

Section 3F:

Glenn Avenue Corridor



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INTRODUCTION

This section documents the results of traffic operations evaluations for the Glenn Avenue Corridor from Donahue Drive to Skyway Drive in Auburn, Alabama. The intersections analyzed in this corridor include:

- Donahue Drive at Glenn Avenue
- Cox Street at Glenn Avenue
- Thomas Street at Glenn Avenue
- Toomer Street at Glenn Avenue
- Wright Street at Glenn Avenue
- N College Street at Glenn Avenue
- Gay Street at Glenn Avenue
- Ross Street at Glenn Avenue
- Dean Road at Glenn Avenue
- E University Drive at Glenn Avenue
- Airport Road at Glenn Avenue
- E Samford Avenue at Glenn Avenue
- Bent Creek Road at Glenn Avenue
- Sam’s Access/Retail Center at Glenn Avenue
- Skyway Drive at Glenn Avenue

The locations of the study intersections along the Glenn Avenue Corridor are illustrated in **Figure 1**. To accomplish the traffic operations evaluations for the Glenn Avenue Corridor, the following tasks were undertaken:

- existing peak hour turning movement counts were conducted for the study intersections;
- drive times were collected for the morning and afternoon commuter peak periods;
- capacity analyses were conducted for the study intersections;
- arterial capacity analyses were conducted for Glenn Avenue;
- current traffic operational deficiencies were identified;
- projections for ten (10) year growth in traffic through the corridor were developed;
- geometric and traffic control improvements were developed for the study intersections to address traffic operational and safety deficiencies for existing and projected ten (10) year conditions.

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.

BACKGROUND INFORMATION

Study Area Roadways

Glenn Avenue is a minor arterial roadway from Donahue Drive to Skyway Drive. Glenn Avenue provides access to various retail, commercial and residential land. Glenn Avenue is approximately 4.7 miles in length. Characteristics of the roadways within the Glenn Avenue Corridor are summarized in

Table 1.

Table 1 - Corridor Roadway Characteristics

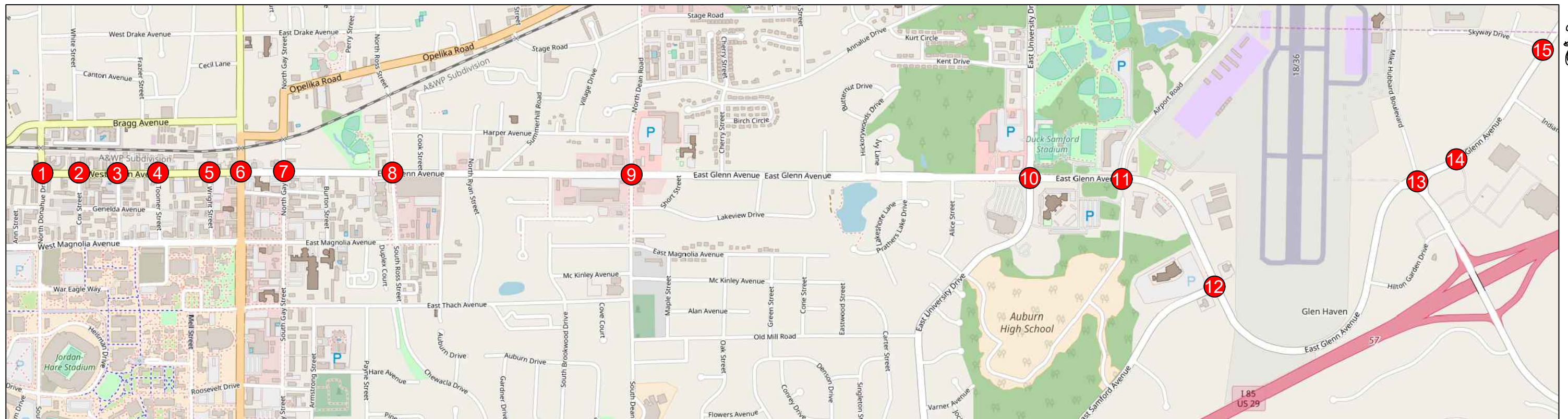
Roadway	Parking	# of Lanes	Travel Direction	Travel Speeds (mph)	Classification
Glenn Avenue	None	3-5	East/West	25-45	Minor Arterial
Donahue Drive	None	3	North/South	25	Minor Arterial
Cox St/Thomas St/ Toomer St/Wright St	Parallel	2	North/South	25	Local Roadway
N College Street	Angled	3	North/South	25	Minor Arterial
Gay Street	None	3	North/South	25	Minor Arterial
Ross Street	None	2	North/South	25	Minor Arterial
Dean Road	None	4	North/South	35	Minor Arterial
E University Drive	None	3-4	North/South	35	Minor Arterial
Airport Road	None	2	North/South	35	Local Roadway
E Samford Avenue	None	3	East/West	35	Local Roadway
Bent Creek Road	None	4	North/South	35	Minor Arterial
Sam’s/Academy Access	None	3	North/South	25	Access Driveway
Skyway Drive	None	2	North/South	25	Access Driveway

E Glenn Avenue Study Corridor

- 1 Donahue Drive at E Glenn Avenue
- 2 Cox Street at E Glenn Avenue
- 3 Thomas Street at E Glenn Avenue
- 4 Toomer Street at E Glenn Avenue
- 5 Wright Street at E Glenn Avenue

- 6 N College Street at E Glenn Avenue
- 7 Gay Street at E Glenn Avenue
- 8 Ross Street at E Glenn Avenue
- 9 Dean Road at E Glenn Avenue
- 10 E University Drive at E Glenn Avenue

- 11 Airport Road at E Glenn Avenue
- 12 E Samford Avenue at E Glenn Avenue
- 13 Bent Creek Road at E Glenn Avenue
- 14 Sam's Access/Retail Center at E Glenn Avenue
- 15 Skyway Drive at E Glenn Avenue



EXISTING CONDITIONS ANALYSES

Peak Hour Traffic Counts

Morning (7:00-9:00 am) and afternoon (4:00-6:00 pm) peak hour turning movement counts were conducted along the Glenn Avenue Corridor at study intersections between 2013 to 2018. Traffic count data utilized for the analyses of these intersections is summarized in **Figure 2**.

Peak Period Observations

Observations of traffic operations were conducted within the Glenn Avenue Corridor during the morning and afternoon peak periods. The following items were noted in these observations:

- Some conflict during peak periods of traffic flow were observed between the free-flow right-turning vehicles from Glenn Avenue onto southbound Bent Creek Road and left-turning vehicles from westbound Glenn Avenue attempting to access the right-turn lane at Auburn Exchange. This conflict was not a constant occurrence but did cause some turbulence when it occurred.
- Some poor lane utilization was observed for the westbound approach of Glenn Avenue at Ross Street. The approach utilizes two lanes with the inside dropping as a left turn at the intersection. Since most of the traffic is going through the intersection, the majority of vehicles are stacking in the outside lane well in advance of the intersection.

Existing Intersection Capacity Analysis

Capacity analyses for peak hour conditions at the study intersections along the Glenn Avenue Corridor were conducted for the morning and afternoon peak hour periods using methods outlined in the *Highway Capacity Manual, 2010*. 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 illustrated in **Figure 3**.

As shown in **Figure 3**, the following study intersections currently experience movements with poor levels of service: Cox Street at Glenn Avenue (NB left/thru/right), Ross Street at Glenn Avenue (NB thru/right, WB thru/right), and Skyway Drive at Glenn Avenue (SB left).

Existing Arterial Segment Capacity Analysis

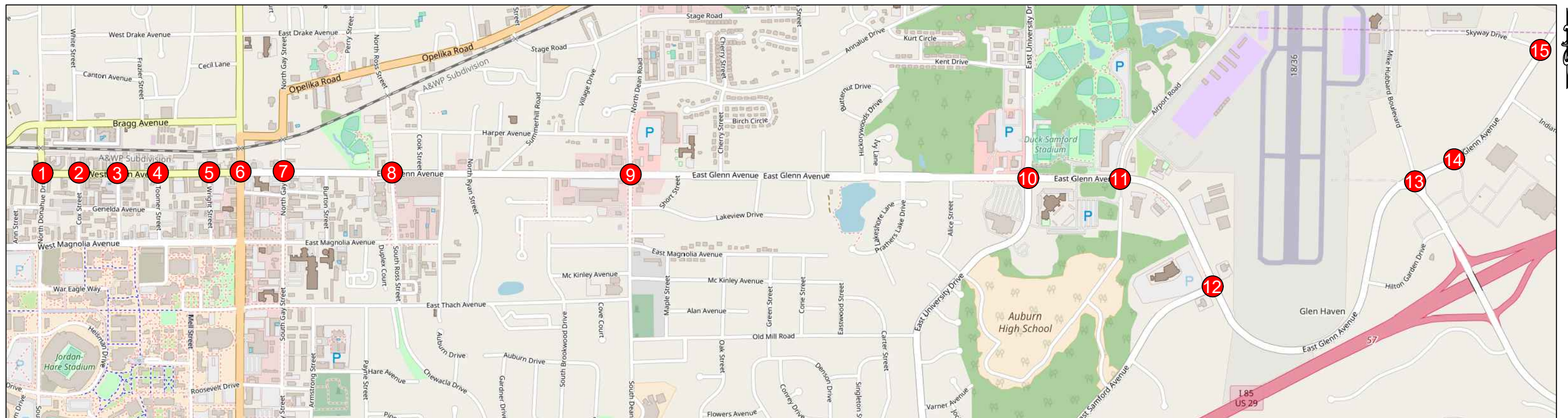
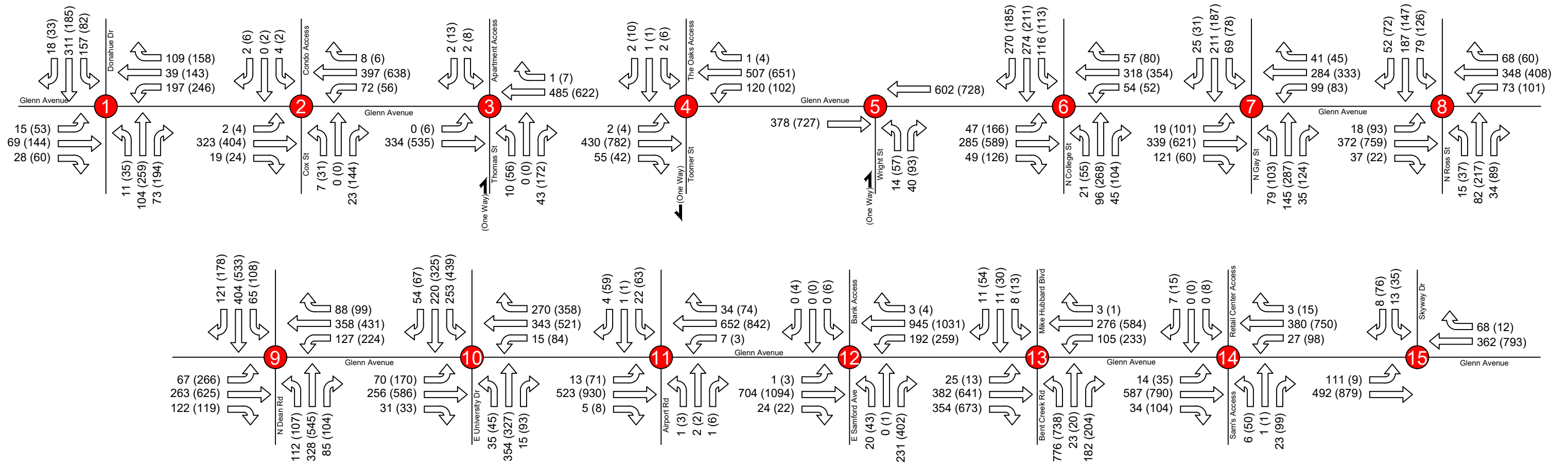
Arterial segment capacity analyses for peak hour conditions along the Glenn Avenue Corridor were conducted for the morning and afternoon peak hour periods using methods outlined in the *Highway Capacity Manual, 2010*. Levels of service for the arterial analyses conducted for Glenn Avenue are summarized in **Table 2**.

Table 2 - Existing Arterial Segment Levels of Service

Glenn Avenue Arterial Analysis						
From	To	Segment Length (miles)	Eastbound Segment Level of Service		Westbound Segment Level of Service	
			AM Peak	PM Peak	AM Peak	PM Peak
Donahue Drive	N College Street	0.50	D	E	C	D
N College Street	N Gay Street	0.11	F	F	F	F
N Gay Street	N Ross Street	0.27	E	E	D	E
N Ross Street	N Dean Road	0.60	C	D	C	D
N Dean Road	E University Drive	1.01	B	B	B	B
E University Drive	Airport Road	0.24	B	C	E	E
Airport Road	E Samford Avenue	0.39	C	C	A	B
E Samford Avenue	Bent Creek Road	0.86	B	B	A	A
Bent Creek Road	Sam’s Access	0.11	C	E	E	E

As indicated in **Table 2** the eastbound and westbound Glenn Avenue segments between Donahue Drive and Ross Street and between E University Drive and Airport Road currently operate at poor levels of service during the morning and afternoon peak hours. This level of service is a result of lane capacity and inefficient signal operation at the study intersections.

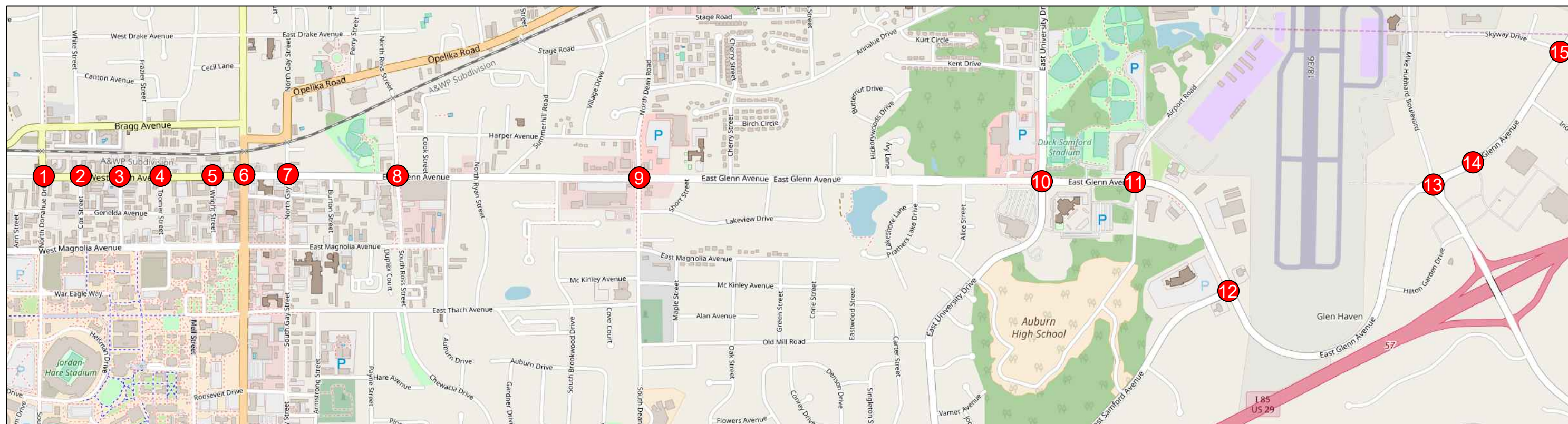
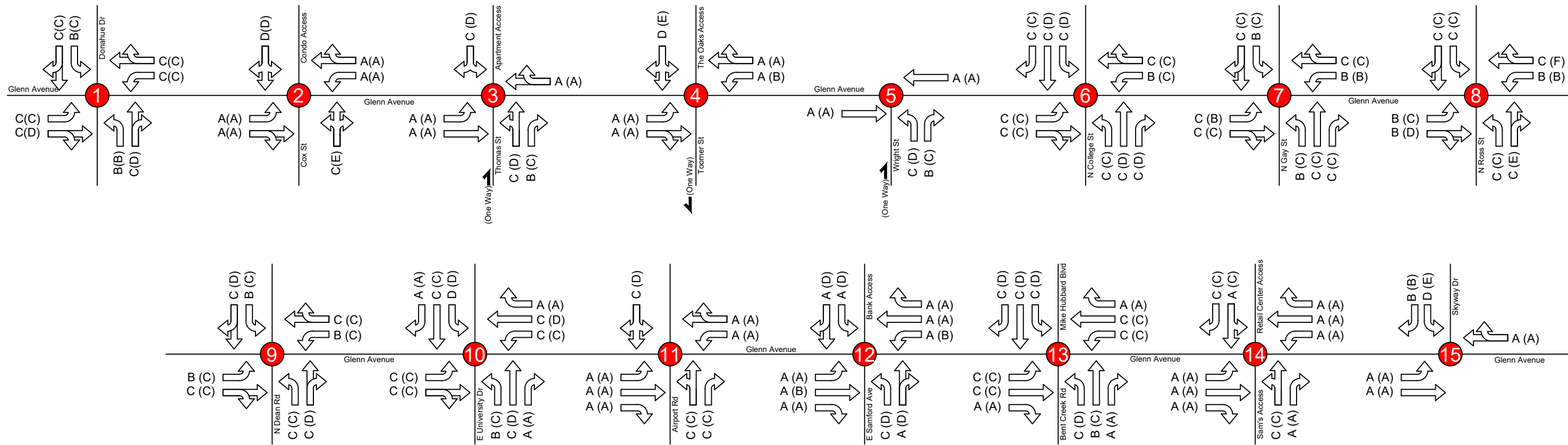
Also, the Glenn Avenue segments between Bent Creek Road and Sam’s Access currently operates at poor levels of service. This level of service is a result of signal spacing between E. Glenn Avenue and Auburn Exchange coupled with the delay for the northbound left-turn movement resulting in lower travel speeds along this segment of Glenn Avenue.



**Figure 2 - Existing Traffic Volumes
Glenn Avenue Corridor
Auburn, Alabama**

LEGEND

- ← AM(PM) Peak Hour Volumes
- ⊗ Study Intersection



**Figure 3 - Existing Intersection Levels of Service
Glenn Avenue Corridor
Auburn, Alabama**



LEGEND

- ← AM(PM) Peak Hour Level of Service
- ⊗ Study Intersection

Scale: Not to Scale
Date: OCT 2018

Right-Turn Lane Warrant Evaluations

Existing peak hour traffic volumes were compared with the turn lane warrant criteria outlined in the National Cooperative Highway Research Program (NCHRP) Report 457 *Evaluating Intersection Improvements: An Engineering Study Guide*, published by the Transportation Research Board. For evaluation purposes, the posted speed limit was utilized for roadways. Evaluation results are listed in **Table 3**.

Table 3 – Right Turn Lane Warrant Evaluation

Intersection	Approach	Peak Hour Evaluated	Turn Lane Warranted
Donahue Dr at Glenn Ave	EB Glenn Ave	PM	No
	WB Glenn Ave	PM	No
	NB Donahue Dr	PM	No
	SB Donahue Dr	PM	No
N College St at Glenn Ave	EB Glenn Ave	PM	No
	WB Glenn Ave	PM	No
Gay St at Glenn Ave	EB Glenn Ave	PM	No
	WB Glenn Ave	PM	No
	SB Gay St	PM	No
N Ross St at Glenn Ave	EB Glenn Ave	PM	No
	WB Glenn Ave	PM	No
	NB Ross St	PM	No
	SB Ross St	PM	No
Dean Rd at Glenn Ave	EB Glenn Ave	PM	Yes
	WB Glenn Ave	PM	No
	NB Dean Rd	PM	No
	SB Dean Rd	PM	Yes
E University Dr at Glenn Ave	EB Glenn Ave	PM	No
Airport Rd at Glenn Ave	WB Glenn Ave	PM	Yes
Skyway Dr at Glenn Ave	WB Glenn Ave	PM	No

As indicated in **Table 3**, the following approaches warrant a right turn lane: eastbound Glenn Avenue at Dean Road, southbound Dean Road at Glenn Avenue, and westbound Glenn Avenue at Airport Road.

Intersection Crash Evaluation

Skipper Consulting, Inc. performed a citywide crash study for intersections and roadway segments maintained by the City of Auburn. The results of this crash study have been documented in a separate bound report. The citywide crash study included the study intersections along Glenn Avenue. Screening procedures and crash analyses were conducted to determine any locations that are worthy of safety-based roadway improvements. As part of the screening procedures, the study intersections were categorized as follows:

Low priority - indicates the crash experience should be considered when completing other roadway improvements at this location. However, the crash experience does not warrant an immediate safety improvement project.

Moderate priority - indicates the crash experience should be monitored in the near future and could be worthy of a safety-based roadway improvement if crash experience trends upward. This does not warrant a safety-based improvement at this time, but a safety-based improvement should be incorporated in any roadway improvement at this location.

High priority – indicates the crash experience is worthy of safety-based roadway improvements and should be evaluated as part of this analysis. Any potential safety-based improvements should be considered for immediate implementation where applicable.

Table 4 lists the crash experience rating for each of the study intersections. Potential safety-based improvements for the identified intersections are detailed in the following sections of this report.

Table 4 – Intersection Crash Experience Rating

Intersection	Crash Experience Rating	Safety-Based Improvement Warranted
Dean Road at Glenn Avenue	High	Yes
N College Street at Glenn Avenue	High	Yes
Wright Street at Glenn Avenue	High	Yes
Gay Street at Glenn Avenue	Moderate	Monitor
E University Drive at Glenn Avenue	Moderate	Monitor
Thomas Street at Glenn Avenue	Moderate	Monitor
Cox Street at Glenn Avenue	Moderate	Monitor
Ross Street at Glenn Avenue	Low	No
Bent Creek Road at Glenn Avenue	Low	No
Toomer Street at Glenn Avenue	Low	No
Airport Road at Glenn Avenue	Low	No
Skyway Drive at Glenn Avenue	Low	No
Sam’s Access at Glenn Avenue	Low	No
Samford Avenue at Glenn Avenue	Low	No

Travel Time

GPS-based Travel time runs were performed on Glenn Avenue from Donahue Drive to Skyway Drive on Thursday, March 22, 2018. Travel time runs were performed during the a.m., midday, and p.m. peak periods of traffic flow. Four to six runs were performed in each direction during each time period. The results of the travel time runs are shown in **Table 5**.

Table 5 –Travel Time Runs

AM Peak				Midday Peak				PM Peak			
Run #	Dir.	Elapsed Time	Avg. Speed	Run #	Dir.	Elapsed Time	Avg. Speed	Run #	Dir.	Elapsed Time	Avg. Speed
1	EB	10:35	25.6	1	EB	9:32	28.2	1	EB	9:04	29.2
2	WB	12:27	21.7	2	WB	8:00	33.4	2	WB	13:19	20.8
3	EB	11:12	23.7	3	EB	8:44	30.5	3	EB	11:03	24.3
4	WB	10:04	26.7	4	WB	11:32	22.7	4	WB	16:21	16.5
5	EB	9:37	27.6	5	EB	10:39	25.4	5	EB	8:03	33.1
6	WB	8:53	29.8	6	WB	10:34	26.1	6	WB	13:35	20.3
7	EB	8:43	30.4	7	EB	11:16	24.0	7	EB	9:46	27.4
8	WB	10:16	25.8	8	WB	12:16	21.7	8	WB	13:52	19.6
9	EB	8:48	30.2	9	EB	9:21	29.0	9	EB	10:19	25.8
				10	WB	12:11	21.8	10	WB	14:33	18.4
				11	EB	9:37	27.6				

EXISTING CONDITIONS ANALYSES WITH IMPROVEMENTS

Recommended Improvements

Roadway and traffic control improvements have been developed to help address capacity deficiencies identified in the capacity analyses conducted or traffic operational issues observed during peak periods along the Glenn Avenue corridor. The following outlines the recommended improvements for existing conditions along Glenn Avenue.

Glenn Avenue from Donahue Drive to N College Street

Pedestrian activity was evaluated as part of this study to identify potential safety issues that may need to be addressed. After reviewing the Glenn Avenue study corridor, the following roadway improvements are recommended: add bicycle shared lane markings (“sharrows”) spaced every 250’ along this stretch of corridor along Glenn Avenue and add raised crosswalks with refuge median islands at existing crosswalk locations (where applicable).

Cox St/Thomas St/Toomer St/Wright St at E. Glenn Avenue

The City of Auburn is considering a project that would convert Thomas Street, Toomer Street and Wright Street to two-way streets from Glenn Avenue to W Magnolia Avenue. Therefore, these improvements were applied to the existing conditions analysis for Glenn Avenue corridor. Traffic volumes were re-distributed at the study intersections on Glenn Avenue. More detail on the results of this two-way conversion project is provided in the Magnolia Avenue corridor section of this report.

N College Street at E. Glenn Avenue

The N College Street and Glenn Avenue intersection was identified with a high priority crash experience rating as part of the crash study. The predominant crash pattern at this intersection were rear-end crashes. Safety-based improvements were evaluated at this intersection due to the crash experience rating. After reviewing the existing signal timings, it was determined that the yellow clearance times were different than what is recommended based on the speeds and intersection geometry. Therefore, adjusting these timings is recommended.

N Gay Street at E. Glenn Avenue

The N Gay Street and Glenn Avenue intersection was identified with a moderate priority crash experience rating as part of the crash study. The predominant crash pattern at this intersection were rear-end crashes. Safety-based improvements were evaluated at this intersection due to the crash experience rating. After reviewing the existing signal timings, it was determined that the yellow clearance times were different than what is recommended based on the speeds and intersection geometry. Therefore, adjusting these timings is recommended.

N Ross Street at E. Glenn Avenue

The following recommended roadway improvements have been developed for implementation at this intersection due to poor levels of service:

- Adjust signal timings to include a max 2 setting for pm peak hours
- Install a northbound right-turn lane along Ross Street.

Dean Road at E. Glenn Avenue

The Dean Road and Glenn Avenue intersection was identified with a high priority crash experience rating as part of the crash study. The predominant crash pattern at this intersection were rear-end crashes. Safety-based improvements were evaluated at this intersection due to the crash experience rating. After reviewing the existing signal timings, it was determined that the yellow clearance times were different than what is recommended based on the speeds and intersection geometry. Therefore, adjusting these timings is recommended.

A westbound right-turn lane along Glenn Avenue is also recommended due to the rear end crashes at this approach. There were also multiple angled crashes for this approach. After reviewing this section of Glenn Avenue, it was noted some access management could be applied as a safety-based improvement.

The following recommended roadway improvements have been developed for implementation at this intersection due to poor levels of service, turn lane warrants, and crash analysis:

- Adjust yellow clearance times (crash analysis)

- Install a southbound right-turn lane along Dean Road (warrants)
- Install an eastbound right-turn lane along Glenn Avenue (warrants)
- Install a westbound right-turn lane along Glenn Avenue (crash analysis)
- Install a raised median along Glenn Avenue east of Dean Road (crash analysis/operations)

It is important to note, that due to large utility poles along Dean Road and the associated cost to relocate the poles installation of the southbound right turn lane may not be feasible.

Dean Road at E. Glenn Avenue (Alternative Recommendations)

Alternate improvements have been developed for the Dean Road at E. Glenn Avenue intersection as part of the Dean Road corridor study. The improvements developed as part of the Dean Road analysis are an option that should be considered as well. The alternate improvements for Dean Road at E. Glenn Avenue are detailed in the Dean Road Corridor section of this report.

Airport Road at E. Glenn Avenue

The following recommended roadway improvements have been developed for implementation at this intersection due to right-turn lane warrants:

- Install a westbound right-turn lane along Glenn Avenue

Bent Creek Road at E. Glenn Avenue

Recommended improvements have been developed for implementation along Bent Creek Road as summarized in the following:

- Modify eastbound E. Glenn Avenue to lessen the radius of the right-turn lane onto Bent Creek Road and install a “Yield” sign to address weaving and turbulence that occurs between the free-flow right-turn movement and conflicting vehicles attempting to turn right into Auburn Exchange.
- Modify the striping for the southbound right-turn lane from Mike Hubbard Boulevard to provide channelization and “Yield” sign control.
- Extend the left-turn lane storage on northbound Bent Creek Road.

Figures 4-6 illustrate the existing conditions improvements for the Glenn Avenue corridor at Ross Street, Dean Road and Airport Road.

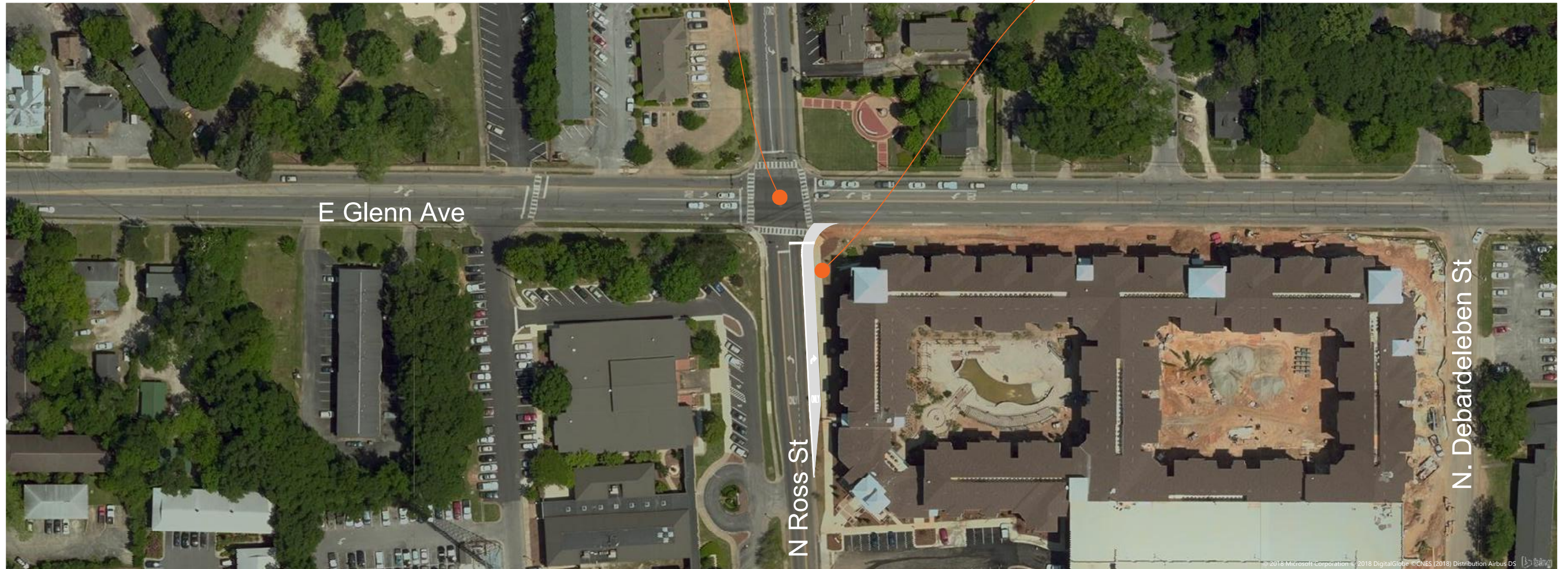
Existing Intersection Capacity Analysis with Improvements

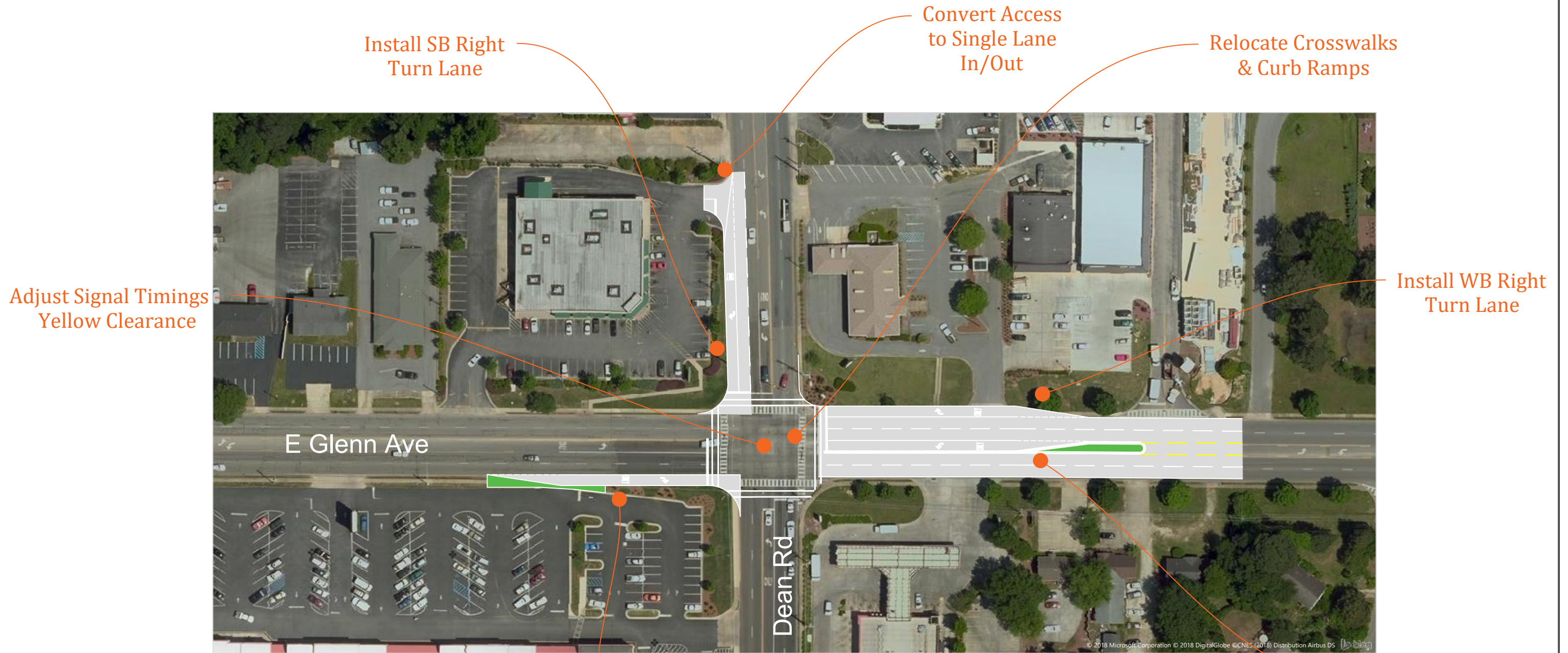
Capacity analyses for peak hour conditions at the study intersections along the Glenn Avenue Corridor were conducted assuming improvements for existing conditions would be in place. Capacity analyses were conducted using methods outlined in the *Highway Capacity Manual, 2010*. Results of these capacity analyses are summarized in **Figure 7**.

As shown in **Figure 7**, most of the study intersections would operate at acceptable levels of service for both peak periods evaluated assuming the recommended roadway improvements would be in place. However, most of the side street approaches at the un-signalized study intersections would operate with poor levels of service. This is expected due the high volumes along Glenn Avenue, which make finding acceptable gaps in traffic very difficult during the peak hours.

Adjust Signal Timings - Create
Max 2 plan for PM Peak;
Increase Cycle Length

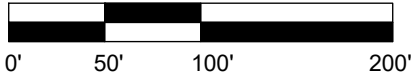
Install NB Right
Turn Lane





Detail "A" - Glenn Ave Cross Section

	11'	↶
←	12'	
←	12'	
	11'	↷
2' Curb		
→	12'	
→	12'	



**Figure 5 - Existing Conditions Improvements
Glenn Avenue Corridor - Dean Road
Auburn, Alabama**

LEGEND

Scale: 1:100
Date: Oct 2018



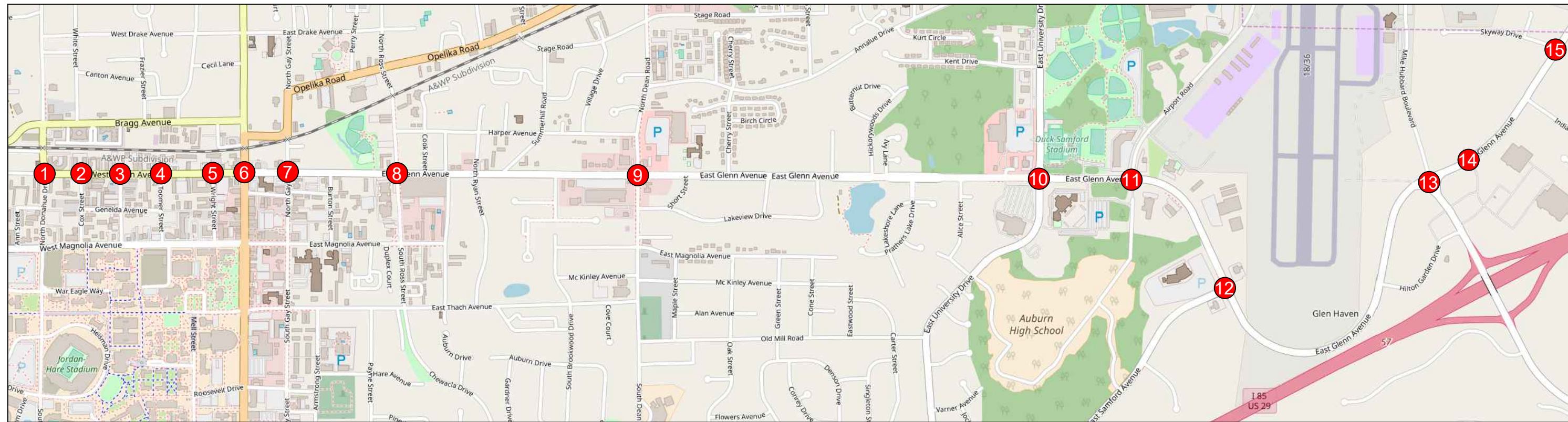
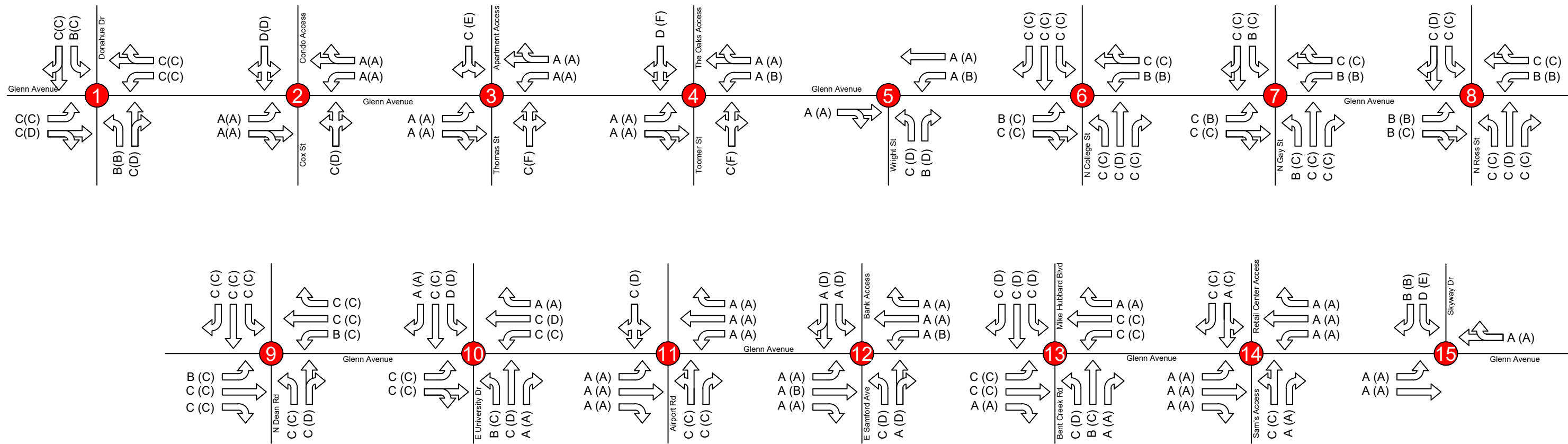
Install WB Right Turn Lane;
Close Existing Access



**Figure 6 - Existing Conditions Improvements
Glenn Avenue Corridor - Airport Road
Auburn, Alabama**

LEGEND

Scale: 1:50
Date: Oct 2018



**Figure 7 - Existing Intersection LOS w/Improvements
Glenn Avenue Corridor
Auburn, Alabama**

LEGEND

- ← AM(PM) Peak Hour Level of Service
- ⊗ Study Intersection

Existing 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 hour periods using methods outlined in the *Highway Capacity Manual, 2010*. Levels of service for the arterial analyses conducted for Glenn Avenue are summarized in **Table 6**.

Table 6 - Existing Arterial Segment Levels of Service w/Improvements

Glenn Avenue Arterial Analysis						
From	To	Segment Length (miles)	Eastbound Segment Level of Service		Westbound Segment Level of Service	
			AM Peak	PM Peak	AM Peak	PM Peak
Donahue Drive	N College Street	0.50	D	E	C	D
N College Street	N Gay Street	0.11	F	F	F	F
N Gay Street	N Ross Street	0.27	E	E	D	E
N Ross Street	N Dean Road	0.60	C	C	C	D
N Dean Road	E University Drive	1.01	B	B	B	B
E University Drive	Airport Road	0.24	B	C	E	E
Airport Road	E Samford Avenue	0.39	C	C	A	B
E Samford Avenue	Bent Creek Road	0.86	B	B	A	A
Bent Creek Road	Sam's Access	0.11	C	E	E	E

As indicated in **Table 6**, several of the study segments would continue to operate with poor levels of service. The only noted improvement in level of service was the segment between Ross Street and Dean Road during the afternoon peak period (LOS D to LOS C). The main issue for the Glenn Avenue corridor is capacity. As volumes increase along the corridor, the need for additional through lanes will need to be evaluated.

PROJECTED TRAFFIC GROWTH

Growth rates were calculated for the study roadways based on historical traffic volumes and growth trends. The Glenn Avenue corridor stretches across multiple areas with different expected growth rates. The historical growth rate calculated for Glenn Avenue between Donahue Dr and Ross St was 3.2% per year. The historical growth rate calculated for Glenn Avenue between Dean Road and Skyway Drive was 2.6% per year. The annual growth rate was applied for a ten (10) year period to result in an

overall growth rates of 32% and 26% percent for study area traffic volumes. Existing peak hour traffic volumes were increased 32% and 26%, respectively, to reflect 10 (10) year projected traffic volumes for the Glenn Avenue corridor.

Analyses were conducted utilizing projected peak hour traffic volumes for the study area roadways and intersection to assess traffic operations within the corridor. Capacity deficiencies were identified for projected conditions to aid in development of potential roadway and traffic control improvements within the corridor to address capacity and traffic operations. **Figure 8** illustrates the existing traffic volumes with the growth rate factors detailed above applied (referred to as future volumes).

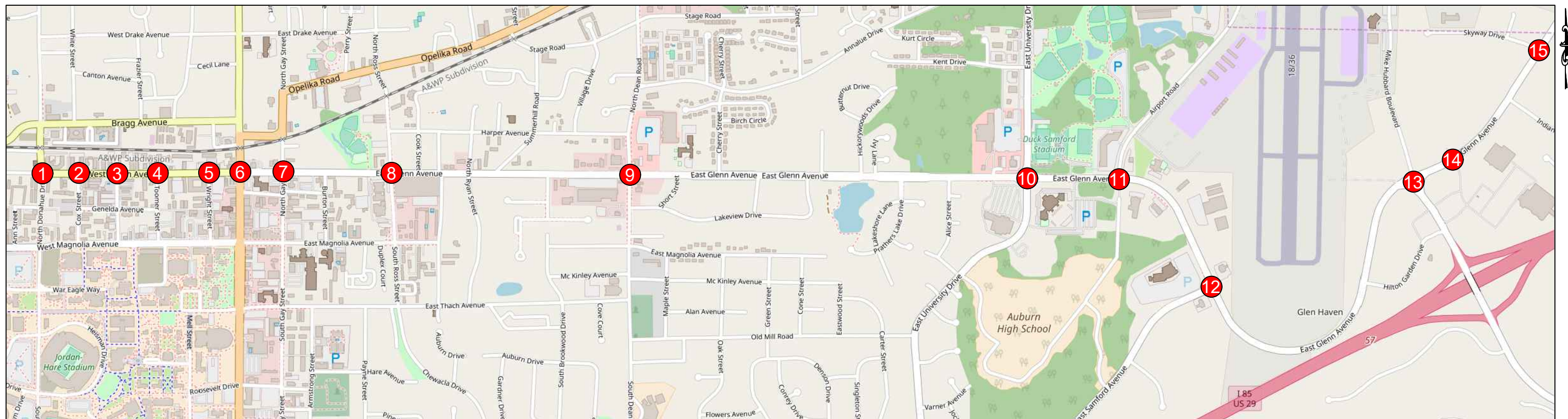
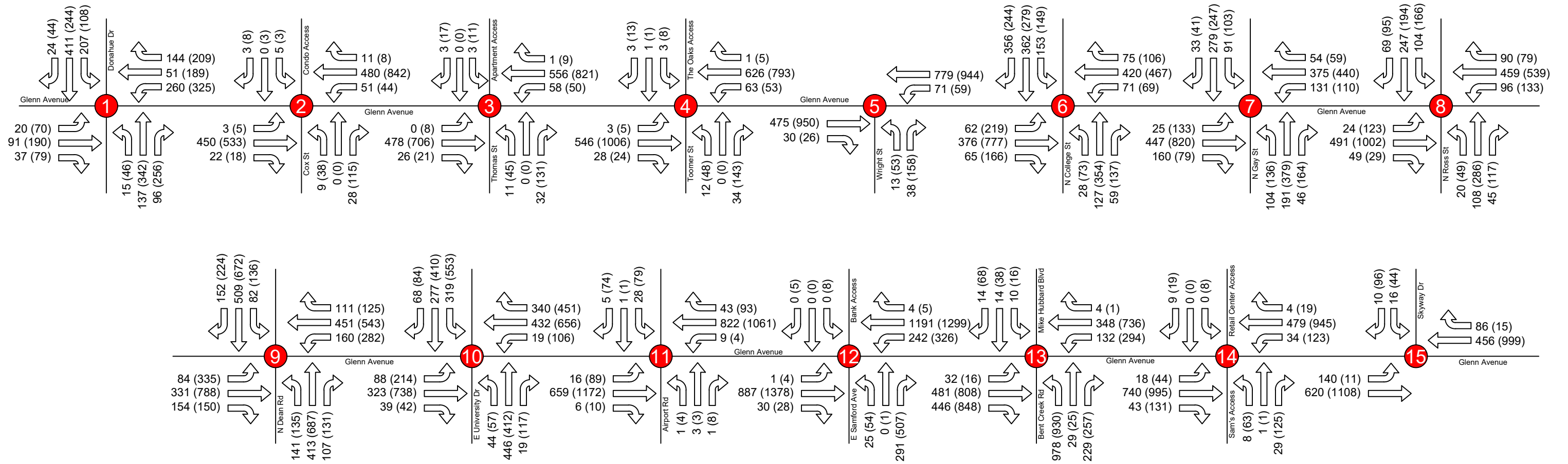
ANALYSES WITH PROJECTED TRAFFIC GROWTH

Analyses conducted for this scenario assumes projected traffic volumes for ten (10) years would be in place and the improvements recommended for existing conditions (previously introduced and illustrated in **Figures 4-6**) would also be in place.

Intersection Capacity Analysis with Projected Traffic Growth

Capacity analyses for projected ten (10) year peak hour conditions were conducted for the study intersections along the Glenn Avenue Corridor using methods outlined in the *Highway Capacity Manual, 2010*. Results of these capacity analyses are summarized in **Figure 9**.

As shown in **Figure 9**, most of the study intersections would experience movements with poor levels of service under expected future conditions. This is due to the increase in overall traffic volumes and inadequate lane geometrics at the intersections.



**Figure 8 - Future Traffic Volumes
Glenn Avenue Corridor
Auburn, Alabama**

LEGEND

- ← AM(PM) Peak Hour Volumes
- ⊗ Study Intersection

Scale: Not to Scale
Date: OCT 2018

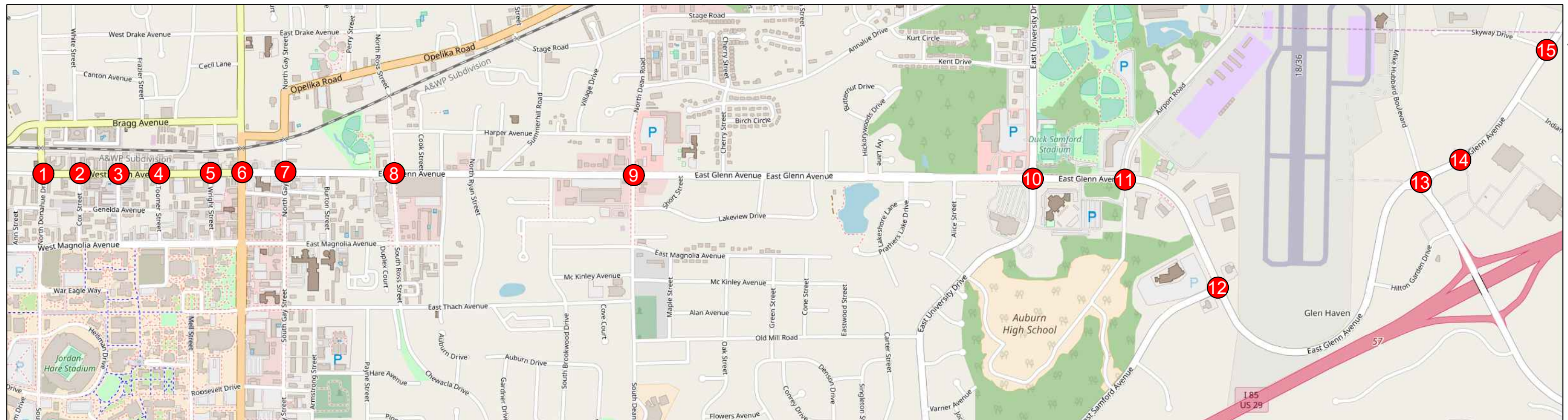
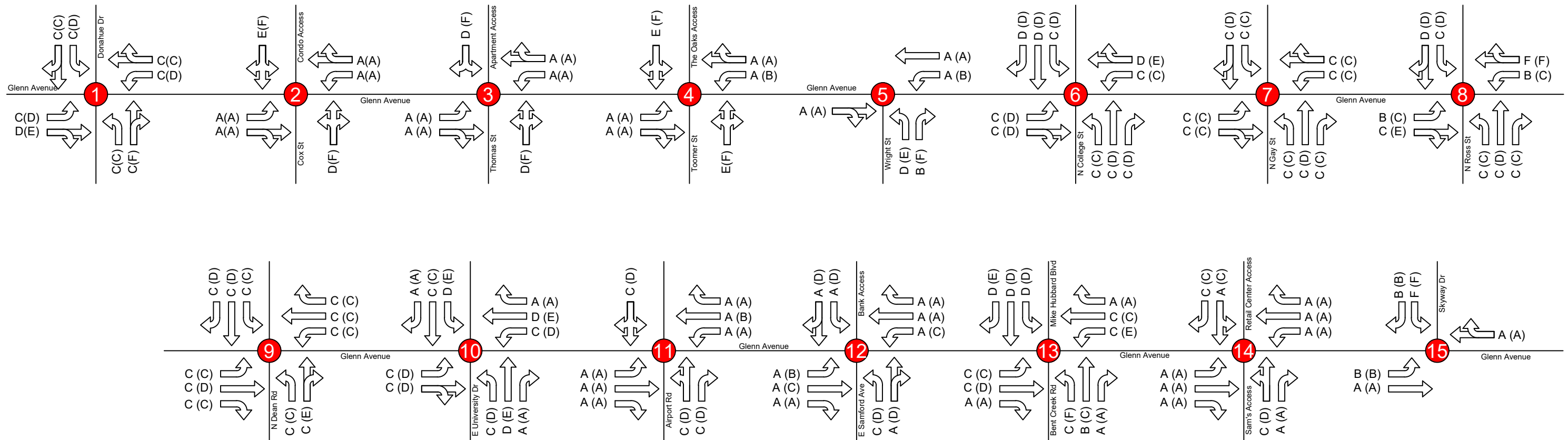


Figure 9 - Intersection LOS - with Existing Improvements and Growth - Glenn Avenue Corridor Auburn, Alabama

LEGEND

- ← AM(PM) Peak Hour Level of Service
- ⓧ Study Intersection

Scale: Not to Scale
Date: OCT 2018

Arterial Segment Capacity Analysis with Projected Traffic Growth

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, 2010*. Levels of service for the arterial analyses conducted for Glenn Avenue are summarized in **Table 7**.

Table 7 - Arterial Segment Levels of Service w/Projected Traffic Growth

Glenn Avenue Arterial Analysis						
From	To	Segment Length (miles)	Eastbound Segment Level of Service		Westbound Segment Level of Service	
			AM Peak	PM Peak	AM Peak	PM Peak
Donahue Drive	N College Street	0.50	D	E	C	E
N College Street	N Gay Street	0.11	F	F	F	F
N Gay Street	N Ross Street	0.27	E	F	E	E
N Ross Street	N Dean Road	0.60	C	D	D	E
N Dean Road	E University Drive	1.01	B	C	B	B
E University Drive	Airport Road	0.24	B	C	E	F
Airport Road	E Samford Avenue	0.39	C	D	A	B
E Samford Avenue	Bent Creek Road	0.86	B	B	A	A
Bent Creek Road	Sam's Access	0.11	D	E	E	E

As indicated in **Table 7**, most of the study segments would continue to operate with poor levels of service. The study segments that noted a decrease in levels of service are highlighted in red. As noted previously, additional through lanes will need to be considered along Glenn Avenue.

Right-Turn Lane Warrant Evaluations with Projected Traffic Growth

Projected peak hour traffic volumes were compared with the turn lane warrant criteria outlined in the National Cooperative Highway Research Program (NCHRP) Report 457 *Evaluating Intersection Improvements: An Engineering Study Guide*, published by the Transportation Research Board. As with existing conditions, the posted speed limit was utilized for roadways. Evaluation results are listed in **Table 8**.

Table 8 – Future Conditions Right Turn Lane Warrant Evaluation

Intersection	Approach	Peak Hour Evaluated	Turn Lane Warranted
Donahue Dr at Glenn Ave	EB Glenn Ave	PM	No
	WB Glenn Ave	PM	Yes
	NB Donahue Dr	PM	No
	SB Donahue Dr	PM	No
N College St at Glenn Ave	EB Glenn Ave	PM	Yes
	WB Glenn Ave	PM	No
Gay St at Glenn Ave	EB Glenn Ave	PM	No
	WB Glenn Ave	PM	No
	SB Gay St	PM	No
N Ross St at Glenn Ave	EB Glenn Ave	PM	No
	WB Glenn Ave	PM	No
	NB Ross St	PM	No
	SB Ross St	PM	No
Dean Rd at Glenn Ave	EB Glenn Ave	PM	Yes
	WB Glenn Ave	PM	Yes
	NB Dean Rd	PM	Yes
	SB Dean Rd	PM	Yes
E University Dr at Glenn Ave	EB Glenn Ave	PM	Yes
Airport Rd at Glenn Ave	WB Glenn Ave	PM	Yes
Skyway Dr at Glenn Ave	WB Glenn Ave	PM	No

As indicated in **Table 8**, the following approaches warrant a right turn lane under future conditions: westbound Glenn Avenue at Donahue Drive, eastbound Glenn Avenue at College Street, westbound Glenn Avenue at Dean Road, northbound Dean Road at Glenn Avenue, eastbound Glenn Avenue at E University Drive, eastbound Glenn Avenue at Dean Road, southbound Dean Road at Glenn Avenue, and westbound Glenn Avenue at Airport Road.

RECOMMENDED IMPROVEMENTS WITH PROJECTED TRAFFIC GROWTH

Based upon the analyses and evaluations conducted for the Glenn Avenue Corridor for existing conditions and projected ten (10) year conditions, recommendations are made to help improve traffic operations along the corridor at study intersections and to address any capacity or safety deficiencies identified. These improvements are in addition to the improvements recommended for existing conditions. The following paragraphs detail the additional recommended improvements for the study corridor.

Donahue Drive at E. Glenn Avenue

The following recommended roadway improvements have been developed for implementation at this intersection due to poor levels of service and turn lane warrants:

- Install a northbound right-turn lane along Donahue Drive (capacity)
- Install a westbound right-turn lane along Glenn Avenue (warrants)

N College Street at E. Glenn Avenue

The following recommended roadway improvements have been developed for implementation at this intersection due to poor levels of service:

- Install a westbound right-turn lane along Glenn Avenue (capacity)

It is important to note that an eastbound right-turn lane on Glenn Avenue was warranted at this intersection for future conditions. However, it was determined that construction of a right turn lane would not be constructible due to the close proximity of an adjacent building structure.

N Ross Street at E. Glenn Avenue

The following recommended roadway improvements have been developed for implementation at this intersection due to poor levels of service:

- Install a southbound right-turn lane along Ross Street (capacity)
- Install a westbound right-turn lane along Glenn Avenue (capacity)
- Adjust signal timings to include a max 2 setting for the afternoon peak period (capacity)

Dean Road at E. Glenn Avenue

The following recommended roadway improvements have been developed for implementation at this intersection due to poor levels of service and turn lane warrants:

- Install a northbound right-turn lane along Dean Road (capacity/warrants)

It is important to note, that due to large utility poles along Dean Road and the associated cost to relocate the poles installation of the northbound right turn lane may not be feasible.

Dean Road at E. Glenn Avenue (Alternative Recommendations)

Alternate improvements have been developed for the Dean Road at E. Glenn Avenue intersection as part of the Dean Road corridor study. The improvements developed as part of the Dean Road analysis are an option that should be considered as well. The alternate improvements for Dean Road at E. Glenn Avenue are detailed in the Dean Road Corridor section of this report.

E University Drive at E. Glenn Avenue

The following recommended roadway improvements have been developed for implementation at this intersection due to poor levels of service and turn lane warrants:

- Adjust signal timings to include a max 2 setting for the afternoon peak period (capacity)
- Install an additional northbound through lane along University Drive (capacity)
- Install an additional through receiving lane along University Drive (capacity)
- Install an eastbound right-turn lane along Glenn Avenue (capacity/warrants)

Bent Creek Road at E. Glenn Avenue

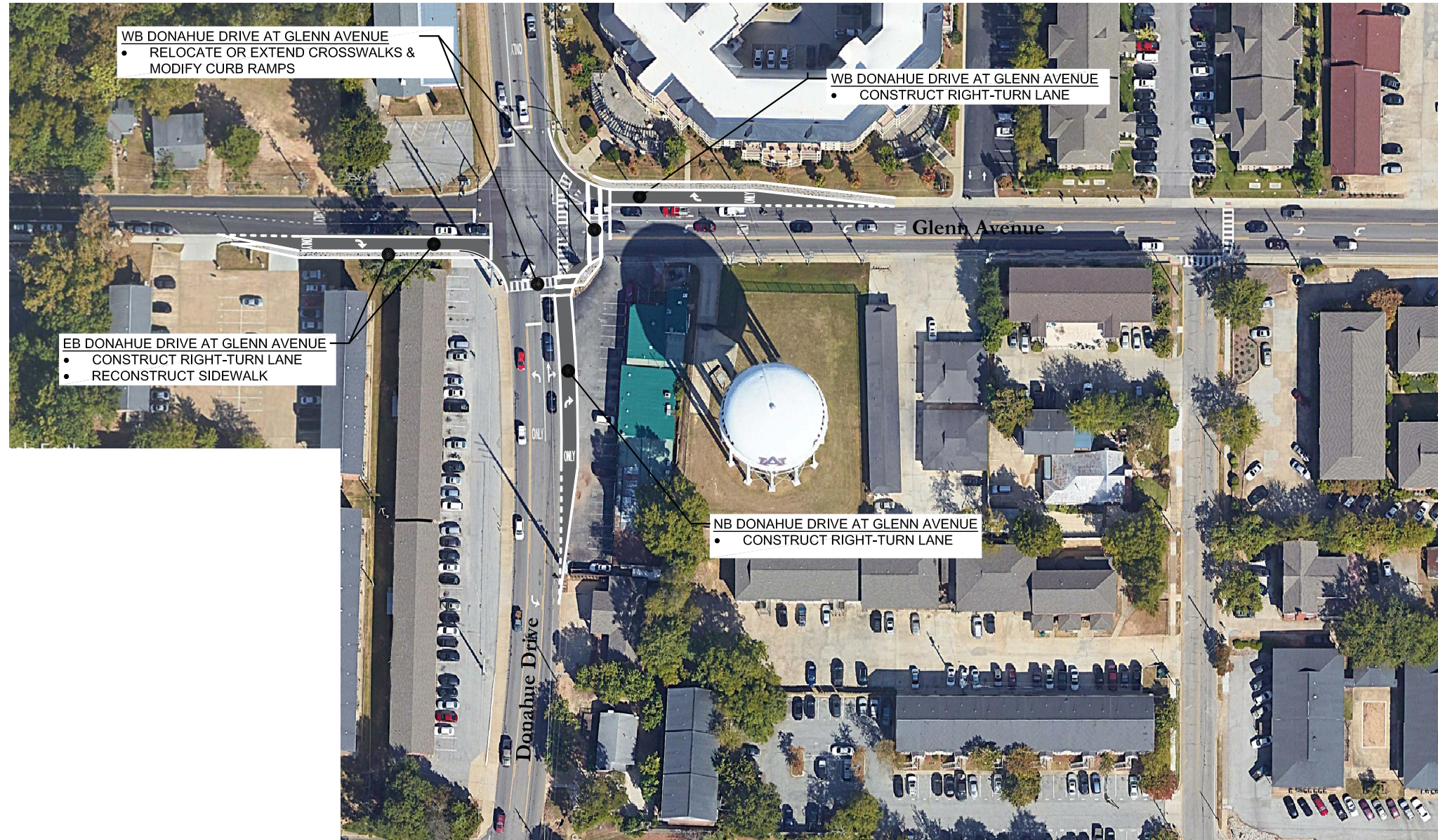
The following recommended roadway improvements have been developed for implementation at this intersection due to poor levels of service and turn lane warrants:

- Restripe westbound E. Glenn Avenue to provide space for offset left-turn lanes.
- Widen the departure of westbound E. Glenn Avenue to accommodate required lane shifts for the offset left-turn lanes on E. Glenn Avenue.
- Widening E. Glenn Avenue to provide offset left-turn lanes has been recommended to help address safety concerns for the movement.

Donahue Drive to N College Street Segment

It is important to note that as redevelopment occurs along this corridor, access points should be limited to help facilitate traffic flows along Glenn Avenue.

Figures 10-14 illustrate the additional improvements for the Glenn Avenue corridor at Donahue Drive, N College Street, Ross Street, Dean Road, and E University Drive. (See the Bent Creek Road corridor section of this report for existing and future improvement drawings).



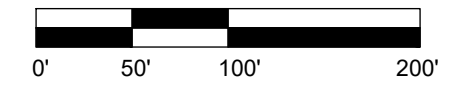
Adjust Signal Timings - Update
Max 2 plan for PM Peak

Relocate Crosswalk &
Curb Ramps

Install WB Right
Turn Lane



(Existing Conditions - Install
NB Right Turn Lane)



**Figure 11 - Future Conditions Improvements
Glenn Avenue Corridor - N Ross Street
Auburn, Alabama**

LEGEND

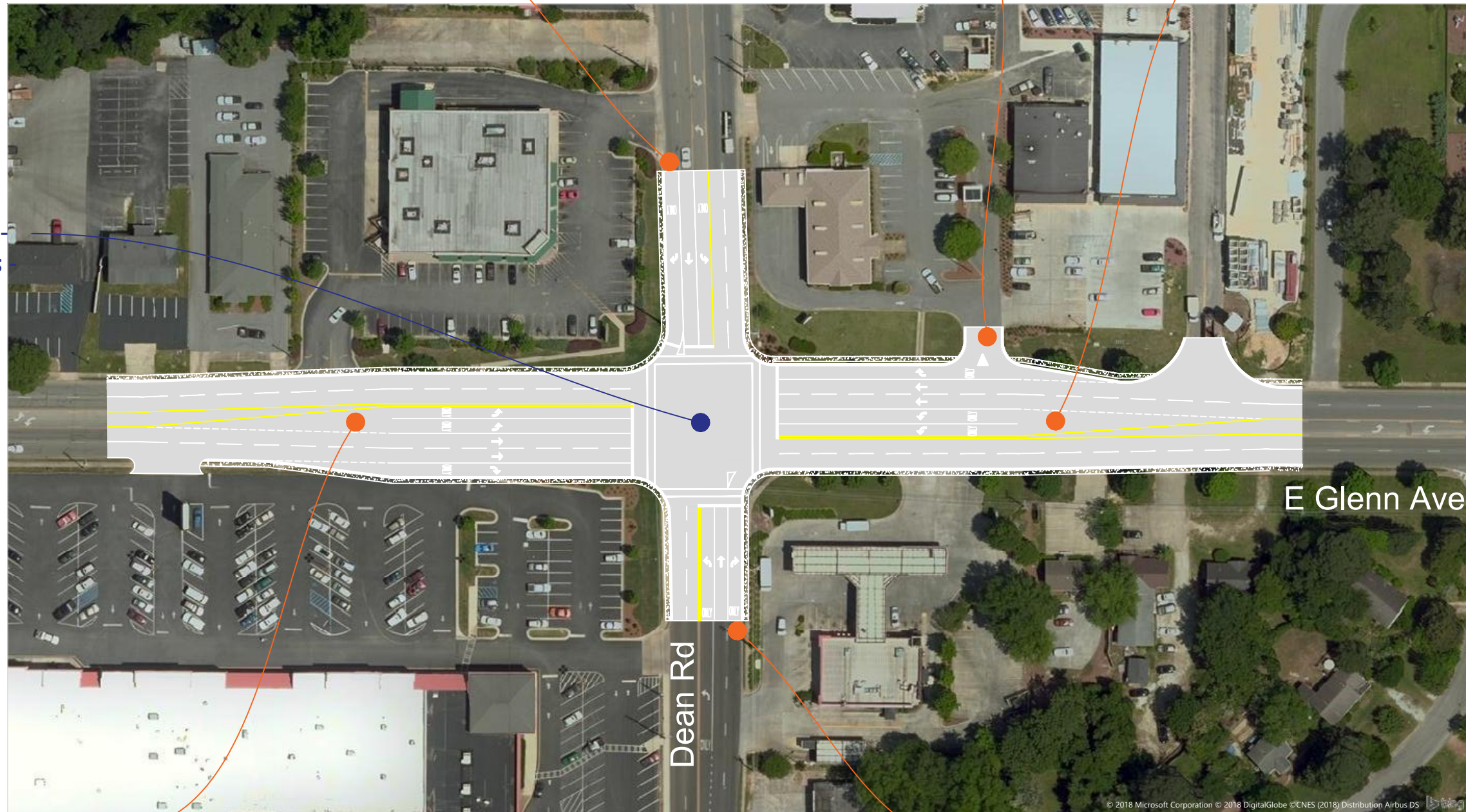
Scale: 1:100
Date: Oct 2018

Outside Lane Drops to Right Turn Lane Only

Convert to Right-in/Right-Out)

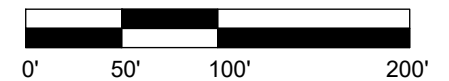
Widen Approach to Include 2 Left Turn Lanes, 2 Thru Lanes & 1 Right Turn Lane

(Existing Conditions - Adjust Signal Timings Yellow Clearance)



Widen Approach to Include 2 Left Turn Lanes, 2 Thru Lanes & 1 Right Turn Lane

Outside Lane Drops to Right Turn Lane Only





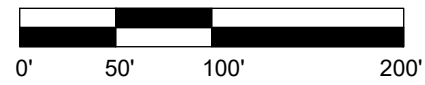
Adjust Signal Timings -
Max 2 plan for PM Peak

Install EB Right Turn Lane

Re-construct to include 2 NB
Through Receiving Lanes

- Relocate Crosswalks &
Curb Ramps

Re-construct to include
2 NB Through Lanes



**Figure 13 - Future Conditions Improvements
Glenn Avenue Corridor - E University Drive
Auburn, Alabama**

LEGEND

Scale: 1:100
Date: Oct 2018



**Figure 14 - Future Conditions Improvements
 Glenn Avenue Corridor - N College Street
 Auburn, Alabama**

LEGEND

Scale: 1:50
 Date: Oct 2018



ANALYSES W/RECOMMENDED IMPROVEMENTS & PROJECTED TRAFFIC GROWTH

Intersection Capacity Analysis with Improvements and Projected Traffic Growth

Capacity analyses were conducted for the study intersections assuming recommended improvements (outlined above) and projected ten (10) traffic volumes would be in place. Capacity analyses were conducted using methods of the *Highway Capacity Manual*, as previously introduced. **Figure 15** illustrates the levels of service for study intersections with recommended improvements and projected ten (10) traffic volumes in place.

As shown in **Figure 15**, most of the study intersections would operate at acceptable levels of service for both peak periods evaluated assuming the recommended roadway improvements would be in place. However, most of the side street approaches at the un-signalized study intersections would operate with poor levels of service. This is expected due the high volumes along Glenn Avenue, which make finding acceptable gaps in traffic very difficult during the peak hours. Also, the Bent Creek Road and Mike Hubbard Boulevard approaches to Glenn Avenue would experience poor levels of service due to the high left turn volumes (Bent Creek Road) and right turn volumes (Mike Hubbard Blvd).

Arterial Segment Capacity Analysis with Recommended Improvements (Future Conditions)

Arterial segment capacity analyses for peak hour conditions along the Glenn Avenue Corridor were conducted assuming the recommended improvements, outlined above, and projected traffic growth would be in place along Glenn Avenue. These capacity analyses were conducted using methods outlined in the *Highway Capacity Manual*, as previously introduced. Levels of service for the arterial analyses conducted for Glenn Avenue are summarized in **Table 9**.

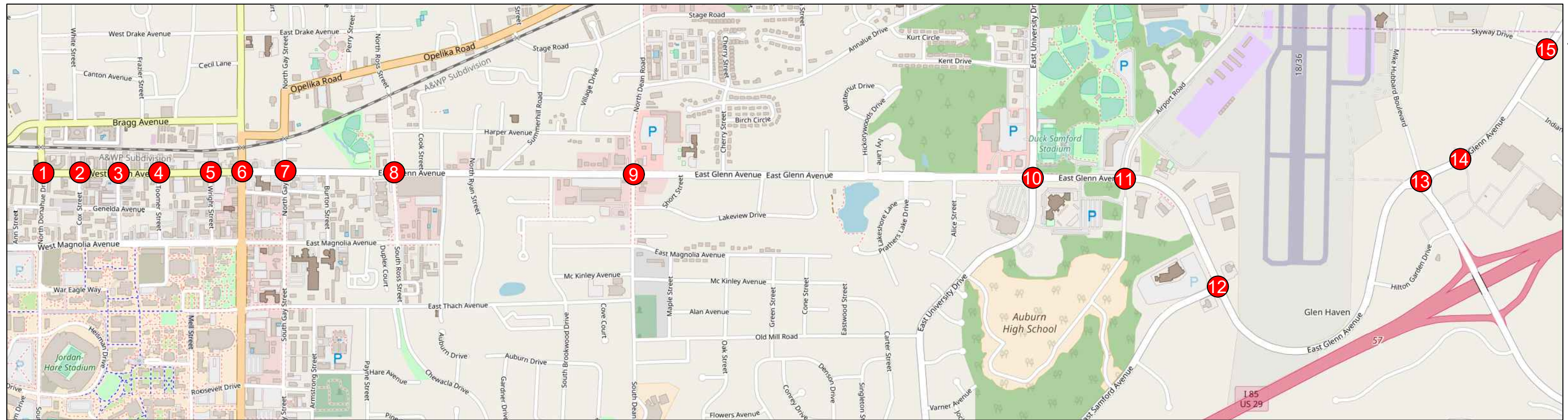
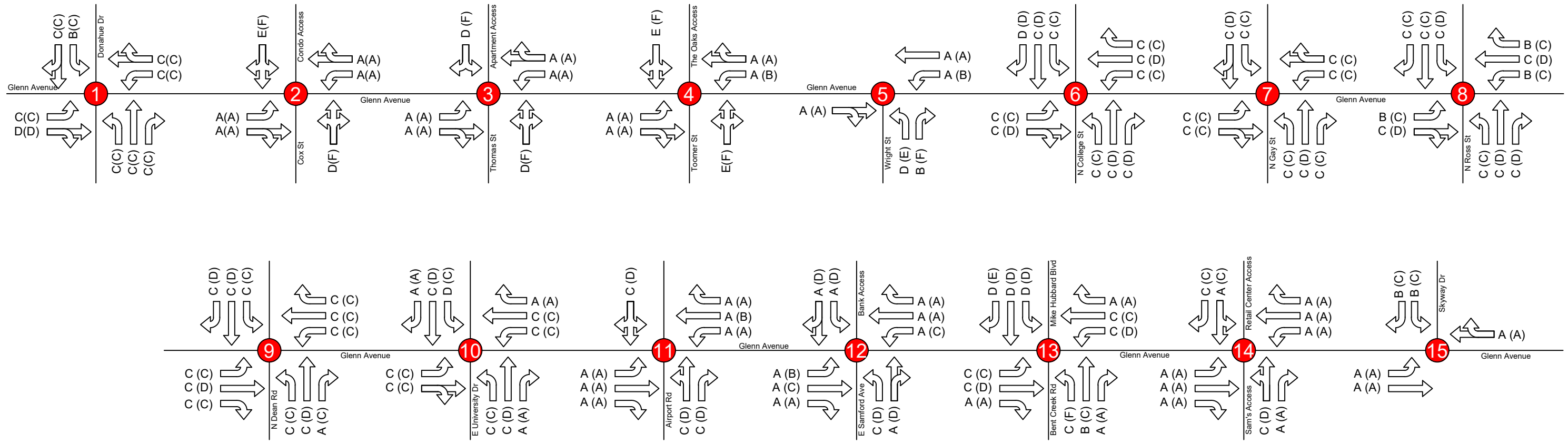
Table 9 - Arterial Segment LOS with Improvements and Projected Traffic

Glenn Avenue Arterial Analysis						
From	To	Segment Length (miles)	Eastbound Segment Level of Service		Westbound Segment Level of Service	
			AM Peak	PM Peak	AM Peak	PM Peak
Donahue Drive	N College Street	0.50	D	E	D	D
N College Street	N Gay Street	0.11	F	F	F	F
N Gay Street	N Ross Street	0.27	E	F	E	E
N Ross Street	N Dean Road	0.60	C	D	C	D
N Dean Road	E University Drive	1.01	B	B	B	B
E University Drive	Airport Road	0.24	B	C	E	E
Airport Road	E Samford Avenue	0.39	C	D	A	B
E Samford Avenue	Bent Creek Road	0.86	B	B	A	A
Bent Creek Road	Sam's Access	0.11	D	E	E	E

As indicated in **Table 9**, several of the study segments would continue to operate with poor levels of service. The noted improvements in level of service are highlighted in red. One exception was noted, the morning peak hour westbound segment of Donahue Drive to College Street saw an increase in level of service (LOS C to D). As previously stated, the main issue for the Glenn Avenue corridor is capacity. As volumes increase to the 10 year growth projections along the corridor, the need for additional through lanes will need to be considered.

Alternate Improvements for Bent Creek Road at E. Glenn Avenue

Alternate improvements have been developed for the Bent Creek Road at E. Glenn Avenue intersection. The alternate improvements were developed as an option should the westbound left-turn movement on E. Glenn Avenue need additional storage and/or crash rates increase to a point which additional measures need to be taken. As noted previously, the recommended improvements for this intersection provide additional left-turn lane storage and improve sight lines with the offset left-turn lanes on E. Glenn Avenue to help improve safety of the permissive left-turn movements. Should traffic patterns change or traffic growth exceed projections, the alternate improvements provides an option to address these potential issues for the westbound left-turn movement on E. Glenn Avenue. The alternate improvements for Bent Creek Road at E. Glenn Avenue are detailed in the Bent Creek Corridor section of this report.



**Figure 15 - Future Intersection LOS with Improvements
Glenn Avenue Corridor
Auburn, Alabama**

LEGEND

- ← AM(PM) Peak Hour Level of Service
- ⊗ Study Intersection

Scale: Not to Scale
Date: OCT 2018