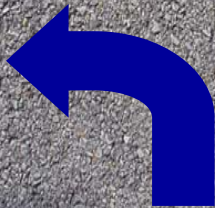
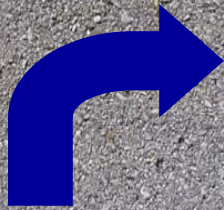


Welcome to Auburn, Alabama
"Loveliest Village  on the Plains"



Glenn Avenue Corridor Traffic Operational Evaluation

PREPARED FOR:

THE CITY OF AUBURN

PREPARED BY:

SKIPPER
CONSULTING INC.

DECEMBER 2007

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INTRODUCTION

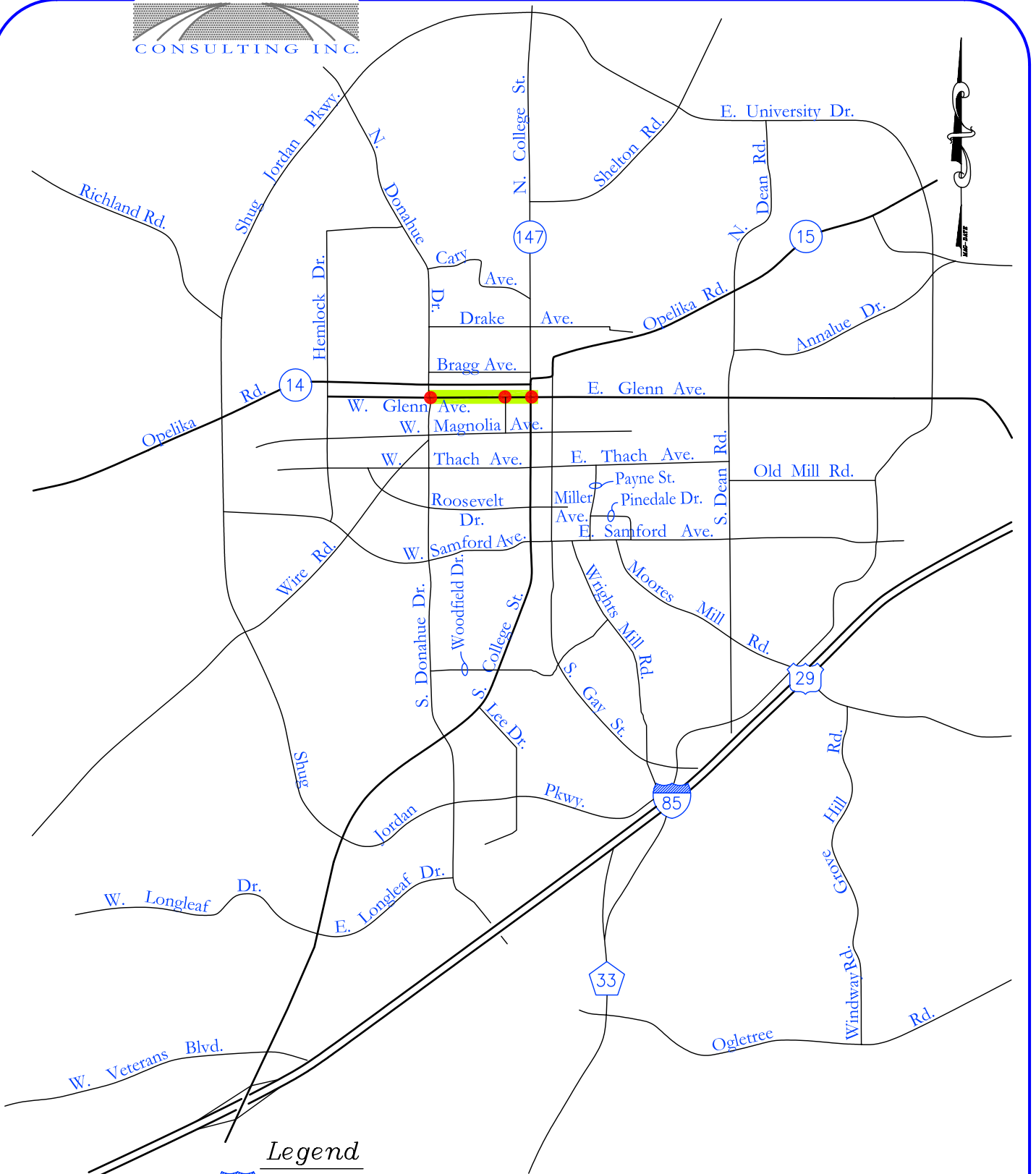
This section documents the results of traffic signal operations evaluations and traffic signal systems needs for the Glenn Avenue Corridor from Donahue Drive to College Street in Auburn, Alabama. The intersections studied in this corridor include:

- Glenn Avenue at Donahue Drive
- Glenn Avenue at Wright Street
- Glenn Avenue at College Street







The locations of the study intersections along the Glenn Avenue Corridor are illustrated in **Figure 3-1**. In order to accomplish the traffic signal operations evaluations at these locations within the study corridor, the following tasks were undertaken:

- existing peak hour turning movement counts were conducted for the study intersections;
- capacity analyses were conducted for the study intersections;
- current traffic operational deficiencies were identified;
- geometric and traffic control improvements were developed for the study intersections to address operational and safety deficiencies; and
- traffic signal systems needs were identified to develop a coordinated signal system.

Sources of information used in this section include: the City of Auburn, Alabama; the Institute of Transportation Engineers; American Association of State Highway and Transportation Officials; the Manual on Uniform Traffic Control Devices; the Transportation Research Board; and the files and field reconnaissance efforts of Skipper Consulting, Inc.



Legend

-  INTERSTATE
-  U.S. HIGHWAY
-  STATE ROUTE
-  COUNTY ROAD
-  STUDY INTERSECTION
-  STUDY LIMITS

DRAWING NOT TO SCALE

FIGURE 3-1
STUDY CORRIDORS
AND INTERSECTIONS
 GLENN AVENUE CORRIDOR
 AUBURN, ALABAMA

BACKGROUND INFORMATION

Study Area Roadways

The Glenn Avenue Corridor from Donahue Drive to College Street runs in an east/west direction. The segment of Glenn Avenue evaluated is approximately 0.5 miles in length. Characteristics for each study roadway evaluated in the Glenn Avenue Corridor are provided in **Table 3-1**.

Table 3-1
Study Corridor Roadways Characteristics

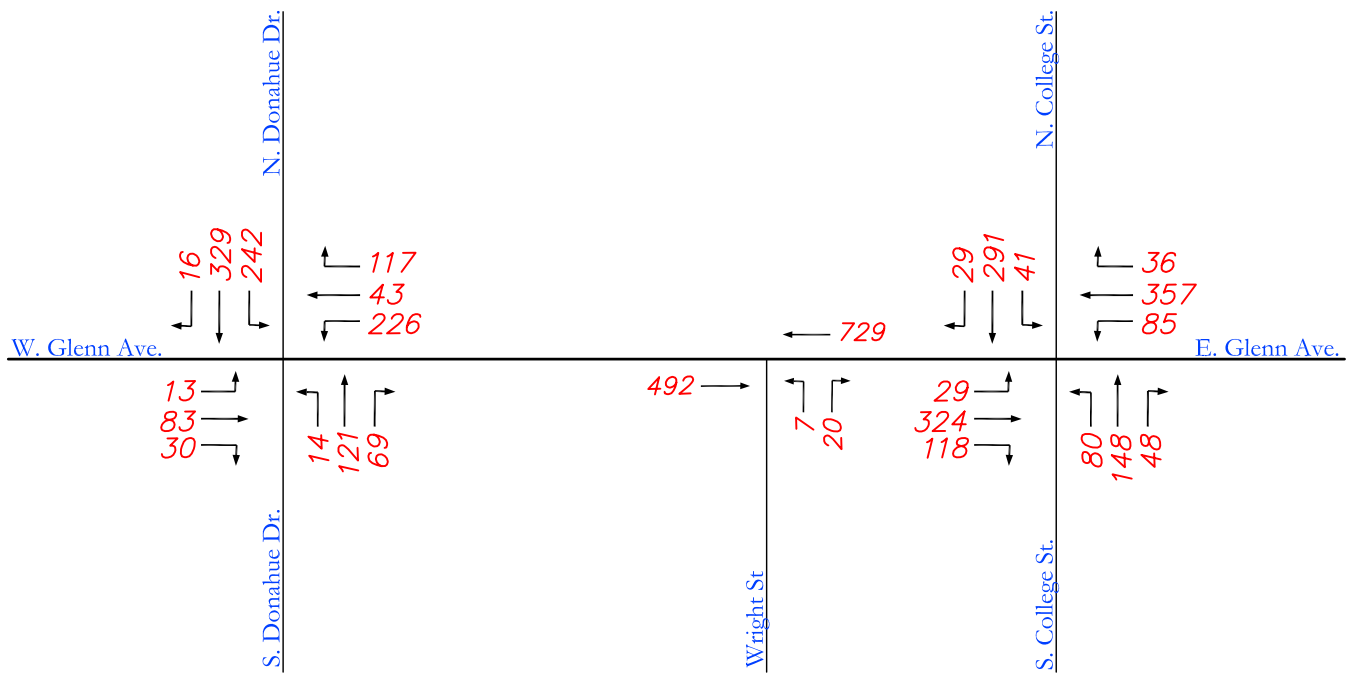
Roadway	Parking	# of Lanes	Travel Direction	Travel Speeds (mph)	Classification
Glenn Avenue	None	2	East/West	25	Arterial
Donahue Drive	None	3	North/South	25	Arterial
Wright Street	Parallel	1	North	25	Collector
College Street	None	4	North/South	35	Arterial

Peak Hour Traffic Counts

Morning (7:00-9:00 am) and afternoon (4:00-6:00 pm) peak hour turning movement counts were conducted at the Glenn Avenue Corridor intersections during the months of September and October 2005. Wright Street counts were conducted in September of 2007. Traffic count data utilized for the analyses of these intersections is illustrated in **Figure 3-2** and **Figure 3-3**. Complete traffic count data is provided in **Appendix A** for reference.

Daily Traffic Counts

Daily traffic counts for Glenn Avenue were conducted by the City of Auburn on April 11, 2007. These counts indicate that the current daily volume on Glenn Avenue is 14,208 vehicles per day. Daily traffic count data for Glenn Avenue is provided in **Appendix A**.

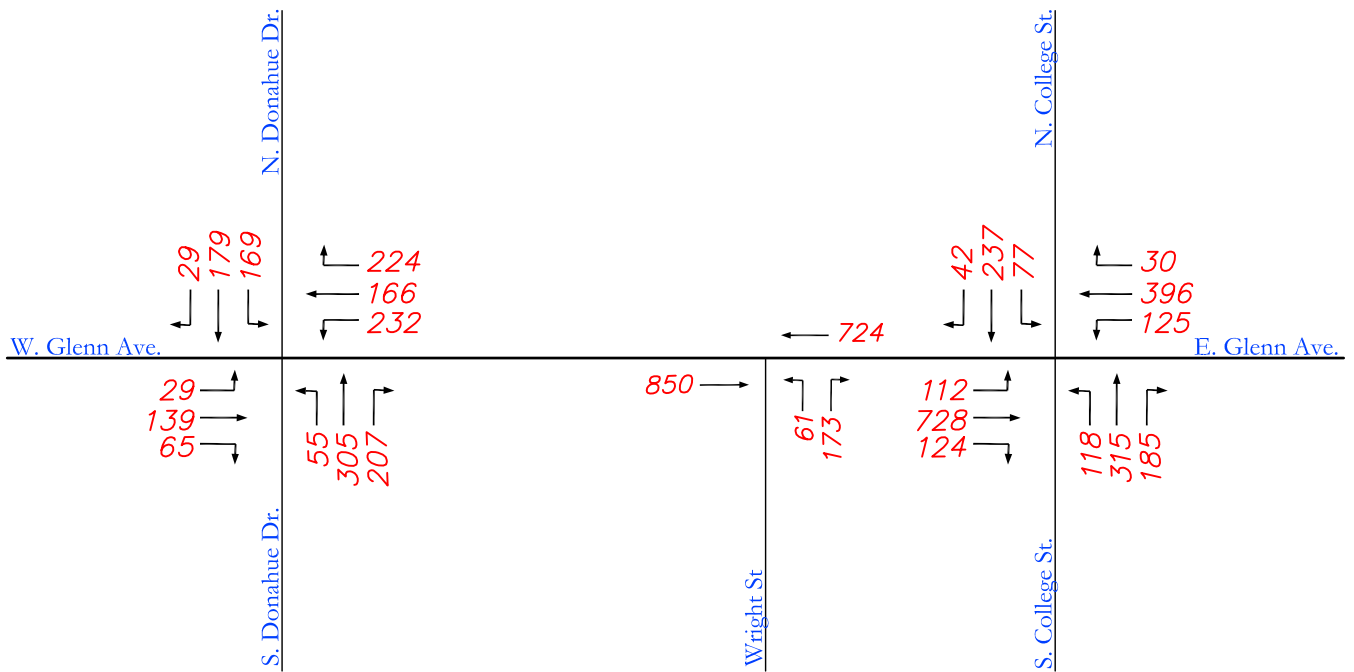


Counts taken in September October 2005 and September 2007
Typical Peak (7:15-8:15 AM)

DRAWING NOT TO SCALE

Legend
00 → TRAFFIC VOLUMES (VEHICLES)

FIGURE 3-2
EXISTING AM PEAK HOUR
TURNING MOVEMENT COUNTS
GLENN AVENUE CORRIDOR
AUBURN, ALABAMA



Counts taken in September October 2005 and September 2007
Typical Peak (4:30-5:30 PM)

DRAWING NOT TO SCALE

Legend
00 → TRAFFIC VOLUMES (VEHICLES)

FIGURE 3-3
EXISTING PM PEAK HOUR
TURNING MOVEMENT COUNTS
GLENN AVENUE CORRIDOR
AUBURN, ALABAMA

EXISTING INTERSECTION CAPACITY ANALYSIS

Capacity analyses for peak hour conditions at the study intersections along the Glenn Avenue Corridor were conducted for morning and afternoon peak hour periods using methods outlined in the *Highway Capacity Manual, Third Edition*. According to methods of the *Highway Capacity Manual*, capacity is expressed as levels of service ranging from “A” (best) through “F” (worst). In general, a level of service “C” is considered desirable while a level of service “D” is considered acceptable during peak hour operations. Results of these capacity analyses for existing conditions are summarized in **Table 3-2**. Existing intersection capacity printouts, which present details of the capacity analyses, are provided in **Appendix B** for reference.

**Table 3-2
Existing Intersection Levels of Service**

Intersection (traffic control)	Approach	Movement/Lane Group	Level of Service	
			A.M. Peak Hour	P.M. Peak Hour
Glenn Avenue at Donahue Drive (traffic signal)	EB Glenn Avenue	Left	C	C
		Through/Right	C	C
	WB Glenn Avenue	Left	D	D
		Through/Right	C	D
	NB Donahue Drive	Left	B	B
		Through/Right	C	D
	SB Donahue Drive	Left	B	B
		Through/Right	C	C
Overall LOS			C	C
Glenn Avenue at Wright Street (side street stop)	NB Wright Street	Left	D	F
		Right	B	D
	Overall LOS			C
Glenn Avenue at College Street (traffic signal)	EB Glenn Avenue	Left	C	B
		Through/Right	C	C
	WB Glenn Avenue	Left	C	C
		Through/Right	D	C
	NB College Street	Left	B	C
		Through	C	E
		Right	C	D
	SB College Street	Left	B	C
		Through	C	D
		Right	C	D
Overall LOS			C	D

As shown in **Table 3-2**, the study intersections evaluated along the Glenn Avenue Corridor operate with acceptable levels of service for both peak periods evaluated. The only movements which operate with less than a level of service “D” is the northbound through movement on College Street and the northbound left turn movement on Wright Street during the afternoon peak hour.

EXISTING ARTERIAL SEGMENT CAPACITY ANALYSIS

Arterial segment capacity analyses for peak hour conditions along the Glenn Avenue Corridor were conducted for the morning and afternoon peak hour periods using methods outlined in the *Highway Capacity Manual, Third Edition*. Levels of service for the arterial analyses conducted for Glenn Avenue are summarized in Table 3-3. Capacity printouts are provided in Appendix B.

**Table 3-3
Existing Arterial Segment Levels of Service**

Eastbound Glenn Avenue Arterial Analysis				
From	To	Segment Length	Arterial Level of Service by Section	
			AM Peak	PM Peak
Donahue Drive	College Street	0.50	B	B
Total Urban Street LOS			B	B
Westbound Glenn Avenue Arterial Analysis				
From	To	Segment Length	Arterial Level of Service by Section	
			AM Peak	PM Peak
College Street	Donahue Drive	0.50	B	B
Total Urban Street LOS			B	B

Table 3-3 indicates that the total urban street level of service along Glenn Avenue from Donahue Drive to College Street would be a level of service “B” for each direction of travel during both the morning and afternoon peak hours.

EXISTING ROADWAY SEGMENT ANALYSIS

A comparison of current daily traffic volumes and daily carrying capacities was conducted for Glenn Avenue. This comparison was conducted utilizing the Alabama Department of Transportation's Approved Capacities and Level of Service Criteria. Based on these criteria, the daily carrying capacity for a two-lane arterial roadway is 13,300 vehicles per day. The current daily traffic volume on Glenn Avenue is 14,208 vehicles, as counted by the City of Auburn on April 11, 2007. Based upon this comparison, the current daily traffic volume on Glenn Avenue exceeds the carrying capacity based upon the ALDOT criteria.

RIGHT-TURN LANE WARRANT EVALUATIONS

An assessment of the need for right turn lanes along Glenn Avenue and the intersecting roadways was conducted. This assessment was conducted for each approach at of Glenn Avenue and the intersecting roadways for each of the study intersections. The criteria utilized was based upon information contained in the *Intersection Channelization Design Guide, Report 279*, published by the Transportation Research Board. Existing peak hour traffic volumes were compared with right-turn lane warrant criteria as presented in the *Intersection Channelization Design Guide, Report 279*.

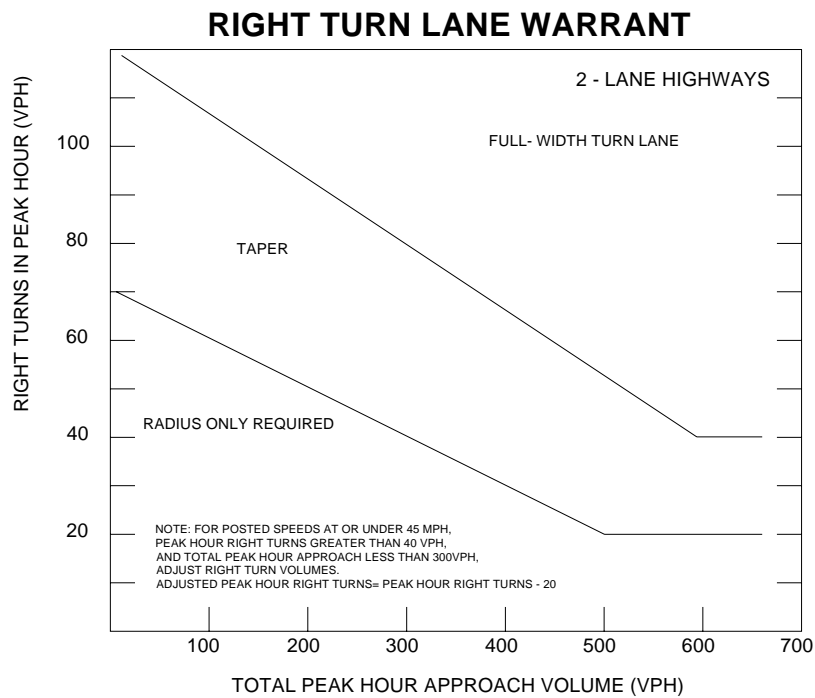
The results of these comparisons indicate current volumes are sufficient to meet the criteria for right-turn lanes as described above.

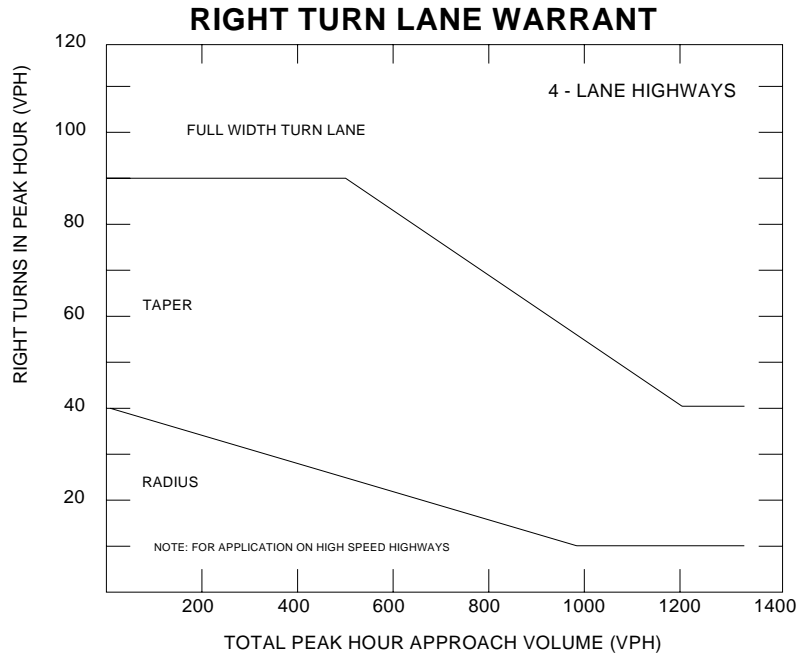
- Westbound Glenn Avenue at Donahue Drive – During both the morning and afternoon peak hours, traffic volumes are sufficient to meet the criteria for full length right turn lanes with tapers.
- Northbound Donahue Drive at Glenn Avenue – During the morning peak hour, traffic volumes are sufficient to meet the criteria for a deceleration taper.

However, during the afternoon peak hour, traffic volumes are sufficient to meet and exceed the criteria for a full length right turn lane with taper.

- Eastbound Glenn Avenue at College Street – During both the morning and afternoon peak hours, traffic volumes would meet and exceed the criteria for a full right turn lane with taper.

Right turn lane guidelines, as presented in the *Intersection Channelization Design Guide, Report 279*, are provided for reference in the following charts.





* Taken from Figure 4-23, Intersection Channelization Design Guide, Report 279, published by the Transportation Research Board.

INTERSECTION ACCIDENT ANALYSIS

North College Street at Glenn Avenue

According to the initial crash screening of this intersection, it has approximately 1.31 crashes per million vehicles entering the intersection for 2003-2004. The City of Auburn provided crash data at this intersection for the purposes of crash pattern analysis. After a review of the latest crash data provided, no sustainable pattern in crashes was observed to indicate contributing conditions to a crash from the intersection. Based on a physical review of the intersection as well as the crash information, it is recommended that no corrective measures would be required at this time to mitigate any crashes for North College Street at Glenn Avenue intersection.

North Donahue Drive at West Glenn Avenue

According to the initial crash screening of this intersection, it has approximately 2.43 crashes per million vehicles entering the intersection for 2003-2004. The City of Auburn provided crash data at this intersection for the purposes of crash pattern analysis. After a review of the latest crash data provided, no sustainable pattern in crashes was observed to

indicate contributing conditions to a crash from the intersection. Based on a physical review of the intersection as well as the crash information, it is recommended that no corrective measures would be required at this time to mitigate any crashes for North Donahue Drive at the West Glenn Avenue intersection. It is recommended, however, that the performance of this intersection be monitored considering it experienced approximately 2.43 crashes per million vehicles entering for the 2003-2004 period.

West Glenn Avenue at Wright Street

According to the initial crash screening of this intersection, it has approximately 0.65 crashes per million vehicles entering the intersection for 2003-2004. The City of Auburn provided crash data at this intersection for the purposes of crash pattern analysis. After a review of the latest crash data provided, no sustainable pattern in crashes was observed to indicate contributing conditions to a crash from the intersection.

Crash data was provided by the City of Auburn for the Wright Street at Glenn Avenue intersection for the most recent 12 month period (2006). A review of the crash data was conducted to determine if any crash patterns were being experienced which would possibly be preventable with the installation of a traffic signal. Upon review of the crash data, approximately 10 crashes were reported to have occurred during 2006 at the study intersection. Further evaluation of the crash data indicates that 5 of these crashes actually occurred at either private driveways or in the vicinity of the study intersection, but were not actually intersection related. Similar results were found during 2004 and 2005. Of the 5 accidents that actually occurred at the study intersection during 2006, 2 were angle crashes which would possibly be preventable with the installation of a traffic signal.

TRAFFIC SIGNAL WARRANT ANALYSIS

Wright Street at Glenn Avenue

As a result of current levels of service for the left turn exiting Wright Street during the afternoon peak hour, a signal warrant analysis was conducted to evaluate the need for a traffic signal at this intersection. The traffic signal warrant criteria utilized is presented in

the *Manual on Uniform Traffic Control Devices (MUTCD) 2000 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. Complete descriptions of the applicable warrants can be found in the MUTCD.

Based on the volumes collected during the peak hours a traffic signal warrant was conducted. Based upon the comparison of existing traffic volumes with the peak hour warrant criteria, sufficient volumes are present to meet the criteria for signal warranting at this location. However, the majority of the approach volumes for Wright Street is in the right turn movement. With right turn reductions applied at this location, traffic signalization would not be warranted.

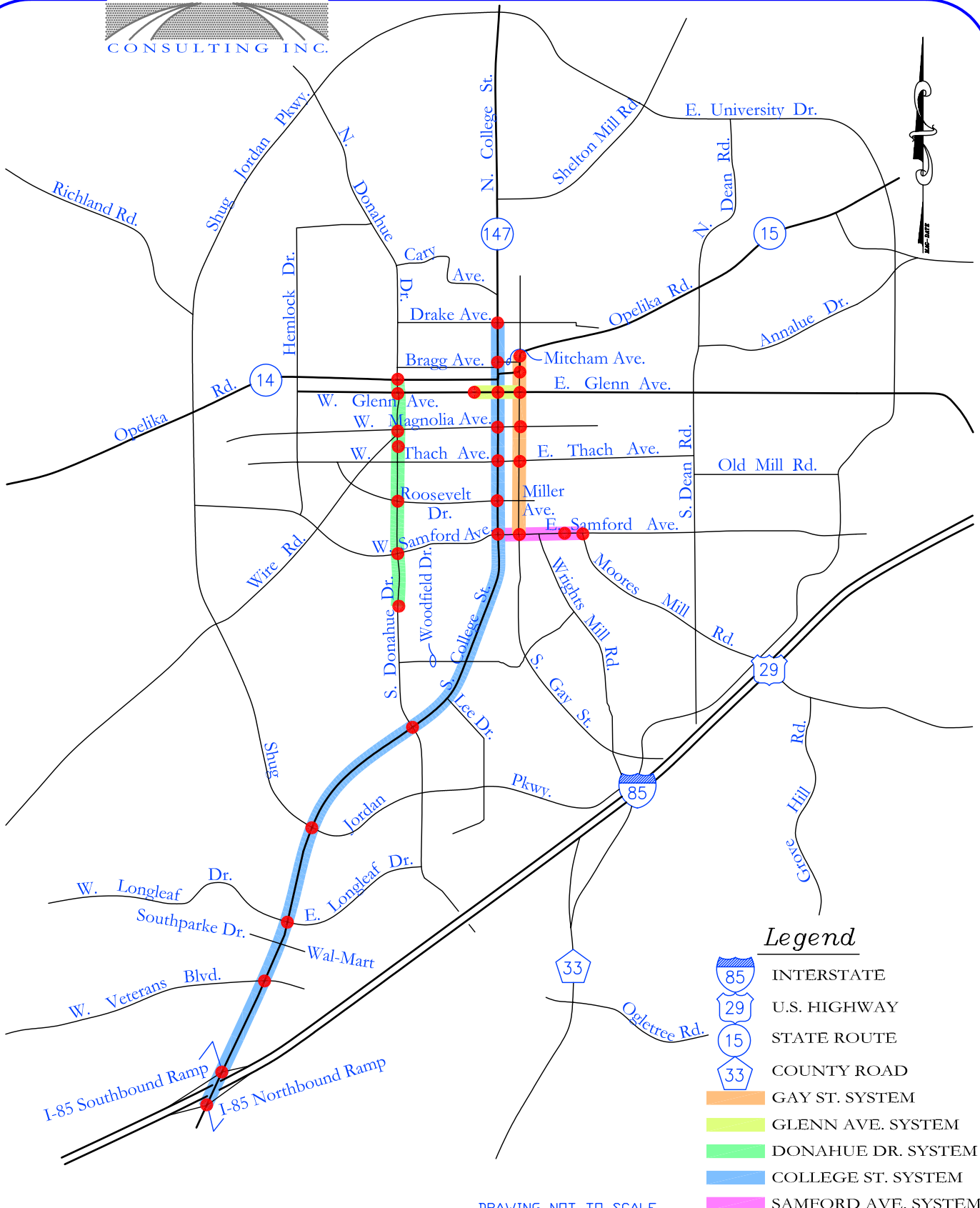
A review of crash data for this intersection was also evaluated for signal warranting purposes. The results of this evaluation, presented in a previous section of this document, indicate that two (2) crashes susceptible to prevention with the installation of a traffic signal occurred at this intersection which does not meet the criteria of the MUTCD of five (5) crashes susceptible for prevention.

TRAFFIC SIGNAL SYSTEMS EVALUATION

Skipper Consulting, Inc. performed an evaluation of traffic signal spacing and traffic flow characteristics on Glenn Avenue. While there are no recommendations for traffic signal coordination between the two study intersections, it should be noted that a coordinated traffic signal system exists on Glenn Avenue from College Street to Gay Street. This system includes two signalized intersections, which are currently supervised by the on-street master controller currently located at the water tank at the corner of Donahue Drive and Glenn Avenue using spread spectrum radios.

The traffic signal system on Glenn Avenue as listed in the previous paragraph of this report should be included in the overall traffic signal system plan for the City of Auburn. Recommendations are made concerning traffic signal systems in other sections of this

report; however due to the overlapping nature of the corridors the signal systems are interdependent. The relationship of the Glenn Avenue signal system with other signal systems recommended in this report is shown in **Figure 3-4**. As shown in this figure, the Glenn Avenue traffic signal system is cross-linked with the College Street signal system (existing) and the Gay Street signal system (proposed). The proposed Wright Street traffic signal should be incorporated into the Glenn Avenue signal system due to the close proximity with the intersection of Glenn Avenue and College Street.



DRAWING NOT TO SCALE

FIGURE 3-4
TRAFFIC SIGNAL SYSTEMS

AUBURN TRAFFIC STUDY
AUBURN, ALABAMA

RECOMMENDED IMPROVEMENTS

Based upon the analyses and evaluations conducted for the Glenn Avenue Corridor, recommended roadway and traffic control improvements were developed in an effort to improve traffic flows through the corridor at study intersections and to address any capacity or safety deficiencies for the study intersections. The following outlines the recommended improvements for the Glenn Avenue Corridor from Donahue Drive to College Street.

Glenn Avenue at Donahue Drive

- Signal timing and phasing modifications to include implementation of westbound protected/permissive left turn phasing.
- Construct a right turn lane for the westbound approach of Glenn Avenue.
- Construct a right turn lane for the northbound approach of Donahue Drive.

Glenn Avenue at Wright Street

- Installation of a traffic signal to include pedestrian features. Traffic signalization at this location shall be coordinated with the Glenn Avenue Signal System. As previously mentioned, peak hour volumes at Wrights Street and Glenn Avenue would be sufficient to meet the peak hour signal warrant criteria of the MUTCD.

Glenn Avenue at College Street

- Construct a right turn lane for the eastbound approach of Glenn Avenue.
- Convert the existing northbound right turn lane on College Street to a northbound through lane.
- Construct a northbound right turn lane on College Street.

Glenn Avenue Improvements

In addition to the intersection improvements recommended along this portion of Glenn Avenue, roadway and pedestrian crossing improvements are also recommended. The roadway improvements consist of widening Glenn Avenue to a three-lane cross section

which would consist of a continuous center left turn lane. The roadway widening is recommended as a result of the current traffic volumes on Glenn Avenue as well as the number of access points along Glenn Avenue. It may be possible to restripe portions of Glenn Avenue to provide the three lane cross section. However, should the current roadway width not provide sufficient lane widths, widening could be accomplished with minimal widening efforts either symmetrically or on one side of Glenn Avenue. The pedestrian improvements are recommended as a result of the pedestrian activity observed crossing Glenn Avenue.

The recommended improvements for the Glenn Avenue Corridor study intersections are illustrated in as follows:

- Figure 3-5 Glenn Avenue at Donahue Drive Improvements
- Figure 3-6 Glenn Avenue at College Street Improvements
- Figure 3-7 Glenn Avenue at Wright Street Improvements
- Figure 3-8 Glenn Avenue Improvements

Glenn Avenue @ Donahue Drive

- ◆ Signal timing adjustments and phasing modification to include WB protected/permissive left turn phase
- ◆ Construct WB right turn lane
- ◆ Construct NB right turn lane

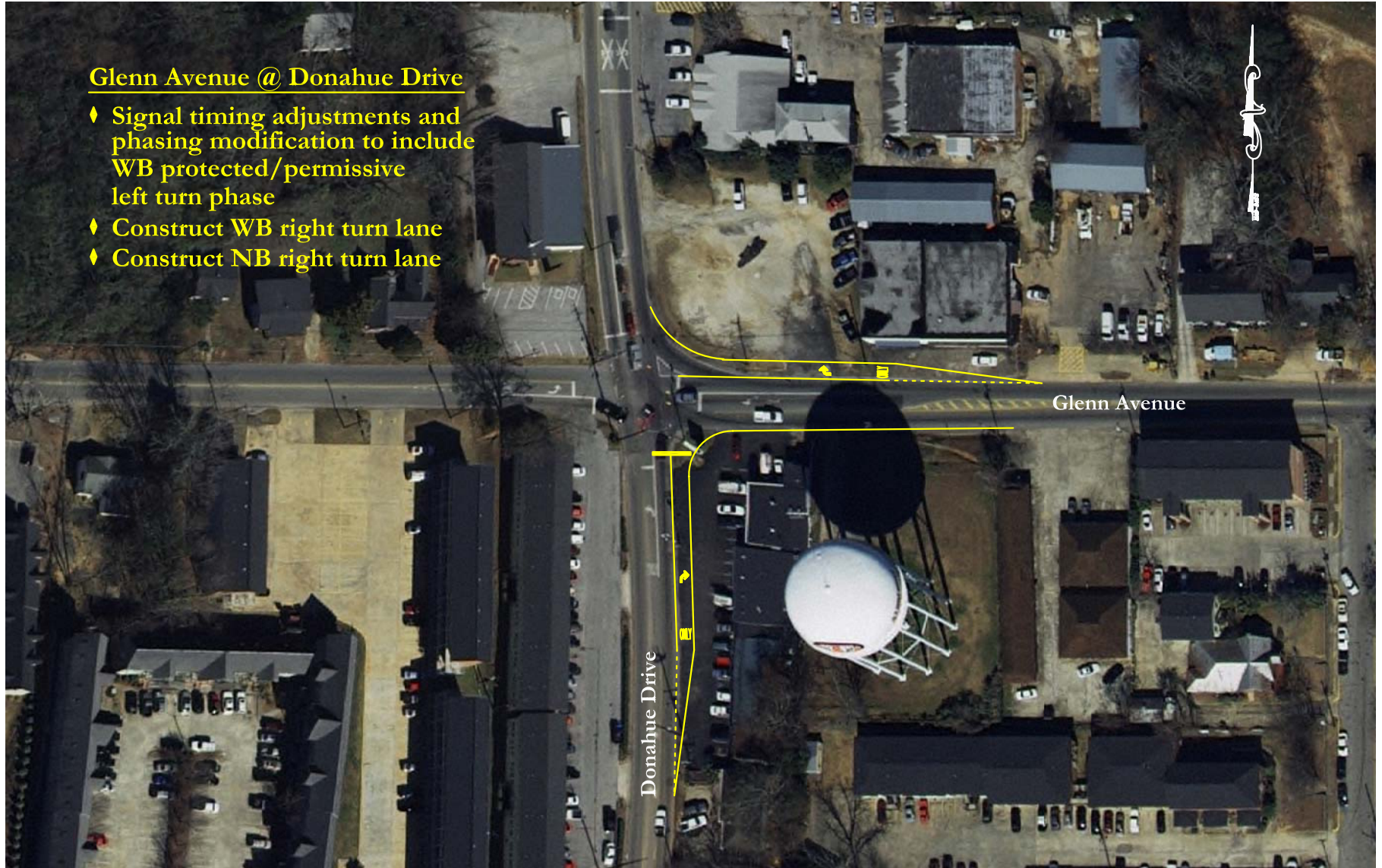


FIGURE 3-5
GLENN AVE. @ DONAHUE DR.
IMPROVEMENTS

AUBURN TRAFFIC STUDY

AUBURN, ALABAMA

0 100
APPROX. SCALE IN FT.

NOVEMBER 2006

1103.007

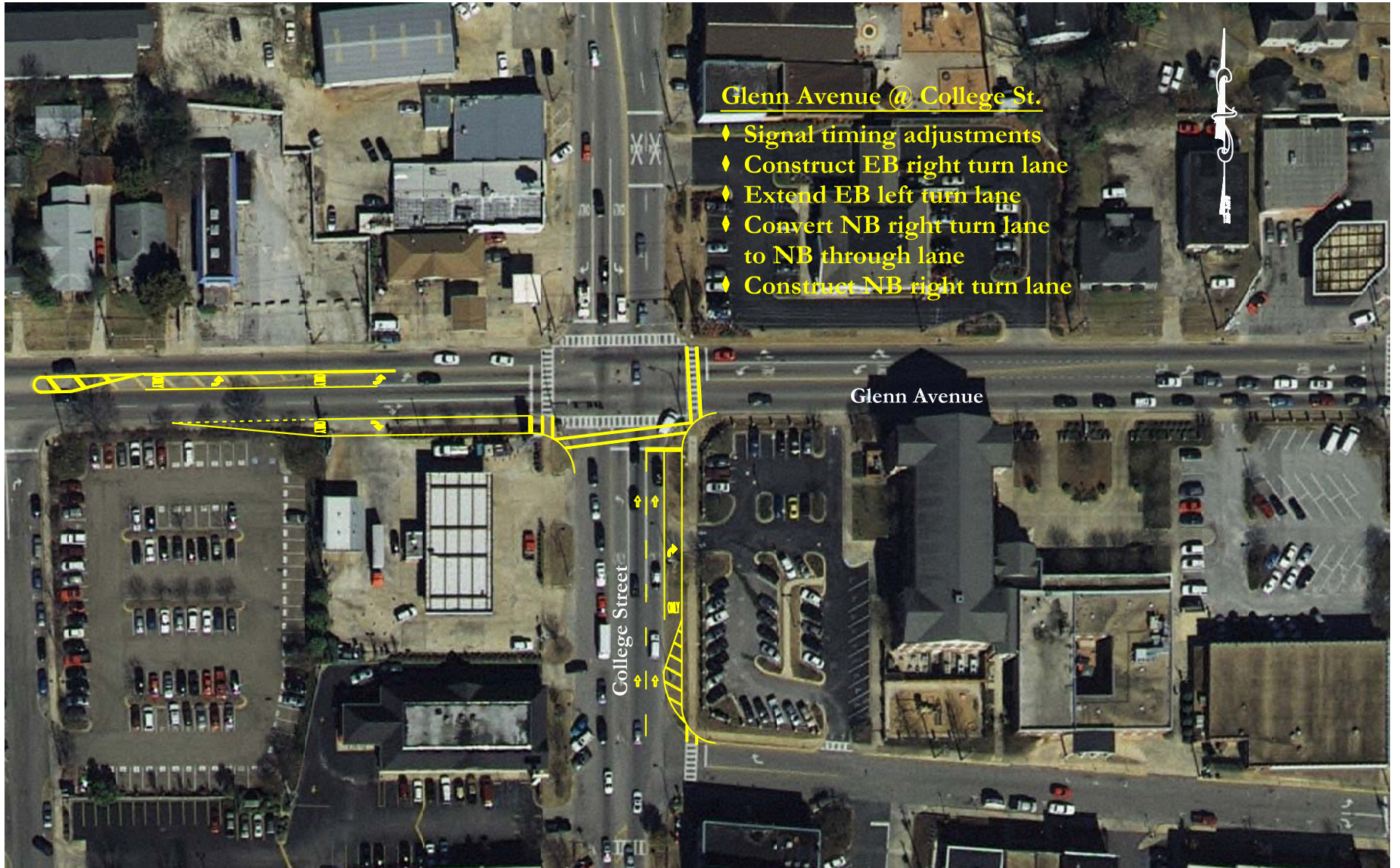


FIGURE 3-6
GLENN AVE. @ COLLEGE ST.
IMPROVEMENTS

AUBURN TRAFFIC STUDY

AUBURN, ALABAMA

0 100
APPROX. SCALE IN FT.

NOVEMBER 2006

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0 60
APPROX. SCALE IN FT.

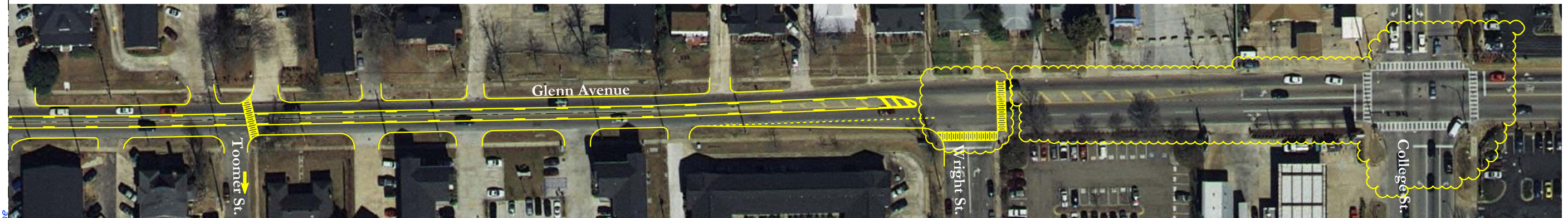
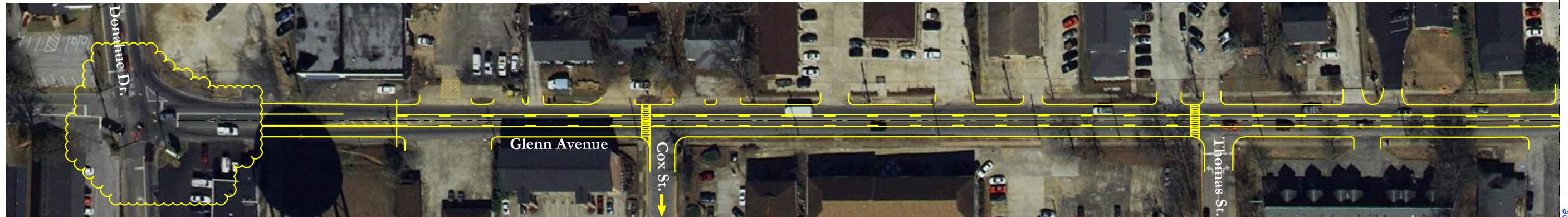
FIGURE 3-7
GLENN AVE. @ WRIGHT STREET
IMPROVEMENTS
AUBURN TRAFFIC STUDY
AUBURN, ALABAMA
JANUARY 2007 1103.007

Glenn Avenue @ Donahue Drive

◆ Improvements for this intersection can be found on Figure 3-5.

Glenn Avenue Improvements

- ◆ Widen Glenn Avenue to provide a 3-lane cross-section with a center left turn lane from Donahue Drive to College Street.
- ◆ Provide pedestrian crosswalks at Cox Street, Thomas Street, Toomer Street, and Wright Street. Appropriate pedestrian crossing signs should also be installed with the crosswalks.



Glenn Avenue @ Wright Street

◆ Improvements for this intersection can be found on Figure 3-7.

Glenn Avenue @ College Street

◆ Improvements for this intersection can be found on Figure 3-6.



FIGURE 3-8
GLENN AVENUE IMPROVEMENTS
AUBURN TRAFFIC STUDY
AUBURN, ALABAMA
NOV. 2007 1103.007

INTERSECTION CAPACITY ANALYSIS WITH RECOMMENDED IMPROVEMENTS

Capacity analyses were conducted for the study intersections along Glenn Avenue with the recommended improvements assumed to be in place. Capacity analyses were conducted using methods of the *Highway Capacity Manual*, as previously introduced. **Table 3-4** provides a summary of the levels of service for study intersections assuming the recommended improvements would be implemented. For comparative purposes, existing levels of service are shown in red in **Table 3-4**. Capacity printouts are provided in **Appendix C**.

Table 3-4
Intersection Levels of Service with Improvements
 (Existing LOS indicated in **RED**)

Intersection (traffic control)	Approach	Movement/Lane Group	Level of Service			
			A.M. Peak Hour		P.M. Peak Hour	
Glenn Avenue at Donahue Drive (traffic signal)	EB Glenn Avenue	Left	C	C	C	C
		Through/Right	C	C	C	C
	WB Glenn Avenue	Left	C	D	D	D
		Through	C	C	C	D
	NB Donahue Drive	Right	A	A	A	D
		Left	B	B	B	B
		Through	C	C	C	D
	SB Donahue Drive	Right	B	B	B	D
		Left	B	B	B	B
	Overall LOS			C	C	C
Glenn Avenue at Wright Street (traffic signal) (LOS in red for existing side street stop condition)	EB Glenn Avenue	Through	A	--	B	--
	WB Glenn Avenue	Through	A	--	A	--
	NB Wright Street	Left	B	D	C	F
		Right	B	B	D	D
	Overall LOS			C	C	B
Glenn Avenue at College Street (traffic signal)	EB Glenn Avenue	Left	C	C	B	B
		Through	C	C	C	C
		Right	B	B	B	C
	WB Glenn Avenue	Left	C	C	C	C
		Through/Right	D	D	C	C
	NB College Street	Left	B	B	C	C
		Through	C	C	D	E
		Right	C	C	D	D
	SB College Street	Left	B	B	C	C
		Through	C	C	D	D
Right		C	C	D	D	
Overall LOS			C	C	C	D

Table 3-4 indicates that acceptable levels of service would be realized at each of the study intersections (Donahue Drive, Wright Street and College Street) along the Glenn Avenue Corridor with the implementation of the recommended improvements. With the implementation of the recommended improvements, delay reduction is expected for overall traffic flows at the study intersections as well as Glenn Avenue.

ARTERIAL SEGMENT CAPACITY ANALYSIS WITH IMPROVEMENTS

Arterial segment capacity analyses for peak hour conditions along the Glenn Avenue Corridor were conducted for the morning and afternoon peak hours using methods outlined in the *Highway Capacity Manual, Third Edition*. Levels of service for the arterial analyses conducted for Glenn Avenue are summarized in **Table 3-5**. For comparative purposes, existing levels of service are shown in red in **Table 3-5**. Capacity printouts are provided in **Appendix C**.

Table 3-5
Arterial Segment Levels of Service with Improvements
 (Existing LOS indicated in **RED**)

Eastbound Glenn Avenue Arterial Analysis						
From	To	Segment Length	Arterial Level of Service by Section			
			AM Peak		PM Peak	
Donahue Drive	Wright Street	0.42	A	n/a	B	n/a
Wright Street	College Street	0.08	C	n/a	C	n/a
Total Urban Street LOS			C	B	C	B
Westbound Glenn Avenue Arterial Analysis						
From	To	Segment Length	Arterial Level of Service by Section			
			AM Peak		PM Peak	
College Street	Wright Street	0.42	A	n/a	A	n/a
Wright Street	Donahue Drive	0.08	C	n/a	C	n/a
Total Urban Street LOS			B	B	C	B

Table 3-5 indicates that the total urban street level of service along Glenn Avenue from Donahue Drive to College Street would operate at levels of service “C” or better for each direction of travel during both the morning and afternoon peak hours. This analysis was

conducted assuming the roadway and traffic control improvements outlined in this report would be in place.

It should be noted that the overall arterial levels of service would generally be levels of service “C” with recommended improvements as compared to existing levels of service “B”. This is a result of installing a new signal at the Wright Street intersection with Glenn Avenue. With the installation of a new traffic signal, it is typical for the arterial level of service to deteriorate to some extent with delay for the main street through movements being realized with stop time for the main street associated with the newly installed traffic signal. However, Glenn Avenue would maintain an overall acceptable level of service with the installation of a signal at Wright Street. In order to minimize any potential impacts of a new signal along Glenn Avenue, side street green time should be held to a minimum and signal coordination with the traffic signal at College Street would be required for the Wright Street and Glenn Avenue intersection.