Missouri Department of Transportation
Southwest District – Traffic Division
(Signal Warrant Study)

Location:
RT FF at Davis – Joplin, Jasper/Newton County line

Recommendation:
The intersection of RT FF and Davis Blvd located on the Jasper/Newton County line presently meets Signal Warrants listed in the MoDOT EPG. It is therefore recommended that this intersection be placed on the traffic needs list as a warranted signal location.

(The City of Joplin is proposing to close the RT FF and Davis Blvd intersection and divert Davis Blvd traffic to Stephens Blvd to combine with existing Stephens Blvd traffic. If Davis Blvd is realigned as proposed it can be concluded that RT FF at Stephens will meet signal warrants. Therefore, RT FF and Stephens should replace RT FF and Davis on the traffic needs list as a warranted signal location following the completion of the proposed realignment.)

Brittany Mitchell — Study By
9/23/2020 — Date

Comments:
I concur with the recommendations in the study. A right turn lane would need to be built on Route FF for the intersection whether it is at Davis or Stephens. A right turn lane should be considered for Davis or Stephens.

Micheal R Bock — Supervising Engineer
9/24/2020 — Date

Comments:
I concur with the recommendation to place the intersection of Route FF and Stephens Blvd. on the Traffic needs list, provided connectivity to the surrounding roadway network is built. Extra care will also need to be taken with the existing driveway on the south side of Route FF at Stephens Blvd. Parking along Stephens Blvd. near Route FF will also likely need to be eliminated in order to provide adequate storage lane widths for a channelized southbound right turn lane. A westbound right turn lane should also be considered if signalized. *

Cindy Dunaway — District Traffic Engineer
9/24/2020 — Date

Comments:

District Engineer/Assistant District Engineer — Date

*Note: There is also the possibility that Route FF will go "up and over" the railroad tracks that are just west of the Davis Blvd. intersection. In this case, it would also be suggested that the intersection and stopping sight distance be evaluated to ensure the location of a potential signal is appropriate at this location due to the possible grade differential. - CAD 9/24/2020

MoDOT
Missouri Department of Transportation

Southwest District
Steve Campbell, District Engineer

3025 East Kearney Street
P.O. Box 868
Springfield, Missouri 65801
417.895.7605

TO: Memo to file

FROM: Brittany Mitchell, E.I.T.
Traffic Studies Specialist

DATE: September 23, 2020

SUBJECT: Traffic Study
Signal Warrant Study
RTFF at Davis Blvd
Joplin
Jasper/Newton County

The purpose of this study is to determine if the intersection of RT FF at Davis Blvd located on the Jasper/Newton County line meets the criteria in the Engineering Policy Guide (EPG) for signal warrants. This study is in response to the City of Joplin proposing a signal at RT FF and Stephens with the realignment of Davis onto Stephens north of RT FF.

Site Information:
The intersection of RT FF and Davis Blvd is a 3-legged intersection.

RT FF is an east/west, undivided, five-lane roadway. The five-lane roadway, two-lanes in each direction and one two-way left turn lane is continued through the intersection of RT FF and Davis Blvd. RT FF has a posted speed limit of 45 mph in this location.

Davis Blvd is a north/south, undivided, two-lane roadway maintained by the Joplin. At the intersection of RT FF and Davis Blvd, the Davis Blvd approach currently has a combination left turn/through/right turn lane. The posted speed limit for Davis Blvd Street is 35 mph. Davis Blvd is currently stop controlled.

The following is an aerial view of the location:

Traffic Volume Information:

A 13-hour traffic count was performed at the intersection of RT FF and Davis Blvd on September 8, 2020. Traffic was counted from 6:00 a.m. to 7:00 p.m.

Traffic Volume Adjustment:

As the right turn percentage of total approach volume increases, the benefit of signalization decreases. To account for this effect in warrant analysis, the percentage of right turns used in warrant analysis is to be reduced as the right turn percentage of total approach volume increases. (Refer to EPG Table 902.3.1) If right turns on red are prohibited for an approach, the full right-turning volume is to be considered in warrant analysis.

For this study, 100 percent of Eastbound and Westbound right turning traffic was included in analysis due to the lack of an adequate approach lane and a right turning vehicle percentage of less than 25 percent.

Only 50 percent of Southbound right turning traffic was included in analysis due to the lack of an adequate approach lane and a right turning vehicle percentage of 50 to 75 percent.

Warrant #1 (8-Hour Vehicular Volume):

Warrant #1A and #1B
The following is an evaluation of the traffic counts regarding traffic signal warrants #1A, and #1B. The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:

> A. The vehicles per hour given in both 100 percent columns of Condition A in Table 902.3.3 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or
>
> B. The vehicles per hour given in both 100 percent columns of Condition B in Table 902.3.3 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 70 percent columns in Table 902.3.3 may be used in place of the 100 percent columns.

Since the posted speed limit is above 40 mph, 70% volumes were used.

Condition A 70% (Minimum Vehicular Volume)	
How many hours was Condition A criteria met?	3
Is Condition A met?	NO

Condition B 70% (Interruption of Continuous Traffic)	
How many hours was Condition B criteria met?	11
Is Condition B met?	YES

Warrant Condition #1A is not met.
Warrant Condition #1B is met.

Warrant #1 Combination of A and B
The combination of Conditions A and B is intended for application at locations where Condition A is not satisfied, and Condition B is not satisfied and should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

The need for a traffic control signal shall be considered if an engineering study finds that **both** of the following conditions exist for each of any 8 hours of an average day:

A. The vehicles per hour given in both 80 percent columns of Condition A in Table 902.3.3 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; **and**

B. The vehicles per hour given in both 80 percent columns of Condition B in Table 902.3.3 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 902.3.3 may be used in place of the 80 percent columns.

Warrant #1 Combination Warrant was not evaluated because Warrant #1B is met and the Combination Warrant is intended for application where neither Warrant #1A nor Warrant #1B are met.

Warrant #1 is met.

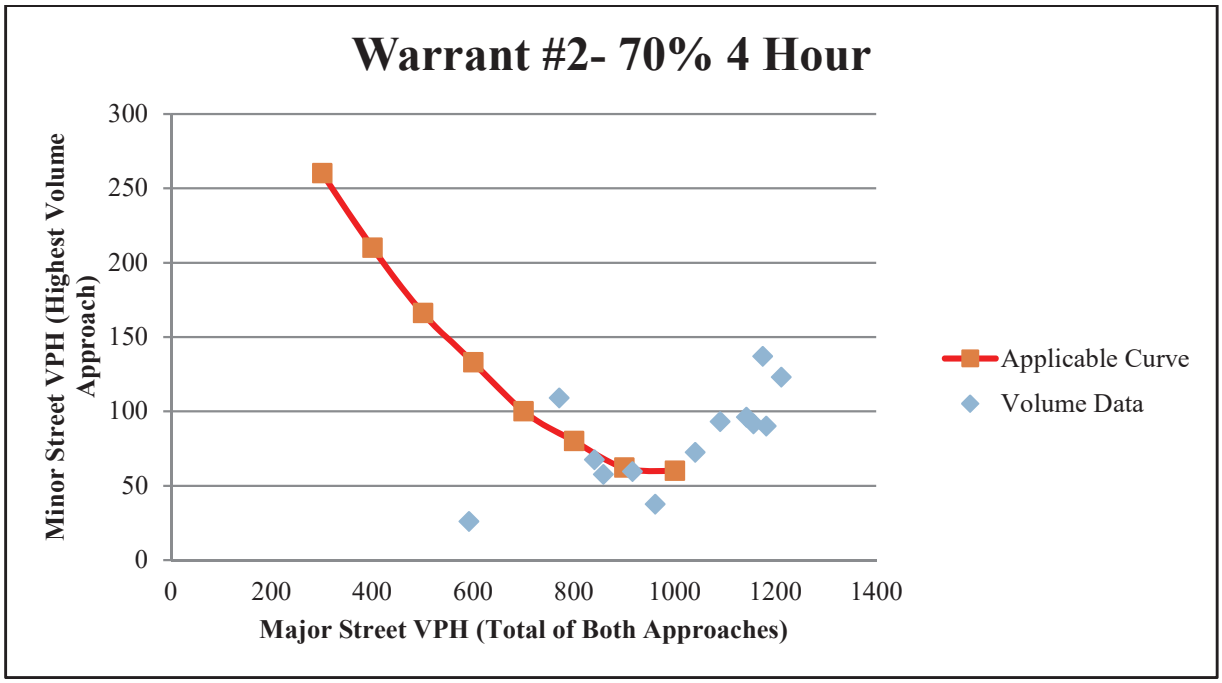
Warrant #2 (4-Hour Vehicular Volume):

This warrant is met if for each of any four (4) hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the

corresponding vehicles per hour on the higher- volume minor-street approach (one direction only) all fall above the applicable curve in Figures 902.3.4.1 or 902.3.4.2 for the existing combination of approach lanes. The applicable curve in this study is 2&1. On the minor street, the higher volume shall not be required to be on the same approach during each of these four hours.

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 70 percent columns in Table 902.3.3 may be used in place of the 100 percent columns.

Since the posted speed limit is above 40 mph, 70% volumes were used.



Based on EPG Figure 902.3.4.2

4 Hour Warrant	
How many hours was criteria met?	8
Is warrant #2 met?	YES

Warrant #2 is met.

Warrant #3 (Peak Hour):

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue

delay when entering or crossing the major street. The need for a traffic signal may exist for peak hours of traffic demand. In order to evaluate a heavy peak hour location, a warrant has been adopted for public streets, industrial or plant entrances, and public institutions.

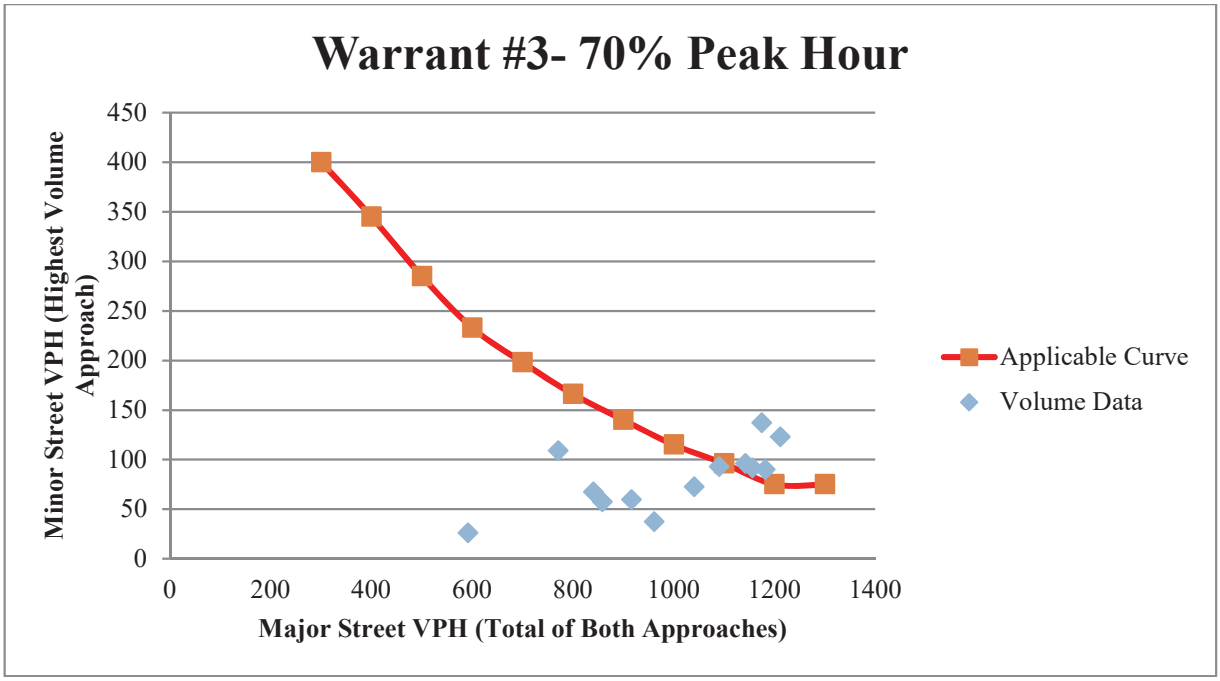
This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:
    1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and
    2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and
    3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.
B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Fig. 902.3.5.1 for the existing combination of approach lanes. The applicable curve for this location is 2&1.

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 70 percent columns in Table 902.3.3 may be used in place of the 100 percent columns.

Due to the industrial facilities located on Davis Blvd Warrant #3 Criteria B was evaluated for this location. Since the posted speed limit is above 40 mph, 70% volumes were used for this evaluation.



Based on EPG Figure 902.3.5.2

Peak Hour Warrant	
How many hours was criteria met?	5
Is warrant #2 met?	YES

Warrant #3 is met.

Warrant #4 (Pedestrian Volume):

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.

The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:

A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Fig. 902.3.6.1; or
B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 902.3.6.3.

There are no pedestrian facilities at this intersection. Therefore, the Pedestrian Volume Warrant was not examined.

Warrant #5 (School Crossing):

The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students.

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see MUTCD Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.

There is not a school crossing or a known need for a school crossing at this location. Therefore, the School Crossing Warrant was not examined.

Warrant #6 (Coordinated Signal System):

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. This warrant is based on the premise that vehicular traffic tends to disperse and increase headways between signalized intersections.

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

> A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.
> B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation

There is not a need to increase platooning at this location. Therefore, the Coordinated Signal System Warrant is not met.

Warrant #6 is not met.

Warrant #7 (Crash Experience):

This warrant is based on crash experience at an intersection. 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. Crash records and supporting data must be submitted on this warrant.

The need for a traffic control signal shall be considered if an engineering study finds that all the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and
B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and
C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 902.3.3 (see EPG 902.3.3), **or** the vph in both of the 80 percent columns of Condition B in Table 902.3.3 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 902.3.3 may be used in place of the 80 percent columns.

Criteria A: No alternative safety improvements have been performed at this intersection.

Criteria A is not met.

Criteria B: Crashes were evaluated from January 2015 through Dec 2019.

Relevant Crashes Per Calendar Year					
Crash Type	Year				
	2015	2016	2017	2018	2019
Left Turn	1	1	0	0	0
LT Right Angle	2	2	3	1	0
Right Angle	0	1	0	0	0
Other Relevant Crashes	0	1	0	0	1
Total	**3**	**5**	**3**	**1**	**1**

Within the past 5 years there has been a 12-month period in which 5 or more correctable crashes have occurred.

Criteria B is met.

Criteria C: 56% Condition A and B was described in Warrant 1. However, Warrant #7 only requires Condition A **OR** B be met for 8 hours, whereas Warrant 1 requires BOTH Condition A and B to be met for 8 hours.

Since the posted speed limit is above 40 mph, 56% volumes were used.

56% (Combination of Condition A and B) For Use in Warrant #7	
How many hours was Condition A met?	7
How many hours was Condition B met?	11
Is the combination warrant met?	YES

Criteria C is met.

Crash Experience Warrant	
Is this warrant met?	NO

Warrant #7 is not met.

However, if an adequate trial of alternatives was performed and failed to reduce crashes this warrant would then be met.

Warrant #8 (Roadway Network):

Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network. This warrant is based on existing traffic and is not normally used during project development.

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2 and 3 during an average weekday; or
B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).

A major route as used in this signal warrant shall have at least one of the following characteristics:

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow.
B. It includes rural or suburban highways outside, entering, or traversing a city.
C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

There is not a need for the concentration or organization of traffic in this area. Therefore, the Roadway Network Warrant was not examined.

Warrant #9 (Intersection Near a Grade Crossing):

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 need for a traffic control signal at an active grade crossing shall be considered if an engineering study finds that both of the following criteria are met:

> A. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 ft. of the stop line or yield line on the approach; and
> B. During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Fig. 902.3.11.1 or Fig. 902.3.11.2 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in EPG 900.1.13 Definitions of Headings, Words and Phrases in the EPG 900 articles.

Although there is a nearby grade crossing, the Intersection Near a Grade Crossing Warrant was not examined due to its intended use being for locations where no other warrants are met.

Comments:

An analysis using the traffic count conducted on September 8th, 2020 shows that the intersection of RT FF and Davis Blvd meets Warrants #1, #2, and #3.

The Jan 2015- Dec 2019 crash data also shows that the intersection of RT FF and Davis Blvd would meet Warrant #7 if an adequate trial of alternatives were attempted and failed to reduce crash frequency.

The intersection of RT FF and Davis Blvd located on the Jasper/Newton County line presently meets Signal Warrants listed in the MoDOT EPG. It is therefore recommended that this intersection be placed on the traffic needs list as a warranted signal location.

The City of Joplin is proposing to close the RT FF and Davis Blvd intersection and divert Davis Blvd traffic to Stephens Blvd to combine with existing Stephens Blvd traffic. If Davis Blvd is realigned as proposed it can be concluded that RT FF at Stephens will meet signal warrants. Therefore, RT FF and Stephens should replace RT FF and Davis on the traffic needs list as a warranted signal location following the completion of the proposed realignment.

Traffic Signal Warrant Volume Worksheet
MoDOT Traffic Division
Revised : March 18, 2020

Date of Count (M/D/Y): 09/08/20
County: Jasper

Major Street: RT FF
Minor Street: Davis
Major Street Direction: East-West ◉ North-South ○ ***BE SURE TO HAVE THE CORRECT MAJOR STREET DIRECTION MARKED BEFORE PROCEEDING**

	Northbound Davis				Southbound Davis				Eastbound RT FF				Westbound RT FF			
Start Time	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
6:00 AM					5	0	1			36	16		11	34		
6:15 AM					1	0	5			69	15		8	35		
6:30 AM					4	0	2			89	20		15	52		
6:45 AM					8	0	9			62	21		27	81		
7:00 AM					8	0	4			70	18		13	77		
7:15 AM					4	0	5			76	10		13	100		
7:30 AM					10	0	5			119	25		19	105		
7:45 AM					11	0	7			108	22		32	154		
8:00 AM					9	0	10			72	26		9	106		
8:15 AM					13	0	7			81	14		13	106		
8:30 AM					11	0	8			86	8		9	122		
8:45 AM					8	0	12			87	8		13	98		
9:00 AM					12	0	7			90	18		13	99		
9:15 AM					22	0	11			81	14		11	91		
9:30 AM					17	0	8			83	9		9	115		
9:45 AM					14	0	9			64	15		15	113		
10:00 AM					12	0	9			78	20		8	99		
10:15 AM					9	0	8			84	15		9	104		
10:30 AM					10	0	14			106	17		23	114		
10:45 AM					8	0	9			83	17		15	124		
11:00 AM					14	0	12			99	13		16	120		
11:15 AM					21	0	11			106	14		14	124		
11:30 AM					21	0	8			107	20		11	130		
11:45 AM					15	0	6			112	28		16	110		
12:00 PM					21	0	13			130	15		14	133		
12:15 PM					18	0	15			120	16		14	138		
12:30 PM					15	0	8			138	14		12	137		
12:45 PM					19	0	19			135	25		13	102		
1:00 PM					19	0	13			112	20		19	136		
1:15 PM					13	0	19			116	23		7	107		
1:30 PM					20	0	17			123	23		23	110		
1:45 PM					10	0	13			123	14		14	120		
2:00 PM					24	0	11			133	25		21	105		
2:15 PM					15	0	13			126	14		10	116		
2:30 PM					16	0	12			162	30		9	144		
2:45 PM					17	0	18			128	19		20	119		
3:00 PM					18	0	16			128	18		16	138		
3:15 PM					25	0	12			122	9		18	123		
3:30 PM					23	0	15			123	13		13	126		
3:45 PM					16	0	12			118	30		16	131		
4:00 PM					20	0	10			128	23		15	123		
4:15 PM					20	0	12			138	17		15	141		
4:30 PM					43	0	32			121	25		15	133		
4:45 PM					23	0	16			135	22		16	144		
5:00 PM					29	0	23			152	22		16	149		
5:15 PM					31	0	18			155	24		14	114		
5:30 PM					27	0	21			127	28		17	117		
5:45 PM					23	0	20			114	27		11	87		
6:00 PM					14	0	19			99	10		8	94		
6:15 PM					30	0	23			116	11		6	77		
6:30 PM					27	0	13			75	13		10	75		
6:45 PM					13	0	12			81	15		6	74		

Traffic Signal Warrant Right Turn Volume Treatment Worksheet
MoDOT Traffic Division
Revised : March 18, 2020

Date of Count(M/D/Y):	**09/08/20**
County:	**Jasper**
Major Street:	**RT FF**
Minor Street:	**Davis**
Major Street Direction:	East-West ◉ North-South ○

Right Turn Volume Treatment

Proposed Right Turn Condition	Right Turn Percentage *RT Vol. / Tot. Approach Vol.*	Percent Right Turns Used in Analysis	*Choose 1 option per Movement*			
			Northbound Davis	Southbound Davis	Eastbound RT FF	Westbound RT FF
Free RT w/adequate approach lane	Any	0	○	○	○	○
Signal Control or Free RT w/o adequate approach lane	0 to 25	100	◉	○	◉	◉
	25 to 50	75	○	○	○	○
	50 to 75	50	○	◉	○	○
	75 to 100	25	○	○	○	○
RTOR Restricted	Any	100	○	○	○	○

Traffic Signal Warrant #1 (8 Hour) Worksheet
MoDOT Traffic Division

Revised : July 30, 2020

		# of Lanes per direction (Thru)	Check if Mainline 85th Percentile Speed >40 mph or Pop. < 10,000
Date of Study (M/D/Y):	09/23/20		
County:	Jasper		
Study Performed By:	Brittany Mitchell		
Major Street:	RT FF	2	☑
Minor Street:	Davis	1	
Major Street Direction:	East-West ◉	North-South ○	

Specific MUTCD Warrant Volume Chart for this Intersection

Street	RT FF (both approaches)				Davis (one direction only)			
Value	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
Condition A	600	480	420	336	150	120	105	84
Condition B	900	720	630	504	75	60	53	42

a Basic Minimum hourly volumes.

b Used for combination of Conditions "A" and "B" after adequate trial of other remedial measures.

c May be used when the major street speed exceeds 40 mph or population less than 10,000.

d Used for combination of Conditions "A" and "B" after adequate trial of other remedial measures when the major street speed exceeds 40 mph or population less than 10,000.

Chart data calculated from criteria published in MUTCD Millenium Ed. Chapter 4.

Click here for supporting document.

Traffic Volume Data					Warrant #1 - 70% Condition A			Warrant #1 - 70% Condition B		
					✔ = Hour Meets Criteria			✔ = Hour Meets Criteria		
Hour	Northbound Davis	Southbound Davis	Eastbound RT FF	Westbound RT FF	Davis	RT FF	Intersection	Davis	RT FF	Intersection
6:00-7:00 AM	0	26	328	263		✔				
7:00-8:00 AM	0	38	448	513		✔			✔	
8:00-9:00 AM	0	58	382	476		✔		✔	✔	✔
9:00-10:00 AM	0	68	374	466		✔		✔	✔	✔
10:00-11:00 AM	0	60	420	496		✔		✔	✔	✔
11:00-12:00 AM	0	73	499	541		✔		✔	✔	✔
12:00-1:00PM	0	92	593	563		✔		✔	✔	✔
1:00-2:00 PM	0	93	554	536		✔		✔	✔	✔
2:00-3:00 PM	0	90	637	544		✔		✔	✔	✔
3:00-4:00 PM	0	96	561	581		✔		✔	✔	✔
4:00-5:00 PM	0	123	609	602	✔	✔	✔	✔	✔	✔
5:00-6:00 PM	0	137	649	525	✔	✔	✔	✔	✔	✔
6:00-7:00 PM	0	109	420	350	✔	✔	✔	✔	✔	✔
Pct. of RT Volumes Included	100%	50%	100%	100%	Satisfies Warrant?		NO	Satisfies Warrant?		YES

Note: Combination Condition was not evaluated since Conditions A and/or B is met

SUMMARY

Warrant #1- 70% Condition A (Minimum Vehicular Volume)	
How many hours was Condition A criteria met?	3
Does the intersection satisfy Warrant 1- Condition A?	NO

Warrant #1- 70% Condition B (Interruption of Continuous Traffic)	
How many hours was Condition B criteria met?	11
Does the intersection satisfy Warrant 1- Condition B?	YES

Is Warrant #1 met?	**YES**

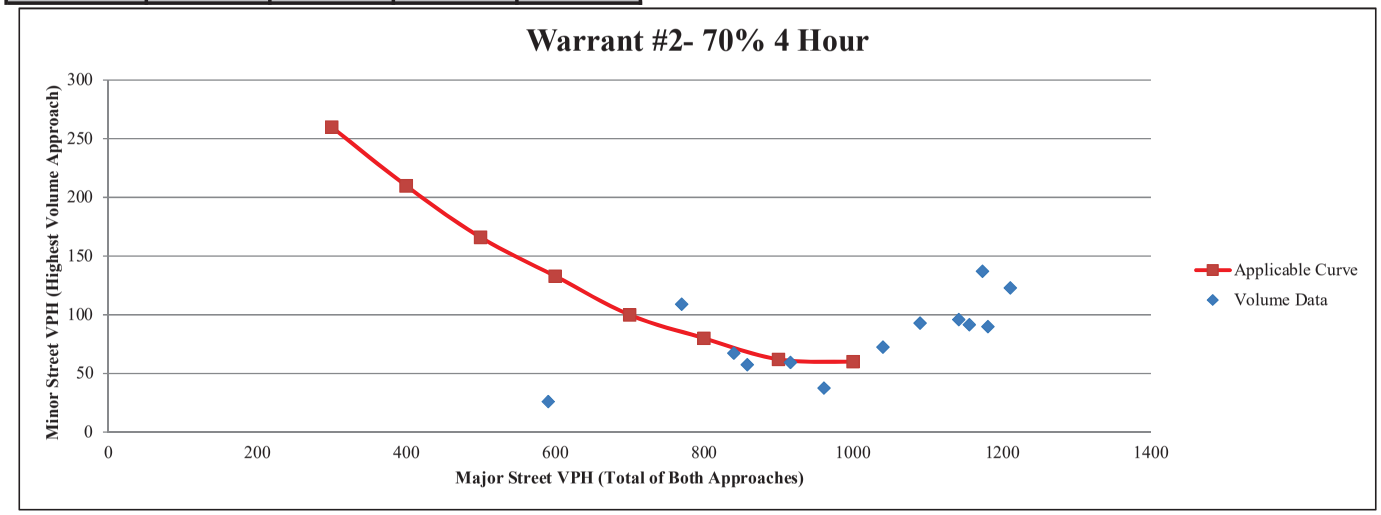
Traffic Signal Warrant #2 (4- Hour) Worksheet
MoDOT Traffic Division
Revised : March 18, 2020

		# of Lanes per direction (Thru)	Check if Mainline 85th Percentile Speed >40 mph or Pop. < 10,000
Date of Study(M/D/Y):	09/23/20		
County:	Jasper		
Study Performed By:	Brittany Mitchell		
Major Street:	RT FF	2	☑
Minor Street:	Davis	1	
Major Street Direction:	East-West ◉	North-South ○	

Traffic Volume Data				
Hour	Northbound Davis	Southbound Davis	Eastbound RT FF	Westbound RT FF
6:00-7:00 AM	0	26	328	263
7:00-8:00 AM	0	37.5	448	513
8:00-9:00 AM	0	57.5	382	476
9:00-10:00 AM	0	67.5	374	466
10:00-11:00 AM	0	59.5	420	496
11:00-12:00 AM	0	72.5	499	541
12:00-1:00PM	0	91.5	593	563
1:00-2:00 PM	0	93	554	536
2:00-3:00 PM	0	90	637	544
3:00-4:00 PM	0	96	561	581
4:00-5:00 PM	0	123	609	602
5:00-6:00 PM	0	137	649	525
6:00-7:00 PM	0	109	420	350
Pct. of RT Volumes Included	100%	50%	100%	100%

Warrant #2- Volume Data	
Total Major Volume	Higher Minor Volume
591	26
961	37.5
858	57.5
840	67.5
916	59.5
1040	72.5
1156	91.5
1090	93
1181	90
1142	96
1211	123
1174	137
770	109

Warrant #2- 70% Applicable Curve	
# of lanes: 2&1	
Major	Minor
300	260
400	210
500	166
600	133
700	100
800	80
900	62
1000	60
#N/A	#N/A
#N/A	#N/A
#N/A	#N/A



SUMMARY

Warrant #2- 70% 4-Hour Volume	
How many hours was criteria met?	8

Is Warrant #2 met?	YES

Traffic Signal Warrant #3 (Peak Hour) Worksheet
MoDOT Traffic Division
Revised : March 18, 2020

This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

According to the above statement, should this warrant be applied at this location?	YES

		# of Lanes per direction (Thru)	Check if Mainline 85th Percentile Speed >40 mph or Pop. < 10,000
Date of Study (M/D/Y):	09/23/20		
County:	Jasper		
Study Performed By:	Brittany Mitchell		
Major Street:	RT FF	2	☑
Minor Street:	Davis	1	
Major Street Direction:	East-West ◉	North-South ○	

Traffic Volume Data

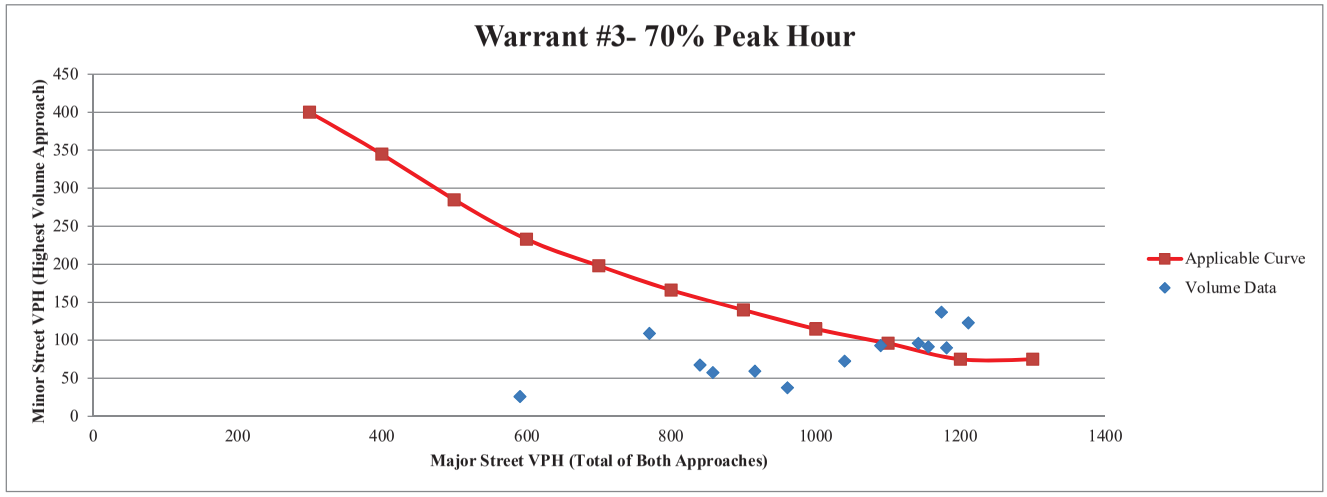
Hour	Northbound Davis	Southbound Davis	Eastbound RT FF	Westbound RT FF
6:00-7:00 AM	0	26	328	263
7:00-8:00 AM	0	37.5	448	513
8:00-9:00 AM	0	57.5	382	476
9:00-10:00 AM	0	67.5	374	466
10:00-11:00 AM	0	59.5	420	496
11:00-12:00 AM	0	72.5	499	541
12:00-1:00PM	0	91.5	593	563
1:00-2:00 PM	0	93	554	536
2:00-3:00 PM	0	90	637	544
3:00-4:00 PM	0	96	561	581
4:00-5:00 PM	0	123	609	602
5:00-6:00 PM	0	137	649	525
6:00-7:00 PM	0	109	420	350
Pct. of RT Volumes Included	100%	50%	100%	100%

Warrant #3- Volume Data

Total Major Volume	Higher Minor Volume
591	26
961	37.5
858	57.5
840	67.5
916	59.5
1040	72.5
1156	91.5
1090	93
1181	90
1142	96
1211	123
1174	137
770	109

Warrant #3- 70% Applicable Curve
# of lanes: 2&1

Major	Minor
300	400
400	345
500	285
600	233
700	198
800	166
900	140
1000	115
1100	96
1200	75
1300	75
#N/A	#N/A
#N/A	#N/A
#N/A	#N/A



SUMMARY

Warrant #3- 70% Peak Hour	
How many hours was criteria met?	5

Is Warrant #3 met?	YES

Traffic Signal Warrant #7 (Crash Experience) Worksheet
MoDOT Traffic Division
Revised : March 18, 2020

		# of Lanes per direction (Thru)	Check if Mainline 85th Percentile Speed >40 mph or Pop. < 10,000
Date of Study(M/D/Y):	09/23/20		
County:	Jasper		
Study Performed By:	Brittany Mitchell		
Major Street:	RT FF	2	☑
Minor Street:	Davis	1	

CRITERIA A

Warrant #7- Adequate Trial of Alternatives	
Has an adequate Trail of alternatives with satisfactory observance and enforcement failed to reduce crash frequency?	NO

CRITERIA B

Warrant #7- Crash History	
Have five or more reported crashes, of types susceptible to correction by a traffic control signal, occurred within a 12-month period?	YES

CRITERIA C

Warrant #7 - 56% Combination		
✔ = *Hour Meets Criteria*		
56% Cond. A	56% Cond. B	Intersection must meet either Condition A **or** B for at least 8 hours.
	✔	
	✔	
	✔	
	✔	
✔	✔	
✔	✔	
✔	✔	
✔	✔	
✔	✔	
✔	✔	
✔	✔	
Satifies Crietria C?		**YES**

Is Warrant #7 Met?	NO

This Warrant Should be re-evaluated if an adequate trial of alternatives does not reduce crashes

Relevant Crash History		
Date	Crash Class	Severity Rating
6/7/2015	LEFT TURN	PROPERTY DAMAGE
6/15/2015	LEFT TURN RIGHT ANGLE	PROPERTY DAMAGE
11/18/2015	LEFT TURN RIGHT ANGLE	PROPERTY DAMAGE
2/8/2016	LEFT TURN	MINOR INJURY
5/16/2016	LEFT TURN RIGHT ANGLE	MINOR INJURY
9/14/2016	LEFT TURN RIGHT ANGLE	MINOR INJURY
10/11/2016	OTHER RELEVANT	MINOR INJURY
10/31/2016	RIGHT ANGLE	DISABLING INJURY
6/23/2017	LEFT TURN RIGHT ANGLE	MINOR INJURY
7/18/2017	LEFT TURN RIGHT ANGLE	PROPERTY DAMAGE
11/22/2017	LEFT TURN RIGHT ANGLE	MINOR INJURY
4/2/2018	LEFT TURN RIGHT ANGLE	PROPERTY DAMAGE
11/26/2019	OTHER RELEVANT	PROPERTY DAMAGE

SUMMARY

Ensure all Yellow Cells have been properly filled out prior to viewing the SUMMARY

WARRANT 1

Warrant #1- 70% Condition A (Minimum Vehicular Volume)	
How many hours was Condition A criteria met?	**3**
Does the intersection satisfy Warrant 1- Condition A?	NO
Warrant #1- 70% Condition B (Interruption of Continuous Traffic)	
How many hours was Condition B criteria met?	**11**
Does the intersection satisfy Warrant 1- Condition B?	**YES**
Warrant #1- 56% Combination	
How many hours meet Condition A?	**7**
How many hours meet Condition B?	11
Have alternative solutions been tried and have failed to solve traffic issues?	0
Does the Intersection satisfy Warrant 1- Combination Warrant?	NO

Is Warrant #1 met?	**YES**

WARRANT 2

Warrant #2- 70% 4-Hour Volume	
How many hours was criteria met?	8

Is Warrant #2 met?	**YES**

WARRANT 3

Warrant #3- 70% Peak Hour	
How many hours was criteria met?	**5**

Is Warrant #3 met?	**YES**

WARRANT 7

Warrant #7- Crash Experience	
Has an adequate Trail of alternatives with satisfactory observance and enforcement failed to reduce crash frequency?	NO
Have five or more reported crashes, of types susceptible to correction by a traffic control signal, occurred within a 12-month period?	YES
Warrant #7 - 56% Combination	YES

Is Warrant #7 met?	**NO**

An adequate trial of alternatives should be attempted in order to reduce crash frequency, if the alternatives fail to reduce crash frequency this warrant should be re-evaluated