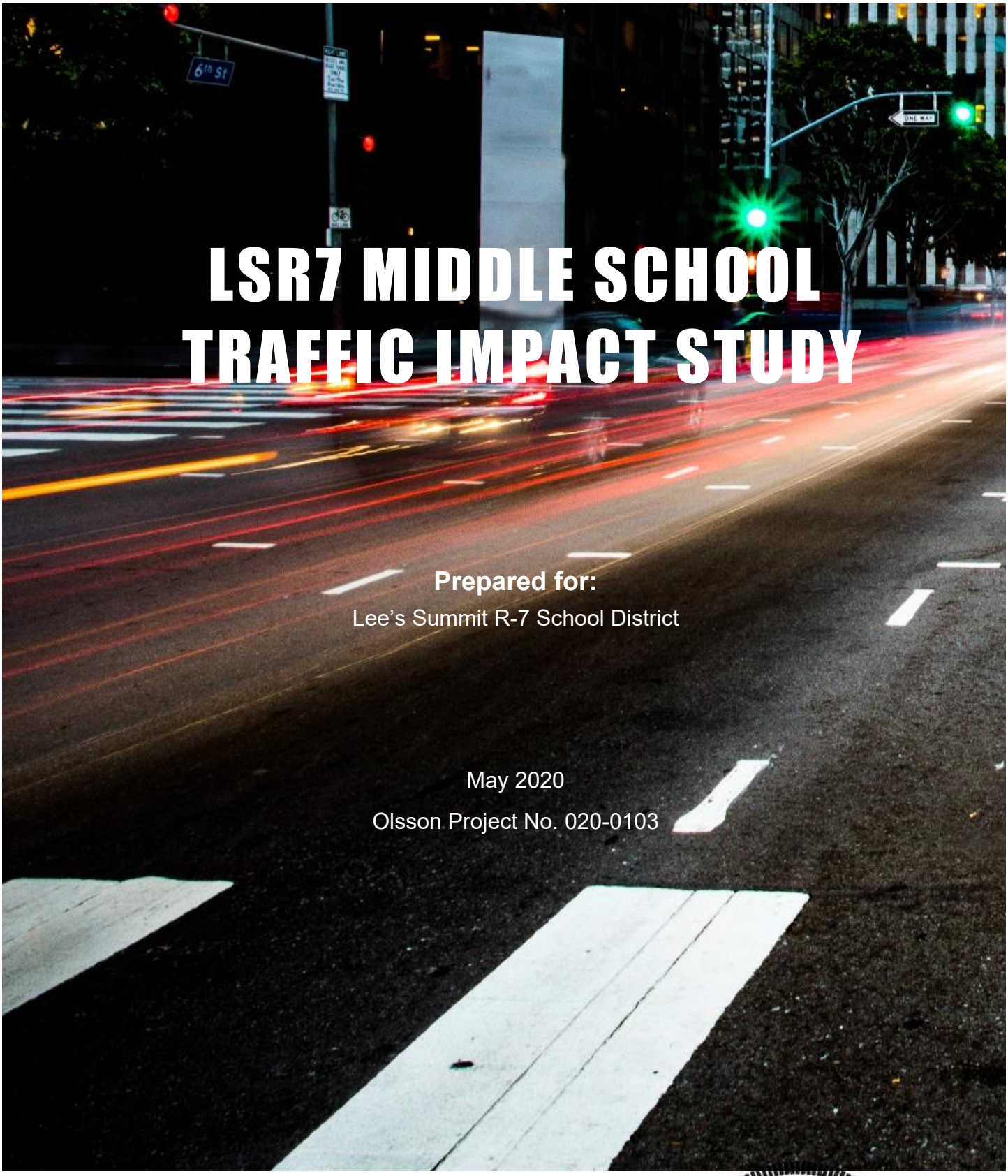

LSR7 MIDDLE SCHOOL TRAFFIC IMPACT STUDY

Prepared for:

Lee's Summit R-7 School District

May 2020

Olsson Project No. 020-0103

olsson

STATE OF MISSOURI
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1. INTRODUCTION

This report studies traffic impacts associated with a proposed middle school complex located south of Bailey Road and west of Ranson Road in Lee's Summit, Missouri.

This report will review the impacts of the proposed site on the existing roadway network and will recommend additional turn lanes, storage bays, and intersection control methods per the City of Lee's Summit *Access Management Code* and Missouri Department of Transportation's (MoDOT's) Engineering Policy Guide (EPG), as appropriate, for the following study intersections:

- Ranson Road and US-50 Westbound Ramps
- Ranson Road and US-50 Eastbound Ramps
- Ranson Road and Oldham Parkway
- Ranson Road and Bailey Road
- Bailey Road and Century Drive / Hamblen Road East (referred to as Century Drive)
- Bailey Road and Hamblen Road West (referred to as Hamblen Road)
- Proposed Site Driveways

For this study, the following scenarios were analyzed for the AM (coincides with school arrival), Afternoon (coincides with school dismissal), and PM (includes commuters and after school functions) peak hour periods:

- Existing Conditions (Includes approved Culver's and Princeton senior living community)
- Existing Plus Proposed School Conditions
- Future Planned Development Conditions (includes future Bailey Farm residential development)

The approximate locations of the proposed school complex, approved developments, and future development are shown on **Figure 1**.

FIGURE 1

Vicinity Map

LSR7 Middle School
Lee's Summit, MO

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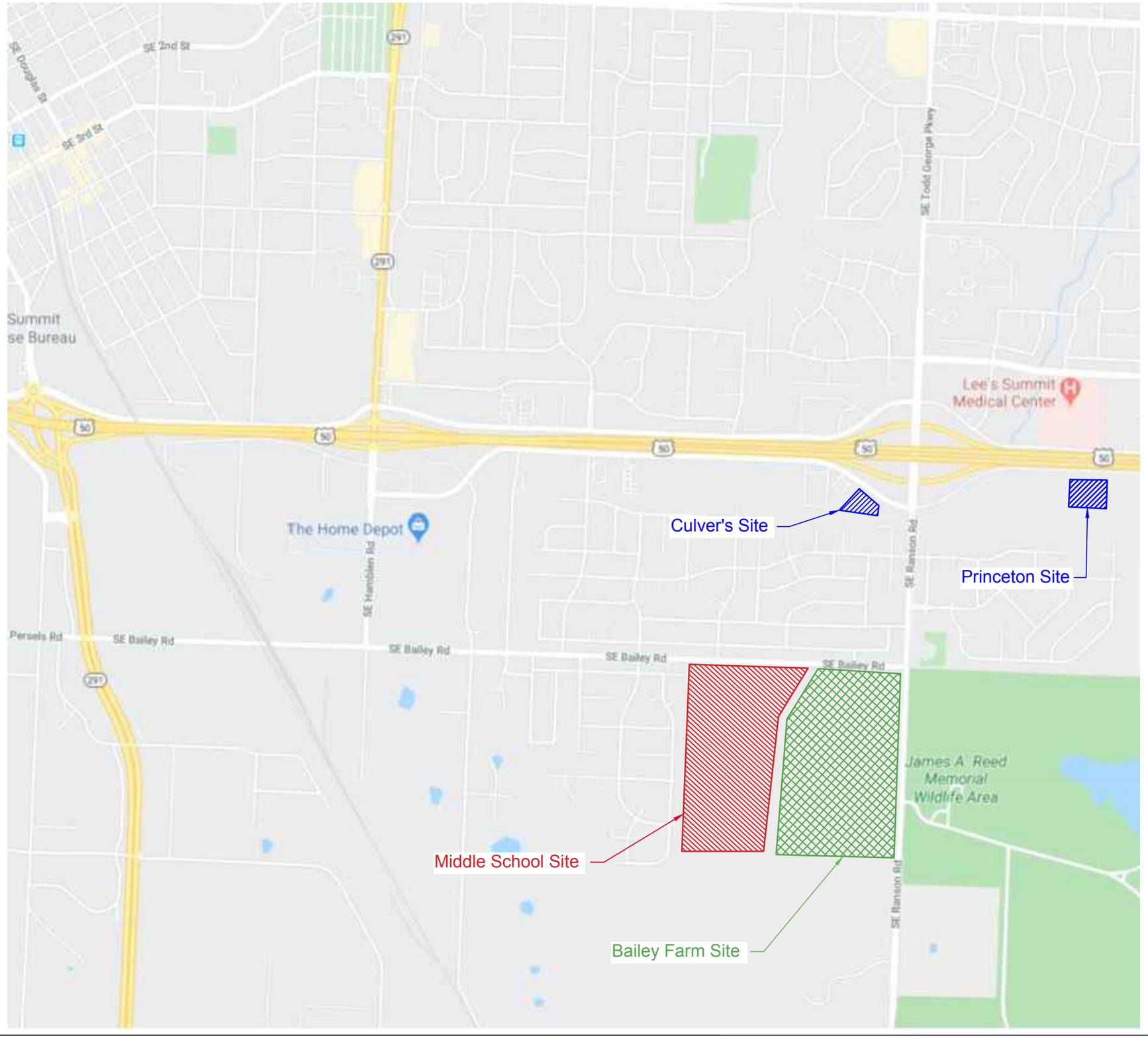

LEGEND

- Middle School Site Location
- Culver's & Princeton Site Locations (Approved)
- Bailey Farm Site Location (Future)

2. DATA COLLECTION

At the time of this report, local and regional travel patterns have been affected by the Covid-19 stay-at-home order, resulting in decreased traffic volumes when compared to typical conditions. To provide for analysis of more typical conditions, recent traffic counts collected prior to the stay-at-home order were utilized where possible. **Table 1** illustrates count data provided and utilized for the purposes of this study.

Table 1. Provided Traffic Count Data.

Intersection	Source	Date of Count	Peak Period Provided
Bailey Road and Hamblen Road	City	May 14th, 2019	AM and PM
Bailey Road and Century Drive	City	May 2nd, 2019	AM and PM
Bailey Road and Ranson Road	City	April 25th, 2017	AM and PM
Ranson Road and Oldham Parkway	Approved traffic impact study	October 24-25th, 2018	AM and PM

The approved traffic impact study provided by the City included traffic volumes for the intersection of Ranson Road and Oldham Parkway which reflect the impact of a proposed Culver's development and the proposed Princeton senior living community. This count was utilized for this study, thus the impact of these two approved developments are included in existing conditions analysis.

New counts were collected at the US-50 Interchange Ramps with Ranson Road on Tuesday, April 7th, 2020. Due to variance in data collection dates, volumes were increased/balanced as appropriate across the study intersections.

The City and approved traffic study counts did not include data for the Afternoon peak hour, expected to occur from 3:00-4:00 PM. To obtain this, City average daily traffic (ADT) data in the vicinity of the project area was reviewed to compare the Afternoon and PM peak hour periods. It was determined that the Afternoon peak hour has approximately 80% of the volume observed during the PM peak hour. At study intersections where data was obtained from City or approved study counts, the existing PM peak hour counts were reduced to obtain existing Afternoon turning movement volumes.

The approach to adjust volumes to address impacts of the Covid-19 stay-at-home orders and determination of afternoon peak hour volumes were coordinated with and approved by the City of Lee's Summit and MoDOT staff.

In general, the AM peak hour was observed to be from 7:15 AM – 8:15 AM. The afternoon peak hour is expected to occur from 3:00 PM – 4:00 PM. The PM peak hour was observed to be from 4:30 PM – 5:30 PM.

The existing peak hour volumes are illustrated in **Figure 1**. Turning movement count data, ADT data, and additional information regarding volume balancing is provided in **Appendix A**.

The data collection effort also included documentation of current roadway geometrics and obtaining existing and planned traffic signal timings. Existing signal timing information at the US-50 Interchange with Ranson Road was obtained from the Mid-America Regional Council's (MARC) Central Traffic Control System (TransSuite). Signal timings have not been developed at the planned signalized intersections but were approximated considering existing volumes, proximity and timings at adjacent intersections, and general guidance from City staff.

FIGURE 2

Existing
Peak Hour Volumes

LSR7 Middle School
Lee's Summit, MO

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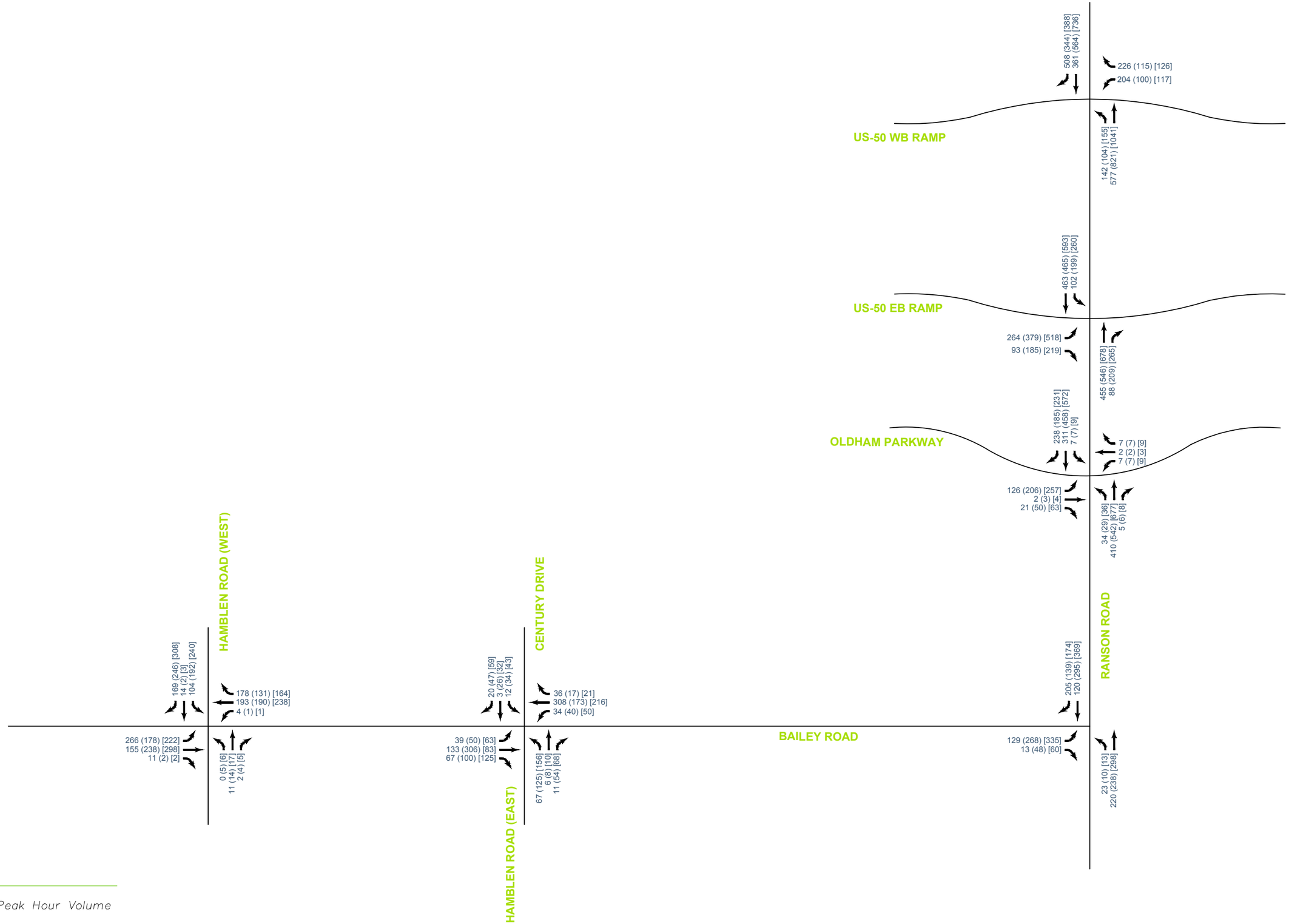

LEGEND

AM (Afternoon) [PM] *Total Peak Hour Volume*

3. EXISTING CONDITIONS

Existing traffic conditions were evaluated to identify any existing deficiencies and to provide a baseline for comparative purposes. At the request of the City, two approved development projects were included within the existing conditions. The proposed Princeton senior living project is located east of Ranson Road along Oldham Parkway. The proposed Culver's project is located west of Ranson Road along Oldham Parkway. Traffic volumes associated with both approved projects were obtained from the approved traffic impact study and are reflected in the turning movement data referenced for the intersection of Ranson Road and Oldham Parkway.

Based on direction from City and MoDOT staff, the following planned improvements were considered in-place under existing conditions analysis:

- Traffic signal at Ranson Road and Oldham Pkwy with 150-foot northbound left-turn lane
- Traffic signal at Bailey Road and Hamblen Road with 90-foot westbound left-turn lane

3.1. Network Characteristics

Six roadways within the study area were considered during analysis: US-50, Oldham Parkway, Ranson Road, Bailey Road, Century Drive, and Hamblen Road. Ranson Road is also designated as Route RA; for the purposes of this report the roadway will be referred to as Ranson Road.

US-50, Ranson Road, and Oldham Parkway are maintained by MoDOT. The functional classification for these roadways was acquired from the MoDOT Functional Classification System Map. The other three roadways are maintained by the City of Lee's Summit and were referenced from the City's *Thoroughfare Master Plan.* Current network characteristics are summarized in **Table 2**.

Table 2. Existing Network Summary.

Roadway	Functional Classification	Typical Section	Median Type	Posted Speed
US-50	Other Freeway and Expressway (MoDOT)	4-Lane	Divided	65 mph on mainline / 40 mph on exit ramps
Oldham Parkway	Local (MoDOT)	2-Lane	None	40 mph
Ranson Road	Minor Arterial / Major Collector* (MoDOT)	4-Lane / 2-Lane*	Divided / None*	40 mph / 45 mph*
Bailey Road	Minor Arterial (City)	2-Lane	None	35 mph
Century Drive / Hamblen Road East	Local / Minor Arterial** (City)	2-Lane	None	25 mph north / 40 mph south
Hamblen Road West	Minor Arterial (City)	2-Lane	None	35 mph north / 25 mph south

*Minor Arterial north of Bailey Road, Major Collector south of Bailey Road. 4-lane divided with 40 mph speed limit near interchange transitioning to 2-lane undivided with 45 mph speed limit south of Oldham Parkway.
**Local north of Bailey Road, Minor Arterial south of Bailey Road

The US-50 Ramps and Ranson Road intersections are signalized. Pedestrian accommodations including marked crosswalks and pedestrian pushbuttons and signal heads are provided at each intersection for north/south crossings. No pedestrian accommodations are present for crossing Ranson Road at either intersection.

The intersection of Oldham Parkway and Ranson Road is planned for signalization. Marked crosswalks are currently provided for north/south travel, and pedestrian pushbuttons and signal heads are assumed to be provided when the signal is installed. No pedestrian accommodations are currently present for crossing Ranson Road at the intersection.

The intersection of Bailey Road and Ranson Road is unsignalized with stop-control at the minor approach (eastbound). Sidewalk is present in the northwest corner. Pedestrian crossing accommodations are not provided at the intersection. An unsignalized pedestrian crossing is provided approximately 450 feet north of Bailey Road across Ranson Road.

The intersection of Bailey Road and Century Drive is unsignalized. Sidewalk is provided along the north side of Bailey Road in the vicinity of the intersection and terminates west of Century Drive. Sidewalks are not present along the south side of Bailey Road except for an unconnected section along a developed lot in the southwest corner. Marked crosswalks are not provided.

The intersection of Bailey Road and Hamblen Road is planned for signalization by the City. Sidewalk will be provided in the northeast corner, and a shared use-path will be provided in the southwest and southeast corners for east/west travel. Pedestrian accommodations including marked crosswalks, pedestrian pushbuttons and signal heads are proposed to be provided at the south and east legs with the signalization project.

The study roadways of Bailey Road and Ranson Road are included in *Exhibit 4 – Bicycle Transportation Plan* of the City's *Thoroughfare Master Plan 2015-2040 (TMP).* Along Bailey Road, on-street bicycle lanes are provided between Century Drive and Ranson Road and is designated as planned west of Century Lane. An off-street path is also designated as planned for this section. Along Ranson Road, an off-street path is provided north of Bailey Road and is designated as planned for south of Bailey Road.

The City of Lee's Summit has adopted an Unimproved Road Policy to provide design guidelines for development activity impacting roadways that are constructed to unimproved/interim standards. Based on *Exhibit 6 – Existing Unimproved and Interim Roadways and Network Gaps* of the *TMP*, Hamblen Road East (south leg of the intersection of Century Drive and Bailey Road) is currently constructed to interim standard. All other study roadways are pending permanent or are not identified as substandard. The proposed middle school is not located along Hamblen Road East and is not expected to generate trips from this section of roadway.

3.2. Existing Warrant Analysis

Signal Warrants

A traffic signal may be justified if traffic conditions meet any of the applicable nine signal warrants described in the 2009 Manual on Uniform Traffic Control Devices (MUTCD). The MUTCD provides criteria for conducting an engineering study to determine whether a traffic signal is appropriate at any intersection.

For this study, based on the data available, the Peak Hour Signal Warrant (Warrant 3) was reviewed under existing conditions to determine if alternative control measures are warranted for the currently unsignalized intersections of Bailey Road with Century Drive and Bailey Road with Ranson Road.

Based on available data, the intersection of Bailey Road with Century Drive is on the threshold for meeting a signal warrant during the PM peak hour.

A traffic signal is currently warranted at intersection of Bailey Road with Ranson Road during the Afternoon and PM peak hours.

Capacity and queueing analysis were also reviewed (see **Section 3.3**) to determine if signalization is recommended. Signal warrant analysis sheets are provided in **Appendix B**.

Turn Lane Warrants

City of Lee's Summit Access Management Code (AMC) guidelines were reviewed for turn lanes at study intersections along Bailey Road. MoDOT's Access Management Guidelines, located in MoDOT Engineering Policy Guide (EPG) Section 940.9, were reviewed for turn lanes at study intersections along Ranson Road.

Left-turn Lanes: Based on the Lee's Summit AMC, left-turn lanes shall be provided on all approaches to intersections controlled by a signal. Left-turn lanes are provided at the planned signal of Hamblen Road and Bailey Road except for the northbound approach, which is a private drive with minimal northbound traffic.

Based on the Lee's Summit AMC, left-turn lanes shall be provided on all arterial streets at the intersection with another arterial and on non-residential connectors intersecting with minor arterial streets where the left-turn volume is at least 20 vehicles per hour (vph). Left-turn lanes are provided at these locations except in the eastbound, westbound, and southbound directions at Century Drive and Bailey Road and in the eastbound at Bailey Road and Ranson Road.

Per the AMC, the minimum length of a left-turn lane should be 250 feet plus taper on an arterial street intersecting another arterial street and 200 feet plus taper on an arterial street at other locations. The existing southbound left-turn lane (110 feet) and planned westbound left-turn (90 feet) at Hamblen Road and Bailey Road and the existing northbound left-turn lane (110 feet) at Century Drive and Bailey Road do not meet the standard turn bay lengths. Increasing these turn bays could be achieved but would result in existing driveways being located within the turn bay and/or taper.

The MoDOT left-turn lane warrant was reviewed at study intersections along Ranson Road for which no left-turn lane is provided. Based on the MoDOT guidelines provided in the *EPG*, no additional left-turn lanes are currently warranted.

Right-turn Lanes: Based on the Lee's Summit AMC, right-turn lanes shall be provided on minor arterial streets at all connections with a turning volume of at least 60 vph. Right-turn lanes are provided at these locations except in the westbound and southbound directions at Hamblen Road and Bailey Road, northbound direction at Century Drive and Bailey Road, and eastbound direction at Ranson Road and Bailey Road.

Per the AMC, the minimum length of a right-turn lane should be 200 feet plus taper on a minor arterial street intersecting another arterial street. The existing eastbound right-turn lane (100 feet) at Century Drive and Bailey Road is below City standard.

The MoDOT right-turn lane warrant was reviewed at study intersections along Ranson Road for which no right-turn lane is provided. Based on the MoDOT guidelines provided in the *EPG*, a southbound right-turn lane is warranted for all three time periods at Ranson Road and Bailey

Road. A northbound right-turn lane is also warranted at Ranson Road and the US-50 Eastbound Ramps for the Afternoon and PM peak hour periods.

Per MoDOT guidelines, a right-turn lane along a 40-mph roadway should have a minimum deceleration/storage of 90 feet plus 100-foot taper. The westbound right-turn lane at Ranson Road and the US-50 Westbound Ramps provides 70 feet of deceleration/storage with no taper.

A summary of existing locations that do not meet left or right-turn lane standards is provided below:

- Northbound left-turn lane at Hamblen Road and Bailey Road is not planned
- Southbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
- Westbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
- Eastbound, westbound, and southbound left-turn lanes at Century Drive and Bailey Road are not provided
- Northbound left-turn lane with reduced storage at Century Drive and Bailey Road
- Eastbound left or right-turn lane at Ranson Road and Bailey Road
- Westbound and southbound right-turn lanes at Hamblen Road and Bailey Road are not provided
- Northbound right-turn lane is not provided at Century Drive and Bailey Road
- Eastbound right-turn lane with reduced storage at Century Drive and Bailey Road
- Southbound right-turn lane at Ranson Road and Bailey Road is not provided
- Northbound right-turn lane at Ranson Road and the US-50 Eastbound Ramps is not provided
- Westbound right-turn lane with reduced storage at Ranson Road and the US-50 Westbound ramps

Capacity and queueing analysis were reviewed (see **Section 3.3**) to determine if additional left/right-turn lanes and/or increased storage length is recommended based on existing operations. Existing conditions lane configurations and traffic control for the study intersections are illustrated in **Figure 3**. Turn lane warrant worksheets are provided in **Appendix B**.

3.3. Existing Capacity Analysis

Capacity analysis was performed for the study intersections utilizing the existing lane configurations and traffic control, including the planned signalization and geometric improvements at the intersections of Bailey Road with Hamblen Road west and Ranson Road with Oldham Parkway. Analysis was conducted using Synchro, Version 11, based on the Highway Capacity Manual (HCM) delay methodologies. For simplicity, the amount of control delay is equated to a grade or Level of Service (LOS) based on thresholds of driver acceptance.

The amount of delay is assigned a letter grade A through F, LOS A representing little or no delay and LOS F representing very high delay. **Table 3** shows the delays associated with each LOS grade for signalized and unsignalized intersections, respectively. Queuing analysis was also conducted using the 95th-percentile queue length. This represents the queue length that has a 5 percent probability of being exceeded during the peak hour period.

Table 3. Intersection LOS Criteria.

Level of Service	Average Control Delay (seconds)	
	Signalized	Unsignalized
A	< 10	< 10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50
Highway Capacity Manual (HCM 6th Edition)		

The City of Lee's Summit references a Level of Service Policy to provide guidelines for acceptable traffic operations on its roadways. According to the policy, an overall LOS C is desirable at signalized intersections, and a LOS D may be acceptable under extraordinary circumstances. Based on discussions with City staff, individual signalized movements with a LOS D or E are typically considered acceptable. A LOS C is desirable at unsignalized intersections, and lower levels of service may be acceptable depending on the situation. MoDOT typically accepts overall peak hour LOS D (or LOS E in certain instances) on urban roadways. LOS D or E is typically considered acceptable for signalized and unsignalized individual movements.

Results of the analysis indicate that the planned signalized study intersection of Hamblen Road and Bailey Road is expected to operate at an overall LOS C or better during the three peak hour periods, which is considered acceptable based on the City's LOS Policy. Individual movements are operating at a LOS C or better with acceptable queues with one exception: the westbound shared through/right movement 95th-percentile queue is expected to extend past the adjacent left-turn lane/taper during all three peak hour periods. During the afternoon and PM peak hours, the queue is expected to block the adjacent driveway and extend toward the intersection of Fleetway Drive. As discussed previously, extension of this turn bay would result in existing driveways being located within the turn lane or taper.

Results of the analysis indicate that the existing signalized study intersections at the US-50 interchange with Ranson Road and the planned signalized intersection at Ranson Road and

Oldham Parkway are expected to operate at an overall LOS D or better during the three peak hour periods, which is typically considered acceptable for MoDOT maintained intersections. Individual signalized movements are expected to operate at a LOS D or better with acceptable queues with the following exceptions:

Ranson Road and Oldham Parkway

- Afternoon and PM Peak Hours
    - The northbound through movement 95th-percentile queue (167 feet in the Afternoon, 215 feet in the PM) is expected to extend past the adjacent left-turn lane and taper.
    - The southbound through movement 95th-percentile queue (177 feet in the Afternoon, 481 feet in the PM) is expected to extend past the adjacent left-turn bay/taper (afternoon) and into the upstream interchange ramp terminal (PM). Queueing between closely spaced outer road signalized intersections is not uncommon during peak hour periods.

Ranson Road and US-50 Eastbound Ramps

- PM Peak Hour
    - The southbound left-turn movement is expected to operate at a LOS F with a 95th-percentile queue of 228 feet, which exceeds available storage (200 feet).
    - The northbound shared through/right turn movement 95th-percentile queue (285 feet) is expected to extend past the adjacent left-turn bay/taper and toward the upstream signal at Oldham Parkway.

Ranson Road and US-50 Westbound Ramps

- AM Peak Hour
    - The southbound right-turn movement is expected to operate with a LOS E with a 95th-percentile queue of 169 feet, which extends toward the outer road signal at Blue Parkway.
    - The westbound left-turn movement is expected to operate at a LOS F with a 95th-percentile queue of 204 feet, which blocks the adjacent right-turn lane/taper.
    - An additional westbound left-turn lane was considered to address existing poor operations but would introduce a potential weaving condition unless significant roadway modifications/widening occurs along Ranson Road
- Afternoon and PM Peak Hours
    - The westbound left-turn movement 95th-percentile queue (106 feet in the Afternoon, 123 feet in the PM) is expected to block the adjacent right-turn lane/taper.

- The southbound through movement 95th-percentile queue (270 feet in the Afternoon, 347 feet in the PM) is expected to extend into the upstream outer road signal at Blue Parkway.

As stated above, poor operations and extended queueing is expected for various movements during the studied peak hour periods at the US-50 Interchange. With diamond interchange configurations, queuing between closely spaced signalized intersections, including adjacent outer road signals, is not uncommon during peak hour periods as higher ramp and crossroad volumes are serviced. An additional westbound left-turn lane was considered to address existing poor operations but would introduce a potential weaving condition without significant roadway modifications/widening along Ranson Road. Modifications to signal timings could improve poor operations but were not considered for the purposes of this study due to the impact to coordinated non-study intersections located north of US-50. A more comprehensive review of the existing interchange/outer road design or signal re-timing (considering adjacent non-study coordinated intersections) may be needed for this location.

All movements at the unsignalized study intersections are expected to operate at LOS C or better with acceptable queues during the three peak hour periods with the following exceptions:

<u>Century Drive and Bailey Road</u>

- AM Peak Hour
  - The westbound shared left/through/right movement is expected to operate at a LOS D with a 95th-percentile queue of 188 feet, which extends past the upstream driveway.
- Afternoon Peak Hour
  - The eastbound shared left/through lane is expected to operate at a LOS E with a 95th-percentile queue of 223 feet, which blocks the adjacent right-turn lane/taper.
- PM Peak Hour
  - The eastbound shared left/through lane is expected to operate at a LOS F with a 95th-percentile queue of 540 feet, which blocks the adjacent right-turn lane and extends approximately halfway to the planned signal at Hamblen Road.
  - The westbound shared left/through/right movement is expected to operate at a LOS D with a 95th-percentile queue of 158 feet, which extends past the upstream driveway.

<u>Ranson Road and Bailey Road</u>

- Afternoon and PM Peak Hour

- The eastbound shared left/right movement is expected to operate at a LOS F. The 95th-percentile queue is approximately 290 feet during the afternoon and 725 feet during the PM peak hour.

The existing conditions capacity analysis summary is illustrated in **Figure 4**. Detailed results may be found in **Appendix B**.

Several existing turn lanes were noted to not meet City or State guidance as presented in **Section 3.2**. Capacity and queuing analysis were reviewed and found that some movements are expected to operate at an acceptable level of service with the current configuration. However, the following modifications are recommended based on existing turn lane warrants and existing poor operations:

- *Provide alternate traffic control at Century Drive and Bailey Road. A traffic signal was considered for this report acknowledging the planned signal at Hamblen Road and the potential for coordination. A roundabout may be feasible at this intersection, but further investigation would be required to review available right-of-way and impact to adjacent existing development.*
- *Provide left-turn lanes at Century Drive and Bailey Road (storage length of 250 feet plus taper eastbound/westbound and 150 feet plus taper southbound).*
- *Provide a traffic signal at Ranson Road and Bailey Road.*
- *Provide right-turn lanes at Ranson Road and Bailey Road (storage length of 200 feet plus taper southbound and eastbound).*
- *Provide northbound right-turn lane at Ranson Road and the US-50 Eastbound Ramps (continuous to the upstream signal at Oldham Parkway with approximately 190 feet of storage and no taper).*

Due to the existing operational and turn lane deficiencies, capacity analysis was subsequently performed with the recommended improvements in place. This provides comparison with and without improvements under existing conditions. These lane configurations and traffic control are illustrated in **Figure 5**. The capacity analysis summary considering existing conditions with recommended improvements is illustrated in **Figure 6**. Detailed results are provided in **Appendix B**.

FIGURE 3

Existing
Lane Configuration and Traffic Control

LSR7 Middle School
Lee's Summit, MO

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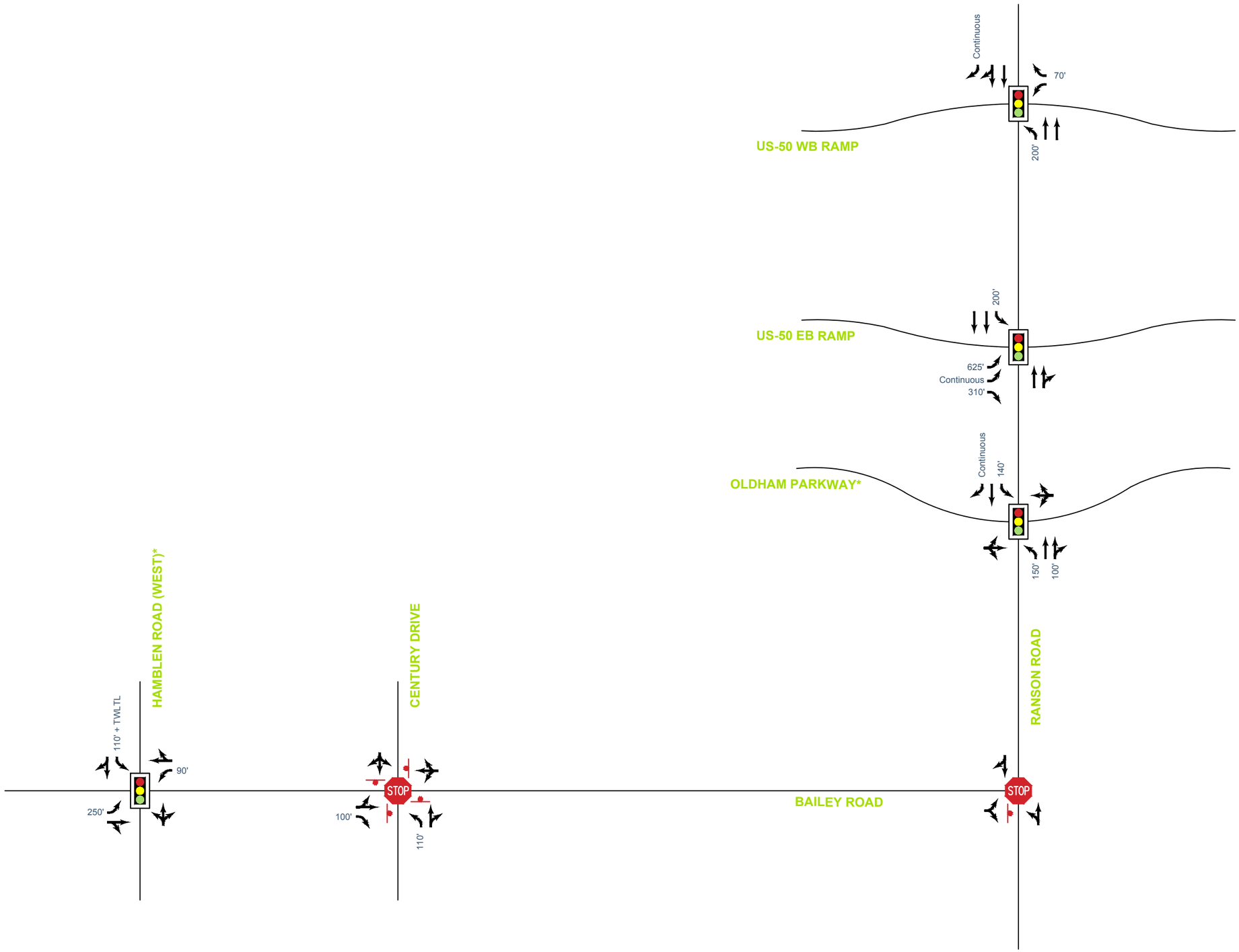

LEGEND

- XX' — *Lane Configuration & Storage Length*
- *Signalized Intersection*
- STOP — *Stop Controlled Intersection*
- *Stop Sign*
- TWLTL — *Two–Way Left–Turn Lane*

**Illustrates planned improvements including signal control and turn lane modifications.*

FIGURE 4

Existing
Capacity Analysis

LSR7 Middle School
Lee's Summit, MO

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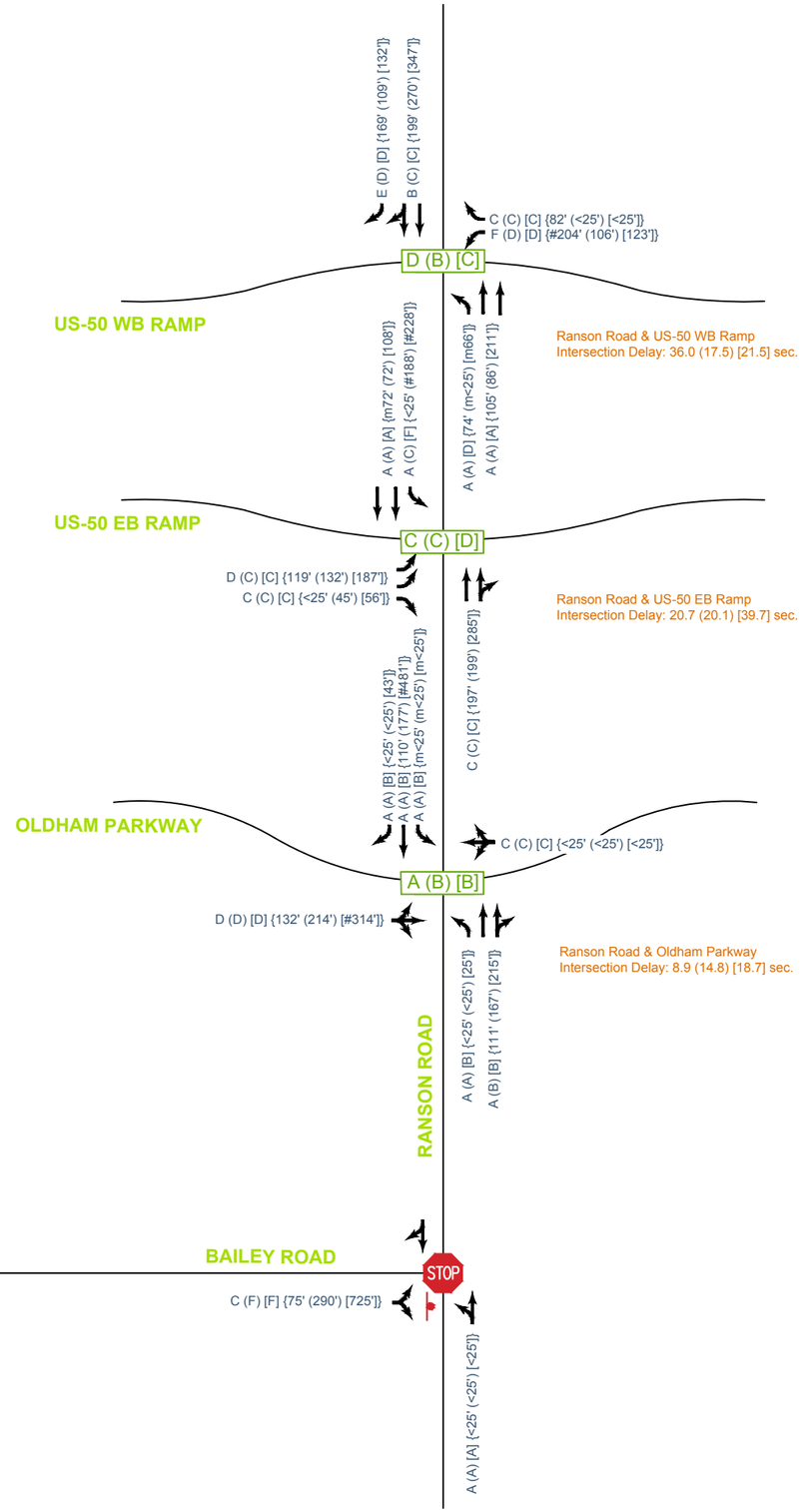

LEGEND

AM (Afternoon) [PM]	Movement LOS & {95th-Percentile Queue}
AM (Afternoon) [PM]	Signalized Intersection LOS
→	Lane Geometry
STOP	Stop Controlled Intersection
	Stop Sign
#	95th-Percentile Queue Exceeds Capacity
m	Metered by Upstream Signal

FIGURE 5

Existing
With Recommended Improvements
Lane Configuration and Traffic Control

LSR7 Middle School
Lee's Summit, MO

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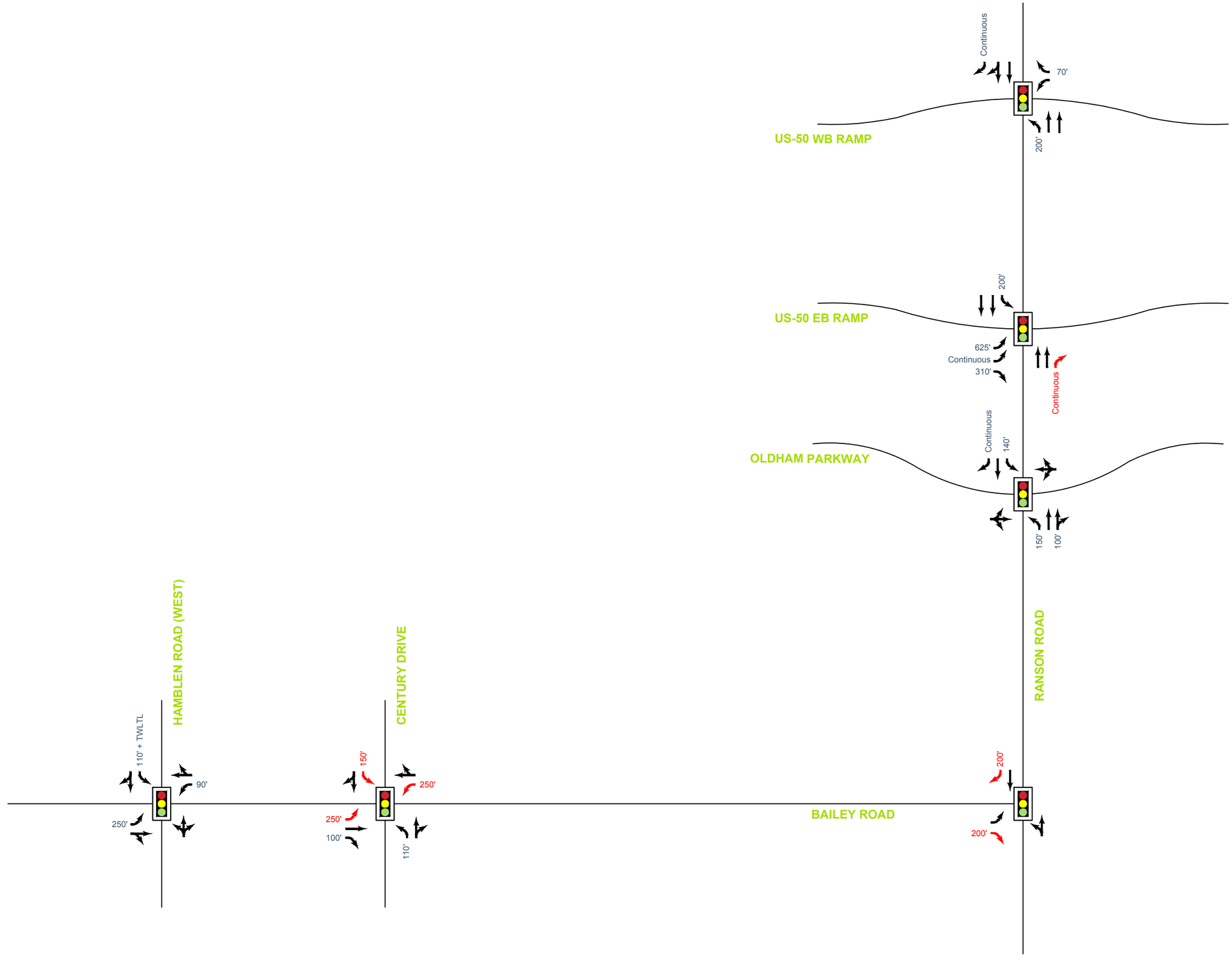

LEGEND

- XX' → *Lane Configuration*
- XX' → *Proposed Lane Configuration & Storage Length*
- *Signalized Intersection*
- STOP *Stop Controlled Intersection*
- *Stop Sign*

FIGURE 6

Existing Conditions
with Recommended Improvements
Capacity Analysis

LSR7 Middle School
Lee's Summit, MO

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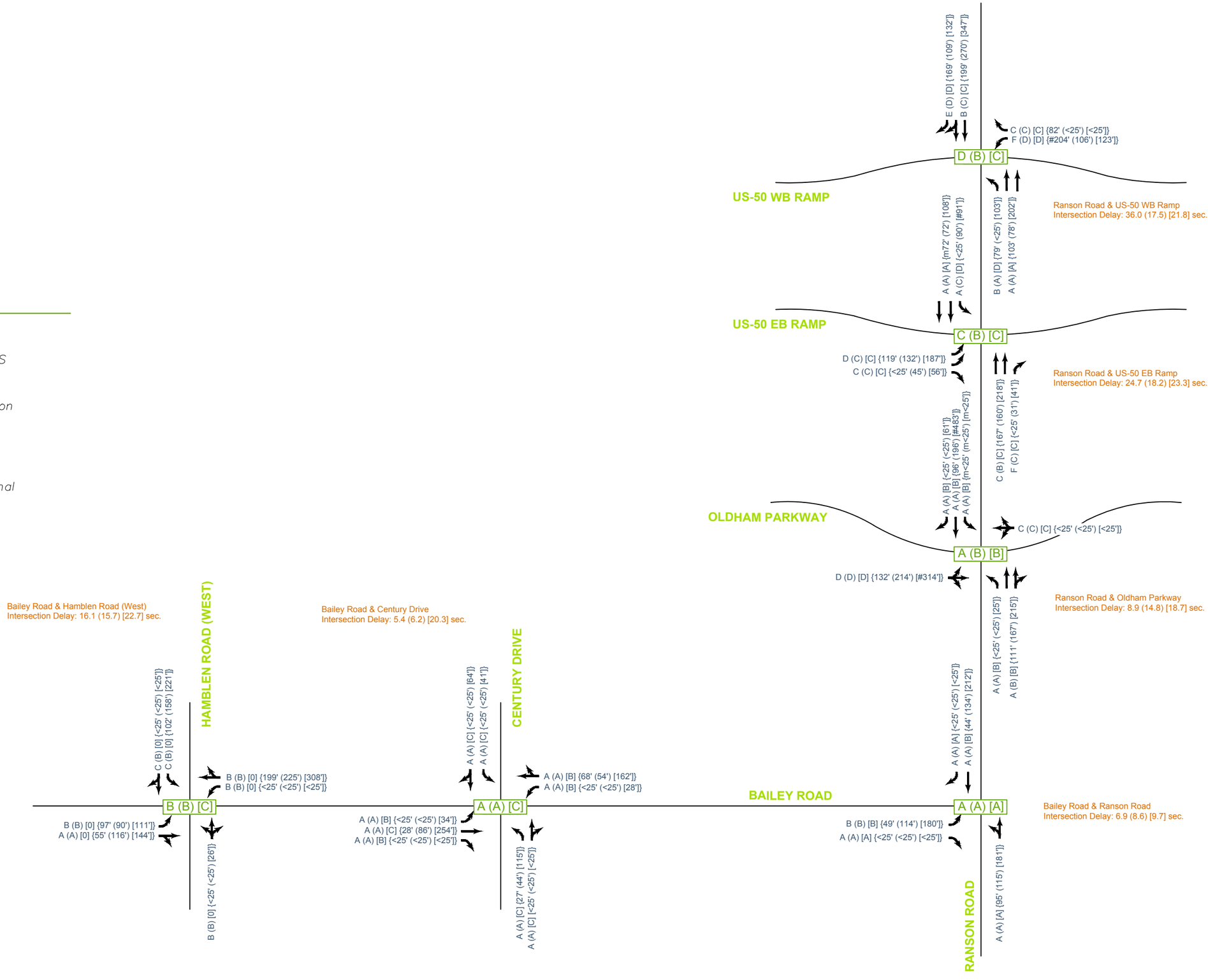
LEGEND

AM (Afternoon) [PM]	Movement LOS & {95th-Percentile Queue}
AM (Afternoon) [PM]	Signalized Intersection LOS
→	Lane Geometry
STOP	Stop Controlled Intersection
	Stop Sign
#	95th-Percentile Queue Exceeds Capacity
m	Metered by Upstream Signal



4. EXISTING PLUS PROPOSED SCHOOL CONDITIONS

The middle school is proposed south of Bailey Road, approximately 2,000 feet west of Ranson Road with an ultimate enrollment of 1,290 students. The proposed site plan is illustrated in **Figure 7**.

The site plan also illustrates four baseball/softball fields, which are expected to be primarily used by the nearby high school, located on the proposed campus north of the middle school. Trips associated with the ballfields are included in this scenario.

4.1. Trip Generation and Distribution

To determine the impact of potential site traffic, expected trips associated with the proposed school complex were generated and applied to the study network. The Institute of Transportation Engineers (ITE) provides methods for estimating traffic volumes of common land uses in the Trip Generation Manual (10th Edition). The land use that most closely resembles the proposed school is Land Use Code 522 (Middle School/Junior High School).

There is not a clearly defined ITE land use for baseball/soccer fields of this type. Thus, trips were generated based on expected usage for a typical day, which considers athletes/staff arriving from the high school for practice during the afternoon peak and leaving to the high school during the PM peak hour. Information regarding field usage trips was provided by school staff.

Trip generation characteristics expected for the site are shown in **Table 4**. Detailed ITE and expected trip generation information is provided in **Appendix C.**

Table 4. Proposed School Complex Trip Generation.

Land Use	Size	Average Weekday	AM Peak Hour			Afternoon Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Middle School / Junior High School	1,290 Students	2,748	749	404	345	410	189	221	220	108	112
Baseball / Softball Fields	4 fields	60	-	-	-	30	30	-	30	-	30
Total		**2,808**	**749**	**404**	**345**	**440**	**219**	**221**	**250**	**108**	**142**

Trips were distributed through the network based on the anticipated school service area, discussions with City and MoDOT staff, and the surrounding roadway network and land uses. Directional trip distribution percentages expected for the site are illustrated in **Table 5.**

Table 5. Proposed School Trip Distribution.

Direction	To/From	
	Middle School	Ballfields
Bailey Road (West)	10%	-
Hamblen Road (North)	5%	100%
Todd George Parkway / Ranson Road (North)	15%	-
Ranson Road (South)	20%	-
US-50 (West)	5%	-
US-50 (East)	40%	-
Adjacent Homes (Internal or Walk)	5%	-
TOTAL	**100%**	**100%**

The expected trip distribution for the proposed school is shown in **Figure 8**. The resulting existing plus proposed school volumes are illustrated in **Figure 9**.

4.2. Access Characteristics

Access to the site is proposed via two full access drives located along Bailey Road. The western drive (Drive 1) aligns with Country Lane, and the eastern drive (Drive 2) is proposed approximately 615 feet east of Drive 1. During school arrival and dismissal, Drive 1 is expected to service primarily school bus traffic, with Drive 2 serving as the main access point for student pickup/drop.

South of Bailey Road along the west side of Drive 1, three existing residential streets are proposed to be extended to connect with Drive 1 – 13th Street and Cape Drive. These connections are internal to the site and are expected to be used by the adjacent homes.

Access Spacing

Access is proposed along the City maintained roadway of Bailey Road, thus Section 15 (Connection Spacing) of the City's AMC was reviewed. Per the AMC, connections shall have a minimum spacing of 400 feet along a minor arterial, such as Bailey Road, and be located outside any intersection influence area and turn lanes. Per the AMC, the upstream intersection influence area along a 35-mph road is 370 feet (270 feet if limiting conditions), and the downstream influence area is 250 feet.

Drive 1 aligns with Country Lane and will be located with approximately 960-foot spacing from the nearest access point to the west (Cape Drive) and 615-foot spacing from the nearest access

to the east (Drive 2), both of which meet AMC spacing standards. The proposed alignment with Country Lane is recommended as it is currently shown.

Drive 2 will be located with approximately 615-foot spacing from the nearest access point to the west (Drive 1) and 1,060-foot spacing from the nearest access to the east (Brownfield Drive), both of which meet AMC spacing standards.

Access Geometrics

City standards outlined in the AMC and Design & Construction Manual were reviewed for drive width and throat characteristics. Section 18.1.D (Driveway Width) of the AMC provides standards for commercial/industrial driveways and states they may be generally applied to non-commercial access points. The Design & Construction Manual provides standards for residential access, which is considered to be similar to the proposed school driveways. Considering the operations of a school drive, which is not typical of a commercial development, residential requirements were reviewed as a minimum standard with commercial requirements referenced for general guidelines.

Table 6. Access Characteristics

Proposed Access	Public Roadway Intersected	Access Type	Proposed Throat Length	Proposed Pavement Width	Median Divided
Drive 1	Bailey Road	Full Access	310 feet	24 feet	No
Drive 2	Bailey Road	Full Access	1,200 feet	22 feet	No

Referencing *Table 18-1* of the AMC, driveways servicing between 150 – 400 vph during the peak hour period should have a driveway width from back-of-curb between 42 feet (striped for 3-lanes) and 56 feet (striped for 4 lanes) for two-way access. Trip generation completed in **Section 4.1** of this report projects that Drive 1 will service 159 vehicles during the PM peak hour but less than 150 vph during other periods. Referencing Table LS-1 of the Design & Construction Manual, residential access should have lane widths between 10.5 – 12 feet, totaling a maximum of 24 feet for two-way access. Drive 1 has a proposed driveway width of 24 feet, which would satisfy residential criteria but is less than commercial requirements. The proposed width of Drive 1 is expected to be acceptable.

Referencing *Table 18-1* of the AMC, driveways servicing over 400 vph during the peak hour period should have a minimum driveway width from back-of-curb of 42 feet (striped for 3-lanes) for two-way access and a maximum width determined by a traffic study. Drive 2 is proposed with a pavement width of 22 feet and is expected to have 641 vph during the highest peak period. It is recommended to construct Drive 2 with a width of 42 feet (from back-of-curb) to

meet minimum AMC requirements. Drive 2 should be striped for one entering lane and two exiting lanes.

Throat length standards are based on projected peak hour volumes, per the City of Lee's Summit AMC. Referencing *Table 18-2* of the AMC, driveways servicing between 100 – 400 vph during the peak hour period shall have a minimum throat length of 125 feet adjacent to an arterial roadway. Drive 1 has a proposed driveway throat length of 310 feet, which meets City standards.

Referencing *Table 18-2* of the AMC, driveways servicing over 400 vph during the peak hour period shall have a minimum throat length of 150 feet adjacent to an arterial roadway. Drive 2 has a proposed driveway throat length of 1,200 feet, which meets City standards.

Additional Safety Considerations

As mentioned in **Section 3.1**, the section of Bailey Road adjacent to the proposed access points has pedestrian and bicycle facilities including sidewalk, on-street bicycle lanes, and a planned off-street path. It is recommended to coordinate potential pedestrian/bicycle needs with the City to ensure that the proposed access points accommodate the potential planned off-street path and crossing maneuvers, if necessary.

An existing crest curve is present approximately 250 feet west of Drive 1. Proposed driveways should meet minimum sight distance requirements.

Consideration should be given to imposing a reduced school zone speed limit during school arrival and drop off periods.

FIGURE 7

Site Plan

LSR7 Middle School
Lee's Summit, MO

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FIGURE 8

Middle School Trip Distribution

LSR7 Middle School
Lee's Summit, MO

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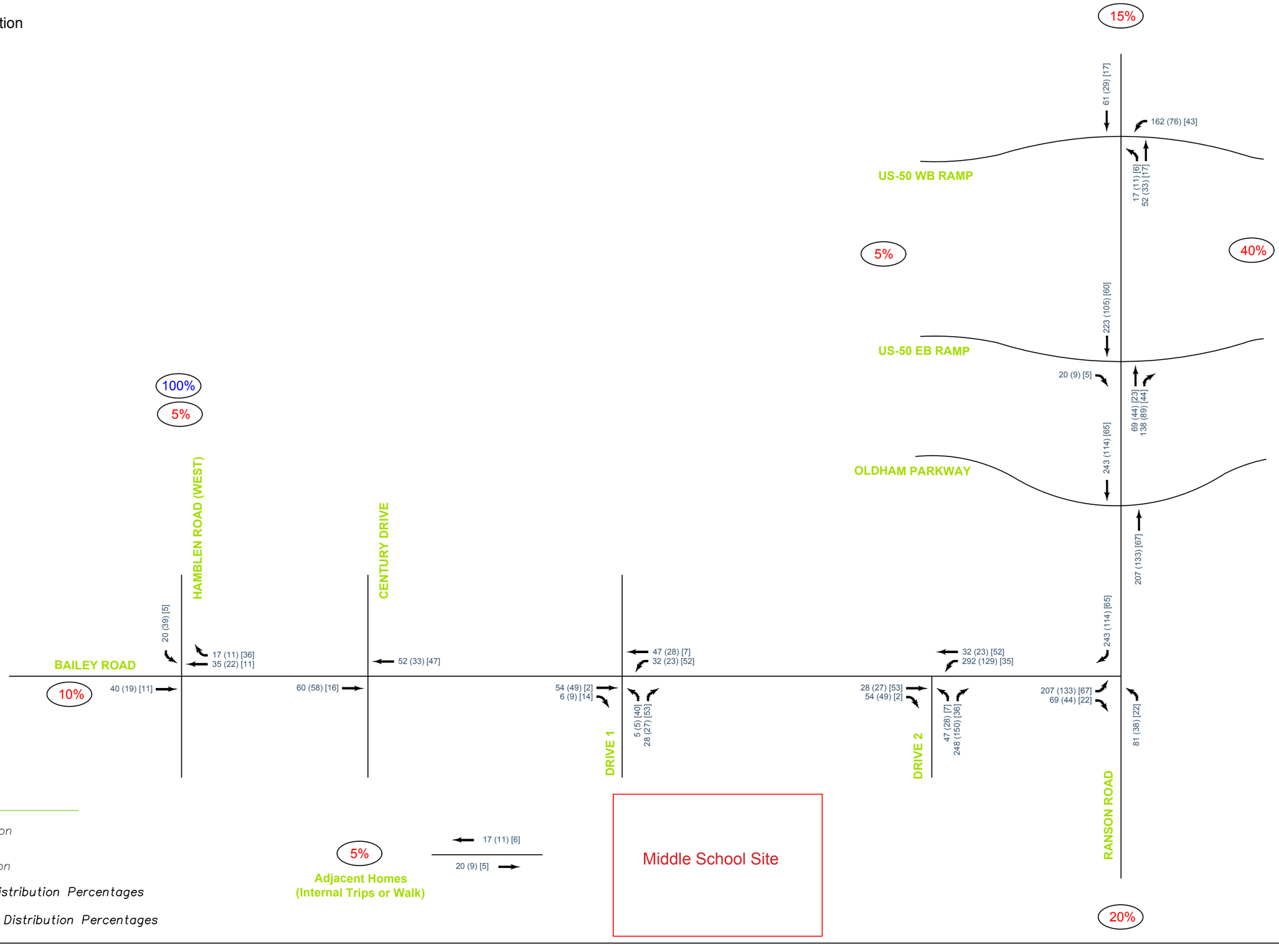

FIGURE 9

Existing Plus Proposed School Conditions
Peak Hour Volumes

LSR7 Middle School
Lee's Summit, MO

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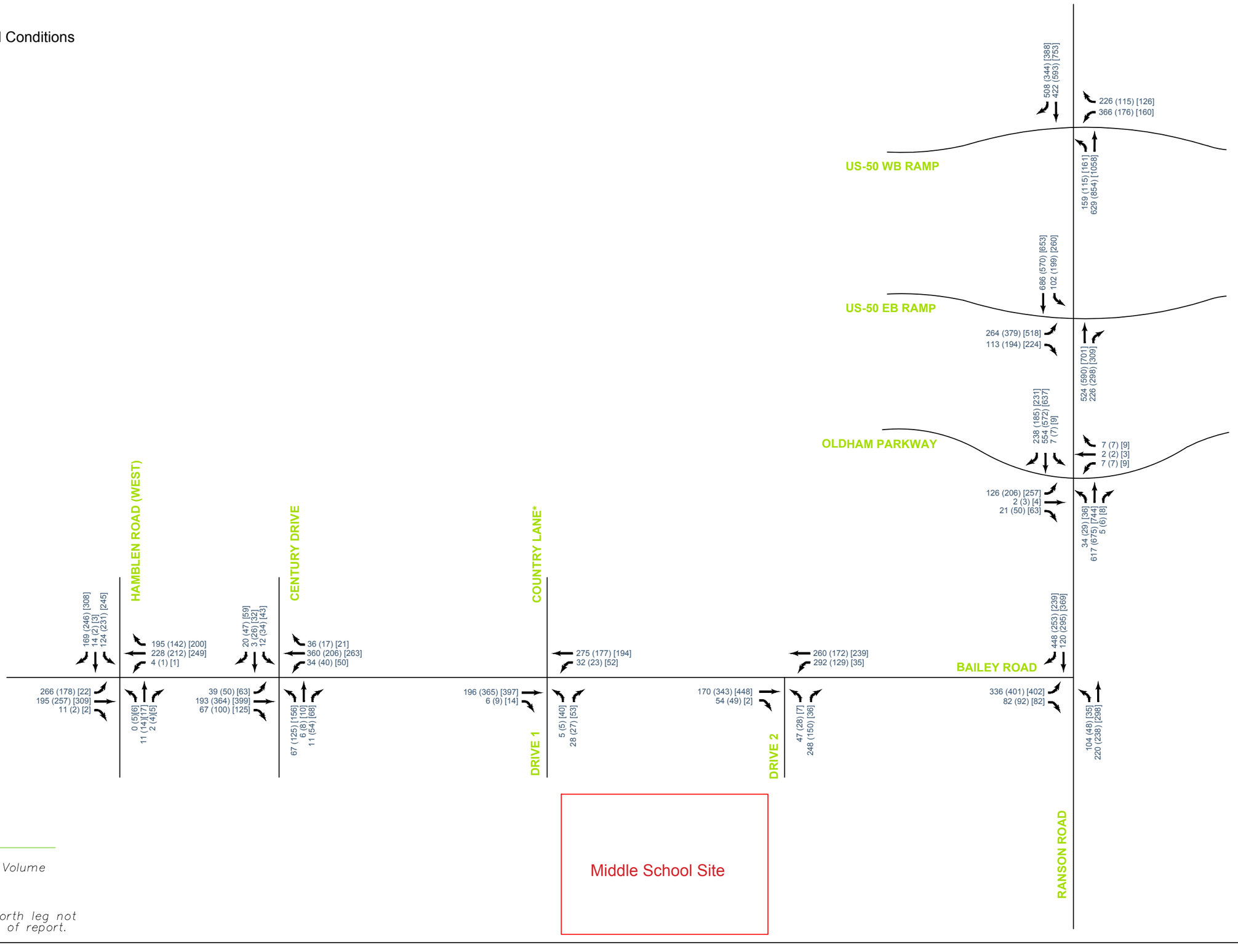

LEGEND

AM (Afternoon) [PM] *Total Peak Hour Volume*

School Location

**Data to/from north leg not available at time of report.*

4.3. Existing Plus Proposed School Warrant Analysis

Warrant analysis was conducted using the same methodology described in **Section 3.2**.

Signal Warrants
Considering existing plus proposed school volumes, school traffic at the intersection of Bailey Road with Drive 1/Country Lane is not expected to meet the criteria for signalization during any peak hour period based on Warrant 3.

The intersection of Bailey Road and Drive 2 is on the threshold for warranting a signal based on expected AM peak hour volumes. However, a significant portion of the minor street volumes (approximately 85% during the AM peak hour) are expected to turn right with minimal conflict with eastbound mainline traffic. Thus, signalization is not recommended at this time.

The intersections of Ranson Road with Bailey Road and Century Drive with Bailey Road were on the threshold or met criteria for signalization under existing conditions and have poor operations with stop-control. As discussed in **Section 3.3**, traffic signals are recommended under existing conditions and were subsequently included under existing plus proposed school conditions.

Signal warrant analysis sheets are provided in **Appendix C**.

Turn Lane Warrants
As discussed in **Section 3.2**, the following turn lane deficiencies were noted in existing conditions.

- Northbound left-turn lane at Hamblen Road and Bailey Road is not planned
- Southbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
- Westbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
- Eastbound, westbound, and southbound left-turn lanes at Century Drive and Bailey Road are not provided (*recommended under existing conditions*)
- Northbound left-turn lane with reduced storage at Century Drive and Bailey Road
- Eastbound left or right-turn lane at Ranson Road and Bailey Road (*right-turn lane recommended under existing conditions*)
- Westbound and southbound right-turn lanes at Hamblen Road and Bailey Road are not provided
- Northbound right-turn lane is not provided at Century Drive and Bailey Road
- Eastbound right-turn lane with reduced storage at Century Drive and Bailey Road
- Southbound right-turn lane at Ranson Road and Bailey Road is not provided (*recommended under existing conditions*)

- Northbound right-turn lane at Ranson Road and the US-50 Eastbound Ramps is not provided (*recommended under existing conditions*)

Left-turn Lanes: Based on the Lee's Summit AMC, left-turn lanes shall be provided on all arterial streets at the intersection with any local street/driveway where the turning volume is at least 20 vph. A left-turn lane is also warranted when a non-residential connector intersects a minor arterial where the turning volume is at least 20 vph. Per the AMC, westbound and northbound left-turn lanes are warranted at both proposed school driveways. It should be noted that, while these driveways are technically "non-residential", they are located in and serve a largely residential population. Based on this and a review of operations (see **Section 4.4**), westbound left-turn lanes with 200 feet of storage plus taper are recommended at Drive 1/Country Lane, and at Drive 2, and a northbound left-turn lane with 150 feet of storage plus taper is recommended at Drive 2. A northbound left-turn is not expected to be required due to acceptable operations.

Based on the MoDOT guidelines provided in the *EPG*, a northbound left-turn lane is expected to be warranted at Ranson Road and Bailey Road during all three peak hours. It is recommended to provide a northbound left-turn lane with 200 feet of storage plus taper at this location.

Right-turn Lanes: Based on City and MoDOT criteria, no right-turn lanes in addition to what was previously described are expected to be warranted under existing plus proposed school conditions.

Capacity and queueing analysis were also reviewed (see **Section 4.4**) to determine if additional turn lanes and/or storage length is recommended based on expected operations. Turn lane warrant worksheets are provided in **Appendix C**. Existing plus proposed school conditions lane configurations and traffic control for the study network are illustrated in **Figure 10**.

4.4. Existing Plus Proposed School Capacity Analysis

Capacity analysis was performed under existing plus proposed school conditions using the methodologies described in **Section 3.3**. The peak hour factors observed under existing conditions were utilized for this scenario except for movements which are expected to experience a notable increase in traffic. At these locations, the peak hour factors were conservatively adjusted considering the Synchro suggested values and expected traffic conditions after development. Signal timings from the previous analysis scenario were maintained.

Results of the analysis indicate that the signalized study intersections of Hamblen Road with Bailey Road and Century Drive with Bailey Road are expected to operate at an overall LOS C or better overall during the three peak hour periods, which is considered acceptable based on the

City's LOS Policy. Movements that are expected to have a reduction in operations (to LOS D or worse) or have significantly more queueing compared to existing conditions include:

Hamblen Road and Bailey Road

- AM Peak Hour
    - The southbound shared through/right movement is expected to operate at a LOS D with minimal queueing. Similar delay would be expected if a southbound right-turn lane were installed. These operations are expected to be acceptable as they are limited to one peak hour.
- AM, Afternoon, and PM Peak Hour
    - The southbound left-turn movement is expected to operate at a LOS D with similar queueing as existing conditions. These operations are expected to be acceptable as the movement is nominally higher than the upper LOS C threshold and queues are not expected to have a significant impact to adjacent traffic lanes.

Century Drive and Bailey Road

- AM Peak Hour
    - The northbound through/right and southbound lanes are expected to operate at a LOS D with minimal queueing. These operations are expected to be acceptable as the movement is nominally higher than the upper LOS C threshold, approaching traffic is minimal, and queues are not expected to have a significant impact to adjacent traffic lanes.
- AM, Afternoon, and PM Peak Hour
    - The northbound left-turn movement is expected to operate at a LOS D with similar queueing as existing conditions. These operations are expected to be acceptable as the movement is nominally higher than the upper LOS C threshold and queues are not expected to have a significant impact to adjacent traffic lanes.

Results of the analysis indicate that the signalized study intersections along Ranson Road are expected to operate at an overall LOS C or better overall during the three peak hour periods, which is typically considered acceptable by MoDOT, with one exception. The intersection of Ranson Road with the US-50 Westbound Ramps is expected to operate with a LOS E overall (57 seconds of delay) during the AM peak hour. This is marginally higher than the LOS D threshold and limited to one peak hour period. No individual signalized movement that was considered acceptable under the previous scenario is expected to operate below a LOS D. Individual signalized movements that are expected to have significantly more queueing compared to existing conditions include:

Ranson Road and US-50 Westbound Ramps

- AM Peak Hour
    - The westbound left-turn is expected to continue operating at a LOS F with a 95th-percentile queue of 482 feet.

All movements at the unsignalized study intersections are operating at LOS C or better with acceptable queues with the one exception. The northbound left-turn movement at Drive 2 is expected to operate at a LOS E during the AM peak hour with a 95th-percentile queue of less than two vehicles. This is expected to be limited to the AM peak hour period during school arrivals and queues are not expected to have a significant impact to adjacent traffic lanes, thus is considered acceptable for proposed conditions.

Several existing turn lane deficiencies were noted in **Section 3.2**. Capacity and queuing analysis were reviewed for each movement considering school conditions. After review of the analysis, it was determined that the proposed school is not expected to have a significant impact to operations for the majority of the listed movements. Identified existing turn lane deficiencies (and expected operations) that are expected to encounter increased volumes due to the proposed school are further detailed below:

- Southbound left-turn lane with reduced storage at Hamblen Road and Bailey Road
    - Movement is expected to operate at an acceptable level of service (LOS D). The longest expected 95th-percentile queue (229 feet) would be contained within the provided TWLTL.
- Westbound right-turn lane at Hamblen Road and Bailey Road is not provided
    - Movement is expected to operate at an acceptable level of service (LOS B or better). The longest expected 95th-percentile queue (338 feet) would extend to the edge of Fleetway Drive and is minimally impacted by the proposed school.

The existing plus proposed school conditions capacity analysis summary is illustrated in **Figure 11**. Detailed results may be found in **Appendix C**.

FIGURE 10

Existing Plus Proposed School
Lane Configuration and Traffic Control

LSR7 Middle School
Lee's Summit, MO

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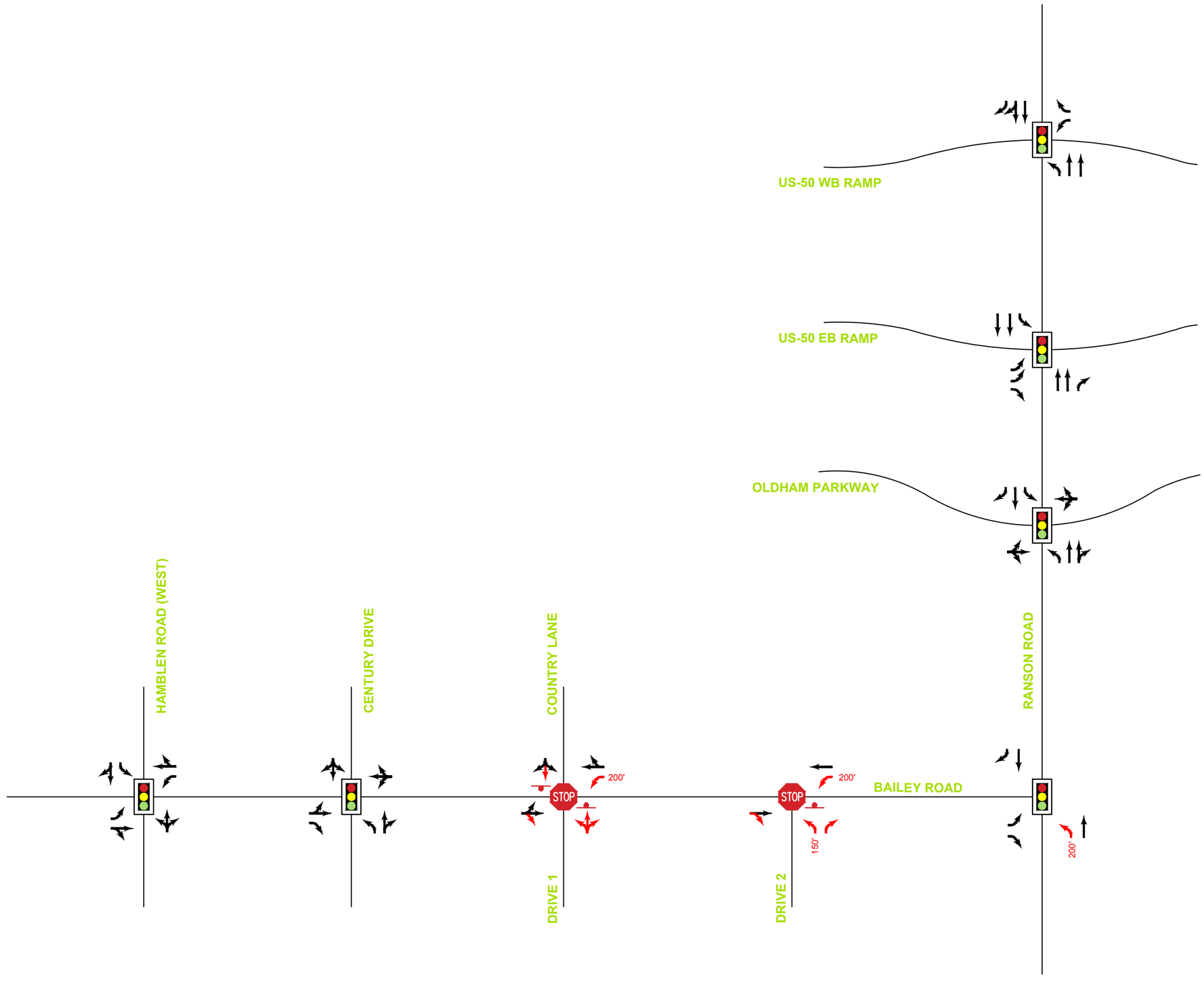

LEGEND

- *Lane Configuration*
- XX' *Proposed Lane Configuration & Storage Length*
- *Signalized Intersection*
- STOP *Stop Controlled Intersection*
- *Stop Sign*

FIGURE 11

Existing Plus Proposed School Capacity Analysis

LSR7 Middle School
Lee's Summit, MO

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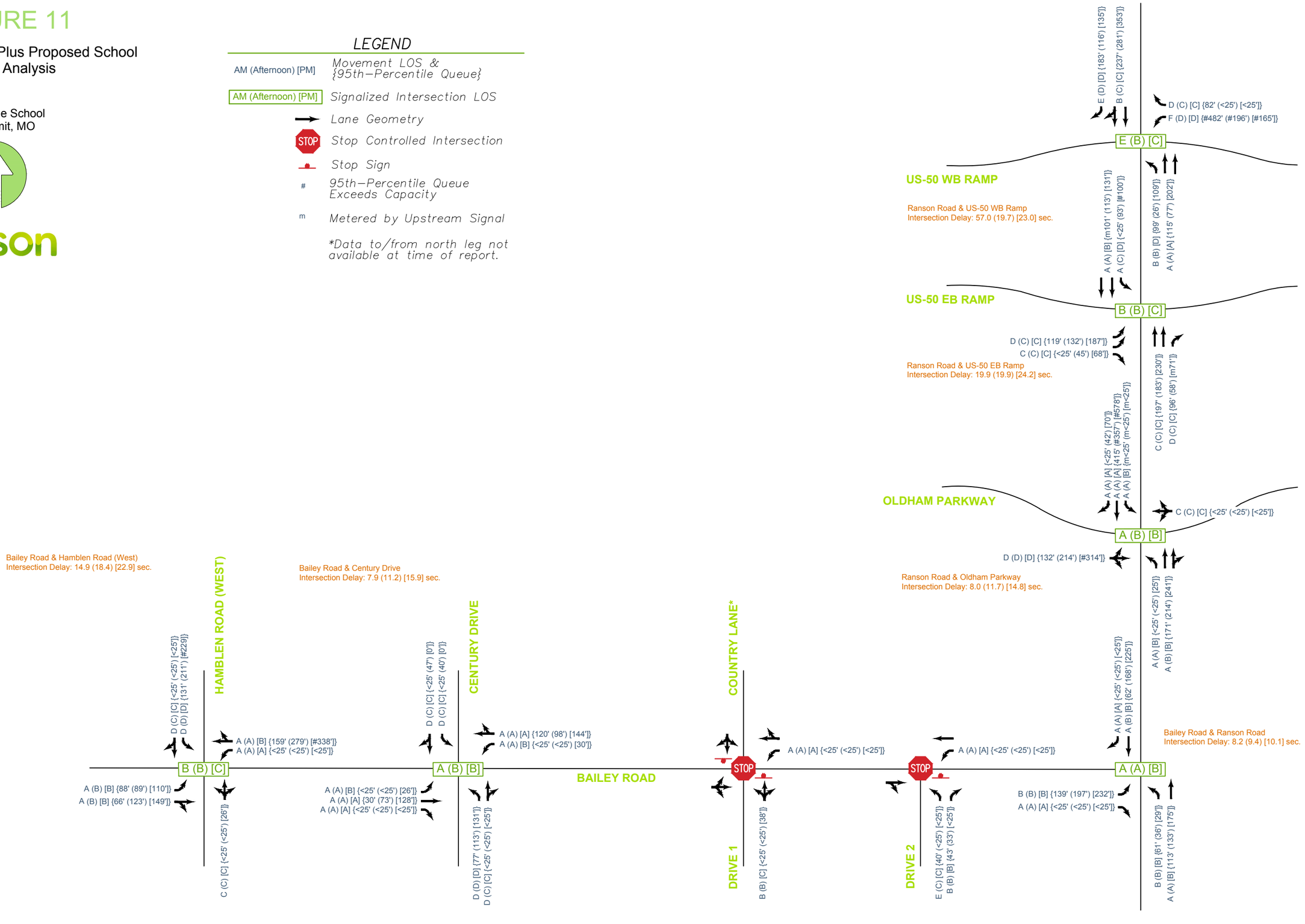
LEGEND

AM (Afternoon) [PM]	Movement LOS & {95th-Percentile Queue}
AM (Afternoon) [PM]	Signalized Intersection LOS
	Lane Geometry
STOP	Stop Controlled Intersection
	Stop Sign
#	95th-Percentile Queue Exceeds Capacity
m	Metered by Upstream Signal
	*Data to/from north leg not available at time of report.



5. FUTURE PLANNED DEVELOPMENT CONDITIONS

A future residential housing development (referred to as “Bailey Farm”) is expected east of the proposed school. At the time of this report, the site plan for this development was not finalized but is expected to include approximately 300 single-family homes. The site is assumed to utilize two driveways – one located along Bailey Road between Drive 2 and Ranson Road and one located along Ranson Road south of Bailey Road. Additional cross access may be provided to the Cape Drive extension located south of the proposed middle school.

The timeline of the Bailey Farm development was unknown at the time of this report but is expected to occur after the school is in place. This analysis condition was reviewed to determine if the future Bailey Farm development is expected to have a significant impact on the study intersections. Specific access considerations, warrant and capacity analysis was not reviewed for the assumed Bailey Farm development driveways. Additional background growth, other than Bailey Farm trips, was not considered for this scenario.

5.1. Trip Generation and Distribution

To determine the impact of potential Bailey Farm traffic, expected trips associated with the proposed development were generated and applied to the study network using similar methodology described in **Section 4.1**. The land use that most closely resembles the proposed school is Land Use Code 210 (Single Family Detached Housing).

Trip generation characteristics expected for the site are shown in **Table 7**. Detailed ITE and expected trip generation information are provided in **Appendix D.**

Table 7. Proposed Bailey Farm Trip Generation.

Land Use	Size	Average Weekday	AM Peak Hour			Afternoon Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Single Family Detached Housing	300 Dwelling Units	2,748	749	404	345	410	189	221	220	108	112

Trips were distributed through the network based on the existing traffic volume gravity, discussions with City and MoDOT staff, and the surrounding roadway network and land uses**.** It is assumed that a portion of trips to the school may be generated from the Bailey Farm development if a connection to Cape Drive is provided, thereby reducing trips on Bailey Road. For the purposes of this study, those internal trips were assumed to be insignificant and/or already captured in the middle school trip distribution (which accounted for adjacent homes). Thus, adjustments to school trips were not made for this scenario.

The expected trip distribution for the future Bailey Farm development is shown in **Figure 12**. The resulting future planned development volumes at the study intersections are illustrated in **Figure 13**.

FIGURE 12

Bailey Farm Trip Distribution

LSR7 Middle School
Lee's Summit, MO

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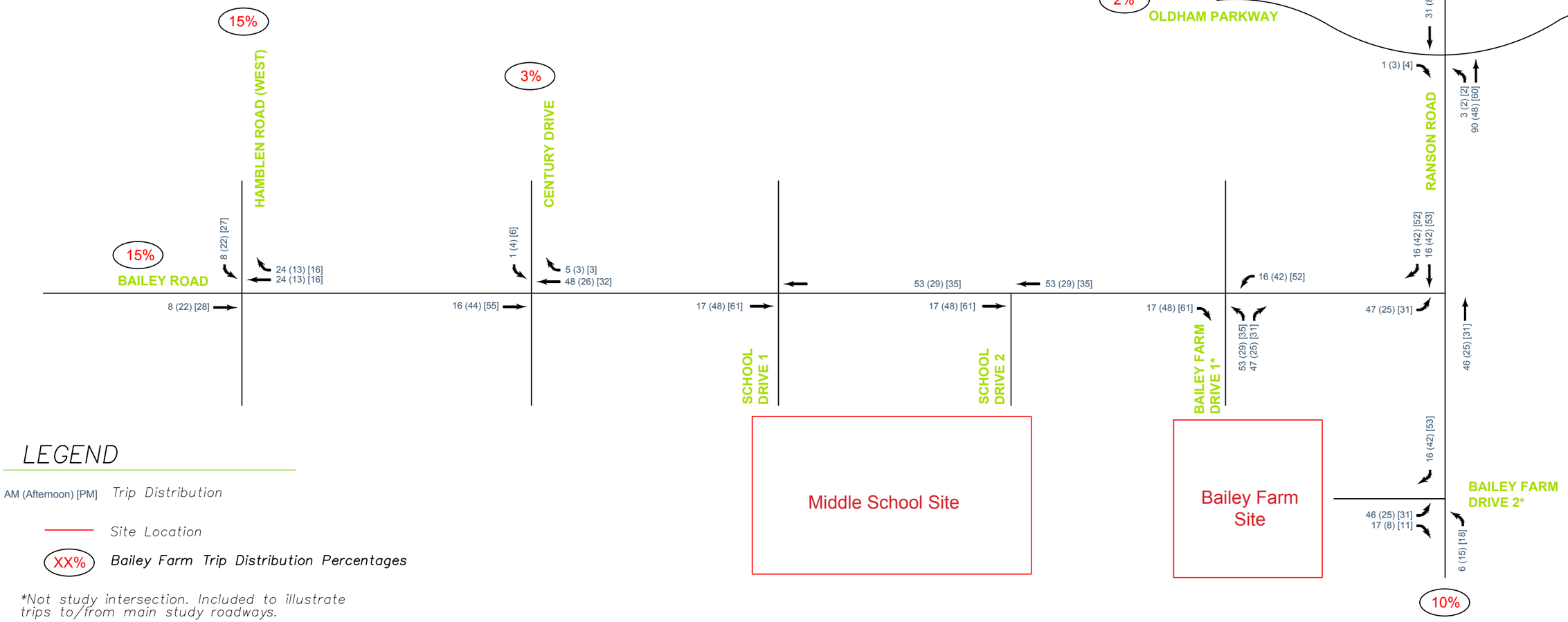

LEGEND

AM (Afternoon) [PM] *Trip Distribution*

Site Location

XX% *Bailey Farm Trip Distribution Percentages*

**Not study intersection. Included to illustrate trips to/from main study roadways.*

FIGURE 13

Future Planned Development
Peak Hour Volumes

LSR7 Middle School
Lee's Summit, MO

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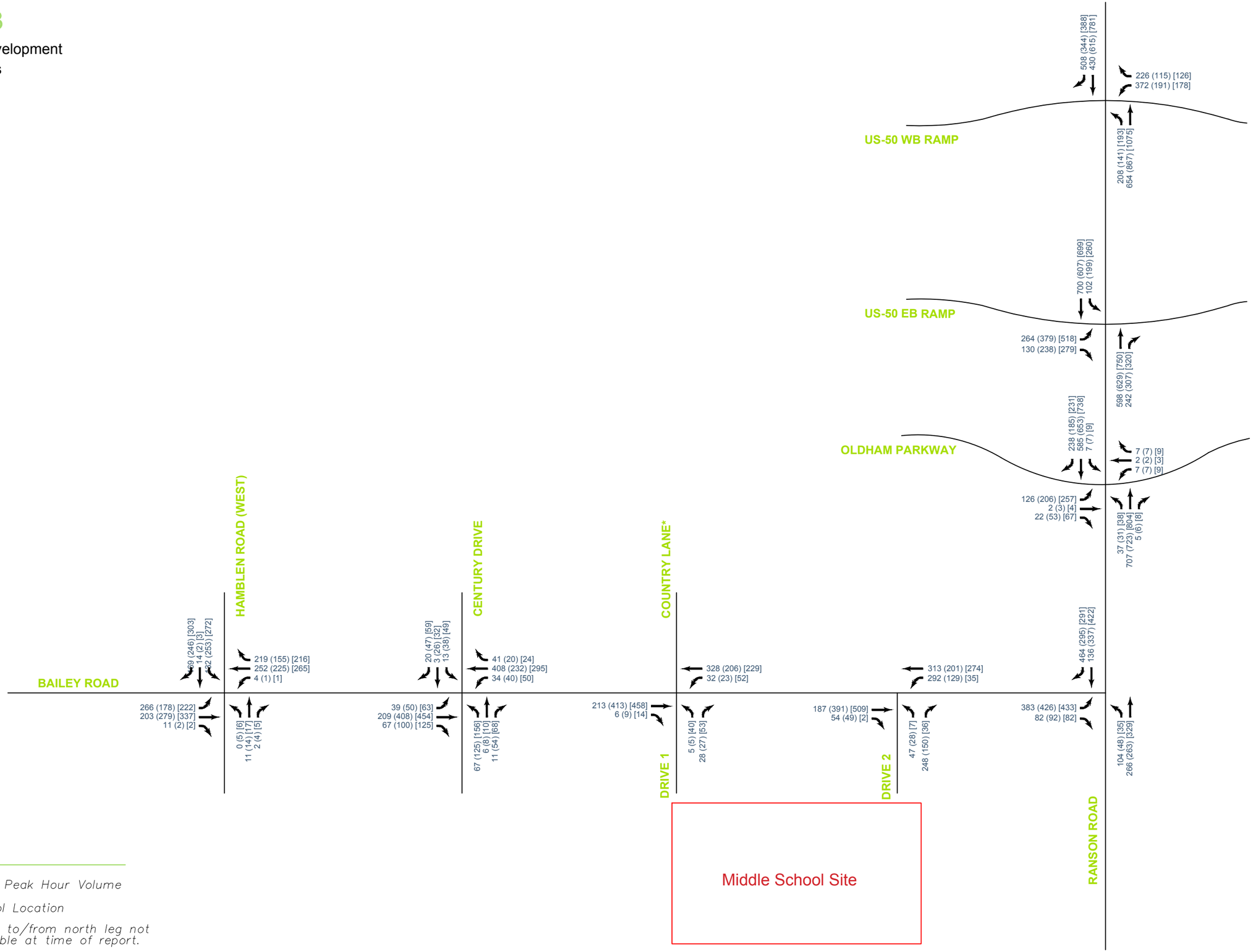


LEGEND

AM (Afternoon) [PM] *Total Peak Hour Volume*

School Location

**Data to/from north leg not available at time of report.*

5.2. Future Planned Development Warrant Analysis

Warrant analysis was conducted at existing study intersections and proposed school driveways using the same methodology described in **Section 3.2**.

Signal Warrants
Considering future planned development volumes, the intersection of Bailey Road with Drive 1/Country Lane is not expected to meet the criteria for signalization during any peak hour period based on Warrant 3.

Similar to the previous scenario, the intersection of Bailey Road and Drive 2 continues to meet the signal warrant for an intersection with one lane approaches during the AM peak hour. However, as described in **Section 4.3**, a significant portion of the minor street volumes are expected to turn right with minimal conflict with eastbound mainline traffic. Thus, signalization is not recommended at this time.

Signal warrant analysis sheets is provided in **Appendix D**.

Turn Lane Warrants
Considering future planned development volumes, no left or right-turn lanes are expected to be warranted in addition to what was discussed for the previous analysis scenarios.

Capacity and queueing analysis were also reviewed (see **Section 5.3**) to determine if additional turn lanes and/or storage length is recommended based on expected operations. Turn lane warrant worksheets are provided in **Appendix D**. Future planned development conditions lane configurations and traffic control for the study network are illustrated in **Figure 14**.

5.3. Future Planned Development Capacity Analysis

Capacity analysis was performed under future planned development conditions using the methodologies described in **Section 3.3**. The peak hour factors and signal timings utilized under the previous scenario were maintained.

Results of the capacity analysis indicate that signalized study intersections along Bailey Road are expected to operate at an overall LOS C or better, which is considered acceptable based on the City's LOS Policy. Individual movements are expected to operate at a LOS D or better during the three peak hour periods except the southbound left-turn movement at Bailey Road and Hamblen Road, which is expected to operate at a LOS E during the PM peak hour. The expected 95th-percentile queue of 283 feet would be contained within the upstream TWLTL but not extend to the nearest upstream intersection at Fleetway Drive.

Intersections along Ranson Road are expected to operate at a LOS C or better except for Ranson Road and the US-50 Westbound ramps, which is expected to continue operating at a

LOS E during the AM peak hour as described under **Section 4.4**. In general, similar operations are expected for individual movements when compared to the previous scenario with slightly increased delay and queueing.

In addition to an unknown construction timeline, analysis conducted for the purposes of this report is based on assumptions regarding access and proposed density of the Bailey Farms development. Additional improvements are not recommended at this time, but further analysis should be conducted when a final development plan is available.

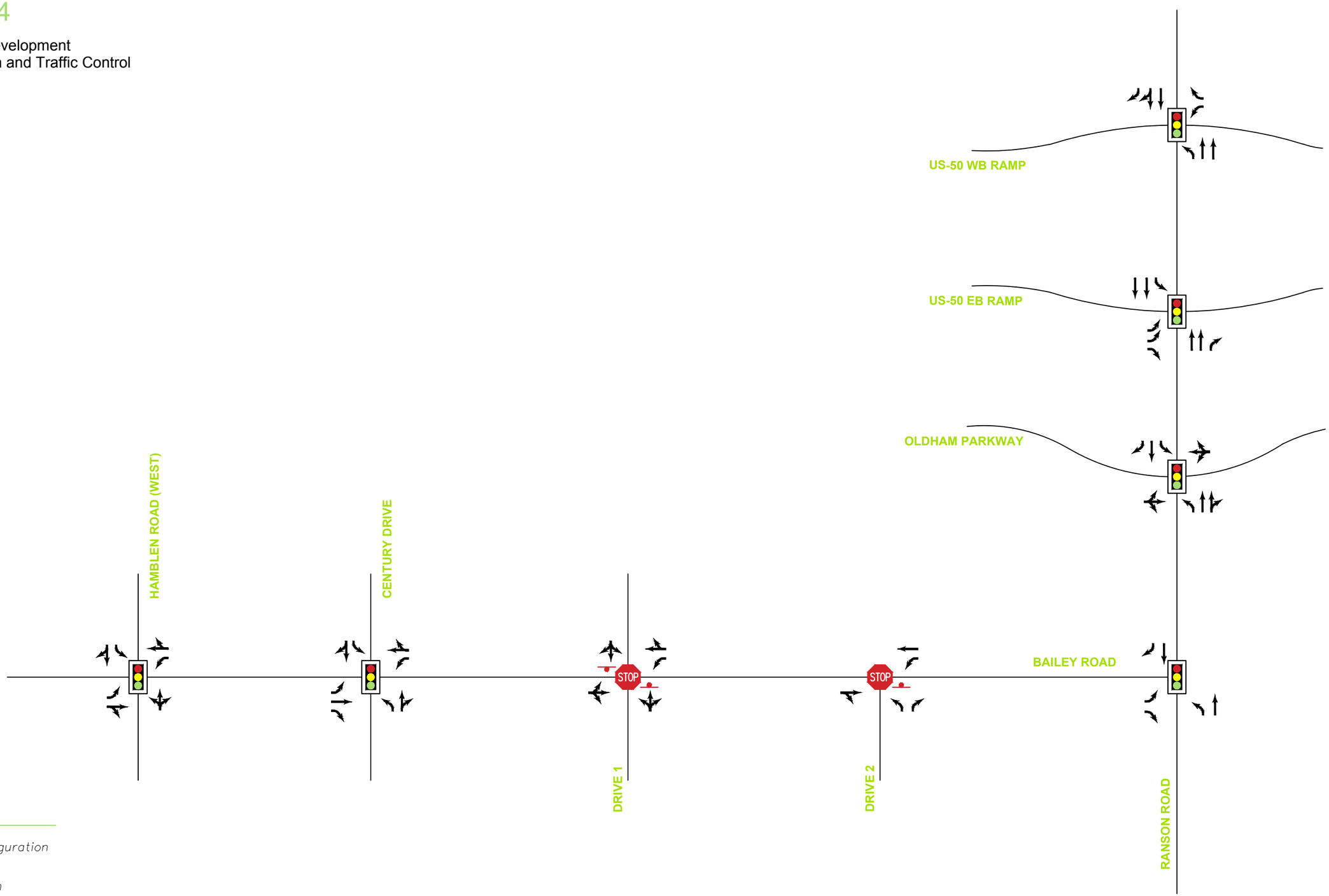
All movements at the unsignalized study intersections are expected to operate at LOS C or better with acceptable queues with one exception. The northbound left-turn movement at Drive 2 is expected to operate at a LOS F during the AM peak hour and LOS D during the afternoon peak hour. In both cases, the 95th-percentile queue is expected to be less than two vehicles. This is expected to be limited to school peak periods and not have a significant effect on mainline traffic, thus is considered acceptable for proposed conditions.

The future planned development conditions capacity analysis summary is illustrated in **Figure 15**. Detailed results may be found in **Appendix D**.

FIGURE 14

Future Planned Development
Lane Configuration and Traffic Control

LSR7 Middle School
Lee's Summit, MO



LEGEND

- *Lane Configuration*
- *Signalized Intersection*
- *Stop Controlled Intersection*
- *Stop Sign*

FIGURE 15

Future Planned Development
Capacity Analysis

LSR7 Middle School
Lee's Summit, MO

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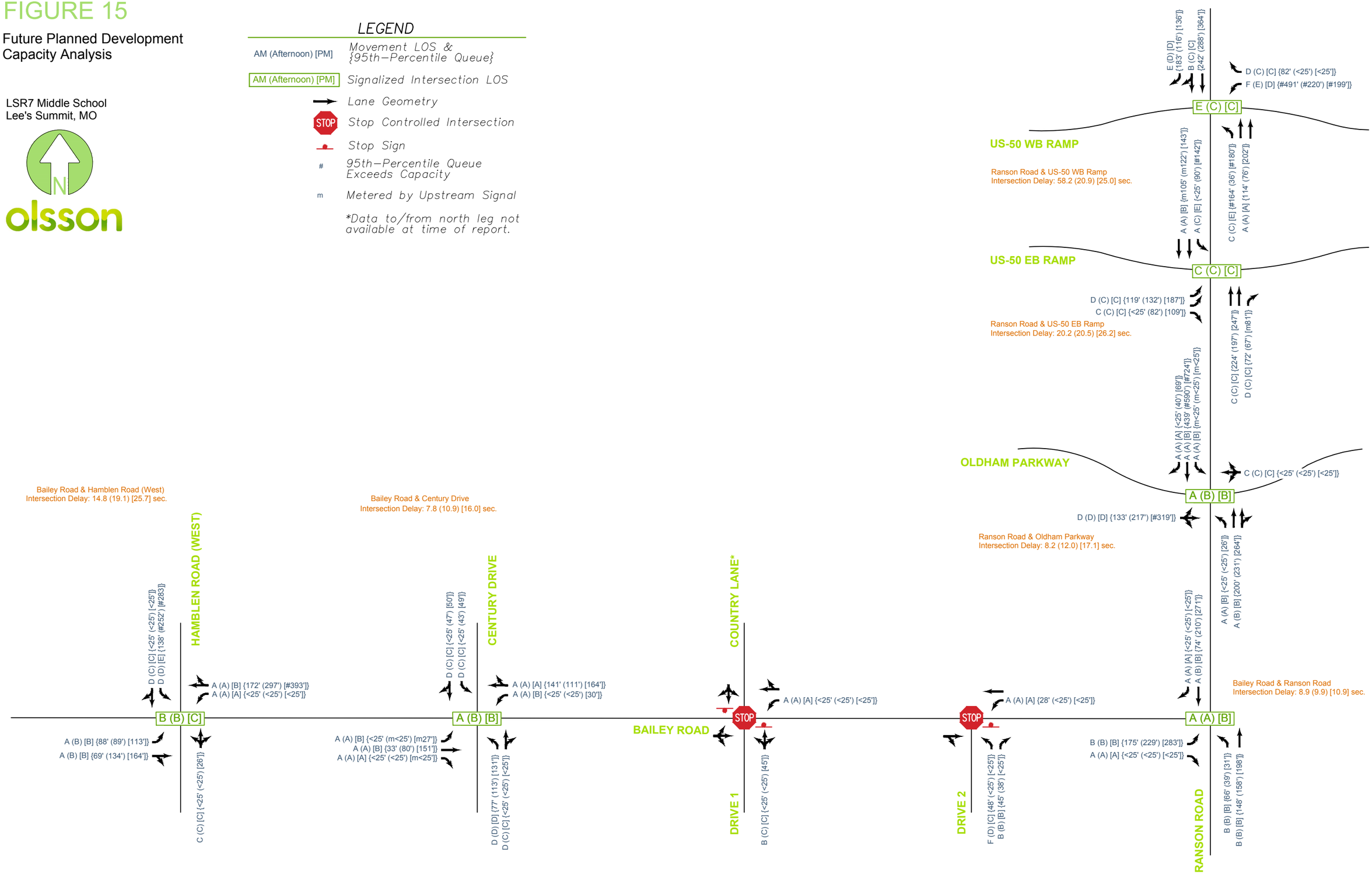
LEGEND

AM (Afternoon) [PM]	Movement LOS & {95th-Percentile Queue}
AM (Afternoon) [PM]	Signalized Intersection LOS
→	Lane Geometry
STOP	Stop Controlled Intersection
	Stop Sign
#	95th-Percentile Queue Exceeds Capacity
m	Metered by Upstream Signal
	*Data to/from north leg not available at time of report.



6. SUMMARY

The purpose of this study was to summarize traffic impacts regarding a proposed middle school located south of Bailey Road and west of Ranson Road in Lee's Summit, Missouri.

6.1. Conclusions

The general findings of note for the traffic impact study include:

1. In addition to the proposed school, the analysis scenarios considered approved (Culver's and Princeton senior living) and planned (Bailey Farm) developments in the surrounding area. Planned infrastructure improvements considered in this study included signal and turn lane installations at the intersections of Hamblen Road with Bailey Road and Ranson Road and Oldham Parkway.
2. Several signal and lane warrants are met under existing conditions. It was also noted that some existing turn lanes are provided with reduced storage. Existing intersection/turn lane warrant deficiencies that also have poor operations were addressed; recommendations to improve these existing conditions are listed in the next section.
3. Queueing in the north/south direction and at the westbound off-ramp was observed at the US-50 Interchange under existing conditions and is expected to continue under subsequent analysis conditions. With diamond interchange configurations, queuing between closely spaced signalized intersections, including adjacent outer road signals, is not uncommon during peak hour periods as higher ramp and crossroad volumes are serviced. An additional westbound left-turn lane was considered to address existing poor operations but would introduce a potential weaving condition without significant roadway modifications/widening along Ranson Road. A more comprehensive review of the existing interchange/outer road design or signal re-timing (considering adjacent non-study coordinated intersections) may be needed for this location.

6.2. Recommendations

Based on review and analysis of the study area, the following action items are recommended:

<u>Existing Conditions</u>

Ranson Road and Bailey Road

1. Install a traffic signal.
2. Install eastbound and southbound right-turn lanes with a storage length of 200 feet plus taper.

Ranson Road and US-50 Eastbound Ramps

3. Install a continuous northbound right-turn lane between the south ramp terminal and the intersection with Oldham Parkway (no taper)

Century Drive and Bailey Road:

4. Install a traffic signal with interconnect to allow for coordination with the planned signal approximately 0.25 mi to the west at Hamblen Road.
5. If a traffic signal is installed, install left-turn lanes with a storage length of 250 feet plus taper eastbound/westbound and 150 feet plus taper southbound resulting in left-turn lanes in all four approaches.

Existing Plus Development Conditions

Ranson Road and Bailey Road

1. Install a northbound left-turn lane with a storage of 200 feet plus taper.

Bailey Road and School Driveways

2. Coordinate potential pedestrian/bicycle needs with the City to ensure that the proposed access points accommodate the potential planned off-street path along Bailey Road and crossing maneuvers, if necessary.
3. Verify sight distance at both proposed driveways, especially considering the hill west of Drive 1.
4. Consider a school zone speed limit during school arrival/dismissal period.
5. Install a westbound left-turn lane at Drive 1 with a storage of 200 feet plus taper.
6. Install a westbound left-turn lane at Drive 2 with a storage of 200 feet plus taper.
7. Construct Drive 2 with a width of 42 feet (measured from back-of-curb) with one 14-foot entering lane and two 12-foot exiting lanes (150-foot storage plus taper) to meet City AMC requirements.