce the intended routing of traffic.

Appendix A - Figures

Figure A-1	Location Map
Figure A-2	Site Plan
Figure A-3	Existing plus Approved Conditions Lane Configurations
Figure A-4	Existing plus Approved Conditions A.M. Peak Hour Traffic Volume
Figure A-5	Existing plus Approved Conditions P.M. Peak Hour Traffic Volume
Figure A-6	Existing plus Approved Conditions A.M. Peak Hour Queue Lengths
Figure A-7	Existing plus Approved Conditions P.M. Peak Hour Queue Lengths
Figure A-8	Existing plus Approved plus Proposed Conditions Lane Configurations
Figure A-9	Existing plus Approved plus Proposed Conditions A.M. Peak Hour Traffic Volume
Figure A-10	Existing plus Approved plus Proposed Conditions P.M. Peak Hour Traffic Volume
Figure A-11	Existing plus Approved plus Proposed Conditions A.M. Peak Hour Queue Lengths
Figure A-12	Existing plus Approved plus Proposed Conditions P.M. Peak Hour Queue Lengths

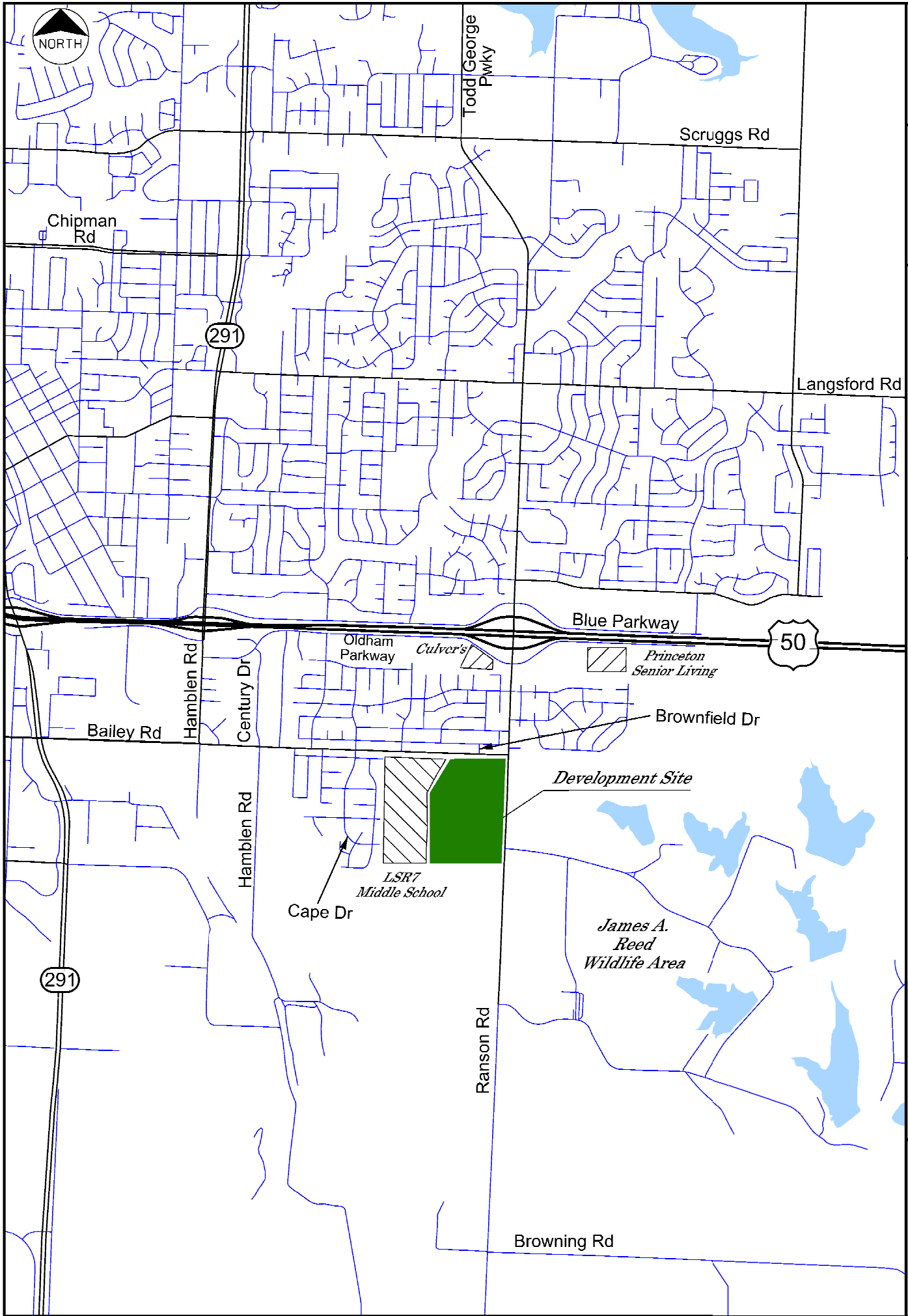


Figure A-1

February 2021

No Scale

Bailey Farms
Traffic Impact Study
Lee's Summit, Missouri

LOCATION MAP

