Appendix E

Traffic Signal Warrants

Intersection: MD 99 (Old Frederick Road) and Taylor Farm Road

Howard County

□ Location does not warrant signalization based on data collected.

Study Year: 2018 Existing Condition

Location:

	Study Date: n/a				
Warra	nt Analysis:				
The SHA's DSED performed a traffic signal warrant analysis in May of 2018 based on the nationally accepted <i>Manual on Uniform Traffic Control Devices</i> (MUTCD). In place of a count, trip generation estimates were used based on the ITE Trip Generation 10 th Edition methodology. Based on the results of the evaluation, the Data Services Engineering Division (DSED) – Travel Forecasting and Analysis office does not recommend the installation of a traffic signal at the intersection of MD 99 (Old Frederick Road) at Taylor Farm Road under 2018 Existing Conditions. The intersection meets none of the traffic signal warrants.					
1	Eight-Hour vehicular volume	YES	□ NO	⊠ N/A	
2	Four-Hour vehicular volume	YES	□ NO	⊠ N/A	
3	Peak Hour	YES	$oxed{oxed}$ NO	□ N/A	
5	School Crossing	YES	□ NO	⊠ N/A	
7	Crash Experience	YES	$oxed{oxed}$ NO	□ N/A	
_ Lo	cation warrants signalization under warrant(s)			

Source: Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2011.

	YEAR ANALYZED 2018			
	s the intersection lie within the built-up area of an isolated communiting a population of less than 10,000?	у	yes 🗌	no 🖂
Nun Min Nun	or Street: Taylor Farm Road	1 EB, 1 WB 1 NB, 1 SB		
	Warrants for Traffic Signal Installation of the following warrants are satisfied:		trian crossin	g, if one or
War	rant 3, Peak Hour WARRANT SATIS	SFIED:	yes 🗌	no 🖂
	warrant is satisfied when either of the following two categories apply	y:	, <u>—</u>	
A.	If all of the following conditions exist for the same 1 hour of an aver	rage day:	yes 🗌	no 🖂
1.	The total delay experienced by the traffic on one minor-street approved (one direction only) controlled by a STOP sign equal or exceeds: f		Condition s yes ☐	satisfied no 🖂

2.	The volume on the same minor-street approach (one direction only) equals	yes 🗌	no 🖂
	or exceeds 100 vph for one moving lane of traffic or 150 vph for two		

3. The total entering volume serviced during the hour equals or exceeds 650 vph for yes ☐ no ☒ intersections with three approaches or 800 vph for intersections with

B. The plot of vehicles per hour on the major street and the corresponding vehicles yes ☐ no ☒ per hour on the higher-volume minor-street approach for 1 hour of average day

falls above the applicable curve in Figure C (major street 85th percentile speed ≤ 40 mph) for the combination of approach lanes.

vehicle-hours for one lane approach; and five vehicle -hours for two--

lane approach, and

moving lanes of traffic, and

four or more approaches.

Warrant 7, Crash Experience	WARRANT SATISFIED:	yes	no 🖂
Trairiant 1, Grash Experience	WARRANT CATIONIES.	, co	

Review of the three year accident report shows 1 crash, which may not be susceptible to improvements under signalized conditions.

This	warrant is satisfied when the following apply:		
1.	Adequate trial of alternatives, with satisfactory observance and enforcement has failed to reduce the crash frequency and	Condition satisfi yes ☐	ed: no ⊠
2.	Five or more reported crashes, of types susceptible to correction by traffic control signal; have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for reportable crashes and	yes 🗌	no 🔀
3.	There exists a volume of vehicle and pedestrian traffic not less than 56% (major street 85 th percentile speed > 40 mph) or 80% of the requirements Specified in Warrant 1 or Warrant 5, respectively.	yes 🗌	no 🗵

Figure A. Warrant 2, Four-Hour Vehicular Volume

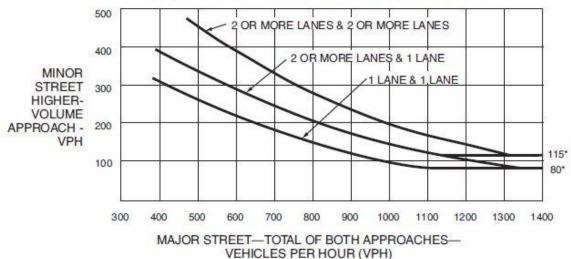


Figure B. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)

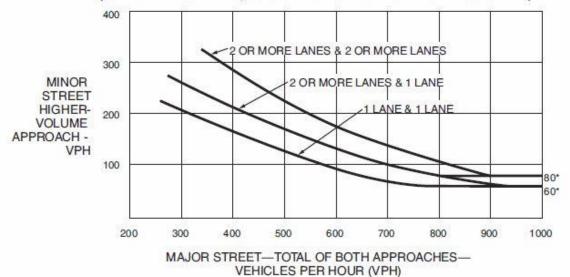
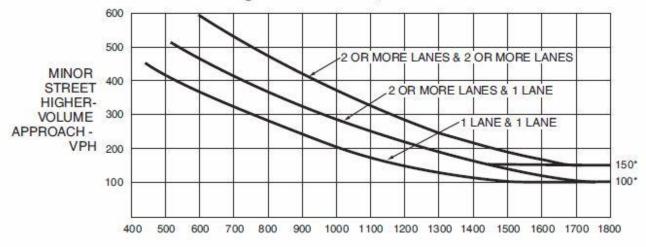


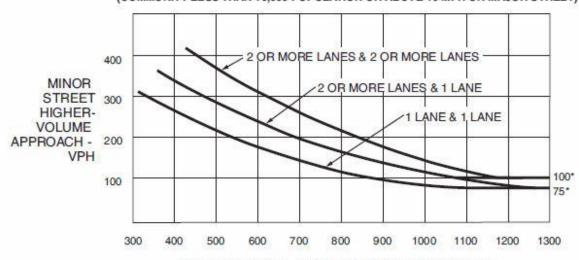
Figure C. Warrant 3, Peak Hour



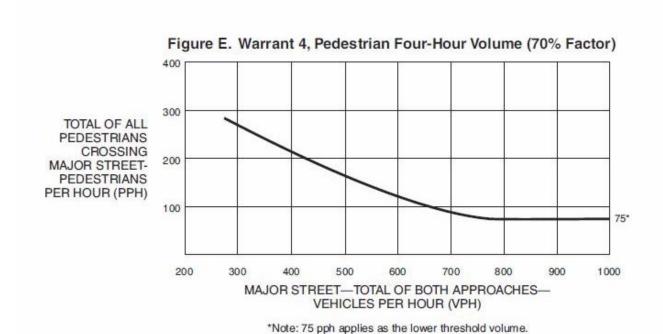
*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

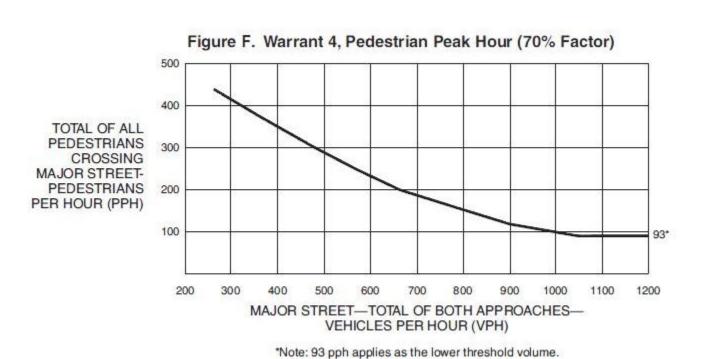
Figure D. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)





	Intersection: MD 99 (Old Frederic Green Clover Road Location: Howard County Study Year: 2018 Existing Condition Study Date: n/a	·	verly Wood	s Drive/	
Warra	nt Analysis:				
Manual based of Service installat	IA's DSED performed a traffic signal warrant on Uniform Traffic Control Devices (MUTCE on the ITE Trip Generation 10 th Edition methods Engineering Division (DSED) – Travel Fotion of a traffic signal at the intersection of MD Road under 2018 Existing Conditions. The intersection of the ITE of the ITE of the ITE of Travel For the ITE of Travel For Tr	D). In place of a count odology. Based on the precasting and Analy D 99 (Old Frederick R	, trip generation the results of the sis office does oad) at Waver	on estimates were e evaluation, the s not recommend by Woods Drive/G	used Data I the
1	Eight-Hour vehicular volume	YES	□NO	⊠ N/A	
_ 2	Four-Hour vehicular volume	☐ YES	□NO	⊠ N/A	
☐ 3	Peak Hour	YES	⊠ NO	□ N/A	
<u> </u>	School Crossing	☐ YES	□NO	⊠ N/A	
□ 7	Crash Experience	YES	$oxed{oxed}$ NO	□ N/A	
☐ Lo	cation warrants signalization under war	rant(s)			
⊠ Loc	cation does not warrant signalization based	d on data collected.			

It should be noted that the study intersection is within a school zone.

Source: Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2011.

more of the following warrants are satisfied:

Warrant 7, Crash Experience

YEAR ANALYZED 2018				
Does the intersection lie within the built-up area of an isolated communating a population of less than 10,000?	unity	yes 🗌	no 🛚	
Major Street: MD 99 (Old Frederick Road) Number of lanes of moving traffic on each major street approach: Minor Street: Waverly Woods Drive/Green Clover Road	1 EB, 1 WB			
Number of lanes of moving traffic on each minor street approach: Posted speed limit along MD 99: 40 MPH	1 NB, 1 SB			
Warrants for Traffic Signal Inst	allation			
Traffic control signal may be justified at an intersection, driveway of	or mid-block pedes	strian crossi	ng, if one or	

Warrant 3, Peak Hour **WARRANT SATISFIED:** yes no \times This warrant is satisfied when either of the following two categories apply: If all of the following conditions exist for the same 1 hour of an average day: yes 🗌 no 🖂 Α. Condition satisfied no 🖂 1. The total delay experienced by the traffic on one minor-street approach yes 🗌 (one direction only) controlled by a STOP sign equal or exceeds: four vehicle-hours for one lane approach; and five vehicle -hours for two-lane approach, and 2. The volume on the same minor-street approach (one direction only) equals ves \square no 🖂 or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes of traffic, and The total entering volume serviced during the hour equals or exceeds 650 vph for 3. yes \square no 🖂 intersections with three approaches or 800 vph for intersections with four or more approaches. The plot of vehicles per hour on the major street and the corresponding vehicles yes 🗌 no 🖂 B. per hour on the higher-volume minor-street approach for 1 hour of average day falls above the applicable curve in Figure C (major street 85th percentile speed ≤ 40 mph) for the combination of approach lanes.

Review of the three year accident report shows 2 crashes	, which would not be susceptible to improvements
under signalized conditions.	

WARRANT SATISFIED:

no 🖂

yes

This	warrant is satisfied when the following apply:		
1.	Adequate trial of alternatives, with satisfactory observance and enforcement has failed to reduce the crash frequency and	Condition satisfi yes ☐	ed: no ⊠
2.	Five or more reported crashes, of types susceptible to correction by traffic control signal; have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for reportable crashes and	yes 🗌	no 🗵
3.	There exists a volume of vehicle and pedestrian traffic not less than 56% (major street 85 th percentile speed > 40 mph) or 80% of the requirements Specified in Warrant 1 or Warrant 5, respectively.	yes 🗌	no 🗵

Figure A. Warrant 2, Four-Hour Vehicular Volume

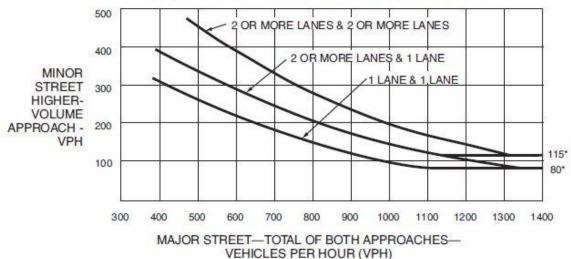


Figure B. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)

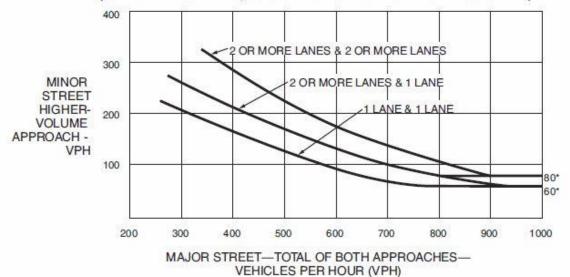
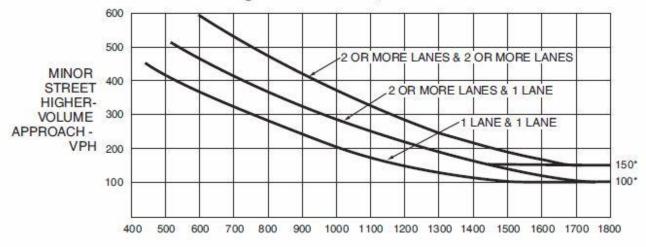


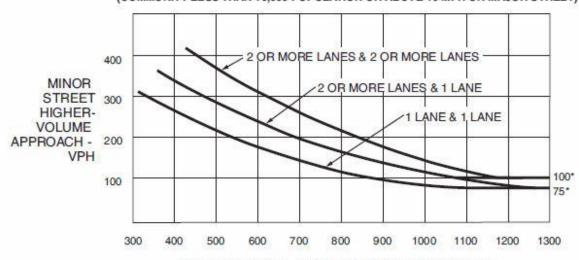
Figure C. Warrant 3, Peak Hour



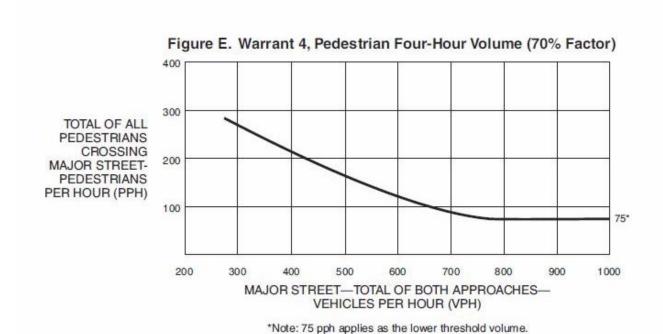
*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

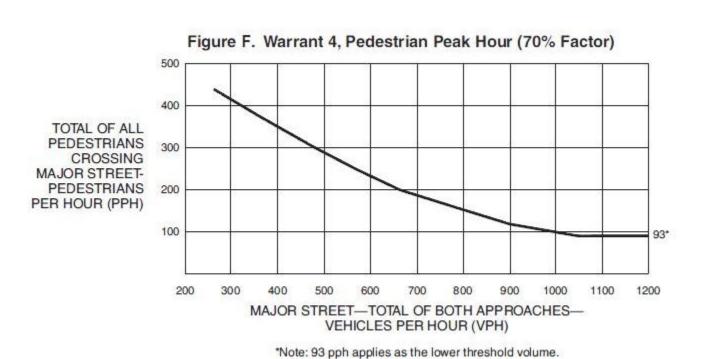
Figure D. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)





	Location:	Bethany Lane and Postv Howard County 2018 Existing Condition 05/22/2018	wick Road			
Warran	t Analysis:					
The SHA's DSED performed a traffic signal warrant analysis in May of 2018 based on the nationally accepted <i>Manual on Uniform Traffic Control Devices</i> (MUTCD). Based on the results of the evaluation, the Data Services Engineering Division (DSED) – Travel Forecasting and Analysis office does not recommend the installation of a traffic signal at the intersection of Bethany Lane at Postwick Road under 2018 Existing Conditions. The intersection meets one of the traffic signal warrants.						
□ 1 I	Eight-Hour vehicu	ular volume	☐ YES	$oxed{oxed}$ NO	□ N/A	
2 I	Four-Hour vehicu	ılar volume	☐ YES	$oxed{oxed}$ NO	□ N/A	
□ 3 I	Peak Hour		☐ YES	$oxed{oxed}$ NO	□ N/A	
□ 5	School Crossing		☐ YES	$oxed{oxed}$ NO	□ N/A	
7	Crash Experience	Э	YES	⊠ NO	□ N/A	
☐ Location warrants signalization under warrant(s)						
⊠ Loca	ation does not wa	rrant signalization based o	n data collected.			

Source: Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2011.

YEAR ANALYZED 2018			
Does the intersection lie within the built-up area of an isolated commu having a population of less than 10,000?	nity	yes 🗌	no 🖂
Major Street: Bethany Lane			
Number of lanes of moving traffic on each major street approach:	1 NB, 1 SB		
Minor Street: Postwick Road			
Number of lanes of moving traffic on each minor street approach:	1 EB, 1 WB		

Posted speed limit along MD 99: 30 MPH

Traffic control signal may be justified at an intersection, driveway or mid-block pedestrian crossing, if one or more of the following warrants are satisfied:

Warrants for Traffic Signal Installation

N	/arrant 1, Eight-Hour Vehicular Volume	WARRANT SATISFIED:	yes
Th	is warrant is satisfied when one of the following	ing apply	
			Condition satisfied:
A.	Minimum Vehicular Volume		yes □ no ⊠
	For each of any 8 hours of an average da	y, the vehicles per hour on the major	or street and on the higher-
	volume minor street or driveway approach	to the intersection equal or exceed the	he following:

Major Street: 400 vph for 80% since the major street 85^{th} percentile speed \leq 40 MPH, = 1 lanes on major and = 1 minor lane

Minor Street: 120 vph for 80% since the major street 85^{th} percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Time	Major Street	Volume	Minor Street	Volume	Requiremen	t Satisfied
06:00 AM - 07:00 AM	Bethany Lane	15	Postwick Road	42	yes 🗌	no 🖂
07:00 AM – 08:00 AM	Bethany Lane	687	Postwick Road	77	yes 🗌	no 🖂
08:00 AM – 09:00 AM	Bethany Lane	635	Postwick Road	62	yes 🗌	no 🖂
09:00 AM – 10:00 AM	Bethany Lane	15	Postwick Road	11	yes 🗌	no 🖂
10:00 AM – 11:00 AM	Bethany Lane	10	Postwick Road	11	yes 🗌	no 🖂
11:00 AM – 12:00 PM	Bethany Lane	15	Postwick Road	8	yes 🗌	no 🖂
12:00 PM – 01:00 PM	Bethany Lane	13	Postwick Road	9	yes 🗌	no 🖂
01:00 PM – 02:00 PM	Bethany Lane	15	Postwick Road	11	yes 🗌	no 🖂
02:00 PM – 03:00 PM	Bethany Lane	13	Postwick Road	10	yes 🗌	no 🖂
03:00 PM – 04:00 PM	Bethany Lane	15	Postwick Road	14	yes 🗌	no 🖂
04:00 PM - 05:00 PM	Bethany Lane	179	Postwick Road	62	yes 🗌	no 🔀
05:00 PM – 06:00 PM	Bethany Lane	910	Postwick Road	83	yes 🗌	no 🖂
06:00 PM – 07:00 PM	Bethany Lane	549	Postwick Road	44	yes 🗌	no 🖂

B. The Interruption of Continuous Traffic

yes ☐ no ☒

For each of any 8 hours of an average day, the vehicles per hour on the major street and on the higher-volume minor street or driveway approach to the intersection equal or exceed the following:

Major Street: 600 vph for 80% since the major street 85^{th} percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Minor Street: 60 vph for 80% since the major street 85^{th} percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Time	Major Street	Volume	Minor Street	Volume	Requiremen	t Satisfied
06:00 AM - 07:00 AM	Bethany Lane	15	Postwick Road	42	yes 🗌	no 🖂
07:00 AM – 08:00 AM	Bethany Lane	687	Postwick Road	77	yes 🗌	no 🛛
08:00 AM – 09:00 AM	Bethany Lane	635	Postwick Road	62	yes 🗌	no 🖂
09:00 AM – 10:00 AM	Bethany Lane	15	Postwick Road	11	yes 🗌	no 🖂
10:00 AM – 11:00 AM	Bethany Lane	10	Postwick Road	11	yes 🗌	no 🖂
11:00 AM – 12:00 PM	Bethany Lane	15	Postwick Road	8	yes 🗌	no 🖂
12:00 PM – 01:00 PM	Bethany Lane	13	Postwick Road	9	yes 🗌	no 🛚
01:00 PM – 02:00 PM	Bethany Lane	15	Postwick Road	11	yes 🗌	no 🛚
02:00 PM – 03:00 PM	Bethany Lane	13	Postwick Road	10	yes 🗌	no 🛚
03:00 PM - 04:00 PM	Bethany Lane	15	Postwick Road	14	yes 🗌	no 🛚
04:00 PM - 05:00 PM	Bethany Lane	179	Postwick Road	62	yes 🗌	no 🛛
05:00 PM – 06:00 PM	Bethany Lane	910	Postwick Road	83	yes 🖂	no 🗌
06:00 PM – 07:00 PM	Bethany Lane	549	Postwick Road	44	yes 🗌	no 🖂

Warrant 2, Four-Hour Vehicular Volume	WARRANT SATISFIED:	yes 🗌 no 🖂
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The Four-Hour Volume Warrant is satisfied when for each of any four hours of an average day, the plotted points representing the vehicles per hour on the major-street and the corresponding vehicles per hour on the higher volume minor-street all fall above the curve in Figure A since the major street 85^{th} Percentile Speed ≤ 40 MPH. The lower threshold volume for minor street is 80 vph.

Time	Major Street	Volume	Minor Street	Volume	Requiremen	t Satisfied
06:00 AM - 07:00 AM	Bethany Lane	15	Postwick Road	42	yes 🗌	no 🖂
07:00 AM – 08:00 AM	Bethany Lane	687	Postwick Road	77	yes 🗌	no 🖂
08:00 AM – 09:00 AM	Bethany Lane	635	Postwick Road	62	yes 🗌	no 🖂
09:00 AM – 10:00 AM	Bethany Lane	15	Postwick Road	11	yes 🗌	no 🖂
10:00 AM – 11:00 AM	Bethany Lane	10	Postwick Road	11	yes 🗌	no 🖂
11:00 AM – 12:00 PM	Bethany Lane	15	Postwick Road	8	yes 🗌	no 🖂
12:00 PM – 01:00 PM	Bethany Lane	13	Postwick Road	9	yes 🗌	no 🖂
01:00 PM - 02:00 PM	Bethany Lane	15	Postwick Road	11	yes 🗌	no 🖂
02:00 PM - 03:00 PM	Bethany Lane	13	Postwick Road	10	yes 🗌	no 🖂
03:00 PM - 04:00 PM	Bethany Lane	15	Postwick Road	14	yes 🗌	no 🖂
04:00 PM – 05:00 PM	Bethany Lane	179	Postwick Road	62	yes 🗌	no 🖂

05:00 PM – 06:00 PM	Bethany Lane	910	Postwick Road	83	yes 🗌	no 🖂
06:00 PM – 07:00 PM	Bethany Lane	549	Postwick Road	44	yes 🗌	no 🖂

Warı	rant 3, Peak Hour	WARRANT SATISFIED:	yes 🔛	no 🖂
This	warrant is satisfied when either of the following	two categories apply:		
A.	If all of the following conditions exist for the san	ne 1 hour of an average day:	yes 🗌	no 🖂
1.	The total delay experienced by the traffic on on (one direction only) controlled by a STOP sign vehicle-hours for one lane approach; and five v lane approach, and	equal or exceeds: four	Condition s yes	satisfied no ⊠
2.	The volume on the same minor-street approach or exceeds 100 vph for one moving lane of traff moving lanes of traffic, and		yes 🗌	no 🖂
3.	The total entering volume serviced during the hintersections with three approaches or 800 vph four or more approaches.		r yes □	no 🗵
B.	The plot of vehicles per hour on the major street per hour on the higher-volume minor-street app falls above the applicable curve in Figure C (mass 40 mph) for the combination of approach lane	proach for 1 hour of average day ajor street 85 th percentile speed	yes 🗌	no 🖂
War	rant 5, School Crossing	WARRANT SATISFIED:	yes 🗌	no 🖂
relate show cross	warrant is satisfied when the study of the frequed to number and size of groups of school childres that the number of adequate gaps in the training is less than the number of minutes in the sents during the highest crossing hour.	en at an established school cross ffic stream during the period who	ing across a r en children ar	stream as najor street e using the
War	rant 7, Crash Experience	WARRANT SATISFIED:	yes 🗌	no 🛚
Revi	ew of the three year accident report shows 0 cra	ashes.		
This	warrant is satisfied when the following apply:	-		
1.	Adequate trial of alternatives, with satisfactory of has failed to reduce the crash frequency and		ondition satisf yes □	ied: no ⊠

2.	Five or more reported crashes, of types susceptible to correction by traffic control signal; have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for reportable crashes and	yes 🗌	no 🗵
3.	There exists a volume of vehicle and pedestrian traffic not less than 56% (major street 85 th percentile speed > 40 mph) or 80% of the requirements Specified in Warrant 1 or Warrant 5, respectively.	yes 🗌	no 🗵

Figure A. Warrant 2, Four-Hour Vehicular Volume

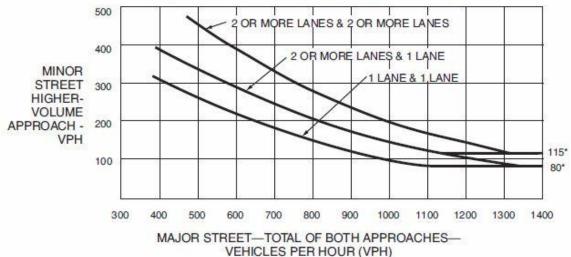


Figure B. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)

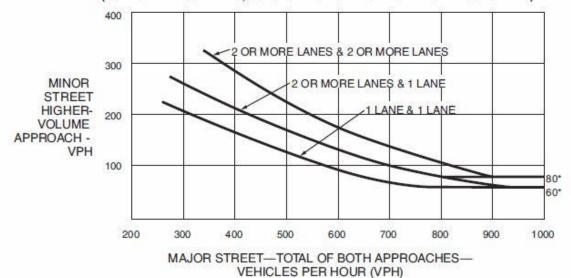
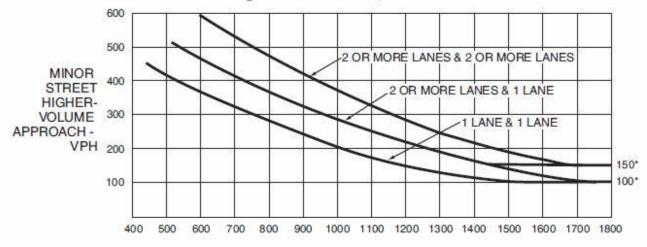


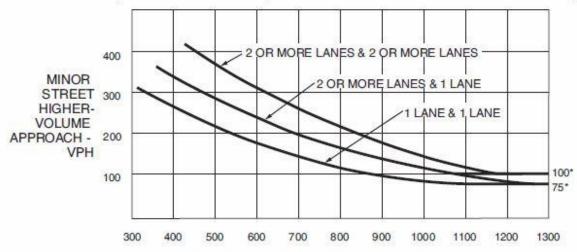
Figure C. Warrant 3, Peak Hour



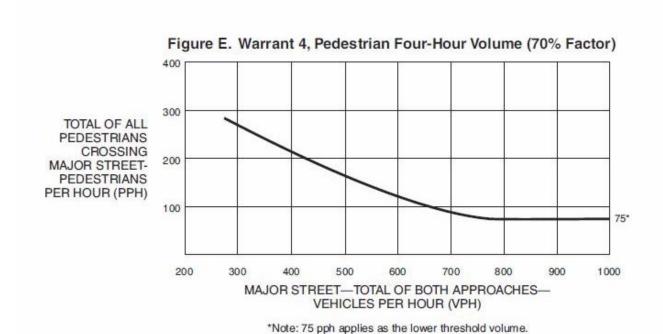
*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

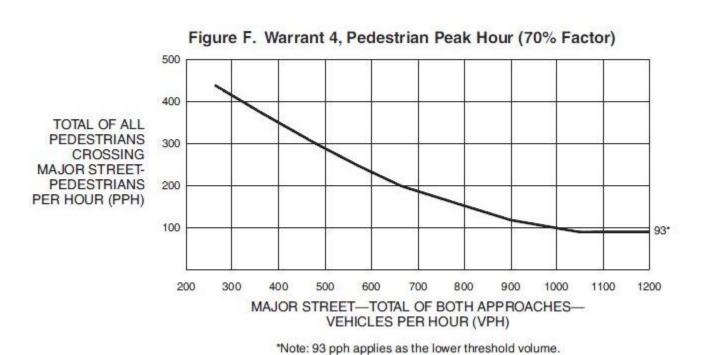
Figure D. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)





	Location:	MD 99 and Liter Drive Howard County 2018 Existing Conditio n/a	n			
Warra	nt Analysis:					
Manual based of Service installat	on Uniform Traffice on the ITE Trip Gents Engineering Divition of a traffic signification.	ed a traffic signal warrant as <i>Control Devices</i> (MUTCD) peration 10 th Edition method sion (DSED) – Travel Formal at the intersection of Material transfer of the section meets none of the). In place of a count, lology. Based on the recasting and Analys (ID 99 (Old Frederic	trip generation e results of the sis office does k Road) at L	on estimates were ne evaluation, the es not recommend	used Data d the
_ 1	Eight-Hour vehice	ular volume	☐ YES	□NO	⊠ N/A	
_ 2	Four-Hour vehicu	ılar volume	☐ YES	□NO	⊠ N/A	
<u> </u>	Peak Hour		☐ YES	$oxed{oxed}$ NO	□ N/A	
<u> </u>	School Crossing		☐ YES	□NO	⊠ N/A	
_ 7	Crash Experience	Э	☐ YES	⊠ NO	□ N/A	
∐ Lo	cation warrants s	signalization under warr	ant(s)			
⊠ Loc	cation does not wa	rrant signalization based	on data collected.			

Source: Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2011.

moving lanes of traffic, and

four or more approaches.

Warrant 7, Crash Experience

3.

B.

	YEAR ANALYZED 2018		
	es the intersection lie within the built-up area of an isolated community ing a population of less than 10,000?	yes 🗌	no 🖂
Nui Mir Nui	for Street: MD 99 (Old Frederick Road) mber of lanes of moving traffic on each major street approach: nor Street: Liter Drive mber of lanes of moving traffic on each minor street approach: 1 NB, 1 SB ted speed limit along MD 99: 40 MPH		
	Warrants for Traffic Signal Installation		
	ffic control signal may be justified at an intersection, driveway or mid-block pedere of the following warrants are satisfied:	estrian crossi	ng, if one or
Wa	rrant 3, Peak Hour WARRANT SATISFIED:	yes 🗌	no 🖂
This	s warrant is satisfied when either of the following two categories apply:		
A.	If all of the following conditions exist for the same 1 hour of an average day:	yes 🗌	no 🖂
1.	The total delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceeds: four vehicle-hours for one lane approach; and five vehicle –hours for two-lane approach, and	Condition yes [satisfied no ⊠
2.	The volume on the same minor-street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two	yes 🗌	no 🖂

The total entering volume serviced during the hour equals or exceeds 650 vph for

The plot of vehicles per hour on the major street and the corresponding vehicles

per hour on the higher-volume minor-street approach for 1 hour of average day falls above the applicable curve in Figure C (major street 85th percentile speed

intersections with three approaches or 800 vph for intersections with

≤ 40 mph) for the combination of approach lanes.

Review of the three year accident report shows 1 crash, which would not be susceptible to improvements under signalized conditions.

WARRANT SATISFIED:

no 🖂

no 🖂

no 🖂

yes \square

yes 🗌

yes

This	warrant is satisfied when the following apply:		
1.	Adequate trial of alternatives, with satisfactory observance and enforcement has failed to reduce the crash frequency and	Condition satisfi yes ☐	ed: no ⊠
2.	Five or more reported crashes, of types susceptible to correction by traffic control signal; have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for reportable crashes and	yes 🗌	no 🗵
3.	There exists a volume of vehicle and pedestrian traffic not less than 56% (major street 85 th percentile speed > 40 mph) or 80% of the requirements Specified in Warrant 1 or Warrant 5, respectively.	yes 🗌	no 🗵

Figure A. Warrant 2, Four-Hour Vehicular Volume

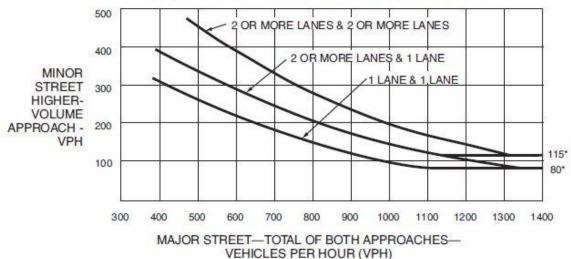


Figure B. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)

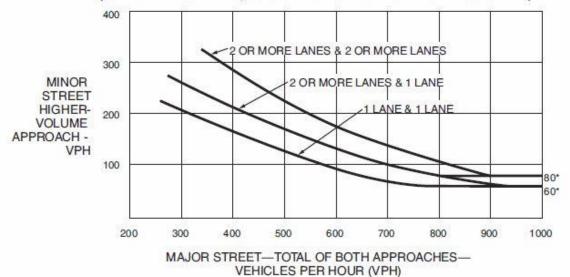
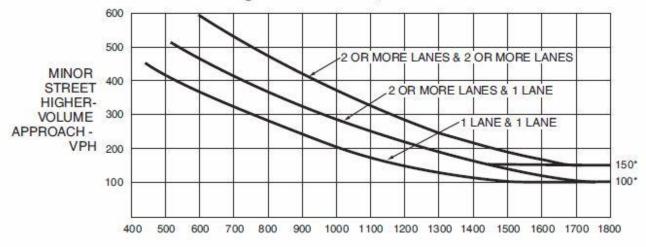


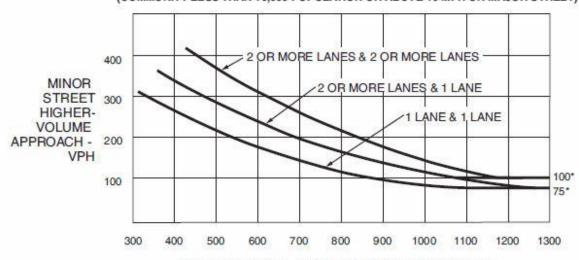
Figure C. Warrant 3, Peak Hour



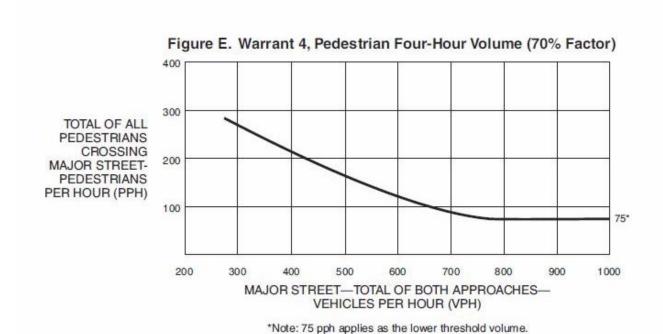
*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

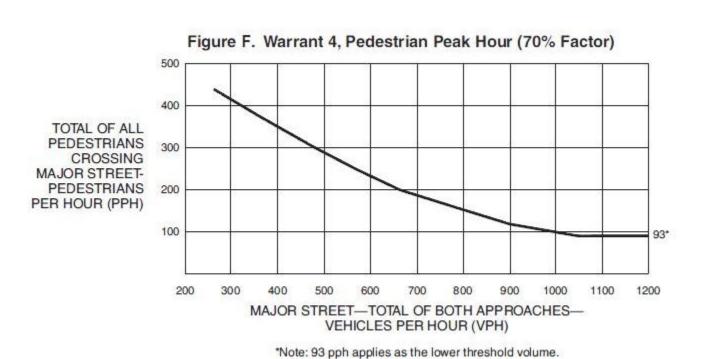
Figure D. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)





Intersection MD 99 and Weatherstone Drive

	Location: Study Year: Study Date:	Howard County 2018 Existing Condition/a	n		
<u>Warrar</u>	nt Analysis:				
Manual based of Services installat	on Uniform Trafficenth the ITE Trip Gents Engineering Division of a traffic sign	ed a traffic signal warrant at Control Devices (MUTCD) teration 10 th Edition method sion (DSED) – Travel For all at the intersection meets none	D. In place of a count, lology. Based on the ecasting and Analysto 99 (Old Frederick	trip generation e results of the sis office doe Road) at Wea	on estimates were used e evaluation, the Data s not recommend the
<u> </u>	Eight-Hour vehice	ular volume	☐ YES	□NO	⊠ N/A
_ 2	Four-Hour vehicu	ılar volume	☐ YES	□NO	⊠ N/A
□ 3	Peak Hour		☐ YES	$oxed{oxed}$ NO	□ N/A
□ 5	School Crossing		☐ YES	□NO	⊠ N/A
7	Crash Experience	Э	YES	$oxed{oxed}$ NO	□ N/A
	eation warrante e	ignalization under warra	ant(s)		
_			. ,		
∑ Loc	ation does not wa	rrant signalization based	on data collected.		

Source: Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2011.

	YEAR ANALYZED 2018							
	es the intersection lie within the built-up area of an isolated community ing a population of less than 10,000?	yes 🗌	no 🖂					
Nur Min Nur	or Street: MD 99 (Old Frederick Road) mber of lanes of moving traffic on each major street approach: or Street: Weatherstone Drive mber of lanes of moving traffic on each minor street approach: 1 NB, 1 SB ted speed limit along MD 99: 40 MPH							
	Warrants for Traffic Signal Installation							
	ffic control signal may be justified at an intersection, driveway or mid-block pedestre of the following warrants are satisfied:	crian crossin	g, if one o					
Wai	rrant 3, Peak Hour WARRANT SATISFIED:	yes 🗌	no 🖂					
This	s warrant is satisfied when either of the following two categories apply:							
A.	If all of the following conditions exist for the same 1 hour of an average day:	yes 🗌	no 🖂					
1.	The total delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceeds: four vehicle-hours for one lane approach; and five vehicle –hours for two-lane approach, and	Condition s	satisfied no 🏻					
2.	The volume on the same minor-street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes of traffic, and	yes 🗌	no 🖂					
3.	The total entering volume serviced during the hour equals or exceeds 650 vph for intersections with three approaches or 800 vph for intersections with four or more approaches.	yes 🗌	no 🛚					
B.	The plot of vehicles per hour on the major street and the corresponding vehicles per hour on the higher-volume minor-street approach for 1 hour of average day falls above the applicable curve in Figure C (major street 85 th percentile speed ≤ 40 mph) for the combination of approach lanes.	yes 🗌	no 🛚					

Warrant 7, Crash Experience	WARRANT SATISFIED:	yes 🗌 no 🖂
-----------------------------	--------------------	------------

Review of the three year accident report shows 0 crashes.

This	warrant is satisfied when the following apply:		
1.	Adequate trial of alternatives, with satisfactory observance and enforcement has failed to reduce the crash frequency and	Condition satisf yes ☐	fied: no ⊠
2.	Five or more reported crashes, of types susceptible to correction by traffic control signal; have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for reportable crashes and	yes □	no 🖂
3.	There exists a volume of vehicle and pedestrian traffic not less than 56% (major street 85 th percentile speed > 40 mph) or 80% of the requirements Specified in Warrant 1 or Warrant 5, respectively.	yes 🗌	no 🛚

Figure A. Warrant 2, Four-Hour Vehicular Volume

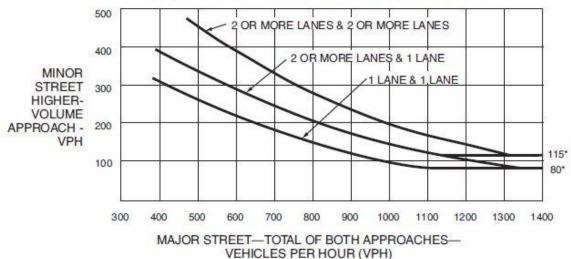


Figure B. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)

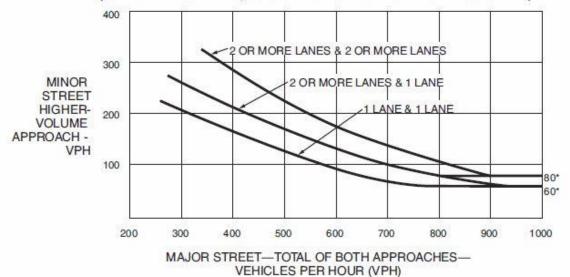
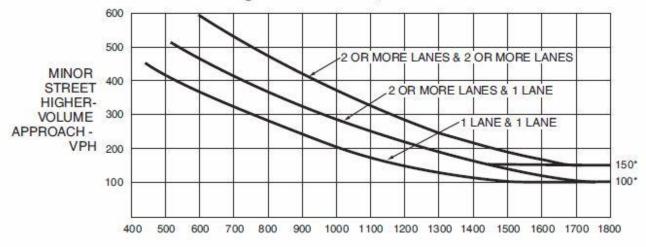


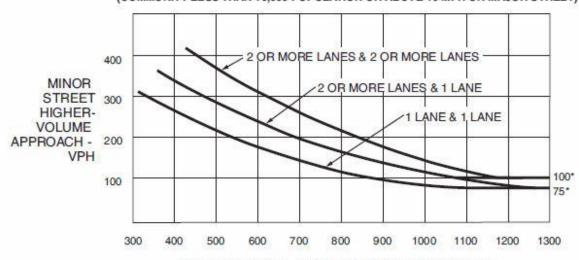
Figure C. Warrant 3, Peak Hour



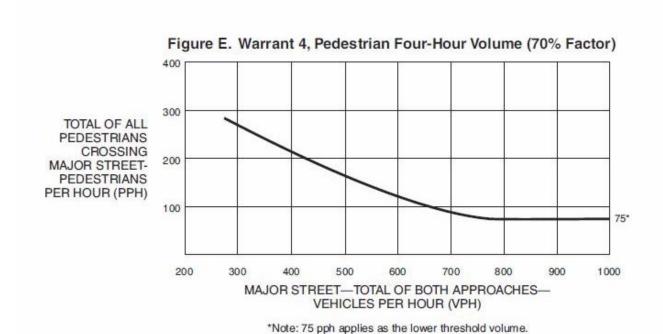
*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

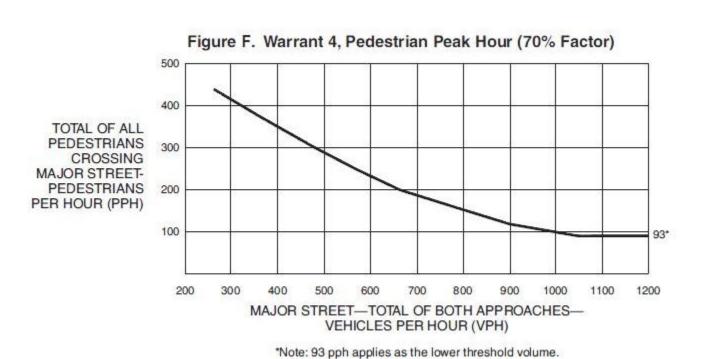
Figure D. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)





Intersection MD 99 and McKenzie Road

Location: Howard County
Study Year: 2018 Existing Condition

	Count Date: 04/05/2016			
<u>Warran</u>	nt Analysis:			
Uniform signal is	formed a traffic signal warrant analysis in Manager Traffic Control Devices (MUTCD). Based on a not recommend at the intersection of MD 9 g Conditions. The intersection meets none of the	n the results of the ends of t	valuation, the bad) at McKe	installation of a traffic
□ 1	Eight-Hour vehicular volume	☐ YES	$oxed{\boxtimes}$ NO	□ N/A
_ 2	Four-Hour vehicular volume	☐ YES	$oxed{oxed}$ NO	□ N/A
□ 3	Peak Hour	☐ YES	$oxed{oxed}$ NO	□ N/A
□ 5	School Crossing	☐ YES	$oxed{oxed}$ NO	□ N/A
7	Crash Experience	☐ YES	$oxed{oxed}$ NO	□ N/A
☐ Loc	cation warrants signalization under warr	ant(s)		
Loc	ation does not warrant signalization based	on data collected.		

Source: Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2011.

YEAR ANALYZED 2016					
Does the intersection lie within the built-up area of an isolated comm having a population of less than 10,000?	unity	yes 🗌	no 🖂		
Major Street: MD 99 (Old Frederick Road) Number of lanes of moving traffic on each major street approach: Minor Street: McKenzie Road	1 EB, 1 WB				

Number of lanes of moving traffic on each minor street approach: 1 NB, 1 SB

Posted speed limit along MD 99: 40 MPH

Warrants for Traffic Signal Installation

Traffic control signal may be justified at an intersection, driveway or mid-block pedestrian crossing, if one or more of the following warrants are satisfied:

V	Varrant 1, Eight-Hour Vehicular Volume	WARRANT SATISFIED:	yes ∐ no ⊠
\mathbf{T}	his warrant is satisfied when one of the followi	ing apply	
			Condition satisfied:
Α	Minimum Vehicular Volume		yes 🗌 🛮 no 🖂
	For each of any 8 hours of an average day	y, the vehicles per hour on the major	or street and on the higher-
	volume minor street or driveway approach	to the intersection equal or exceed the	he following:

Major Street: 400 vph for 80% since the major street 85th percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Minor Street: 120 vph for 80% since the major street 85th percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Time	Major Street	Volume	Minor Street	Volume	Requiremen	nt Satisfied
06:00 AM – 07:00 AM	MD 99	407	McKenzie Road	28	yes 🗌	no 🖂
07:00 AM – 08:00 AM	MD 99	1064	McKenzie Road	67	yes 🗌	no 🖂
08:00 AM – 09:00 AM	MD 99	1280	McKenzie Road	69	yes 🗌	no 🖂
09:00 AM – 10:00 AM	MD 99	826	McKenzie Road	39	yes 🗌	no 🖂
10:00 AM – 11:00 AM	MD 99	561	McKenzie Road	34	yes 🗌	no 🖂
11:00 AM – 12:00 PM	MD 99	540	McKenzie Road	33	yes 🗌	no 🛚
12:00 PM - 01:00 PM	MD 99	547	McKenzie Road	47	yes 🗌	no 🖂
01:00 PM - 02:00 PM	MD 99	635	McKenzie Road	42	yes 🗌	no 🖂
02:00 PM - 03:00 PM	MD 99	737	McKenzie Road	48	yes 🗌	no 🖂
03:00 PM - 04:00 PM	MD 99	854	McKenzie Road	27	yes 🗌	no 🖂
04:00 PM - 05:00 PM	MD 99	1309	McKenzie Road	55	yes 🗌	no 🖂
05:00 PM - 06:00 PM	MD 99	1290	McKenzie Road	43	yes 🗌	no 🖂
06:00 PM - 07:00 PM	MD 99	1175	McKenzie Road	52	yes 🗌	no 🖂

B. The Interruption of Continuous Traffic

yes ☐ no ⊠

For each of any 8 hours of an average day, the vehicles per hour on the major street and on the higher-volume minor street or driveway approach to the intersection equal or exceed the following:

Major Street: 600 vph for 80% since the major street 85^{th} percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Minor Street: 60 vph for 80% since the major street 85^{th} percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Time	Major Street	Volume	Minor Street	Volume	Requiremen	t Satisfied
06:00 AM – 07:00 AM	MD 99	407	McKenzie Road	28	yes 🗌	no 🖂
07:30 AM – 08:30 AM	MD 99	1253	McKenzie Road	72	yes 🖂	no 🗌
08:30 AM – 09:30 AM	MD 99	1077	McKenzie Road	59	yes 🗌	no 🖂
09:30 AM – 10:30 AM	MD 99	650	McKenzie Road	30	yes 🗌	no 🖂
10:30 AM – 11:30 AM	MD 99	531	McKenzie Road	33	yes 🗌	no 🖂
11:30 AM – 12:30 PM	MD 99	535	McKenzie Road	42	yes 🗌	no 🖂
12:30 PM – 01:30 PM	MD 99	589	McKenzie Road	49	yes	no 🖂
01:30 PM – 02:30 PM	MD 99	648	McKenzie Road	38	yes 🗌	no 🖂
02:00 PM - 03:00 PM	MD 99	737	McKenzie Road	48	yes	no 🖂
02:30 PM - 03:30 PM	MD 99	808	McKenzie Road	38	yes	no 🖂
03:00 PM - 04:00 PM	MD 99	854	McKenzie Road	27	yes 🗌	no 🖂
03:30 PM – 04:30 PM	MD 99	1098	McKenzie Road	50	yes 🗌	no 🖂
04:00 PM - 05:00 PM	MD 99	1309	McKenzie Road	55	yes 🗌	no 🖂
04:30 PM – 05:30 PM	MD 99	1334	McKenzie Road	43	yes 🗌	no 🖂
05:00 PM – 06:00 PM	MD 99	1290	McKenzie Road	43	yes 🗌	no 🖂
06:00 PM – 07:00 PM	MD 99	1175	McKenzie Road	52	yes 🗌	no 🖂

The Four-Hour Volume Warrant is satisfied when for each of any four hours of an average day, the plotted points representing the vehicles per hour on the major-street and the corresponding vehicles per hour on the higher volume minor-street all fall above the curve in Figure A since the major street 85^{th} Percentile Speed ≤ 40 MPH. The lower threshold volume for minor street is 80 vph.

Time	Major Street	Volume	Minor Street	Volume	Require Satisf	
06:00 AM - 07:00 AM	MD 99	407	McKenzie Road	28	yes 🗌	no 🖂
07:30 AM – 08:30 AM	MD 99	1253	McKenzie Road	72	yes 🗌	no 🔀
08:30 AM – 09:30 AM	MD 99	1077	McKenzie Road	59	yes 🗌	no 🖂
09:30 AM – 10:30 AM	MD 99	650	McKenzie Road	30	yes 🗌	no 🖂
10:30 AM – 11:30 AM	MD 99	531	McKenzie Road	33	yes 🗌	no 🖂
11:30 AM – 12:30 PM	MD 99	535	McKenzie Road	42	yes 🗌	no 🖂
12:30 PM – 01:30 PM	MD 99	589	McKenzie Road	49	yes 🗌	no 🔀

01:30 PM – 02:30 PM	MD 99	648	McKenzie Road	38	yes 🗌	no 🖂
02:00 PM - 03:00 PM	MD 99	737	McKenzie Road	48	yes 🗌	no 🖂
02:30 PM – 03:30 PM	MD 99	808	McKenzie Road	38	yes 🗌	no 🖂
03:00 PM - 04:00 PM	MD 99	854	McKenzie Road	27	yes 🗌	no 🖂
03:30 PM – 04:30 PM	MD 99	1098	McKenzie Road	50	yes 🗌	no 🖂
04:00 PM - 05:00 PM	MD 99	1309	McKenzie Road	55	yes 🗌	no 🖂

Warr	ant 3, Peak Hour	WARRANT SATISFIED:	yes 🗌	no 🛚
This	warrant is satisfied when either of the following t	wo categories apply:		
A.	If all of the following conditions exist for the same	ne 1 hour of an average day:	yes 🗌	no 🖂
1.	The total delay experienced by the traffic on one (one direction only) controlled by a STOP sign vehicle-hours for one lane approach; and five velane approach, and	equal or exceeds: four	Condition s	atisfied no ⊠
2.	The volume on the same minor-street approach or exceeds 100 vph for one moving lane of traff moving lanes of traffic, and	• • • • • • • • • • • • • • • • • • • •	yes 🗌	no 🖂
3.	The total entering volume serviced during the heintersections with three approaches or 800 vph four or more approaches.	•	yes 🗌	no 🛚
B.	The plot of vehicles per hour on the major stree per hour on the higher-volume minor-street app falls above the applicable curve in Figure C (ma ≤ 40 mph) for the combination of approach lane	roach for 1 hour of average day ajor street 85 th percentile speed	yes 🗌	no 🖂

This warrant is satisfied when the study of the frequency and adequacy of gaps in vehicular traffic stream as related to number and size of groups of school children at an established school crossing across a major street shows that the number of adequate gaps in the traffic stream during the period when children are using the crossing is less than the number of minutes in the same period and that there are a minimum of twenty (20) students during the highest crossing hour.

WARRANT SATISFIED:

Warrant 5, School Crossing

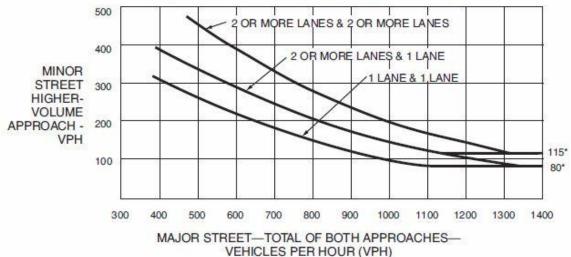
Though Warrant 5 is not satisfied, it should be noted that the intersection is in the walkshed of Mount Hebron High School.

no 🖂

yes

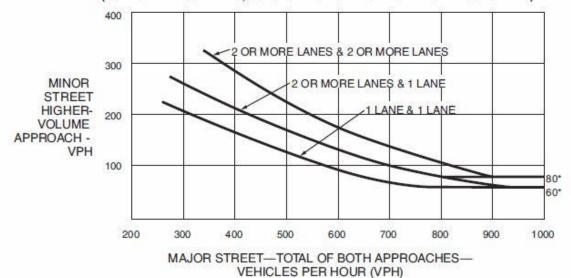
Wa	rrant 7, Crash Experience	WARRANT SATISFIED:	yes	no 🖂
	ew of the three year accident report shows 3 ovement with a traffic signal.	crashes, though none of the	em are likely sus	ceptible to
This	warrant is satisfied when the following apply:		Condition satisfi	eq.
1.	Adequate trial of alternatives, with satisfactory of has failed to reduce the crash frequency and	observance and enforcement	yes	no 🖂
2.	Five or more reported crashes, of types suscept control signal; have occurred within a 12-month personal injury or property damage apparently requirements for reportable crashes and	period, each crash involving	yes 🗌	no 🖂
3.	There exists a volume of vehicle and pedestriar (major street 85 th percentile speed > 40 mph) o Specified in Warrant 1 or Warrant 5, respective	r 80% of the requirements	yes 🗌	no 🖂

Figure A. Warrant 2, Four-Hour Vehicular Volume



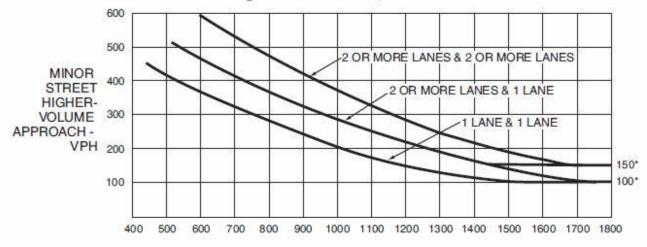
*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure B. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure C. Warrant 3, Peak Hour

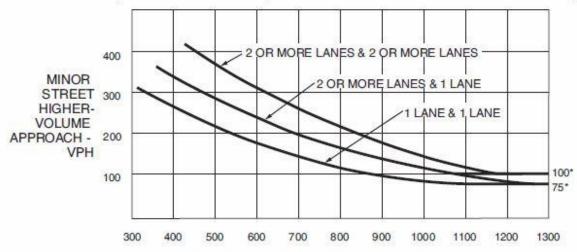


MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

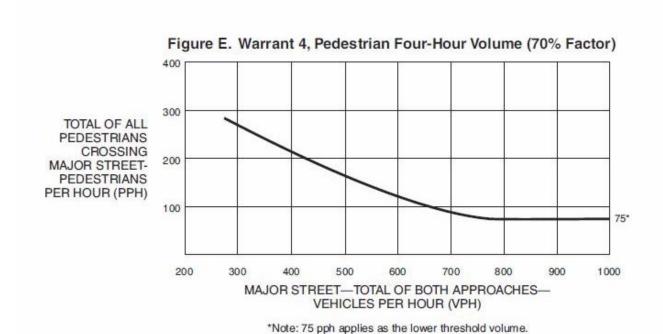
Figure D. Warrant 3, Peak Hour (70% Factor)

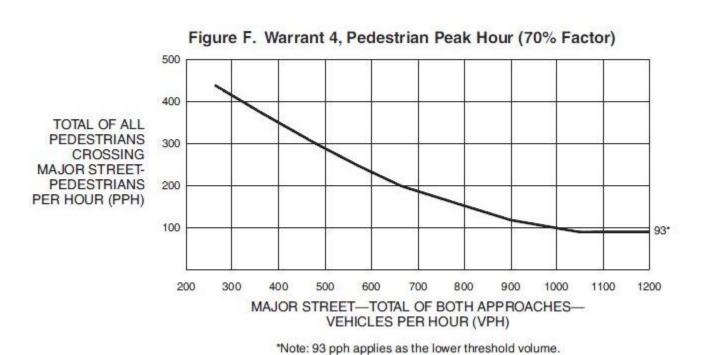
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.





Summary of Traffic Signal Warrant Analysis

Intersection MD 99 and West Mount Hebron High School Entrance

Howard County

□ Location does not warrant signalization based on data collected.

Location:

	Study Year: Study Date:	2018 Existing Condition 05/15/2018	1		
Warrant A	Analysis:				
Manual or Services E installation	n Uniform Traffic Engineering Divis n of a traffic signa	ed a traffic signal warrant and <i>c Control Devices</i> (MUTC) sion (DSED) – Travel Forell at the intersection of MD 9 Existing Conditions. The in	D). Based on the recasting and Analysis (Old Frederick Ro	results of the is office does ad) at the wes	evaluation, the Data s not recommend the t Mount Hebron High
1 Ei	ght-Hour vehicu	ılar volume	☐ YES	$oxed{\boxtimes}$ NO	□ N/A
☐ 2 Fc	our-Hour vehicul	lar volume	☐ YES	$oxed{oxed}$ NO	□ N/A
☐ 3 Pe	eak Hour		☐ YES	$oxed{oxed}$ NO	□ N/A
□ 5 Sc	chool Crossing		☐ YES	$oxed{oxed}$ NO	□ N/A
☐ 7 Cr	rash Experience	•	YES	$oxed{\boxtimes}$ NO	□ N/A
☐ Locat	ion warrants si	ignalization under warra	nt(s)		

Traffic Signal Warrant Analysis

Source: Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2011.

YEAR ANALYZED 2018						
Does the intersection lie within the built-up area of an isolated commu having a population of less than 10,000?	nity	yes 🗌	no 🖂			
Major Street: MD 99 (Old Frederick Road)						
Number of lanes of moving traffic on each major street approach:	1 EB, 1 WB					
Minor Street: West Mount Hebron High School Entrance						
Number of lanes of moving traffic on each minor street approach:	1 NB, 1 SB					

Posted speed limit along MD 99: 40 MPH

Warrants for Traffic Signal Installation

Traffic control signal may be justified at an intersection, driveway or mid-block pedestrian crossing, if one or more of the following warrants are satisfied:

Warrant 1, Eight-Hour Vehicular Volume	WARRANT SATISFIED:	yes 💹 🛮 no 🖂
This warrant is satisfied when one of the following	ing apply	
		Condition satisfied:
A. Minimum Vehicular Volume		yes 🗌 🛮 no 🖂
For each of any 8 hours of an average da	ay, the vehicles per hour on the major	or street and on the higher-
volume minor street or driveway approach	to the intersection equal or exceed the	ne following:

Major Street: 400 vph for 80% since the major street 85^{th} percentile speed \leq 40 MPH, = 1 lanes on major and = 1 minor lane

Minor Street: 120 vph for 80% since the major street 85^{th} percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Time	Major Street	Volume	Minor Street	Volume	Require Satist	
06:00 AM – 07:00 AM	MD 99	675	West Mount Hebron High School Entrance	15	yes 🗌	no 🖂
07:00 AM – 08:00 AM	MD 99	1268	West Mount Hebron High School Entrance	120	yes 🖂	no 🗌
08:00 AM – 09:00 AM	MD 99	505	West Mount Hebron High School Entrance	17	yes 🗌	no 🖂
09:00 AM – 10:00 AM	MD 99	17	West Mount Hebron High School Entrance	15	yes 🗌	no 🖂
10:00 AM – 11:00 AM	MD 99	16	West Mount Hebron High School Entrance	10	yes 🗌	no 🖂
11:00 AM – 12:00 PM	MD 99	11	West Mount Hebron High School Entrance	15	yes 🗌	no 🖂
12:00 PM -	MD 99	14	West Mount Hebron High School	13	yes 🗌	no 🖂

01:00 PM			Entrance			
01:00 PM – 02:00 PM	MD 99	554	West Mount Hebron High School Entrance	52	yes 🗌	no 🖂
02:00 PM – 03:00 PM	MD 99	354	West Mount Hebron High School Entrance	57	yes 🗌	no 🖂
03:00 PM – 04:00 PM	MD 99	18	West Mount Hebron High School Entrance	15	yes 🗌	no 🖂
04:00 PM – 05:00 PM	MD 99	1064	West Mount Hebron High School Entrance	20	yes 🗌	no 🖂
05:00 PM – 06:00 PM	MD 99	1588	West Mount Hebron High School Entrance	22	yes 🗌	no 🖂
06:00 PM – 07:00 PM	MD 99	574	West Mount Hebron High School Entrance	36	yes 🗌	no 🖂

B. <u>The Interruption of Continuous Traffic</u>

For each of any 8 hours of an average day, the vehicles per hour on the major street and on the higher-volume minor street or driveway approach to the intersection equal or exceed the following:

yes 🗌

no 🖂

Major Street: 600 vph for 80% since the major street 85^{th} percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Minor Street: 60 vph for 80% since the major street 85^{th} percentile speed \leq 40 MPH, = 1 lanes on major and = 1 minor lane

Time	Major Street	Volume	Minor Street	Volume	Require Satist	
06:15 AM – 07:15 AM	MD 99	999	West Mount Hebron High School Entrance	81	yes 🖂	no 🗌
07:15 AM – 08:15 AM	MD 99	1190	West Mount Hebron High School Entrance	49	yes 🗌	no 🖂
08:15 AM – 09:15 AM	MD 99	274	West Mount Hebron High School Entrance	17	yes	no 🖂
09:15 AM – 10:15 AM	MD 99	14	West Mount Hebron High School Entrance	15	yes 🗌	no 🖂
10:15 AM – 11:15 AM	MD 99	16	West Mount Hebron High School Entrance	13	yes 🗌	no 🖂
11:15 AM – 12:15 PM	MD 99	11	West Mount Hebron High School Entrance	12	yes 🗌	no 🖂
12:15 PM – 01:15 PM	MD 99	135	West Mount Hebron High School Entrance	12	yes 🗌	no 🖂
01:15 PM – 02:15 PM	MD 99	511	West Mount Hebron High School Entrance	103	yes 🖂	no 🗌
02:00 PM – 03:00 PM	MD 99	354	West Mount Hebron High School Entrance	57	yes 🗌	no 🖂
02:15 PM – 03:15 PM	MD 99	276	West Mount Hebron High School Entrance	14	yes	no 🖂
04:00 PM – 05:00 PM	MD 99	18	West Mount Hebron High School Entrance	15	yes 🗌	no 🖂

04:15 PM – 05:15 PM	MD 99	288	West Mount Hebron High School Entrance	17	yes 🗌	no 🖂
05:00 PM – 06:00 PM	MD 99	1064	West Mount Hebron High School Entrance	22	yes 🗌	no 🖂

Warrant 2, Four-Hour Vehicular Volume WARRANT SATISFIED: ye	yes 🗌	no 🖂
---	-------	------

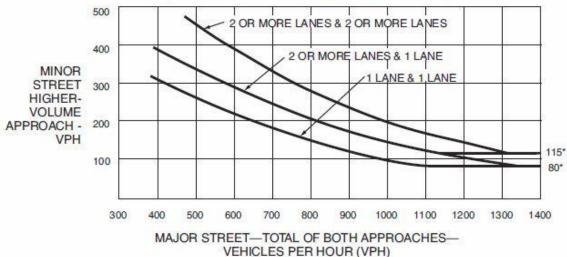
The Four-Hour Volume Warrant is satisfied when for each of any four hours of an average day, the plotted points representing the vehicles per hour on the major-street and the corresponding vehicles per hour on the higher volume minor-street all fall above the curve in Figure A since the major street 85^{th} Percentile Speed ≤ 40 MPH. The lower threshold volume for minor street is 80 vph.

Time	Major Street	Volume	Minor Street	Volume	Require Satist	
06:15 AM – 07:15 AM	MD 99	999	West Mount Hebron High School Entrance	81	yes 🖂	no 🗌
07:15 AM – 08:15 AM	MD 99	1190	West Mount Hebron High School Entrance	49	yes	no 🖂
08:15 AM – 09:15 AM	MD 99	274	West Mount Hebron High School Entrance	17	yes 🗌	no 🖂
09:15 AM – 10:15 AM	MD 99	14	West Mount Hebron High School Entrance	15	yes 🗌	no 🖂
10:15 AM – 11:15 AM	MD 99	16	West Mount Hebron High School Entrance	13	yes 🗌	no 🖂
11:15 AM – 12:15 PM	MD 99	11	West Mount Hebron High School Entrance	12	yes 🗌	no 🖂
12:15 PM – 01:15 PM	MD 99	135	West Mount Hebron High School Entrance	12	yes 🗌	no 🖂
01:15 PM – 02:15 PM	MD 99	511	West Mount Hebron High School Entrance	103	yes 🖂	no 🗌
02:15 PM – 03:15 PM	MD 99	276	West Mount Hebron High School Entrance	14	yes 🗌	no 🖂
03:15 PM – 04:15 PM	MD 99	288	West Mount Hebron High School Entrance	17	yes 🗌	no 🖂
04:15 PM – 05:15 PM	MD 99	1178	West Mount Hebron High School Entrance	17	yes 🗌	no 🖂
05:15 PM – 06:15 PM	MD 99	1491	West Mount Hebron High School Entrance	37	yes 🗌	no 🖂
06:15 PM – 07:15 PM	MD 99	380	West Mount Hebron High School Entrance	25	yes 🗌	no 🖂

War	rant 3, Peak Hour	WARRANT SATISFIED:	yes 🗌	no 🖂		
This	warrant is satisfied when either of the following	wo categories apply:				
A.	If all of the following conditions exist for the san	ne 1 hour of an average day:	yes 🗌	no 🖂		
1.	The total delay experienced by the traffic on on (one direction only) controlled by a STOP sign vehicle-hours for one lane approach; and five v lane approach, and	equal or exceeds: four	Condition s yes ☐	satisfied no ⊠		
2.	The volume on the same minor-street approach or exceeds 100 vph for one moving lane of traff moving lanes of traffic, and		yes □	no 🖂		
3.	The total entering volume serviced during the hintersections with three approaches or 800 vph four or more approaches.		for yes 🗌	no 🖂		
B.	The plot of vehicles per hour on the major street per hour on the higher-volume minor-street app falls above the applicable curve in Figure C (mass ≤ 40 mph) for the combination of approach lane	roach for 1 hour of average da ajor street 85 th percentile speed	y	no 🛚		
War	rant 5. School Crossing	WARRANT SATISFIED:	ves	no 🖂		
Warrant 5, School Crossing WARRANT SATISFIED: yes no This warrant is satisfied when the study of the frequency and adequacy of gaps in vehicular traffic stream as related to number and size of groups of school children at an established school crossing across a major street shows that the number of adequate gaps in the traffic stream during the period when children are using the crossing is less than the number of minutes in the same period and that there are a minimum of twenty (20) students during the highest crossing hour. Though Warrant 5 is not met, it should be noted that this intersection is within a school zone.						
Wai	rant 7, Crash Experience	WARRANT SATISFIED:	yes	no 🛚		
Review of the three year accident report shows 1 crash, which is not susceptible to correction by a traffic signal.						
This	warrant is satisfied when the following apply:		0 100 00			
1.	Adequate trial of alternatives, with satisfactory of has failed to reduce the crash frequency and	observance and enforcement	Condition satisf	no ⊠		
2.	Five or more reported crashes, of types suscept control signal; have occurred within a 12-month personal injury or property damage apparently requirements for reportable crashes and	period, each crash involving	yes 🗌	no 🖂		

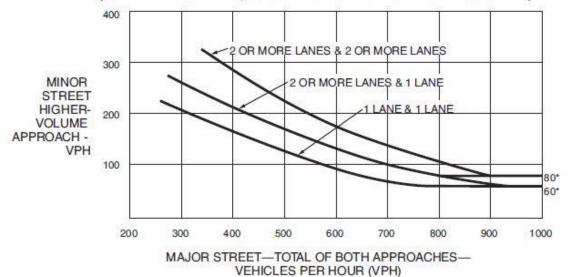
_	There exists a value of valida and a destrict toff and been flow 500/		1 🔽
პ.	There exists a volume of vehicle and pedestrian traffic not less than 56%	yes _] no 🖂
	(major street 85 th percentile speed > 40 mph) or 80% of the requirements		
	Specified in Warrant 1 or Warrant 5, respectively.		

Figure A. Warrant 2, Four-Hour Vehicular Volume



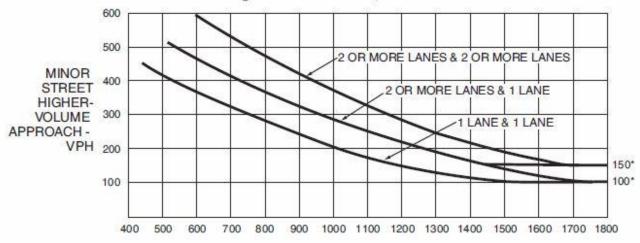
*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure B. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure C. Warrant 3, Peak Hour

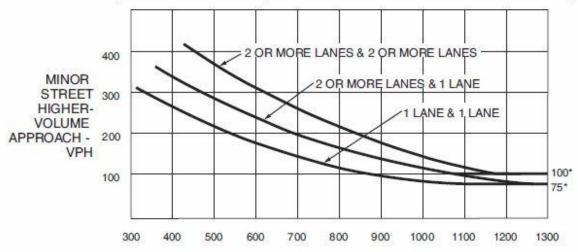


MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

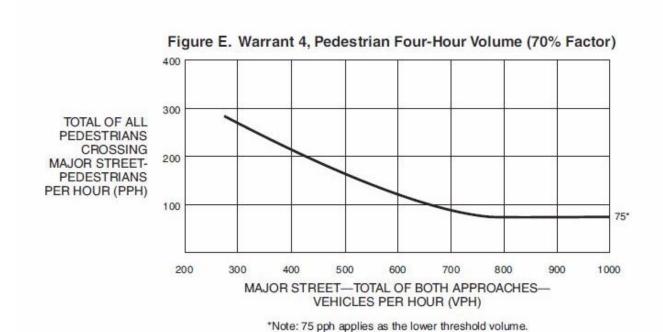
Figure D. Warrant 3, Peak Hour (70% Factor)

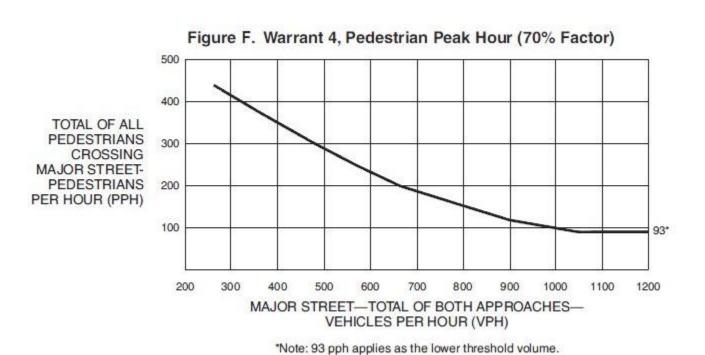
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.





Summary of Traffic Signal Warrant Analysis

Intersection MD 99 and Tiller Drive

	Location: Study Year: Study Date:	Howard County 2018 Existing Condition 04/17/2016	on			
Warra	nt Analysis:					
Manual Service installat	on Uniform Traff. s Engineering Divition of a traffic sign	ed a traffic signal warrant a ic Control Devices (MUTO sion (DSED) — Travel Fo nal at the intersection of M intersection meets none of the	CD). Based on the recasting and Analys ID 99 (Old Frederick	results of the sis office doe c Road) at Ti	e evaluation, the Data es not recommend the	
1	Eight-Hour vehice	ular volume	☐ YES	$oxed{\boxtimes}$ NO	□ N/A	
_ 2	Four-Hour vehicu	ılar volume	☐ YES	$oxed{oxed}$ NO	□ N/A	
□ 3	Peak Hour		☐ YES	$oxed{oxed}$ NO	□ N/A	
<u> </u>	School Crossing		☐ YES	$oxed{oxed}$ NO	□ N/A	
□ 7	Crash Experience	е	☐ YES	$oxed{oxed}$ NO	□ N/A	
☐ Location warrants signalization under warrant(s)						
□ Location does not warrant signalization based on data collected.						

Traffic Signal Warrant Analysis

Source: Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2011.

YEAR ANALYZED 2016					
Does the intersection lie within the built-up area of an isolated communication of less than 10,000?	nity	yes 🗌	no 🖂		
Major Street: MD 99 (Old Frederick Road) Number of lanes of moving traffic on each major street approach: 1 EB, 1 WB					

Minor Street: **Tiller Drive**

Number of lanes of moving traffic on each minor street approach: 1 NB, 1 SB

Posted speed limit along MD 99: 40 MPH

Warrants for Traffic Signal Installation

Traffic control signal may be justified at an intersection, driveway or mid-block pedestrian crossing, if one or more of the following warrants are satisfied:

Warrant 1, Eight-Hour Vehicular Volume	WARRANT SATISFIED:	yes
This warrant is satisfied when one of the follow	ing apply	
		Condition satisfied:
A. Minimum Vehicular Volume		yes □ no ⊠

For each of any 8 hours of an average day, the vehicles per hour on the major street and on the highervolume minor street or driveway approach to the intersection equal or exceed the following:

Major Street: 400 vph for 70% since the major street 85th percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Minor Street: 120 vph for 70% since the major street 85th percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Time	Major Street	Volume	Minor Street	Volume	Requiremen	t Satisfied
06:00 AM – 07:00 AM	MD 99	447	Tiller Drive	33	yes 🗌	no 🖂
07:00 AM – 08:00 AM	MD 99	1485	Tiller Drive	111	yes 🗌	no 🖂
08:00 AM – 09:00 AM	MD 99	1196	Tiller Drive	95	yes 🗌	no 🔀
09:00 AM – 10:00 AM	MD 99	892	Tiller Drive	72	yes 🗌	no 🖂
10:00 AM – 11:00 AM	MD 99	552	Tiller Drive	40	yes 🗌	no 🖂
11:00 AM – 12:00 PM	MD 99	511	Tiller Drive	39	yes 🗌	no 🖂
12:00 PM - 01:00 PM	MD 99	579	Tiller Drive	32	yes 🗌	no 🖂
01:00 PM - 02:00 PM	MD 99	666	Tiller Drive	31	yes 🗌	no 🖂
02:00 PM - 03:00 PM	MD 99	835	Tiller Drive	42	yes	no 🖂
03:00 PM - 04:00 PM	MD 99	1115	Tiller Drive	29	yes 🗌	no 🖂
04:00 PM - 05:00 PM	MD 99	1501	Tiller Drive	35	yes 🗌	no 🔀
05:00 PM – 06:00 PM	MD 99	1466	Tiller Drive	34	yes 🗌	no 🖂
06:00 PM – 07:00 PM	MD 99	1430	Tiller Drive	44	yes 🗌	no 🖂

B. The Interruption of Continuous Traffic

yes ☐ no ⊠

For each of any 8 hours of an average day, the vehicles per hour on the major street and on the higher-volume minor street or driveway approach to the intersection equal or exceed the following:

Major Street: 600 vph for 80% since the major street 85^{th} percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Minor Street: 60 vph for 80% since the major street 85^{th} percentile speed ≤ 40 MPH, = 1 lanes on major and = 1 minor lane

Time	Major Street	Volume	Minor Street	Volume	Require Satisf	
06:30 AM – 07:30 AM	MD 99	1215	Tiller Drive	83	yes 🖂	no 🗌
07:30 AM – 08:30 AM	MD 99	1323	Tiller Drive	107	yes 🖂	no 🗌
08:30 AM – 09:30 AM	MD 99	1028	Tiller Drive	85	yes 🖂	no 🗌
09:30 AM – 10:30 AM	MD 99	668	Tiller Drive	63	yes 🛚	no 🗌
10:30 AM – 11:30 AM	MD 99	538	Tiller Drive	29	yes 🗌	no 🖂
11:30 AM – 12:30 PM	MD 99	598	Tiller Drive	44	yes 🗌	no 🖂
12:30 PM - 01:30 PM	MD 99	735	Tiller Drive	25	yes 🗌	no 🖂
01:30 PM - 02:30 PM	MD 99	865	Tiller Drive	44	yes 🗌	no 🖂
02:00 PM - 03:00 PM	MD 99	835	Tiller Drive	42	yes 🗌	no 🖂
02:30 PM - 03:30 PM	MD 99	1316	Tiller Drive	25	yes 🗌	no 🖂
03:00 PM - 04:00 PM	MD 99	1115	Tiller Drive	29	yes 🗌	no 🖂
03:30 PM - 04:30 PM	MD 99	1511	Tiller Drive	35	yes 🗌	no 🖂
04:00 PM - 05:00 PM	MD 99	1501	Tiller Drive	35	yes 🗌	no 🖂
04:30 PM - 05:30 PM	MD 99	1497	Tiller Drive	34	yes 🗌	no 🖂
05:00 PM - 06:00 PM	MD 99	1466	Tiller Drive	34	yes 🗌	no 🖂
05:30 PM – 06:30 PM	MD 99	1193	Tiller Drive	44	yes 🗌	no 🖂

, , , ,	Warrant 2, Four-Hour Vehicular Volun	e WARRANT SATISFIED:	yes 🗌 🛮 no 🖂
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The Four-Hour Volume Warrant is satisfied when for each of any four hours of an average day, the plotted points representing the vehicles per hour on the major-street and the corresponding vehicles per hour on the higher volume minor-street all fall above the curve in Figure A since the major street 85^{th} Percentile Speed ≤ 40 MPH. The lower threshold volume for minor street is 80 vph.

Time	Major Street	Volume	Minor Street	Volume	Requiremen	t Satisfied
06:30 AM – 07:30 AM	MD 99	1215	Tiller Drive	83	yes 🔀	no 🗌
07:30 AM – 08:30 AM	MD 99	1323	Tiller Drive	107	yes 🖂	no 🗌
08:30 AM – 09:30 AM	MD 99	1028	Tiller Drive	85	yes 🖂	no 🗌
09:30 AM – 10:30 AM	MD 99	668	Tiller Drive	63	yes 🗌	no 🛚
10:30 AM – 11:30 AM	MD 99	538	Tiller Drive	29	yes 🗌	no 🛚
11:30 AM – 12:30 PM	MD 99	598	Tiller Drive	44	yes 🗌	no 🔀
12:30 PM - 01:30 PM	MD 99	735	Tiller Drive	25	yes 🗌	no 🖂
01:30 PM - 02:30 PM	MD 99	865	Tiller Drive	44	yes 🗌	no 🖂
02:30 PM - 03:30 PM	MD 99	1316	Tiller Drive	25	yes 🗌	no 🖂

Ī	03:30 PM - 04:30 PM	MD 99	1511	Tiller Drive	35	yes 🗌	no 🖂
I	04:30 PM - 05:30 PM	MD 99	1497	Tiller Drive	34	yes 🗌	no 🖂
I	05:30 PM - 06:30 PM	MD 99	1193	Tiller Drive	44	yes 🗌	no 🖂
I	06:30 PM - 07:30 PM	MD 99	273	Tiller Drive	22	yes 🗌	no 🖂

Warı	rant 3, Peak Hour	WARRANT SATISFIED:	yes 🗌	no 🛚				
This	nis warrant is satisfied when either of the following two categories apply:							
A.	If all of the following conditions exist for the same	ne 1 hour of an average day:	yes 🗌	no 🖂				
1.	The total delay experienced by the traffic on one (one direction only) controlled by a STOP sign vehicle-hours for one lane approach; and five velane approach, and	equal or exceeds: four	Condition s yes ☐	atisfied no ⊠				
2.	The volume on the same minor-street approach or exceeds 100 vph for one moving lane of traff moving lanes of traffic, and		yes 🗌	no 🛚				
3.	The total entering volume serviced during the h intersections with three approaches or 800 vph four or more approaches.		yes 🗌	no 🖂				
B.	The plot of vehicles per hour on the major street per hour on the higher-volume minor-street app falls above the applicable curve in Figure C (mass ≤ 40 mph) for the combination of approach lane	roach for 1 hour of average day ajor street 85 th percentile speed	yes 🗌	no 🖂				

This warrant is satisfied when the study of the frequency and adequacy of gaps in vehicular traffic stream as related to number and size of groups of school children at an established school crossing across a major street shows that the number of adequate gaps in the traffic stream during the period when children are using the crossing is less than the number of minutes in the same period and that there are a minimum of twenty (20) students during the highest crossing hour.

WARRANT SATISFIED:

Warrant 5, School Crossing

Though Warrant 5 is not satisfied, it should be noted that the intersection is in the walkshed of Mount Hebron High School.

no 🖂

yes

	iew of the three year accident report shows 5 crashes. At least two of the rented by a signalized intersection.	e crashes could h	nave been
This	warrant is satisfied when the following apply:	Condition satisfie	ed:
1.	Adequate trial of alternatives, with satisfactory observance and enforcement has failed to reduce the crash frequency and	yes	no 🖂
2.	Five or more reported crashes, of types susceptible to correction by traffic control signal; have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable	yes 🗌	no 🖂

WARRANT SATISFIED:

Warrant

yes 🗌

yes 🗌

5,

no 🖂

no 🖂

respectively.

Warrant 7, Crash Experience

3.

Specified

requirements for reportable crashes and

in

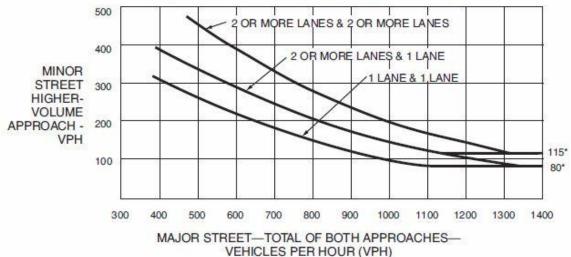
There exists a volume of vehicle and pedestrian traffic not less than 56%

(major street 85th percentile speed > 40 mph) or 80% of the requirements

1

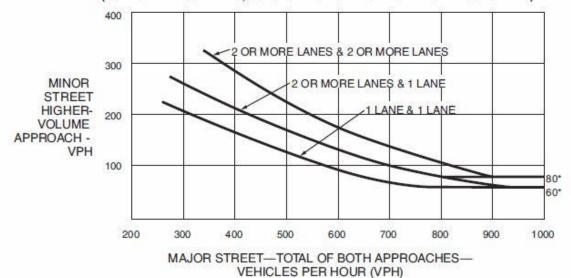
. Warrant

Figure A. Warrant 2, Four-Hour Vehicular Volume



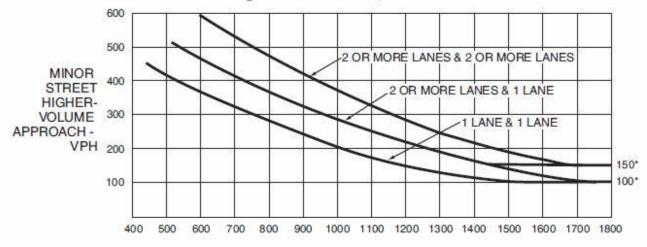
*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure B. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure C. Warrant 3, Peak Hour

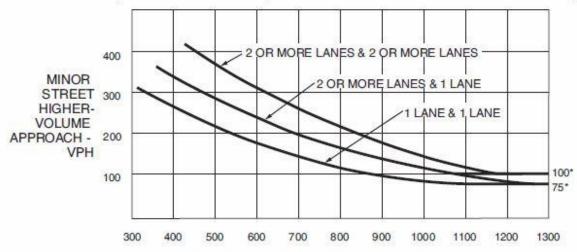


MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure D. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



MAJOR STREET—TOTAL OF BOTH APPROACHES— VEHICLES PER HOUR (VPH)

*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

