

Interchange Justification Study Update

Interstate 459 at South Shades Crest Road

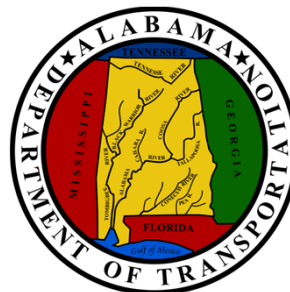
Hoover, Alabama

Prepared for:

The City of Hoover



Alabama Department
of Transportation



Revision 1; September, 2022

Interchange Justification Study

Interstate 459 at South Shades Crest Road

Hoover, Alabama

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Revision 1; September, 2022



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INTRODUCTION

This report documents an update to a study (originally completed in March, 2010) to develop improvements to the Interstate and surface roadway system for a proposed interchange on Interstate 459 in the vicinity of South Shades Crest Road which would result in acceptable traffic operations for current year and future year 2045 conditions. The location of the proposed interchange on Interstate 459 is in the vicinity of South Shades Crest Road located in the City of Hoover in Jefferson County, Alabama. The improvements contemplated which are addressed in this study include the following alternatives: Alternative 1) construction of a DDI (Diverging Diamond) interchange on Interstate 459 at an extension of Ross Bridge Parkway, or Alternative 2) construction of a Tight Diamond interchange on Interstate 459 at an extension of Ross Bridge Parkway. This report is presented in a manner to comply with the requirements of interchange justification studies of the Federal Highway Administration and Alabama Department of Transportation, including evaluation of multiple alternative improvement concepts to determine their benefits and impacts. Included in the analysis is an examination of the traffic operational impacts of the proposed construction of the new the interchange on Interstate 459.

The proposed improvements are intended to meet three primary objectives: 1) alleviate regularly-occurring congestion at the interchange of Alabama Highway 150 at Interstate 459; 2) alleviate existing traffic congestion at the intersection of South Shades Crest Road at Alabama Highway 150; and 3) address projected roadway capacity deficiencies for future year 2045 conditions.

Sources of information used in this study effort include the City of Hoover, Alabama, the Alabama Department of Transportation, the Federal Highway Administration, the Regional Planning Commission of Greater Birmingham, Traffic Data, L.L.C., the Transportation Research

Board, Neel-Schaffer, Inc. and office files and field reconnaissance efforts of Skipper Consulting, Inc.

Purpose and Need for Project

The primary purpose of the proposed project is to provide an alternative route that will improve mobility in the southwest sector of the City of Hoover by providing improved regional access for traffic on South Shades Crest Road and Alabama Highway 150 to the regional Interstate roadway system. A secondary benefit of this improved regional access will be an alleviation of congestion at the interchanges of Interstate 459 with Alabama Highway 150 and Morgan Road (County Road 52).

Study Area Description

In order to meet Federal Highway Administration requirements, a study area encompassing the nearest interchanges on Interstate 459 to the north and south of the proposed South Shades Crest Road interchange, plus major connector roadways, was established. The study area extends along Interstate 459 from south of the Morgan Road (County Highway 52) interchange to north of the Alabama Highway 150 interchange. The distance from the existing interchange at Interstate 459 and Morgan Road (County Highway 52) to the existing interchange at Interstate 459 and Alabama Highway 150 is approximately 22,700 feet (4.3 miles), measured along the centerline of the Interstate from the center of the overpass to the center of the overpass. The distance from the interchange at Interstate 459 and Alabama Highway 150 to the proposed interchange at Interstate 459 at South Shades Crest Road is approximately 8,800 (1.67 miles).

The following roadways are also included in the study area:

- Morgan Road (Jefferson County Road 52), from north of the Interstate 459 interchange to south of Parkwood Road;
- South Shades Crest Road, from the CSXT railroad bridge and tunnel to Alabama Highway 150;
- Shades Crest Road, immediately north of Alabama Highway 150;
- Ross Bridge Parkway, immediately north of Alabama Highway 150;
- Alabama Highway 150, from Stadium Trace Parkway to Parkwood Road;
- Stadium Trace Parkway, from Alabama Highway 150 to Brock's Gap Parkway; and
- Brock's Gap Parkway, from South Shades Crest Road to Stadium Trace Parkway.

A map of the major roadways within the study area and other significant geographic features of the study area are shown in Figure 1. Also shown in Figure 1 are the existing study intersections which are addressed in this report.

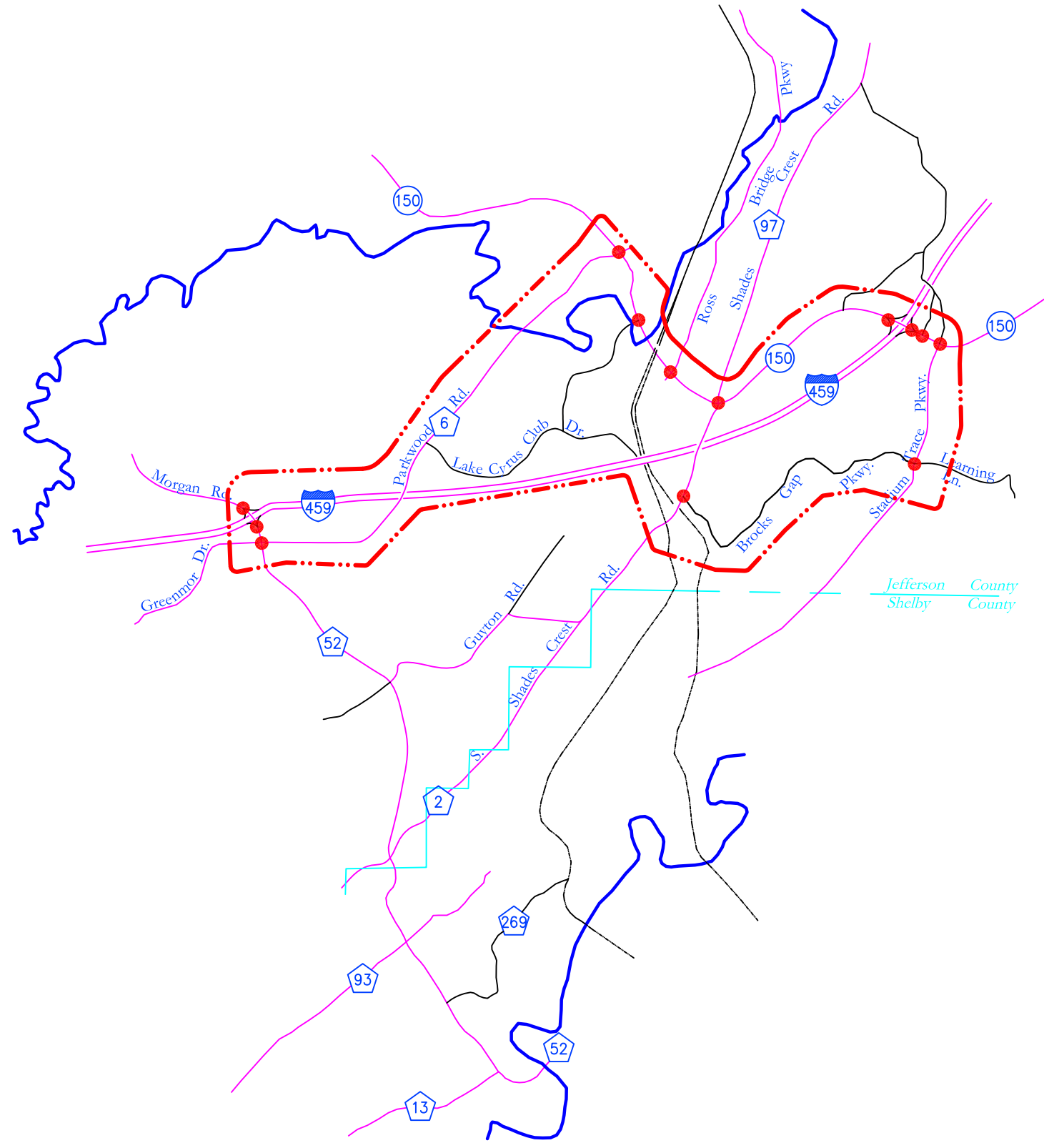
Study Methodology

A study methodology was developed which would provide a systematic means of ensuring that all requirements for the preparation of an interchange justification study were met and documented. The following paragraphs describe the work tasks that were undertaken in this study effort and documented in this study.






Existing Conditions Analysis. Analyses were performed to determine current traffic operational conditions on roadways in the study area. An inventory of the existing transportation system was performed. Traffic counts and other required data to perform analyses were collected. Analyses of current roadway conditions were performed, including intersection capacity analyses, roadway segment capacity analyses, and ramp junction capacity analyses.

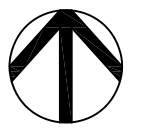
Travel Demand Forecasting. The base year 2015 and future year 2045 transportation demand model for the Birmingham study area was obtained from the Regional Planning Commission of Greater Birmingham. This included the base year 2015 roadway network, base year 2015 socioeconomic data, the future year 2045 roadway network which includes all the projects in the current regional long range transportation plan, and the future year 2045 socioeconomic data. The transportation demand model was used to forecast traffic for future year 2045 conditions on the “existing plus committed” network, which includes the existing roadway system and programmed improvements likely to be constructed by 2045. Capacity analyses were performed for future year 2045 “existing plus committed” conditions to determine the projected future year 2045 operational deficiencies on the study area roadway system.

Alternative Development and Analysis. In work sessions with the design team, the City of Hoover, and the Alabama Department of Transportation, a set of alternative improvements which could alleviate projected future year 2045 operational deficiencies on the study area roadway system were developed. Some of these alternatives have obvious flaws and were thus eliminated from further analysis. The remaining alternatives were then analyzed with the transportation demand model to develop future year 2045 traffic volumes, and capacity analyses were performed. Preliminary right-of-way requirements, and cost estimates were performed for each alternative being analyzed.



Legend

-  INTERSTATE
-  STATE ROUTE
-  COUNTY ROAD
-  STUDY AREA
-  STUDY INTERSECTION



North
Scale: n.t.s



Figure 1 - Study Area

South Shades Crest IJS - Hoover, Alabama

February 2022

EXISTING CONDITIONS ANALYSIS

This section documents an analysis performed of existing conditions of the transportation system in the study area. Elements included in this analysis are an inventory of the existing roadway network, traffic counts, and capacity analyses.

Roadway Descriptions

Interstate 459. In the vicinity of South Shades Crest Road, Interstate 459 is a six-lane median divided freeway with a posted speed limit of 70 miles per hour. Interstate 459 connects Interstate 20/59 on the west side of Jefferson County near Bessemer with Interstate 65 in Hoover, Interstate 20 near Irondale, and Interstate 59 near Trussville. Interchanges on Interstate 459 within the study



area are located at County Highway 52 (Morgan Road) and Alabama Highway 150. For the purposes of this study, Interstate 459 is considered to be a north/south roadway.

Morgan Road (County Road 52). Morgan Road (County Highway 52) is a two-lane roadway with a posted speed limit of 40 miles per hour. It connects Alabama Highway 150 in Bessemer with Interstate 65 near the Pelham/Helena area. For the purposes of this study, Morgan Road (County Highway 52) is considered to be a north/south roadway. Within



the study area, traffic signals on Morgan Road are located at the Interstate 459 Northbound and Southbound Ramps and Greenmor Drive.

Alabama Highway 150. Within the study area, Alabama Highway 150 is a five-lane roadway from Stadium Trace Parkway to Lake Cyrus Boulevard and a two-lane roadway from Lake Cyrus Boulevard to Parkwood Road. Alabama Highway 150 begins at U. S. Highway 11 in Bessemer and terminates at U. S. Highway 31 in Hoover. The posted speed limits range from 35 to 50 miles per hour. For the purposes of this study, Alabama Highway 150 is considered to be an east/west roadway. Traffic signals on Alabama Highway 150 are located at Stadium Trace Parkway, Princeton Parkway, the Interstate 459 Ramps, Lake Crest Drive, South Shades Crest Road, and Ross Bridge Parkway.



Shades Crest Road/South Shades Crest Road.

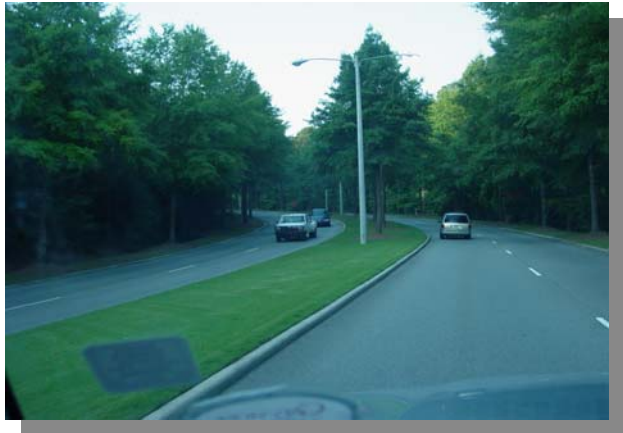
Shades Crest Road/South Shades Crest Road is a two-lane roadway with posted speed limits ranging from 20 to 45 miles per hour. South Shades Crest Road begins south of Hoover and Shades Crest Road ends near U. S. Highway 280 in Vestavia Hills. For the purposes of this study, Shades Crest Road/South Shades Crest Road is considered to be a north/south roadway. Traffic signals on Shades Crest Road/South Shades Crest Road in the study area are located at Alabama Highway 150 and Brock’s Gap Parkway.



Brock's Gap Parkway. Brock's Gap Parkway is a two-lane roadway, with a posted speed limit of 30 miles per hour. Brock's Gap Parkway runs from South Shades Crest Road to Stadium Trace Parkway. Traffic signals located on Brock's Gap Parkway are at the intersections with South Shades Crest Road and Stadium Trace Parkway. For the purposes of this study, Brock's Gap Parkway is considered to be an east/west roadway.



Stadium Trace Parkway. Within the study area, Stadium Trace Parkway is a four-lane, median-divided roadway with a posted speed limit of 35 miles per hour. Stadium Trace Parkway begins at Alabama Highway 150 and provides access to Hoover Metropolitan Stadium and the Blackridge subdivision. Traffic signals are located at Alabama Highway 150 and Brock's Gap Parkway. For the purposes of this study, Stadium Trace Parkway is considered to be a north/south roadway.



Existing Traffic Counts

In order to analyze the existing conditions of the transportation system in the study area, traffic counts were performed in the study area. The traffic counts included machine traffic counts conducted for twenty-four hours on a weekday and turning movement counts conducted at intersections during the morning and afternoon peak periods on a weekday. The following two sections of this report describe the data collection efforts and results in detail.

Machine Traffic Counts. Machine traffic counts were performed on study area roadways and interstate mainline lanes and ramps. Machine traffic count data was collected for a twenty-four hour period on weekdays between June, 2020 to June, 2021. The daily traffic count data was collected in fifteen (15) minute increments in order to determine peak hours of traffic flow. For this study, the morning and afternoon peak hours of traffic flow were analyzed. The morning peak hour is the highest hour occurring from 7:00 a.m. to 9:00 a.m., while the afternoon peak hour is the highest hour between 4:00 p.m. to 6:00 p.m. The following daily traffic counts were performed:

Interstate Mainline Counts:

- Interstate 459 south of Alabama Highway 150
- Interstate 459 north of Alabama Highway 150

Interstate Ramp Counts:

- Interstate 459 northbound on ramp from Morgan Road
- Interstate 459 northbound exit ramp onto Morgan Road
- Interstate 459 southbound on ramp from Morgan Road
- Interstate 459 southbound exit ramp onto Morgan Road
- Interstate 459 northbound on ramp from Alabama Highway 150

- Interstate 459 northbound exit ramp onto Alabama Highway 150
- Interstate 459 southbound on ramp from Alabama Highway 150
- Interstate 459 southbound exit ramp onto Alabama Highway 150

Surface Street Counts:

- Alabama Highway 150 east of Lake Cyrus Boulevard
- Alabama Highway 150 west of Interstate 459
- County Highway 52 south of Parkwood Road
- Ross Bridge Parkway north of Alabama Highway 150
- Shades Crest Road north of Alabama Highway 150
- South Shades Crest Road north of Brocks Gap Parkway
- South Shades Crest Road south of Brocks Gap Parkway
- Stadium Trace Parkway south of Alabama Highway 150
- Stadium Trace Parkway south of Brocks Gap Parkway

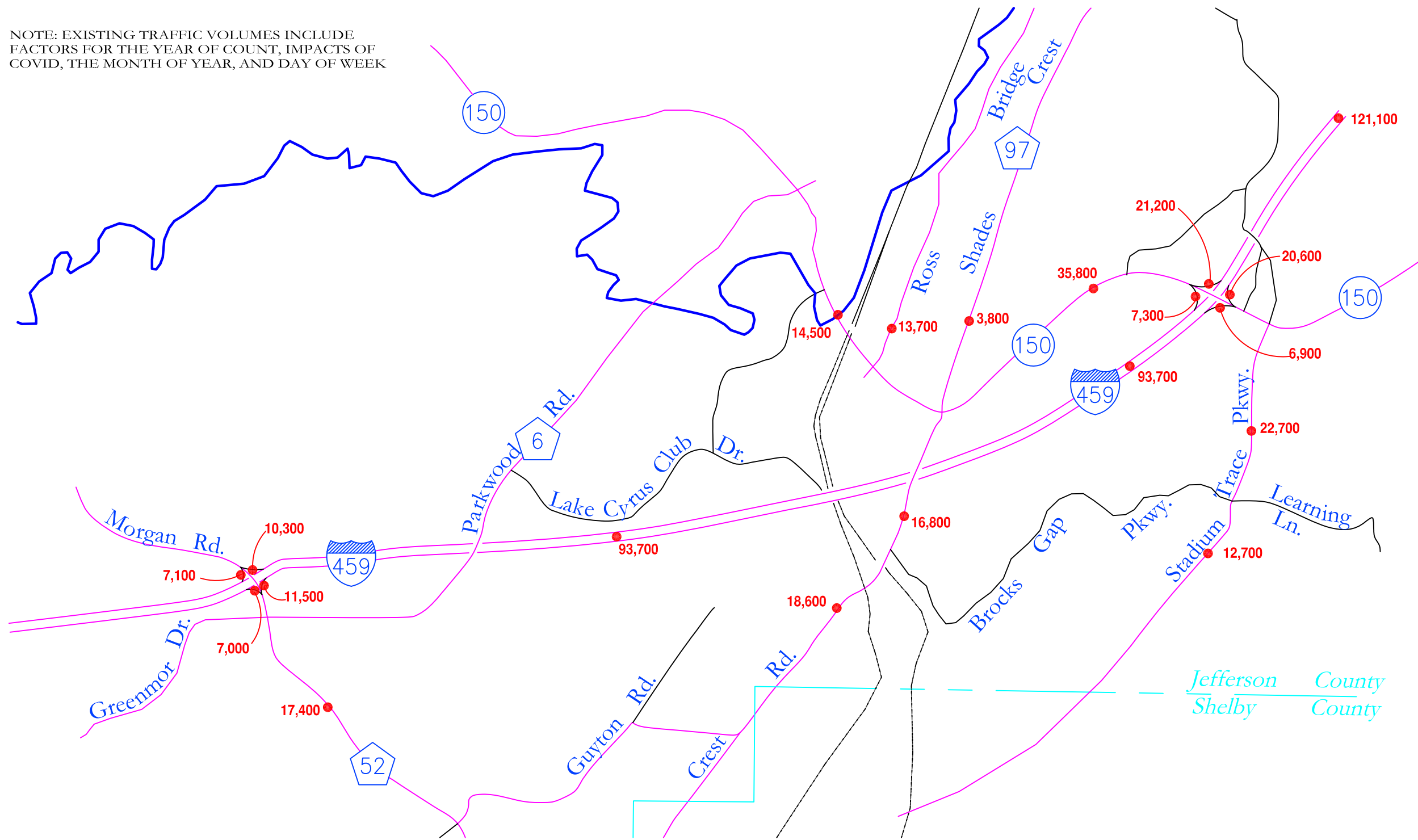
The daily machine traffic count data is shown in Figure 2. The morning and afternoon peak hour machine traffic count data is shown in Figure 3. It should be noted that the traffic volumes reported in Figures 2 and 3 reflect adjustments made for a factor for the year of the traffic count, a factor to account for effects of Covid, a monthly adjustment factor, and a daily adjustment factor in order to represent a typical weekday in 2021.

Peak Hour Intersection Turning Movement Counts. Peak period turning movement traffic count data was collected for major intersections in the study area. Turning movement traffic count data was collected from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. The intersections that were counted include the following:

- Alabama Highway 150 at Stadium Trace Parkway/Preserve Parkway
- Alabama Highway 150 at Princeton Parkway/Peridot Place
- Alabama Highway 150 at Interstate 459 northbound ramps
- Alabama Highway 150 at Interstate 459 southbound ramps
- Alabama Highway 150 at Shades Crest Road/South Shades Crest Road
- Alabama Highway 150 at Ross Bridge Parkway/Edna Road
- Alabama Highway 150 at Lake Cyrus Boulevard
- Alabama Highway 150 at Parkwood Road/Maxwell Lake Road
- Morgan Road at Parkwood Road/Greenmor Drive
- Morgan Road at Interstate 459 northbound ramps
- Morgan Road at Interstate 459 southbound ramps
- South Shades Crest Road at Brock's Gap Parkway
- Stadium Trace Parkway at Brock's Gap Parkway/Learning Lane

Turning movement traffic count data was collected on weekdays between January, 2017 and June, 2021. The turning movement traffic count data was collected in fifteen (15) minute increments in order to determine peak hours of traffic flow. For this study, the morning and afternoon peak hours of traffic flow were analyzed. The morning peak hour is the highest hour occurring from 7:00 a.m. to 9:00 a.m. The afternoon peak hour is the highest hour between 4:00 p.m. to 6:00 p.m. The morning and afternoon peak hour turning movement traffic count data is shown in Figure 4. It should be noted that the traffic volumes reported in Figure 4 reflect adjustments made for a factor for the year of the traffic count, a factor to account for effects of Covid, a monthly adjustment factor, and a daily adjustment factor in order to represent a typical weekday in 2021.

NOTE: EXISTING TRAFFIC VOLUMES INCLUDE FACTORS FOR THE YEAR OF COUNT, IMPACTS OF COVID, THE MONTH OF YEAR, AND DAY OF WEEK



- Legend**
- INTERSTATE
 - STATE ROUTE
 - COUNTY ROAD

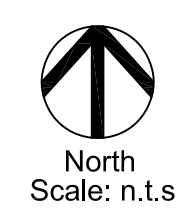
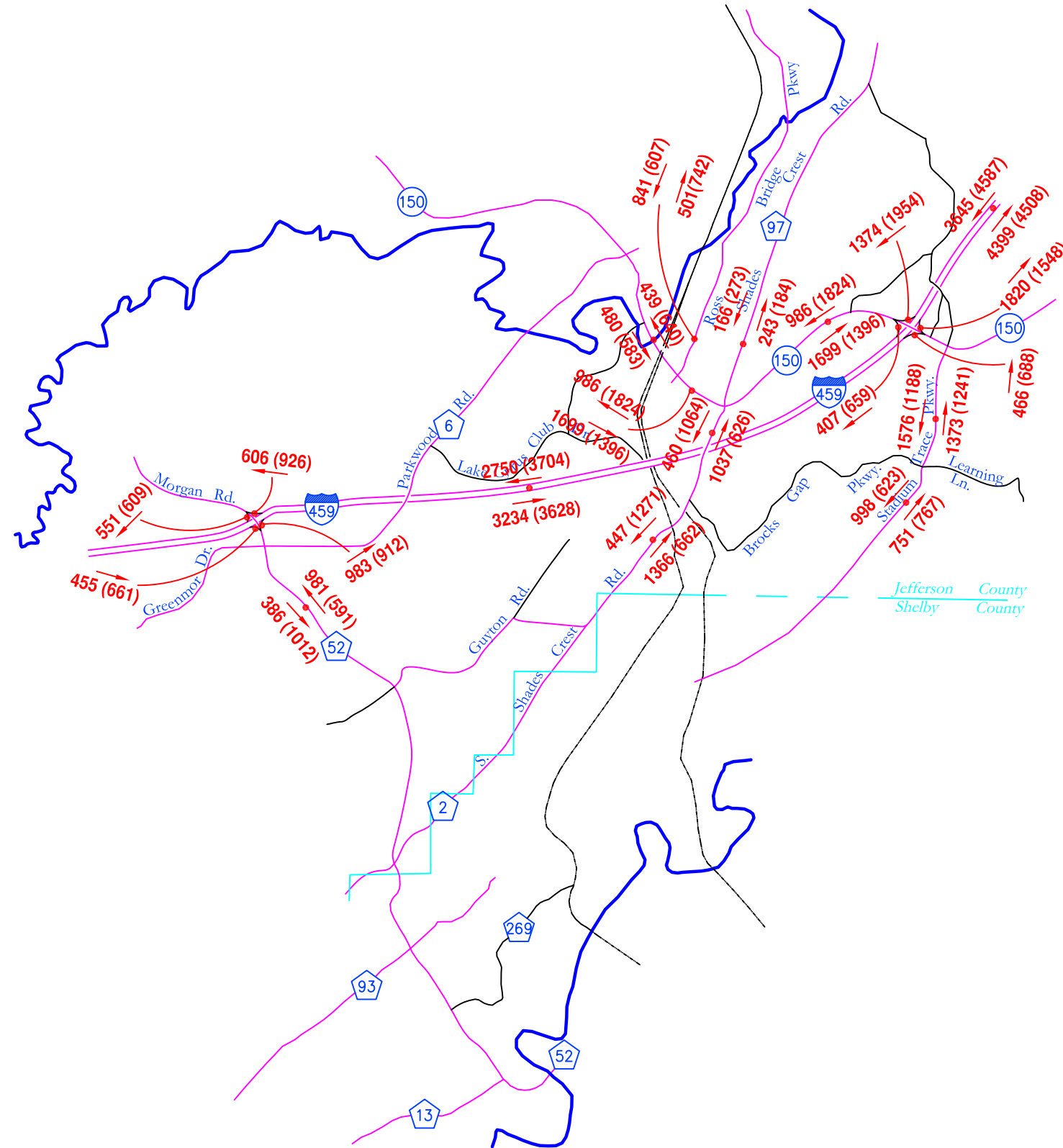


Figure 2 - Existing Daily Traffic Volumes

South Shades Crest IJS - Hoover, Alabama

February 2022

NOTE: EXISTING TRAFFIC VOLUMES INCLUDE FACTORS FOR THE YEAR OF COUNT, IMPACTS OF COVID, THE MONTH OF YEAR, AND DAY OF WEEK



- Legend**
- INTERSTATE
 - STATE ROUTE
 - COUNTY ROAD
- AM Peak (PM Peak)**



North
Scale: n.t.s

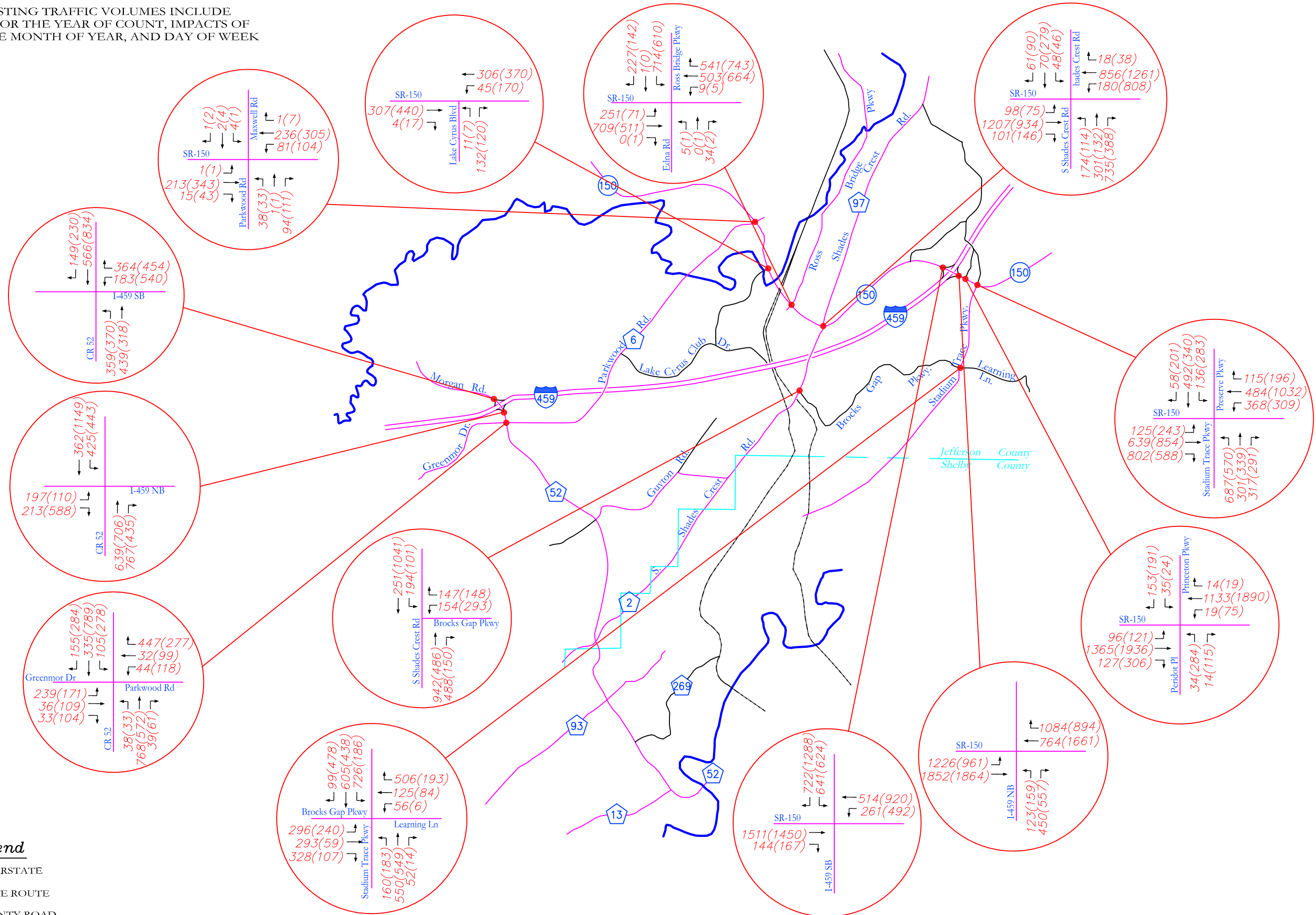


Figure 3 - Existing Peak Hour Traffic Volumes

South Shades Crest IJS - Hoover, Alabama

February 2022

NOTE: EXISTING TRAFFIC VOLUMES INCLUDE FACTORS FOR THE YEAR OF COUNT, IMPACTS OF COVID, THE MONTH OF YEAR, AND DAY OF WEEK



Legend
 INTERSTATE
 STATE ROUTE
 COUNTY ROAD
AM Peak (PM Peak)



SKIPPER CONSULTING INC **Figure 4 - Existing Peak Hour Intersection Traffic Volumes**
 South Shades Crest IJS - Hoover, Alabama
 February 2022

Existing Capacity Analysis

Capacity analyses were performed for existing morning and afternoon peak hour conditions for roadway intersections, roadway segments, and ramp junctions in the study area. The methods of analysis used were those documented in the *Highway Capacity Manual, 6th Edition*, as published by the Transportation Research Board. Capacities are expressed as levels of service, and range from a level of service “A” (highest quality of service) to a level of service “F” (jammed conditions). As a general rule, operation at a level of service “C” or better is desirable, with a level of service “D” considered as acceptable during peak hours of traffic flow.

Intersection Capacity Analysis. Using methods presented in the *Highway Capacity Manual*, the capacity and levels of service of the study area roadway intersections were analyzed for existing morning and afternoon peak hour conditions. The existing traffic counts that were conducted at the intersections, along with the existing roadway geometrics and traffic control devices, were used for conducting the existing intersection capacity analyses. Levels of service and delay resulting from existing intersection capacity analyses are summarized in Table 1.

Roadway Segment Capacity Analysis. The existing capacity and levels of service of study area roadway segments were analyzed for the morning and afternoon peak hour conditions. Analyses were conducted for freeway segments, multi-lane highway segment, and two-lane highway segments. The levels of service resulting from the existing roadway segment capacity analyses are summarized in Table 2.

Ramp Junction Capacity Analysis. The existing capacity and levels of service for ramp junctions in the study area were analyzed for the morning and afternoon peak hour conditions. Ramp junctions within the study area occur on Interstate 459 at Alabama Highway 150 (four ramps) and Interstate 459 at Morgan Road (four ramps). The levels of service resulting from the existing ramp capacity analyses are summarized in Table 3.

**Table 1
Existing Intersection Levels of Service**

<i>Intersection</i>	<i>Approach</i>	<i>Level of Service (Delay, in seconds)</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Alabama Highway 150 at Interstate 459 Northbound Ramp	Alabama Highway 150 Eastbound	C (23)	C (28)
	Alabama Highway 150 Westbound	D (53)	D (36)
	Interstate 459 Ramp Northbound	C (26)	C (31)
	Overall Intersection	C (34)	C (32)
Alabama Highway 150 at Interstate 459 Southbound Ramp	Alabama Highway 150 Eastbound	E (65)	F (205)
	Alabama Highway 150 Westbound	D (42)	D (43)
	Interstate 459 Ramp Southbound	E (60)	F (333)
	Overall Intersection	E (59)	F (211)
Alabama Highway 150 at Ross Bridge Parkway	Alabama Highway 150 Eastbound	B (20)	B (12)
	Alabama Highway 150 Westbound	C (27)	B (16)
	Edna Road Northbound	D (40)	D (48)
	Ross Bridge Parkway Southbound	C (35)	C (34)
	Overall Intersection	C (27)	C (20)
Alabama Highway 150 at Shades Crest Road/South Shades Crest Rd	Alabama Highway 150 Eastbound	E (73)	E (56)
	Alabama Highway 150 Westbound	D (51)	D (40)
	South Shades Crest Road Northbound	F (82)	D (36)
	Shades Crest Road Southbound	D (40)	E (67)
	Overall Intersection	E (68)	D (46)
Alabama Highway 150 at Stadium Trace Parkway	Alabama Highway 150 Eastbound	D (49)	C (33)
	Alabama Highway 150 Westbound	E (62)	D (41)
	Stadium Trace Parkway Northbound	D (40)	D (47)
	Preserve Parkway Southbound	E (72)	E (60)
	Overall Intersection	D (53)	D (43)
Alabama Highway 150 at Princeton Parkway	Alabama Highway 150 Eastbound	A (8)	B (13)
	Alabama Highway 150 Westbound	A (3)	B (18)
	Peridot Place Northbound	E (72)	E (70)
	Princeton Parkway Southbound	E (70)	E (65)
	Overall Intersection	B (11)	C (23)

Table 1
Existing Intersection Levels of Service (continued)

<i>Intersection</i>	<i>Approach</i>	<i>Level of Service (Delay, in seconds)</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Morgan Road at Greenmor Drive/Parkwood Road	Greenmor Drive Eastbound	D (36)	C (32)
	Parkwood Road Westbound	E (67)	C (28)
	Morgan Road Northbound	D (43)	C (23)
	Morgan Road Southbound	B (17)	B (14)
	Overall Intersection	D (42)	C (21)
Morgan Road at Interstate 459 Northbound Ramp	Interstate 459 Ramp Eastbound	C (32)	D (38)
	Morgan Road Northbound	C (24)	C (27)
	Morgan Road Southbound	B (11)	B (13)
	Overall Intersection	C (21)	C (23)
Morgan Road at Interstate 459 Southbound Ramp	Interstate 459 Ramp Westbound	B (20)	C (30)
	Morgan Road Northbound	A (7)	B (19)
	Morgan Road Southbound	B (14)	C (24)
	Overall Intersection	B (13)	C (25)
Brock's Gap Parkway at South Shades Crest Road	Brock's Gap Parkway Westbound	D (41)	D (44)
	South Shades Crest Road Northbound	C (26)	B (11)
	South Shades Crest Road Southbound	C (34)	C (22)
	Overall Intersection	C (30)	C (24)
Learning Lane/Brock's Gap Parkway at Stadium Trace Parkway	Brock's Gap Parkway Eastbound	E (71)	D (43)
	Learning Lane Westbound	D (48)	D (38)
	Stadium Trace Parkway Northbound	E (75)	C (34)
	Stadium Trace Parkway Southbound	E (71)	C (35)
	Overall Intersection	E (68)	D (36)
Alabama Highway 150 at Lake Cyrus Boulevard	Alabama Highway 150 Westbound	A (1)	A (3)
	Lake Cyrus Boulevard Northbound	B (12)	B (13)
Alabama Highway 150 at Parkwood Road	Alabama Highway 150 Eastbound	A (0)	A (0)
	Alabama Highway 150 Westbound	A (3)	A (3)
	Parkwood Road Northbound	B (13)	C (15)
	Maxwell Lake Road Southbound	B (12)	C (16)

**Table 2
Existing Roadway Segment Levels of Service**

Roadway	From	To	Direction of Travel	Configuration	Level of Service	
					AM Peak	PM Peak
Interstate 459	Morgan Road	Alabama Highway 150	Northbound	Freeway	C	C
			Southbound	Freeway	B	C
	Alabama Highway 150	U. S. Highway 31	Northbound	Freeway	D	C
			Southbound	Freeway	C	D
Alabama Highway 150	I-459	South Shades Crest Road	Eastbound	Multi-Lane	C	B
			Westbound	Multi-Lane	B	C
	South Shades Crest Road	Shades Creek	Eastbound	Multi-Lane	A	A
			Westbound	Multi-Lane	A	A
Morgan Road	South Shades Crest Road	I-459	N/A	Two Lane	E	E
Stadium Trace Parkway	Alabama Highway 150	Brock's Gap Parkway	Northbound	Multi-Lane	B	C
			Southbound	Multi-Lane	C	B
	Brocks Gap Parkway	Fleming Parkway	Northbound	Multi-Lane	A	B
			Southbound	Multi-Lane	B	A
Ross Bridge Parkway	Alabama Highway 150	Deer Trail Road	Northbound	Multi-Lane	A	B
			Southbound	Multi-Lane	B	A
Shades Crest Road	Sulphur Springs Road	Alabama Highway 150	N/A	Two-Lane	C	C
South Shades Crest Road	Alabama Highway 150	Brock's Gap Parkway	N/A	Two-Lane	E	E
	Brock's Gap Parkway	Willow Lake Drive	N/A	Two-Lane	E	E

Table 3
Existing Ramp Junction Levels of Service

<i>Freeway</i>	<i>Ramp</i>	<i>Level of Service</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Interstate 459 Northbound	I-459 Northbound Exit Ramp to AL Hwy 150	C	D
	I-459 Northbound Entrance Ramp from AL Hwy 150	D	C
	I-459 Northbound Exit Ramp to Morgan Road	D	E
	I-459 Northbound Entrance Ramp from Morgan Road	D	D
Interstate 459 Southbound	I-459 Southbound Exit Ramp to AL Hwy 150	D	E
	I-459 Southbound Entrance Ramp from AL Hwy 150	B	B
	I-459 Southbound Exit Ramp to Morgan Road	B	C
	I-459 Southbound Entrance Ramp from Morgan Road	C	C

TRANSPORTATION MODELING PROCEDURES

The process for estimating future year 2045 traffic volumes and reassigning future year 2045 traffic volumes to the various alternative improvement concepts involves the use of a microcomputer-based transportation demand model. The transportation demand model simulates the regional transportation system with a computer model of the roadway network and trip productions and attractions based on socioeconomic factors (households, employment, and school enrollment). The transportation demand model is set up and calibrated to replicate base year traffic conditions, in this case 2015. Then, future year (in this case 2045) traffic conditions can be projected by forecasting the socioeconomic data forward to the future year. Roadway improvements can be tested by modifying the computer roadway network model.

Data Sources

The transportation demand model for the Birmingham region was obtained from the Regional Planning Commission (RPC) of Greater Birmingham. The regional model includes all classified roadways in Jefferson and Shelby Counties. The base year 2015 and future year 2045 transportation demand model files were obtained. Information obtained from the RPC included the base year 2015 roadway network, the future year 2045 roadway network which includes roadway projects in the regional long range transportation plan, the base year 2015 socioeconomic data file, the future year 2045 socioeconomic data file, and other information required to run the regional model.

Traffic Analysis Zones

A traffic analysis zone (TAZ) is defined as a subdivision of the study area that includes homogeneous land use within a distinct border. TAZ's are developed for the compilation of socioeconomic data for the purposes of calculating trip productions and attractions. The TAZ system included in the regional model provided by the Regional Planning Commission of Greater Birmingham was used for this study.

Base Year 2015 Socioeconomic Data

The socioeconomic factors which are used to determine trip productions and attractions on a per-TAZ basis include:

- households in the TAZ;
- mean income of households in the TAZ;
- retail employment in the TAZ (number of retail jobs);
- non-retail employment in the TAZ (number of non-retail jobs); and
- school enrollment in the TAZ (at the location of the school, not at the home).

Trips are produced in each TAZ by households according to the mean income of the households in the TAZ. Trips are attracted to each TAZ according to the number of jobs in each TAZ and the school enrollment in each TAZ. The base year 2015 socioeconomic data file for each TAZ in the regional model was provided by the Regional Planning Commission of Greater Birmingham.

Forecast 2045 Socioeconomic Data

The forecasted socioeconomic data for future year 2045 conditions was provided by the Regional Planning Commission of Greater Birmingham. The 2045 socio-economic data was adjusted to account for developments within the study area which were not reflected in the 2045 socio-economic data set. These additional developments are shown in Figure 5.

Modeling Process

Roadway transportation demand in the study area was analyzed using a standard transportation demand modeling process. The standard modeling process is defined by a four-step analysis procedure:

Step 1	Trip Generation
Step 2	Trip Distribution
Step 3	Mode Split
Step 4	Assignment

The standard transportation demand modeling process in the State of Alabama deals with only private transportation (i.e., not public transit), so Step 3, Mode Split, is ignored.

In order to project future year roadway transportation demand for the planning of projects, a transportation demand model is developed and calibrated to the base year, in this case 2015. In general, the transportation demand model calculates the trip generation of the socioeconomic data set and assigns these trips to the roadway network based on capacity and speed. The process of calibration involves making modifications to a base year model set to replicate base year traffic conditions. Once a transportation demand model is properly calibrated to replace base year conditions, future year, in this case 2045, socioeconomic data can be input to the process to determine the number of future year trips on the roadway

LAKE CYRUS NORTH
 -1644 dwelling units
 -300 age-restricted dwelling units
 -100 multi-family dwelling units
 -250,000 sq.ft. commercial

BROCKS GAP RETAIL
 -130,000 sq.ft. retail




INNOVATION/INCUBATOR
 -343 acres office/warehouse

BLACKRIDGE
 -additional 180 dwelling units

LUXURY LAKE
 -320 dwelling units

TRIGGER CREEK
 -1,500 dwelling units

BLACKRIDGE SOUTH
 -320 dwelling units

Legend
 INTERSTATE
 STATE ROUTE
 COUNTY ROAD



 North
 Scale: n.t.s



Figure 5 - Proposed Developments

South Shades Crest IJS - Hoover, Alabama

February 2022

network. The network can then be altered (i.e., with new roadways or widening of existing roadways), and the trips reassigned to the network to determine the impacts of the improvements.

The State of Alabama Department of Transportation has adopted a transportation demand modeling package known as CUBE Voyager, for use in modeling in the State of Alabama. In addition, the Alabama Department of Transportation has developed standardized input data files and operating parameters for the transportation demand modeling process. The following paragraphs describe some of the specific standardization used in the transportation demand modeling process in the State of Alabama.

Trip Generation. The State of Alabama Department of Transportation has developed a stand-alone program to perform trip generation for the transportation modeling process. The trip generation program calculates productions and attractions for each traffic analysis zone (TAZ), using a socioeconomic data set containing:

- occupied housing units
- median income
- retail employment
- non-retail employment
- school enrollment

The trip generation program also requires the input at cordon counts at the regional study area boundary. The trip generation program produces production and attraction data files for six trip purposes. The six trip purposes are:

Trip Purpose 1	Home Base Work (HBW)
Trip Purpose 2	Home Base Other (HBO)
Trip Purpose 3	Non-Home Base (NHB)
Trip Purpose 4	Truck-Taxi (T-T)
Trip Purpose 5	Internal-External (I-X)
Trip Purpose 6	External-External

Trip Distribution. After the trip generation program is used to determine productions and attractions, the next step in the modeling process is to distribute the trips. Trip distribution is performed using a gravity model. A gravity model is a mathematical formula which relates desire for travel to three factors: 1) trip productions; 2) trip attractions; and 3) friction factors. The gravity model formula is:

$$\text{Trips}_{ij} = \frac{\text{Prods}_i \times \text{Attr}_j \times \text{Ff}_{ij}}{\sum \text{Attr}_j \times \text{Ff}_{ij}}$$

where

Prods _i	=	productions at origin zone i
Attr _j	=	attractions at destination zone j
Ff _{ij}	=	friction factor between origin zone i and destination zone j

The formula states that the number of trips which will travel from a zone to any other zone is a ration of the productions of the origin zone multiplied by the attractiveness of the destination zone multiplied by the likelihood of travel from the origin zone to the destination zone divided by the summation of the attractiveness of every zone multiplied by the likelihood of travel from the origin zone to every other zone.

The end result of trip distribution is a matrix, or a trip table, that represents the number of trips from one traffic analysis zone (TAZ) to another. The matrix is used in the traffic assignment step of the modeling process.

Traffic Assignment. In trip generation, the number of trips by zone was forecast. Those forecast trips were then given destinations by trip distribution. Assigning these trips to specific routes and establishing traffic volumes is the last phase of the forecasting process. In the assignment process the existing trip tables that are produced in the trip distribution step of the modeling process is used to assign base year trips to the base year network. Trips between any two zones will generally follow the path (roadway links) between zones that require the least amount of travel time. In determining time to go from one zone to another, delays due to congestion are taken into consideration.

The equilibrium assignment process which was used in this study considers demand in relation to capacity. The equilibrium assignment technique consists of a series of all or nothing loadings with an adjustment of travel time according to delays encountered in the associated iteration. The assignment from each iteration is combined with the assignment for the previous iteration in such a way as to minimize the travel time of each trip. As a result of these time adjustments, the loadings of different iterations may be assigned to different paths. By combining information from various iterations, the number of iterations required to reach equilibrium is reduced. Equilibrium occurs when no trip can be made by an alternate path without increasing the total travel time of all trips on the network.

TRAVEL DEMAND FORECASTS

Planned and Programmed Roadway Improvements

There are four primary types of planned and programmed roadway improvements which are considered in the study process. The first type is improvements listed in the Birmingham Metropolitan Planning Organization's *Transportation Improvement Program* (TIP) for Fiscal Years 2020 through 2023. These are improvements which have a dedicated funding source and a high likelihood of construction over the next several years. The second type is improvements which are listed in the Birmingham Metropolitan Planning Organization's *2045 Regional Transportation Plan*. This plan includes projects which are within the *Transportation Improvement Program* and also other projects proposed beyond the year 2023 which do not yet have a dedicated funding source. The third source is local improvements funded and constructed by cities, counties, and private entities. The fourth source are projects which are currently under construction, regardless of funding source. Table 4 is a listing of the planned and programmed roadway improvements found in the *Transportation Improvement Program* and the *2045 Long Range Transportation Plan*, other improvements anticipated from local and private resources, and projects currently under construction. This listing includes only roadway type projects which add capacity, turn lanes, or signalization, and specifically excludes trail, greenway, and enhancement projects.

**Table 4
Planned and Programmed Roadway Improvements**

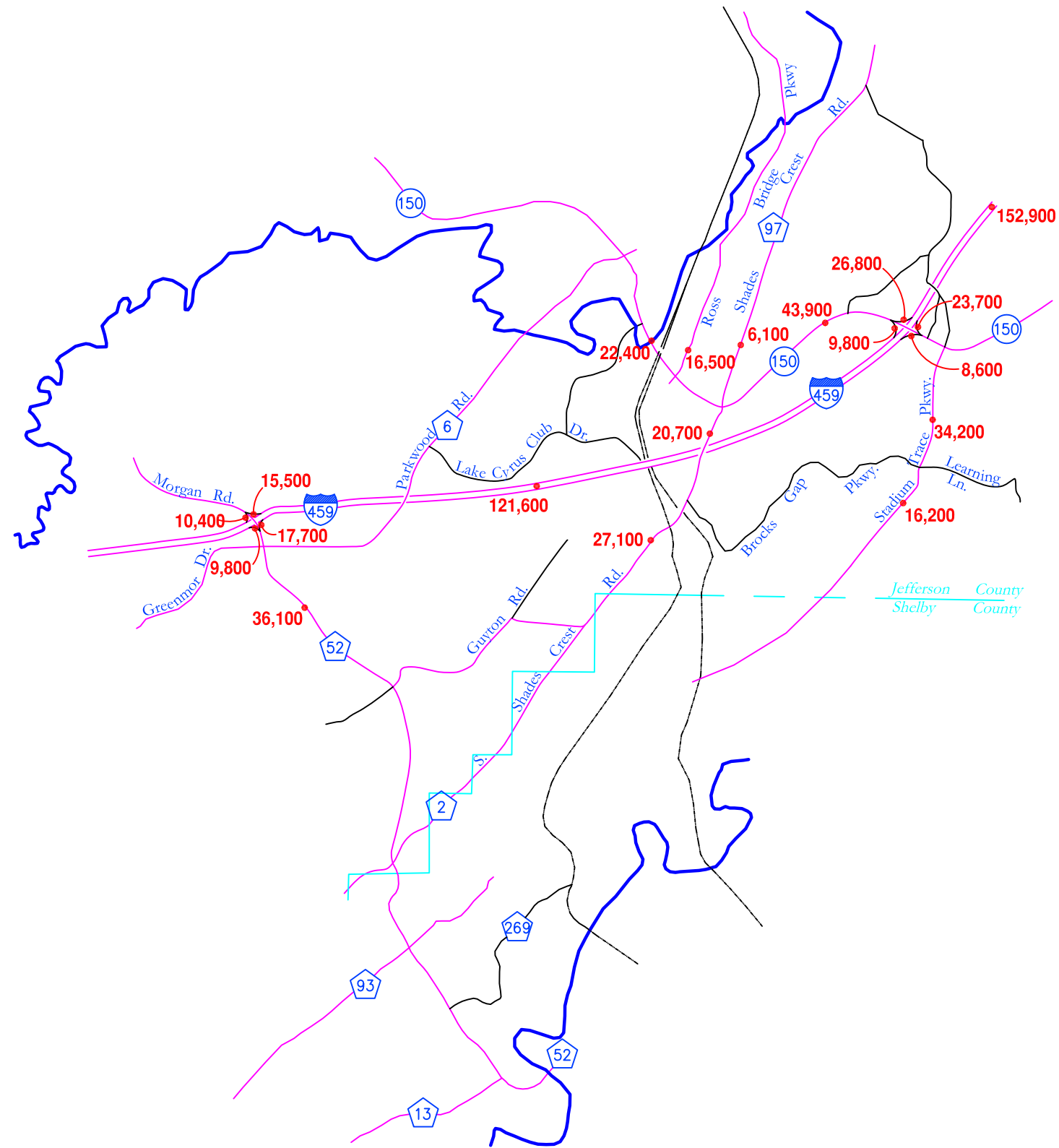
Transportation Improvement Program FY 2020-2023					
Source	Description	Limits	FY	Scope	Estimated Cost
State	State Route 150 Widening (2 to 4 lanes)	West of Parkwood Road to West of Shades Creek	2020	Construction	\$9.9 million
2045 Regional Transportation Plan					
No Projects in Study Area					
Local and Private Projects					
Description		Limits		Estimated FY	
Dual right turn lanes		SR-150 westbound at I-459 NB Ramps		2022	
Dual right turn lanes		SR-150 eastbound at Stadium Trace Parkway		2022	
Projects Under Construction (February, 2022)					
Description		Description			
Morgan Road Widening		I-459 to South Shades Crest Road			

Traffic Projections on Existing Plus Committed Roadway Network




Roadway Segments. Skipper Consulting used the Birmingham area regional 2045 Existing Plus Committed travel demand model to project future volumes on the study roadway segments. By applying the existing hourly count percentage distributions to the forecasted 2045 Existing Plus Committed average daily traffic volumes, Skipper Consulting produced a.m. and p.m. peak hour volumes for the Existing Plus Committed alternative. 2045 Existing Plus Committed daily segment traffic volumes are illustrated in Figure 6 and peak hour traffic volumes for roadway segments are illustrated in Figure 7.

Ramps. Skipper Consulting forecasted the daily ramp volumes using the 2045 Existing Plus Committed travel demand model. Peak hour traffic volumes were produced by applying hourly count percentage distributions to the forecasted 2045 Existing Plus Committed average daily traffic volumes. The forecasted ramp daily traffic volumes are illustrated in Figure 6 and peak hour traffic volumes are illustrated in Figure 7.

Intersections. Skipper Consulting used the 2045 Existing Plus Committed travel demand model to forecast daily turning movement volumes at each intersection. Hourly count percentage distributions were applied to the forecast daily turning movement volumes to produce a.m. and p.m. peak hour volumes for each intersection. The Existing Plus Committed turning movement volumes are illustrated in Figure 8.



Legend

-  INTERSTATE
-  STATE ROUTE
-  COUNTY ROAD



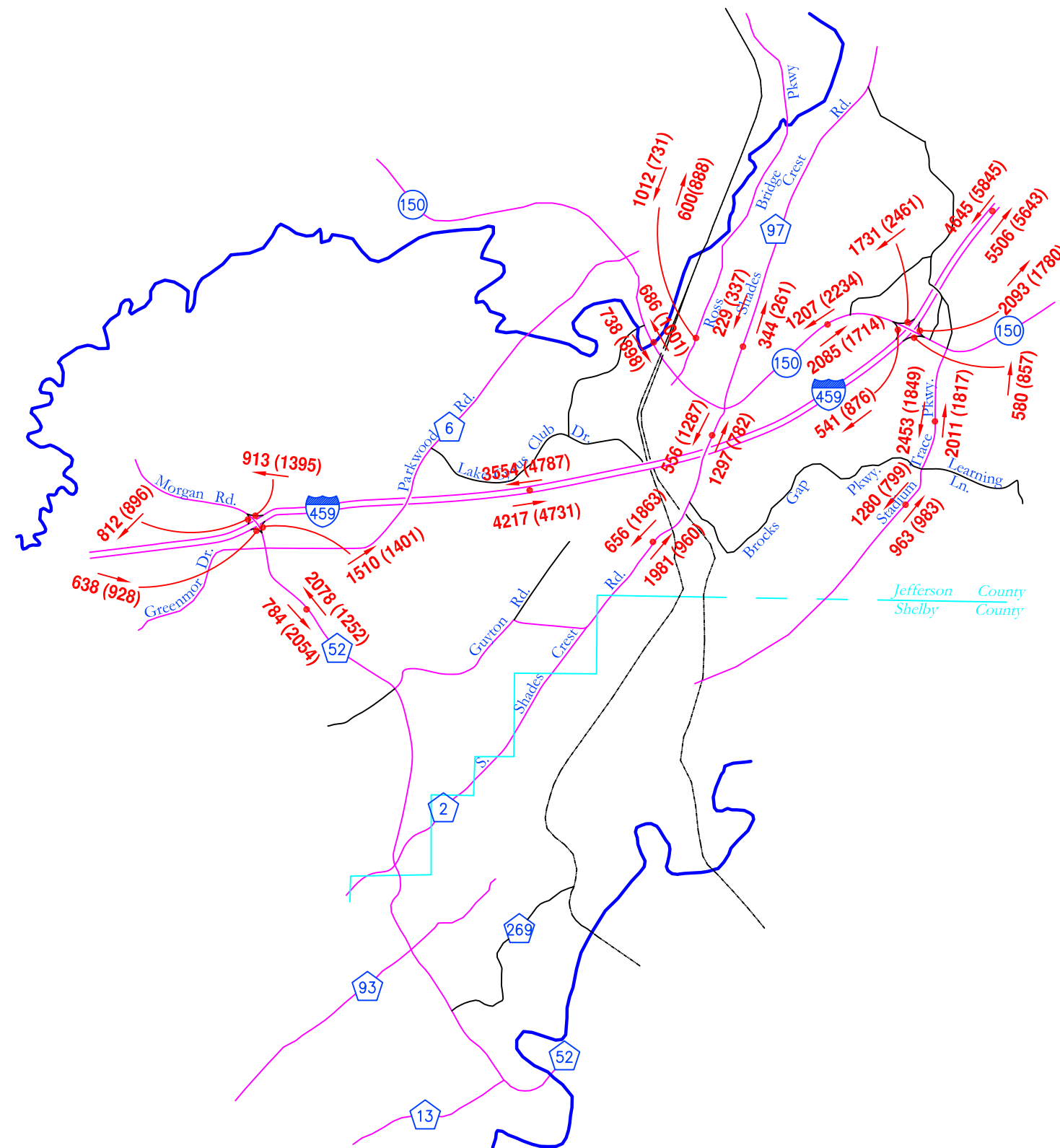
North
Scale: n.t.s






Figure 6 - 2045 No Build Daily Traffic Volumes

South Shades Crest IJS - Hoover, Alabama

February 2022



Legend

-  INTERSTATE
-  STATE ROUTE
-  COUNTY ROAD

AM Peak (PM Peak)






North
Scale: n.t.s



Figure 7 - 2045 No Build Peak Hour Traffic Volumes

South Shades Crest IJS - Hoover, Alabama

February 2022

- Legend**
-  INTERSTATE
 -  STATE ROUTE
 -  COUNTY ROAD
- AM Peak (PM Peak)**

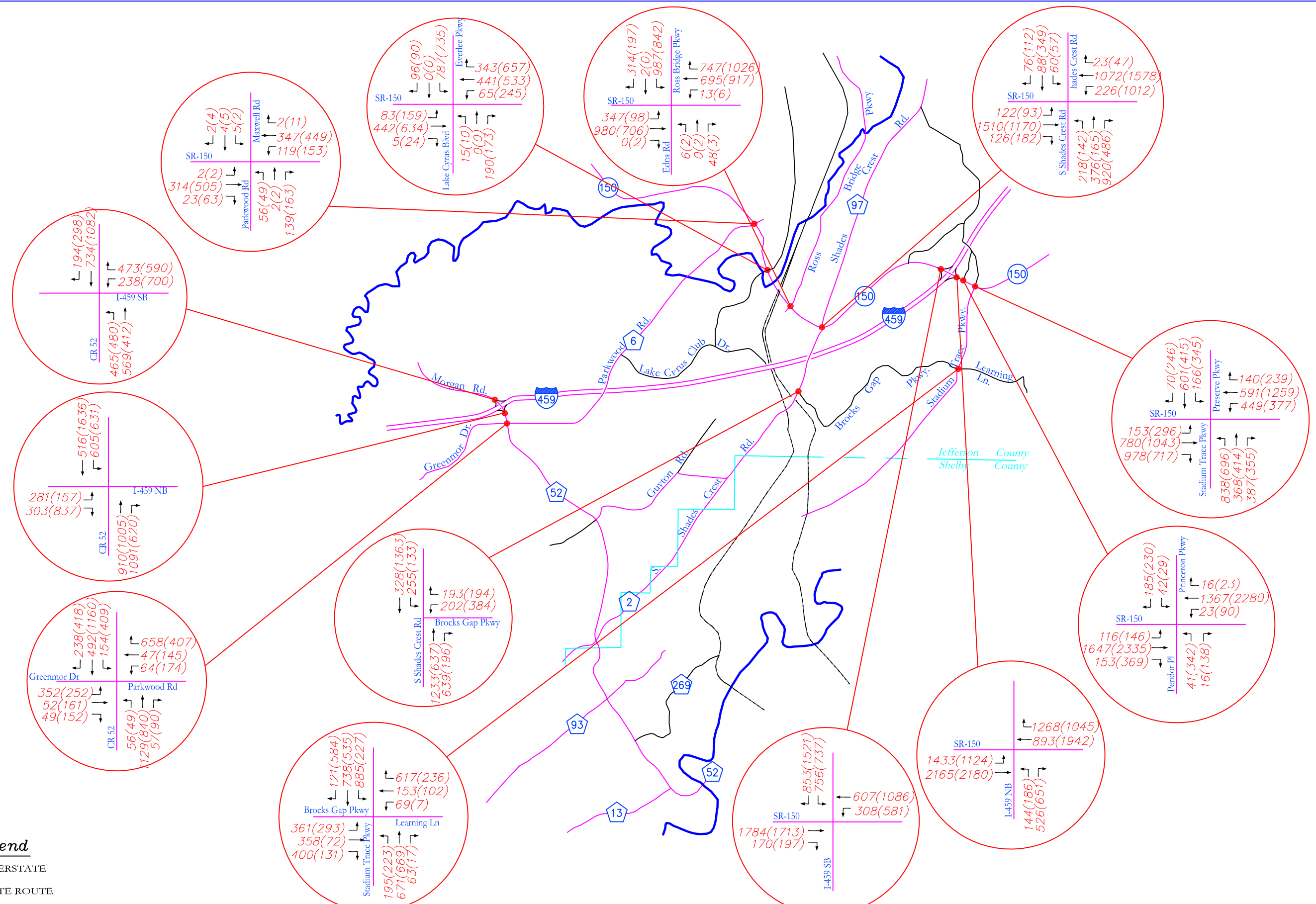


Figure 8 - 2045 No Build Peak Hour Intersection Traffic Volumes

South Shades Crest IJS - Hoover, Alabama

February 2022

2045 Existing Plus Committed Capacity Analysis

Capacity analyses were conducted for the study intersections, roadway segments, and ramp junctions in the study area assuming current roadways and committed roadway improvements would be in place. In addition, projected traffic volumes for the design year were included in the analyses.

Intersection Capacity Analysis. Intersection capacity analyses were conducted for the study intersections with the existing roadways and committed roadway improvements in place as well as the design year traffic volumes. Any traffic control improvements which would be required as a part of the committed roadway improvements were also included in this level of analysis. Levels of service and delays resulting from the intersection capacity analyses for the study intersections associated with the existing plus committed roadway network for the design year are summarized in Table 5.

Roadway Segment Capacity Analysis. The roadway segments within the study area were analyzed assuming the existing roadways and committed roadway improvement projects would be in place. These analyses were conducted assuming the design year traffic volumes would be in place. Freeway segments, multi-lane highway segments, and two lane highway segments were analyzed for this level of evaluation. Levels of service resulting from the existing plus committed roadway segment capacity analyses are summarized in Table 6.

Ramp Junction Capacity Analysis. The ramp junctions associated with the entry and exit points for Interstate 459 at both Morgan Road and Alabama Highway 150 were analyzed assuming the existing plus committed roadway network and design year traffic volumes would be in place. Results of the capacity analyses for the ramp junctions are summarized in Table 7.

Table 5
2045 Existing Plus Committed Intersection Levels of Service

<i>Intersection</i>	<i>Approach</i>	<i>Level of Service (Delay, in seconds)</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Alabama Highway 150 at Interstate 459 Northbound Ramp	Alabama Highway 150 Eastbound	C (25)	B (18)
	Alabama Highway 150 Westbound	C (25)	D (37)
	Interstate 459 Ramp Northbound	D (42)	D (49)
	Overall Intersection	C (27)	C (30)
Alabama Highway 150 at Interstate 459 Southbound Ramp	Alabama Highway 150 Eastbound	F (127)	F (305)
	Alabama Highway 150 Westbound	D (38)	D (54)
	Interstate 459 Ramp Southbound	F (134)	F (517)
	Overall Intersection	F (112)	F (319)
Alabama Highway 150 at Ross Bridge Parkway	Alabama Highway 150 Eastbound	C (33)	B (17)
	Alabama Highway 150 Westbound	D (49)	C (30)
	Ross Bridge Parkway Ext. Northbound	D (46)	D (48)
	Ross Bridge Parkway Southbound	F (123)	D (41)
	Overall Intersection	E (65)	C (30)
Alabama Highway 150 at Shades Crest Road/South Shades Crest Rd	Alabama Highway 150 Eastbound	F (206)	F (94)
	Alabama Highway 150 Westbound	E (64)	E (66)
	South Shades Crest Road Northbound	F (156)	D (45)
	Shades Crest Road Southbound	D (44)	F (91)
	Overall Intersection	F (146)	E (73)
Alabama Highway 150 at Stadium Trace Parkway	Alabama Highway 150 Eastbound	D (40)	C (35)
	Alabama Highway 150 Westbound	D (54)	D (44)
	Stadium Trace Parkway Northbound	E (64)	E (60)
	Preserve Parkway Southbound	E (66)	E (63)
	Overall Intersection	D (54)	D (47)
Alabama Highway 150 at Princeton Parkway	Alabama Highway 150 Eastbound	A (8)	B (17)
	Alabama Highway 150 Westbound	A (4)	C (25)
	Peridot Place Northbound	E (71)	E (69)
	Princeton Parkway Southbound	E (71)	E (71)
	Overall Intersection	B (12)	C (28)

Table 5
2045 Existing Plus Committed Intersection Levels of Service (continued)

Intersection	Approach	Level of Service (Delay, in seconds)	
		AM Peak	PM Peak
Morgan Road at Greenmor Drive/Parkwood Road	Greenmor Drive Eastbound	C (26)	D (41)
	Parkwood Road Westbound	F (105)	C (29)
	Morgan Road Northbound	E (61)	C (34)
	Morgan Road Southbound	D (38)	C (21)
	Overall Intersection	E (61)	C (28)
Morgan Road at Interstate 459 Northbound Ramp	Interstate 459 Ramp Eastbound	D (50)	F (114)
	Morgan Road Northbound	F (114)	E (59)
	Morgan Road Southbound	F (122)	D (50)
	Overall Intersection	F (106)	E (66)
Morgan Road at Interstate 459 Southbound Ramp	Interstate 459 Ramp Westbound	D (39)	E (71)
	Morgan Road Northbound	B (19)	D (46)
	Morgan Road Southbound	C (27)	D (35)
	Overall Intersection	C (27)	D (50)
Brock's Gap Parkway at South Shades Crest Road	Brock's Gap Parkway Westbound	D (46)	F (108)
	South Shades Crest Road Northbound	F (97)	B (14)
	South Shades Crest Road Southbound	F (98)	F (86)
	Overall Intersection	F (90)	E (70)
Learning Lane/Brock's Gap Parkway at Stadium Trace Parkway	Brock's Gap Parkway Eastbound	F (104)	E (64)
	Learning Lane Westbound	E (75)	D (41)
	Stadium Trace Parkway Northbound	F (126)	D (46)
	Stadium Trace Parkway Southbound	F (113)	D (49)
	Overall Intersection	F (108)	D (49)
Alabama Highway 150 at Lake Cyrus Boulevard	Alabama Highway 150 Eastbound	C (28)	C (32)
	Alabama Highway 150 Westbound	C (28)	C (24)
	Lake Cyrus Boulevard Northbound	D (36)	D (37)
	Everlee Parkway Southbound	C (25)	C (32)
	Overall intersection	C (28)	C (29)
Alabama Highway 150 at Parkwood Road	Alabama Highway 150 Eastbound	A (0)	A (0)
	Alabama Highway 150 Westbound	A (2)	B (3)
	Parkwood Road Northbound	B (14)	C (18)
	Maxwell Lake Road Southbound	C (16)	C (19)

Table 6
2045 Existing Plus Committed Roadway Segment Levels of Service

Roadway	From	To	Direction of Travel	Configuration	Level of Service	
					AM Peak	PM Peak
Interstate 459	Morgan Road	Alabama Highway 150	Northbound	Freeway	C	D
			Southbound	Freeway	C	D
	Alabama Highway 150	U. S. Highway 31	Northbound	Freeway	E	D
			Southbound	Freeway	D	F
Alabama Highway 150	I-459	South Shades Crest Road	Eastbound	Multi-Lane	C	C
			Westbound	Multi-Lane	B	D
	South Shades Crest Road	Shades Creek	Eastbound	Multi-Lane	A	A
			Westbound	Multi-Lane	A	B
Morgan Road	South Shades Crest Road	I-459	Northbound	Multi-Lane	C	B
			Southbound	Multi-Lane	A	C
Stadium Trace Parkway	Alabama Highway 150	Brock's Gap Parkway	Northbound	Multi-Lane	C	D
			Southbound	Multi-Lane	E	C
	Brocks Gap Parkway	Fleming Parkway	Northbound	Multi-Lane	B	B
			Southbound	Multi-Lane	C	A
Ross Bridge Parkway	Alabama Highway 150	Deer Trail Road	Northbound	Multi-Lane	A	A
			Southbound	Multi-Lane	B	A
Shades Crest Road	Sulphur Springs Road	Alabama Highway 150	N/A	Two-Lane	C	C
South Shades Crest Road	Alabama Highway 150	Brock's Gap Parkway	N/A	Two-Lane	E	E
	Brock's Gap Parkway	Willow Lake Drive	N/A	Two-Lane	F	F

Table 7
2045 Existing Plus Committed Ramp Junction Levels of Service

<i>Freeway</i>	<i>Ramp</i>	<i>Level of Service</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Interstate 459 Northbound	I-459 Northbound Exit Ramp to AL Hwy 150	D	D
	I-459 Northbound Entrance Ramp from AL Hwy 150	E	D
	I-459 Northbound Exit Ramp to Morgan Road	E	E
	I-459 Northbound Entrance Ramp from Morgan Road	F	F
Interstate 459 Southbound	I-459 Southbound Exit Ramp to AL Hwy 150	E	F
	I-459 Southbound Entrance Ramp from AL Hwy 150	B	C
	I-459 Southbound Exit Ramp to Morgan Road	C	D
	I-459 Southbound Entrance Ramp from Morgan Road	D	F

DEVELOPMENT AND ANALYSIS OF ALTERNATIVES

Federal Highway Administration requirements for preparation of an interchange justification study require that all reasonable alternatives to the proposed interchange be examined. The process to fulfill this requirement included conducting several work sessions with the design team, City of Hoover, Alabama Department of Transportation, and Federal Highway Administration to develop a set of reasonable alternatives, and then subjecting each alternative to an analysis process to project the ability of the alternative to accommodate design hour traffic volume conditions for the 2045 design year of the project.

Description of Alternatives

This section presents alternatives developed to address the capacity and mobility deficiencies determined in the existing conditions analysis and 2045 “Existing Plus Committed” analysis. The two alternative interchange configurations are shown in Figures 9 and 10.

- Alternate 1 – Diverging Diamond Interchange at an extension of Ross Bridge Parkway (Figure 9)

- Alternate 2 – Tight Diamond Interchange at an extension of Ross Bridge Parkway (Figure 10)

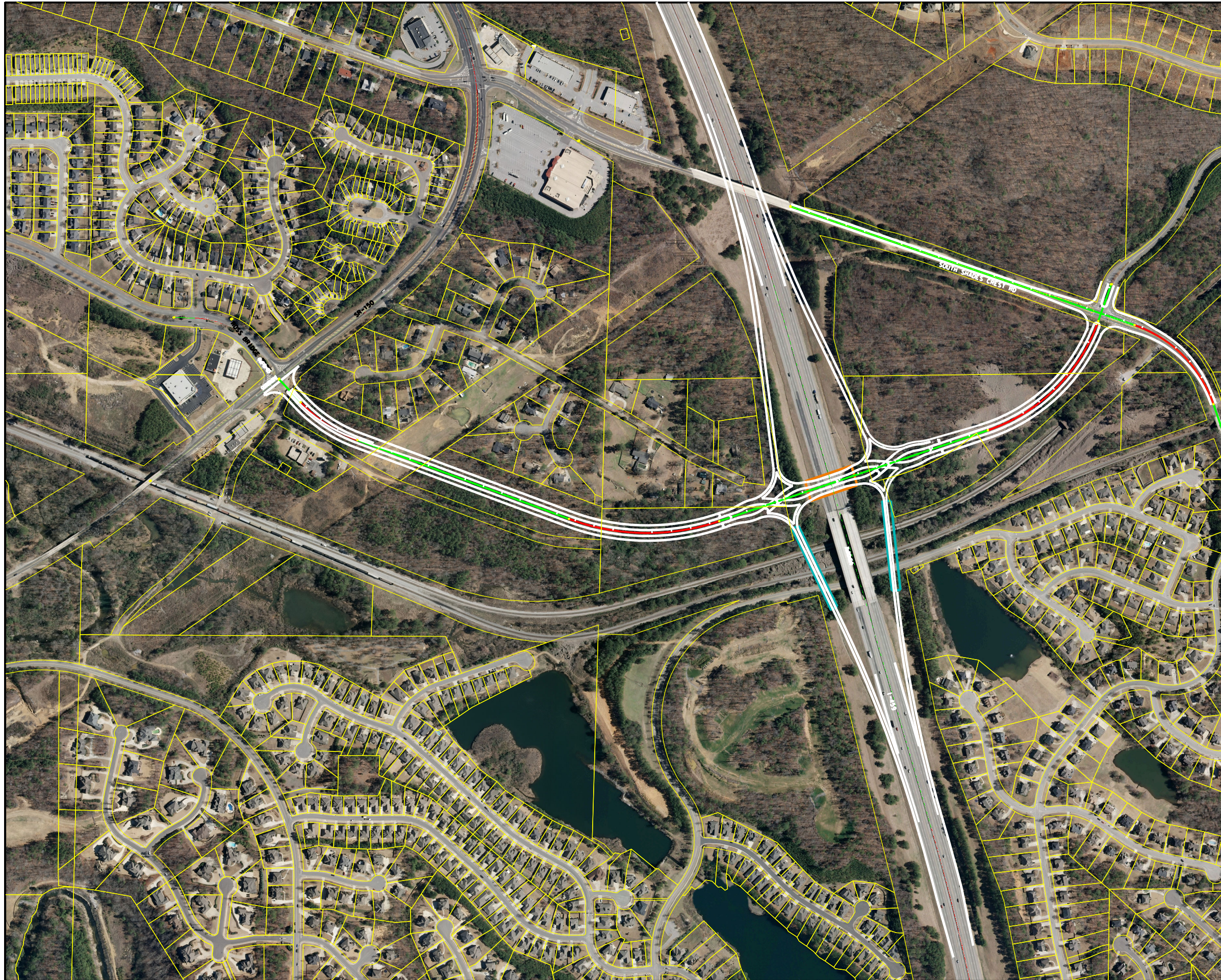



FIGURE 9	
ALTERNATIVE A DDI @ ROSS BRIDGE PKWY EXTENSION	
DATE: 2/22/2022	SCALE: 1" = 500'
 NEEL-SCHAFFER <i>Solutions you can build upon</i>	
	SHT. NO. XX



FIGURE 10

ALTERNATIVE B
TIGHT DIAMOND
ROSS BRIDGE PKWY EXTENSION

DATE:
2/22/2022

SCALE:
1" = 500'

NEEL-SCHAFFER
Solutions you can build upon

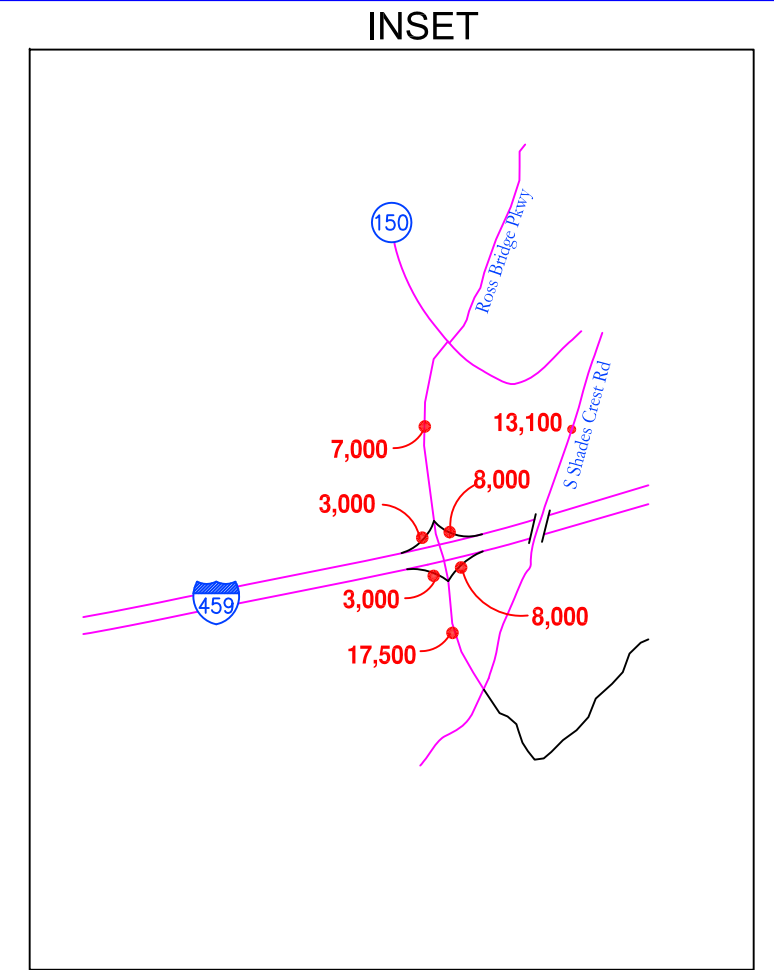
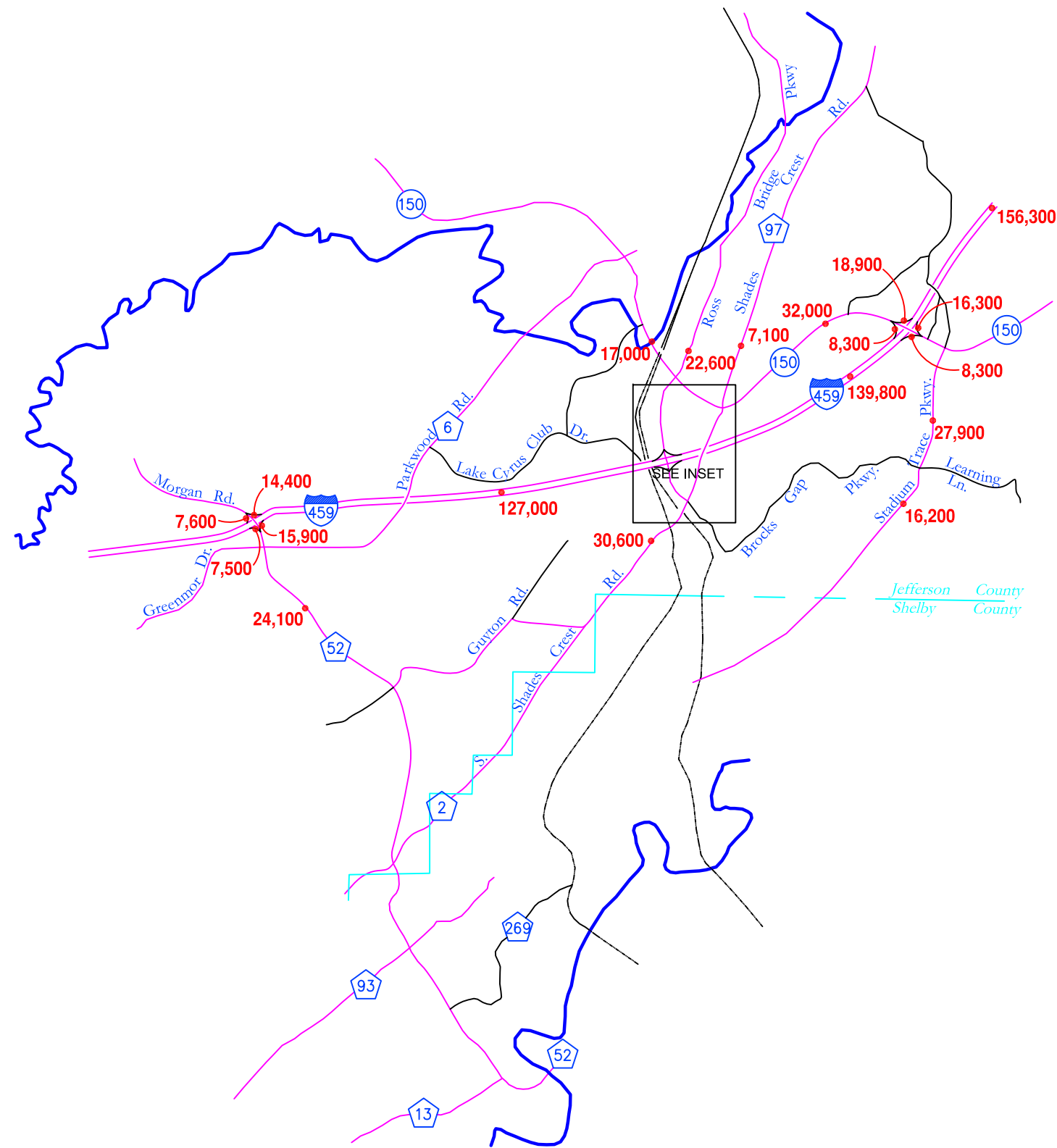
SHT.
NO.
XX

Traffic Forecasts for Alternatives

Roadway Segments. Using the Birmingham Area 2045 Existing Plus Committed network as a base network, Skipper Consulting developed a travel demand model for the alternatives to be tested. Forecasted daily and design hour traffic volumes were developed for the alternatives for all existing roadway segments and new roadway segments. The daily roadway segment traffic projections are shown in Figure 11. The peak hour roadway segment traffic volumes are shown in Figure 12.

Ramps. Skipper Consulting forecasted the daily ramp volumes using the travel demand model for the alternatives. 2045 traffic volumes were forecasted for all existing ramps in the study area as well as proposed ramps in the alternatives tested. . The daily ramp traffic projections are shown in Figure 11. The peak hour ramp traffic volumes are shown in Figure 12.

Intersections. Skipper Consulting used the travel demand model for the alternatives to forecast daily turning movement volumes at each intersection. The distribution of traffic during the a.m. and p.m. peak hours was applied to the forecast daily turning movement volumes in each alternative to produce design hour volumes for each intersection. The peak hour intersection turning movement traffic volumes are shown in Figure 13.



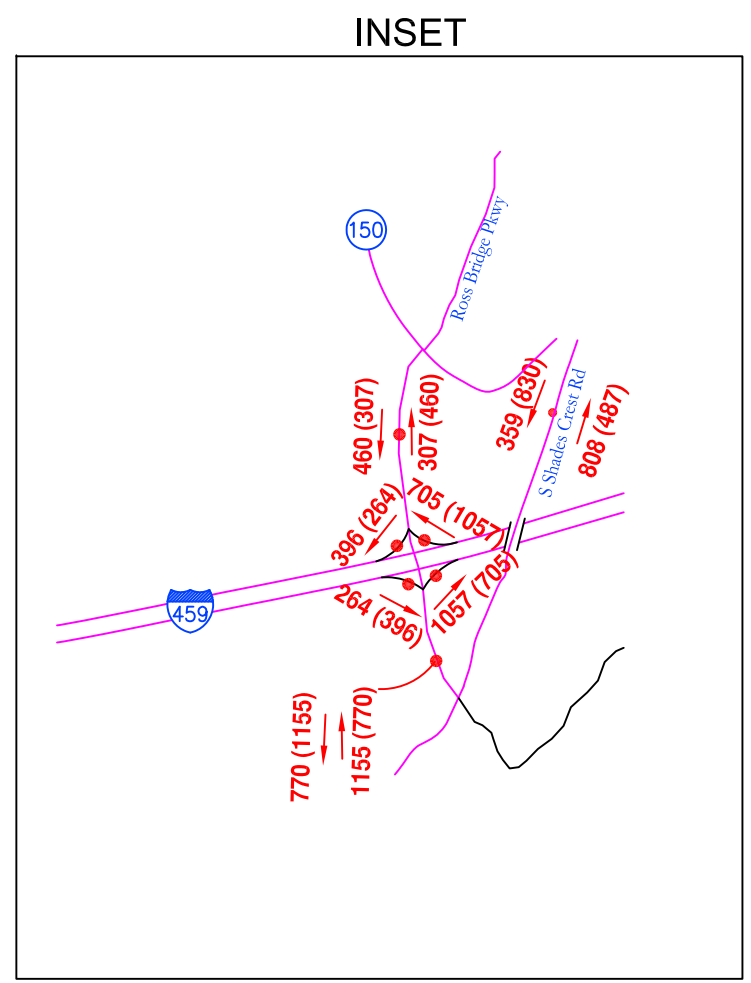
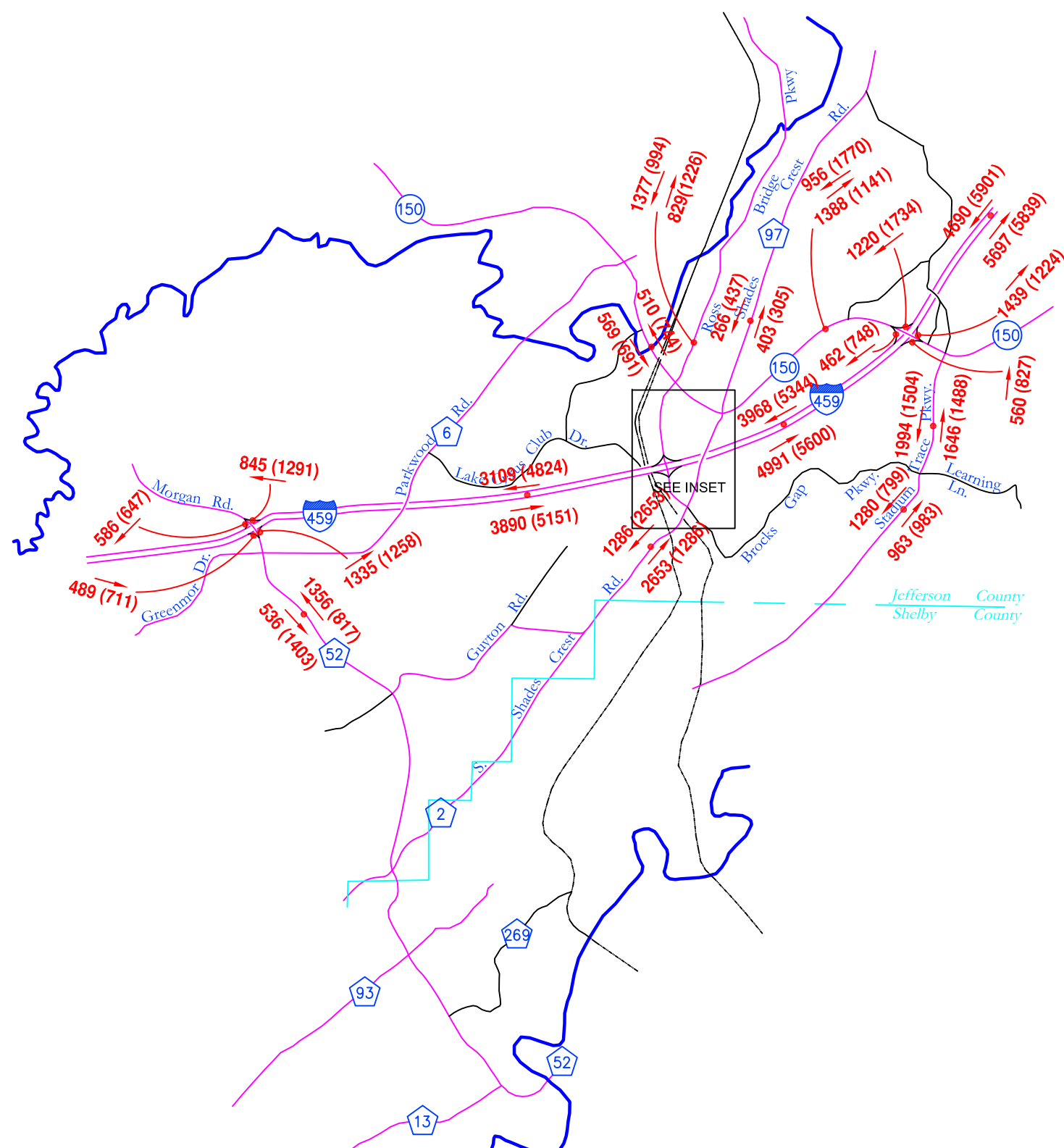
- Legend**
- INTERSTATE
 - STATE ROUTE
 - COUNTY ROAD



Figure 11 - 2045 Build Daily Traffic Volumes

South Shades Crest IJS - Hoover, Alabama

February 2022



Legend

- INTERSTATE
- STATE ROUTE
- COUNTY ROAD

AM Peak (PM Peak)

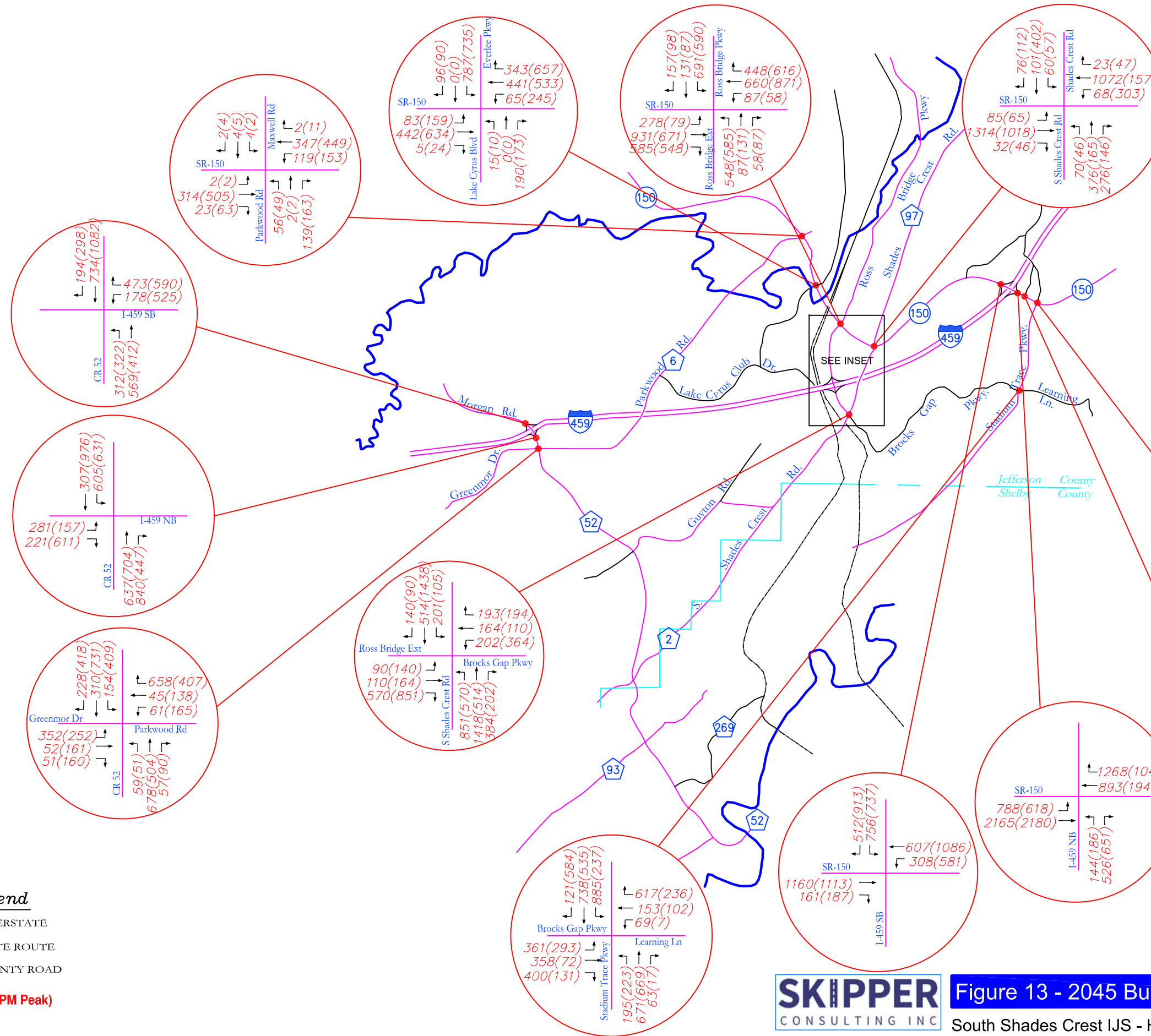
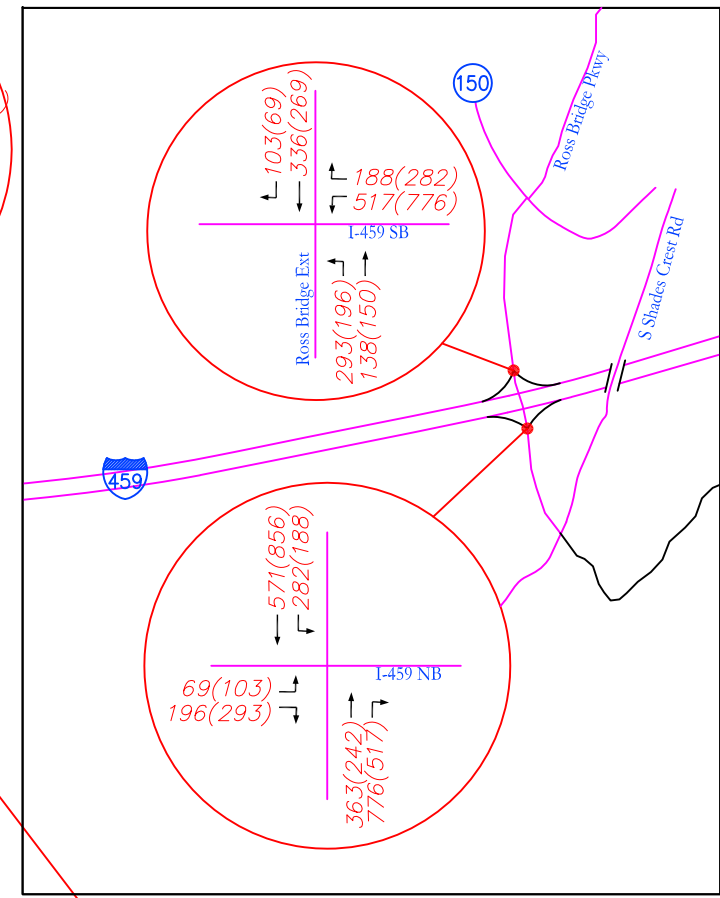


Figure 12 - 2045 Build Peak Hour Traffic Volumes

South Shades Crest IJS - Hoover, Alabama

February 2022

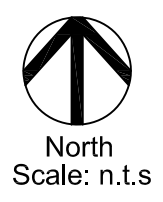
INSET



Legend

- INTERSTATE
- STATE ROUTE
- COUNTY ROAD

AM Peak (PM Peak)



SKIPPER CONSULTING INC Figure 13 - 2045 Build Peak Hour Intersection Traffic Volumes
South Shades Crest IJS - Hoover, Alabama February 2022

Capacity Analysis of Alternatives

Capacity analyses were conducted design year 2045 conditions for the study intersections, roadway segments, and ramp junctions in the study area assuming current roadways and committed roadway improvements and the proposed project would be in place.

Intersection Capacity Analysis. Intersection capacity analyses were conducted for the study intersections with the existing roadways and committed roadway improvements and the proposed project in place as well as the design year traffic volumes. Any traffic control improvements which would be required as a part of the roadway improvements were also included in this level of analysis. Levels of service and delays resulting from the intersection capacity analyses for the study intersections associated with the future roadway network for the design year are summarized in Table 8.

Roadway Segment Capacity Analysis. The roadway segments within the study area were analyzed assuming the existing roadways and committed roadway improvement projects and proposed project would be in place. These analyses were conducted assuming the design year traffic volumes would be in place. Freeway segments, multi-lane highway segments, and two lane highway segments were analyzed for this level of evaluation. Levels of service resulting from the future roadway segment capacity analyses are summarized in Table 9.

Ramp Junction Capacity Analysis. The ramp junctions associated with the entry and exit points for Interstate 459 at Morgan Road, Alabama Highway 150, and the proposed interchange were analyzed assuming the existing plus committed roadway network, proposed project, and design year traffic volumes would be in place. Results of the capacity analyses for the ramp junctions are summarized in Table 10.

Table 8
2045 Future Intersection Levels of Service

<i>Intersection</i>	<i>Approach</i>	<i>Level of Service (Delay, in seconds)</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Alabama Highway 150 at Interstate 459 Northbound Ramp	Alabama Highway 150 Eastbound	A (9)	B (17)
	Alabama Highway 150 Westbound	A (6)	B (18)
	Interstate 459 Ramp Northbound	C (24)	C (30)
	Overall Intersection	A (10)	B (19)
Alabama Highway 150 at Interstate 459 Southbound Ramp	Alabama Highway 150 Eastbound	C (30)	F (83)
	Alabama Highway 150 Westbound	C (26)	C (33)
	Interstate 459 Ramp Southbound	D (52)	F (166)
	Overall Intersection	D (37)	F (96)
Alabama Highway 150 at Ross Bridge Parkway	Alabama Highway 150 Eastbound	D (53)	C (22)
	Alabama Highway 150 Westbound	E (60)	C (25)
	Ross Bridge Parkway Ext. Northbound	E (67)	D (37)
	Ross Bridge Parkway Southbound	D (41)	D (38)
	Overall Intersection	E (65)	C (28)
Alabama Highway 150 at Shades Crest Road/South Shades Crest Rd	Alabama Highway 150 Eastbound	C (34)	C (30)
	Alabama Highway 150 Westbound	C (28)	C (34)
	South Shades Crest Road Northbound	D (52)	C (33)
	Shades Crest Road Southbound	D (43)	E (60)
	Overall Intersection	D (36)	D (37)
Alabama Highway 150 at Stadium Trace Parkway	Alabama Highway 150 Eastbound	D (42)	C (35)
	Alabama Highway 150 Westbound	D (54)	D (44)
	Stadium Trace Parkway Northbound	E (64)	E (60)
	Preserve Parkway Southbound	E (66)	E (63)
	Overall Intersection	D (55)	D (47)
Alabama Highway 150 at Princeton Parkway	Alabama Highway 150 Eastbound	A (7)	B (17)
	Alabama Highway 150 Westbound	A (3)	C (25)
	Peridot Place Northbound	E (71)	E (69)
	Princeton Parkway Southbound	E (71)	E (71)
	Overall Intersection	B (11)	C (28)

Table 8
2045 Future Intersection Levels of Service (continued)

<i>Intersection</i>	<i>Approach</i>	<i>Level of Service (Delay, in seconds)</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Morgan Road at Greenmor Drive/Parkwood Road	Greenmor Drive Eastbound	B (18)	C (30)
	Parkwood Road Westbound	D (47)	C (24)
	Morgan Road Northbound	D (41)	C (28)
	Morgan Road Southbound	C (28)	B (14)
	Overall Intersection	D (36)	C (21)
Morgan Road at Interstate 459 Northbound Ramp	Interstate 459 Ramp Eastbound	D (52)	D (43)
	Morgan Road Northbound	E (60)	C (31)
	Morgan Road Southbound	D (45)	D (39)
	Overall Intersection	D (53)	D (38)
Morgan Road at Interstate 459 Southbound Ramp	Interstate 459 Ramp Westbound	C (31)	D (39)
	Morgan Road Northbound	B (12)	C (23)
	Morgan Road Southbound	C (22)	C (24)
	Overall Intersection	C (21)	C (28)
Brock's Gap Parkway at South Shades Crest Road	Brock's Gap Parkway Ext. Eastbound	F (86)	F (143)
	Brock's Gap Parkway Westbound	D (48)	E (69)
	South Shades Crest Road Northbound	E (60)	F (100)
	South Shades Crest Road Southbound	E (64)	F (149)
	Overall Intersection	E (62)	F (121)
Learning Lane/Brock's Gap Parkway at Stadium Trace Parkway	Brock's Gap Parkway Eastbound	F (104)	E (64)
	Learning Lane Westbound	E (75)	D (41)
	Stadium Trace Parkway Northbound	F (126)	D (46)
	Stadium Trace Parkway Southbound	F (113)	D (49)
	Overall Intersection	F (108)	D (49)
Alabama Highway 150 at Lake Cyrus Boulevard	Alabama Highway 150 Eastbound	C (28)	C (32)
	Alabama Highway 150 Westbound	C (28)	C (24)
	Lake Cyrus Boulevard Northbound	D (36)	D (37)
	Everlee Parkway Southbound	C (25)	C (32)
	Overall intersection	C (28)	C (29)
Alabama Highway 150 at Parkwood Road	Alabama Highway 150 Eastbound	A (0)	A (0)
	Alabama Highway 150 Westbound	A (2)	B (3)
	Parkwood Road Northbound	B (14)	C (18)
	Maxwell Lake Road Southbound	C (16)	C (19)

Table 8
2045 Future Intersection Levels of Service (continued)

New Interchange – Alternate 1 (Diverging Diamond)

<i>Intersection</i>	<i>Approach</i>	<i>Level of Service (Delay, in seconds)</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Ross Bridge Extension North Crossover	Ross Bridge Extension Northbound	A (6)	A (6)
	Ross Bridge Extension Southbound	A (6)	A (6)
	Overall Intersection	A (6)	A (6)
Ross Bridge Extension South Crossover	Ross Bridge Extension Northbound	A (8)	B (11)
	Ross Bridge Extension Southbound	A (7)	A (7)
	Overall Intersection	A (8)	A (7)
Ross Bridge Extension Northbound at I-459 NB Exit Left Turn	Interstate 459 Northbound Ramp – Left Turn	B (10)	A (10)
Ross Bridge Extension Northbound at I-459 SB Exit Right Turn	Interstate 459 Southbound Ramp – Right Turn	A (10)	B (11)
Ross Bridge Extension Southbound at I-459 NB Exit Right Turn	Interstate 459 Northbound Ramp – Right Turn	B (11)	B (11)
Ross Bridge Extension Southbound at I-459 SB Exit Left Turn	Interstate 459 Southbound Ramp – Left Turn	C (20)	D (28)

New Interchange – Alternate 2 (Tight Diamond)

<i>Intersection</i>	<i>Approach</i>	<i>Level of Service (Delay, in seconds)</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Ross Bridge Extension at I-459 Northbound Ramps	I-459 NB Exit Ramp Eastbound	B (10)	B (17)
	Ross Bridge Extension Northbound	B (13)	B (14)
	Ross Bridge Extension Southbound	A (4)	A (7)
	Overall Intersection	B (11)	B (11)
Ross Bridge Extension at I-459 Southbound Ramps	I-459 SB Exit Ramp Westbound	C (30)	C (24)
	Ross Bridge Extension Northbound	A (7)	A (10)
	Ross Bridge Extension Southbound	B (15)	B (19)
	Overall Intersection	B (19)	C (20)

**Table 9
2045 Future Roadway Segment Levels of Service**

Roadway	From	To	Direction of Travel	Configuration	Level of Service	
					AM Peak	PM Peak
Interstate 459	Morgan Road	Ross Bridge Extension	Northbound	Freeway	C	D
			Southbound	Freeway	B	D
	Ross Bridge Extension	Alabama Highway 150	Northbound	Freeway	D	D
			Southbound	Freeway	C	E
	Alabama Highway 150	U. S. Highway 31	Northbound	Freeway	E	E
			Southbound	Freeway	D	F
Alabama Highway 150	I-459	South Shades Crest Road	Eastbound	Multi-Lane	B	B
			Westbound	Multi-Lane	B	C
	South Shades Crest Road	Shades Creek	Eastbound	Multi-Lane	A	A
			Westbound	Multi-Lane	A	B
Morgan Road	South Shades Crest Road	I-459	Northbound	Multi-Lane	B	B
			Southbound	Multi-Lane	A	B
Stadium Trace Parkway	Alabama Highway 150	Brock's Gap Parkway	Northbound	Multi-Lane	C	C
			Southbound	Multi-Lane	D	C
	Brocks Gap Parkway	Fleming Parkway	Northbound	Multi-Lane	B	B
			Southbound	Multi-Lane	C	A
Ross Bridge Parkway	Alabama Highway 150	Deer Trail Road	Northbound	Multi-Lane	A	B
			Southbound	Multi-Lane	C	B
Shades Crest Road	Sulphur Springs Road	Alabama Highway 150	N/A	Two-Lane	C	C
South Shades Crest Road	Alabama Highway 150	Brock's Gap Parkway	N/A	Two-Lane	E	E
	Brock's Gap Parkway	Willow Lake Drive	N/A	Two-Lane	F	F
Ross Bridge Parkway Extension	Alabama Highway 150	I-459	Northbound	Multi-Lane	A	A
			Southbound	Multi-Lane	A	A
	I-459	South Shades Crest Road	Northbound	Multi-Lane	B	A
			Southbound	Multi-Lane	A	B

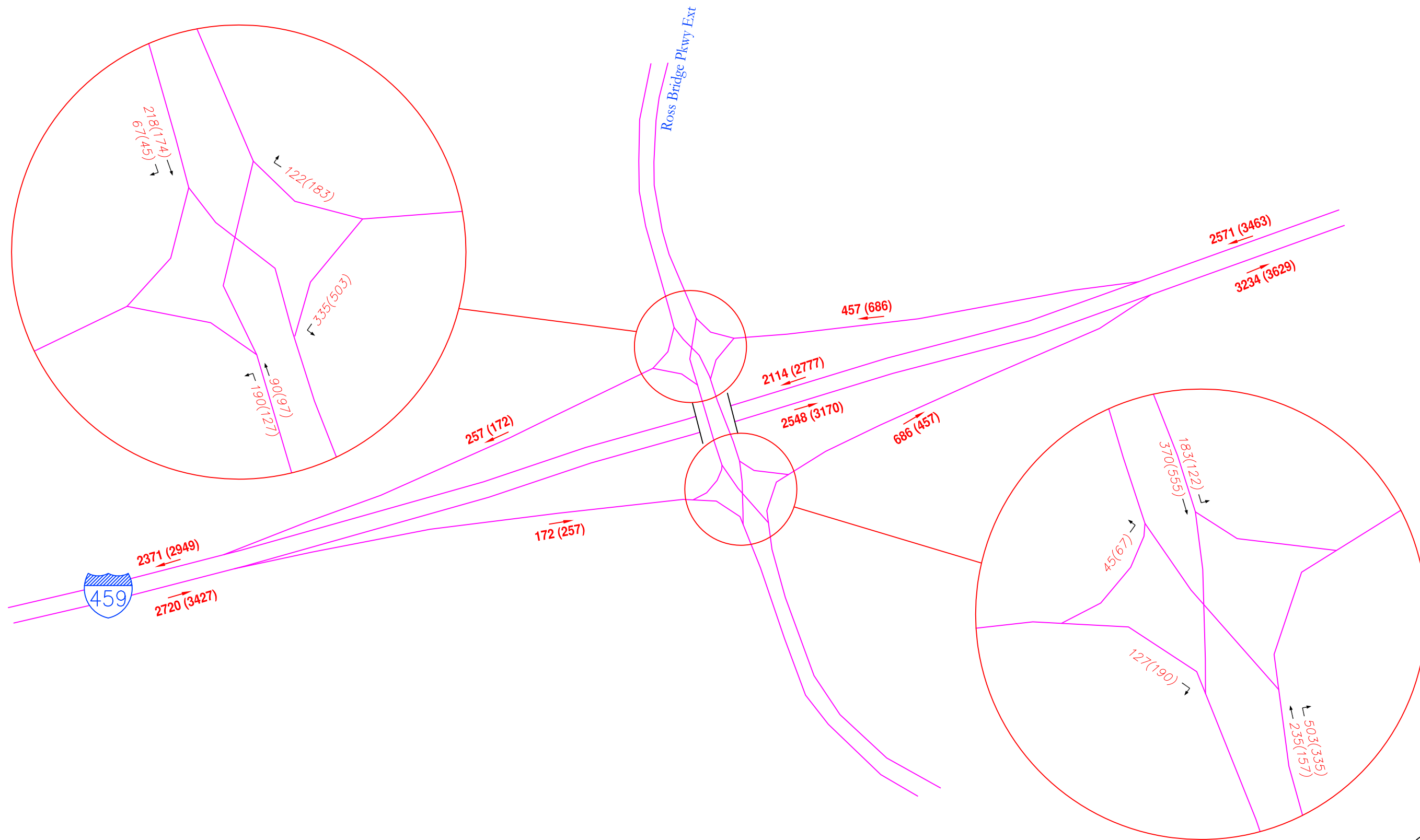
Table 10
2045 Future Ramp Junction Levels of Service

<i>Freeway</i>	<i>Ramp</i>	<i>Level of Service</i>	
		<i>AM Peak</i>	<i>PM Peak</i>
Interstate 459 Northbound	I-459 Northbound Exit Ramp to AL Hwy 150	D	E
	I-459 Northbound Entrance Ramp from AL Hwy 150	E	E
	I-459 Northbound Exit Ramp to Ross Bridge Parkway Extension	D	D
	I-459 Northbound Entrance Ramp from Ross Bridge Parkway Extension	D	D
	I-459 Northbound Exit Ramp to Morgan Road	E	F
	I-459 Northbound Entrance Ramp from Morgan Road	E	F
Interstate 459 Southbound	I-459 Southbound Exit Ramp to AL Hwy 150	E	F
	I-459 Southbound Entrance Ramp from AL Hwy 150	C	D
	I-459 Southbound Exit Ramp to Ross Bridge Parkway Extension	D	D
	I-459 Southbound Entrance Ramp from Ross Bridge Parkway Extension	B	C
	I-459 Southbound Exit Ramp to Morgan Road	C	D
	I-459 Southbound Entrance Ramp from Morgan Road	C	D

2023 and 2043 Analysis of Diverging Diamond

Additional analyses were performed for the proposed Diverging Diamond interchange at Ross Bridge Parkway Extension (Alternate 1) to determine if traffic operations would be acceptable in the years 2023 and 2043. Traffic modeling was performed to determine projected a.m. and p.m. peak hour traffic volumes for the proposed Diverging Diamond interchange for the years 2023 and 2043. The projected traffic volumes are shown in Figures 14 and 15. The projected volumes include intersection turning movement traffic volumes, ramp volumes, and I-459 mainline traffic volumes.

Capacity analyses were performed for a.m. and p.m. peak hour conditions for the years 2023 and 2043 for the intersections and ramp junctions associated with the Diverging Diamond. The results of the intersection capacity analyses are shown in Table 11. The results of the ramp junction capacity analyses are shown in Table 12.



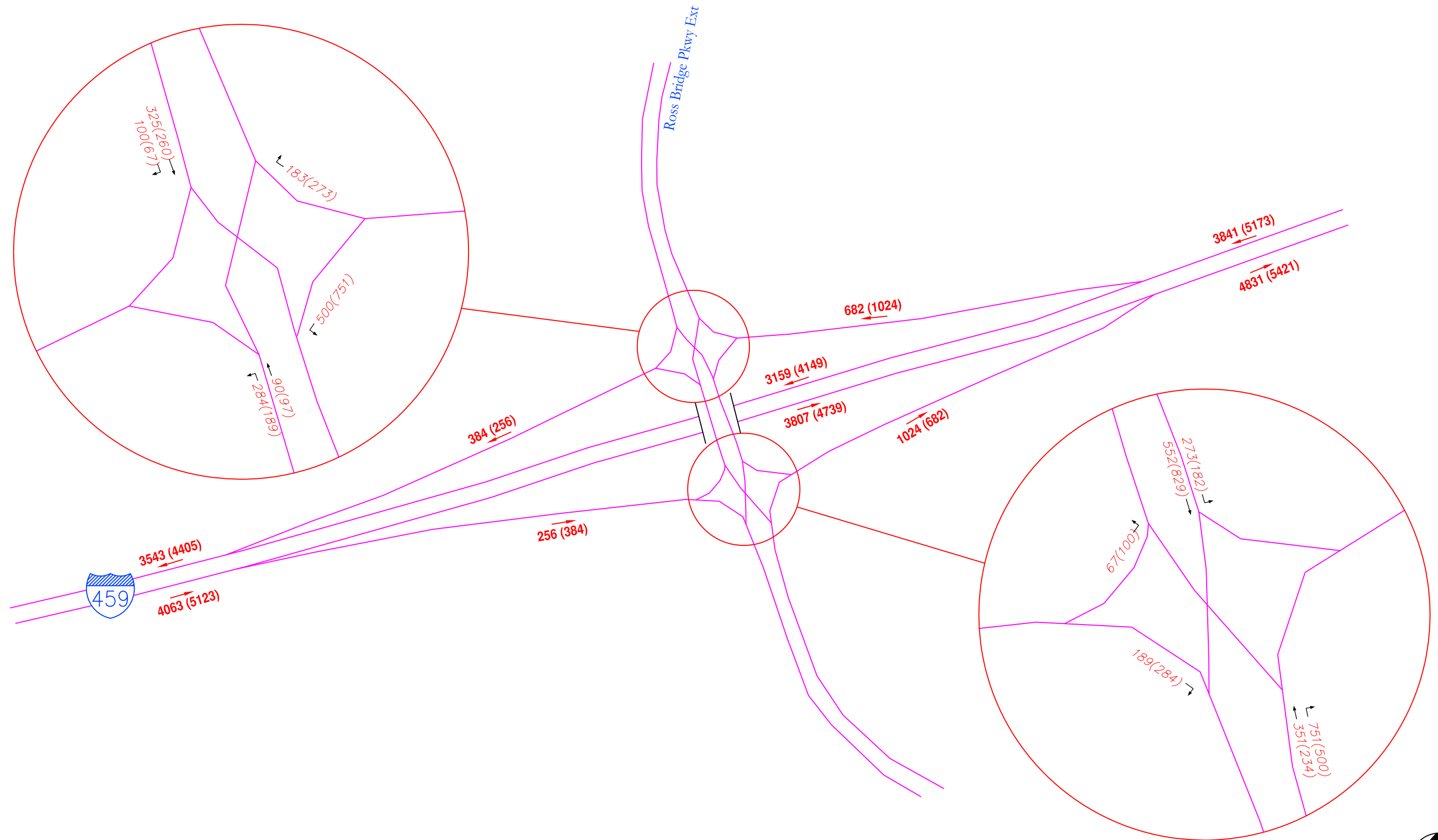
Legend
 INTERSTATE
 STATE ROUTE
 COUNTY ROAD
AM Peak (PM Peak)






Figure 14 - 2023 Build Peak Hour Traffic Volumes

South Shades Crest IJS - Hoover, Alabama

September 2022



Legend

-  INTERSTATE
-  STATE ROUTE
-  COUNTY ROAD

AM Peak (PM Peak)



North
Scale: n.t.s



Figure 15 - 2043 Build Peak Hour Traffic Volumes

South Shades Crest IJS - Hoover, Alabama

September 2022

Table 11
2023 and 2043 Future Intersection Levels of Service
New Interchange – Alternate 1 (Diverging Diamond)

<i>Intersection</i>	<i>Approach</i>	<i>2023</i>		<i>2043</i>	
		<i>Level of Service (Delay, in seconds)</i>		<i>Level of Service (Delay, in seconds)</i>	
		<i>AM Peak</i>	<i>AM Peak</i>	<i>AM Peak</i>	<i>PM Peak</i>
Ross Bridge Extension North Crossover	Ross Bridge Extension Northbound	A (6)	A (6)	A (6)	A (6)
	Ross Bridge Extension Southbound	A (6)	A (6)	A (6)	A (6)
	Overall Intersection	A (6)	A (6)	A (6)	A (6)
Ross Bridge Extension South Crossover	Ross Bridge Extension Northbound	A (6)	A (8)	A (8)	B (11)
	Ross Bridge Extension Southbound	A (7)	A (6)	A (7)	A (6)
	Overall Intersection	A (7)	A (6)	A (7)	A (7)
Ross Bridge Extension Northbound at I-459 NB Exit Left Turn	Interstate 459 Northbound Ramp – Left Turn	A (10)	A (9)	B (10)	A (10)
Ross Bridge Extension Northbound at I-459 SB Exit Right Turn	Interstate 459 Southbound Ramp – Right Turn	A (9)	A (10)	A (10)	B (10)
Ross Bridge Extension Southbound at I-459 NB Exit Right Turn	Interstate 459 Northbound Ramp – Right Turn	B (10)	B (12)	B (11)	B (12)
Ross Bridge Extension Southbound at I-459 SB Exit Left Turn	Interstate 459 Southbound Ramp – Left Turn	B (12)	B (12)	C (19)	C(25)

Table 12
2023 and 2043 Future Ramp Junction Levels of Service
New Interchange – Alternate 1 (Diverging Diamond)

Freeway	Ramp	2023 Level of Service		2043 Level of Service	
		AM Peak	PM Peak	AM Peak	PM Peak
Interstate 459 Northbound	I-459 Northbound Exit Ramp to Ross Bridge Parkway Extension	C	C	D	D
	I-459 Northbound Entrance Ramp from Ross Bridge Parkway Extension	B	B	D	D
Interstate 459 Southbound	I-459 Southbound Exit Ramp to Ross Bridge Parkway Extension	C	C	D	D
	I-459 Southbound Entrance Ramp from Ross Bridge Parkway Extension	B	B	B	C

CONCLUSION

This study was undertaken to support a request made to the Alabama Department of Transportation and the Federal Highway Administration for approval to construct a new interchange on Interstate 459 in the vicinity of the existing South Shades Crest Road overpass in the City of Hoover (Jefferson County), Alabama. The study involved an analysis of the alternatives to providing improved transportation services in the vicinity of the interchange. Basic to the proposed improvement alternatives is the construction of a new median-divided roadway between Alabama Highway 150 and South Shades Crest Road (known as Ross Bridge Extension) which would provide access to the new interchange with I-459. The study was undertaken in accordance with the current Federal Highway Administration policy for granting new and modified access to the Interstate system. The key findings of this report are addressed in the following paragraphs.

Existing and Forecasted Traffic Congestion. The key intersections, roadway segments, and ramp junctions at the interchanges of Interstate 459 and Morgan Road and Alabama Highway 150 are currently experiencing delay and congestion as evidenced by the capacity analyses tables and observations. Also, the existing intersection of Alabama Highway 150 at Shades Crest Road/South Shades Crest Road is currently experiencing congestion and unacceptable delays. These conditions are anticipated to continue into the future and further deteriorate as growth continues in the area. Construction of a new interchange on Interstate 459 in the vicinity of the South Shades Crest Road overpass is needed based on current and projected traffic volumes in the vicinity.

Operational Assessment of Alternatives. Federal Highway Administration requirements for preparation of an interchange justification study require that all reasonable alternatives to the proposed interchange be examined. Two alternatives were developed to address the capacity and mobility deficiencies:

- Alternate 1 – Diverging Diamond Interchange (DDI) at Ross Bridge Parkway Extension
- Alternate 2 – Tight Diamond Interchange at Ross Bridge Parkway Extension

The alternatives were assessed based on their ability to provide acceptable traffic operations for future year conditions. Three types of assessments were performed: intersection levels of service, roadway segment levels of service, and ramp junction levels of service. Comparing the levels of service for each of these assessments for each alternative result in the following conclusions:

- For the proposed interchange, all ramp junctions with Interstate 459 operate at adequate levels of service.
- For the proposed interchange, the roadway segments of Ross Bridge Parkway Extension both north and south of Interstate 459 operate at a level of service “A” or “B”.
- For the proposed interchange, the intersections of Ross Bridge Parkway with the entrance and exit ramps operate at adequate levels of service regardless of the alternative analyzed.

Capacity Benefits. The proposed construction of a new interchange on Interstate 459 in the vicinity of the South Shades Crest Road overpass has significant positive impacts on the capacity and operations of multiple intersections, roadway segments, and ramp junctions within the study area, which can be seen by comparing the 2045 Existing Plus Committed capacity

analyses with the 2045 Future capacity analyses with the proposed interchange in place. Significant improvement is expected to be experienced at the following intersections:

- Alabama Highway 150 at the Interstate 459 Northbound and Southbound ramps
- Alabama Highway 150 at Shades Crest Road/South Shades Crest Road
- Morgan Road at Parkwood Road/Greenmor Drive
- Morgan Road at the Interstate 459 Northbound and Southbound ramps

Significant improvement is expected to be experienced on the following roadway segments:

- Alabama Highway 150 between South Shades Crest Road and Interstate 459
- Morgan Road between South Shades Crest Road and Interstate 459
- Stadium Trace Parkway between Brocks Gap Parkway at Alabama Highway 150

Significant improvement is expected to be experienced at the following ramp junctions:

- The Interstate 459 Northbound entrance ramp from Morgan Road
- The Interstate 459 Southbound entrance ramp from Morgan Road

Mobility Benefits. The proposed construction of a new interchange on Interstate 459 in the vicinity of the South Shades Crest Road overpass was developed with an area-wide roadway network improvement focus. The findings of this study are that the current programmed roadway improvements do not fully address current and projected roadway deficiencies. The results of this study show that proposed construction of an interchange at Interstate 459 near South Shades Crest Road will relieve traffic in other congested areas, such as on Alabama Highway 150 and at the Interstate 459 interchange with Morgan Road. This is evident because

of the significant residential areas and other developments which will be afforded more direct access to the Interstate system by the proposed interchange, including:

Residential Areas

- Russett Woods
- Brock's Gap
- Lake Crest
- Willow Lakes
- Lake Cyrus
- Wilborn Lakes
- Ross Bridge
- Blackridge
- Everlee

Transportation Planning. The proposed interchange at Interstate 459 and South Shades Crest Road is not included in the *2045 Birmingham Area Long Range Transportation Plan*. It is recognized that the project must be included in the Birmingham Metropolitan Planning Organization's Long Range Transportation Plan prior to final approval. A funding source must be identified in order for the project to be included in the Long Range Transportation Plan.

Preferred Alternative. While the selection of a preferred alternative must and should be deferred until the required NEPA environmental documentation is completed, the study can draw certain conclusions as to alternatives which are more or less preferable from a traffic operations standpoint. Based on capacity analyses, it can be concluded that Alternative 1 (Diverging Diamond interchange) has better traffic performance at the ramp junctions with Ross Bridge Parkway Extension as compared to Alternative 2 (Tight Diamond interchange).

Statement of Need. The analysis of current and future traffic volumes for the area roadway network and intersections clearly demonstrates the need for construction of an interchange on Interstate 459 in the vicinity of south Shades Crest Road. Therefore, it is recommended that the Alabama Department of Transportation concur with the findings of this study. This recommendation is based on the facts that the adjacent interchanges on Interstate 459 currently operate at inadequate levels of service, and will continue to worsen in the future. In addition, the proposed interchange has demonstrable mobility benefits for a significant region of southwest Jefferson County and northwest Shelby County.