U.S. Highway 280 Alternatives Analysis and Visualization

Conducted for the
The Regional Planning Commission of Greater Birmingham

By

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16. Abstract

The Regional Planning Commission of Greater Birmingham (RPCGB), with coordination from Progress 280 and the Alabama Department of Transportation (ALDOT), initiated the current study to utilize microscopic traffic simulation to examine the effects of various alternatives on traffic flow along the U.S 280 corridor. A total of seven alternatives were analyzed. The alternatives are categorized into the following scenarios: existing conditions, urban interchange alternatives, parallel corridor alternative, at-grade improvements alternative and transit alternative. The results showed that high quality facilities such as urban interchanges improved flow along some sections of the corridor and exacerbated existing problems in other sections. Alternatives to reduce the traffic demand on U.S. 280 (parallel corridor and transit) were shown to have negligible effects on traffic operations throughout the corridor as a whole. Similarly, at-grade improvements at intersections along the corridor were to result in little corridor-level improvements. Ultimately, the results indicated that a combination of additional lanes and at-grade improvements at various locations along the corridor would yield the most travel time savings throughout the corridor. The project also showcased the use of the microscopic traffic simulation package AIMSUN and its 3-D animation capabilities.

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Executive Summary

U.S. Highway 280 is a principal arterial serving both suburban development in southeast Jefferson County and northeast Shelby County and regional traffic to and from southeast Alabama (Alexander City, Auburn, Opelika, Phenix City, etc.). The segment of U.S. 280 between the E.B. Stephens Expressway and Hugh Daniel Drive is a densely developed suburban retail corridor with direct access to large residential communities. As such it currently exhibits congested traffic during much of the day. Recent traffic counts recorded an average daily traffic (ADT) in the vicinity of the I-459 interchange of over 70,000 vehicles per day on a six lane facility. A previous traffic engineering study found that nearly half of the signalized intersections on this segment operate at or near capacity during peak hours (Sain, 2001). There have been numerous discussions in recent years about upgrading U.S. 280 in order to improve traffic flow and reduce delays, including recent proposals to widen it to eight lanes or construct urban interchanges at key intersections and make it a limited access facility. At present, however, there is no consensus regarding what course of action should be taken. Contributing to the lack of direction is the fact that there has been no systematic evaluation of these proposals and the impacts they would have on the corridor as a whole.

The Regional Planning Commission of Greater Birmingham, with coordination from Progress 280 and the Alabama Department of Transportation, initiated the current study to utilize microscopic traffic simulation to examine the effects of various alternatives on traffic flow along the U.S 280 corridor. A total of seven alternatives were analyzed. The alternatives are categorized into the following categories of scenarios:

- Existing conditions;
- Urban Interchange Alternatives;
- Parallel Corridor Alternative;
- Transit Alternative; and
- At-grade Improvements Alternative.

The seven scenarios were analyzed using AIMSUN, a traffic simulation model. The results for the analyses are presented in the form of two common traffic operation measures of effectiveness (MOE), travel time and delay. Each MOE was generated for several "paths" along the corridor to show how each scenario would impact the AM peak hour commute from several points along the corridor. For summary purposes, sample travel times for each scenario are presented in Table E-1. The changes in travel time were determined by simply subtracting the travel time projected for the new scenarios from that estimated for the existing scenario. They are shown in Table E-2. In cases where the travel time increases, the travel time reduction is reported as a negative value.

Table E-1. Projected AM peak travel time (minutes)

From	Scenario					
	Existing	4-Lane UI	6-Lane UI	Grants Mill	BRT	At-grade
Inbound at Hugh Daniel Drive to E.B. Stephens Expressway	34:52	39:33	27:47	36:33	33:55	32:28
Inbound at Hugh Daniel Drive to I-459	23:30	16:14	7:57	24:27	22:00	23:42
I-459 to E.B. Stephens Expressway	11:22	23:19	19:50	12:06	12:11	8:46

Table E-2. Projected AM peak travel time savings (minutes)

From	Scenario				
	4-Lane UI	6-Lane UI	Grants Mill	BRT	At-grade
Inbound at Hugh Daniel Drive to E.B. Stephens Expressway	-4:41	7:05	-1:41	0:57	2:24
Inbound at Hugh Daniel Drive to I-459	7:16	15:33	-0:57	1:30	-0:12
I-459 to E.B. Stephens Expressway	-11:57	-8:28	-0:44	-0:33	2:36

Based on the analysis presented herein, the following conclusions are offered:

Urban Interchange Alternative

- The U.S. 280 corridor between Hugh Daniel Drive and E.B. Stephens Expressway functions as two distinct sections: Hugh Daniel Drive to I-459 and I-459 to the E.B. Stephens Expressway. There exist considerable operational differences between these two sub-corridor sections. The Hugh Daniel Drive to I-459 segment is a congested suburban corridor with densely-spaced intersections and driveways. These side streets and other access points generate considerable turning volumes that must be accommodated in addition to the through traffic on U.S. 280. These heavy turning volumes result in significant choke points at existing major intersections along the segment (Meadow Brook Parkway, Valleydale Road, Inverness Parkway, etc.) The close spacing of these over-saturated signalized intersections has a cumulative impact on traffic as queues from downstream intersections interfere with upstream operations. Traffic operations on the I-459 to E.B. Stephens Expressway section are less dense and consist mostly of through traffic and commuter traffic entering the corridor in the direction of peak flow. The operational problems on this section are confined to a couple of key choke points (Rocky Ridge Road and the E. B. Stephens Expressway).
- Construction of urban interchanges (4 or 6 lane) between Hugh Daniel Drive and I-459 would significantly improve operations and reduce AM peak hour inbound travel times to the I-459 interchange.
- Construction of the ten proposed urban interchanges (4 or 6 lane) would not significantly improve AM peak hour inbound travel times from points west of I-459 to the E.B. Stephens Expressway. Any benefits associated with increased capacity (flow) on U.S. 280 would be negated by operational limitations of the interchange at the E.B. Stephens Expressway and heavy merges created at Dolly Ridge Road and Rocky Ridge Road.

Parallel Corridor Alternative

- No significant travel time benefits are associated with an improved Grants Mill Road as an alternative corridor to U.S. 280. In fact, some of the path travel times are shown to increase slightly. It should be noted here that no increase in travel times or delays would actually be expected to result from the parallel corridor scenario. The variation in MOE values is within the range of that associated with random variation inherent to the modeling process.

Transit Alternative

- Implementation of bus rapid transit (BRT) would result in some travel time improvement on side street approaches that are directly served by BRT stations. There is little travel time benefit for the corridor as a whole. It is worth noting at this point that the projected BRT ridership (and subsequent reduction in vehicle trips and travel times) is a function of the land uses and transit accessibility along the corridor. Benefits of regional transit systems should be viewed a system-wide and not judged on the basis of individual corridor performance.

At-grade Improvements Alternative

- The results indicate that the at-grade improvements scenario offers no travel time savings between Hugh Daniel Drive and I-459 (in fact, travel times appear to increase slightly). This is primarily due to the creation of a new choke point at Cahaba Park Circle. The additional turning movements at this intersection resulting from the proposed improvements require additional signal phases and more of the available cycle length to be used to serve side street traffic. Thus, less green-time is available for U.S. 280 traffic. Also, the side streets upstream of Cahaba Park Circle are being "served" more efficiently due to the intersection improvements allowing side street traffic to enter the mainline traffic more rapidly and adding to existing queues and congestion levels on U.S. 280.

An additional through lane in each direction on U.S. 280 was also modeled. The analysis was cursory and was done for comparison purposes. The simulation analyses indicated that the eight-lane scenario would result in a travel time from Hugh Daniel Drive to the E.B. Stephens Expressway of approximately 22 minutes. Therefore, the projected travel time savings between Hugh Daniel drive to the E.B. Stephens Expressway would be about 13 minutes. The eight-lane scenario did not assume any additional improvements west of I-459. As such travel times from I-459 inbound remained unchanged and the overall travel time for the corridor (Hugh Daniel Drive to E.B. Stephens Expressway) improved only slightly. Additional improvements in this section of the corridor would be needed to improve overall travel times. In particular, the inclusion of access management concepts into the widening of U.S. 280 would be essential to preserving the benefits gained by adding another through lane.

Section 1
Introduction

1.1. Background

U.S. Highway 280 is a principal arterial serving both suburban development in southeast Jefferson County and northeast Shelby County and regional traffic to and from southeast Alabama (Alexander City, Auburn, Opelika, Phenix City, etc.). The segment of U.S. 280 between the E.B. Stephens Expressway and Hugh Daniel Drive is a densely developed suburban retail corridor with immediate access to large residential communities. As such it currently exhibits congested traffic during much of the day. Recent traffic counts recorded an average daily traffic (ADT) in the vicinity of the I-459 interchange of over 70,000 vehicles per day on a six lane facility. A previous traffic engineering study found that nearly half of the signalized intersections on this segment operate at or near capacity during peak hours (Sain, 2001). There have been numerous discussions in recent years about upgrading U.S. 280 in order to improve traffic flow and reduce delays, including recent proposals to widen it to eight lanes or construct urban interchanges at key intersections and make it a limited access facility. At present, however, there is no consensus regarding what course of action should be taken. Contributing to the lack of direction is the fact that there has been no systematic evaluation of these proposals and the impacts they would have on the corridor as a whole.

1.2. Purpose & Scope

The Regional Planning Commission of Greater Birmingham (RPCGB), with coordination from Progress 280 and the Alabama Department of Transportation (ALDOT), initiated the current study to utilize microscopic traffic simulation to examine the effects of various alternatives on traffic flow along the U.S 280 corridor. A schematic of the corridor showing major intersections is presented in Figure 1-1. The alternatives analyzed are categorized into the following categories of scenarios:

- Urban Interchange Alternatives;
- Parallel Corridor Alternative;
- At-grade Improvements Alternative; and
- Transit Alternative.

Each of the scenarios is described in Section 3. A comparison of the scenarios is presented in Section 4. Additionally, 3-dimensional (3-D) visualizations of the proposed urban interchange at SR 119 were developed. Example 3-D images are presented in Section 5.

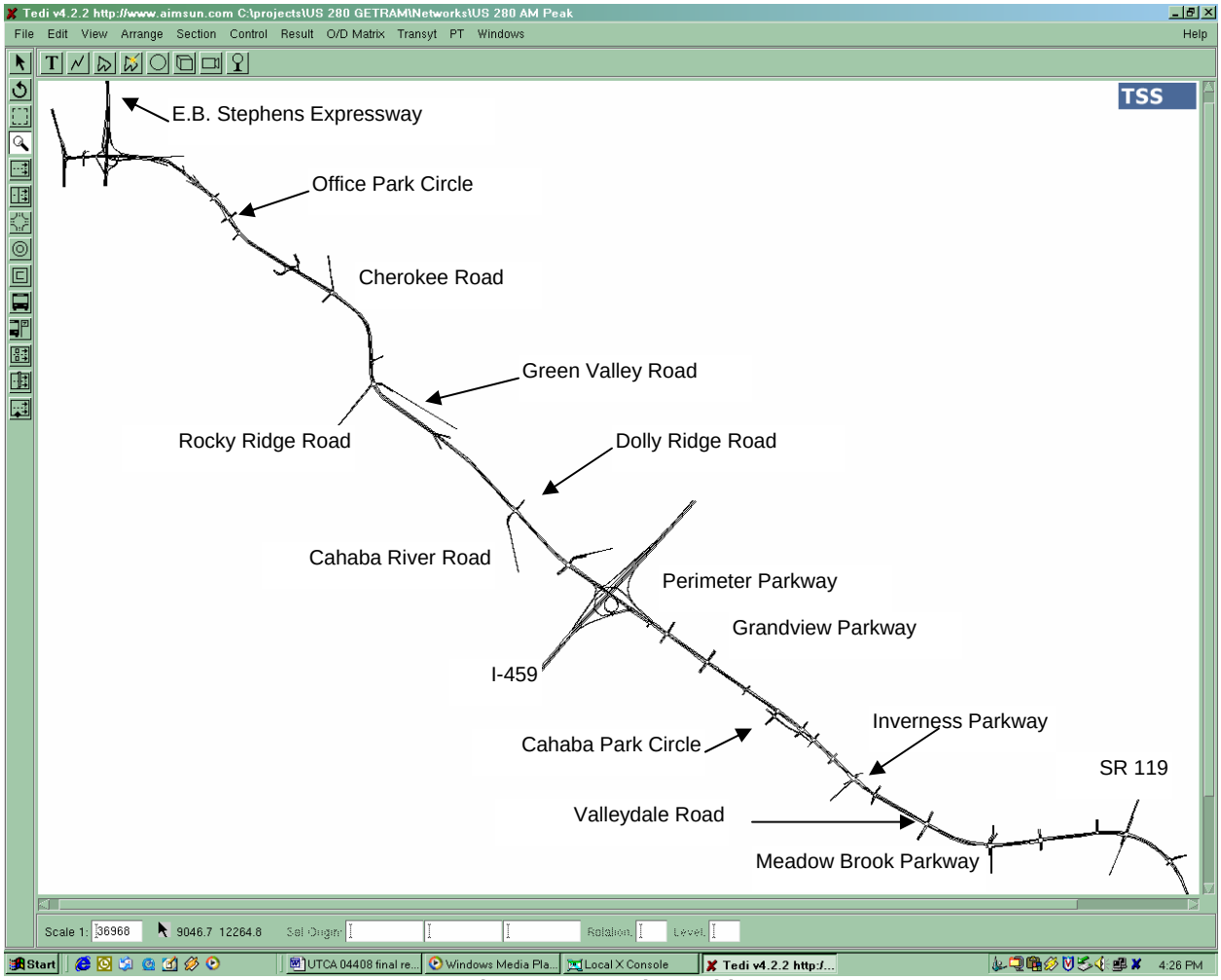

Figure 1-1. Study corridor

Section 2
Methodology

2.1. Data Collection

The base data used for the present study had been collected and analyzed by Sain Associates, Inc. during the latest signal system re-timing project (Sain, 2001). At the time of the present analysis, however, the traffic data was approximately three years old. To account for this, all traffic volumes were factored up by an annual growth rate (AGR) of 4% for three years. Also, additional turning movement counts were collected as necessary to account for land use changes that have significantly affected traffic patterns (e.g., the addition of a Target Superstore at Riverview Road, a Wal-Mart Supercenter north of AL 119, and expansion of The Summit Shopping Center).

2.2. Simulation

Traffic simulation models are a very useful tool for evaluating the types of improvements being considered on U.S. 280. They offer advantages over traditional capacity analysis techniques in that they can model the combined effects of a variety of improvements ranging from urban interchanges to access management techniques. They also more-accurately reflect certain aspects of traffic operations, such as the effects of closely spaced signals, signal coordination, and vehicle queuing. One of the most attractive features of traffic simulation models for the current project is their ability to generate detailed summaries of delay, travel speeds, and estimated travel times for the entire corridor, allowing detailed comparisons of alternatives. The travel time and travel speed outputs are particularly useful when presenting the findings to the public, as these measures of effectiveness (MOEs) are much more meaningful to the average commuter than are levels of service or volume/capacity ratios. Finally, the animations generated by these models can be used in presentations to allow the public (citizens and decision makers) to visualize the impacts associated with particular improvements.

2.2.1. Selecting a Simulation Package

There are numerous microscopic traffic simulations available. Considerable consideration was given to the selection of AIMSUN for the present study. AIMSUN has capabilities similar to other simulation packages. Some functions (e.g., gap acceptance for turning vehicles), however, are treated more realistically in AIMSUN. Other differences include the ability of AIMSUN to utilize origin-destination data and perform dynamic traffic assignment (GETRAM, 2002; Sullivan et al., 2004; Jones et al. 2004). Although not used in the current analyses, now that the AIMSUN model for U.S. 280 has been built, these capabilities can be used in future analyses of the corridor. Future analyses could include responses to land use changes, roadway construction and intelligent transportation (ITS) applications (driver response to traffic information displayed

on dynamic messages signs). Finally, AIMSUN has the ability to generate 3-D animations. For these reasons, AIMSUN was deemed most appropriate for the present study.

2.2.2. Coding

The data initially input represented existing AM peak hour conditions. Once the existing conditions were calibrated, validated and the results deemed satisfactory, the input data were varied to represent the different scenarios analyzed as alternatives. The following data was input into AIMSUN:

- Physical conditions (number of lanes, lane usage, length and width dimensions, grades, curvature, and speed limits);
- AM peak hour traffic conditions (entry volumes, vehicle mix, intersection turning movement percentages); and
- AM peak hour traffic control parameters (channelization, signal timing and coordination data, detector locations and function, speeds)

Detailed information regarding the data input for each of the scenarios analyzed is presented in Section 3.

2.2.3. Validation and Calibration

Microsimulation models use various algorithms and driver behavior models to simulate the movement of individual vehicles on a network. Each vehicle that enters the network is assigned a vehicle type (auto, truck, bus, or carpool) and corresponding vehicle performance characteristics (acceleration, deceleration, speed, and turning characteristics). It is also assigned driver characteristics (ranging from aggressive to cautious), giving each vehicle a unique and realistic performance profile that it maintains while traveling through the network. The position and speed of each vehicle on the network is updated once per second based on its own performance and driver characteristics, the actions of vehicles around it, roadway properties, and traffic control devices. Thus the interaction of vehicle to vehicle, vehicle to road, and vehicle to control devices are modeled accurately for each simulation. Default vehicle and driver characteristics can also be modified to better reflect actual traffic conditions for a given scenario.

Once a vehicle is assigned performance and driver characteristics, its movement through the network is determined by three primary algorithms:

- Car following;
- Lane changing; and
- Gap Acceptance.

There are other algorithms which influence vehicle behavior, such as those which govern queue discharge and traffic signal control, but car following, lane changing, and gap acceptance are the most important and are common to all traffic simulation models.

All simulation models, no matter how carefully coded, must be calibrated to make sure they accurately reflect real-world conditions. Because driver behavior is so variable, even the best models can produce results very different from what is actually observed in the field and therefore must be inspected closely. For the U.S. 280 simulation model, the outputs of the model were carefully compared with traffic conditions observed during the AM peak hour (7:00 AM to 8:00 AM). Observations on U.S. 280 were made over a period of several months (non-summertime) in 2004, most recently after the completion of the ALDOT project to upgrade the signals in November 2004. Observations included measuring travel times between major intersections, travel speeds, and the extents of vehicle queues on both the mainline and side streets.

Typically when calibrating a model, a first pass is made to ensure that the model is in fact replicating the observed traffic volumes at each intersection. Volumes that vary significantly from observations usually indicate errors in the model and must be addressed. Once good agreement between the U.S. 280 traffic counts and the simulated volumes was achieved, the model was further calibrated to reflect observed traffic conditions.

One of the parameters used to make an initial calibration of the model was vehicle queuing. During the AM peak there are several choke points along 280 that create very long vehicle queues. Although queues develop at almost all intersections during the morning peak, the major ones occur:

- east of AL 119 coming down Double Oak Mountain;
- from Inverness Parkway east through Valleydale and Brook Highland;
- from Grandview Parkway east through Riverview Road; and
- from Rocky Ridge Road east to Dolly Ridge Road.

Vehicle discharge headways and simulated signal operation were adjusted to replicate the queues and delays experienced by motorists traveling through these intersections. The discharge headway is the rate at which vehicles start up and leave an intersection (e.g., after a light turns green). This can vary significantly based on roadway grade, congestion, truck traffic, and the proximity of adjacent signals and was adjusted in the models to reflect observed conditions on 280. Another behavior important to simulation models (and one typically not modeled well) is red light running, of which there is plenty on 280 during peak periods. Red light running affects queue lengths and discharge headways and had to be accounted for at key intersections through signal operation and headway parameters.

Special attention was also paid to merge areas along the corridor. There are several significant merging areas along U.S. 280, namely:

- Brook Highland Parkway westbound onto U.S. 280;
- I-459 northbound to U.S. 280 eastbound;
- I-459 southbound to U.S. 280 westbound; and
- Lakeshore Drive to U.S. 280 eastbound and westbound.

Merge areas are often a source of error for simulation models because of the complex driver behaviors involved. Each of these merge areas was carefully modeled in AIMSUN and then calibrated to real world conditions. Simulated speeds and queues in the merge areas were compared to speeds measured in the field and the driver behavior parameters were adjusted until a good match was achieved. Simulation models such as AIMSUN allow the user to modify key driver behavior parameters related to lane changing, such as when a driver will decide to make a lane change, how big a gap in traffic a driver requires for doing so, and what distance a driver requires in order to complete the maneuver. Each parameter was adjusted until there was reasonable agreement between model output and field measurements.

The lane changing parameters were even more important when evaluating the urban interchange alternatives, because each urban interchange creates four merge areas at the on/off ramps. In these cases, reasonable but conservative values for lane changing and merging behavior were used so as not to overestimate the capacity or performance of the interchanges.

Once agreement was achieved for the simulated volumes, queues, and merging behavior, a final check of travel times was performed. Changes were made to running speeds and some roadway geometrics to obtain simulated travel times in agreement with those observed in the field. Because there is day to day variation in traffic and travel times, the simulated travel times were adjusted until they were within approximately 5%-10% of observed averages. Table 2-1 shows a comparison of observed and simulated travel times between key intersections in the corridor. It should be noted that the travel times shown in this report are intended to reflect peak travel times on a typical day, excluding Fridays, holidays, and summer months.

Table 2-1. Travel time measurements used for simulation validation

Link		Travel Time	
From	**To**	**Observed**	**Simulated**
Hugh Daniel Drive	Inverness Parkway	10:50	11:18
Hugh Daniel Drive	I-459 SB Ramps	21:55	23:30
I-459 SB Ramps	Rocky Ridge Road	8:05	8:54
I-459 SB Ramps	E. B. Stephens Expressway	12:08	11:22
Hugh Daniel Drive	E. B. Stephens Expressway	34:03	34:52

Section 3
Alternative Scenarios

Including existing conditions, a total of seven scenarios were examined using AIMSIN. Each of the scenarios is briefly summarized in Table 3-1. Detailed discussion of each scenario is presented in Sections 3.2 through 3.6. Each scenario was simulated three to five times with all input parameters held constant expect for the random seed. This was done to validate the simulation of future conditions and to ensure that stochastic variation of internal simulation parameters (driver type, vehicle type, etc.) do not affect the results. The measures of effectiveness (MOEs) of the analyses were examined to ensure that there was no more than 5% variation among runs with different random seeds.

Table 3-1. Summary of scenarios analyzed

Scenario	Description	
	Volumes	**Roadway**
Existing	Existing AM Peak.	Existing geometric conditions.
4-Lane UI	Existing AM Peak.	Single-point urban interchanges (SPUI) with two-lanes in each direction on U.S. 280 at SR 119, Brook Highland, Valleydale Road, Inverness Parkway, Riverview Parkway, Grandview Parkway, Dolly Ridge Road, Green Valley/Rocky Ridge Road, Cherokee Road, Office Park Circle.
6-Lane UI	Existing AM Peak.	Single-point urban interchanges with three-lanes in each direction on U.S. 280 at SR 119, Brook Highland, Valleydale Road, Inverness Parkway, Riverview Parkway, Grandview Parkway, Dolly Ridge Road, Green Valley/Rocky Ridge Road, Cherokee Road, Office Park Circle.
Grants Mill	Existing AM Peak volumes with 3% traffic diverted to Grants Mill Road as a parallel alternative for the northern portion of the corridor from AL 119 to Valley Dale Road.	Improved three-lane Grants Mill Road connection between SR 119 and I-459 north of U.S 280.
BRT	Ridership estimates form the Birmingham Regional Transportation Alternatives Analysis (RPCGB, 2004) were used to estimate the reduction of traffic volumes entering the U.S. 280 corridor from key side streets.	Existing geometric conditions.
At-grade	Existing AM Peak. Some the geometric improvements resulted in the modification of traffic access to U.S. 280. In such cases, traffic was reassigned to the nearest (and most logical) remaining side street access to U.S. 280.	Various intersection improvements including construction of dual left-turn lanes and closures of gratuitous access points to U.S. 280.
8-Lane	Existing AM Peak.	An additional travel lane in each direction on U.S. 280 between Hugh Daniel Drive and I-459 was coded. This scenario also included the at-grade improvements coded into the previous scenario.

3.1. Existing Conditions Scenario

The existing conditions scenario represents the U.S. 280 corridor as it currently operates. All roadway geometries and operational parameters (signal phasing, timing, coordination, etc.) were

input into the simulation model as they currently exist[1]. As previously explained, the 2001 traffic volumes were factored up to 2004 levels and additional movements were coded as necessary. The traffic volumes entering from each of the key side streets along the corridor are presented in Table 3-2. Using the inputs described in this section, the existing conditions were modeled using AIMSUN. The results are reported in Section 4.

Table 3-2. Entering volumes at side streets for existing conditions scenario

Intersection	AM Peak Entering Volume (vph)	
	NB[2]	SB
Hugh Daniel Drive	-	606
SR 119	567	500
Brook Highland Parkway/Meadow Brook Road	526	950
Valleydale Road	630	375
Inverness Parkway	510	460
Riverview Parkway/Cahaba Park Circle	100	-
Grandview Parkway	27	93
Perimeter Parkway	158	51
The Summit	25	615
Dolly Ridge Road	1105	286
Green Valley Road/ Rocky Ridge Road	467	650
Cherokee Road	784	100
Lakeshore Drive	200	200
Office Park Circle	60	75

3.2. Urban Interchange Scenarios

The effects of urban interchanges along the U.S. 280 corridor were analyzed. For these analyses, ten single-point urban interchanges (SPUI) were assumed at the following locations and coded into the AIMSUN model:

- Office Park
- Cherokee Road
- Green Valley Road/Rocky Ridge Road
- Dolly Ridge Road/Cahaba River Road
- Grandview Parkway
- Riverview Parkway
- Inverness Parkway
- Valleydale Road
- Meadow Brook Road/Brook Highland Parkway
- SR 119.

No specific designs for urban interchanges at these locations currently exist. The interchanges coded into AIMSUN were done so using reasonable geometric assumptions. The general assumptions included 12' travel lanes for all movements and sufficient grade to accommodate minimum vertical clearances of 25' for all overpasses as specified by RPCGB.

[1] Includes through Phase 3 of the ALDOT plans for the I-459 interchange at U.S. 280.

[2] Movement directions assume U.S. 280 is oriented east-west.

Two geometric configurations were studied under the urban interchange scenario. The first consisted of a four-lane cross section of U.S. 280 (two lanes in each direction) at each interchange flanked by one-lane service roads. An example of this configuration is shown for the U.S 280 at SR 119 interchange in Figure 3-1. This configuration was modeled in attempt to "fit" the urban interchange scenario into the existing right-of-way of U.S. 280.

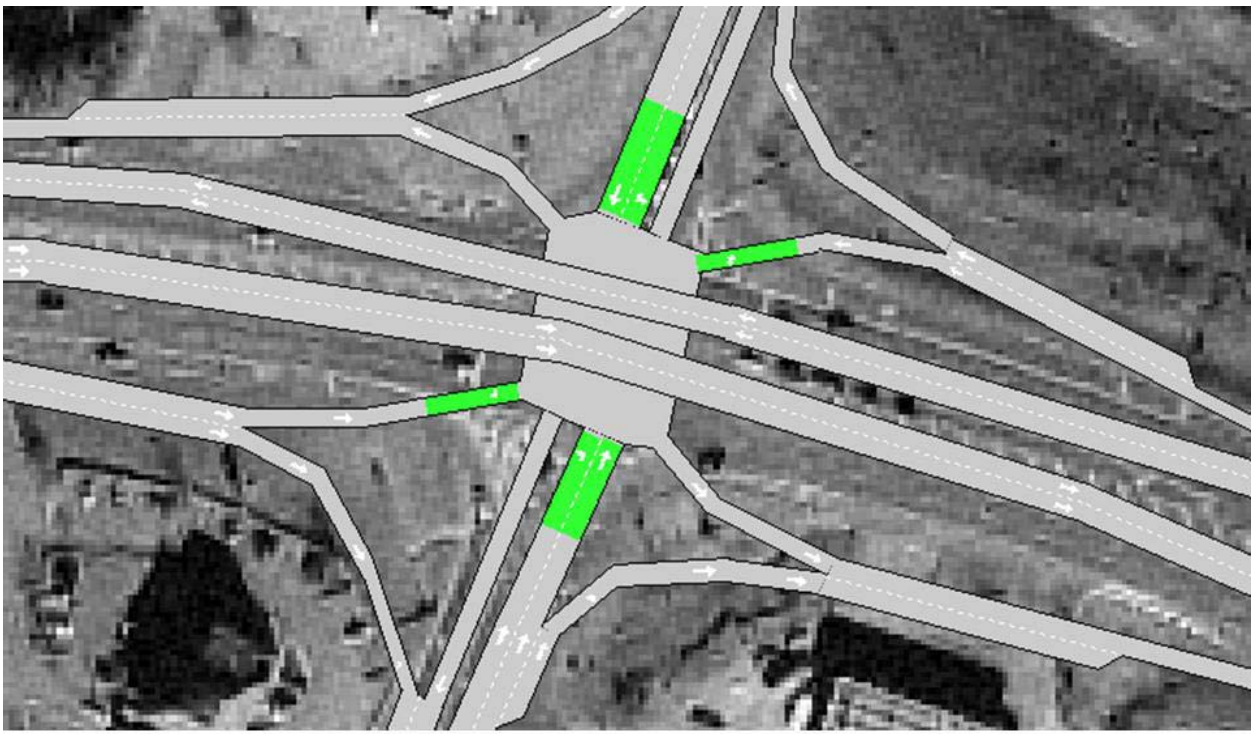

Figure 3-1. Example of four-lane urban interchange used in simulations.

ALDOT has recently adopted a preferred SPUI configuration consisting of a 6-lane section on the mainline flanked by three-lane frontage roads. An example of this configuration is shown in Figure 3-2.

As indicated in the four- and six-lane scenario descriptions, the urban interchange scenarios also included frontage roads on either side of U.S 280. As the purpose of the present study was to assess traffic flow on U.S. 280, the frontage roads were not explicitly coded into the simulation model. Changes in traffic volumes results from the frontage roads, however, were accounted for in the simulations. This was done by reassigning side street traffic that currently accesses U.S 280 directly to the major side streets connected to adjacent properties by the frontage roads and U.S 280 by the urban interchanges. Additional reassignment of vehicle entering U.S. 280 was projected as a result of the urban interchanges. The traffic entering the U.S 280 corridor from the major side streets under both urban interchange scenarios is shown in Table 3-3[3].

[3] Changes from existing conditions are highlighted in ***bold italics.***

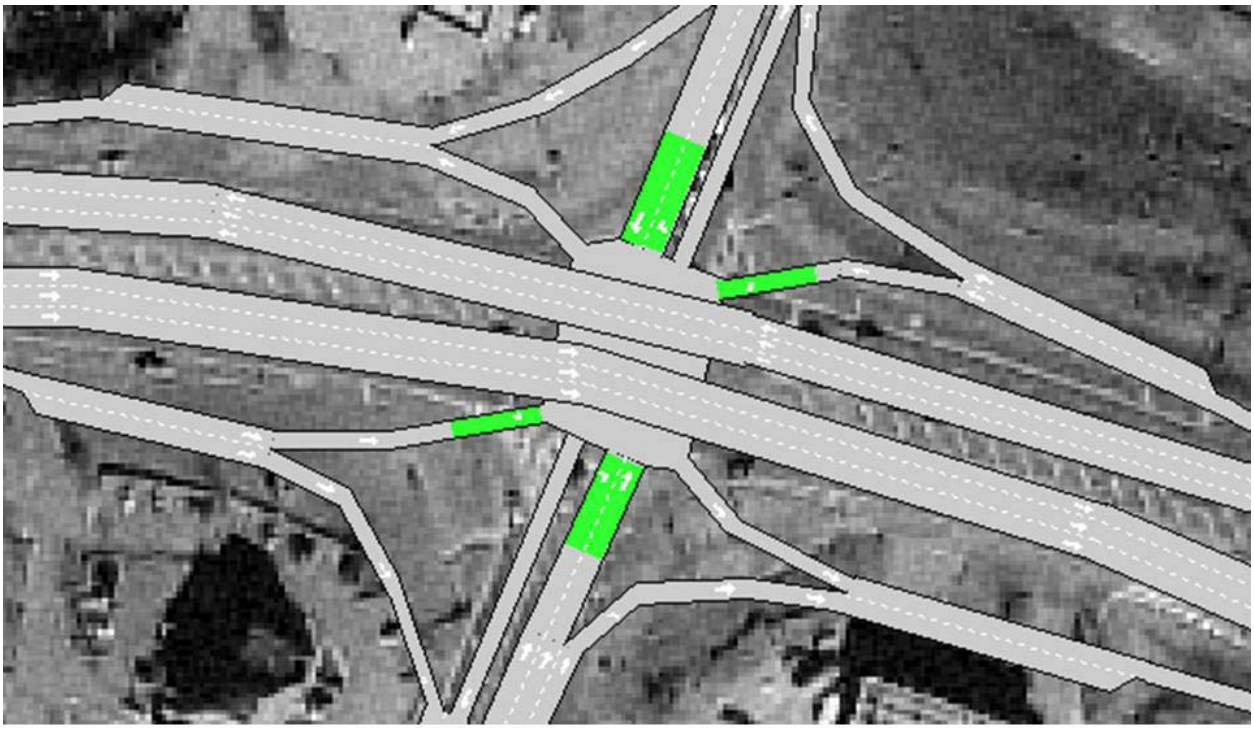

Figure 3-2. Example of six-lane urban interchange used in simulations

Table 3-3. Entering volumes at side streets for urban Interchange scenarios

Intersection	AM Peak Entering Volume (vph)	
	NB	SB
Hugh Daniel Drive	-	606
SR 119	567	***675***
Brook Highland Parkway/Meadow Brook Road	***675***	***1,066***
Valleydale Road	630	375
Inverness Parkway	***629***	***545***
Riverview Parkway/Cahaba Park Circle	***590***	***425***
Grandview Parkway	***X***[4]	***X***
Perimeter Parkway	***185***	***145***
The Summit	***1,125***	***1,550***
Dolly Ridge Road	**X**	**X**
Green Valley Road/ Rocky Ridge Road	467	***885***
Cherokee Road	100	784
Lakeshore Drive	200	200
Office Park Circle	***75***	***150***

The urban interchange scenarios were simulated using the geometric conditions shown in Figures 3-1 and 3-2, the traffic volumes shown in Table 3-3 and the existing traffic entering U.S. 280 from either end of the corridor. A summary of the results of the urban interchange scenarios and a comparison with other scenarios is presented in Section 4.

[4] ***X*** – implies the side street does not exist in the present scenario (e.g., served by a frontage road that feeds to an interchange).

3.3. Parallel Corridor Scenario

An improved three-lane cross-section for Grants Mill Road was assumed to be a potential parallel corridor. RPCGB input the upgraded corridor into the regional transportation model which predicted that the improved Grants Mill Road would draw 3%-4% of the traffic currently entering the U.S 280 corridor. For the simulation analysis, it was assumed that 4% of the AM peak hour traffic that currently uses inbound U.S. 280 would instead use the improved Grants Mill Road. Therefore, traffic volumes entering U.S. 280 from the side streets affected by the Grants Mill Road alternative were reduced by 4%. The resulting entering traffic volumes are presented in Table 3-4. In addition to the traffic entering form side streets, 4% of the traffic entering the U.S. 280 corridor at Hugh Daniel Drive during the AM peak hour was reduced by 4% (from 2,860 vehicles to 2,756 vehicles). Using the inputs described in this section, the existing conditions were modeled using AIMSUN. The results are reported in Section 4.

Table 3-4. Entering volumes at side streets for parallel corridor scenario

Intersection	AM Peak Entering Volume (vph)	
	NB	SB
Hugh Daniel Drive	-	***582***
SR 119	567	***482***
Brook Highland Parkway/Meadow Brook Road	526	***913***
Valleydale Road	630	***360***
Inverness Parkway	510	460
Riverview Parkway/Cahaba Park Circle	100	-
Grandview Parkway	27	93
Perimeter Parkway	158	51
The Summit	25	615
Dolly Ridge Road	1105	286
Green Valley Road/ Rocky Ridge Road	467	650
Cherokee Road	784	100
Lakeshore Drive	200	200
Office Park Circle	60	75

3.4. At-grade Improvements Scenario

A list of at-grade improvements along the corridor were coded into AIMSUN. A description of the improvements[5] modeled is presented in Table 3-5. The resulting entering traffic volumes are presented in Table 3-6.

[5] These treatments were identified in local government meetings and/or in the *U.S. Highway 280 West Traffic Operations Study* prepared for Jefferson County Roads and Transportation and the 2000 *Horizon 280 Improvement Plan.*

Table 3-5. Summary of at-grade improvements modeled

US 280 at Hampton Inn. No changes to current configurations.

US 280 at Office Park Circle. No changes to current configurations.

Lakeshore Drive/Shades Crest Road. In traffic scenarios that increase travel speed on US 280, close the Mountain Brook exit ramp located on eastbound U.S. 280 between Cherokee Road and the Shades Crest Road exit as identified in local government meetings. Modify ramps to accommodate dual lefts from northbound Lakeshore to eastbound U.S. 280. Widen bridge ramp, extending to Cherokee Road.

Cherokee Road. Widen Cherokee Road northbound to receive dual lefts from eastbound U.S. 280.

Overton Road. Additional stacking space for eastbound U.S. 280 left turn lane onto Overton Road.

Green Valley Road/Rocky Ridge Road. Green Valley Road relocated 1000 ft to the east, a "T" intersection at Rocky Ridge Road and U.S. 280, and Shades Crest Road relocated 400 feet to the west, as introduced as a base plan improvement option in the 1989 *U.S. Highway 280 Corridor Transportation Study, Hollywood Blvd. – Oak Mountain*. This scenario is similar to the Green Valley Road closure/relocation scenario presented by Bayer properties with the exception that it does not close Pumphouse Rd. The other option to be modeled will be the realignment of the Green Valley/Rocky Ridge and accommodate double lefts from US 280 westbound onto Rocky Ridge Road. Additionally, restripe eastbound U.S. 280 for second left turn and widen receiving lane onto Green Valley Road.

Dolly Ridge Road. Close the U.S. 280 entrance to the former Bible College property as identified in local government meetings. Upgrade Cahaba River Road south of U.S.280 as a three-lane section, "low-load" road to carry traffic to the Colonnade and other properties at the southwest corner of I-459 & U.S. 280 as identified in local government meetings.

The Summit Shopping Center/BellSouth. Convert existing private drive into BellSouth to a public road connecting Cahaba River Road and U.S. 280.

Grandview/Perimeter Park & Grandview II/Healthsouth. Add service road behind Copeland's/O'Charley's to connect Healthsouth Parkway to Perimeter Park (moving Healthsouth guardhouse farther south) and service road from Healthsouth to Cahaba River Road. Eliminate median cuts on U.S. 280 from Colonnade entrance to Grandview/Perimeter Park intersection, making that intersection the primary access point to Perimeter Park, HealthSouth and Colonnade destinations.

Cahaba River Rd./U.S. 280. Eliminate left turn access from Cahaba River Road onto U.S. 280. Fire station will continue to use signal pre-empt. Convert the Cahaba River Rd access point between the Birmingham Fire Station and the Target signal as a right in/right out access point. Closure of Cahaba River Road access to U.S. 280, but continue signal pre-empt for Fire Station.

Riverview Road. Double lefts from U.S. 280 westbound onto Riverview Road. Concept in Cahaba Park/Riverview area is to maximize service-road concept with existing frontage roads and a 3-way "T" within the right of way. Closure of Riverview Road access to U.S. 280.

Cahaba Park Circle. Double lefts at intersections in all directions. Intersection improvements at Old U.S. 280 and Cahaba Park Circle to accommodate traffic from the closing of U.S. 280 access points from Cahaba River Road, Riverview Road and Key Drive.

Inverness Center Drive/Green Hill Parkway. Connect Inverness Center Parkway east to Meadow Brook Road to Corporate Drive to SR-119.

Valleydale Road. Improve Cahaba Beach Road with double through lanes, double lefts eastbound and maximize rights.

Meadow Brook Road/Brook Highland Parkway. Double lefts at Meadow Brook Corporate Park. Double lefts are available at Brook Highland Plaza with re-striping.

SR 119. Widen SR 119 southbound to receive double lefts from US 280 westbound. Widen SR 119 northbound to receive double lefts from US 280 eastbound. Double lefts SR 119 northbound onto US 280 westbound. Widen SR 119 southbound for double lefts onto US 280 eastbound. Improve SR 119 southbound to US 280 westbound with right turn lane. Connecting rear access service road from SR 119 westbound to Brook Highland Center.

Hugh Daniel Drive. Re-stripe for double left from U.S. 280 eastbound onto Hugh Daniel Drive.

Table 3-6. Entering volumes at side streets for at-grade improvements scenario

Intersection	AM Peak Entering Volume (vph)	
	NB	SB
Hugh Daniel Drive	-	606
SR 119	567	500
Brook Highland Parkway/Meadow Brook Road	526	950
Valleydale Road	630	375
Inverness Parkway	510	460
Riverview Parkway/Cahaba Park Circle	***263***	***220***
Grandview Parkway	27	93
Perimeter Parkway	158	51
The Summit	25	615
Dolly Ridge Road	1105	286
Green Valley Road/ Rocky Ridge Road	467	650
Cherokee Road	784	100
Lakeshore Drive	200	200
Office Park Circle	60	75

3.5. Transit Scenario

For the transit scenario, it was assumed that a bus-rapid transit (BRT) line served the corridor from the Meadow Brook Parkway intersection inbound to the E.B. Stephens Expressway. Although AIMSUN is capable of modeling transit operations, BRT operations were not explicitly analyzed. Results from the Birmingham Regional Transportation Alternatives Analysis (RTAA) were used to estimate the ridership of the proposed BRT line along the U.S. 280 corridor (RPCGB, 2003).

The RTAA recommended BRT stations at seven locations along the U.S 280 corridor. For the present study, the primary item of interest was the effect a BRT line would have on traffic operations along the corridor. The number of vehicles "taken off" (i.e., diverted trips) U.S. 280 during the AM peak hour was estimated using equation 3-1. The entered data values are shown in text below the equation.

$$(\#\ \text{daily new riders}) \times \left(\frac{\#\ \text{HBW}^{6}\ \text{BRT linked trips}}{\text{Total BRT linked trips}}\right) \times (50\%) = \#\ \text{AM peak hour vehicle trips diverted to BRT} \qquad \text{(EQ 3-1)}$$

2,060

5,430 = .58
9,350

Assumed % boardings
AM peak hour

598 diverted trips

Once the total of number of diverted trips was estimated, the RTAA estimates for daily boardings at the seven proposed BRT stations are used to "assign" the diverted trips to the traffic volumes entering the corridor. The daily station boardings, percentages and estimated vehicle trips diverted to BRT at each station location are summarized in Table 3-7.

[6] As specified in the RTAA, it is assumed that home-based work (HBW) trips occur between 6-9 AM (RPCG, 2004).

Table 3-7. Summary of vehicle trips diverted from U.S. 280 corridor transit scenario

Location (BRT Stop/U.S 280 side street)	Daily Boardings	% along corridor	Vehicle Trips diverted to BRT at this location[7]
Lakeshore Drive	330	27%	159
Green Valley Road/ Rocky Ridge Road	140	11%	68
The Summit	240	19%	116
Grandview Parkway	140	11%	68
Inverness Parkway	150	12%	72
Meadow Brook Parkway	240	19%	116

The RTAA estimate of 2,060 daily new riders on the southeast (U.S. 280) BRT corridor was distributed among the seven stations based on the proportion of daily boardings projected for each station in the RTAA. The resulting entering traffic volumes are presented in Table 3-8.

Table 3-8. Entering volumes at side streets for transit scenario

Intersection	AM Peak Entering Volume (vph)	
	NB	SB
Hugh Daniel Drive	-	606
SR 119	567	500
Brook Highland Parkway/Meadow Brook Road	468	892
Valleydale Road	630	375
Inverness Parkway	474	424
Riverview Parkway/Cahaba Park Circle	100	-
Grandview Parkway	27	25
Perimeter Parkway	158	51
The Summit	25	499
Dolly Ridge Road	1105	286
Green Valley Road/ Rocky Ridge Road	467	582
Cherokee Road	784	100
Lakeshore Drive	200	41
Office Park Circle	60	75

3.6. Eight-Lane Scenario

In addition to the scenarios described in previous sections, a cursory analysis was performed on the effects of adding a fourth through-lane on U.S. 280 in each direction. Specifically, U.S. 280 was converted to an eight-lane cross-section between Hugh Daniel Drive and I-459. All intersections were modified to accommodate the existing lanes. The 8-lane scenario was built on the at-grade improvement scenario and, therefore, retains all of the improvements listed in Table 3-5 as well as the additional through-lanes.

The analysis and its results are presented for comparison purposes only. In order to be more confident in the ultimate impact of an eight-lane section of U.S 280 east of I-459, a detailed analysis would need to be performed. Such an analysis would require modification to traffic

[7] In some cases it was assumed that the BRT stop served both sides of U.S. 280 and the diverted vehicle trips were evenly distributed on the side street approaches. For example, the estimates indicate that 116 vehicle trips would be diverted to BRT at the Meadow Brook Parkway intersection. To account for this reduction in entering volumes, 58 were subtracted from the volumes entering U.S. 280 from Meadow Brook Parkway and 58 were subtracted from the volumes entering from Brook Highland Parkway.

signal timings and coordination parameters. It would also need to be coupled with additional at-grade improvements, especially access management treatments along the commercial sections between SR 119 and I-459.

3.7. Rocky Ridge Road/Green Valley Road

Due to considerable interest among RPCGB, Progress 280, local governments and ALDOT, a specific comparison of the corridor-level impacts of two alternative configurations of the Rocky Ridge Road/Green Valley Road intersection were performed. The first alternative was a 6-lane urban interchange at Rocky Ridge Road/Green Valley Road. The second alternative was the offset, separate intersections of Rocky Ridge Road and Green Valley Road described in Table 3-5 above. These configurations are shown in Figures 3-3 and 3-4. As with the other scenarios, the results are discussed in Section 4.

Figure 3-3. 4-lane urban interchange at Rocky Ridge Road/Green Valley Road

Figure 3-4. Offset intersections at Rocky Ridge Road and Green Valley Road

Section 4
Results

The seven scenarios were analyzed using AIMSUN. The results for the analyses are presented in the form of two common traffic operation MOES, travel time and delay. Each MOE was generated for several "paths" along the corridor to show how each scenario would impact the AM peak hour commute from several points along the corridor. The paths for which MOEs were generated are as follows[8]:

1. A commuter inbound on U.S. 280 at Hugh Daniel Drive;
2. A commuter traveling southbound on SR 119 entering U.S. 280;
3. A commuter traveling northbound on SR 119 entering U.S. 280;
4. Inbound on U.S. 280 at Brook Highland Plaza;
5. Southbound on Meadow Brook Parkway entering U.S. 280;
6. Southbound on Cahaba Beach Road entering U.S. 280;
7. Northbound on Valleydale Road entering U.S. 280;
8. Inbound on U.S. 280 at Inverness;
9. Northbound on Inverness Parkway entering U.S. 280;
10. Northbound on Riverview Parkway entering U.S. 280;
11. Northbound on Grandview Parkway entering U.S. 280;
12. Inbound on U.S. 280 at I-459;
13. Southbound from the Summit entering U.S. 280;
14. Southbound on Dolly Ridge Road entering U.S. 280;
15. Northbound on Cahaba River Road entering U.S. 280;
16. Inbound on U.S. 280 at Pumphouse Road overpass;
17. Southbound on Green Valley Road entering U.S. 280;
18. Northbound on Rocky Ridge Road entering U.S. 280;
19. Southbound on Overton Road entering U.S. 280;
20. Inbound on Cherokee Road entering U.S. 280; and
21. Southbound from the Summit entering U.S. 280.

The actual MOEs generated for each of the paths are presented in tables 4-1 through 4-6[9]. Observations gleaned from the results are presented after each table. Table 4-1 presents the estimated travel time for the various commuter paths listed above to the entrance ramp to the E.B. Stephens Parkway. Table 4-2 shows the estimated delay for a commuter along each path. The delay values reported in Table 4-2 support the observations presented for the travel time results. In particular, it is interesting to note the significant delay reduction to side streets

[8] All "paths" assume that U.S 280 is oriented east-west and side streets are north-south.
[9] The MOEs for the eight-lane scenario are not reported in the tables. As previously explained, this simulation was done as a cursory look at probable impacts. Until the eight-scenario is examined completely, the travel times and delays from the various points along U.S. 280 and side streets cannot be considered valid.

associated with the urban interchange scenarios. Table 4-3, then, summarizes the impact of each scenario by presenting the change in travel time for each commuter path. The change in travel time was determined by subtracting the travel time projected for the new scenario from that estimated for the existing scenario. Where the travel time increases, the travel time reduction is reported as a negative value. Following the MOEs presented in Tables 4-1 through 4-7, an estimate of the probable travel time savings associated with an eight-lane section are discussed.

Table 4-1. Projected AM peak travel time to E.B. Stephens Expressway (minutes)

From	Scenario					
	Existing	4-Lane UI	6-Lane UI	Grants Mill	BRT	At-grade
Inbound at Hugh Daniel Drive	34:52	39:33	27:47	36:33	33:55	32:28
Southbound SR 119	35:56	39:03	27:25	36:43	35:35	33:01
Northbound SR 119	40:38	39:30	27:51	39:49	38:22	40:01
Inbound at Brook Highland	30:02	38:28	26:58	30:14	29:43	28:21
Meadow Brook Parkway	31:07	42:49	26:55	31:32	29:36	30:36
Cahaba Beach Road	25:00	32:36	24:41	24:41	25:01	22:50
Valleydale Road	25:13	33:01	25:03	24:56	25:04	23:21
Inbound at Inverness	23:34	32:20	24:26	23:08	23:24	21:13
Inverness	26:11	30:41	24:05	27:39	24:34	23:57
Riverview Parkway	19:36	29:24	23:07	19:01	19:41	08:46
Grandview Parkway	16:39	28:50	22:28	16:41	16:58	14:18
I-459	11:22	23:19	19:50	12:06	12:11	8:46
The Summit Shopping Center	16:05	27:20	19:28	14:15	12:57	13:22
Dolly Ridge Road	18:23	21:47	20:00	19:23	18:33	12:19
Cahaba River Road	10:25	27:20	19:28	11:25	11:10	14:35
Inbound 280 at Pump House Rd.	8:31	17:16	18:49	9:29	8:29	6:12
Green Valley Road	13:48	6:45	14:24	14:12	10:56	5:19
Rocky Ridge Road	14:42	6:59	13:58	13:29	10:08	9:03
Overton Road	3:32	6:45	14:24	3:37	3:33	3:59
Inbound at Cherokee Road	3:23	4:24	11:56	3:27	3:23	3:49
Inbound at Office Park	1:37	2:07	8:55	1:36	1:36	1:39

Table 4-2. Projected AM peak delay to E.B. Stephens Expressway (minutes/vehicle)

From	Scenario					
	Existing	4-Lane UI	6-Lane UI	Grants Mill	BRT	At-grade
Inbound at Hugh Daniel Drive	22:52	27:40	15:55	24:34	21:56	20:27
Southbound SR 119	24:03	27:30	15:51	24:59	23:42	20:58
Northbound SR 119	28:39	27:51	16:12	27:50	26:24	28:06
Inbound at Brook Highland	19:13	27:14	15:38	19:25	18:54	17:31
Meadow Brook Parkway	20:16	32:08	16:24	20:41	18:46	19:47
Cahaba Beach Road	14:58	22:46	14:51	14:39	14:59	12:48
Valleydale Road	15:05	23:06	15:08	14:48	14:57	13:12
Inbound U.S. 280 at Inverness	13:43	22:44	14:50	13:17	13:33	11:21
Inverness	16:38	21:32	14:55	18:05	15:00	14:20
Riverview Parkway	11:24	20:54	14:36	10:49	11:29	3:03
Grandview Parkway	8:55	20:39	14:17	8:57	9:14	6:33
I-459	5:40	17:36	14:07	6:24	12:06	7:18
The Summit Shopping Center	10:10	21:56	14:05	8:21	7:02	3:03
Dolly Ridge Road	12:57	16:16	14:30	13:57	13:07	7:26
Cahaba River Road	5:38	21:56	14:05	6:38	6:23	9:17
Inbound 280 at Pump House Rd.	3:55	12:25	13:57	4:53	3:52	1:35
Green Valley Road	9:21	2:37	10:32	9:44	6:29	1:15
Rocky Ridge Road	10:11	2:31	9:55	8:58	9:26	4:32
Overton Road	0:22	2:37	10:32	0:26	0:22	0:48
Inbound at Cherokee Road	0:22	1:31	8:52	0:26	0:22	0:47
Inbound at Office Park	0:08	0:24	6:55	0:07	0:07	0:10

Table 4-3. Projected AM peak travel time savings to E.B. Stephens Expressway (minutes)[10]

	Scenario				
From	**4-Lane UI**	**6-Lane UI**	**Grants Mill**	**BRT**	**At-grade**
Inbound at Hugh Daniel Drive	-4:41	7:05	-1:41	0:57	2:24
Southbound SR 119	-3:07	8:31	-0:47	0:54	2:55
Northbound SR 119	1:08	12:47	0:49	2:16	0:37
Inbound at Brook Highland	-8:26	3:04	-0:12	0:19	1:41
Meadow Brook Parkway	-11:42	4:12	-0:25	1:31	0:31
Cahaba Beach Road	-7:36	0:19	0:19	-0:01	2:10
Valleydale Road	-7:48	0:10	0:17	0:09	1:52
Inbound at Inverness	-8:46	-0:52	0:26	0:10	2:21
Inverness	-4:30	2:06	-1:28	1:37	2:14
Riverview Parkway	-9:48	-3:31	0:35	-0:05	-
Grandview Parkway	-12:11	-5:49	-0:02	-0:19	2:21
I-459	-11:57	-8:28	-0:44	-0:33	2:36
The Summit Shopping Center	11:15	-3:23	1:50	3:08	2:43
Dolly Ridge Road	-3:24	-1:37	-1:00	-0:10	6:04
Cahaba River Road	-16:55	-9:03	-1:00	-0:45	-4:10
Inbound 280 at Pump House Road	-8:45	-10:18	-0:58	0:02	2:19
Green Valley Road	7:03	-0:36	-0:24	2:52	8:29
Rocky Ridge Road	7:43	0:44	1:13	4:34	5:39
Overton Road	-3:13	-10:52	-0:05	-0:01	-0:27
Inbound at Cherokee Road	-1:01	-8:33	-0:04	0:00	-0:26
Inbound at Office Park	-0:30	-7:18	0:01	0:01	-0:02

4.1. Observations from the Interchange Scenarios

- The interchanges allow traffic to enter U.S. 280 from side streets more rapidly than signalized intersections. This is especially the case for traffic traveling southbound and turning right onto U.S. 280. In some cases, these movements are significant. For example, Table 3-3 indicates that 1,066 vehicles would be entering the U.S. 280 corridor from Brook Highland Parkway. Under the urban interchanges scenarios, these movements would essentially be free-flow movements that would merge into traffic from a westbound ramp. Such large merge volumes create intense weaving section downstream of certain interchanges that adversely impact operations. Similarly, Table 3-3 shows that the southbound entry volumes for the combined the Dolly Ridge Road/Summit approach are 1,550 vph. This location and others (Green Valley Road, Cherokee Road) result in weaving areas that affect operation on much of the western portion of the corridor.
- The four-lane urban interchange scenario actually results in significant increases in travel time for most of the corridor. The four-lane urban interchange scenario does, however, show significant improvement for traffic entering U.S. 280 from both Rocky Ridge Road and Green Valley Road.
- For the four-lane interchange scenario, these conditions are exacerbated by the fact that under the interchange scenario, some sections U.S. 280 are carrying over 3,500 vehicle per hour (vph). The theoretical capacity of a 2-lane grade separated segment ≈ 4000 vph.
- The six-lane interchange scenario results indicate reduced travel times for the commuter paths originating east of Riverview Parkway. Paths originating closer to I-459 and point

[10] A negative (-) travel time savings value indicates an increase in travel time.

further inbound experience travel times greater than that estimated for existing conditions.

- Another factor affecting operations under the six-lane scenario is the fact that the extra throughput of the interchanges allows more traffic to enter the junction with E.B. Stephens Expressway than it can handle. The resulting choke point at E.B. Stephens Expressway causes queues that extend back along U.S. 280.
- Both urban interchange scenarios result in significant increases in travel time to the E.B. Stephens Expressway from points west of I-459.

4.2. Observations from the Parallel Corridor Scenario

- Tables 4-1 through 4-3 indicate no travel time benefits associated with an improved Grants Mil Road as an alternative corridor to U.S. 280. In fact, some of the path travel times are shown to increase slightly. It should be noted here that no increase in travel times or delays would actually be expected to result from the parallel corridor scenario. The variation in MOE values is within the range of that associated with random variation inherent to the modeling process.

4.3. Observations from the Transit Scenario

- The results indicate some travel time improvement on side street approaches that would be directly served by BRT stations. There is little travel time benefit for the corridor as a whole. It is worth noting at this point that the projected BRT ridership (and subsequent reduction in vehicle trips and travel times) is a function of the land uses and transit accessibility along the corridor. Benefits of regional transit systems should be viewed a system-wide and not judged on the basis of individual corridor performance.

4.4. Observations from the At-grade Improvements Scenario

- The results indicate that the at-grade improvements scenario offer no travel time savings (in fact, they appear to increase slightly). This is primarily due to a new choke point created at Cahaba Park Circle. The additional turning movements at this intersection resulting from the improvements require more of the available cycle length to be used to serve side street traffic. Thus, less green-time is available for U.S. 280 traffic. Also, the side streets upstream of Cahaba Park Circle are being "served" more efficiently due to the intersection improvements allowing side street traffic to enter the mainline traffic more rapidly and contributing to existing queues and congestion levels on U.S. 280.
- When viewed in terms of the overall corridor, the at-grade scenario presents the most improvement in travel time savings.

4.5. Overall Observations

- From a corridor-level perspective, none of the scenarios examined offer significant travel time savings over existing conditions.

- The results did reinforce assertions that the corridor functions as two separate sections. As such, the most congested section of the corridor (Hugh Daniel Drive to I-459) was studied separately. The results are summarized and discussed in the following section.

4.6. Observations from the Eastern Section of the Corridor.

A separate set of MOEs was generated for various commuter paths along the eastern section of the corridor. The following commuter paths were used to generate travel time and delay estimates from the specified point on the corridor to I-459:

1. A commuter inbound on U.S. 280 at Hugh Daniel Drive;
2. A commuter traveling southbound on SR 119 entering U.S. 280;
3. A commuter traveling northbound on SR 119 entering U.S. 280;
4. Inbound on U.S. 280 at Brook Highland Plaza;
5. Southbound on Meadow Brook Parkway entering U.S. 280;
6. Southbound on Cahaba Beach Road entering U.S. 280;
7. Northbound on Valleydale Road entering U.S. 280;
8. Inbound on U.S. 280 at Inverness;
9. Northbound on Inverness Parkway entering U.S. 280;
10. Northbound on Riverview Parkway entering U.S. 280;
11. Northbound on Grandview Parkway entering U.S. 280;

The results for the eastern section of the corridor (i.e., inbound to I-459) are reported in Tables 4-4 through 4-6.

Table 4-4. Projected AM peak travel time to I-459 (minutes)

From	Scenario					
	Existing	4-Lane UI	6-Lane UI	Grants Mill	BRT	At-grade
Inbound at Hugh Daniel Drive	23:30	16:14	7:57	24:27	22:00	23:42
Southbound SR 119	24:34	15:44	7:35	24:37	27:18	24:15
Northbound SR 119	29:16	16:11	8:01	27:43	26:27	31:20
Inbound at Brook Highland	18:40	15:09	7:08	18:08	17:48	19:35
Meadow Brook Parkway	19:45	19:30	7:05	19:26	17:41	21:50
Cahaba Beach Road	13:38	9:17	4:51	12:35	13:06	14:04
Valleydale Road	13:51	9:42	5:13	12:50	13:09	14:35
Inbound U.S. 280 at Inverness	12:12	9:01	4:36	11:02	11:29	12:27
Inverness	14:49	7:22	4:15	15:33	12:39	15:11
Riverview Parkway	8:14	6:05	3:17	6:55	7:46	-[11]
Grandview Parkway	5:17	5:31	2:38	4:35	5:03	5:32

[11] The intersection at Riverview Parkway is eliminated under the At-grade scenario.

Table 4-5. Projected AM peak delay to I-459 (minutes/vehicle)

From	Scenario					
	Existing	4-Lane UI	6-Lane UI	Grants Mill	BRT	At-grade
Inbound at Hugh Daniel Drive	17:12	10:04	1:48	18:10	15:43	17:24
Southbound SR 119	18:23	9:54	1:44	18:35	21:06	17:55
Northbound SR 119	22:59	10:15	2:05	21:26	20:11	25:03
Inbound at Brook Highland	13:33	9:38	1:31	13:01	12:41	14:28
Meadow Brook Parkway	14:36	14:32	2:17	14:17	12:33	16:44
Cahaba Beach Road	9:18	5:10	0:44	8:15	8:46	9:45
Valleydale Road	9:25	5:30	1:01	8:24	8:44	10:09
Inbound U.S. 280 at Inverness	8:03	5:08	0:43	6:53	7:20	8:18
Inverness	10:58	3:56	0:48	11:41	8:47	11:17
Riverview Parkway	5:44	3:18	0:29	4:25	5:16	-
Grandview Parkway	3:15	3:03	0:10	2:33	3:01	3:30

Table 4-6. Projected AM peak travel time savings to I-459 (minutes)

From	Scenario				
	4-Lane UI	6-Lane UI	Grants Mill	BRT	At-grade
Inbound at Hugh Daniel Drive	7:16	15:33	-0:57	1:30	-0:12
Southbound SR 119	8:50	16:59	-0:03	-2:44	0:19
Northbound SR 119	13:05	21:15	1:33	2:49	-1:59
Inbound at Brook Highland	3:31	11:32	0:32	0:52	-0:55
Meadow Brook Parkway	0:15	12:40	0:19	2:04	-2:05
Cahaba Beach Road	4:21	8:47	1:03	0:32	-0:26
Valleydale Road	4:09	8:38	1:01	0:42	-0:44
Inbound U.S. 280 at Inverness	3:11	7:36	1:10	0:43	-0:15
Inverness	7:27	10:34	-0:44	2:10	-0:22
Riverview Parkway	2:09	4:57	1:19	0:28	-
Grandview Parkway	-0:14	2:39	0:42	0:14	-0:15

As discussed in Section 3.6, an additional through lane on U.S. 280 in each direction was modeled. The analysis was cursory and was done for comparison purposes. The simulation analyses indicated that the eight-lane scenario would result in a travel time from Hugh Daniel Drive to the E.B. Stephens Expressway of approximately 22 minutes. Therefore, the projected travel time savings between Hugh Daniel drive to the E.B. Stephens Expressway would be about 13 minutes. The eight-lane scenario did not assume any additional improvements west of I-459. As such travel times from I-459 inbound remained unchanged and the overall travel time for the corridor (Hugh Daniel Drive to E.B. Stephens Expressway) improved only slightly. Additional improvements in this section of the corridor would be needed to improve overall travel times. In particular, the inclusion of access management concepts into the widening of U.S. 280 would be essential to preserving the benefits gained by adding another through lane.

4.7. Rocky Ridge Road/Green Valley Road Alternatives

The results of the comparison of the Rocky Ridge Road/Green Valley Road alternatives are summarized in Table 4-7. Table 4-7 analysis indicates that the proposed offset intersections alternative provides similar operational benefits to an urban interchange at Rocky Ridge Road/Green Valley Road.

Table 4-7. Comparison of alternatives for Rocky Ridge Road/Green Valley Road

	Travel time to E.B. Stephens Expressway (minutes)		
From	**Existing**	**Urban Interchange**	**Offset Intersections**
Rocky Ridge Road	14:42	~ 3	9:03
Green Valley Road	13:48	~ 5	5:19
Inbound 280 at Pump House Road	8:31	~ 8	6:12

Section 5
3-D Visualization

As presented in the initial scope of the project, microscopic traffic simulation was also used to develop 3-D visualizations of the proposed urban interchange at SR 119. The 3-D results were shown to Progress 280 members and were well received. The 3-D animiations were then made available for future discussion of the urban interchange alternative. Screenshots from the AIMSUN 3D renderings of the SR 119 interchange are presented in Figures 5-1 through 5-6.

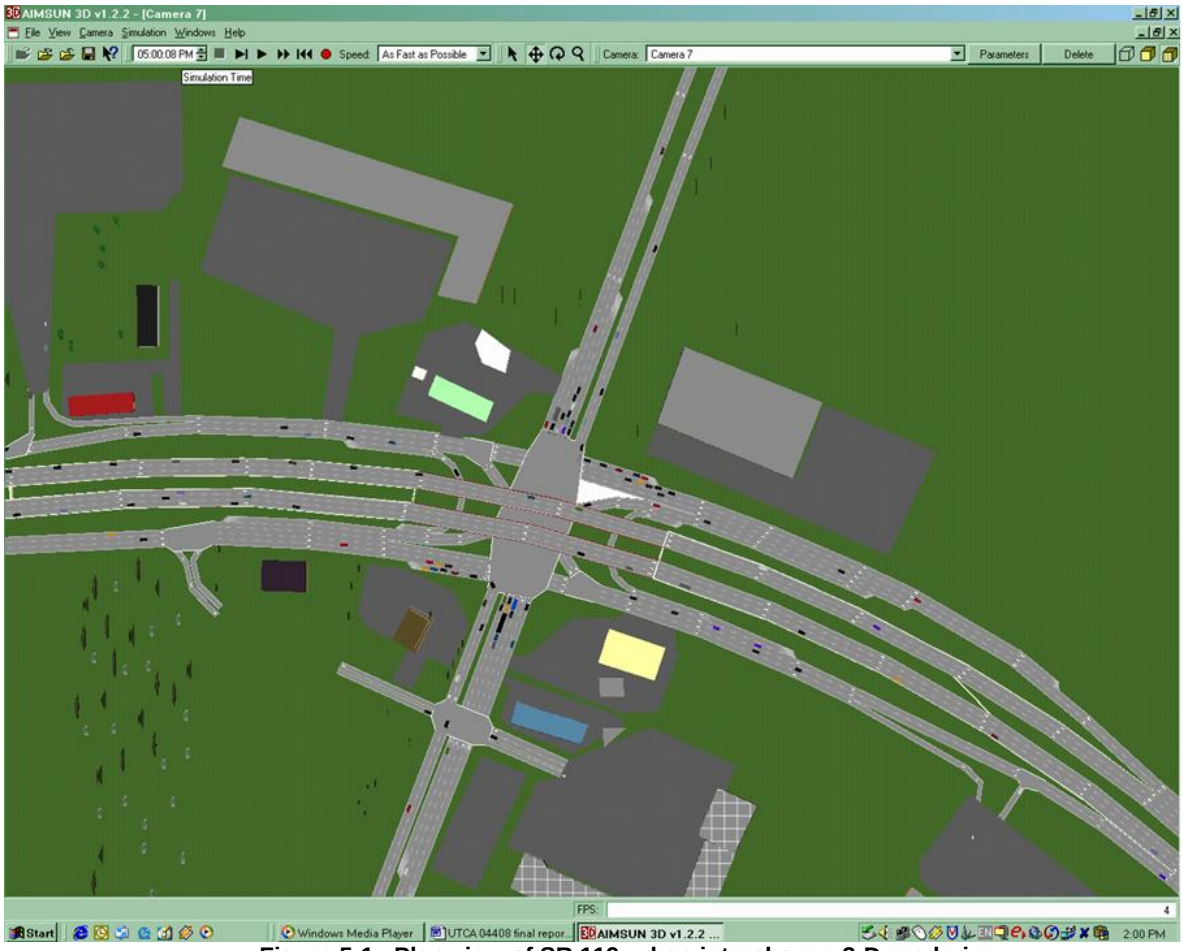

Figure 5-1. Plan view of SR 119 urban interchange 3-D rendering

Figure 5-2. View of SR 119 urban interchange looking east towards Hugh Daniel Drive

Figure 5-3. Additional view of SR 119 urban interchange looking east towards Hugh Daniel Drive

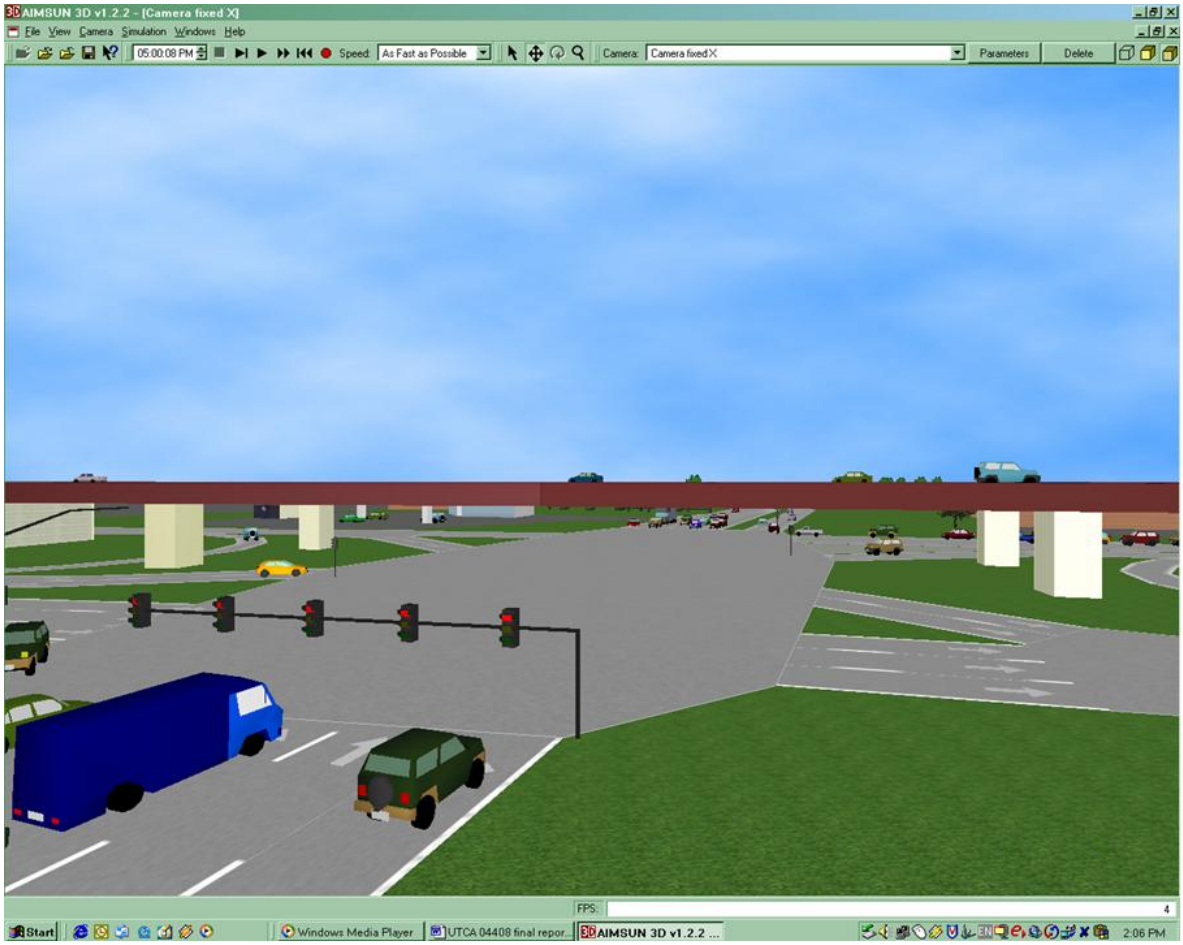

Figure 5-4. View of SR 119 urban interchange looking north towards SR 119

Figure 5-5. View of vehicles queued at Hugh Daniel Drive headed west on U.S. 280

Figure 5-6. View of vehicles traveling west on U.S. 280 over SR 119

Section 6
Conclusions and Recommendations

An analysis of seven alternatives scenarios for U.S. 280 between Hugh Daniel Drive and E.B. Stephens Expressway was conducted. The scenarios included existing conditions, urban interchanges, transit options, and at-grade traffic engineering improvements. Based on the analysis presented herein, the following conclusions are offered:

- The U.S. 280 corridor between Hugh Daniel Drive and E.B. Stephens Expressway functions as two distinct sections: Hugh Daniel Drive to I-459 and I-459 to the E.B. Stephens Expressway. There exist considerable operational differences between these two sub-corridor sections. The Hugh Daniel Drive to I-459 segment is a congested suburban corridor with densely-spaced intersections and driveways. These side streets and other access points generate considerable turning volumes that must be accommodated in addition to the through traffic on U.S. 280. These heavy turning volumes result in significant choke points at existing major intersections along the segment (Meadow Brook Parkway, Valleydale Road, Inverness Parkway, etc.) The close spacing of these over-saturated signalized intersections has a cumulative impact on traffic as queues from downstream intersections interfere with upstream operations. Traffic operations on the I-459 to E.B. Stephens Expressway section are less dense and consist mostly of through traffic and commuter traffic entering the corridor in the direction of peak flow. The operational problems on this section are confined to a couple of key choke points (Rocky Ridge Road and the E. B. Stephens Expressway).
- Construction of urban interchanges (4 or 6 lane) between Hugh Daniel Drive and I-459 would significantly improve operations and reduce AM peak hour inbound travel times to the I-459 interchange.
- Construction of the ten proposed urban interchanges (4 or 6 lane) would not significantly improve AM peak hour inbound travel times from points west of I-459 to the E.B. Stephens Expressway. Any benefits associated with increased capacity (flow) on U.S. 280 would be negated by operational limitations of the interchange at the E.B. Stephens Expressway and heavy merges created at Dolly Ridge Road and Rocky Ridge Road.
- No significant travel time benefits are associated with an improved Grants Mill Road as an alternative corridor to U.S. 280. In fact, some of the path travel times are shown to increase slightly. It should be noted here that no increase in travel times or delays would actually be expected to result from the parallel corridor scenario. The variation in MOE values is within the range of that associated with random variation inherent to the modeling process.
- Implementation of bus rapid transit (BRT) would result in some travel time improvement on side street approaches that are directly served by BRT stations. There is little travel time benefit for the corridor as a whole. It is worth noting at this point that the projected BRT ridership (and subsequent reduction in vehicle trips and travel times) is a function of the land uses and transit accessibility along the corridor. Benefits of regional transit

systems should be viewed as system-wide and not judged on the basis of individual corridor performance.

- The results indicate that the at-grade improvements scenario offers no travel time savings between Hugh Daniel Drive and I-459 (in fact, travel times appear to increase slightly). This is primarily due to the creation of a new choke point at Cahaba Park Circle. The additional turning movements at this intersection resulting from the proposed improvements require additional signal phases and more of the available cycle length to be used to serve side street traffic. Thus, less green-time is available for U.S. 280 traffic. Also, the side streets upstream of Cahaba Park Circle are being "served" more efficiently due to the intersection improvements allowing side street traffic to enter the mainline traffic more rapidly and adding to existing queues and congestion levels on U.S. 280.
- A cursory analysis indicates that combining the proposed at-grade improvements with an additional through-lane in each direction on U.S. 280 between SR 119 and I-459 would greatly improve traffic operation along this section of the corridor.
- The offset intersections alternative for the Rocky Ridge Road/Green Valley Road provides similar operational benefits to an urban interchange at Rocky Ridge Road/Green Valley Road.

Section 7
References

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