

Memorandum

To: *Brett Basquin, P.E.*
Foresite Group
2128 Moores Mill Rd., Suite C
Auburn, AL 36830

From: Cody Long, P.E.

Date: August 20, 2008

Subject: East Glenn Avenue at Hilton Garden Drive – Auburn, Alabama

The purpose of this memorandum is to document a traffic signal warrant evaluation conducted for the existing intersection of East Glenn Avenue and Hilton Garden Drive in Auburn, Alabama. The traffic signal warrant evaluation was conducted based upon existing traffic volumes and those associated with future developments along Hilton Garden Drive that would have an impact on the study intersection. Such future developments include a hotel and a fast food restaurant. **Figure 1** illustrates the location of the study intersection along with its relationship with area roadways. An existing intersection diagram is provided as **Figure 2**.



Figure 1
Site Aerial Photograph

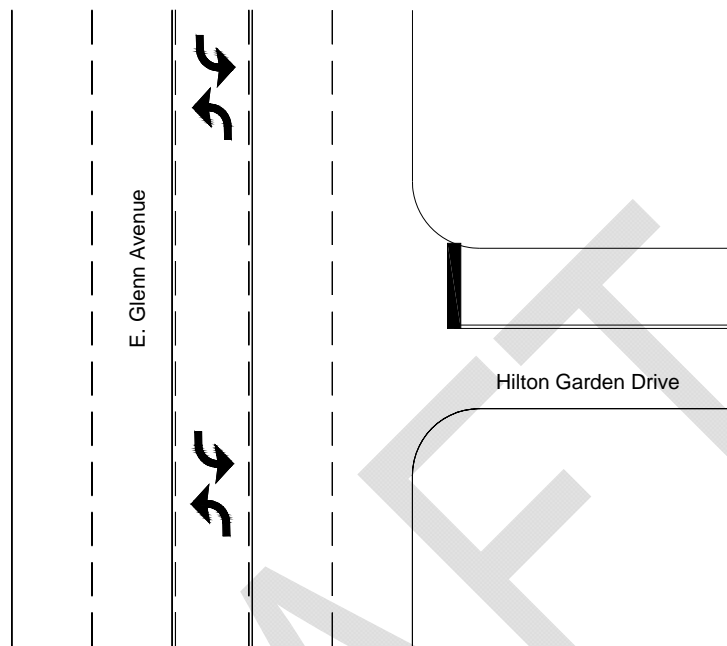


Figure 2
Existing Intersection Diagram

Existing Traffic Counts

Hourly traffic counts were conducted along each approach of East Glenn Avenue for a twenty-four hour period beginning Thursday, April 3, 2008, and Hilton Garden Drive, was counted on Thursday July 18, 2008. It should be noted that counts taken on Hilton Garden Drive were adjusted to account for the absence of students during the summer months. Additionally, morning and afternoon turning movement counts were conducted at the study intersection. Existing peak hour turning movement counts are illustrated in **Figure 3**. **Table 1** lists the existing traffic counts for a twenty-four hour period for each approach. Detailed traffic count data is provided in **Appendix A**.

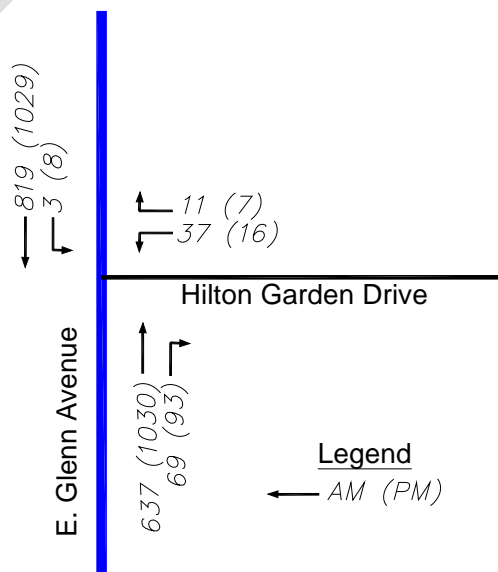


Figure 3

Existing Peak Hour Traffic Counts
Table 1
Existing Traffic Counts

Hour	East Glenn Avenue		Hilton Garden Drive
	Northbound	Southbound	Westbound
12-1 a.m.	52	68	2
1-2 a.m.	27	26	1
2-3 a.m.	33	20	1
3-4 a.m.	43	26	1
4-5 a.m.	54	45	1
5-6 a.m.	145	87	4
6-7 a.m.	372	297	11
7-8 a.m.	655	770	34
8-9 a.m.	548	583	41
9-10 a.m.	555	562	38
10-11 a.m.	690	578	28
11-12 noon	784	682	29
12-1 p.m.	913	752	65
1-2 p.m.	812	757	30
2-3 p.m.	809	739	47
3-4 p.m.	966	807	28
4-5 p.m.	1018	869	31
5-6 p.m.	1121	844	28
6-7 p.m.	716	653	35
7-8 p.m.	555	566	42
8-9 p.m.	348	440	37
9-10 p.m.	193	306	30
10-11 p.m.	112	220	12
11-12 mid	61	102	7

Trip Generation

Trips expected to be generated by the proposed developments were developed based upon information presented in the Institute of Transportation Engineers' publication *Trip Generation, Seventh Edition*. Trips to be generated by the proposed hotel land use are considered to be new trips, while the fast food restaurant is considered to produce both intercept and new trips. Daily, morning, and afternoon peak hour trip generation estimates for the proposed development are presented in **Table 2**.

**Table 2
Trip Generation Estimates**

Land Use	Size	Units	Total Daily Trips	AM PEAK		PM PEAK	
				In	Out	In	Out
Hotel	71	rooms	633	15	11	17	18
Fast Food Restaurant W/ Drive Through	3,071	ft ²	1524			55	51

**AM peak hour trips were not included considering the proposed land use is not usually open during the morning commuter peak.*

***Of the projected PM peak hour trips, approximately 48 are considered to be new trips (25 in and 23 out) and approximately 58 are considered to be intercept trips (30 in and 28 out).*

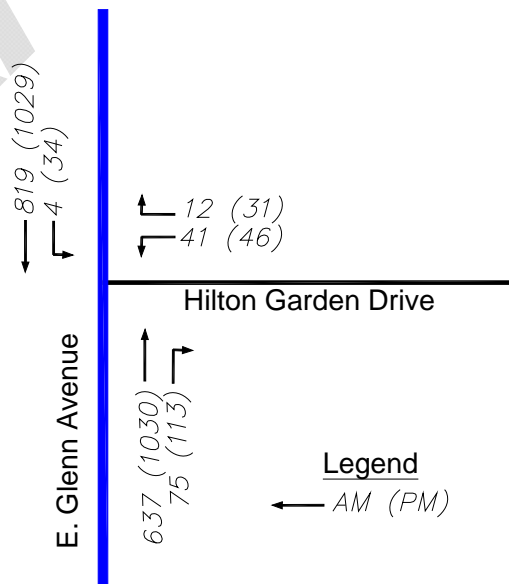
Trip Distribution Patterns

The directional distribution of new traffic generated by the proposed development was estimated based upon population concentrations within the site’s market area and existing traffic count data. The directional distribution of development traffic is as follows:

- 45% of trips will access Hilton Garden Drive from northbound E. Glenn Avenue
- 5% of trips will access Hilton Garden Drive from southbound E. Glenn Avenue
- The remaining trips will access the site from Bent Creek Road to the East of the site.

Trip Assignment and Future Traffic Volumes

Using the distribution patterns outlined above, projected new trips for the morning and afternoon peak hour were assigned to the study intersection. Trips were added to existing traffic volumes to result in future traffic volumes. In addition to the trips created by the hotel, additional trips to be created by a future fast food restaurant were included in the future traffic volumes. Future morning and afternoon peak hour turning movement volumes, illustrated in **Figure 4**, were used as the basis for determining the recommended intersection traffic control at the study intersection. Future hourly traffic volumes are included later in this memorandum as **Table 4**.



**Figure 4
Projected Future Peak
Hour Traffic Volumes**

Traffic Signal Warrant Procedures

The traffic signal warrant evaluation process used for this study is based upon the criteria for the installation of traffic signals presented in the *Manual on Uniform Traffic Control Devices (MUTCD) 2003 Edition*, as published by the Federal Highway Administration. To warrant traffic signalization, an intersection must satisfy one or more of the eight warrants presented in the MUTCD. For the purpose of this study process, the traffic signal warrant evaluations were limited to applicable warrants for the study intersection. Descriptions of the applicable warrants, as presented in the MUTCD, are provided as follows (complete descriptions of traffic signal warrants can be found in the MUTCD):

Warrant 1 – Eight Hour Vehicular Volume

Warrant 1 – Eight Hour Vehicular Volume consists of two conditions. The Minimum Vehicular Volume - Condition A is intended for application where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal. The Interruption of Continuous Traffic - Condition B is intended for application where the traffic volume on a major street is so heavy that traffic on a minor street suffers excessive delay or conflict in entering or crossing the major street. The need for a traffic control signal shall be considered if an engineering study finds that minimum traffic volumes are present for each of any eight (8) hours of an average day, as defined in **Table 3**. Either the 100% volume levels of either Condition A and Condition B can be used, or the 80% volume levels of both Condition A and Condition B may be used.

Option: If the posted speed limit of 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 may be reduced to 70 percent of the requirement.

**Table 3
Eight Hour Traffic Volume Criteria**

Condition A – Minimum Vehicular Volume							
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher volume minor street approach (one direction only)		
Major Street	Minor Street	100%	80%	70%	100%	80%	70%
1	1	500	400	350	150	120	105
2 or more	1	600	480	420	150	120	105
2 or more	2 or more	600	480	420	200	160	140
1	2 or more	500	400	350	200	160	140
Condition B – Interruption of Continuous Traffic							
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher volume minor street approach (one direction only)		
Major Street	Minor Street	100%	80%	70%	100%	80%	70%
1	1	750	600	525	75	60	53
2 or more	1	900	720	630	75	60	53
2 or more	2 or more	900	720	630	100	80	70
1	2 or more	750	600	525	100	80	70

Warrant 2 – Four Hour Vehicular Volume

The Four Hour Vehicular Volume warrant conditions are intended to be applied where the volume of intersecting traffic is the principle reason to consider installing a traffic signal. The need for a traffic signal shall be considered if an engineering study finds that for each of any four hours of an average day the traffic volumes are greater than the minimum requirements as shown in the Federal Highway Administration *Manual on Uniform Traffic Control Devices – 2003 Edition*). Figure 4C-1 (page 4C-7) is typically applied. Figure 4C-2 (page 4C-7) is applied for conditions where the traffic control signal is being considered in the built-up area of an isolated community with less than 10,000 population or where the posted or 85th percentile travel speed on the major roadway is greater than 40 miles per hour.

Warrant 3 – Peak Hour Vehicular Volume

The Peak Hour Vehicular Volume warrant conditions are intended to be applied where traffic conditions are such that for a minimum of one hour of an average day, the minor street traffic suffers undue delay when entering or crossing the major street. The need for a traffic signal shall be considered if an engineering study finds that either of the following two criteria applies:

Condition A:

If all three of the following conditions exist for the same one (1) hour of an average day:

1. the total stopped delay on one minor street approach equals or exceeds 4 vehicle-hours on a one lane approach or 5 vehicle-hours on a two lane approach; and
2. the volume on the same minor street approach equals or exceeds 100 vehicles per hour in one moving lane or 150 vehicles per hour in two moving lanes; and
3. The total entering volume serviced equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

Condition B:

For at least one hour of an average day the traffic volumes are greater than the minimum requirements as shown in the Federal Highway Administration *Manual on Uniform Traffic Control Devices – 2003 Edition*. Figure 4C-3 (page 4C-9) is typically applied. Figure 4C-4 (page 4C-9) is applied for conditions where the traffic control signal is being considered in the built-up area of an isolated community with less than 10,000 population or where the posted or 85th percentile travel speed on the major roadway is greater than 40 miles per hour.

Traffic Signal Warrant Evaluation

Right Turn Volume Reduction

It should be noted that a portion of the right turn movement from the side street approaches for the study intersection was discounted for signal warranting purposes. The MUTCD states that “Engineering judgment should be used to determine what, if any, portion of the right turn traffic is subtracted from the minor street traffic count...” when performing a traffic signal warrant analysis (Section 4C.01, page 4C-2). Based upon current Alabama Department of Transportation policies regarding right turn reduction for traffic signal warrant purposes, the right turns at the study intersection were reduced by approximately twenty percent (20%) according to information published in the *Traffic Signal Design Guide & Timing Manual, July 2006*, published by the Alabama Department of Transportation.

Traffic Signal Warrant Evaluation

To complete the traffic signal warrant evaluation for future conditions, future hourly intersection approach volumes were developed. Hourly traffic volumes for future intersection approaches were developed by comparing projected daily traffic volumes with hourly rates published in Institute of Transportation Engineers’ publication *Trip Generation Handbook, March 2001* for each land use and then placing future

volumes at the study intersection with existing traffic using directional patterns previously listed. **Table 4** lists the future approach volumes for the study intersection.

Table 4
Future Volumes

<i>Hour</i>	<i>E. Glenn Avenue</i>		<i>Hilton Garden Drive</i>	
	Northbound	Southbound	Westbound	WB w/RTR
<i>12-1 a.m.</i>	52	68	2	2
<i>1-2 a.m.</i>	27	26	1	1
<i>2-3 a.m.</i>	33	20	1	1
<i>3-4 a.m.</i>	43	26	1	1
<i>4-5 a.m.</i>	54	45	1	1
<i>5-6 a.m.</i>	145	87	4	3
<i>6-7 a.m.</i>	372	297	11	10
<i>7-8 a.m.</i>	692	803	47	45
<i>8-9 a.m.</i>	591	618	55	52
<i>9-10 a.m.</i>	592	593	52	49
<i>10-11 a.m.</i>	707	593	36	34
<i>11-12 noon</i>	809	703	38	36
<i>12-1 p.m.</i>	942	777	79	75
<i>1-2 p.m.</i>	841	783	44	42
<i>2-3 p.m.</i>	833	758	57	54
<i>3-4 p.m.</i>	994	829	42	40
<i>4-5 p.m.</i>	1043	884	44	41
<i>5-6 p.m.</i>	1150	866	54	51
<i>6-7 p.m.</i>	716	653	35	33
<i>7-8 p.m.</i>	555	566	42	40
<i>8-9 p.m.</i>	348	440	37	35
<i>9-10 p.m.</i>	193	306	30	28
<i>10-11 p.m.</i>	112	220	12	11
<i>11-12 mid</i>	61	102	7	7

Traffic Signal Warrant Results

The results of the traffic signal warrant evaluation are outlined in **Table 5**. Detailed traffic signal warrant evaluation printouts are included in Appendix C.

Table 6
Traffic Signal Warrant Evaluation Results

<i>Traffic Signal Warrant</i>	<i>E. Glenn Avenue at Hilton Garden Drive</i>	
	Future Conditions	
	Warrant Met	Not Met
<i>Warrant 1A - Minimum Vehicular Volume</i>		X
<i>Warrant 1B - Interruption of Continuous Traffic</i>		X
<i>Warrant 1 A&B Combination of Warrants</i>		X
<i>Warrant 2 - Four Hour Vehicular volume</i>		X
<i>Warrant 3 - Peak Hour</i>		X

SUMMARY OF CONCLUSIONS

Based on the findings of this study it was determined that traffic signalization would not be warranted based upon projected traffic volumes at the intersection of E. Glenn Avenue and Hilton Garden Drive in Auburn, Alabama. As previously mentioned in this memorandum, projected traffic volumes associated with a proposed hotel development, as well as a proposed fast food restaurant were included in future traffic volumes.