

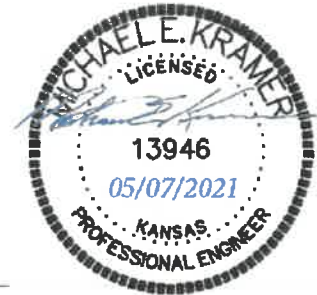
Memorandum

To: Michael Spickelmier, P.E.
Public Works Director / City Engineer
City of Lansing, Kansas

From: Michael E. Kramer, P.E.

Date: 5/7/2021

Re: K-7 (US-73, Main Street) and Gilman Road Intersection



Summary Conclusions and Recommendations:

The intent of this memo is to document and present the results of a traffic evaluation of the K-7/Gilman Road Intersection. The key goal was to determine the need for intersection signalization based on an analysis of signal warrants available in the 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD) as would be required by the Kansas Department of Transportation (KDOT) for signalization of the intersection.

Chapter 4C, Traffic Control Signal Needs Studies. The Traffic Signal Warranty Summary Table below shows that none of the nine warrants contained in the MUTCD are met for the intersection. Warrants 5, 6, 8, and 9 are not applicable and were not evaluated. Crash experience at the intersection, Warrant 7 crash experience is not met. Warrant 7 is discussed in further detail within this memo.

The warrant analysis indicates that a traffic signal is not currently warranted. It is recommended that the intersection continue to be re-evaluated in the future. The City may wish to consider temporarily increasing law enforcement to deter speeding in the area and increase driver awareness of the stop condition at the intersection, and that traffic on K-7 does not stop.

Traffic Signal Warranty Summary:

Warrant (MUTCD Section 4C)	Result
Warrant 1, Eight-Hour Vehicular Volume	Not Met
Warrant 2, Four-Hour Vehicular Volume	Not Met
Warrant 3, Peak Hour	Not Met
Warrant 4, Pedestrian Volume	Not Evaluated
Warrant 5, School Crossing	Not Evaluated
Warrant 6, Coordinated Signal System	Not Evaluated
Warrant 7, Crash Experience	Not Met
Warrant 8, Roadway Network	Not Evaluated
Warrant 9, Intersection Near a Grade Crossing	Not Evaluated

Intersection Characteristics: The intersection of K-7 and Gillman is a four-leg intersection. K-7 runs north/south, and Gilman Rd runs east/west.

Intersection Approaches:

Major Approach:

K-7 northbound - 2 thru lanes, and a single left turn lane.

K-7 southbound - 2 thru lanes, a right turn lane, and a single left turn lane.

K-7 is 4 lane divided grass median about 38 feet in width, shoulders varying width.

Minor Approach:

Gilman Rd. eastbound – 1 thru lane, a right turn lane, and a single left turn lane.

Gilman Rd. westbound – 1 right turn lane, and a thru/left lane.

Gilman Rd. approaches are stop controlled, and the median is yield controlled.

Roadway Access:

Driveways access K-7 on the east and west, with a median crossing approximately 875 feet north of the intersection.

Driveways access Gilman Rd. on the eastbound approach approximately 350' west of the intersection, and on the north side of Gilman Rd. approximately 175' east of the intersection.



Traffic Data:

Traffic counts were performed utilizing video traffic counters in August of 2020. As such, the data was obtained during the COVID-19 pandemic. However, no adjustment factors were evaluated or applied as previous detailed count information was unavailable. It is not expected that an adjustment would make a significant impact on the analysis, but the traffic should be re-evaluated as conditions change.

Gilman Rd & K-7 - Peak Hour Traffic Count Summary Table														
Location: Lansing, KS														
Intersection: Gilman Rd & K-7														
Date: Thursday August 6th, 2020														
Time	SB K-7			WB Gilman				NB K-7			EB Gilman			
	R	L	Total	R	T	L	Total	R	L	Total	R	T	L	Total
Peak AM Counts														
07:00	1	0	1	0	0	0	0	0	0	0	4	3	4	11
07:15	2	0	2	0	0	0	0	0	1	1	5	10	0	15
07:30	7	0	7	0	1	0	1	0	1	1	6	10	2	18
07:45	9	0	10	0	0	0	0	0	1	1	7	8	1	16
Peak AM Hour Total	19	0	20	0	1	0	1	0	3	3	22	31	7	60
Peak PM Counts														
16:00	15	0	15	0	2	0	2	0	0	0	3	5	0	8
16:15	13	0	13	0	5	0	5	0	0	0	2	11	0	13
16:30	13	0	13	0	5	0	5	0	1	1	4	11	0	15
16:45	16	0	16	0	7	0	7	0	3	3	10	13	0	23
Peak PM Hour Total	57	0	57	0	19	0	19	0	4	4	19	40	0	59

R=right turns, T=thru traffic, L=left turns

*Intersection Total, NB/SB thru traffic data collected but not summarized in the peak hour table, NB/SB thru traffic is assumed, based on KDOT counts of 22100 ADT (traffic count map published November 2020); estimate a total of both directions greater than 640 VPH for Warrant 1, 920 VPH for Warrant 2, and 1100 VPH for Warrant 3. A greater VPH on K-7 would not affect the signal warrant analysis, as the minor approach is the controlling factor due to the low traffic volumes on Gillman Rd.

Signal Warrant Analysis:

A warrant is a condition that an intersection must meet to justify a signal installation. The Manual on Uniform Traffic Control Devices (MUTCD) specifies "traffic control signal needs studies", known as warrants. However, "The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal." (MUTCD, 4C.01) The final decision is made based upon the traffic engineer's judgment.

Unwarranted signals in addition to having significant monetary impacts in installation and maintenance, have the potential to increase rear-end accidents, increase delays at intersections, and increase the risk of drivers ignoring the signal at the studied intersection and other locations.

The need for intersection signalization was evaluated based on an analysis of the applicable warrants available in the 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD), Chapter 4C, Traffic Control Signal Needs Studies. The following table summarizes the results of this warrant analysis; none of the nine warrants contained in the MUTCD are met for the intersection. Warrants 5, 6, 8, and 9 are not applicable and were not evaluated. Crash experience at the intersection, Warrant 7, is not met. Each warrant evaluation is discussed in greater detail in this section of the report. It should be noted that for all relevant warrants, a 50 percent reduction in right turning vehicles from the side street were made since there are right turn lanes provided. This reduction is consistent with KDOT signal warrant evaluation practice.

Traffic Signal Warrant Summary Table

Warrant (MUTCD Section 4C)	Result
Warrant 1, Eight-Hour Vehicular Volume	Not Met
Warrant 2, Four-Hour Vehicular Volume	Not Met
Warrant 3, Peak Hour	Not Met
Warrant 4, Pedestrian Volume	Not Evaluated
Warrant 5, School Crossing	Not Evaluated
Warrant 6, Coordinated Signal System	Not Evaluated
Warrant 7, Crash Experience	Not Met
Warrant 8, Roadway Network	Not Evaluated
Warrant 9, Intersection Near a Grade Crossing	Not Evaluated

Warrant 1, Eight-Hour Vehicular Volume (Not Met)

As stated in the MUTCD (Section 4C.02), “the Minimum Vehicular Volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.”

The MUTCD (Section 4C.02) also states that “the Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.”

The turning movement count data was used to conduct the evaluation. The K-7/major street speed limit is posted as 50 mph, so the evaluation used the reduced volume thresholds for the analysis.

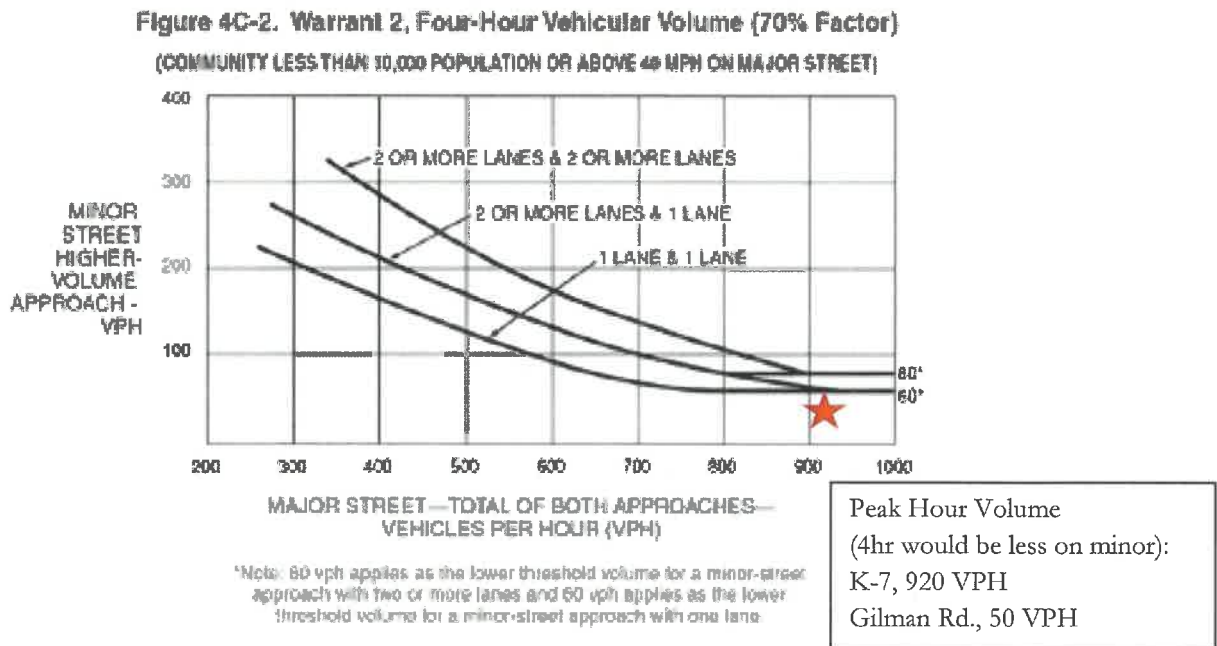
For Condition A, the volume warrants on the major and minor streets of the intersection were not met for any of the study hours. Because the minimum vehicular volumes must be satisfied for eight hours or more, Condition A was not met.

For Condition B, the minimum vehicular requirements was met for 1 hour, the PM Peak study hour. Since the minimum vehicular volumes must be satisfied for at least eight hours in a day, Condition B was not met. For the combination of Conditions A and B, the minimum vehicular requirements were not satisfied.

Warrant 2, Four-Hour Vehicular Volume (Not Met)

As stated in the MUTCD (Section 4C.03), “the Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.”

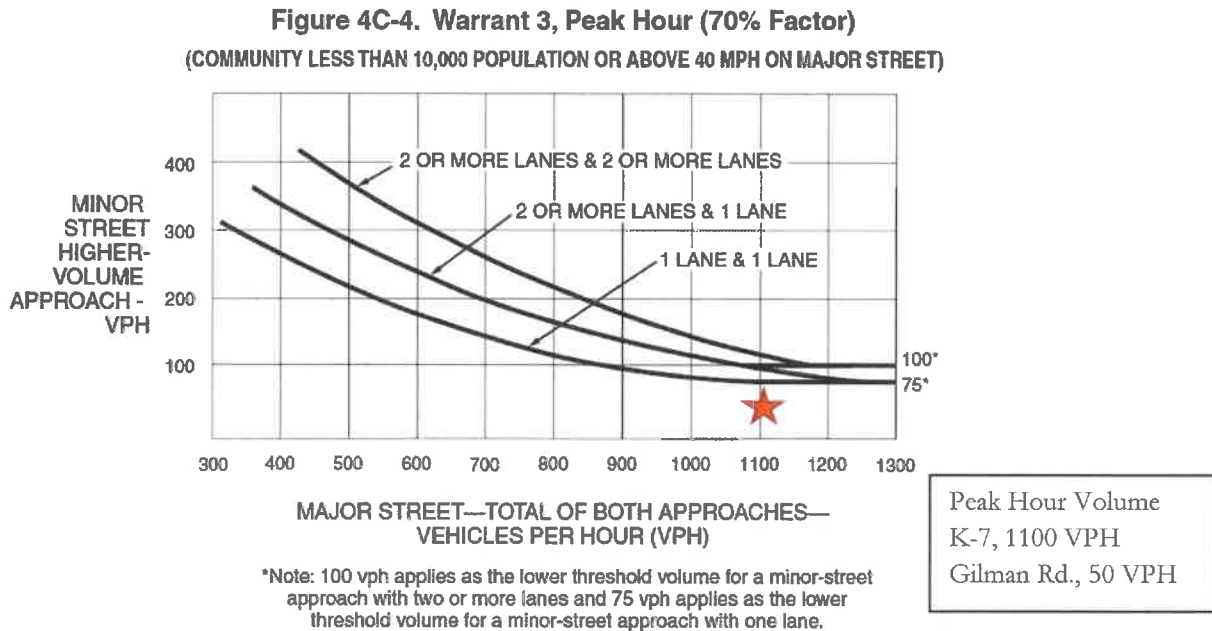
The 70 percent factor table was used for the Warrant 2 evaluation because the major street posted speed limit is 50 mph. Figure 4C-2 summarizes the evaluation and indicates that none of the four highest hourly traffic conditions at the intersection meets or exceeds the trend line (a minimum of 80 vehicles per hour on the side street is required for four hours out of the day). Warrant 2, Four-Hour Vehicular Volume is not met for the study location.



Warrant 3, Peak Hour Volumes (Not Met)

As stated in the MUTCD (Section 4C.04), “the Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of one hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.” Typically, Warrant 3 is only applicable to intersections adjacent to large businesses that generate considerable amounts of traffic for short periods of time (e.g. at shift changes), or similar land uses. Since the area around the intersection is typical commercial and office land and residential uses, the current land uses serviced by the

intersection are not consistent with the types that would generate the traffic described by this warrant. Therefore, this warrant is not applicable to the study location. Additionally, as shown in figure 4C-4 the Warrant is not met.



Warrant 4, Pedestrian Volume (Not Evaluated)

As stated in the MUTCD (Section 4C.05), “the Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.” Pedestrian volume was not evaluated as part of this analysis. The intersection has not been reported not have any significant pedestrian crossing activity. As such, Warrant 4, Pedestrian Volume is not applicable to the study location.

Warrant 5, School Crossing (Not Evaluated)

As stated in the MUTCD (Section 4C.06), “the School Crossing signal warrant is intended for application where the fact that school children cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word ‘school children’ includes elementary through high school students.” There are no schools located near the intersection and school crossings are not the principal reason a traffic signal is being considered. As such, Warrant 5, School Crossing is not applicable to the study location.

Warrant 6, Coordinated Signal System (Not Evaluated)

As stated in the MUTCD (Section 4C.07), “progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.” There are no other nearby signals along

K-7, therefore, signal progression is not a concern. As such, Warrant 6, Coordinated Signal System is not applicable to the study location.

Warrant 7, Crash Experience (Not Met)

As stated in the MUTCD (Section 4C.08), “the Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.”

The MUTCD also states that this warrant is only met if “five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period.”

Accident data for the intersection was evaluate for the years 2015 through 2020. There were 17 total reported accidents in the five year span examined, with 10 of those accidents being intersection related. Angle-Side Impact Crashes, potentially one of the most severe types of crashes, accounted for 7 of the intersection related crashes.

Intersection Related Crash Data 2015 through 2020

Year	Date	Accident Location	TYPE	# of Deaths	# of Injuries	Light Conditions
2016	09-Apr-16	Intersection	Angle - Side Impact	0	1	Daylight
2017	12-May-17	Intersection-related	Head On	0	0	Daylight
2017	22-Jun-17	Intersection	Angle - Side Impact	0	0	Daylight
2017	25-Oct-17	Intersection	Angle - Side Impact	0	2	Daylight
2018	30-Oct-18	Intersection	Angle - Side Impact	0	0	Daylight
2019	04-May-19	Intersection-related	Backed Into	0	0	Daylight
2019	07-Aug-19	Intersection	Angle - Side Impact	0	0	Daylight
2019	12-Aug-19	Intersection	Angle - Side Impact	0	0	Daylight
2019	12-Aug-19	Intersection-related	Rear End	0	0	Daylight
2019	04-Nov-19	Intersection crossover	Angle - Side Impact	0	2	Daylight

Six crashes occurred during the period from October 30, 2018 to November 4, 2019 (roughly 1 year). One of these was a rear end, and another was a backed into, therefore the total number of crashes susceptible to correction by a traffic control signal is reduced to 4. The warrant is not met.

A total of 7 angle–side impact crashes were reported during the years 2015 thru 2020. However, they were distributed throughout the study period, with greater numbers in the years 2017 and 2019. As such, it is difficult to draw any conclusions from the data that a signal would correct/improve the intersection related crashes. Additionally, the MUTCD also states that the following criteria must be met: “Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency”. Applicable alternative improvements were not included as part of the analysis.

It is recommended that the intersection continue to be re-evaluated in the future. The City may wish to consider temporarily increasing law enforcement to deter speeding in the area and increase awareness of the stop condition at the intersection, and that traffic on K-7 does not stop.

Warrant 8, Roadway Network (Not Applicable)

As stated in the MUTCD (Section 4C.09), “installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.” The Roadway Network warrant is only applicable at the intersection of two major roadways. Warrant 8 is not applicable to the study location.

Warrant 9, Intersection Near a Grade Crossing (Not Applicable)

As stated in the MUTCD (Section 4C.10), “the Intersection Near a Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.” The intersection is not adjacent to any rail or light rail grade crossings. As such, Warrant 9, Intersection Near a Grade Crossing is not applicable to the study location.