



sain associates

244 West Valley Avenue, Suite 200 Birmingham, Alabama 35209

TECHNICAL MEMORANDUM

TO: Meinrad Tabengwa, P.E. - City of Gadsden

FROM: Lauren Nickles
Jeff Stephenson, P.E.

DATE: March 5, 2008

SUBJECT: Traffic Signal Warrant Evaluation
SR-291/SR-759 (Hood Avenue) at Elmwood Avenue/Aldi driveway
Gadsden, AL
SA #06-0310

This technical memorandum presents the findings of our traffic signal warrant evaluation for the intersection of SR-291/SR-759 (Hood Avenue) at Elmwood Avenue/Aldi driveway in Gadsden, Alabama. SR-291/SR-759 (Hood Avenue) is herein referred to as Hood Avenue.

The Elmwood Avenue and Aldi driveway legs each contain a two-lane section with one (1) approach lane and one (1) departure lane. Hood Avenue contains a four-lane section containing two (2) northbound lanes and two (2) southbound lanes. The intersection of Hood Avenue and Meighan Boulevard is approximately 400 feet the north of the study intersection, and is controlled by a traffic signal within a closed-loop system.

On February 27, 2008, Sain Associates conducted traffic volume counts at the intersection of Hood Avenue and Elmwood Avenue/Aldi driveway. The existing hourly traffic volumes at the intersection from 6:00am - 10:00pm are shown in Table 1.

**TABLE 1
EXISTING HOURLY TRAFFIC VOLUMES**

Hour	Hood Avenue		Aldi	Elmwood Avenue
	NB	SB	EB	WB
6-7 am	424	270	0	16
7-8 am	567	558	0	45
8-9 am	570	432	6	32
9-10 am	604	511	13	37
10-11 am	700	516	17	49
11 am-12 pm	793	600	24	56
12-1 pm	831	629	27	62
1-2 pm	790	592	15	64
2-3 pm	781	606	34	60
3-4 pm	797	623	27	56
4-5 pm	826	615	20	64
5-6 pm	776	603	18	65
6-7 pm	689	447	17	63
7-8 pm	475	365	8	36
8-9 pm	370	270	4	28
9-10 pm	251	190	1	14

TECHNICAL MEMORANDUM

March 5, 2008

Page 2

We conducted a traffic signal warrant evaluation for the intersection of Hood Avenue at Elmwood Avenue/Aldi driveway in accordance with the *Manual on Uniform Traffic Control Devices* (MUTCD, 2003 Edition), published by the Federal Highway Administration. The results of the evaluation indicate that traffic signalization would be warranted at the intersection under MUTCD warrant #2. Attached is a printout of the traffic signal warrant evaluation.

However, we do not recommend traffic signalization at the intersection due to the short distance to the existing traffic signal at Meighan Boulevard and Hood Avenue. The resulting distance between these two intersections would not meet current ALDOT guidelines for access management if they were both controlled by traffic signalization. In addition, coordination between these two traffic signals would be necessary and would likely result in excessive delays for Elmwood Avenue/Aldi driveway due to the amount of green time that would be required for Hood Avenue to properly coordinate with the existing closed-loop traffic signal system on Meighan Boulevard.

We hope this technical memorandum addresses your needs in this matter. Please feel free to contact us if you have any questions or comments.



sain associates

Consulting Engineers/Surveyors

TRAFFIC SIGNAL WARRANT SUMMARY

City: Gadsden
 County: Etowah County, Alabama

Engineer: Sain Associates, Inc.
 Date: February 27, 2008

Major Street: SR-291/SR-759 (Hood Avenue)
 Minor Street: Elmwood Avenue/Aldi driveway

Lanes: 2+ Critical Approach Speed: < 40
 Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic > 70 km/h (40 mph) ? Yes No
2. Is the intersection in a built-up area or isolated community of < 10,000 population ? Yes No
- If Question 1 or 2 above is answered "Yes", then use 70% volume level 70% 100%

WARRANT 1 - EIGHT-HOUR VEHICULAR VOLUME

Warrant 1 is satisfied if Condition A or Condition B is "100%" satisfied.
 Warrant is also satisfied if both Condition A and Condition B are "80%" satisfied.

Applicable: Yes No
 Satisfied: Yes No

Condition A - Minimum Vehicular Volume

100% Satisfied: Yes No
 80% Satisfied: Yes No

(volumes in veh/hr)	Minimum Requirements (80% Shown in Brackets)				Eight Highest Hours							
					1		2 or more		5PM-6PM	1PM-2PM	1PM-2PM	6PM-7PM
	100%	70%	100%	70%								
Both Approaches on Major Street	500 (400)	350 (280)	600 (480)	420 (336)	1,379	1,382	1,382	733	1,460	1,387	1,393	1,393
Highest Approach on Minor Street	150 (120)	105 (84)	200 (160)	140 (112)	65	64	64	63	62	60	56	56

Record 8 highest hours and the corresponding volumes in boxes provided. Condition is 100% satisfied if the minimum volumes are met for eight hours for either the 100% or 70% conditions.
 Condition is 80% satisfied if parenthetical volumes are met for eight hours.

Condition B - Interruption of Continuous Traffic

Condition B is intended for application where the traffic volume is so heavy that traffic on the minor street suffers excessive delay.

Applicable: Yes No
 Excessive Delay: Yes No
 100% Satisfied: Yes No
 80% Satisfied: Yes No

(volumes in veh/hr)	Minimum Requirements (80% Shown in Brackets)				Eight Highest Hours							
					1		2 or more		5PM-6PM	1PM-2PM	1PM-2PM	6PM-7PM
	100%	70%	100%	70%								
Both Approaches on Major Street	750 (600)	525 (420)	900 (720)	630 (504)	1,379	1,382	1,382	733	1,460	1,387	1,393	1,393
Highest Approach on Minor Street	75 (60)	53 (42)	100 (80)	70 (56)	65	64	64	63	62	60	56	56

Record 8 highest hours and the corresponding volumes in boxes provided. Condition is 100% satisfied if the minimum volumes are met for eight hours for either the 100% or 70% conditions.
 Condition is 80% satisfied if parenthetical volumes are met for eight hours.

WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

Delay is not excessive.

Not Applicable:

WARRANT 3 - PEAK HOUR

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

Not Applicable:

TRAFFIC SIGNAL WARRANT SUMMARY

City: Gadsden
 County: Etowah County, Alabama

Engineer: Sain Associates, Inc.
 Date: February 27, 2008

Major Street: SR-291/SR-759 (Hood Avenue)
 Minor Street: Elmwood Avenue/Aldi driveway

Lanes: 2+ Critical Approach Speed: < 40
 Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic > 70 km/h (40 mph) ? Yes No
2. Is the intersection in a built-up area or isolated community of < 10,000 population ? Yes No
- If Question 1 or 2 above is answered "Yes", then use 70% volume level 70% 100%

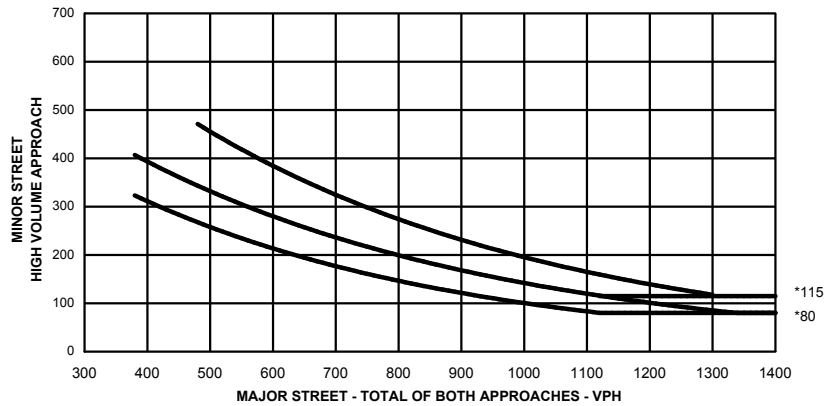
WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

Applicable: Yes No
 Satisfied: Yes No

If all four points lie above the appropriate line, then the warrant is satisfied.

Plot four volume combinations on the applicable figure below.

FIGURE 4C-1: Criteria for "100%" Volume Level

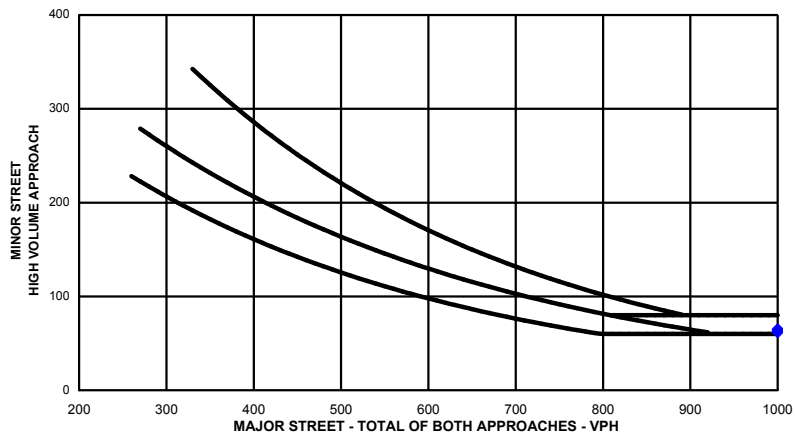


* Note: 115 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 80 vph applies as the lower threshold volume threshold for a minor street approach with one lane.

Four Highest Hours	Volumes	
	Major Street	Minor Street
5PM-6PM	1,379	65
1PM-2PM	1,382	64
1PM-2PM	1,382	64
12PM-1PM	1,460	62

FIGURE 4C-2: Criteria for "70%" Volume Level

(Community Less than 10,000 population or above 70 km/hr (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 threshold for a minor street approach with one lane.

TRAFFIC SIGNAL WARRANT SUMMARY

City: Gadsden
 County: Etowah County, Alabama

Engineer: Sain Associates, Inc.
 Date: February 27, 2008

Major Street: SR-291/SR-759 (Hood Avenue)
 Minor Street: Elmwood Avenue/Aldi driveway

Lanes: 2+ Critical Approach Speed: < 40
 Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic > 70 km/h (40 mph) ? Yes No
2. Is the intersection in a built-up area or isolated community of < 10,000 population ? Yes No
- If Question 1 or 2 above is answered "Yes", then use 70% volume level 70% 100%

WARRANT 3 - PEAK HOUR

Applicable: Yes No
 Satisfied: Yes No

If all three criteria are fulfilled or the plotted point lies above the appropriate line, then the warrant is satisfied.

Unusual condition justifying use of warrant:

Record hour when criteria are fulfilled and the corresponding delay or volume in boxes provided.

Peak Hour		
5PM-6PM	1,379	65

Criteria

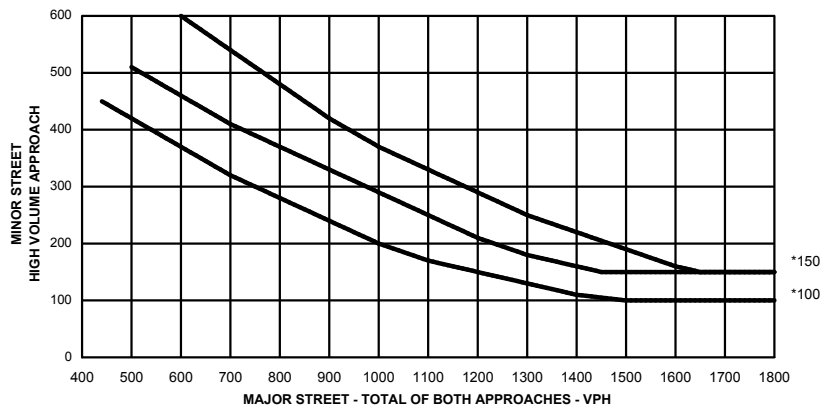
1. Delay on Minor Approach *(vehicle-hours)		
Approach Lanes	1	2
Delay Criteria	4.0	5.0
Delay		
Fulfilled?		

2. Volume on Minor Approach *(vehicles per hour)		
Approach Lanes	1	2
Volume Criteria	100	150
Volume		
Fulfilled?		

2. Total Entering Volume *(vehicle-hours)		
# Approaches	3	4
Volume Criteria	650	800
Volume		
Fulfilled?		

Plot volume combination on the applicable figure below.

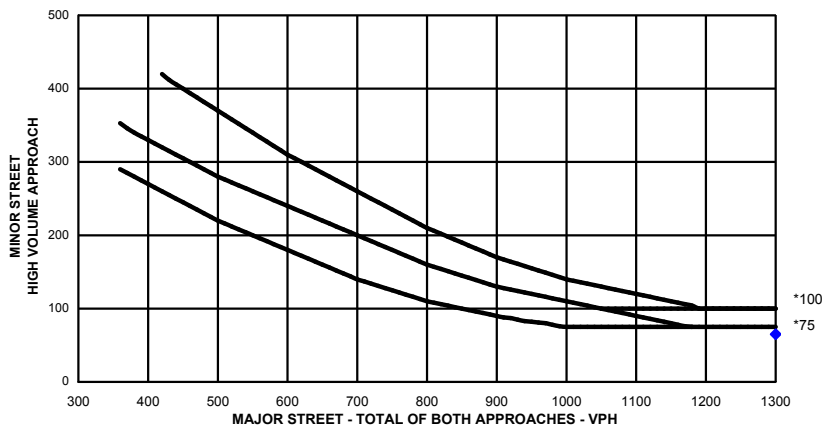
FIGURE 4C-3: Criteria for "100%" Volume Level



* 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 threshold for a minor street approach with one lane.

FIGURE 4C-4: Criteria for "70%" Volume Level

(Community Less than 10,000 population or above 70 km/hr (40 mph) on Major Street)



* 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 threshold for a minor street approach with one lane.

TRAFFIC SIGNAL WARRANT SUMMARY

City: Gadsden
 County: Etowah County, Alabama

Engineer: Sain Associates, Inc.
 Date: February 27, 2008

Major Street: SR-291/SR-759 (Hood Avenue)
 Minor Street: Elmwood Avenue/Aldi driveway

Lanes: 2+ Critical Approach Speed: < 40
 Lanes: 1

WARRANT 4 - PEDESTRIAN VOLUME

Record hours where criteria are fulfilled and the corresponding volume or gap frequency in the boxes provided. The warrant is satisfied if condition 1 or 2 and condition 3 is fulfilled.

Applicable: Yes No
 Satisfied: Yes No

Criteria	Hour	Pedestrian Volume	Pedestrian Gaps	Fulfilled?	
				Yes	No
1. Pedestrian volume crossing the major street is 100 ped/hr or more for each of any four hours and there are less than 60 gaps per hour in the major street traffic stream of adequate length.					
2. Pedestrian volume crossing the major street is 190 ped/hr or more for any one hour and there are less than 60 gaps per hour in the major street traffic stream of adequate length.					
3. The nearest traffic signal along the major street is located more than 90 m (300 ft) away, or the nearest signal is within 90 m (300 ft) but the proposed traffic signal will not restrict the progressive movement of traffic.					

WARRANT 5 - SCHOOL CROSSING

Record hours where criteria are fulfilled and the corresponding volume or gap frequency in the boxes provided. The warrant is satisfied if all three of the criteria are fulfilled.

Applicable: Yes No
 Satisfied: Yes No

Criteria	Fulfilled?			
	Yes	No		
1. There are a minimum of 20 students crossing the major street during the highest crossing hour.	Students:	Hour:		
2. There are fewer adequate gaps in the major street traffic stream during the period when the children are using the crossing than the number of minutes in the same period.	Minutes:	Gaps:		
3. The nearest traffic signal along the major street is located more than 90 m (300 ft) away, or the nearest signal is within 90 m (300 ft) but the proposed traffic signal will not restrict the progressive movement of traffic.				

WARRANT 6 - COORDINATED SIGNAL SYSTEM

Indicate if the criteria are fulfilled in the boxes provided. The warrant is satisfied if either criterion is fulfilled. This warrant should not be applied when the resulting signal spacing would be less than 300 m (1,000 ft).

Applicable: Yes No
 Satisfied: Yes No

Criteria	Fulfilled?	
	Yes	No
1. On a one-way street or a street that has traffic predominately in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.		
2. On a two-way street, adjacent signals do not provide the necessary degree of platooning, and the proposed and adjacent signals will collectively provide a progressive operation.		

TRAFFIC SIGNAL WARRANT SUMMARY

City: Gadsden
 County: Etowah County, Alabama

Engineer: Sain Associates, Inc.
 Date: February 27, 2008

Major Street: SR-291/SR-759 (Hood Avenue)
 Minor Street: Elmwood Avenue/Aldi driveway

Lanes: 2+ Critical Approach Speed: < 40
 Lanes: 1

WARRANT 7 - CRASH EXPERIENCE

Record hours where criteria are fulfilled, the corresponding volume, and other information in the boxes provided. The warrant is satisfied if all three of the criteria are fulfilled.

Applicable: Yes No
 Satisfied: Yes No

Criteria	Hour	Volume	Met?		Fulfilled?		
			Yes	No	Yes	No	
1. One of the warrants to the right is met.	Warrant 1, Condition A (80% satisfied)						
	Warrant 1, Condition B (80% satisfied)						
	Warrant 4, Pedestrian Volume at 80% of volume requirements:						
	80 ped/hr for four (4) hours or 152 ped/hr for one (1) hour						
2. Adequate trial of other remedial measure has failed to reduce crash frequency.	Measure tried:						
3. Five or more reported crashes, of types susceptible to correction by signal, have occurred within a 12-mo. period.	Number of crashes per 12 months:						

WARRANT 8 - ROADWAY NETWORK

Record hours where criteria are fulfilled, and the corresponding volume or other information in the boxes provided. The warrant is satisfied if at least one of the criteria is fulfilled and if all intersecting routes have one or more of the characteristics listed.

Applicable: Yes No
 Satisfied: Yes No

Criteria	Met?		Fulfilled?	
	Yes	No	Yes	No
1. Both of the criteria to the right are met.	a. Total entering volume of at least 1,000 veh/hr during a typical weekday peak hour.		Entering Volume:	
	b. Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.		Warrant:	1 2 3
2. Total entering volume of at least 1,000 veh/hr for each of any 5 hrs of a non-normal business day (Sat. or Sun.)			← Hour	
			← Volume	

Characteristics of Major Routes	Met?		Fulfilled?	
	Yes	No	Yes	No
1. Part of the street or highway system that serves as the principal roadway network for through traffic flow.	Major Street:			
	Minor Street:			
2. Rural or suburban highway outside of, entering, or traversing a city.	Major Street:			
	Minor Street:			
3. Appears as a major route on an official plan.	Major Street:			
	Minor Street:			

CONCLUSIONS

Warrants Satisfied: 1 2 3 4 5 6 7 8 9 10

Remarks: _____
