



I-440 AT RIDGE ROAD/CRABTREE VALLEY AVENUE INTERCHANGE

**WAKE COUNTY
STIP PROJECT No. I-5870
WBS No. 6307.1.1**



TRAFFIC SIMULATION ANALYSIS TECHNICAL MEMORANDUM



**PREPARED FOR:
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**

**PREPARED BY:
PATRIOT TRANSPORTATION ENGINEERING, PLLC**



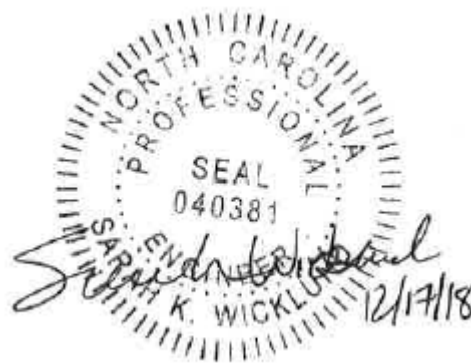
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EXECUTIVE SUMMARY

NCDOT State Improvement Program (STIP) Project Number I-5870 proposes to construct a new interchange on I-440 in the vicinity of Ridge Road to connect with Crabtree Valley Avenue. Additionally, the project would realign the I-440 interchange with US 70 (Glenwood Avenue) and realign/widen Crabtree Valley Avenue between SR 3009 (Edwards Mill Road) and Ridge Road. The subject project is scheduled for right-of-way in FY 2022 and construction in FY 2023, based on the 2018-2027 STIP; however, I-5870 has been accelerated and included in the upcoming round of design build projects, which is scheduled to be advertised in November 2018. For analysis purposes, a future design year of 2021 was chosen to analyze opening year operations, as this is considered an operational improvement.

The project area includes I-440, also known as The Beltline, a 16.4 mile long interstate facility that encircles central Raleigh. In the study area I-440 is a six-lane facility with intermittent auxiliary lanes and a 2017 Average Annual Daily Traffic (AADT) ranging between 122,000 and 157,000 vehicles per day (vpd). US 70 (Glenwood Avenue) is a major east-west arterial with a 2017 AADT of 95,600 vpd, which currently serves as the main access to the Crabtree Valley Mall. Ridge Road is a local collector that provides access to residential traffic and has a 2017 AADT of 10,100 vpd. Crabtree Valley Avenue runs parallel to US 70, providing access to the back side of the Crabtree Valley Mall and has a 2017 AADT of 6,500 vpd.

The analysis of the proposed project includes the evaluation of the four build design alternatives that provide additional capacity and access at the Glenwood Road interchange and Crabtree Valley Mall Area. The build analyses were based on the conceptual designs for each alternative listed below:

- Alternative 1 – 2011 City of Raleigh Study Preferred Alternative, with echelon intersection at Glenwood Avenue and Blue Ridge Road/Lead Mine Road
- Alternative 1 with I-440 Auxiliary Lanes – 2011 City of Raleigh Study Preferred Alternative, with echelon intersection at Glenwood Avenue and Blue Ridge Road/Lead Mine Road and auxiliary lanes on I-440 between Ridge Road/Glenwood Ave and Lake Boone Trail off-ramp
- Alternative 2 – Diverging Diamond Interchange (DDI) Conceptual Alternative, with a Continuous Flow Intersection (CFI) option at Glenwood Avenue and Blue Ridge Road/Lead Mine Road
- Alternative 2 with I-440 Auxiliary Lanes – DDI Conceptual Alternative, with a CFI option at Glenwood Avenue and Blue Ridge Road/Lead Mine Road and auxiliary lanes on I-440 between Ridge Road/Glenwood Ave and Lake Boone Trail off-ramp

The results of the 2017 Base Year No-Build, 2021 Design Year No-Build and 2021 Design Year Build are included in the following sections. The results are only summarized for the I-5870 Study Area and do not include the adjacent interchanges at Lake Boone Trail and Six Forks Road.

2017 Base Year No-Build Scenario

The 2017 Base Year No-Build scenario shows that during the AM peak period, all segments on I-440 eastbound are operating at LOS_s D or better and 8 segments operating at LOS_s F in the westbound direction for one hour with one segment operating at LOS_s F for two hours. There are 11 westbound segments operating at an unacceptable LOS_s E for at least one hour. The PM peak period shows four segments on I-440 eastbound operating at LOS_s F for one hour and nine segments operating at LOS_s F in the westbound direction with two segments operating at LOS_s F for two hours and one segment failing for three hours. There are 10 eastbound segments and three westbound segments that are operating at an unacceptable LOS_s E for at least one hour.

In the AM peak period, I-440 westbound experiences reduced speeds and congestion approaching the Wade Ave off-ramp starting around 7AM and continues for about one and half hours. This is mostly due to downstream congestion on both I-440 and Wade Ave. In the PM peak period, I-440 westbound experiences heavy congestion at the Wade Ave off-ramp due to the lane drop to Wade Ave and congestion downstream on I-440 spilling back in to the project study area. The congestion starts around 4PM and lasts about two hours. In the AM peak period, I-440 eastbound

EXECUTIVE SUMMARY

experiences little to no reduction in speed along the corridor. In the PM peak period, I-440 eastbound experiences a reduction in speed at the Lake Boone Trail on-ramp merge starting around 5PM and lasts about 45 minutes.

The overall intersection LOS_s for the signalized intersections in the 2017 Base Year No-Build scenario shows that 7 of the 12 project study area intersections are operating at LOS_s E or F in either the AM or PM peak period. The overall intersection LOS_s for signalized intersections in the project study area shows that seven intersections are operating at LOS_s D or better in either peak period; however, these locations have at least one lane group with a LOS_s E or F. Based on a review of the unsignalized intersections, there are ten intersections that have at least one movement that operates at LOS_s E or F in either of the peak periods.

2021 Design Year No-Build Scenario

The 2021 Design Year No-Build scenario shows that during the AM peak period, all segments on I-440 eastbound are operating at LOS_s D or better and 12 segments operating at LOS_s F in the westbound direction for two hours with seven segments operating at LOS_s F for at least three hours. Included in those 12 failing segments, seven segments are operating at an unacceptable LOS_s E for at least one hour. The PM peak period shows five segments on I-440 eastbound operating at LOS_s F for one hour with one segment operating at LOS_s F for two hours and 12 segments operating at LOS_s F in the westbound direction for one hour with 11 segments operating at LOS_s F for two hours. There are 11 eastbound segments and nine westbound segments operating at an unacceptable LOS_s E for at least one hour.

While the I-440/Wade Ave interchange improvements (U-2719) at the interchange of I-440 and Wade Avenue provide some congestion relief, there is still a slow down around Lake Boone Trail due to the section between Lake Boone Trail and Wade Ave behaving more like a weaving segment. The U-2719 designs changes the Lake Boone Trail on-ramp to be a lane add onto I-440 and shortens the distance between the gore points of the Lake Boone Trail and Wade Ave ramps. In the AM peak period, I-440 westbound speed is expected to decrease greatly starting around 7AM due to the friction of the entering and exiting volume at Glenwood Ave and Six Forks Rd. This congestion continues for two hours and causes issues east of Six Forks Rd for the rest of the AM peak period. The congestion east of Glenwood Ave meters the traffic flowing to the downstream interchanges, allowing some intersection to appear to operate better than is really expected. In the PM peak period, I-440 westbound is expected to experience congestion that spills back past the Six Fork Rd interchange starting around Lake Boone Trail that starts around 4:45PM and lasts for about an hour and a half. In the AM peak period, I-440 eastbound is expected to operate well with little reduction in speed along the corridor. In the PM peak period, I-440 eastbound is expected to experience a considerable speed reduction starting at the Lake Boone Trail on-ramp and spills back into the Wade Ave interchange. This congestion starts around 5PM and continues for about one hour.

The overall intersection LOS_s for the signalized intersections in the 2021 Design Year No-Build scenario shows that 7 of the 12 project study area intersections are operating at LOS_s E or F in either the AM or PM peak period. The overall intersection LOS_s for signalized intersections shows that six intersections are operating at LOS_s D or better in either peak period; however, these locations have at least one lane group with a LOS_s E or F. Based on a review of the unsignalized intersections, there are 12 intersections that have at least one movement that operates at LOS_s E or F in either of the peak periods.

2021 Design Year Build Alternative 1 with Auxiliary Lanes Scenario

The 2021 Design Year Build Alternative 1 with auxiliary lanes scenario shows that during the AM peak period, all segments on I-440 eastbound are operating at LOS_s D or better and 10 segments operating at LOS_s F in the westbound direction for two hours with seven segments operating at LOS_s F for at least three hours. Included in those 10 failing segments, five are operating at an unacceptable LOS_s E for one hour. The PM peak period shows four segments on I-440 eastbound operating at LOS_s F for one hour with nine segments operating at an unacceptable LOS_s E for at least one hour and nine segments operating at LOS_s F in the westbound direction for one hour with six segments operating at LOS_s F for at least two hours. Included in those nine failing westbound segments, three are operating at an unacceptable LOS_s E for at least one hour. The density is reported for the collector/distributor

EXECUTIVE SUMMARY

segments on westbound I-440. However, as this is just a one lane facility, the HCM freeway LOS methodology cannot be applied.

Compared to the 2021 No-Build model and the Alternative 1 model, the eastbound direction of I-440 is projected to operate in similarly during AM peak period and better in the PM peak period. The eastbound auxiliary lane is expected to only have 15 to 30 minutes of reduced speeds around 35 mph at the Lake Boone Trail interchange, instead of 75 to 90 minutes of 15 to 25 mph speeds. Since vehicles are able to travel faster with less delay, there is expected to be some delay and reduced speeds further downstream at the Ridge Rd/Glenwood Ave off-ramp for about 45 minutes during the PM peak period. The westbound direction is projected to operate better during both peak periods with the addition of an auxiliary lane between the Glenwood Ave/Crabtree Valley Ave on-ramp and the Lake Boone Trail off-ramp. Traffic is projected to start queuing back from the Lake Boone Trail interchange to upstream of the Six Forks Rd interchange and queue off the network with speeds under 30mph. The queuing is projected to last over two hours during the AM peak period and for one hour during the PM peak period.

The overall intersection LOS for the signalized intersections in the 2021 Design Year Build Alternative 1 scenario shows that 8 of the 13 project study area intersections are operating at LOS_s E or F in either the AM or PM peak period. The overall intersection LOS for signalized intersections in the project study area shows that 11 intersections are operating at LOS_s D or better in either peak period; however, these locations have at least one lane group with a LOS_s E or F. Based on a review of the unsignalized intersections, there are seven intersections that have at least one movement that operates at LOS_s E or F in either of the peak periods.

The interchange configuration on I-440 at Glenwood Ave was determined to not be feasible. Southbound Glenwood Ave queues from the I-440 eastbound ramps/Ridge Rd intersection back through several of the upstream signals due to the high volume that is now being processed through a signal in Alternative 1. The I-440 westbound off-loop to southbound Glenwood Ave queues back on to the collector-distributor due to the lack of acceptable gaps on southbound Glenwood Ave. This movement was modeled as a free flow movement to determine if removing the stop control would help, but it is the downstream signal that is causing vehicles to queue up in the right lane of Glenwood Ave.

The intersection of Creedmoor Rd at Glenwood Ave shows a degradation in operations, compared to the no-build model. This is partly due to the improvements made by the echelon intersection allowing more traffic to flow through that intersection, and partly due to the shift in trip patterns to and from the mall. Any improvements along Glenwood Ave will most likely result in worse operations at this intersection, unless Creedmoor Rd is included in the improvements.

2021 Design Year Build Alternative 2 with Auxiliary Lanes Scenario

The 2021 Design Year Build Alternative 2 scenario shows that during the AM peak period, all segments on I-440 eastbound are operating at LOS_s D or better and 11 segments operating at LOS_s F in the westbound direction for one hour with 10 segments operating at LOS_s F for two hours and four segments operating at LOS_s F for at least three hours. Included in those 11 failing segments, seven are operating at an unacceptable LOS_s E for at least one hour. The PM peak period shows two segments on I-440 eastbound operating at LOS_s F for one hour with six segments operating at an unacceptable LOS_s E for at least one hour and 11 segments operating at LOS_s F in the westbound direction for one hour with nine segments operating at LOS_s F for two hours and two segments operating at LOS_s F for at least three hours. Included in those 11 failing segments, six are operating at an unacceptable LOS_s E for one hour.

Compared the 2021 No-Build scenario, the eastbound direction of I-440 looks fairly similar in the AM peak period and shows a smaller reduction in speed for a shorted period of time in the PM peak period. Speeds are expected to reduce to 45mph upstream of the Lake Boone Trail off-ramp for 30 minutes and reduce to 35-40mph downstream of the Glenwood Ave on -ramp for 45 minutes in the PM. The westbound direction of I-440 is still expected to experience reduce speeds in the AM peak period, but for only two hours instead of three. The PM peak is expected to have some queuing back from Lake Boone Trail, but this queueing is not anticipated to extend past Crabtree Valley Ave. During the 5PM hour, there is expected to be queueing back from the Glenwood Ave and Crabtree Valley Ave interchanges that will extend back through Six Forks and off the network for a little over an hour.

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The overall intersection LOS_s for signalized intersections in the 2021 Design Year Build Alternative 2 scenario shows that 7 of the 18 project study area intersections are operating at LOS_s E or F in either the AM or PM peak period. The overall intersection LOS_s for signalized intersections shows that 9 intersections are operating at LOS_s D or better in either peak period; however, these locations have at least one lane group with a LOS_s E or F. Based on a review of the unsignalized intersections, there are six intersections that have at least one movement that operates at LOS_s E or F in either of the peak periods.

The diverging diamond interchange is expected to improve operations at the Glenwood Ave and I-440 interchange when compared to the 2021 no-build scenario. However, the drawbacks of a DDI not being able to progress both sides of the corridor simultaneously causes some minor queuing in both directions. But overall, the operations are expected to be much better than the existing configuration or the Alternative 1 configuration.

The continuous flow intersection at Glenwood Ave and Lead Mine Rd/Blue Ridge Rd is expected to operate much better than the existing intersection. However, with the direct access to Crabtree Valley Ave from westbound I-440 and northbound Glenwood Ave proposed in Alternative 2, the northbound left turn volume onto Blue Ridge Rd is not expected to increase. Therefore, the full benefit of a CFI is not experienced with the trip patterns in Alternative 2.

Conclusions

Based on the results of the analysis, the Alternative 1 I-440 interchange configuration is projected to have worse operations than the no-build option in 2021. Keeping a similar interchange design in place results in the same queuing problem spilling back onto westbound I-440 in the PM peak. The echelon interchange at Glenwood Ave and Lead Mine Rd/Blue Ridge Rd is expected to operate well in 2021, but it is difficult to fully assess its operations due to the queues that are extending through it in both directions.

Alternative 2 is projected to improve traffic operations along Glenwood Ave. The DDI on Glenwood Ave in conjunction with the diamond interchange on Crabtree Valley Ave allows traffic to exit I-440 without spilling back on the freeway through travel lanes. Compared to the 2021 No-Build scenario, the continuous flow intersection is expected to improve operations at Glenwood Ave and Lead Mine Rd/Blue Ridge Rd, but will still experience some queuing on Glenwood Ave.

Both build analyses identified the need for auxiliary lanes in both directions I-440 between the Lake Boone Trail interchange and the Glenwood Ave/Crabtree Valley Ave/Ridge Rd interchanges. With any improvements made along Glenwood Ave, consideration needs to be given to improving the intersection at Creedmoor Rd, as this becomes the new pinch point once operations improve along the Glenwood Ave corridor between I-440 and Creedmoor Rd. Future analyses should consider operation with the echelon interchange on Glenwood Ave at Lead Mine Rd/Blue Ridge Rd and the DDI at Glenwood Ave and I-440.

Because it is now recommended that the I-440 bridges be replaced, it is recommended that an enhanced Partial Cloverleaf – Type B interchange be considered as additional alternatives are developed.

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Appendix I: Network Travel Time Results

1. PROJECT BACKGROUND

Under a contract with the North Carolina Department of Transportation (NCDOT), Dewberry Engineers, Inc. has been requested to assist NCDOT in the development of the planning and design of State Transportation Improvement Program (STIP) Project Number I-5870; I-440 at Ridge Road/Crabtree Valley Avenue Interchange Improvements in Wake County. Patriot Transportation Engineering, PLLC (Patriot), as a subconsultant to Dewberry, has been contracted to develop the traffic capacity analysis for the subject project.

1.1 PURPOSE OF TECHNICAL MEMORANDUM

The purpose of this technical memorandum is to analyze the traffic operations for the proposed alternatives for I-5870. The study includes the analysis of the 2017 and 2021 No-Build Scenarios and 2021 Build scenarios. The analysis utilizes microscopic simulation of each of the scenarios in TransModeler (Version 5, Build 7155), including the development of a visually validated base year model.

1.2 PROJECT DESCRIPTION

I-5870 proposes to construct a new interchange at Ridge Road to connect with Crabtree Valley Avenue. Additionally, the project would realign the I-440 interchange with US 70 (Glenwood Avenue) and realign/widen Crabtree Valley Avenue between SR 3009 (Edwards Mill Road) and Ridge Road. The subject project is scheduled for right-of-way in FY 2022 and construction in FY 2023, based on the 2018-2027 STIP; however, I-5870 has been accelerated and included in the next round of design build projects, which is scheduled to be advertised in November 2018. For analysis purposes, a future design year of 2021 was chosen to analyze opening year operations.

The project area includes I-440, also known as The Beltline, a 16.4 mile long interstate facility that encircles central Raleigh. In the study area I-440 is a six-lane facility with intermittent auxiliary lanes and a 2017 Average Annual Daily Traffic (AADT) ranging between 122,000 and 157,000 vehicles per day (vpd). US 70 (Glenwood Avenue) is a major east-west arterial with a 2017 AADT of 95,600 vpd, which currently serves as the main access to the Crabtree Valley Mall. Ridge Road is a local collector that provides access to residential traffic and has a 2017 AADT of 10,100 vpd. Crabtree Valley Avenue runs parallel to US 70, providing access to the back side of the Crabtree Valley Mall and has a 2017 AADT of 6,500 vpd.

An analysis of interstate operations along I-440 was performed from west of the Lake Boone Trail interchange to east of the Six Forks Road interchange and the following intersections are included in the study area:

- US 70 (Glenwood Avenue) at Woman's Club Drive
- US 70 (Glenwood Avenue) at National Drive
- US 70 (Glenwood Avenue) at I-440 EB Ramp
- US 70 (Glenwood Avenue) at I-440 WB Ramp
- US 70 (Glenwood Avenue) at Arrow Drive
- US 70 (Glenwood Avenue) at Crabtree View Place
- US 70 (Glenwood Avenue) at Blue Ridge Road/Lead Mine Road
- US 70 (Glenwood Avenue) at Crabtree Valley Mall Driveway
- US 70 (Glenwood Avenue) at Crabtree Valley Mall/Marriot Drive
- US 70 (Glenwood Avenue) at NC 50 (Creedmoor Road)
- US 70 (Glenwood Avenue) at Morehead Drive
- US 70 (Glenwood Avenue) at Fairhill Drive/Rembert Drive
- Ridge Road at Manuel St
- Ridge Road at I-440 EB Ramp

- Ridge Road at Varnell Avenue
- Ridge Road at Glen Eden Drive
- Blue Ridge Road at Homewood Banks Drive
- Blue Ridge Road at Arinto Drive
- Blue Ridge Road at Crabtree Valley Avenue
- Blue Ridge Road at Crabtree View Place
- Blue Ridge Road at Crabtree Valley Mall Driveway
- Lead Mine Road at North Hills Drive
- Creedmoor at Riverwood Circle
- Creedmoor at Crabtree Valley Avenue
- Creedmoor at Crabtree Valley Mall Driveway
- Crabtree Valley Avenue at Homewood Banks Drive
- Crabtree Valley Avenue at Edwards Mill Road
- Edwards Mill Road at Creekside Apartments
- Homewood Banks Drive at Vilana Ridge Road
- Lake Boone Trail at Wycliff Road
- Lake Boone Trail at Myron Drive
- Lake Boone Trail at I-440 EB Ramp
- Lake Boone Trail at I-440 WB Ramp
- Lake Boone Trail at Ridge Road
- Six Forks Road at Barrett Drive
- Six Forks Road at Computer Drive
- Six Forks Road at I-440 EB On-Ramp/Ramblewood Drive
- Six Forks Road at I-440 WB On-Ramp/ Front Street
- Six Forks Road at I-440 WB Off-Ramp
- Six Forks Road at Main Street/Dartmouth Road

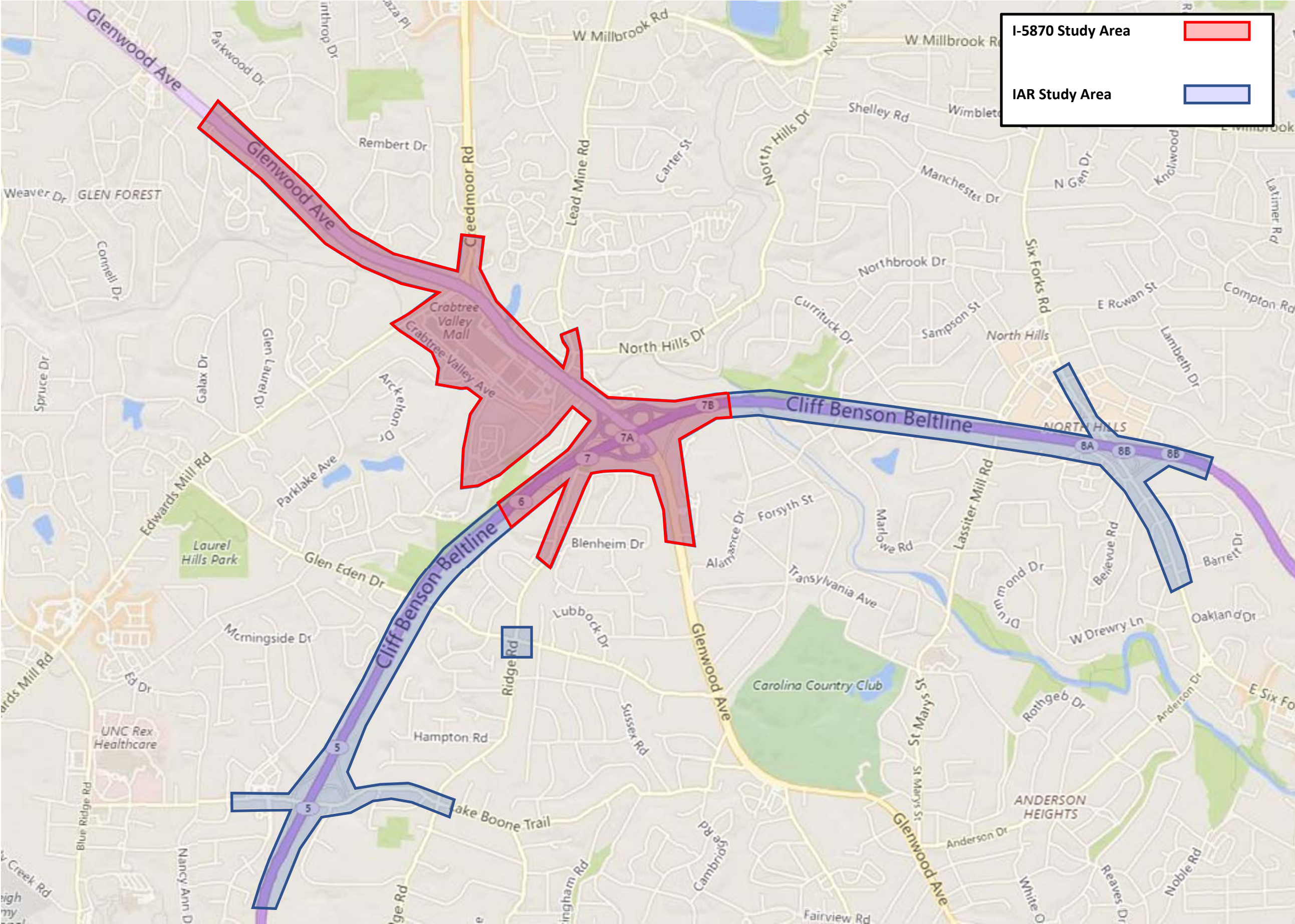
It should be noted that the study area was expanded beyond the project limits to include adjacent areas to prepare an Interstate Access Report (IAR). The Project Study Area is shown in Figure 1-1.

The analysis of the proposed project includes the evaluation of the two design alternatives that provide additional capacity and access. The Build Alternative analysis was based on the preliminary designs of each project.

- Alternative 1 – 2011 City of Raleigh Study Preferred Alternative, with echelon at Glenwood Avenue and Blue Ridge Road/Lead Mine Road
- Alternative 2 – Diverging Diamond Interchange (DDI) Conceptual Alternative, with Continuous Flow Intersection (CFI) option at Glenwood Avenue and Blue Ridge Road/Lead Mine Road

The preliminary design alternatives are included in the Appendix A.

Figure 1-1: Project Study Area



2. DESCRIPTION OF SCENARIOS ANALYZED

The scenarios that require analysis as a part of this study include analysis of both existing and design year conditions, both with and without the project. The following scenarios were evaluated for traffic operations.

2.1 2017 BASE YEAR NO-BUILD CONDITIONS

The Base Year No-Build analysis is based on the current traffic volumes and the existing configuration of the transportation network within the project study area. This analysis provides a baseline for comparison against future scenarios.

2.2 2021 DESIGN YEAR NO-BUILD SCENARIO

This scenario evaluated what the traffic operations will be in the vicinity of the proposed project in the design year 2021 if the proposed project is not constructed. For the study area, the following projects are included in the future year analysis:

- U-2719 – Widen I-440/US 1 from south of SR 1313 (Walnut Street) to north of SR 1728 (Wade Avenue)
 - Includes improvements to the ramp terminal of the I-440 WB exit ramp to Lake Boone Trail.

2.3 2021 DESIGN YEAR BUILD SCENARIOS

This scenario evaluated what the traffic operations will be in the vicinity of the proposed project in the design year 2021 if the proposed projects is constructed. The 2021 scenarios assume that all improvements within the model study area are included in the analysis. The 2021 Design Year Build analysis includes the following Build Alternatives:

- Alternative 1 – 2011 City of Raleigh Study Preferred Alternative, with echelon at Glenwood Avenue and Blue Ridge Road/Lead Mine Road
- Alternative 2 – DDI Conceptual Alternative, with CFI option at Glenwood Avenue and Blue Ridge Road/Lead Mine Road

3. METHODOLOGY

The use of microscopic simulation was completed using TransModeler software (version 5.0 Build 7155), due to the complexity of the project and the integration of freeway and arterial networks. TransModeler is a microscopic, behavior-based multi-purpose traffic simulation program that has emerged as one of the leading simulation software programs. For many engineering disciplines, simulation has become an indispensable instrument for the optimization of complex technical systems. The microscopic simulation model was developed for the build and no-build alternatives for the project and was based on a validated base model for the area.

The methodology for microscopic simulation begins with a base model developed from data collected for the transportation network. The base model is then validated against the observations made in the field to arrive at a validated base model. Once the base model is validated the design year scenarios can be developed and their results compared. Each scenario model was created in accordance with the *NCDOT Congestion Management Simulation Guidelines* (Effective October 1, 2016)

4. MEASURES OF EFFECTIVENESS

Measures of Effectiveness (MOE) are system performance statistics that best characterize the degree to which a particular alternative meets the project objectives. The MOEs for microscopic simulation can be abundant due to the nature of the type of analysis. On an overall network level, MOEs such as vehicle hours traveled (VHT), vehicle miles traveled (VMT), average system speed, average system delay, and number of stops can provide overall indications of the operations of a network. The primary MOEs for freeway facilities are typically average speed, density and Level of Service for individual segments within the network. For arterial corridors, the primary MOEs are control delay, Level of Service and queue lengths.

For this analysis it was determined that the use of intersection level MOEs, such as control delay and level of service at each intersection, would be used as the primary method of comparison for alternatives. The queue lengths also played a substantial role in the evaluation and include both the link level 95th percentile queue for each lane group and the maximum spillback queue length for each approach to the intersection.

The following MOEs were developed, based on NCDOT Simulation Guidelines, for each scenario being analyzed:

- Network MOE's
 - Vehicle Miles Traveled (VMT)
 - Vehicle Hours Traveled (VHT)
 - Average Network Speed
- Intersection MOEs
 - Delay and LOS by Intersection for signalized intersections
 - Delay and LOS by Lane Group for signalized and stop-controlled intersections
 - Maximum Spillback Queue by Approach for all intersections
- Freeway MOEs
 - Freeway LOS by Analysis Segment
 - Speed heat maps
- Travel time through the length of the network to and from the main entry and exit points of the network

5. DATA COLLECTION

This section of the report presents the identification, collection, and preparation of the data sets that were needed to develop the microscopic simulation model, based on the techniques described in Chapter 2 of the *FHWA Traffic Analysis Toolbox, Volume III*. This section presents a summary of the data used to develop the base microsimulation model that was ultimately validated to the real-world conditions present in the study area.

The data collection effort generally included four types of data collection: model data/base data collection, field data collection, traffic data collection and INRIX speed data collection.

5.1 MODEL DATA/BASE MODEL DATA COLLECTION

The data collected includes what is shown in Table 5-1:

Table 5-1: Data Collection Summary

Data	Description	Source
Aerial Photography	2017 Aerial Photography	Google Aerial Imagery via TransModeler WebMap Layer
Digital Elevation Model	Elevation Grid @ 20-foot cell size – LIDAR data from May 2007	NCDOT GIS Elevation Data via NOneMap
Traffic Signal Design Plans	Signal Design Plans	NCDOT
Traffic Signal Timing and Coordination	Plans for current timing, phasing and coordination	NCDOT
INRIX Speed Data	Speed and travel time data corresponding to field data collection	The Vehicle Probe Project Suite, Regional Integrated Transportation Information System https://vpp.ritis.org/suite/
Traffic Forecast	Traffic Forecast for STIP Project I-5870 (May 2018)	Patriot Transportation Engineering, PLLC.

5.2 FIELD DATA COLLECTION

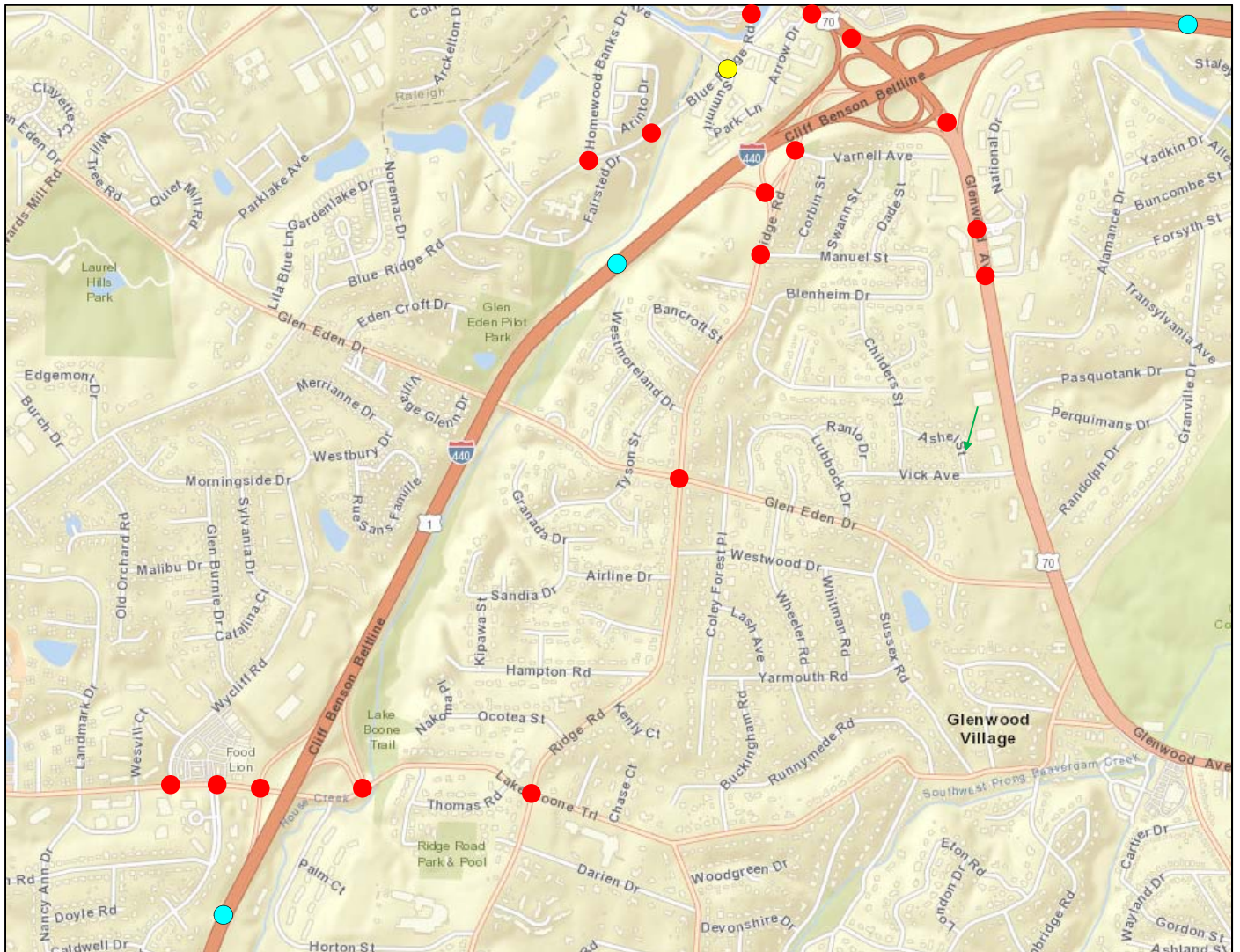
The project team spent several days in the project area during April 2018 collecting field data, including the following:

- A field visit to the study area to observe driver behavior and traffic patterns during the peak and off-peak conditions
- Verification of geometry and signal plans
- Filming corridors for comparison to simulation model runs
- Collecting and verifying speed limit data

5.3 TRAFFIC DATA COLLECTION

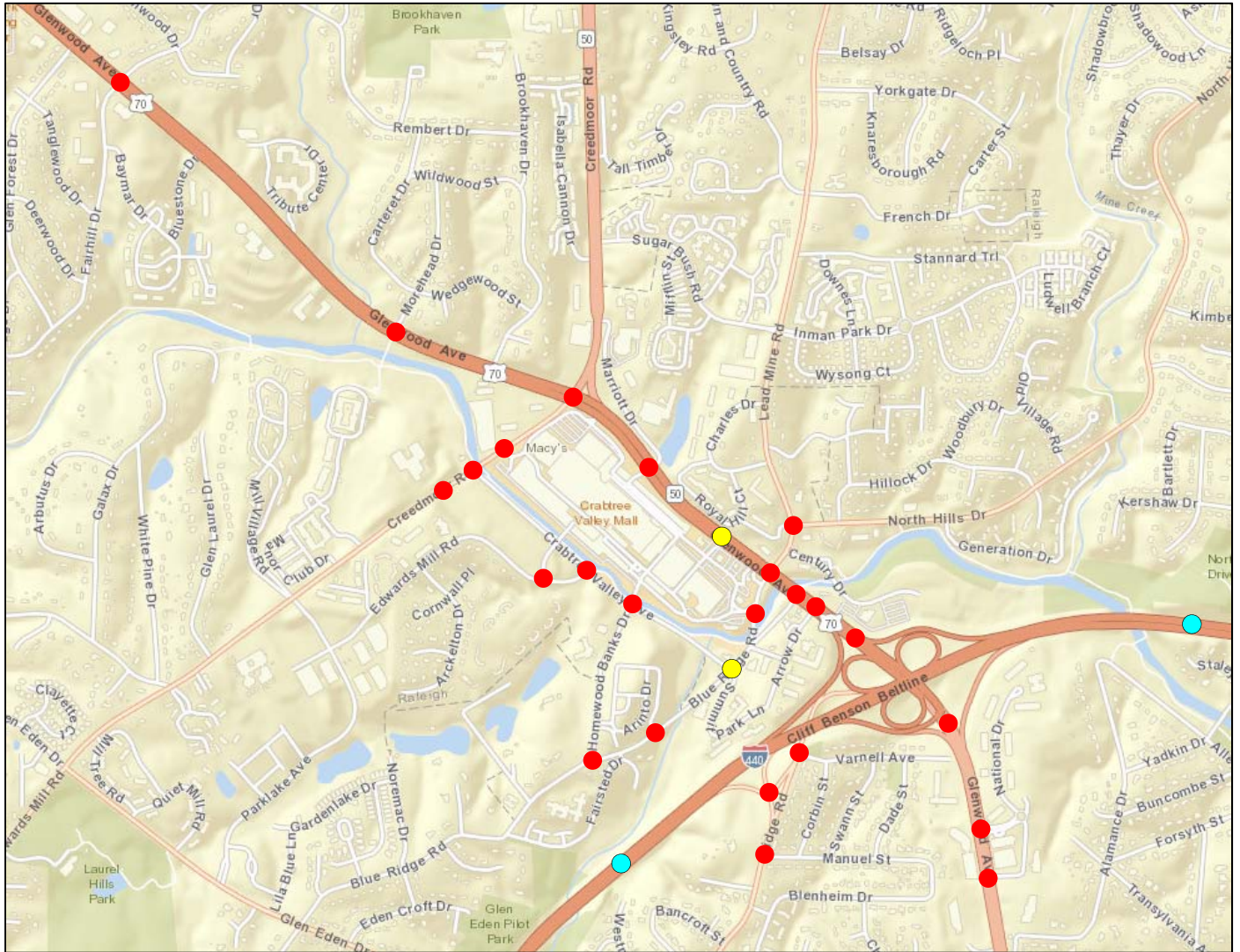
The project team collected traffic data for a period of one day on November 16, 2017 from 6:00 AM until 10:00 PM. The data was collected in fifteen (15) minute increments at the locations shown in Figure 5-1 through Figure 5-3 and included the volume and vehicle classification for each time period.

Figure 5-1: Traffic Volume Data Locations (1)



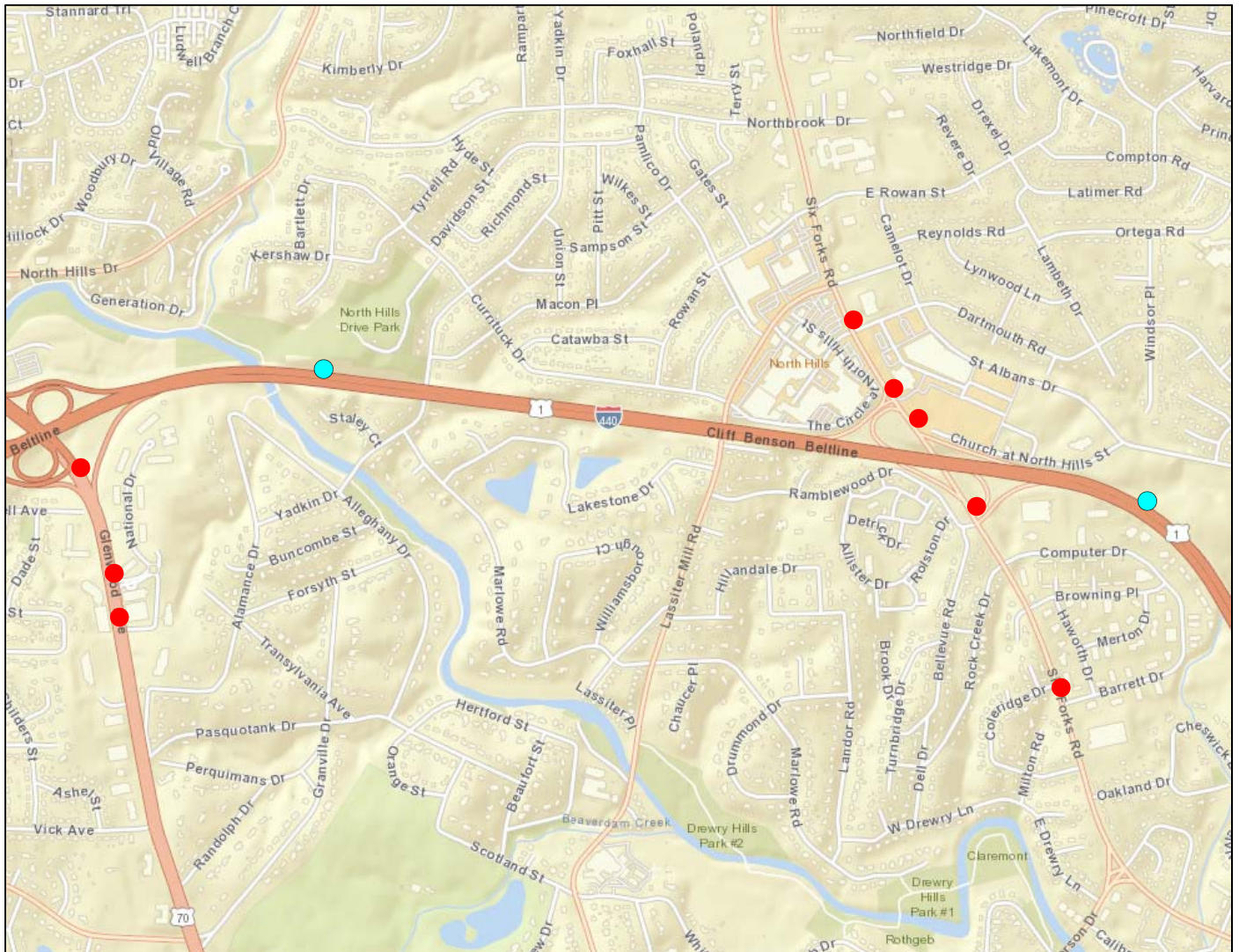
- - TMC Count Location
- - 48-hour Classification Count Location
- - Manual Classification Count Location

Figure 5-2: Traffic Volume Data Locations (2)



- - TMC Count Location
- - 48-hour Classification Count Location
- - Manual Classification Count Location

Figure 5-3: Traffic Volume Data Locations (3)



- - TMC Count Location
- - 48-hour Classification Count Location
- - Manual Classification Count Location

5.3.1 TRAFFIC VOLUME DATA

Traffic data collection should be performed under normal conditions that are free of inclement weather, crashes or vehicle breakdowns. The data collection effort was not affected by any substantial irregular occurrences. Based on an evaluation of the traffic volumes it was determined that the peak hours to be included in the model would be as follows:

- AM Peak Hour – 7:30 to 8:30 AM
- PM Peak Hour – 4:45 to 5:45 PM

Following the selection of the peak hour for the AM and PM periods, the next step was to determine the likely duration of the peak period based on the individual count locations. Due to variations in travel patterns, the locations within the study area display slightly different peak periods ranging from as early as 7:00 AM to as late as 10:00 AM for the AM peak and as early as 3:00 PM and as late as 6:45 PM for the PM peak. The duration of time for the model was developed such that the model would include all of the peak hour periods for all of the count locations included the model. Based on the data it was determined that each peak period would consist of four hours. To remain consistent with the INRIX travel time data, the period would begin at the beginning of each hour. The AM peak period would be from 6:00 to 10:00 AM, and the PM peak period would be from 3:00 to 7:00 PM. A thirty-minute warm-up period was also included for each peak period (resulting in a total of four and one-half hours being modeled).

5.3.2 TIME DISTRIBUTIONS

The development of the base model included the use of a time distribution that would assign trips to the network in a manner that replicated the field collected patterns for when vehicles were counted at particular locations. Therefore, the next step was to determine what percentage of the four-hour peak period traffic occurs in each fifteen-minute time bin. It was determined that four one-hour matrices would be utilized to determine the trip departure time for the vehicles in the simulation model utilizing the curve-based time distribution function in TransModeler. The curve-based distribution uses a series of discrete time intervals that form a curve that replicates the trip departure time for each location.

In addition to the four hourly curve-based distributions in TransModeler that are used to report output, a model warm-up period is required to load the model with base traffic prior to collecting outputs. The warm-up period was run by utilizing a scale factor applied to the trip matrix for the first hour of the simulation. The traffic data was reviewed, and the following scaling factors were determined:

- AM Peak Period
 - Warm-up Matrix Scale Factor = 0.408
- PM Peak Period
 - Warm-up Matrix Scale Factor = 0.950

5.4 INRIX SPEED DATA COLLECTION

INRIX is a software company which provides a variety of mobile applications and internet services pertaining to traffic and driver services. INRIX provides historical, real-time traffic information, traffic forecasts, and travel times to businesses and individuals via the aggregation of cellular devices and GPS units. Therefore, the INRIX data, in the form of speeds and travel times, is a critical element to the development of the validated base model.

The INRIX data from the peak periods identified in Section 5.3.2 was collected on a segment by segment basis for each Monday, Tuesday, Wednesday, and Thursday from September 5, 2017 to November 16, 2017 for each of the four peak hours included in the modeling effort. Table 5-2 through Table 5-3 include a summary of the INRIX data for each segment including the average travel time and average speed for each of the four peak periods.

Table 5-2: I-440 Westbound INRIX Data – September 5-November 16, 2017

	Wade Avenue		Lake Boone Trail		Ridge Road		US 70/Glenwood Avenue		Six Forks Road	
6:00	60.3	60.8	62.5	63.7	65.8	65.8	66.1	66.1	64.2	63.0
6:15	61.1	60.8	62.9	63.4	65.8	65.2	65.7	66.3	64.4	64.1
6:30	60.6	57.6	60.1	62.1	64.0	64.1	64.6	64.5	62.4	61.8
6:45	57.3	42.8	44.2	55.4	60.9	60.3	61.1	62.3	59.2	57.5
7:00	56.5	41.1	41.6	51.5	56.3	55.9	56.9	61.1	58.9	57.7
7:15	54.9	38.5	35.9	42.5	46.0	45.0	46.0	55.6	54.0	51.7
7:30	52.4	34.6	32.3	34.1	30.9	30.6	30.9	42.4	42.6	38.7
7:45	51.3	35.1	33.8	32.8	25.6	25.4	25.5	34.3	33.3	28.3
8:00	49.8	34.8	34.9	35.2	29.9	30.0	30.2	38.7	37.1	32.7
8:15	47.3	33.6	36.0	37.5	35.6	35.0	35.6	44.3	44.8	42.2
8:30	49.6	35.6	39.5	41.9	42.2	41.1	42.1	50.2	50.1	48.5
8:45	52.5	43.1	47.0	48.5	51.5	50.4	51.3	55.5	54.1	53.0
9:00	54.7	51.0	55.0	55.6	58.0	57.0	58.1	61.7	59.2	57.0
9:15	58.8	56.4	60.6	61.7	63.2	62.8	63.3	64.3	60.9	59.2
9:30	59.4	58.1	62.0	61.7	62.9	62.9	63.2	64.1	60.8	58.9
9:45	57.8	58.2	60.7	62.2	62.7	60.8	61.3	62.1	59.1	58.9
15:00	58.8	57.9	62.0	63.4	65.0	64.6	65.2	66.2	63.2	62.2
15:15	57.8	57.5	61.2	63.4	65.8	65.2	65.9	66.5	64.1	63.1
15:30	56.7	56.2	60.0	61.9	65.1	64.4	65.1	66.2	63.8	62.9
15:45	53.2	52.4	56.5	60.2	62.8	61.8	62.7	65.3	63.2	62.5
16:00	51.5	48.9	51.4	57.9	63.1	60.0	61.2	63.4	62.1	63.3
16:15	41.8	39.4	41.9	51.3	59.5	56.3	57.8	62.4	61.0	62.7
16:30	31.7	29.2	27.8	37.5	49.8	47.0	49.4	62.0	61.9	61.6
16:45	25.5	23.0	19.5	28.2	46.4	41.8	45.4	61.0	62.6	62.3
17:00	24.4	21.0	16.7	23.9	47.0	41.7	45.2	59.1	62.3	62.4
17:15	18.9	16.9	12.8	22.9	49.8	45.0	47.3	56.2	60.9	62.2
17:30	20.4	18.4	13.7	21.2	41.7	37.1	39.7	50.0	59.8	60.7
17:45	25.4	22.7	20.3	31.5	47.6	44.1	45.9	51.5	59.3	60.0
18:00	33.7	31.9	33.0	43.2	55.5	53.6	54.7	58.5	60.6	60.5
18:15	44.0	44.4	46.7	52.4	59.8	59.2	59.8	61.7	61.4	61.2
18:30	53.6	51.7	53.8	55.8	62.3	60.8	61.6	64.3	63.0	62.3
18:45	55.1	54.9	58.6	60.1	63.2	62.1	63.0	65.2	63.1	62.6



Direction of Travel

Table 5-3: I-440 Eastbound INRIX Data – September 5-November 16, 2017

	Wade Avenue		Lake Boone Trail		Ridge Road		US 70/Glenwood Avenue		Six Forks Road	
6:00	63.2	65.8	67.4	67.5	66.4	65.7	65.8	65.6	66.4	66.3
6:15	63.3	66.1	67.5	65.5	65.1	64.5	65.3	65.1	66.0	65.2
6:30	65.7	67.0	67.8	66.8	65.4	64.9	65.7	65.3	65.9	65.2
6:45	65.7	67.5	68.3	67.5	65.8	65.0	65.9	65.6	65.4	65.0
7:00	65.4	68.2	69.1	68.0	65.9	65.3	66.3	66.8	66.9	66.2
7:15	62.3	65.5	66.8	65.8	64.2	63.7	64.7	65.2	64.9	64.7
7:30	60.9	65.4	65.7	64.3	61.8	61.0	60.4	61.5	63.8	64.0
7:45	59.5	64.8	65.1	63.3	60.0	58.3	58.0	59.3	63.7	64.7
8:00	60.5	63.9	63.8	62.4	59.5	59.0	59.3	60.2	63.8	64.3
8:15	60.4	62.9	63.3	61.9	59.8	59.3	60.3	61.0	64.1	64.5
8:30	58.9	63.4	64.3	63.5	61.6	60.9	61.9	60.9	63.4	64.7
8:45	58.8	63.3	64.3	63.3	60.9	60.4	61.7	60.9	62.7	64.2
9:00	61.5	65.1	65.1	64.4	62.4	61.3	62.2	61.5	63.1	63.7
9:15	63.1	66.7	66.6	65.7	64.0	62.9	63.1	63.6	64.2	64.4
9:30	62.7	65.9	65.7	65.3	63.5	62.7	63.3	64.3	65.1	65.2
9:45	60.9	64.3	64.2	63.6	62.2	61.3	61.9	63.2	63.5	63.5
15:00	63.1	66.3	66.0	64.7	63.1	62.5	63.2	63.9	64.4	64.0
15:15	62.3	66.2	65.3	63.8	62.0	61.4	63.0	63.5	63.9	63.3
15:30	61.1	64.4	63.7	63.1	61.9	61.2	63.0	63.2	63.0	61.9
15:45	59.3	61.6	58.8	59.4	59.5	59.0	60.8	61.8	61.7	61.3
16:00	56.1	58.0	56.4	56.5	57.9	57.6	59.3	60.3	60.1	58.5
16:15	52.1	52.7	51.0	54.0	56.5	56.0	57.4	57.8	58.0	56.0
16:30	48.4	47.5	45.9	52.6	56.0	55.3	56.9	57.3	58.3	56.3
16:45	41.9	40.8	40.1	49.4	53.6	52.8	54.2	54.2	55.9	53.1
17:00	39.5	37.7	36.5	47.1	53.6	52.1	54.7	54.1	54.7	51.2
17:15	39.6	36.5	34.7	45.3	50.2	48.7	50.0	50.7	50.2	44.2
17:30	38.0	34.6	33.0	41.1	47.8	46.8	48.8	49.4	50.0	44.4
17:45	43.6	40.3	38.0	44.9	50.8	50.4	53.1	53.2	54.1	49.2
18:00	50.6	53.2	50.2	52.3	55.9	55.2	57.2	57.8	58.8	56.8
18:15	53.3	59.0	57.8	58.0	58.0	57.5	59.5	60.3	61.0	60.8
18:30	56.7	61.7	60.8	59.5	58.8	58.4	60.3	61.1	61.5	61.7
18:45	57.9	63.2	62.2	60.5	59.0	58.7	59.8	61.4	62.5	62.4



Direction of Travel

6. TRAFFIC VOLUME DEVELOPMENT

Traffic demand is one of the most important elements of a simulation project. Defining traffic demand in TransModeler includes not only the volumes of vehicle trips to be simulated, but also the paths vehicles choose to travel to reach their assigned destination. Traffic demand can be specified through a variety of methods, such as defining link volumes and turning movements, origin-destination trip tables, or a specific set of vehicle paths.

The primary source of volume data for this study was the *Traffic Forecast Report for STIP No. I-5870 Wake County, North Carolina* (Patriot Transportation Engineering, PLLC, May 2018). The traffic forecast included four scenarios: the 2017 Base Year No-Build, 2017 Base Year Build, 2045 Future Year No-Build and the 2045 Future Year Build. The traffic forecast diagrams are included in Appendix B.

6.1 ORIGIN-DESTINATION MATRIX DEVELOPMENT OVERVIEW

For a network of this size and the level of detail for the design options, it was determined that utilizing an Origin-Destination (O-D) matrix would be the best method to define how the actual volumes are loaded onto the network. Trip matrices have two components. The first component is an O-D matrix that lists the number of trips between each O-D pair. The second component is a set of Trip Matrix Settings which govern the specifics of how each of the trips between each O-D pair should be simulated. The trip matrix settings are saved as part of the standard matrix file. Both components are necessary in order to use a Trip Matrix as a simulation input.

O-D matrices can be created by various ways including:

- Forecasts of O-D demand from a planning model or subarea analysis
- Derived from observed volumes and/or turning movement counts
- Based on engineering judgment
- Based on passive data collection such as Bluetooth data, probe data or license plate recognition techniques

The primary tool for developing complex O-D matrices is through Origin-Destination Matrix Estimation (ODME). The two main inputs to the ODME process are a seed (or base) matrix and the observed (or target) counts. The seed matrix serves two purposes: to set the dimensions for the output matrix, and to provide initial values for the estimated trip table. The ODME procedure is aimed at producing an OD matrix that is consistent with observed traffic counts. Therefore, a set of observed segment or link counts is required for the procedure to create a target volume for each link where counts were collected. These counts typically only cover a subset of the road network, because counts are usually not taken on all segments of the network. And the complex problem of calculating an OD matrix that is consistent with a set of traffic counts has been of methodological interest for at least twenty years. Various methods have been proposed that treat important aspects of the problem.

An issue is consistency with route choice behavior, so that predicted traffic counts can be estimated as the result of an assignment process in which predicted OD matrix flows traverse the network. Some methods assume fixed link use proportions by OD pair, but this is not desirable (Yang et al., 1992). Link utilization is arguably flow-dependent, and therefore should be calculated with equilibrium flows.

A second consideration is that there is often a prior estimate of the trip table to be predicted. In other words, it is generally considered appropriate to find a new matrix that is close to the prior matrix, as well as achieving consistency with counts. Complicating this consideration is that traffic counts themselves are stochastic variables that are measured with error and may be inconsistent with flow conservation. Thus, methods that treat counts as deterministic may give unstable or unrealistic results. Furthermore, counts are usually available for only a small subset of segments.

This presents no insurmountable difficulties, but an effective sample should be comprised of measurements from widely-dispersed parts of the network.

The ODME procedure in TransModeler is based on the work of Nielsen (1993, 1998), who independently developed it as a procedure for TransCAD 2.1. The method was re-implemented by Caliper Corporation. This method has the advantages of treating counts as stochastic variables, as well as working with any traffic assignment method. It therefore is attractive for use with the Stochastic User Equilibrium Assignment method, as well as with User Equilibrium Assignment. Nielsen's method is an iterative (or bi-level) process that switches back and forth between a traffic assignment stage and a matrix estimation stage. The procedure requires an initial estimate of the OD matrix. This can be a default, be a prior estimate based upon survey measurements, or be synthetically generated (e.g., from a trip distribution model).

6.2 2017 BASE YEAR VOLUME DEVELOPMENT

6.2.1 2017 BASE YEAR TARGET VOLUMES

The ODME procedure is aimed at producing an O-D matrix that is consistent with observed traffic counts. Therefore, a set of observed segment or link counts, known as target volumes, is required for the procedure. A Link-Node Diagram showing the Node IDs and Link IDs for the study is included in Appendix C1. For this study, it was determined that the target volumes would be developed by calculating the volumes for each link within the model based on the traffic forecast AADT volumes. The volumes were calculated by multiplying the AADT by the Directional Distribution (D) and Peak Hour Factor (K) for each direction of traffic for all the links in the network for each of the eight hours being simulated. The 2017 Base Year Target Volumes are included in Appendix C2.

6.2.2 2017 BASE YEAR INITIAL INPUT MATRIX

An initial trip matrix was developed from StreetLight Data output that included the following attributes:

- Relative volume data from each origin and destination in the network for the following data types:
 - Global Positioning System (GPS) data for personal vehicles from June 2016 to November 2017– 878,584 total trips
- The data was refined to include only average weekday (Monday-Thursday) for both the AM Peak (6 AM to 10 AM) and PM Peak (3 PM to 7 PM) – 281,171 total trips

The final 2017 Base Year Input Matrices are included in Appendix C3.

6.2.3 2017 BASE YEAR SEED MATRIX DEVELOPMENT

The development of the seed matrix for use in the ODME process was developed based on the target volumes (Section 6.2.1) and the initial input matrix (Section 6.2.2) through a matrix iteration process. The matrix iteration process from *NCHRP 255: Highway Traffic Data for Urbanized Area Project Planning and Design* (December 1982) was used in the development of the 2017 Base Year scenario seed matrices. The inputs into the matrix iteration process were the 2017 Base Year OD initial input matrices and the 2017 Base Year Seed Matrix Target Volumes for each entry and exit link in the network for each of the eight hours being simulated. The initial matrix was first iterated for each row of the matrix to attempt to match the predicted 2017 origin volume. The matrix was then iterated for each column of the matrix to attempt to match the predicted 2017 destination volume. The iterative process was implemented for 20 iterations of both the rows (origins) and columns (destinations) with a final matrix being developed that averaged the twentieth iteration of the matrix derived from the rows and the matrix derived from the columns. The 2017 Base Year Seed Matrices (AM and PM) are included in Appendix C4.

In addition to the seed matrices, the ODME process allows the user to limit how much the ODME process can change a particular O-D volume during the iterative process. Therefore, an additional constraint was developed to bound the seed matrix by applying value change constraints that represent lower and upper bounds of percent change for each O-D pair within the seed matrix. Because the seed matrix was developed to match the existing travel patterns there was a relatively high degree of comfort in the matrices; however, the variability of traffic throughout the peak period results in a degree of temporal uncertainty that resulted in using a slightly larger range. Therefore, the following ranges were applied:

- OD volume less than 50 per hour: +/- 80%
- OD volume from 50 to 99 per hour: +/- 60%
- OD volume from 100 to 249 per hour: +/- 40%
- OD volume from 250 to 499 per hour: +/- 30%
- OD volume greater than 500 per hour: +/- 20%

6.2.4 2017 BASE YEAR ADDITIONAL ODME INPUTS

The next step in the volume development process was to utilize the ODME tools in TransModeler to develop the O-D matrices that were used for the project level simulation study. The ODME procedure is aimed at producing an O-D matrix that is consistent with observed traffic counts. The following sections include the inputs required to run the ODME process in TransModeler.

6.2.4.1 Simplified ODME Network

The ODME process is also somewhat sensitive to the geometry of the network, especially where access control measures redistribute turn volumes to other locations. Therefore, where feasible, locations that had access control that were relocating turn movements to other intersections were revised to represent the desired movements during the ODME process. This step helped to provide better information when iterating the volumes and determining travel patterns, with the access control features being added back to the model before being simulated.

6.2.4.2 Link Weighting

A set of observed segment or link counts, known as target volumes (described in Section 6.2.1), is required for the procedure. In addition to the target link volumes, TransModeler allows the user to prioritize, or give a higher weight to certain counts within the model. The weighting of counts was used to improve the performance of the process in critical areas or to reflect the level of confidence the modeler had in a certain count or set of counts.

The project team tested several approaches to weighting the count data and ultimately determined that the best approach would be to apply variable weights to links based on how critical they were in the analysis. The original weights were determined by the project team; however, the weights were revisited during the iterative ODME process to better improve the results and allow for the resultant volumes to match the link data to the greatest extent possible.

6.2.4.3 Turning Movement Volumes

In addition to the target link volumes, the ODME process can be further constrained by turning movement volumes. The additional constraints provide supplementary information during the ODME process such that it attempts to match both the link and turning movement volumes as closely as possible. The turning movement counts (described in Section 5.3) were input for each intersection in the model for each of the eight one-hour periods being simulated. Because the counts were taken in mid-November (just prior to the week of Thanksgiving) they tended to be higher than the average data included in the AADT volumes. Therefore, the turning movement counts were iterated with the

traffic volume estimating tool in TransModeler to match the link target volumes and provide a more consistent basis for developing the O-D matrices.

6.2.5 2017 BASE YEAR ODME DEVELOPMENT

The static ODME process is an iterative (or bi-level) process that switches back and forth between a traffic assignment stage and a matrix estimation stage. The procedure requires an initial estimate of the O-D matrix and the target volumes for links within the network. There are several options for running the static ODME process. The first choice is the traffic assignment method, with five options: (1) User Equilibrium (UE), (2) Stochastic User Equilibrium (SUE), (3) All-or-Nothing (AON), (4) Path Based User Equilibrium, or (5) N Conjugate User Equilibrium. The Stochastic User Equilibrium method was selected as the preferred option for running the ODME process as it resulted in the highest levels of convergence in the shortest amount of time. The second input choice was for the delay function, which has 6 options, of which the Bureau of Public Road (BPR) function was selected due to it being a US based equation that relates the travel time to the volume/capacity ratio of each link.

The ODME process was then run for the four one-hour AM periods and the four one-hour PM periods and O-D matrices were developed for each the eight hours being modeled. For each ODME run, the assigned link volumes were compared to the target volumes developed from the forecast and any difference greater than 10 percent were reviewed in closer detail.

The following thresholds were used for ODME target volumes:

- Link target volumes greater than 1,000 can vary by +/- 10 from the link assignment volume
- Link target volumes of 1,000 or less can vary by up to 100 vehicles from the link assignment volume
- Link target volumes of 500 or less can vary by up to 50 vehicles from the link assignment volume
- Link target volumes of 100 or less can vary by up to 15 vehicles from the link assignment volume

As noted, it is often not possible for every movement to fall within the thresholds included above; therefore, the goal is for 90% of the links in each category to meet the criteria, if possible. However, with no trip paths having multiple competitive routes and starting from a balanced forecast it was much easier to replicate link level volumes using a static ODME process. The AM and PM OD matrices for the eight total hours being simulated produced volumes that met the above criteria for all time periods with the following overall statistics:

- Link target volumes greater than 1,000 can vary by +/- 10 – 98 percent of links meet criteria
- Link target volumes of 1,000 or less can vary by up to 100 vehicles – 97 percent of links meet criteria
- Link target volumes of 500 or less can vary by up to 50 vehicles – 94 percent of links meet criteria
- Link target volumes of 100 or less can vary by up to 15 vehicles – 92 percent of links meet criteria

A summary of the link volume comparisons is included in Appendix C5.

The final Estimated O-D matrices from the ODME process are included in Appendix C6.

6.2.6 2017 BASE YEAR CLASS MATRIX OD DEVELOPMENT

At the completion of the ODME matrix development process, the demand volumes for the AM and PM peaks were established. However, the matrices only included the total number of trips occurring between each O-D pair and were not broken down by vehicle type. Because the proposed project includes improvements to the ramp terminals and adjacent roadways it was decided that further disaggregating the O-D matrices by vehicle class would provide for more realistic results. Therefore, this project utilized Method 3 in NCDOT's simulation guideline for modeling heavy

vehicles and three O-D matrices were created to represent the vehicle volumes in the network: an Automobile matrix, a Dual Truck matrix, and a TTST Truck matrix.

There is no simple method for separating the matrices into individual vehicle classes, so it was accomplished through an iterative process using spreadsheets as follows:

1. Each external node was classified based on the truck percentage of the entering link from the traffic forecast.
2. Each origin and destination node volume was multiplied by the vehicle class percentage to determine the likely number of trips entering and exiting the network at each node. The node volumes were then combined into total volumes based on the vehicle categories and represented a control total for each location category.
3. The total number of vehicles for each vehicle class was calculated by adding the individual categories together for each location category.
4. The O-D volumes in each of the peak hour matrices were then multiplied by a series of percentages for each vehicle class, which totaled 100 percent, such that three individual matrices were developed for each respective vehicle class. The percentages were adjusted iteratively until the volumes met the following criteria:
 - a. The sum of the total volume for each vehicle class matrix was within 2% of the control total, calculated in Item 3 above, and;
 - b. Each location category had a total volume (sum of origin and destination volume) that was within 10% of the control total

The result of the process was a set of percentages, by O-D pair, that could be multiplied by each of the O-D pairs in the peak hour matrices to create matrices for each vehicle class. Because the volumes in the matrices were for a one-hour period, there were relatively low volumes for each matrix cell for some minor roadways, which when combined with lower percentages for trucks, resulted in fractional trips that were typically rounded to zero when converted to integer trip values. To mitigate this loss of trips, fractional trips above a certain threshold were rounded up so the total number of vehicle classes would be preserved when converting to the peak hour matrix level. The result of the development of the volume data by class was a set of three matrices, with volumes for each of the three vehicle classes for the AM and PM peaks. Each of the matrices, by vehicle class, are included in Appendix C7.

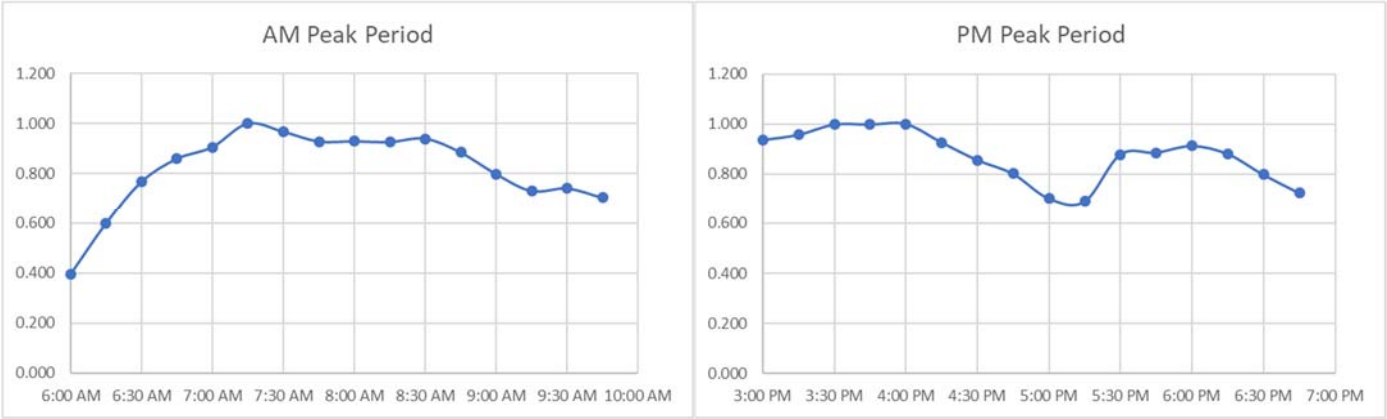
6.2.7 2017 BASE YEAR MATRIX EXPANSION TO INCLUDE WADE AVENUE

At the completion of the O-D matrix development process the volume data was reviewed and compared to the INRIX data. Based on this review it was determined that the I-440 Westbound diverge to Wade Avenue and the reduction from a six-lane freeway to a four-lane freeway west of the diverge was the primary reason for the existing delays along the corridor. In order to model this condition, the O-D volumes required expansion to include the diverge to Wade Avenue. The matrices were then expanded based on proportions derived from traffic counts taken on March 1, 2018.

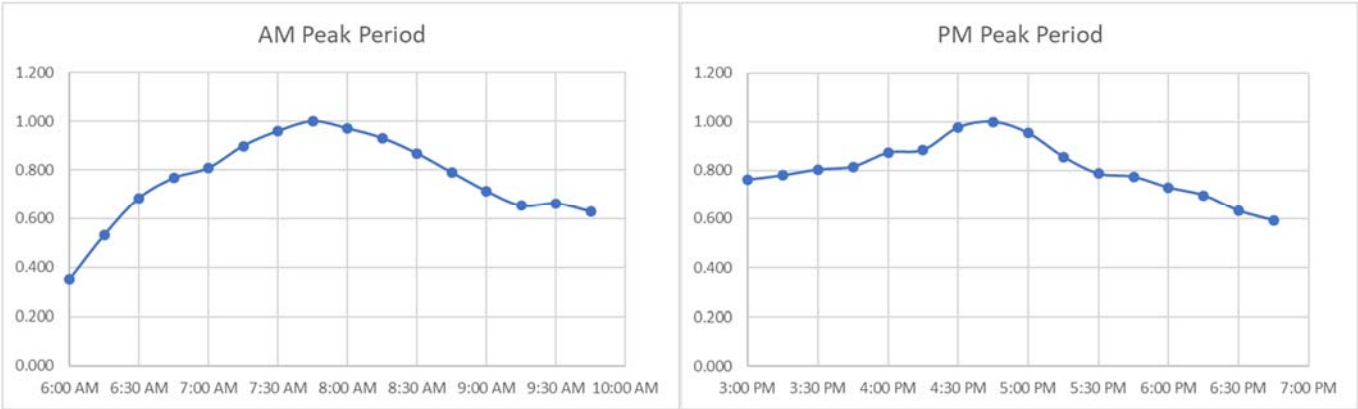
6.2.8 2017 BASE YEAR MATRIX SHIFT TO ACCOUNT FOR OVER CAPACITY CONDITIONS

The development of volume data for congested facilities is a challenging task as the traffic volumes collected are typically based on the number of vehicles that crossed a particular point on a roadway or passed through an intersection. The counts represent the number of vehicles processed in a particular time period; however, a simulation model operates best with pure demand volumes (number of vehicles that would have traversed a particular location if not for the congestion). Developing demand volumes presents significant challenges and ultimately volume development defaults to using the volumes processed at a particular location. The use of processed volumes is difficult to model as it requires the analyst to model the capacity of the roadway perfectly. If the demand volume is slightly

below the model’s capacity, there will be much less congestion observed. If the demand volume is slightly higher than the model’s capacity, there will be much more congestion in the model than what likely occurred in the field. Therefore, it is common to vary the demand slightly to best replicate the demand volume that results in a reasonable capacity for the facility being modeled. The following graphics show the volumes along I-440 in the AM and PM peaks. Based on the INRIX data the peak congestion occurs from 7:30 AM to 8:30 AM and 4:00 PM to 5:30 PM; however, the volume data actually showed the highest volumes occurring at 7:15 AM and 3:45 PM highlighting the effect on demand caused by the congestion. Similarly, the lowest volume passing through the corridor was recorded at 5:15 at the peak of the congestion along the corridor.



Based on this, it was determined that synthesizing a revised curve that accounts for the actual demand along the corridor was more appropriate. Therefore, a revised curve was developed that shifted volumes to account for the difference between processed volume from the counts and the actual demand.



Therefore, the O-D matrices were revised such that the through volume on I-440 was adjusted to match the synthesized demand curve. The final 2017 Base Year O-D matrices are included in Appendix C8.

6.3 2021 DESIGN YEAR NO-BUILD VOLUME DEVELOPMENT

The 2021 Design Year No-Build volumes for the No-Build scenario were developed based on interpolated volumes between the 2017 Base Year No-Build and 2045 Future Year No-Build scenario forecasts. The same directional and peak hour factors were applied to the interpolated boundary link volumes to create 2021 target volumes. The 2017 final O-D matrices were then iterated based on the NCHRP 255 methodology to match the 2021 target volumes resulting in the 2021 No-Build O-D matrices. The final 2021 No-Build O-D matrices are included in Appendix D.

6.4 2021 DESIGN YEAR BUILD VOLUME DEVELOPMENT

Similar to the 2021 Design Year No-Build volume development, the 2021 Design Year Build volumes were developed based on interpolated volumes between the 2017 Base Year Build and 2045 Future Year Build scenario forecasts. The final 2021 No-Build O-D matrices were then iterated based on the NCHRP 255 methodology to match the 2021 Build target volumes for each of the origins and destinations except those at Crabtree Valley Mall access points. Given that the access to the mall driveways changes in each of the build scenarios, the traffic patterns would be different from the no-build scenario; therefore, the resultant O-D matrices were then taken through a 10-step process of rerouting trips to and from Crabtree Valley Mall based on the changes in access. The methodology and percentages used to reroute the trips in the O-D matrices was based on the methodology used in the development of build forecasts. After rerouting the trips associated with the mall, the O-D matrices were then iterated based on the NCHRP 255 methodology to match the 2021 Build target volumes for the origins and destinations associated with Crabtree Valley Mall access points. The final 2021 Build O-D matrices are included in Appendix E1 and E2.

6.5 ORIGIN-DESTINATION MATRIX SETTINGS

A variety of other parameters describe how trips are to be generated from the matrix. These settings are defined in the trip matrix settings. The Trip Matrix Setup used the basic parameters described in the NCDOT Simulation Guidelines. Due to the high levels of congestion, the traffic counts collected only show the processed volumes, not the full demand for each time period. Therefore, it was determined that a portion of the traffic needed to be shifted to the 4PM and 5PM hours to model the full demand during the PM peak and to the 7AM and 8AM hours during the AM peak. The time distribution matrix curves are based on the synthesized curve that was derived from the collected traffic counts at the interchange of I-440 and Glenwood Avenue and are shown below.

AM Peak	Time Distribution	PM Peak	Time Distribution
6:00 AM	15.06%	3:00 PM	24.11%
6:15 AM	22.82%	3:15 PM	24.67%
6:30 AM	29.30%	3:30 PM	25.42%
6:45 AM	32.82%	3:45 PM	25.80%
7:00 AM	22.04%	4:00 PM	23.38%
7:15 AM	24.52%	4:15 PM	23.68%
7:30 AM	26.17%	4:30 PM	26.16%
7:45 AM	27.26%	4:45 PM	26.78%
8:00 AM	27.27%	5:00 PM	28.30%
8:15 AM	26.15%	5:15 PM	25.41%
8:30 AM	24.39%	5:30 PM	23.35%
8:45 AM	22.18%	5:45 PM	22.95%

6.6 VEHICLE ROUTING

One of the more important tasks of a traffic simulation model is to ensure that the paths that vehicles follow through the network reflect those that drivers actually choose and that the distribution of vehicles, both in spacing throughout the network and over time throughout the simulation period, result in realistic congestion patterns. The Routing settings are project settings that are used as inputs to the route choice model. In TransModeler, a path is selected for each individual vehicle. Because of varying perceptions and behaviors, drivers traveling between the same origin-destination pair likely may not always follow the same path. Furthermore, drivers do not necessarily choose the

minimum cost path. Route choice is one of the most complex of driver behaviors and one of the most critical in traffic modeling.

The route choice setting for this model was set to stochastic shortest path and included the use of turning delays. The stochastic shortest path method is similar to the deterministic shortest path in that all vehicles choose a shortest path. Path costs are randomized, however, for each individual vehicle to account for variations in perception and behavior. Thus, if multiple physical paths exist, there is not one, but multiple potential shortest paths between a given origin-destination pair.

The shortest path can be determined in one of two ways: (1) based on the free flow speed of the facilities between the origin-destination points or (2) through the use of historical travel times. The historical travel time table is a table of segment travel times by time period representing historical, or expected, average travel conditions. TransModeler employs a route choice model to determine, prior to departure, the path each vehicle will follow from its origin to its destination. That choice is primarily a function of each path's total generalized cost, which, in turn, is primarily based on historical travel time information. If no historical travel time table is given, path costs will be based on calculated free-flow travel times, which are derived from free flow speeds associated with each link's road class. The models for this study included the use of the TransModeler features for both historic travel times along each link and the turning delay at each node that is generated through the dynamic traffic assignment process.

TransModeler uses one of a number of route choice models to decide the path each vehicle takes. Those route choice decisions are largely a function of path costs, which are largely determined by travel time. There are a variety of methods for estimating travel times that range from "expensive" (e.g. collecting travel time measurements in the field) to "cheap" (running a traffic assignment). When observed travel times are not available, a simulation-based dynamic traffic assignment can be run in order to estimate "loaded" (i.e., congested) travel times. The idea behind the simulation-based dynamic traffic assignment is that by running the simulation from start to finish iteratively and averaging output travel costs with input travel costs between each iteration, the network loading will converge toward user equilibrium, where vehicles "learn" from prior iterations by choosing better paths each subsequent iteration/simulation run until no one can improve their travel time significantly by switching to an alternative path. When this condition is satisfied, User Equilibrium is achieved. Simulation-based dynamic traffic assignment (DTA) with 200 iterations was utilized in developing the model for this study with the TransModeler default parameters being utilized.

7. VISUAL VALIDATION

7.1 DEVIATION FROM DEFAULT VALUES

Part of the model development process is to run the model and review the animation in comparison to information observed during the field visit. A field visit was taken to observe the PM peak on April 2, 2018. The initial model, based on the NCDOT default data, showed much less congestion than was observed in the field. The primary location within the project limits where the congestion was less than what was observed was at the I-440 westbound off ramp to US 70 (Glenwood Avenue). These parameters were adjusted in an iterative process to match the simulated speeds and queuing to the current existing conditions in the field. The following parameters were included in the 2017 Base Year Model:

Model Action: Modify Run Yellow Threshold

Run Yellow Threshold (S)	2.2
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Model Action: Modify Stop Time at Stop Signs

Percentage (%)	No competing traffic (sec)	With competing traffic (sec)
45.0	0.0	0.5
25.0	0.3	0.7
20.0	0.5	1.0
8.0	0.7	1.3
2.0	1.0	1.5

Model Action: Modify Desired Speed Reduction when Reduced Speeds are Visible Downstream

Reduced speed perceived when gaps between vehicles are less than (ft)	55.0
Reduced speed perceived when speeds are less than (mph)	25.0
Reduction in desired speed (%)	28.0

Model Action: Modify Initiation of Lane Connector Bias

Initiation of Lane Connector Bias (ft)	600
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Model Action: Modify Stopped Gaps (sec)

	Mean (ft)	Standard Deviation (ft)
Non-heavy vehicle in front	11.0	6.0
Heavy vehicle in front	14.0	7.0

Model Action: Modify Stopped times between which acceptable headway shrinks (sec)

Lower Bound	15
Upper Bound	35

Model Action: Modify Headway Threshold

Percentage (%)	Lower bound (sec)	Upper bounds (sec)
5.0	0.25	1.75
10.0	0.30	2.46
30.0	0.35	3.17
40.0	0.40	3.89
15.0	0.45	4.60

Model Action: Modify Critical Headway Threshold

Percentage (%)	Freeway Merging (sec)	Street Merging (sec)	Street Crossing (sec)
10.0	0.2	1.0	0.8
45.0	0.4	1.5	1.0
25.0	0.6	2.0	1.4
20.0	0.8	2.5	1.8

The main congestion issues on westbound I-440 occur outside the limits of the network and spillback into the project limits. Therefore, the model was extended to the Wade Avenue interchange to include the westbound Wade Avenue off-ramp with localized speed changes to create the congestion that occurs within this interchange. Speed limit changes were applied in the peak periods on the westbound Wade Avenue off ramp, westbound I-440 just past the westbound Wade Avenue off ramp, and where the weaving section between the loops within the Wade Avenue

interchange. Speed changes were applied to produce the congestion caused by the high volume on Wade Avenue in the AM and the congestion caused by high volumes and friction downstream of the Wade Avenue off-ramp in the PM.

Given that this network was originally planned to terminate between the Lake Boone Trail and Wade Avenue interchanges, the traffic volumes entering the network include the vehicles from I-440 and Wade Avenue. These high traffic volumes were being denied entry into the TransModeler network due to the lack of capacity on the two-lane section of I-440. Therefore, I-440 was modified to carry three eastbound lanes into the network to account for the lane add from the Wade Avenue loop in order to allow the network to load properly and give realistic results.

The lane connector bias on the Lake Boone Trail westbound on-ramp acceleration lane was set at 1.0 instead of the standard 0.6 based on field observations of vehicles using the full length of the acceleration lane and vehicles merging into the acceleration lane, mistaking it to be the exit only lane to Wade Avenue.

The lane connector bias on right turns at several right-in-right-out intersections was set at 0.5 to discourage simulated vehicles from waiting for a gap in the far-left lane. Based on field observations the right turns lane connectors on Crabtree View Place at Glenwood Avenue and Arrow Drive at Glenwood Avenue were set at 0.5 due to the vehicles queuing back from the I-440 interchange blocking the left lanes during the PM peak. The right turn lane connector from Myron Drive to Lake Boone Trail was set at 0.5 to help relieve the unrealistic queue that develops during the PM peak.

8. 2017 BASE YEAR NO-BUILD ANALYSIS

8.1 MODEL GEOMETRY

The basis for developing the geometric data was aerial photography, elevation data, and knowledge based on field observations. Aerial photography from Google was used as a background to digitize the network into the simulation model. The three-dimensional attributes and grades were determined based on elevation data from NCOneMap.

8.2 MODEL PARAMETERS

Every microscopic simulation package has its own unique methodology for coding the model. Most models include a default set of parameters that define how the model operates and is based on data taken from locations outside of North Carolina. The initial model development included the use of the NCDOT default parameters file for TransModeler (dated October 2016). The process of visual validation reviews and refines these model parameters to better replicate the conditions observed in the field. Section 6 outlines the parameters that were modified from the defaults to achieve visual validation.

8.3 INTERSECTIONS

The geometric layout for the signalized intersections were coded in the network according to the signal design plans collected for this study and included in Appendix F. The signal detectors and timings were coded based on the signal plans obtained from NCDOT. The Ring and Barrier Table was coded in TransModeler based on the Phasing Diagram shown on the signal control plan. The signal timings entered into TransModeler were all based on the signal timings obtained from the City of Raleigh. For isolated (non-coordinated) signals or for free running timings for off peak periods, the timings provided in the signal design plan were utilized.

8.3.1 SIGNAL OPTIMIZATION

The coordinated signal systems within the network are modeled with the existing offsets. Intersections with isolated signals (non-coordinated), were optimized individually based on the peak hour volumes. Based on field observations of the signal operations, the offset at the intersection of Glenwood Avenue and the I-440 westbound off ramp was

modified to be 20 second later. The offset provided by the City of Raleigh did not show the ramp traffic getting blocked by the queue on Glenwood Avenue, as was frequently observed in the field.

8.4 VOLUME DATA AND VEHICLE ROUTING

Traffic demand and vehicle routing inputs were defined in the model as described in Section 6. The peak period volumes for the 2017 Base Year No-Build analysis are included in Appendix C.

8.5 OUTPUTS AND MEASURES OF EFFECTIVENESS

After running a simulation, the next step is to use the output statistics in order to analyze traffic conditions in the network. The development of selection sets in TransModeler included defining the nodes for delay output and links for the spillback queue analysis. For the purposes of the 2017 Base Year Model, the MOEs detailed in Section 4 were extracted from the model and summarized in Section 8.5.

8.6 SIMULATION AND RUN CONTROLS

All simulation software contain run control parameters to enable the modeler to customize the software operation for their specific modeling needs. Multiple repetitions of the same model are required because microscopic simulation results will vary depending on the random number seed used in each run. The random number seed is an input that TransModeler uses to select a sequence of random numbers, which are utilized in the model to make numerous decisions throughout the simulation run. The outcomes of all of these decisions will affect the simulation results. The results of each run are usually close to the average of all of the runs; however, each run will be different from the other.

The number of repetitions required for the base model is typically based on a statistical evaluation of the results based on a desired range and confidence interval. After a review of the output data, it was determined that ten simulation runs would be adequate for this project.

8.7 2017 BASE YEAR NO-BUILD MODEL RESULTS

The output data was extracted from the TransModeler model via the Output Manager. The outputs were collected in accordance with the MOEs defined in Section 4 and are summarized in the following sections.

8.7.1 NETWORK RESULTS

Network-level MOEs were developed for Vehicle Hours Traveled (VHT), Vehicle Miles Traveled (VMT), Average Speed, and Total Delay. These statistics were calculated for every vehicle included in the peak hour of the simulation runs and are averaged over the ten runs performed for each scenario. For the VMT, VHT, and Total Delay, the average was calculated from completed trips, incomplete trips, queued vehicles, and loaded vehicles. The Average Speed was based only on vehicles that made completed trips. The network results for the Base Year No-Build scenario are included in Table 8-1.

Table 8-1: 2017 Base Year Network Measures of Effectiveness

2017 Base Year No-Build	Time	VHT	VMT	Average Speed (mph)	Total Delay (hr)
AM	6:00-7:00	1281.9	56747.9	48.0	356.1
	7:00-8:00	2514.6	87196.3	41.9	1055.6
	8:00-9:00	3474.1	87705.8	40.2	1996.9
	9:00-10:00	2048.0	64360.9	45.0	968.6
PM	3:00-4:00	2682.1	87504.2	43.1	1205.7
	4:00-5:00	2825.8	90541.2	40.3	1292.6
	5:00-6:00	3902.0	98035.4	32.8	2240.2
	6:00-7:00	2282.5	70593.7	43.1	1093.2

Travel times and average speeds through the length of the network between the major entry and exit point of the network were extract and provided in Appendix I.

8.7.2 FREEWAY RESULTS

The results of the freeway analysis are included in Table 8-2. The 2017 Base Year No-Build scenario shows that during the AM peak period, all segments on I-440 eastbound are operating at LOS_s D or better and 8 segments operating at LOS_s F in the westbound direction for one hour with one segment operating at LOS_s F for two hours. There are 11 westbound segments operating at an unacceptable LOS_s E for at least one hour. The PM peak period shows four segments on I-440 eastbound operating at LOS_s F for one hour and nine segments operating at LOS_s F in the westbound direction with two segments operating at LOS_s F for two hours and one segment failing for three hours. There are 10 eastbound segments and three westbound segments that are operating at an unacceptable LOS_s E for at least one hour.

Figure 8-1 and Figure 8-2 show the average speed for each 15-minute period in each peak across the I-440 corridor. In the AM peak period, I-440 eastbound experiences little to no reduction in speed along the corridor. In the PM peak period, I-440 eastbound experiences a reduction in speed at the Lake Boone Trail on-ramp merge starting around 5PM and lasts about 45 minutes.

In the AM peak period, I-440 westbound experiences reduced speeds and congestion approaching the Wade Ave off-ramp starting around 7AM and continues for about one and half hours. This is mostly due to downstream congestion on both I-440 and Wade Ave. In the PM peak period, I-440 westbound experiences heavy congestion at the Wade Ave off-ramp due to the lane drop to Wade Ave and congestion downstream on I-440 spilling back in to the project study area. The congestion starts around 3:30PM and lasts about two hours.

Table 8-2: 2017 Base Year No-Build Freeway Measures of Effectiveness

Analysis ID	Analysis Segment	Type	AM Density				AM LOS _s			
			6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00
1	I-440 EB - West of Lake Boone Trail Exit Ramp	Basic	15.0	27.9	26.2	19.4	B	D	D	C
2	I-440 EB - Lake Boone Trail Exit Ramp	Diverge	13.7	24.6	23.2	17.0	B	C	C	B
3	I-440 EB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	13.3	26.1	25.3	18.9	B	D	C	C
4	I-440 EB - Lake Boone Trail Entrance Ramp	Merge	10.3	22.5	21.9	17.3	B	C	C	B
5	I-440 EB - Lake Boone Trail to Ridge Road	Basic	14.1	28.9	27.6	21.2	B	D	D	C
6	I-440 EB - Ridge Rd Exit Ramp	Diverge	10.4	22.5	21.9	17.4	B	C	C	B
7	I-440 EB - Ridge Rd Exit Ramp to Ridge Rd Entrance Ramp	Basic	15.8	31.3	29.4	23.7	B	D	D	C
8	I-440 EB - Ridge Rd Entrance Ramp to Glenwood Ave Exit Ramp	Weaving	11.8	24.5	24.0	19.1	B	C	C	B
9	I-440 EB - Glenwood Ave Exit Ramp to Glenwood Ave Entrance Loop	Basic	13.7	26.9	26.3	19.8	B	D	D	C
10	I-440 EB - Glenwood Ave Entrance Loop	Merge	13.1	25.1	25.7	19.5	B	C	C	B
11	I-440 EB - Glenwood Ave Entrance Ramp to Six Forks Rd Exit Ramp	Basic	11.9	23.5	24.2	18.3	B	C	C	C
12	I-440 EB - Six Forks Rd Exit Ramp	Diverge	8.4	16.8	18.4	14.2	A	B	B	B
13	I-440 EB - Six Forks Exit Rd Loop	Diverge	14.0	26.1	27.6	21.5	B	C	C	C
14	I-440 EB - Six Forks Exit Rd Loop to Six Forks Rd Entrance Ramp	Basic	14.2	26.7	26.5	20.2	B	D	D	C
15	I-440 EB - Six Forks Rd Entrance Ramp	Merge	6.7	13.1	13.6	10.7	A	B	B	B
16	I-440 EB - East of Six Forks Rd Entrance Ramp	Basic	11.5	21.3	22.0	16.8	B	C	C	B
17	I-440 WB - East of Six Forks Rd Exit Ramp	Basic	24.2	30.8	42.5	23.0	C	D	E	C
18	I-440 WB - Six Forks Exit Rd Loop	Diverge	24.7	30.2	32.1	24.2	C	D	D	C
19	I-440 WB - Six Forks Rd Exit Loop to Six Forks Rd Entrance Ramp	Basic	30.4	36.9	39.3	27.8	D	E	E	D
20	I-440 WB - Six Forks Rd Entrance Ramp	Merge	18.3	24.1	25.0	20.7	B	C	C	C
21	I-440 WB - Six Forks Rd Entrance Ramp to Glenwood Ave Exit Ramp	Basic	22.3	28.8	31.5	21.8	C	D	D	C
22	I-440 WB - Glenwood Ave Exit Ramp to Glenwood Ave Entrance Loop	Basic	27.7	35.4	47.5	24.5	D	E	F	C
23	I-440 WB - Glenwood Ave Entrance Loop to Glenwood Ave/Ridge Rd Exit Ramp	Weaving	21.8	29.1	40.6	20.3	C	D	E	C
24	I-440 WB - Glenwood Ave/Ridge Rd Exit Ramp to Glenwood Entrance Ramp	Basic	26.4	37.5	56.0	23.0	D	E	F	C
25	I-440 WB - Glenwood Entrance Ramp	Merge	24.9	41.8	56.5	22.4	C	E	F	C
26	I-440 WB - Glenwood Ave Entrance Ramp to Lake Boone Trail Exit Ramp	Basic	28.7	48.8	61.6	26.1	D	F	F	D
27	I-440 WB - Lake Boone Trail Exit Ramp	Diverge	25.3	41.9	56.3	23.2	C	E	F	C
28	I-440 WB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	23.8	65.2	44.3	21.8	C	F	E	C
29	I-440 WB - Lake Boone Trail Entrance Ramp	Merge	26.4	61.8	36.4	19.6	C	F	E	B
30	I-440 WB - Wade Ave Exit Ramp	Diverge	27.2	54.7	43.3	25.8	C	F	E	C
34	I-440 WB - West of Wade Ave Exit Ramp	Basic	19.1	34.0	40.1	24.8	C	D	E	C
Analysis ID	Analysis Segment	Type	PM Density				PM LOS _s			
			3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00	3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00
1	I-440 EB - West of Lake Boone Trail Exit Ramp	Basic	27.5	31.3	59.7	26.0	D	D	F	D
2	I-440 EB - Lake Boone Trail Exit Ramp	Diverge	24.1	26.8	51.7	22.5	C	C	F	C
3	I-440 EB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	27.3	30.9	68.1	26.1	D	D	F	D
4	I-440 EB - Lake Boone Trail Entrance Ramp	Merge	27.3	30.9	41.0	25.5	C	D	E	C
5	I-440 EB - Lake Boone Trail to Ridge Road	Basic	32.1	36.9	41.0	30.0	D	E	E	D
6	I-440 EB - Ridge Rd Exit Ramp	Diverge	27.3	31.3	39.4	25.4	C	D	E	C
7	I-440 EB - Ridge Rd Exit Ramp to Ridge Rd Entrance Ramp	Basic	34.8	39.5	45.3	32.6	D	E	F	D
8	I-440 EB - Ridge Rd Entrance Ramp to Glenwood Ave Exit Ramp	Weaving	26.9	33.2	36.3	25.5	C	D	E	C
9	I-440 EB - Glenwood Ave Exit Ramp to Glenwood Ave Entrance Loop	Basic	27.5	33.1	36.6	26.0	D	D	E	C
10	I-440 EB - Glenwood Ave Entrance Loop	Merge	27.2	30.8	33.9	26.6	C	D	D	C
11	I-440 EB - Glenwood Ave Entrance Ramp	Merge	26.5	31.0	35.1	25.3	C	D	E	C
11	I-440 EB - Glenwood Ave Entrance Ramp to Six Forks Rd Exit Ramp	Basic	26.5	31.0	35.1	25.3	D	D	E	C
12	I-440 EB - Six Forks Rd Exit Ramp	Diverge	19.9	22.6	25.7	18.9	B	C	C	B
13	I-440 EB - Six Forks Exit Rd Loop	Diverge	30.2	34.7	39.0	29.0	D	D	E	D
14	I-440 EB - Six Forks Exit Rd Loop to Six Forks Rd Entrance Ramp	Basic	29.9	36.5	41.6	29.2	D	E	E	D
15	I-440 EB - Six Forks Rd Entrance Ramp	Merge	16.4	19.4	22.6	15.1	B	B	C	B
16	I-440 EB - East of Six Forks Rd Entrance Ramp	Basic	25.4	29.3	32.5	23.9	C	D	D	C
17	I-440 WB - East of Six Forks Rd Exit Ramp	Basic	20.1	23.0	25.6	18.7	C	C	C	C
19	I-440 WB - Six Forks Rd Exit Ramp	Diverge	20.1	23.0	25.6	18.7	C	C	C	B
18	I-440 WB - Six Forks Exit Rd Loop	Diverge	22.1	24.5	26.9	20.5	C	C	C	C
19	I-440 WB - Six Forks Rd Exit Loop to Six Forks Rd Entrance Ramp	Basic	24.5	28.3	32.0	23.7	C	D	D	C
20	I-440 WB - Six Forks Rd Entrance Ramp	Merge	20.6	22.2	28.1	19.5	C	C	D	B
21	I-440 WB - Six Forks Rd Entrance Ramp to Glenwood Ave Exit Ramp	Basic	21.1	23.8	28.8	19.7	C	C	D	C
24	I-440 WB - Glenwood Ave Exit Ramp	Diverge	21.1	23.8	28.8	19.7	C	C	D	B
22	I-440 WB - Glenwood Ave Exit Ramp to Glenwood Ave Entrance Loop	Basic	24.0	27.2	44.7	22.0	C	D	E	C
23	I-440 WB - Glenwood Ave Entrance Loop to Glenwood Ave/Ridge Rd Exit Ramp	Weaving	19.9	24.1	43.3	19.3	B	C	F	B
24	I-440 WB - Glenwood Ave/Ridge Rd Exit Ramp to Glenwood Entrance Ramp	Basic	23.0	26.1	64.0	21.2	C	D	F	C
25	I-440 WB - Glenwood Entrance Ramp	Merge	20.3	22.9	63.3	19.2	C	C	F	B
26	I-440 WB - Glenwood Ave Entrance Ramp to Lake Boone Trail Exit Ramp	Basic	24.7	28.3	74.3	23.6	C	D	F	C
27	I-440 WB - Lake Boone Trail Exit Ramp	Diverge	21.3	23.8	63.6	19.9	C	C	F	B
28	I-440 WB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	21.5	29.8	99.3	25.3	C	D	F	C
29	I-440 WB - Lake Boone Trail Entrance Ramp	Merge	20.6	41.3	78.5	23.0	C	E	F	C
30	I-440 WB - Wade Ave Exit Ramp	Diverge	26.5	62.9	83.0	30.8	C	F	F	D
34	I-440 WB - West of Wade Ave Exit Ramp	Basic	32.8	84.7	80.9	39.8	D	F	F	E

Figure 8-1: 2017 Base Year No-Build Eastbound Freeway Speeds

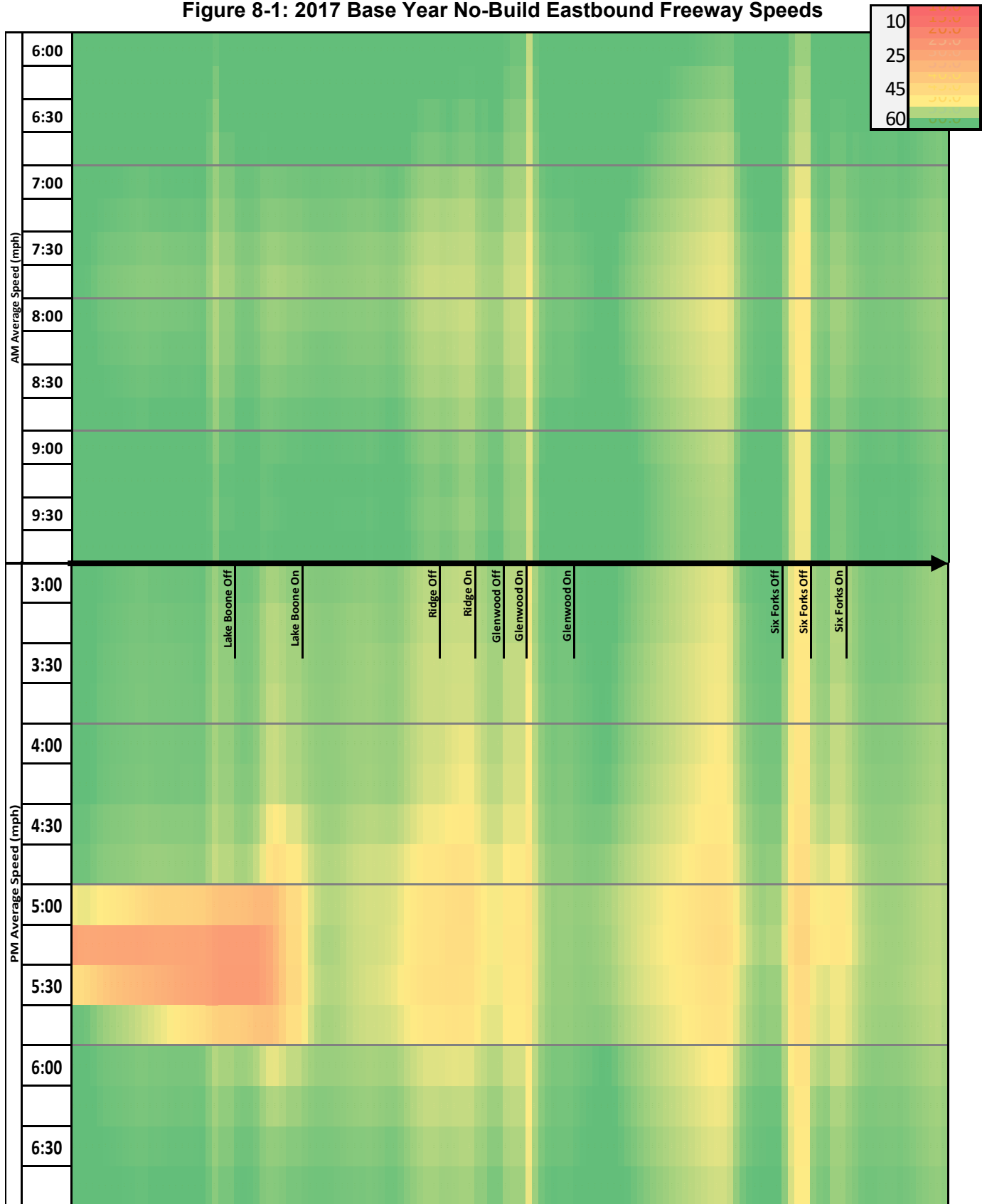
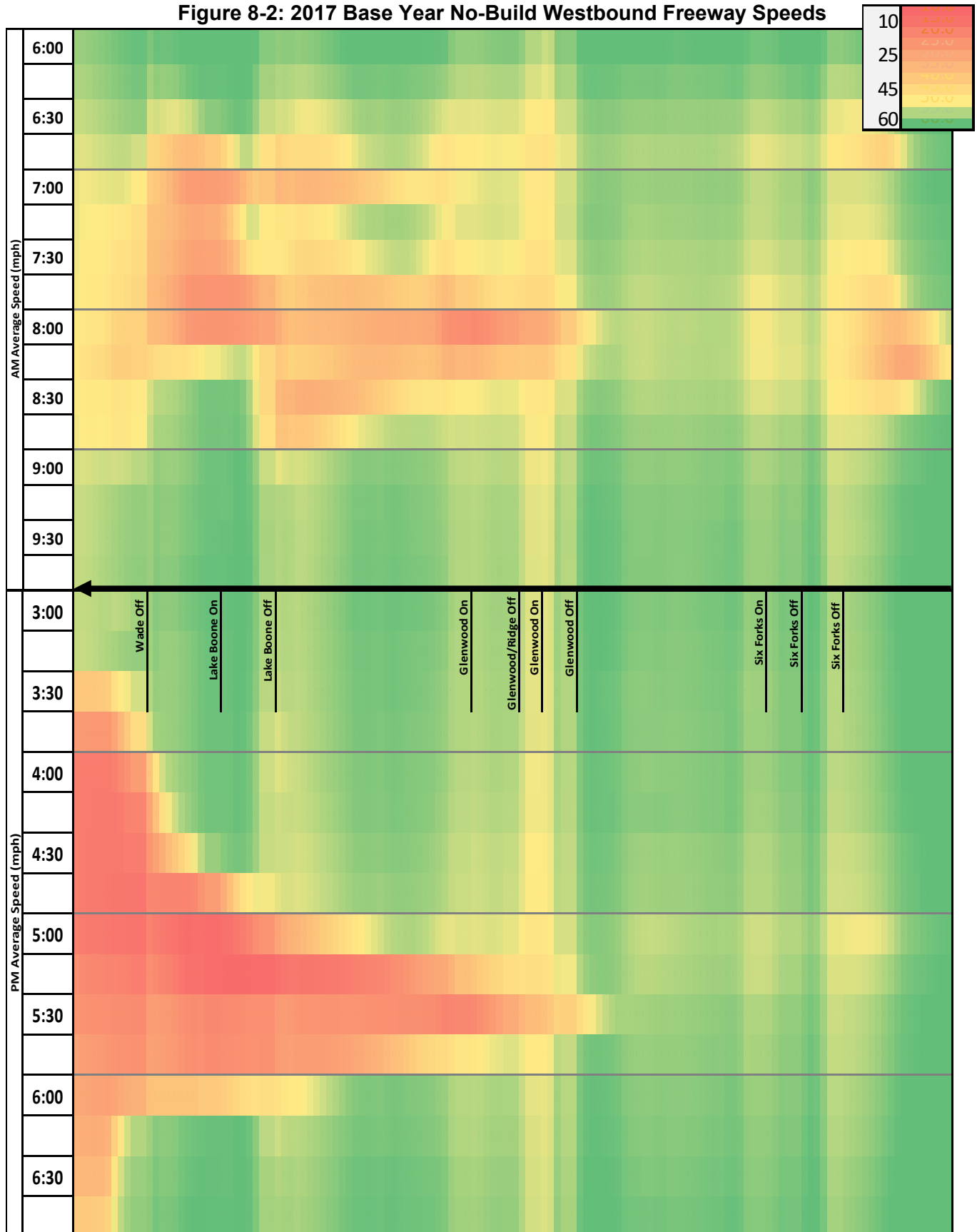


Figure 8-2: 2017 Base Year No-Build Westbound Freeway Speeds



8.7.3 ARTERIAL/INTERSECTION RESULTS

The results of the intersection analysis along the arterial portions of the study area are included in Table 8-3 and Figure 8-3. It should be noted that the tables and figures include the results of the analysis for intersections along Lake Boone Trail and Six Forks Road; however, only the intersections in the I-5870 project study area will be summarized below.

The overall intersection LOS_s for signalized intersections in the 2017 Base Year No-Build scenario shows that seven of the 12 project study area intersections are operating at LOS_s E or F in either the AM or PM peak period. These intersections are listed below and include the number of lane groups that are E or F.

AM peak hour

- Glenwood Ave at Creedmoor Rd operates at LOS_s E or F for four hours
 - 11 lane groups operate at LOS_s E or F
- Glenwood Ave at Blue Ridge Rd/Lead Mine Rd operates at LOS_s E for two hours
 - 8 lane groups operate at LOS_s E or F
- Lead Mine Rd at North Hills Dr operates at LOS_s F for three hours
 - 7 lane groups operate at LOS_s E or F

PM peak hour

- Glenwood Ave at Creedmoor Rd operates at LOS_s E or F for four hours
 - 11 lane groups operate at LOS_s E or F
- Glenwood Ave at Blue Ridge Rd/Lead Mine Rd operates at LOS_s E for four hours
 - 8 lane groups operate at LOS_s E or F
- Glenwood Ave at I-440 WB off-ramp operates at LOS_s E for one hour
 - 2 lane groups operate at LOS_s E or F
- Creedmoor Rd at Crabtree Valley Ave/ Bank Drwy operates at LOS_s F for two hours
 - 7 lane groups operate at LOS_s E or F
- Blue Ridge Rd at Crabtree Valley Ave/Summit Park Ln operates at LOS_s F for two hours
 - 5 lane groups operate at LOS_s E or F
- Blue Ridge Rd at Crabtree Valley Mall entrance operates at LOS_s E for two hours
 - 4 lane groups operate at LOS_s E or F
- Lead Mine Rd at North Hills Dr operates at LOS_s F for four hours
 - 7 lane groups operate at LOS_s E or F

The overall intersection LOS for signalized intersections in the 2017 Base Year No-Build scenario shows that multiple intersections are operating at LOS_s D or better in both the AM and PM peak periods; however, these locations have at least one lane group with a LOS_s E or F. These intersections are listed below and include the number of lane groups that are E or F.

AM peak hour

- Glenwood Ave at Fairhill Dr/Rembert Dr operates at a LOS_s A and B
 - 5 lane groups operate at LOS_s E or F for four hours
- Glenwood Ave at Marriot Dr/Crabtree Valley Mall Entrance operates at a LOS_s A
 - 5 lane groups operate at LOS_s E or F for four hours

- Glenwood Av at Woman's Club Dr operates at LOS_s A
 - 6 lane groups operate at LOS_s E or F for at least one hour
- Creedmoor Rd at BB&T Driveway/Crabtree Valley Avenue operates at LOS_s A
 - 2 lane groups operate at LOS_s E or F for at least one hour
- Creedmoor Rd at Office Center Driveway/Crabtree Valley Mall Entrance operates at LOS_s A
 - 5 lane groups operate at LOS_s E or F for at least one hour
- Blue Ridge Rd at Crabtree Valley Avenue/Summit Park Lane operates at LOS_s B
 - 3 lane groups operate at LOS_s E or F for at least one hour
- Blue Ridge Rd at Crabtree Valley Mall Entrance operates at LOS_s A
 - 2 lane groups operate at LOS_s E or F for at least one hour

PM peak hour

- Glenwood Ave at Fairhill Dr/Rembert Dr operates at a LOS_s A and B
 - 5 lane groups operate at LOS_s E or F for four hours
- Glenwood Ave at Marriot Dr/Crabtree Valley Mall Entrance operates at a LOS_s A
 - 5 lane groups operate at LOS_s E or F for at least three hours
- Glenwood Av at Woman's Club Dr operates at LOS_s A and B
 - 6 lane groups operate at LOS_s E or F for at least two hours
- Creedmoor Rd at Office Center Driveway/Crabtree Valley Mall Entrance operates at LOS_s B, C and D
 - 6 lane groups operate at LOS_s E or F for at least one hour

Based on a review of the unsignalized intersections, there are ten intersections that have at least one movement that operates at LOS_s E or F in either of the peak periods. These intersections are listed below and include the movements that operates at E or F.

AM peak hour

- Glenwood Ave at Morehead Dr
 - Westbound left-turn operates at LOS_s E or F for three hours
 - Southbound left-turn operates at LOS_s F for one hour
- Glenwood Ave at Crabtree Valley Mall Entrance
 - Westbound right-turn operates at LOS_s E and F for two hours
- Glenwood Ave at Crabtree View Place
 - Westbound right-turn operates at LOS_s F for three hours
- Glenwood Ave at Arrow Dr
 - Westbound right-turn operates at LOS_s E for two hours
- Glenwood Ave at Varnell Ave/National Dr
 - Eastbound left-turn/right-turn operates at LOS_s F for three hours
- Creedmoor Rd at Riverwood Circle
 - Northbound left-turn operates at LOS_s F for two hours

PM peak hour

- Glenwood Ave at Morehead Dr

- Westbound left-turn/right-turn operates at LOS_s F for four hours
 - Southbound left-turn operates at LOS_s F for three hours
- Glenwood Ave at Crabtree Valley Mall Entrance
 - Westbound right-turn operates at LOS_s F for one hour
- Glenwood Ave at Crabtree View Place
 - Westbound right-turn operates at LOS_s E or F for four hours
- Glenwood Ave at Arrow Dr
 - Westbound right-turn operates at LOS_s E for two hours
- Glenwood Ave at I-440 WB Off-Loop
 - Eastbound right-turn operates at LOS_s E for two hours
- Glenwood Ave at Varnell Ave/National Dr
 - Westbound right-turn operates at LOS_s F for two hours
 - Eastbound left-turn and right-turn operates at LOS_s F for four hours
- Creedmoor Rd at Riverwood Circle
 - Westbound left-turn operates at LOS_s E or F for three hours
 - Northbound left-turn operates at LOS_s F for four hours
 - Northbound right-turn operates at LOS_s E and F for two hours
 - Eastbound through and through/right operate at LOS_s F for two hours
- Crabtree Valley Ave at Homewood Banks Dr/Crabtree Valley Mall Entrance
 - Westbound left-turn operates at LOS_s E or F for two hours
 - Eastbound left-turn operates at LOS_s F for two hours
 - Eastbound through/right-turn operates at LOS_s F for two hours
- Blue Ridge Rd at Homewood Banks Dr/Crabtree Valley Mall Entrance
 - Southbound left-turn operates at LOS_s F for two hours
 - Eastbound left-turn operates at LOS_s E for one hour
 - Eastbound though operates at LOS_s F for one hour
- Blue Ridge Rd at Arinto Dr
 - Eastbound left-turn operates at LOS_s F for two hours
 - Eastbound through operates at LOS_s F for two hours
 - Southbound left-turn operates at LOS_s F for two hours
 - Southbound right-turn operates at LOS_s F for two hours

Table 8-3: 2017 Base Year No-Build Intersection Delay and LOS

Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²					
			6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM			
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	Overall	18.1	21.6	25.7	17.4	B	C	C	B		
			L	52.9	54.4	59.1	55.1	D	D	E	E		
		Lake Boone Trail WB	R	38.3	40.9	40.9	38.9	D	D	D	D		
			T	13.3	17.2	18.9	11.8	B	B	B	B		
		Lake Boone Trail EB	R	6.6	12.9	16.1	6.4	A	B	B	A		
			L	9.6	27.4	57.5	16.6	A	C	E	B		
2	Lake Boone Trail & I-440 WB Ramps	I-440 WB Off-Ramp SB	T	4.4	5.0	5.3	4.7	A	A	A	A		
			Overall	33.6	38.4	45.8	34.5	C	D	D	C		
		Lake Boone Trail WB	R	43.0	49.0	63.2	36.0	D	D	E	D		
			LTR	42.8	49.3	64.1	36.2	D	D	E	D		
		Lake Boone Trail EB	L	42.3	51.0	67.7	54.7	D	D	E	D		
			T	28.6	32.0	42.6	30.1	C	C	D	C		
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	R	26.3	35.1	33.6	41.2	C	D	C	D		
			T	27.3	33.7	31.5	34.2	C	C	C	C		
		Lake Boone WB	Overall	12.6	16.6	15.8	15.4	B	B	B	B		
			L	29.3	23.3	25.7	24.0	C	C	C	C		
		Ridge Rd NB	TR	24.7	20.0	19.3	20.7	C	C	B	C		
			L	8.6	16.9	17.0	14.6	A	B	B	B		
		Lake Boone Trail EB	T	4.4	8.6	8.5	6.2	A	A	A	A		
			TR	3.9	8.5	8.3	6.7	A	A	A	A		
		4	Ridge Rd & Glen Eden Dr	Ridge Rd SB	L	35.7	72.8	65.8	61.5	D	E	E	E
					TR	28.2	15.3	15.4	17.5	C	B	B	B
				Glen Eden Dr WB	L	8.7	17.8	17.4	14.6	A	B	B	B
					T	6.3	15.0	13.9	12.1	A	B	B	B
Glen Eden Dr EB	TR			4.8	8.9	8.9	7.5	A	A	A	A		
	Overall			19.2	22.6	24.1	21.0	B	C	C	C		
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Rembert Dr SWB	L	8.1	18.8	17.5	15.4	A	B	B	B		
			TR	5.6	12.4	13.0	10.1	A	B	B	B		
		Glenwood Ave NWB	L	57.5	40.1	46.7	44.0	E	D	D	D		
			TR	43.4	38.0	40.4	34.3	D	D	D	C		
		Ridge Rd NB	L	10.1	23.4	22.2	15.3	B	C	C	B		
			TR	8.4	11.3	11.6	9.8	A	B	B	A		
		Glenwood Ave SEB	L	56.1	48.7	51.1	52.7	E	D	D	D		
			TR	32.5	23.7	24.6	26.0	C	C	C	C		
		6	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	Overall	5.5	9.7	12.0	10.4	A	A	B	B
					LTR	99.8	79.3	80.4	77.1	F	E	F	E
				Glenwood Ave NWB	L	111.2	89.7	90.1	91.0	F	F	F	F
					T	2.9	7.2	8.4	7.1	A	A	A	A
Fairhill Dr NEB	TR			2.9	7.6	8.7	7.1	A	A	A	A		
	L			82.1	88.8	91.3	85.4	F	F	F	F		
Glenwood Ave SEB	TR			99.9	84.0	76.7	77.7	F	F	E	E		
	L			123.1	111.0	109.6	108.4	F	F	F	F		
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance			Marriott Dr SWB	T	2.5	5.5	7.6	5.2	A	A	A	A
					TR	2.6	6.2	8.3	5.4	A	A	A	A
				Glenwood Ave NWB	Overall	61.2	72.7	91.7	69.2	E	E	F	E
					L	83.6	86.3	100.6	81.3	F	F	F	F
		Creedmoor Rd SWB	T	75.6	65.9	68.5	71.7	E	E	E	E		
			TR	74.3	64.9	66.3	71.2	E	E	E	E		
		Glenwood WB	L	100.3	83.1	79.8	75.8	F	F	E	E		
			T	63.3	88.2	96.2	85.7	E	F	F	F		
		Creedmoor Rd NEB	L	92.8	93.8	88.7	75.3	F	F	F	E		
			T	64.3	60.8	59.1	62.0	E	E	E	E		
		Glenwood Ave EB	R	55.5	48.7	53.6	49.1	E	D	D	D		
			L	92.3	113.6	138.6	91.7	F	F	F	F		
8	Blue Ridge Rd, Glenwood Ave & Lead Mine Rd	Lead Mine Rd SWB	TR	38.2	64.4	106.0	54.2	D	E	F	D		
			TR	40.6	71.5	183.4	62.1	D	E	F	E		
		Glenwood Ave NWB	Overall	2.4	2.9	3.7	4.3	A	A	A	A		
			L	90.0	88.3	88.2	83.9	F	F	F	F		
		Blue Ridge Rd NEB	TR	--	--	--	--	--	--	--	--		
			L	117.1	89.6	79.7	69.2	F	F	E	E		
		Glenwood Ave SEB	T	0.6	1.3	1.8	1.3	A	A	A	A		
			TR	0.8	1.3	1.8	1.3	A	A	A	A		
		9	Blue Ridge Rd, Glenwood Ave & Lead Mine Rd	Crabtree Valley Mall Entrance NEB	LT	--	137.7	127.0	97.1	--	F	F	F
					R	118.0	97.7	92.5	74.7	F	F	F	E
				Lead Mine Rd SWB	L	122.8	120.2	114.7	104.0	F	F	F	F
					T	0.6	0.5	0.3	0.6	A	A	A	A
Glenwood Ave NWB	TR			0.8	0.6	0.6	1.4	A	A	A	A		
	L			81.3	83.6	99.1	101.1	F	F	F	F		
Blue Ridge Rd NEB	T			66.4	70.0	76.5	82.9	E	E	E	F		
	TR			47.0	51.0	61.7	67.1	D	D	E	E		
Glenwood Ave SEB	L			97.9	166.6	498.0	610.1	F	F	F	F		
	T			14.3	42.0	44.7	46.9	B	D	D	D		
10	Blue Ridge Rd, Glenwood Ave & Lead Mine Rd			Lead Mine Rd SWB	R	3.5	6.7	9.5	5.9	A	A	A	A
					L	113.3	116.0	108.6	124.3	F	F	F	F
		Glenwood Ave NWB	T	98.7	88.3	88.6	91.5	F	F	F	F		
			R	104.2	61.3	116.8	78.9	F	E	F	E		
		Blue Ridge Rd NEB	L	108.2	103.2	104.4	98.3	F	F	F	F		
			T	10.0	22.1	20.0	24.4	A	C	B	C		
		Glenwood Ave SEB	TR	13.6	32.9	29.8	26.1	B	C	C	C		
			Overall	26.8	44.3	60.5	69.3	C	D	E	E		

Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²					
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM		
9	Genwood Ave & I-440 WB Off-Ramp		Overall	12.6	11.4	12.9	12.8	B	B	B	B		
		I-440 WB Off-Ramp	T	25.7	23.4	26.2	24.7	C	C	C	C		
		Glenwood Ave NWB	T	18.5	21.5	24.6	24.0	B	C	C	C		
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A		
10	Genwood Ave & I-440 EB Off-Ramp		Overall	15.8	17.7	18.7	18.5	B	B	B	B		
		Glenwood Ave NWB	T	5.9	7.7	7.6	7.4	A	A	A	A		
		I-440 EB Off-Ramp	L	42.9	42.7	42.7	43.6	D	D	D	D		
		Glenwood Ave SEB	T	10.6	16.4	17.3	16.6	B	B	B	B		
11	Glenwood Ave & Parking Deck / Womans Club Dr		Overall	5.3	7.4	9.7	9.8	A	A	A	A		
		Glenwood Ave SB	L	56.6	51.9	52.7	52.2	E	D	D	D		
			T	0.4	2.6	3.6	3.4	A	A	A	A		
			R	0.0	4.0	6.1	4.8	A	A	A	A		
		Womans Club Dr WB	LT	93.3	86.9	78.4	78.1	F	F	E	E		
			R	80.7	63.4	53.3	44.7	F	E	D	D		
			L	--	81.4	92.3	82.1	--	F	F	F		
		Glenwood Ave NB	T	2.8	6.0	7.6	7.7	A	A	A	A		
			TR	3.2	6.1	8.4	7.9	A	A	A	A		
			Parking Deck EB	L	--	117.3	89.0	86.0	--	F	F	F	
		TR		--	88.9	108.0	127.2	--	F	F	F		
				Overall	3.7	3.4	3.8	4.7	A	A	A	A	
12	Creedmoor Rd & Crabtree Valley Ave / Bank Drwy		Overall	3.7	3.4	3.8	4.7	A	A	A	A		
		Creedmoor Rd SWB	L	1.0	1.7	1.8	4.4	A	A	A	A		
			T	0.9	1.8	1.8	1.0	A	A	A	A		
			TR	0.9	1.6	1.6	0.9	A	A	A	A		
		Crabtree Valley Ave NWB	LT	63.0	60.3	64.2	64.4	E	E	E	E		
			R	65.1	49.0	48.8	49.4	E	D	D	D		
			L	--	--	--	--	--	--	--	--		
		Creedmoor Rd NEB	T	1.4	3.0	3.8	4.6	A	A	A	A		
			TR	2.6	4.3	4.6	5.9	A	A	A	A		
			LT	--	--	74.7	60.3	--	--	E	E		
		Bank Drwy SEB	R	--	--	114.5	94.8	--	--	F	F		
				Overall	5.3	3.9	7.5	8.5	A	A	A	A	
13	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy		Creedmoor Rd SWB	L	62.3	61.0	53.6	56.8	E	E	D	E	
		T		0.6	1.6	4.6	1.5	A	A	A	A		
		TR		0.5	1.7	4.7	1.6	A	A	A	A		
		Crabtree Valley Mall Entrance NWB	LT	55.6	52.7	53.6	45.3	E	D	D	D		
			R	43.4	42.6	37.5	30.2	D	D	D	C		
			L	--	80.0	67.0	68.6	--	E	E	E		
		Creedmoor Rd NEB	T	3.8	4.3	7.4	7.8	A	A	A	A		
			TR	6.5	4.9	10.7	10.6	A	A	B	B		
			LT	--	--	86.7	100.1	--	--	F	F		
		Office Drwy SEB	R	--	75.4	67.4	77.2	--	E	E	E		
				Overall	12.4	16.9	17.3	13.1	B	B	B	B	
			14	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Blue Ridge Rd SWB	LT	5.1	13.1	12.3	5.9	A	B	B
R	3.4	16.2				12.6	6.2	A	B	B	A		
L	62.2	35.8				33.3	41.6	E	D	C	D		
Summit Park Ln NWB	TR	59.7			47.1	49.8	59.9	E	D	D	E		
	L	4.2			11.1	14.8	10.6	A	B	B	B		
	L	46.4			33.9	33.4	38.6	D	C	C	D		
Crabtree Valley Ave SEB	TR	63.9			49.1	42.1	45.5	E	D	D	D		
		Overall			2.7	3.2	7.6	5.8	A	A	A	A	
15	Crabtree Valley Mall Entrance & Blue Ridge Rd	Blue Ridge Rd SB	T	1.6	3.2	4.8	5.2	A	A	A	A		
			R	0.0	0.0	0.0	0.1	A	A	A	A		
			LT	1.2	3.2	3.1	6.1	A	A	A	A		
		Blue Ridge Rd NB	T	0.7	1.5	15.4	2.8	A	A	B	A		
			L	79.7	50.2	46.3	40.3	E	D	D	D		
			R	78.6	87.2	67.4	48.5	E	F	E	D		
		16	Lead Mine Rd & North Hills Dr		Overall	11.0	139.7	197.0	225.5	B	F	F	F
					L	9.2	124.6	207.4	206.2	A	F	F	F
T	6.7				157.2	237.0	241.9	A	F	F	F		
TR	6.3				178.4	212.8	198.9	A	F	F	F		
North Hills Dr WB	L			40.4	305.5	717.1	940.1	D	F	F	F		
	LTR			42.1	288.7	500.0	561.0	D	F	F	F		
	L			17.8	37.5	29.7	36.2	B	D	C	D		
	T			5.4	12.0	10.7	11.7	A	B	B	B		
Lead Mine Rd NB	R	1.1	2.4	2.0	2.1	A	A	A	A				
	LT	--	76.5	133.7	--	--	E	F	--				
	R	66.4	93.0	93.4	91.6	E	F	F	F				
		Overall	18.8	25.6	29.2	25.7	B	C	C	C			
17	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	L	75.4	86.3	86.7	70.3	E	F	F	E		
			T	105.9	67.9	57.9	60.1	F	E	E	E		
			R	81.5	63.7	61.1	62.2	F	E	E	E		
		Six Forks Rd NWB	L	53.6	86.5	82.9	81.9	D	F	F	F		
			T	5.3	7.2	8.1	6.7	A	A	A	A		
			R	3.5	2.9	3.9	3.2	A	A	A	A		
		Main Street NEB	L	88.5	79.7	78.7	83.7	F	E	E	F		
			TR	83.3	71.9	70.6	70.2	F	E	E	E		
		Six Forks Rd SEB	L	85.9	72.1	81.3	68.8	F	E	F	E		
			T	13.4	22.2	26.8	22.2	B	C	C	C		
			TR	14.9	24.8	25.9	23.5	B	C	C	C		

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
18	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	Overall	11.0	14.9	15.4	14.4	B	B	B	B
			L	75.7	62.3	63.1	67.0	E	E	E	E
			T	74.8	61.0	68.0	64.8	E	E	E	E
		Six Forks Rd NWB	R	72.5	50.8	47.3	51.9	E	D	D	D
			L	68.0	93.8	90.8	92.3	E	F	F	F
			T	5.4	6.4	6.8	6.9	A	A	A	A
		I-440 WB Off Loop	R	2.4	3.2	3.4	2.8	A	A	A	A
			R	6.6	11.4	14.9	10.3	A	B	B	B
			L	70.6	49.9	54.2	56.0	E	D	D	E
		Six Forks Rd SEB	T	5.6	7.7	8.6	7.2	A	A	A	A
			R	4.2	9.8	10.8	7.8	A	A	B	A
19	Six Forks Rd & I-440 EB Ramps	Overall		14.7	17.1	21.7	18.7	B	B	C	B
		I-440 WB Off-Ramp	T	61.6	54.7	54.2	55.4	E	D	D	E
		Six Forks Rd NWB	T	2.7	15.7	23.4	17.6	A	B	C	B
		Six Forks SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
20	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Overall		24.8	28.6	29.2	25.6	C	C	C	C
		Six Forks Rd NWB	L	113.1	82.8	83.6	71.3	F	F	F	E
			T	10.2	19.1	20.5	18.6	B	B	C	B
			TR	7.7	18.2	20.0	17.7	A	B	C	B
		Ramblewood Dr NEB	L	73.6	88.4	95.3	73.4	E	F	F	E
			T	92.8	78.9	95.9	68.8	F	E	F	E
			R	63.1	75.0	82.1	59.7	E	E	F	E
		Six Forks Rd SEB	L	64.1	60.4	64.6	62.2	E	E	E	E
			T	11.0	15.3	15.6	14.2	B	B	B	B
			TR	6.7	13.8	14.3	12.6	A	B	B	B
21	Six Forks Rd & Barrett Dr	Overall		25.6	38.2	21.7	13.2	C	D	C	B
		Six Forks Rd SB	L	934.3	1204.0	297.5	140.2	F	F	F	F
			T	5.4	16.7	11.4	5.8	A	B	B	A
		Barrett Dr WB	L	146.3	100.1	89.8	87.6	F	F	F	F
			R	129.2	117.8	81.6	75.4	F	F	F	E
		Six Forks Rd NB	T	0.7	2.9	6.5	6.6	A	A	A	A
			TR	0.6	2.9	6.2	6.3	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
61	Lake Boone Trail, Shopping Center Drwy & Myron Dr	Shopping Center Drwy SB	R	17.6	35.0	64.7	18.0	C	E	F	C
		Lake Boone Trail WB	L	4.8	7.8	12.0	11.5	A	A	B	B
			T	0.8	2.3	4.1	1.0	A	A	A	A
			TR	0.6	2.0	3.4	0.7	A	A	A	A
		Myron Dr NB	R	8.1	10.1	12.6	12.9	A	B	B	B
		Lake Boone Trail EB	T	0.0	0.0	0.0	0.0	A	A	A	A
62	Lake Boone Trail & I-440 EB Ramps	I-440 EB Off-Loop	L	12.0	29.7	90.1	41.7	B	D	F	E
			R	8.1	12.7	67.9	9.3	A	B	F	A
63	Ridge Rd & I-440 EB Ramps	I-440 WB Off-Ramp/Ridge Rd	L	4.9	7.6	8.1	6.7	A	A	A	A
		Ridge Rd NB	T	0.0	0.0	0.0	0.0	A	A	A	A
64	Ridge Rd & Varnell Ave	I-440 WB Off-Ramp/Ridge Rd	LT	0.0	0.0	0.0	0.0	A	A	A	A
			T	0.0	0.0	0.0	0.0	A	A	A	A
65	Ridge Rd & Manuel St	Varnell Ave WB	L	8.7	8.4	9.0	7.2	A	A	A	A
		Ridge Rd SB	LT	0.0	0.0	0.2	0.1	A	A	A	A
		Manuel St WB	LR	13.6	8.7	8.4	8.7	B	A	A	A
		Ridge Rd NB	TR	0.0	0.0	0.0	0.0	A	A	A	A
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	29.7	66.4	88.2	46.0	D	F	F	E
		Glenwood Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
			L	5.2	--	64.2	28.5	A	--	F	D
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
67	Glenwood Ave & Crabtree Valley Mall Entrance	Glenwood Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
		Crabtree Valley Mall Entrance NEB	R	9.2	59.6	46.1	18.4	A	F	E	C
		Glenwood Ave SEB	T	0.0	0.1	0.1	0.0	A	A	A	A
			TR	0.0	0.1	0.0	0.0	A	A	A	A
68	Glenwood Ave & Crabtree View Place	Glenwood Ave NWB	T	0.3	2.3	6.5	4.9	A	A	A	A
		Crabtree View Place NEB	R	16.5	64.0	102.6	78.6	C	F	F	F
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
69	Glenwood Ave & Arrow Dr	Glenwood Ave NWB	T	0.0	1.3	0.8	0.2	A	A	A	A
		Arrow Dr NEB	R	15.0	39.0	45.0	27.5	B	E	E	D
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
70	Glenwood Ave & I-440 WB Off-Loop	I-440 WB Off-Loop EB	T	13.5	24.7	30.1	20.6	B	C	D	C
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
71	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	0.0	0.6	1.0	0.4	A	A	A	A
		National Dr WB	TR	0.0	0.1	0.7	0.0	A	A	A	A
			R	9.8	14.9	14.3	8.1	A	B	B	A
		Glenwood Ave NB	L	9.6	23.2	26.6	22.1	A	C	D	C
			T	0.0	0.0	0.0	0.1	A	A	A	A
			R	--	0.0	0.0	0.0	--	A	A	A
		Varnell Ave EB	LR	24.3	105.9	185.3	69.8	C	F	F	F

Unsignalized Intersections ³													
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²					
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM		
72	Creedmoor Rd & Riverwood Cir	Creedmoor Rd SWB	L	--	7.0	9.6	11.8	--	A	A	B		
			T	0.0	0.0	0.0	0.0	A	A	A	A		
		Riverwood Cir NWB	L	7.5	77.6	59.5	--	A	F	F	--		
			R	6.9	8.0	9.4	11.8	A	A	A	B		
		Creedmoor Rd NEB	T	0.1	0.1	0.1	0.1	A	A	A	A		
			TR	0.1	0.1	0.1	0.1	A	A	A	A		
73	Edwards Mill Rd & ApartmentDrwy/Mall Entrance	Apt Drwy/ Mall Entrance SB	L	6.7	6.7	6.7	7.2	A	A	A	A		
			R	5.9	6.6	5.7	5.6	A	A	A	A		
		Edwards Mill Rd WB	TR	0.0	0.0	0.0	0.0	A	A	A	A		
			Edwards Mill Rd EB	LT	0.2	0.1	0.1	0.3	A	A	A	A	
74	Crabtree Valley Ave & Edwards Mill Rd	Crabtree Valley Ave NWB	L	0.2	0.5	0.5	2.5	A	A	A	A		
			T	0.0	0.0	0.0	0.0	A	A	A	A		
		Edwards Mill Rd NEB	L	12.8	14.3	13.0	14.2	B	B	B	B		
			R	11.2	11.2	11.4	11.7	B	B	B	B		
		Crabtree Valley Ave SEB	TR	0.0	0.0	0.0	0.0	A	A	A	A		
75	Crabtree Valley Ave, Homewood Banks Dr & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance SWB	L	4.9	4.5	6.0	7.0	A	A	A	A		
			TR	4.4	5.7	5.7	6.2	A	A	A	A		
		Crabtree Valley Ave NWB	L	--	--	--	--	--	--	--	--		
			TR	0.0	0.0	0.0	0.0	A	A	A	A		
		Homewood Banks Dr NEB	L	9.9	9.0	9.7	9.3	A	A	A	A		
			TR	5.7	9.0	9.3	8.6	A	A	A	A		
		Crabtree Valley Ave SEB	L	1.9	2.2	1.9	1.8	A	A	A	A		
			TR	0.0	0.0	0.0	0.1	A	A	A	A		
		76	Blue Ridge Rd & Homewood Banks Dr	Homewood Bankks Dr SB	L	12.9	24.2	17.0	17.1	B	C	C	C
					Blue Ridge Rd WB	T	0.0	0.0	0.0	0.0	A	A	A
Blue Ridge Rd EB	L			4.3	9.8	9.3	10.0	A	A	A	A		
	T			0.1	0.1	0.1	0.1	A	A	A	A		
77	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd SWB	T	0.0	0.0	0.0	0.0	A	A	A	A		
			R	--	0.0	0.0	0.0	--	A	A	A		
		Blue Ridge Rd NEB	L	--	--	--	--	--	--	--	--		
			T	0.0	0.0	0.0	0.0	A	A	A	A		
		Arinto Dr SEB	L	11.3	21.8	16.4	16.9	B	C	C	C		
			R	--	--	--	--	--	--	--	--		
78	Browning & Six Forks Rd	Browning SWB	L	18.5	29.8	41.1	36.8	C	D	E	E		
			R	8.3	6.7	8.7	8.7	A	A	A	A		
		Six Forks Rd NWB	T	0.0	0.0	0.0	0.0	A	A	A	A		
			TR	0.0	0.0	0.0	0.0	A	A	A	A		
		Six Forks Rd SEB	L	2.9	7.6	10.7	9.9	A	A	B	A		
			T	0.1	0.8	1.1	0.8	A	A	A	A		

Notes:

- 1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations
- 2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies
- 3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	Overall	17.5	20.3	100.7	18.9	B	C	F	B
			L	34.2	38.8	57.9	36.0	C	D	E	D
			R	19.7	20.7	20.5	20.6	B	C	C	C
		Lake Boone Trail WB	T	22.7	21.8	21.5	22.5	C	C	C	C
			R	10.0	9.0	7.2	8.6	B	A	A	A
		Lake Boone Trail EB	L	16.8	19.9	170.0	14.1	B	B	F	B
			T	9.8	13.8	181.0	12.7	A	B	F	B
2	Lake Boone Trail & I-440 WB Ramps	I-440 WB Off-Ramp SB	Overall	31.3	36.2	56.6	39.2	C	D	E	D
			R	122.6	122.4	101.9	140.6	F	F	F	F
			LTR	125.7	121.9	103.7	142.2	F	F	F	F
		Lake Boone Trail WB	L	30.4	34.5	42.0	29.2	C	C	D	C
			T	7.4	7.6	8.2	7.8	A	A	A	A
		Lake Boone Trail EB	T	12.4	27.6	74.2	14.5	B	C	E	B
			R	16.0	19.2	39.3	15.9	B	B	D	B
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	Overall	13.3	14.5	21.6	12.9	B	B	C	B
			L	32.3	29.4	31.7	29.3	C	C	C	C
			TR	18.7	19.6	21.2	19.9	B	B	C	B
		Lake Boone WB	L	14.9	18.9	31.0	14.5	B	B	C	B
			T	6.2	8.6	13.4	5.9	A	A	B	A
			TR	6.4	8.7	13.5	6.0	A	A	B	A
		Ridge Rd NB	L	33.0	51.8	76.0	38.7	C	D	E	D
			TR	19.0	16.3	13.0	19.6	B	B	B	B
		Lake Boone Trail EB	L	13.1	16.4	78.6	14.4	B	B	E	B
			T	11.1	14.6	21.2	10.9	B	B	C	B
			TR	7.1	9.6	17.3	6.8	A	A	B	A

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
4	Ridge Rd & Glen Eden Dr	Overall	22.2	27.0	70.7	23.5	C	C	E	C	
		L	18.1	25.6	33.5	16.5	B	C	C	B	
		Ridge Rd SB	TR	11.8	15.7	18.4	14.3	B	B	B	B
		Glen Eden Dr WB	L	40.6	56.3	334.3	43.9	D	E	F	D
		TR	35.4	35.2	229.6	38.4	D	D	F	D	
		Ridge Rd NB	L	18.5	25.3	40.5	20.9	B	C	D	C
		TR	11.8	14.1	16.9	13.1	B	B	B	B	
		Glen Eden Dr EB	L	40.7	55.0	62.5	41.2	D	D	E	D
TR	21.8	24.1	26.7	21.2	C	C	C	C			
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Overall	10.6	13.5	15.1	10.0	B	B	B	A	
		LTR	89.2	93.5	92.6	93.4	F	F	F	F	
		Glenwood Ave NWB	L	102.6	111.9	114.2	112.2	F	F	F	F
		T	7.0	10.9	14.9	8.5	A	B	B	A	
		TR	8.5	12.0	15.7	9.4	A	B	B	A	
		Fairhill Dr NEB	L	100.6	109.2	103.1	91.0	F	F	F	F
		TR	92.0	89.8	89.9	98.8	F	F	F	F	
		Glenwood Ave SEB	L	104.2	102.5	95.4	109.7	F	F	F	F
T	5.0	6.2	6.1	4.5	A	A	A	A			
TR	5.5	6.7	6.9	5.1	A	A	A	A			
6	Glenwood Ave & Creedmoor Rd	Overall	77.1	81.7	95.2	109.4	E	F	F	F	
		Creedmoor Rd SWB	L	141.3	159.5	140.1	405.7	F	F	F	F
		T	82.8	89.7	97.4	145.6	F	F	F	F	
		TR	84.8	90.8	97.1	138.2	F	F	F	F	
		Glenwood WB	L	118.2	113.1	111.0	114.4	F	F	F	F
		T	49.9	56.5	91.9	62.7	D	E	F	E	
		Creedmoor Rd NEB	L	128.2	125.8	145.9	131.5	F	F	F	F
		T	83.2	103.3	120.2	111.0	F	F	F	F	
R	63.1	85.4	98.9	85.7	E	F	F	F			
Glenwood Ave EB	L	161.8	194.9	193.4	173.0	F	F	F	F		
T	59.1	62.5	63.8	61.4	E	E	E	E			
TR	70.8	74.2	72.3	69.8	E	E	E	E			
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Overall	14.6	13.4	30.3	22.9	B	B	C	C	
		Marriott Dr SWB	L	116.3	106.6	97.7	101.6	F	F	F	F
		TR	111.6	102.1	118.2	107.4	F	F	F	F	
		Glenwood Ave NWB	L	114.3	105.9	88.9	105.0	F	F	F	F
		T	0.6	1.0	19.8	8.7	A	A	B	A	
		TR	1.3	1.7	36.2	11.3	A	A	D	B	
		Crabtree Valley Mall Entrance NEB	LT	112.2	113.0	215.4	141.1	F	F	F	F
		R	67.3	67.0	54.6	59.3	E	E	D	E	
Glenwood Ave SEB	L	--	--	--	--	--	--	--	--		
T	9.6	12.6	23.8	18.7	A	B	C	B			
TR	15.7	15.2	23.9	22.5	B	B	C	C			
8	Blue Ridge Rd, Glenwood Ave & Lead Mine Rd	Overall	55.7	61.4	79.8	71.0	E	E	E	E	
		Lead Mine Rd SWB	L	200.0	197.5	191.7	194.4	F	F	F	F
		T	138.3	150.4	186.9	184.1	F	F	F	F	
		TR	131.7	134.5	132.2	150.7	F	F	F	F	
		Glenwood Ave NWB	L	95.3	122.1	287.1	215.5	F	F	F	F
		T	34.1	43.8	66.1	44.4	C	D	E	D	
		R	17.0	25.6	32.0	18.6	B	C	C	B	
		Blue Ridge Rd NEB	L	233.1	243.4	251.4	227.8	F	F	F	F
T	101.7	125.8	135.5	132.8	F	F	F	F			
R	48.4	42.9	36.5	46.8	D	D	D	D			
Glenwood Ave SEB	L	129.5	120.6	130.3	119.2	F	F	F	F		
T	23.1	21.3	27.6	25.9	C	C	C	C			
TR	39.6	36.5	45.6	43.0	D	D	D	D			
9	Genwood Ave & I-440 WB Off-Ramp	Overall	18.6	19.5	55.5	21.6	B	B	E	C	
		I-440 WB Off-Ramp	T	35.9	35.4	147.8	41.8	D	D	F	D
		Glenwood Ave NWB	T	32.2	33.2	60.8	34.8	C	C	E	C
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
10	Genwood Ave & I-440 EB Off-Ramp	Overall	27.3	26.6	42.9	26.3	C	C	D	C	
		Glenwood Ave NWB	T	13.6	16.7	51.3	13.5	B	B	D	B
		I-440 EB Off-Ramp	L	52.0	51.1	53.5	52.3	D	D	D	D
		Glenwood Ave SEB	T	22.9	20.6	22.5	19.5	C	C	C	B
11	Glenwood Ave & Parking Deck / Womans Club Dr	Overall	11.2	13.5	13.8	7.5	B	B	B	A	
		Glenwood Ave SB	L	77.8	83.1	92.6	89.0	E	F	F	F
		T	5.1	5.8	7.0	3.9	A	A	A	A	
		R	10.0	21.7	0.0	--	A	C	A	--	
		Womans Club Dr WB	LT	80.1	76.2	69.3	79.1	F	E	E	E
		R	61.7	53.3	58.2	--	E	D	E	--	
		Glenwood Ave NB	L	126.0	173.4	180.8	--	F	F	F	--
		T	8.3	11.2	11.3	7.4	A	B	B	A	
TR	8.4	11.7	12.3	8.5	A	B	B	A			
Parking Deck EB	L	86.9	80.4	77.8	109.8	F	F	E	F		
TR	79.8	72.9	76.0	91.5	E	E	E	F			

Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²					
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM		
12	Creedmoor Rd & Crabtree Valley Ave / Bank Drwy	Overall		11.2	33.8	156.8	112.9	B	C	F	F		
		Creedmoor Rd SWB	L	15.2	30.1	44.1	29.3	B	C	D	C		
			T	6.5	6.4	2.3	3.4	A	A	A	A		
			TR	5.5	5.6	2.3	3.0	A	A	A	A		
		Crabtree Valley Ave NWB	LT	65.3	67.0	70.6	67.5	E	E	E	E		
			R	41.6	74.7	1130.7	937.3	D	E	F	F		
			L	15.0	33.7	194.5	215.5	B	C	F	F		
		Creedmoor Rd NEB	T	8.8	41.8	223.3	147.0	A	D	F	F		
			TR	11.5	58.3	295.4	210.7	B	E	F	F		
		Bank Drwy SEB	LT	132.6	140.5	306.9	--	F	F	F	--		
R	118.1		95.4	132.3	--	F	F	F	--				
13	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Overall		17.1	29.4	39.6	35.9	B	C	D	D		
		Creedmoor Rd SWB	L	57.3	61.6	58.4	63.7	E	E	E	E		
			T	11.4	14.8	12.0	13.2	B	B	B	B		
			TR	11.4	14.9	12.3	13.0	B	B	B	B		
		Crabtree Valley Mall Entrance NWB	LT	39.1	47.6	43.2	43.4	D	D	D	D		
			R	28.0	47.6	58.5	58.8	C	D	E	E		
		Creedmoor Rd NEB	L	97.8	110.5	102.7	123.5	F	F	F	F		
			T	12.9	30.2	50.7	42.1	B	C	D	D		
			TR	18.4	40.4	62.0	54.9	B	D	E	D		
		Office Drwy SEB	LT	121.3	130.8	90.6	124.3	F	F	F	F		
			R	117.1	86.2	76.9	96.1	F	F	E	F		
		14	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Overall		18.5	54.7	171.3	126.8	B	D	F	F
Blue Ridge Rd SWB	LT			11.3	17.7	46.9	27.5	B	B	D	C		
	R			10.4	13.4	42.7	21.1	B	B	D	C		
Summit Park Ln NWB	L			54.5	58.0	37.3	46.8	D	E	D	D		
	TR			71.4	85.0	110.3	89.8	E	F	F	F		
Blue Ridge Rd NEB	LTR			12.9	83.0	270.7	167.1	B	F	F	F		
	L			43.9	72.5	315.8	278.7	D	E	F	F		
Crabtree Valley Ave SEB	TR			39.4	48.0	201.3	118.0	D	D	F	F		
	15			Crabtree Valley Mall Entrance & Blue Ridge Rd	Overall		13.3	46.8	79.2	64.8	B	D	E
Blue Ridge Rd SB		T	4.9		13.6	37.8	25.3	A	B	D	C		
		R	0.0		0.1	0.4	0.4	A	A	A	A		
Blue Ridge Rd NB		LT	7.2		97.9	165.8	143.8	A	F	F	F		
		T	7.6		67.0	152.4	98.9	A	E	F	F		
Crabtree Valley Mall Entrance EB		L	46.1		105.0	155.4	144.2	D	F	F	F		
		R	43.9		58.5	75.5	84.7	D	E	E	F		
16		Lead Mine Rd & North Hills Dr	Overall			94.6	170.8	186.4	206.5	F	F	F	F
			Lead Mine Rd SB		L	138.9	158.3	77.8	237.2	F	F	E	F
					T	181.5	192.5	118.1	300.5	F	F	F	F
	TR			96.8	101.6	116.3	221.7	F	F	F	F		
	North Hills Dr WB		L	2517.3	5881.3	6399.4	5004.1	F	F	F	F		
			LTR	777.9	4266.0	2943.4	1763.4	F	F	F	F		
	Lead Mine Rd NB		L	28.6	21.0	18.1	17.2	C	C	B	B		
			T	10.3	12.9	12.1	10.0	B	B	B	A		
			R	4.9	4.7	4.3	3.7	A	A	A	A		
	North Hills Dr EB		LT	94.2	747.2	2108.3	2608.0	F	F	F	F		
			R	403.6	1021.5	2473.9	2940.9	F	F	F	F		
	17		Six Forks Rd & Main Street / Dartmouth Rd	Overall		35.8	36.6	40.0	39.1	D	D	D	D
Dartmouth Rd SWB		L		87.5	98.0	105.7	90.4	F	F	F	F		
		T		76.9	77.2	75.3	74.0	E	E	E	E		
		R		82.5	82.9	82.8	80.9	F	F	F	F		
Six Forks Rd NWB		L		41.5	42.4	40.3	34.9	D	D	D	C		
		T		14.2	13.7	12.4	16.7	B	B	B	B		
		R		11.1	9.6	9.6	10.8	B	A	A	B		
Main Street NEB		L		124.8	119.2	115.4	128.5	F	F	F	F		
		TR		92.9	91.0	84.8	89.6	F	F	F	F		
Six Forks Rd SEB		L		87.0	84.1	87.3	87.9	F	F	F	F		
		T		37.0	37.1	40.7	37.8	D	D	D	D		
		TR		41.7	41.4	49.2	42.7	D	D	D	D		
18	Six Forks Rd & I-440 WB Ramps / Front St	Overall		19.5	20.9	24.8	19.1	B	C	C	B		
		Front Street SWB	L	81.9	77.7	76.3	82.0	F	E	E	F		
			T	83.3	81.5	87.7	83.9	F	F	F	F		
			R	66.5	66.2	78.3	64.1	E	E	E	E		
		Six Forks Rd NWB	L	138.1	133.0	139.7	135.9	F	F	F	F		
			T	9.0	10.0	11.9	10.7	A	A	B	B		
			R	4.0	4.8	5.3	4.3	A	A	A	A		
		I-440 WB Off Loop	R	10.1	12.3	11.7	10.2	B	B	B	B		
			L	54.1	49.5	52.7	53.4	D	D	D	D		
			T	4.6	4.9	6.8	4.4	A	A	A	A		
R	5.7	6.5	12.0	4.8	A	A	B	A					
19	Six Forks Rd & I-440 EB Ramps	Overall		19.9	21.2	23.7	16.9	B	C	C	B		
		I-440 WB Off-Ramp	T	77.2	82.8	88.0	76.4	E	F	F	E		
		Six Forks Rd NWB	T	18.1	19.5	22.3	12.7	B	B	C	B		
		Six Forks SEB	T	0.0	0.0	0.0	0.0	A	A	A	A		

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
20	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	Overall	30.1	29.2	31.2	28.7	C	C	C	C
			L	98.1	103.9	97.3	101.5	F	F	F	F
			T	22.8	25.0	25.8	18.7	C	C	C	B
		Ramblewood Dr NEB	TR	21.9	24.0	24.9	17.8	C	C	C	B
			L	88.5	89.7	94.0	90.9	F	F	F	F
			T	90.2	89.8	87.7	89.8	F	F	F	F
		Six Forks Rd SEB	R	74.2	77.7	80.3	91.6	E	E	F	F
			L	66.0	65.0	68.7	70.2	E	E	E	E
			T	10.6	10.8	11.3	10.2	B	B	B	B
			TR	9.3	10.0	11.6	10.3	A	A	B	B
21	Six Forks Rd & Barrett Dr	Six Forks Rd SB	Overall	9.1	9.8	9.5	6.6	A	A	A	A
			L	66.8	62.7	61.9	184.0	E	E	E	F
		T	3.5	3.8	4.3	3.6	A	A	A	A	
		Barrett Dr WB	L	44.9	43.2	43.6	46.9	D	D	D	D
			R	35.2	32.1	33.8	47.0	D	C	C	D
		Six Forks Rd NB	T	8.1	8.2	8.1	4.8	A	A	A	A
			TR	7.7	8.2	8.1	4.9	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
61	Lake Boone Trail, Shopping Center Drwy & Myron Dr	Shopping Center Drwy SB	R	13.9	10.2	10.5	10.9	B	B	B	B
		Lake Boone Trail WB	L	19.2	29.1	34.2	13.9	C	D	D	B
			T	0.4	0.3	0.3	0.3	A	A	A	A
			TR	0.3	0.2	0.1	0.1	A	A	A	A
		Myron Dr NB	R	16.0	41.4	1934.4	928.5	C	E	F	F
			T	0.0	0.0	0.7	0.0	A	A	A	A
		Lake Boone Trail EB	TR	0.0	0.0	0.2	0.0	A	A	A	A
			L	105.7	99.1	155.0	95.6	F	F	F	F
62	Lake Boone Trail & I-440 EB Ramps	I-440 EB Off-Loop	R	9.9	9.7	11.7	11.3	A	A	B	B
63	Ridge Rd & I-440 EB Ramps	I-440 WB Off-Ramp/Ridge Rd	L	7.3	10.5	12.8	7.5	A	B	B	A
		Ridge Rd NB	T	0.0	0.0	0.0	0.0	A	A	A	A
64	Ridge Rd & Varnell Ave	I-440 WB Off-Ramp/Ridge Rd	LT	0.0	0.0	96.3	19.4	A	A	F	C
			T	0.0	0.0	165.3	55.8	A	A	F	F
		Varnell Ave WB	L	8.6	8.7	66.7	15.9	A	A	F	C
65	Ridge Rd & Manuel St	Ridge Rd SB	LT	0.1	0.2	0.2	0.1	A	A	A	A
		Manuel St WB	LR	9.3	10.2	12.4	9.2	A	B	B	A
		Ridge Rd NB	TR	0.0	0.0	0.0	0.0	A	A	A	A
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	63.6	94.9	107.1	124.0	F	F	F	F
		Glenwood Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Glenwood Ave SEB	L	34.7	48.4	73.6	43.3	D	E	F	E
67	Glenwood Ave & Crabtree Valley Mall Entrance	Glenwood Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			R	20.0	23.8	71.4	22.1	C	C	F	C
		Glenwood Ave SEB	T	0.0	0.0	0.1	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
68	Glenwood Ave & Crabtree View Place	Glenwood Ave NWB	T	1.7	2.5	5.0	2.7	A	A	A	A
		Crabtree View Place NEB	R	49.8	85.2	208.7	131.4	E	F	F	F
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
69	Glenwood Ave & Arrow Dr	Glenwood Ave NWB	T	0.1	0.1	0.1	0.2	A	A	A	A
		Arrow Dr NEB	R	26.4	43.1	40.6	27.3	D	E	E	D
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
70	Glenwood Ave & I-440 WB Off-Loop	I-440 WB Off-Loop EB	T	33.4	37.8	35.8	28.0	D	E	E	D
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
71	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	0.1	0.2	0.6	0.1	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		National Dr WB	R	12.3	19.9	66.2	221.7	B	C	F	F
		Glenwood Ave NB	L	15.6	19.4	21.8	17.6	C	C	C	C
			T	0.0	0.0	4.2	3.5	A	A	A	A
			R	0.0	0.0	0.0	11.4	A	A	A	B
72	Creedmoor Rd & Riverwood Cir	Creedmoor Rd SWB	LR	65.1	84.7	110.9	90.9	F	F	F	F
			L	25.8	40.5	50.8	45.5	D	E	F	E
		Riverwood Cir NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			L	51.8	77.1	84.4	60.1	F	F	F	F
73	Edwards Mill Rd & ApartmentDrwy/Mall Entrance	Creedmoor Rd NEB	R	16.6	33.2	98.6	38.0	C	D	F	E
			T	0.2	5.1	179.1	115.0	A	A	F	F
		Apt Drwy/ Mall Entrance SB	TR	0.2	9.3	281.5	141.9	A	A	F	F
			L	7.1	7.2	7.8	6.9	A	A	A	A
74	Crabtree Valley Ave & Edwards Mill Rd	Edwards Mill Rd WB	R	5.7	5.6	5.4	5.5	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Edwards Mill Rd EB	LT	0.4	0.3	0.3	0.2	A	A	A	A
			L	1.0	1.7	0.9	1.5	A	A	A	A
75	Crabtree Valley Ave & Edwards Mill Rd	Crabtree Valley Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			L	13.4	14.2	13.3	13.6	B	B	B	B
		Crabtree Valley Ave SEB	R	11.5	12.0	12.0	11.7	B	B	B	B
			TR	0.0	0.0	0.0	0.0	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
75	Crabtree Valley Ave, Homewood Banks Dr & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance SWB	L	7.8	9.7	69.9	47.7	A	A	F	E
			TR	8.1	9.6	11.4	14.4	A	A	B	B
		Crabtree Valley Ave NWB	L	--	--	--	--	--	--	--	--
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Homewood Banks Dr NEB	L	13.8	14.0	72.6	56.4	B	B	F	F
			TR	11.2	14.8	165.7	124.0	B	B	F	F
		Crabtree Valley Ave SEB	L	4.0	3.1	2.1	1.5	A	A	A	A
			TR	0.0	0.0	1.1	0.0	A	A	A	A
76	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks Dr SB	L	16.0	19.4	81.2	201.7	C	C	F	F
		Blue Ridge Rd WVB	T	0.0	0.0	0.0	0.0	A	A	A	A
		Blue Ridge Rd EB	L	4.9	5.4	41.5	23.2	A	A	E	C
			T	0.3	0.3	79.2	30.0	A	A	F	D
77	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd SWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			R	0.0	0.0	0.0	0.0	A	A	A	A
		Blue Ridge Rd NEB	L	5.0	9.0	167.0	98.2	A	A	F	F
			T	0.0	0.1	176.9	95.5	A	A	F	F
		Arinto Dr SEB	L	13.3	16.7	502.2	236.8	B	C	F	F
			R	8.0	--	589.5	81.4	A	--	F	F
78	Browning & Six Forks Rd	Browning SWB	L	40.1	98.5	237.7	25.3	E	F	F	D
			R	11.8	41.9	126.7	8.5	B	E	F	A
		Six Forks Rd NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Six Forks Rd SEB	L	11.9	12.0	13.2	8.4	B	B	B	A
			T	0.4	0.3	0.2	0.1	A	A	A	A

Notes:

- 1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations
- 2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies
- 3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

Based on the queue data output and visual observations during the simulation, there are multiple intersections where traffic queues beyond the existing storage or affects the operations of adjacent locations. Table 8-4 shows the maximum queue lengths on each approach of all the study intersections. The areas of excessive queuing are listed below:

AM peak hour

- Glenwood Ave at Blue Ridge Rd/Lead Mine Rd
 - All approaches, except the eastbound approach, have excessive queuing. Queuing from the Blue Ridge Rd/Lead Mine Rd intersection extends along Glenwood Ave and effects operations at adjacent intersections in both directions.
- Lead Mine Rd at North Hills Drive
 - The westbound approach of North Hills Drive has a queue of more than 1,000' and the southbound approach has a queue of more than 1,100'. This is due to the left-turn queuing at Glenwood Ave at Blue Ridge Rd/Lead Mine Rd intersection extending beyond North Hills Drive.

PM peak hour

- Glenwood Ave at Creedmoor Rd
 - The southbound approach of Creedmoor Rd is projected to queue more than 1,000'
 - The northbound approach of Creedmoor Rd is projected to queue more than 1,300'
- Glenwood Ave at Blue Ridge Rd/Lead Mine Rd
 - All approaches at this intersection have excessive queuing. Queuing from the Blue Ridge Rd/Lead Mine Rd intersection extends along Glenwood Ave and effects operations at adjacent intersections in both directions.
 - The queuing in the westbound direction extends back through the I-440 interchange and the queuing in the southbound direction extends past the North Hills Dr intersection.
- Ridge Rd at I-440 Ramp
 - The eastbound approach of this stop-controlled intersection of Ridge Rd and the I-440 Ramp is projected to queue more than 750'.

- Glenwood Ave at I-440 Westbound Off-Ramp
 - The I-440 westbound off-ramp queues beyond the ramp gore and cause spillback onto I-440 which would likely affect freeway operations.
- Lead Mine Rd at North Hills Dr
 - The westbound approach of North Hills Dr has a queue more than 1,200' and the southbound approach has a queue of more than 900'. This is due to the left-turn queuing at Glenwood Ave at Blue Ridge Rd/Lead Mine Rd extending beyond North Hills Dr.
- Blue Ridge at Crabtree Valley Ave/Summit Park Ln
 - All approaches, except the westbound approach, have long queues. The queues on northbound Blue Ridge and eastbound Crabtree Valley Ave are due to the spillback from the intersection of Glenwood Ave at Blue Ridge Rd.

Table 8-4: 2017 Base Year No-Build Intersection Queue Lengths

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	L	197	320	395	341	62.6	100.5	112.8	91.8
			R	179	312	298	211				
		Lake Boone Trail WB	T	947	1,307	1,513	1,099	34.9	64.9	73.3	31.3
			R	103	188	172	118				
		Lake Boone Trail EB	L	92	203	250	222	4.0	33.2	93.0	25.4
			T	216	470	551	639				
2	Lake Boone Trail & I-440 WB Ramps	I-440 WB Off-Ramp SB	R	463	532	553	430	327.9	490.5	862.4	228.2
			LTR	385	458	493	383				
		Lake Boone Trail WB	L	29	63	58	64	53.3	85.7	125.3	72.1
			T	472	826	975	647				
		Lake Boone Trail EB	T	269	599	685	734	33.4	102.5	113.6	152.9
			R	163	222	278	266				
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	L	34	70	87	52	2.9	35.6	19.3	11.9
			TR	134	458	400	345				
		Lake Boone WB	L	9	27	21	19	4.2	11.1	13.8	9.7
			T	61	164	211	133				
		Ridge Rd NB	TR	71	190	248	168	1.4	35.7	39.6	23.6
			L	14	74	89	65				
		Lake Boone Trail EB	TR	23	147	234	158	6.6	14.4	17.8	17.3
			L	16	36	66	69				
			T	25	59	66	54				
			TR	101	200	210	200				
4	Ridge Rd & Glen Eden Dr	Ridge Rd SB	L	15	20	31	27	3.6	33.2	34.2	17.8
			TR	179	429	396	336				
		Glen Eden Dr WB	L	19	75	69	70	10.1	75.3	85.5	39.8
			TR	33	244	269	141				
		Ridge Rd NB	L	15	39	65	48	1.3	7.7	13.6	6.7
			TR	26	116	152	127				
		Glen Eden Dr EB	L	30	106	113	79	16.8	35.3	48.5	36.2
			TR	103	266	346	252				
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Rembert Dr SWB	LTR	18	51	86	54	8.0	23.8	45.3	22.9
			L	20	58	78	61				
		Glenwood Ave NWB	T	663	1,049	1,128	954	18.9	42.4	58.1	55.1
			TR	312	487	532	416				
		Fairhill Dr NEB	L	18	40	42	37	11.2	21.8	20.9	20.0
			TR	18	21	28	28				
		Glenwood Ave SEB	L	4	12	16	14	9.3	32.6	47.4	29.1
			T	628	1,265	1,391	984				
			TR	237	508	572	407				
			L	514	703	667	645				
6	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	T	207	512	584	386	144.0	219.2	245.3	191.1
			TR	218	530	608	389				
		Glenwood WB	L	89	313	340	335	196.3	386.4	393.7	345.4
			T	912	1,437	1,539	1,264				
		Creedmoor Rd NEB	L	37	98	114	101	36.2	88.2	110.2	123.9
			T	133	310	392	433				
			R	52	135	115	136	81.9	201.1	396.2	150.0
			L	38	44	102	85				
		Glenwood Ave EB	T	643	1,298	1,506	1,038				
			TR	159	353	354	313				
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Marriott Dr SWB	L	30	78	99	57	12.3	44.6	64.4	25.3
			TR	0	0	0	0				
		Glenwood Ave NWB	L	20	27	45	118	12.2	19.8	24.6	33.2
			T	765	1,386	1,472	1,242				
			TR	529	799	859	845	2.4	6.3	7.0	9.2
			LT	0	5	7	11				
		Crabtree Valley Mall Entrance NEB	R	8	11	17	22				
			L	6	9	13	12	3.4	9.7	10.4	11.6
		Glenwood Ave SEB	T	1,066	1,951	2,061	1,612				
			TR	212	425	374	362				
8	Blue Ridge Rd, Glenwood Ave & Lead Mine Rd	Lead Mine Rd SWB	L	534	1,096	1,120	1,228	135.9	842.4	1,062.0	1,078.3
			T	163	530	434	461				
			TR	41	144	151	190	76.5	294.4	807.9	899.8
			L	117	258	321	325				
		Glenwood Ave NWB	T	1,245	2,043	2,178	1,994	15.7	84.0	221.4	77.1
			R	195	436	551	450				
		Blue Ridge Rd NEB	L	16	18	23	30	47.7	131.3	101.2	93.9
			T	30	108	102	122				
			R	3	171	206	117				
			L	13	33	33	45				
		Glenwood Ave SEB	T	938	1,833	1,989	1,508				
			TR	342	555	465	398				

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
9	Genwood Ave & I-440 WB Off-Ramp	I-440 WB Off-Ramp	T	1,052	1,510	1,750	1,532	96.4	135.4	198.2	162.2
		Glenwood Ave NWB	T	522	1,256	1,285	1,219	16.6	60.6	80.3	70.8
		Glenwood Ave SEB	T	1,290	2,600	2,936	2,494	0.0	5.8	4.9	0.0
10	Genwood Ave & I-440 EB Off-Ramp	Glenwood Ave NWB	T	327	887	869	837	3.1	8.9	9.0	9.7
		I-440 EB Off-Ramp	L	252	499	558	534	28.6	57.9	66.0	63.8
		Glenwood Ave SEB	T	567	1,426	1,697	1,512	15.6	24.2	33.0	29.7
11	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	L	69	170	263	243	17.9	53.6	82.6	68.3
			T	551	1,424	1,651	1,393				
			R	3	9	18	13				
		Womans Club Dr WB	LT	5	13	18	13	1.9	5.2	5.8	4.0
			R	6	17	13	13				
		Glenwood Ave NB	L	0	7	10	11	0.1	4.3	5.7	4.8
			T	255	713	729	648				
		Parking Deck EB	TR	106	310	339	317	0.0	1.4	2.0	3.3
			L	0	3	5	12				
			TR	0	3	4	3				
12	Creedmoor Rd & Crabtree Valley Ave / Bank Drwy	Creedmoor Rd SWB	L	18	55	58	156	0.4	7.7	16.9	6.4
			T	227	677	775	433				
			TR	253	717	820	522				
		Crabtree Valley Ave NWB	LT	9	22	21	14	10.6	20.7	25.0	28.7
			R	26	56	73	77				
		Creedmoor Rd NEB	L	0	0	0	0	0.6	5.2	6.8	5.6
			T	164	405	476	487				
		Bank Drwy SEB	TR	46	134	144	168	0.0	0.0	1.8	3.2
			LT	0	0	4	11				
			R	0	0	2	2				
13	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	L	37	32	59	126	13.9	10.3	30.8	34.4
			T	244	711	807	566				
			TR	247	707	801	511				
		Crabtree Valley Mall Entrance NWB	LT	13	16	29	28	4.2	5.7	9.6	9.3
			R	12	12	13	33				
		Creedmoor Rd NEB	L	0	4	11	2	2.2	8.2	18.7	15.4
			T	152	382	450	462				
		Office Drwy SEB	TR	63	164	187	220	0.0	4.0	8.9	4.1
			LT	0	0	3	4				
			R	0	11	24	9				
14	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Blue Ridge Rd SWB	LT	176	579	474	445	9.3	36.0	26.1	40.6
			R	61	106	106	90				
		Summit Park Ln NWB	L	5	45	39	19	12.8	23.5	21.8	9.8
			TR	39	76	67	27				
		Blue Ridge Rd NEB	LTR	90	246	250	281	1.4	18.0	21.7	17.1
			L	38	108	127	132				
15	Crabtree Valley Mall Entrance & Blue Ridge Rd	Blue Ridge Rd SB	TR	6	12	13	17	13.4	69.2	149.2	157.7
			T	235	687	573	486				
		Blue Ridge Rd NB	R	40	104	183	256	0.2	4.1	31.0	27.0
			LT	26	49	56	131				
		Crabtree Valley Mall Entrance EB	T	23	246	238	149	3.2	6.8	14.1	17.5
			L	3	24	51	73				
16	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	R	7	6	5	11	13.7	853.1	1,138.2	1,128.6
			L	26	76	92	98				
		North Hills Dr WB	T	458	980	972	1,068	27.1	677.2	1,092.1	1,176.2
			TR	130	442	330	390				
		Lead Mine Rd NB	L	72	137	145	162	3.4	16.5	21.0	20.9
			LTR	80	260	283	295				
		North Hills Dr EB	L	6	10	6	9	7.8	9.9	13.0	5.5
			T	192	425	566	479				
17	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	R	44	147	111	126	38.6	122.1	134.9	70.5
			LT	0	6	4	1				
			R	23	18	21	15				
		Six Forks Rd NWB	L	86	239	275	178	23.1	55.2	99.0	91.1
			T	8	35	53	47				
		Main Street NEB	R	14	67	82	54	25.9	46.7	57.1	70.3
			L	96	123	258	256				
		Six Forks Rd SEB	T	536	1,430	1,587	1,392	60.2	122.5	158.1	106.2
			R	48	157	224	165				
			L	10	25	28	35				
18	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	TR	47	89	112	128	22.6	48.8	65.7	42.8
			L	35	158	221	137				
			T	368	965	942	829				
		Six Forks Rd NWB	TR	530	812	749	678	31.1	114.6	111.8	113.7
			L	27	87	112	76				
		I-440 WB Off Loop	T	60	121	142	107	2.0	5.9	15.1	8.9
			R	11	39	61	39				
		Six Forks Rd SEB	L	122	285	293	272	15.4	76.1	83.5	52.9
			T	667	1,672	2,008	1,760				
			R	150	387	544	389				
			L	39	101	159	133				
			T	16	49	99	44				
			L	423	1,157	1,207	1,081				
			R	545	787	660	589				

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
19	Six Forks Rd & I-440 EB Ramps	I-440 WB Off-Ramp	T	314	687	936	745	91.9	174.1	224.7	187.5
		Six Forks Rd NWB	T	627	1,663	1,896	1,678	2.6	76.5	149.4	80.6
		Six Forks SEB	T	485	1,334	1,471	1,283	0.0	0.0	0.0	0.0
20	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	L	8	25	24	32	10.2	57.4	65.5	69.1
			T	114	369	443	424				
			TR	123	370	455	425				
		Ramblewood Dr NEB	L	47	131	132	96	24.8	123.9	140.5	66.6
			T	19	56	61	52				
			R	20	94	111	65				
		Six Forks Rd SEB	L	185	452	469	397	43.3	104.8	112.8	100.3
			T	297	876	1,031	899				
			TR	148	366	434	384				
21	Six Forks Rd & Barrett Dr	Six Forks Rd SB	L	21	54	102	83	213.6	358.1	174.8	84.2
			T	369	1,120	1,277	1,080				
		Barrett Dr WB	L	4	27	54	77	2.3	15.5	38.1	62.9
			R	3.9	7.3	27.8	40.4				
		Six Forks Rd NB	T	124.8	422.2	496.2	459.0	0.0	2.7	2.1	6.0
			TR	151.2	513.2	590.2	532.7				

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
61	Lake Boone Trail, Shopping Center Drwy & Myron Dr	Shopping Center Drwy SB	R	34	70	71	48	13.6	16.3	34.6	4.0
		Lake Boone Trail WB	L	27	49	68	28				
			TR	565	774	879	640				
		Myron Dr NB	R	44	65	73	78	1.4	3.5	5.0	4.2
		Lake Boone Trail EB	T	150	327	366	393				
			TR	272	480	592	595	0.0	0.9	1.4	4.5
62	Lake Boone Trail & I-440 EB Ramps	I-440 EB Off-Loop	L	9	15	20	12	18.4	41.0	287.2	25.3
			R	360	406	455	341	18.4	41.0	287.2	25.3
63	Ridge Rd & I-440 EB Ramps	I-440 WB Off-Ramp/Ridge Rd	L	193	435	406	339	4.2	48.8	42.1	19.1
		Ridge Rd NB	T	47	212	254	190				
			T	0	17	18	12				
64	Ridge Rd & Varnell Ave	I-440 WB Off-Ramp/Ridge Rd	LT	141	265	300	222	0.0	0.0	0.0	0.0
			T	66	165	123	125				
		Varnell Ave WB	L	3	24	15	11	0.2	0.8	0.7	0.5
		NB	R	0	0	9	4				
65	Ridge Rd & Manuel St	Ridge Rd SB	LT	193	449	423	349	0.0	0.0	0.0	0.0
		Manuel St WB	LR	4	15	23	10				
		Ridge Rd NB	TR	46	205	246	188	0.0	0.0	0.0	0.0
			LR	9	19	25	31				
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	T	668	1,121	1,224	1,009	0.0	0.0	0.0	0.0
			TR	304	458	503	416				
		Glenwood Ave SEB	L	2	0	1	4				
			T	838	1,724	1,907	1,367	0.0	0.0	0.0	0.0
		Glenwood Ave NWB	T	1,289	2,191	2,313	2,159	0.0	0.0	0.0	0.0
67	Glenwood Ave & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NEB	R	8	4	6	33	0.3	0.8	1.0	2.0
		Glenwood Ave SEB	T	1,038	1,904	2,012	1,571				
			TR	266	557	505	406	0.0	3.1	1.3	0.0
68	Glenwood Ave & Crabtree View Place	Glenwood Ave NWB	T	1,565	2,747	3,032	2,739	5.1	76.4	409.7	537.0
		Crabtree View Place NEB	R	107	112	121	171				
		Glenwood Ave SEB	T	1,191	2,497	2,792	2,290	0.0	1.1	0.0	2.4
			TR	613	1,108	904	916				
69	Glenwood Ave & Arrow Dr	Glenwood Ave NWB	T	1,565	2,752	3,034	2,741	0.0	19.4	243.7	371.6
		Arrow Dr NEB	R	52	61	66	54				
		Glenwood Ave SEB	T	1,264	2,560	2,875	2,424	0.0	0.3	0.0	0.0
			TR	642	1,137	923	860				
70	Glenwood Ave & I-440 WB Off-Loop	I-440 WB Off-Loop EB	T	523	1,255	1,290	1,220	3.0	27.8	40.3	27.3
		Glenwood Ave SEB	T	57	64	141	121				
71	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	604	1,578	1,845	1,579	0.0	0.0	15.1	0.0
			TR	6	19	36	34				
		National Dr WB	R	8	16	26	80	0.0	1.5	1.9	3.0
			L	2	14	20	19				
		Glenwood Ave NB	T	335	939	929	843	0.0	0.0	0.0	0.1
			R	0	4	4	7				
		Varnell Ave EB	LR	31.8	47.6	56.2	47.0	3.2	32.8	45.0	18.6
72	Creedmoor Rd & Riverwood Cir	Creedmoor Rd SWB	L	0	10	16	11	0.0	0.0	0.0	0.0
			T	475	1,381	1,578	906				
		Riverwood Cir NWB	L	3	3	4	0	0.7	0.8	0.8	0.4
			R	12	8	11	8				
		Creedmoor Rd NEB	T	75	198	246	252	0.0	0.0	0.0	0.0
			TR	127	344	375	420				
73	Edwards Mill Rd & Apartment Drwy/Mall Entrance	Apt Drwy/ Mall Entrance SB	L	20	31	30	33	0.7	0.9	0.9	1.6
		Edwards Mill Rd WB	R	3	5	5	3				
			TR	64	134	158	170	0.0	0.0	0.0	6.9
		Edwards Mill Rd EB	LT	50	84	123	140				
74	Crabtree Valley Ave & Edwards Mill Rd	Crabtree Valley Ave NWB	L	48	96	103	89	0.0	0.0	0.0	0.4
			T	20	56	68	62				
		Edwards Mill Rd NEB	L	15	24	25	28	1.5	2.2	2.5	3.3
			R	50	89	125	125				
		Crabtree Valley Ave SEB	TR	19	60	49	146	0.0	0.0	0.0	0.0

I-440 AT RIDGE ROAD/CRABTREE VALLEY AVENUE INTERCHANGE (I-5870)

WAKE COUNTY

Unsignalized Intersections ³													
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length					
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM		
75	Crabtree Valley Ave, Homewood Banks Dr & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance SWB	L	8	23	24	26	0.9	1.1	2.3	3.2		
			TR	16	36	39	52						
		Crabtree Valley Ave NWB	L	0	0	0	0	0.0	0.0	0.0	0.0		
			TR	72	143	151	133						
		Homewood Banks Dr NEB	L	2	7	12	9	13.4	20.7	66.0	72.7		
			TR	8	14	20	20						
		Crabtree Valley Ave SEB	L	24.4	23.3	36.6	68.9	0.1	0.0	0.0	0.1		
			TR	37.4	115.1	130.1	185.2						
76	Blue Ridge Rd & Homewood Banks Dr	Homewood Bankks Dr SB	L	4	13	27	27	4.6	7.0	24.4	26.8		
		Blue Ridge Rd WB	T	153	555	410	383	0.0	0.0	0.0	0.0		
		Blue Ridge Rd EB	L	9	16	21	20	0.0	0.1	0.2	0.0		
			T	83	230	213	239						
		Blue Ridge Rd SWB	T	161	589	453	406	0.0	0.0	0.0	0.0		
			R	0	4	12	13						
77	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd NEB	L	0	0	0	0	0.0	0.0	0.0	0.0		
			T	85	240	238	265						
		Arinto Dr SEB	L	10	13	15	19	0.3	1.1	1.2	1.5		
			R	0	0	0	0						
		78	Browning & Six Forks Rd	Browning SWB	L	4	22	57	74	0.2	3.5	14.3	18.5
					R	5	16	36	38				
Six Forks Rd NWB	T			117	406	470	455	0.0	0.0	0.0	0.0		
	TR			129	366	448	408						
Six Forks Rd SEB	L			31	113	165	137	0.0	3.2	5.2	2.9		
	T			392	1,140	1,310	1,084						
Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length					
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM		
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	L	376	503	493	360	68.5	92.5	131.9	60.7		
			R	178	136	229	170						
		Lake Boone Trail WB	T	857	805	749	738	86.1	60.5	69.5	69.9		
			R	85	86	80	89						
		Lake Boone Trail EB	L	223	212	235	199	48.4	78.5	985.5	36.9		
			T	1,167	1,243	1,182	854						
2	Lake Boone Trail & I-440 WB Ramps	I-440 WB Off-Ramp SB	R	280	272	247	288	578.9	563.0	488.4	653.1		
			LTR	280	275	285	260						
		Lake Boone Trail WB	L	34	31	93	23	20.1	19.1	29.3	16.4		
			T	655	642	660	552						
		Lake Boone Trail EB	T	1,258	1,403	1,455	1,094	74.9	231.7	1,034.9	108.6		
			R	382	428	308	302						
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	L	42	63	90	49	5.7	22.2	65.5	6.9		
			TR	226	427	669	232						
		Lake Boone WB	L	28	38	43	16	10.6	10.5	18.3	7.7		
			T	131	131	193	100						
		Ridge Rd NB	TR	183	198	270	133	18.6	13.7	26.1	8.2		
			L	83	53	49	44						
		Lake Boone Trail EB	TR	285	310	403	180	20.5	32.5	112.9	25.2		
			L	93	134	205	135						
			T	79	135	222	93	34.4	117.6	142.7	38.8		
			TR	305	366	445	287						
4	Ridge Rd & Glen Eden Dr	Ridge Rd SB	L	27	35	35	35	16.3	49.7	77.9	27.9		
			TR	238	384	515	308						
		Glen Eden Dr WB	L	53	101	117	83	53.1	64.2	667.7	62.7		
			TR	191	208	308	205						
		Ridge Rd NB	L	95	94	112	82	14.5	29.5	66.7	14.8		
			TR	183	248	378	145						
		Glen Eden Dr EB	L	124	230	204	134	34.4	117.6	142.7	38.8		
			TR	229	342	501	287						
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Rembert Dr SWB	LTR	53	65	48	36	28.9	35.9	23.3	17.2		
		Glenwood Ave NWB	L	47	45	42	33	66.5	96.4	133.2	71.0		
			T	1,062	1,383	1,675	1,255						
			TR	438	580	746	527						
		Fairhill Dr NEB	L	43	74	87	55	24.5	53.5	57.8	28.9		
			TR	23	40	41	22						
		Glenwood Ave SEB	L	24	29	42	21	60.8	68.8	84.6	54.6		
			T	1,141	1,389	1,472	1,234						
			TR	452	555	580	474						
		6	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	L	467	474	430	514	317.7	366.5	329.7	1,065.7
T	319				343	357	337						
TR	313				328	350	389						
Glenwood WB	L			155	154	245	243	139.0	193.8	446.5	193.9		
	T			1,169	1,590	2,003	1,405						
Creedmoor Rd NEB	L			303	326	361	325	387.2	650.2	1,358.8	921.1		
	T			830	910	968	859						
Glenwood Ave EB	R			180	187	235	226	217.1	286.4	291.3	238.7		
	L			107	118	137	100						
	T			1,111	1,381	1,467	1,231						

Signalized Intersections																
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length								
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM					
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Marriott Dr SWB	L	36	58	97	76	27.0	44.0	84.5	54.0					
			TR	21	40	82	64									
		Glenwood Ave NWB	L	212	136	205	266	113.8	73.0	224.3	148.7					
			T	1,128	1,474	2,046	1,312									
		Crabtree Valley Mall Entrance NEB	TR	917	1,019	1,025	972	68.5	77.8	114.1	70.9					
			LT	75	103	76	74									
		Glenwood Ave SEB	R	109	92	73	84	36.8	50.1	139.3	81.4					
			L	0	0	0	0									
			T	1,525	1,787	1,859	1,712									
			TR	407	479	548	488									
8	Blue Ridge Rd, Glenwood Ave & Lead Mine Rd	Lead Mine Rd SWB	L	612	605	621	604	1,588.1	1,725.3	1,668.0	1,735.0					
			T	135	187	220	190									
			TR	96	119	138	147									
		Glenwood Ave NWB	L	542	511	454	466	367.2	421.1	951.8	605.1					
			T	2,184	2,472	3,090	2,360									
			R	628	686	684	584									
		Blue Ridge Rd NEB	L	16	68	101	98	180.6	675.4	1,489.2	1,043.6					
			T	319	432	417	339									
			R	291	250	179	243									
		Glenwood Ave SEB	L	68	118	144	111	124.0	147.2	202.6	138.7					
			T	1,632	1,779	1,916	1,774									
			TR	327	417	448	396									
		9	Genwood Ave & I-440 WB Off-Ramp	I-440 WB Off-Ramp	T	1,406	1,437	1,539	1,397	121.7	116.3	807.7	134.0			
				Glenwood Ave NWB	T	1,941	2,264	2,677	1,959	148.4	159.6	224.7	152.5			
10	Genwood Ave & I-440 EB Off-Ramp	Glenwood Ave SEB	T	2,436	2,539	2,616	2,469	21.1	55.2	54.3	42.9					
		Glenwood Ave NWB	T	1,182	1,508	1,811	1,121	18.1	53.6	302.0	16.0					
		I-440 EB Off-Ramp	L	932	991	1,107	922	211.7	214.2	233.3	207.6					
		Glenwood Ave SEB	T	1,072	1,062	1,162	1,068	84.7	79.5	142.1	71.4					
11	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	L	84	60	29	15	40.5	26.6	25.6	13.6					
			T	1,141	1,168	1,256	1,187									
			R	4	2	1	0									
		Womans Club Dr WB	LT	57	96	144	48	28.6	52.3	78.2	20.7					
			R	25	39	41	1									
		Glenwood Ave NB	L	8	2	3	1	27.7	46.2	63.4	22.7					
			T	931	1,156	1,381	906									
			TR	397	472	578	340									
		Parking Deck EB	L	26	42	26	9	14.4	22.3	15.8	7.2					
			TR	16	27	33	15									
L	78		81	141	183											
12	Creedmoor Rd & Crabtree Valley Ave / Bank Drwy	Creedmoor Rd SWB	T	342	365	401	333	27.7	54.6	95.4	91.6					
			TR	399	422	463	431									
			LT	63	69	64	54									
		Crabtree Valley Ave NWB	R	129	73	44	78	51.9	62.3	505.6	329.7					
			L	5	8	2	1									
		Creedmoor Rd NEB	T	834	990	1,025	840	8.7	210.6	937.9	492.4					
			TR	294	445	517	358									
			Bank Drwy SEB	LT	2	15	2					0	2.3	9.6	2.2	0.0
		R		5	4	2	0									
		13	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	L	125	109	133	134	29.0	32.8	34.9	35.7			
T	387				417	496	476									
TR	377				401	436	423									
Crabtree Valley Mall Entrance NWB	LT			54	41	45	30	29.8	54.7	73.7	75.9					
	R			209	199	217	260									
	L			3	4	3	3									
Creedmoor Rd NEB	T			789	893	926	786	64.1	275.3	1,197.3	684.7					
	TR			403	491	570	441									
	LT			4	10	10	6									
Office Drwy SEB	R			7	17	27	12	3.1	8.0	7.9	4.2					
	LT	312	349	426	363											
14	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Blue Ridge Rd SWB	R	133	111	76	58	37.5	105.9	470.6	203.9					
			L	12	13	19	14									
		Summit Park Ln NWB	TR	35	39	47	35	17.5	20.7	32.2	19.1					
			LTR	457	508	427	359									
		Blue Ridge Rd NEB	L	185	299	281	284	60.6	152.3	619.2	765.9					
			TR	15	20	28	49									
		Crabtree Valley Ave SEB	T	360	384	385	322	2.3	43.3	280.3	85.4					
			R	370	378	363	396									
15	Crabtree Valley Mall Entrance & Blue Ridge Rd		Blue Ridge Rd SB	LT	137	222	227					177	6.3	365.4	1,163.4	738.1
				T	257	357	259					277				
		Blue Ridge Rd NB	L	271	229	229	226	132.1	209.3	312.1	288.4					
			R	81	73	84	63									

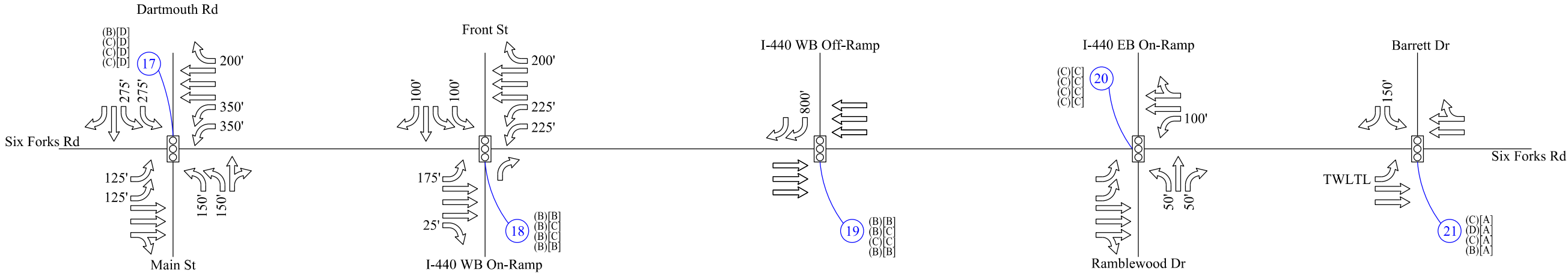
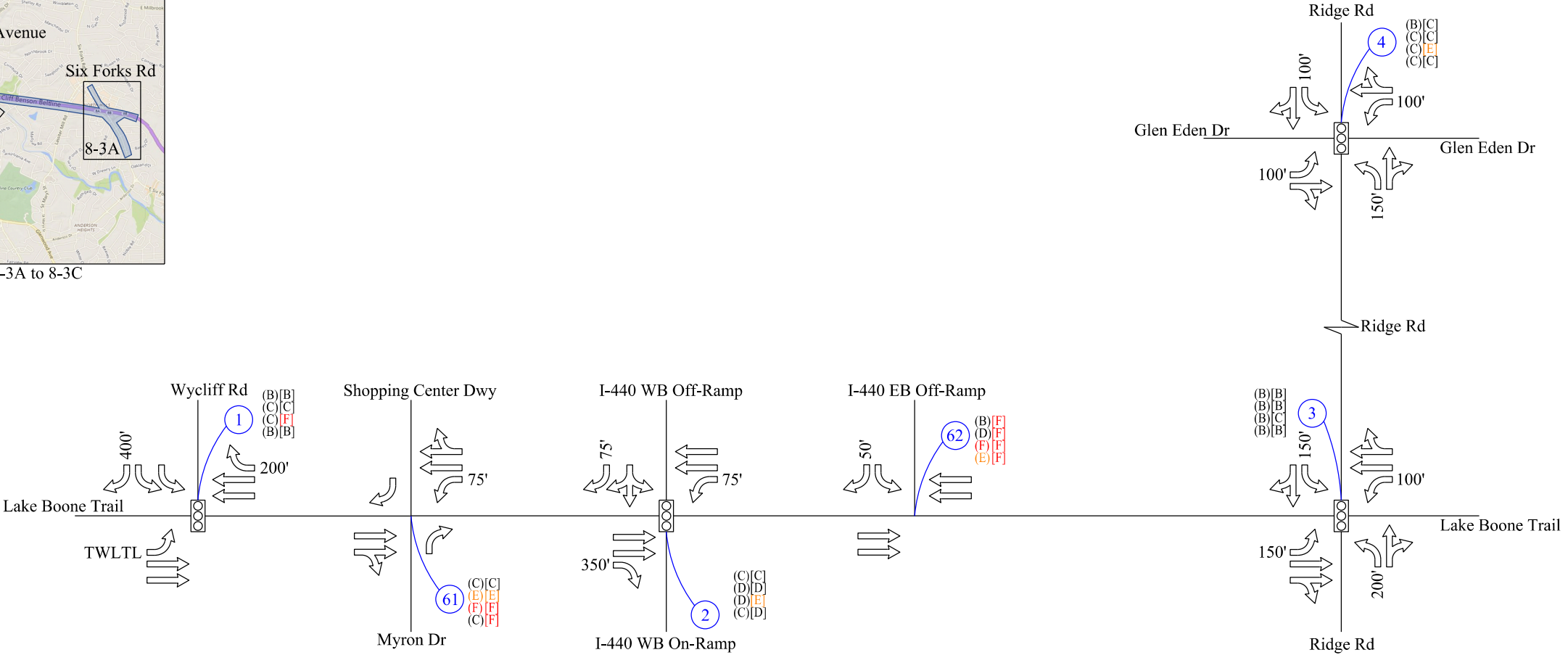
Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
16	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	L	49	31	67	60	508.0	486.7	356.5	911.0
			T	602	577	556	601				
			TR	189	252	306	276				
		North Hills Dr WB	L	11	31	53	11	1,095.6	1,236.9	1,228.8	1,234.6
			LTR	77	82	79	77				
			L	7	12	11	7				
		Lead Mine Rd NB	T	747	902	924	775	30.2	51.4	103.3	30.3
			R	259	316	312	245				
			LT	5	8	11	9				
		North Hills Dr EB	R	14	28	39	29	34.6	320.0	624.8	606.2
			L	174	196	265	196				
17	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	T	62	75	130	89	95.4	121.6	164.6	103.5
			R	123	145	189	143				
			L	277	318	377	339				
		Six Forks Rd NWB	T	1,618	1,591	1,565	1,266	99.2	106.3	105.1	95.2
			R	115	139	154	134				
			L	62	58	56	61				
		Main Street NEB	TR	157	146	147	177	122.6	105.6	100.2	124.4
			L	106	117	140	122				
		Six Forks Rd SEB	T	938	922	921	829	221.9	225.1	247.6	198.3
			TR	772	755	770	700				
18	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	L	176	204	286	166	100.2	124.7	197.8	113.7
			T	150	179	263	161				
			R	67	98	101	101				
		Six Forks Rd NWB	L	277	297	307	200	191.9	206.5	233.5	127.2
			T	1,948	1,950	1,987	1,627				
			R	280	337	400	353				
		I-440 WB Off Loop	R	102	95	113	108	5.9	7.0	7.8	6.8
			L	38	46	39	56				
		Six Forks Rd SEB	T	1,135	1,117	1,117	998	42.7	43.3	73.3	39.1
			R	789	760	817	696				
19	Six Forks Rd & I-440 EB Ramps	I-440 WB Off-Ramp	T	570	555	612	501	182.2	201.6	229.6	161.2
		Six Forks Rd NWB	T	1,927	2,028	2,058	1,662	100.3	112.2	126.8	64.8
		Six Forks SEB	T	1,412	1,411	1,507	1,264	0.0	0.0	0.0	0.0
20	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	L	89	49	71	36	122.1	111.3	133.2	66.2
			T	525	595	586	372				
			TR	589	638	627	403				
		Ramblewood Dr NEB	L	42	48	41	59	51.0	44.1	47.2	54.8
			T	62	59	64	68				
			R	62	37	42	37				
		Six Forks Rd SEB	L	620	619	639	513	147.2	141.6	158.8	131.2
			T	826	792	844	727				
			TR	379	401	450	404				
21	Lake Boone Trail & Wycliff Rd	Six Forks Rd SB	L	69	44	28	13	27.5	18.9	14.5	16.9
			T	1,109	1,135	1,223	1,008				
		Barrett Dr WB	L	82	157	128	65	24.1	41.1	34.2	18.2
			R	109.9	125.7	139.5	36.6				
		Six Forks Rd NB	T	515.9	526.6	508.1	372.8	32.1	31.5	31.8	16.3
			TR	568.9	563.8	537.3	403.9				

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
61	Lake Boone Trail, Shopping Center Drwy & Myron Dr	Shopping Center Drwy SB	R	51	57	57	83	3.0	16.3	34.6	4.0
		Lake Boone Trail WB	L	52	36	38	30	13.6	47.4	97.7	9.7
			T	458	441	403	404				
			TR	639	614	617	605				
		Myron Dr NB	R	89	106	123	174	1.4	3.5	5.0	4.2
		Lake Boone Trail EB	T	685	783	693	547	0.0	0.9	1.4	4.5
			TR	890	1,028	1,025	685				
62	Lake Boone Trail & I-440 EB Ramps	I-440 EB Off-Loop	L	12	12	23	10	18.4	41.0	287.2	25.3
			R	326	316	223	288	18.4	41.0	287.2	25.3
63	Ridge Rd & I-440 EB Ramps	I-440 WB Off-Ramp/Ridge Rd	L	258	398	478	313	4.2	48.8	42.1	19.1
			T	265	433	490	223				
		Ridge Rd NB	T	5	22	31	15	0.0	0.0	0.0	0.0
64	Ridge Rd & Varnell Ave	I-440 WB Off-Ramp/Ridge Rd	LT	216	325	352	238	0.0	0.0	0.0	0.0
			T	72	126	235	113				
		Varnell Ave WB	L	8	17	10	9	0.2	0.8	0.7	0.5
		NB	R	4	8	29	6	0.0	0.0	0.0	0.0
65	Ridge Rd & Manuel St	Ridge Rd SB	LT	260	417	508	327	0.0	0.0	0.0	0.0
		Manuel St WB	LR	10	23	68	14	0.0	0.7	0.8	0.7
		Ridge Rd NB	T	275	441	520	237	0.0	0.0	0.0	0.0
			TR								

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	16	23	14	7	1.2	6.1	10.5	6.7
		Glenwood Ave NWB	T	1,154	1,533	1,881	1,403	0.0	0.0	0.0	0.0
			TR	410	472	611	463				
		Glenwood Ave SEB	L	5	4	4	4	0.0	0.0	0.0	0.0
			T	1,547	1,912	2,013	1,674				
67	Glenwood Ave & Crabtree Valley Mall Entrance	Glenwood Ave NWB	T	2,245	2,583	3,337	2,644	0.0	0.0	0.0	0.0
		Crabtree Valley Mall Entrance NEB	R	177	140	131	141	0.3	0.8	1.0	2.0
		Glenwood Ave SEB	T	1,576	1,820	1,925	1,749	0.0	3.1	1.3	0.0
			TR	348	432	533	428				
68	Glenwood Ave & Crabtree View Place	Glenwood Ave NWB	T	3,336	3,651	4,357	3,585	5.1	76.4	409.7	537.0
		Crabtree View Place NEB	R	191	188	224	210	14.7	51.3	92.4	100.8
		Glenwood Ave SEB	T	2,244	2,347	2,396	2,347	0.0	1.1	0.0	2.4
			TR	587	665	742	677				
69	Glenwood Ave & Arrow Dr	Glenwood Ave NWB	T	3,335	3,655	4,353	3,575	0.0	19.4	243.7	371.6
		Arrow Dr NEB	R	71	68	91	38	3.5	10.4	15.3	6.7
		Glenwood Ave SEB	T	2,390	2,479	2,557	2,488	0.0	0.3	0.0	0.0
			TR	619	694	749	689				
70	Glenwood Ave & I-440 WB Off-Loop	I-440 WB Off-Loop EB	T	1,940	2,261	2,759	2,078	3.0	27.8	40.3	27.3
		Glenwood Ave SEB	T	77	81	95	66				
71	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	1,206	1,198	1,256	1,163	0.0	0.0	15.1	0.0
			TR	30	28	32	40				
		National Dr WB	R	137	181	161	59	0.0	1.5	1.9	3.0
			L	22	17	25	19				
		Glenwood Ave NB	T	1,280	1,610	1,971	1,271	0.0	0.0	0.0	0.1
			R	10	11	10	5				
		Varnell Ave EB	LR	48.4	33.4	47.6	42.9	3.2	32.8	45.0	18.6
			L	13	22	46	63				
72	Creedmoor Rd & Riverwood Cir	Creedmoor Rd SWB	T	765	802	870	739	0.0	0.0	0.0	0.0
			L	11	3	8	11				
		Riverwood Cir NWB	R	26	26	18	26	0.7	0.8	0.8	0.4
			T	468	644	812	576				
		Creedmoor Rd NEB	TR	676	804	705	627	0.0	0.0	0.0	0.0
			L	73	75	87	94				
73	Edwards Mill Rd & Apartment Drwy/Mall Entrance	Apt Drwy/ Mall Entrance SB	R	34	36	42	38	0.7	0.9	0.9	1.6
			TR	157	145	147	162				
		Edwards Mill Rd WB	LT	123	194	235	106	0.0	0.0	0.0	0.0
			L	97	88	48	61				
74	Crabtree Valley Ave & Edwards Mill Rd	Crabtree Valley Ave NWB	T	139	103	77	66	0.0	0.0	0.0	0.4
			L	49	43	35	40				
		Edwards Mill Rd NEB	R	135	200	262	152	1.5	2.2	2.5	3.3
			TR	87	155	111	130				
75	Crabtree Valley Ave, Homewood Banks Dr & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance SWB	L	56	68	56	84	0.9	1.1	2.3	3.2
			TR	103	116	120	102				
		Crabtree Valley Ave NWB	L	0	1	0	0	0.0	0.0	0.0	0.0
			TR	210	151	82	77				
		Homewood Banks Dr NEB	L	9	22	34	33	13.4	20.7	66.0	72.7
			TR	38	55	126	110				
		Crabtree Valley Ave SEB	L	52.2	65.4	116.5	91.2	0.1	0.0	0.0	0.1
			TR	161.9	278.0	257.4	203.9				
76	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks Dr SB	L	42	32	9	2	4.6	7.0	24.4	26.8
		Blue Ridge Rd WB	T	237	282	338	312	0.0	0.0	0.0	0.0
			L	75	83	178	92				
		Blue Ridge Rd EB	T	397	457	436	286	0.0	0.1	0.2	0.0
77	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd SWB	T	290	321	373	350	0.0	0.0	0.0	0.0
			R	21	18	26	33				
		Blue Ridge Rd NEB	L	8	8	20	11	0.0	0.0	0.0	0.0
			T	431	477	420	302				
		Arinto Dr SEB	L	27	10	20	16	0.3	1.1	1.2	1.5
			R	3	0	4	3				
78	Browning & Six Forks Rd	Browning SWB	L	104	150	157	65	66.1	93.9	425.2	10.3
			R	147	206	196	55				
		Six Forks Rd NWB	T	569	571	575	386	0.0	0.0	0.0	0.0
			TR	525	571	575	389				
		Six Forks Rd SEB	L	62	42	30	15	2.0	1.9	0.8	0.2
			T	1,079	1,022	1,102	955				



Legend for Figures 8-3A to 8-3C

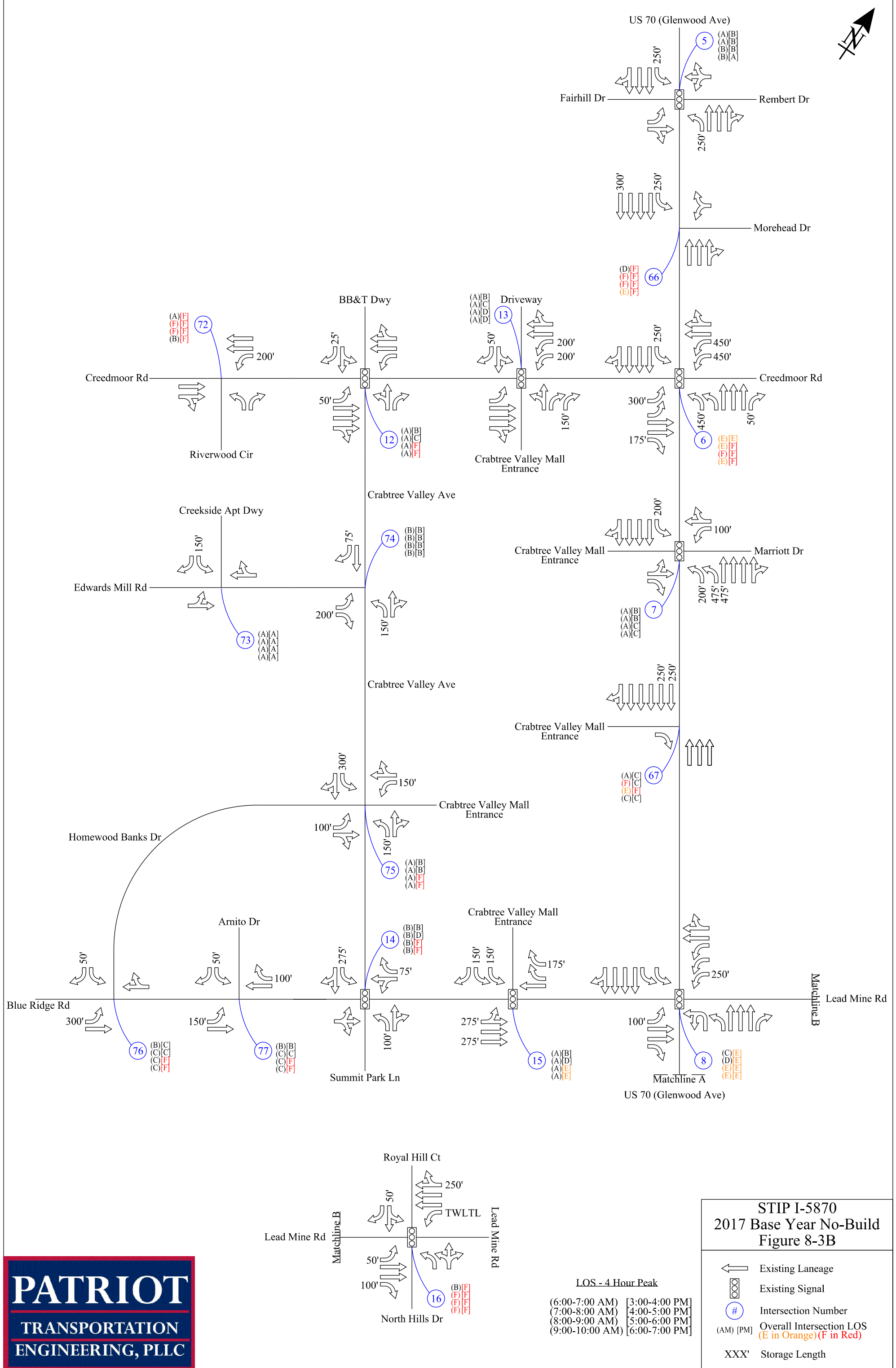


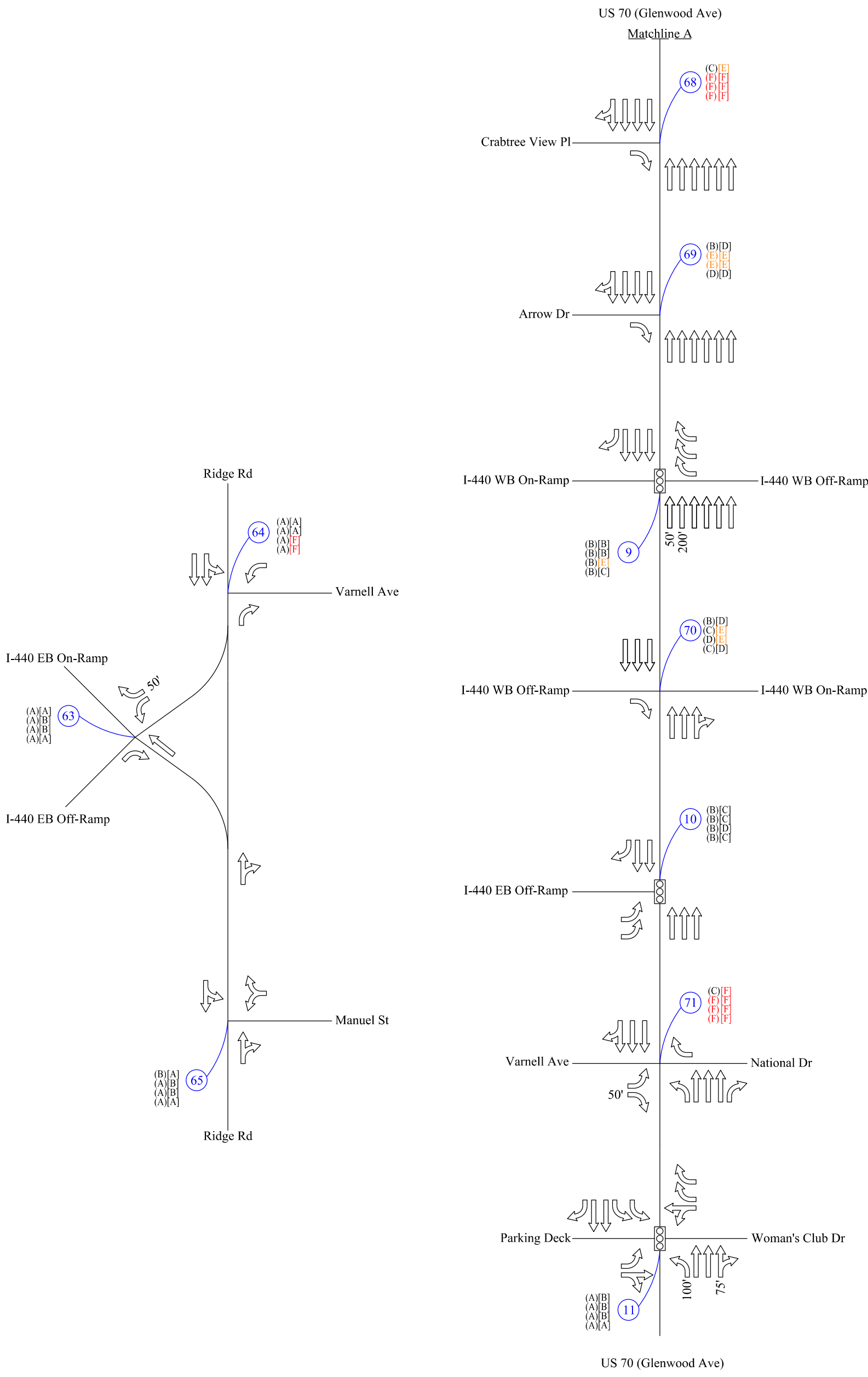
LOS - 4 Hour Peak

(6:00-7:00 AM)	[3:00-4:00 PM]
(7:00-8:00 AM)	[4:00-5:00 PM]
(8:00-9:00 AM)	[5:00-6:00 PM]
(9:00-10:00 AM)	[6:00-7:00 PM]

STIP I-5870
2017 Base Year No-Build
Figure 8-3A

- Existing Laneage
- Existing Signal
- Intersection Number
- Overall Intersection LOS
(AM) [PM] (E in Orange) (F in Red)
- XXX' Storage Length





LOS - 4 Hour Peak

(6:00-7:00 AM)	[3:00-4:00 PM]
(7:00-8:00 AM)	[4:00-5:00 PM]
(8:00-9:00 AM)	[5:00-6:00 PM]
(9:00-10:00 AM)	[6:00-7:00 PM]

STIP I-5870
2017 Base Year No-Build
Figure 8-3C

- Existing Laneage
- Existing Signal
- Intersection Number
- Overall Intersection LOS
(AM) [PM]
(E in Orange)(F in Red)
- XXX' Storage Length

9. 2021 DESIGN YEAR NO-BUILD ANALYSIS

Based on the requirements of the National Environmental Policy Act (NEPA), the Design Year No-Build alternative must be given full consideration and is often used as a means of comparison for the build alternatives. Therefore, the next step was to utilize the validated base model to determine how the transportation network within the study area will operate in the future.

9.1 MODEL PARAMETERS

All of the driver behaviors and parameters established while validating the base year model were reviewed and it was determined that they would be carried forward to the design year network, with the exception of the speed limit restrictions on I-440. Those speed limits were used in the base year to replicate downstream congestion that will be relieved with the construction of STIP project U-2719.

9.2 VOLUME DATA

The development of the volume data for the 2021 No-Build model was described in Section 6. The O-D matrices for the 2021 Future Year No-Build analysis included in Appendix D. The vehicle loading and matrix setting were identical to those used in the 2017 Base Year No-Build model.

9.3 DESIGN ASSUMPTIONS/MODEL NETWORK

The 2021 scenarios assume that all improvements in the Capital Area Metropolitan Planning Organization (CAMPO) *Metropolitan Transportation Plan (MTP)* 2025 horizon year adopted in February 2018 are included in the analysis. For the study area included in this analysis, the following projects were assumed to be completed.

- U-2719 – Widen I-440/US 1 from south of SR 1313 (Walnut Street) to north of SR 1728 (Wade Avenue)

The 2021 Design Year No-Build lane configurations are shown in Figure 9-3. STIP project U-2719 proposes to widen I-440 from just west of the Lake Boone Trail interchange and to construct an additional right-turn lane on the Lake Boone Trail westbound off-ramp. With the addition of the improvements from U-2719, the localized speed limits that were included in the base year model were removed, as this project is expected to resolve the congestion on the section of I-440 southwest of the project study area.

9.4 SIGNAL TIMINGS AND OPERATIONS

The 2021 No-Build model signal timings were based on the 2017 No-Build timings with the exception of the intersection of Lake Boone Trail and the I-440 westbound off ramp. STIP project U-2719 added a 600 foot right turn lane to the ramp. The simulated signal timing along the Lake Boone corridor still operates as well as it did in the 2017 simulation. However, with the additional right turn lane on the ramp, the use of max recall in the ramp did not seem to be needed; therefore, that phase was modified to be min recall in the design year.

9.5 VISUAL VALIDATION OF MODEL

Quality control was performed for the 2021 No-Build model to ensure it was developed in a manner consistent with the current guidelines and best practices being utilized for TransModeler. The model was then visually validated by observing the model animations in the same manner that was described in Section 5. Following the conclusion of the model review process it was determined that 2021 No-Build model was visually valid and ready for developing detailed MOEs.

9.6 MEASURES OF EFFECTIVENESS

The MOEs extracted for the 2021 No-Build scenario are identical to those utilized for the 2017 Base Year No-Build model and are discussed in detail in Section 4.

9.7 SIMULATION RUN CONTROL

The simulation model run controls for the future year no-build model were identical to those included in Section 8.6 for the 2017 Base Year No-Build model.

9.8 2021 DESIGN YEAR NO-BUILD MODEL RESULTS

The output data was extracted from the TransModeler model via the Output. The outputs were collected in accordance with the MOEs defined in Section 4 and are summarized in the following sections.

9.8.1 NETWORK RESULTS

Network-level MOEs were developed for Vehicle Hours Traveled (VHT), Vehicle Miles Traveled (VMT), Average Speed, and Total Delay. These statistics were calculated for every vehicle included in the peak hour of the simulation runs and are averaged over the ten runs performed for each scenario. For the VMT, VHT, and Total Delay, the average was calculated from completed trips, incomplete trips, queued vehicles, and loaded vehicles. The Average Speed was based only on vehicles that made completed trips. The network results the Design Year No-Build scenario are shown in Table 9-1.

Table 9-1: 2021 Design Year No-Build Network Wide Measures of Effectiveness

2021 Design Year No-Build	Time	VHT	VMT	Average Speed (mph)	Total Delay (hr)
AM	6:00-7:00	2,180.3	70,511.1	39.9	1,034.5
	7:00-8:00	6,990.5	102,338.9	27.2	5,287.6
	8:00-9:00	10,906.7	101,039.2	24.6	9,212.6
	9:00-10:00	2,504.1	46,809.1	41.7	1,695.5
PM	3:00-4:00	3,240.5	100,919.0	42.3	1,546.4
	4:00-5:00	3,512.2	102,855.1	39.7	1,779.1
	5:00-6:00	6,199.9	111,259.0	27.9	4,322.0
	6:00-7:00	4,042.8	82,737.1	36.3	2,728.2

Travel times and average speeds through the length of the network between the major entry and exit point of the network were extract and provided in Appendix I.

9.8.2 FREEWAY RESULTS

The results of the freeway analysis are included in Table 9-2. The 2021 Design Year No-Build scenario shows that during the AM peak period, all segments on I-440 eastbound are operating at LOS_s D or better and 12 segments operating at LOS_s F in the westbound direction for two hours with seven segments operating at LOS_s F for at least three hours. Included in those 12 failing segments, seven segments are operating at an unacceptable LOS_s E for at least one hour. The PM peak period shows five segments on I-440 eastbound operating at LOS_s F for one hour with one segment operating at LOS_s F for two hours and 12 segments operating at LOS_s F in the westbound direction for one hour with 11 segments operating at LOS_s F for two hours. There are 11 eastbound segments and nine westbound segments operating at an unacceptable LOS_s E for at least one hour.

Figure 9-1 and Figure 9-2 show the average speeds for each 15-minute period in each peak across the I-440 corridor. While the I-440/Wade Ave interchange improvements (U-2719) at the interchange of I-440 and Wade Avenue provide some congestion relief, there is still a slow down around Lake Boone Trail due to the section between Lake Boone Trail and Wade Ave behaving more like a weaving segment. The U-2719 designs changes the Lake Boone Trail on-ramp to be a lane add onto I-440 and shortens the distance between the gore points of the Lake Boone Trail and Wade Ave ramps.

In the AM peak period, I-440 eastbound is expected to operate well with little reduction in speed along the corridor. In the PM peak period, I-440 eastbound is expected to experience a considerable speed reduction starting at the Lake Boone Trail on-ramp and spills back into the Wade Ave interchange. This congestion starts around 5PM and continues for about one hour.

In the AM peak period, I-440 westbound speed is expected to decrease greatly starting around 6:45AM due to the friction of the entering and exiting volume at Glenwood Ave and Six Forks Rd. This congestion continues for two and a half hours and causes issues east of Six Forks Rd for the rest of the AM peak period. The congestion east of Glenwood Ave meters the traffic flowing to the downstream interchanges, allowing some intersections to appear to operate better than is really expected. In the PM peak period, I-440 westbound is expected to experience congestion that spills back past the Six Fork Rd interchange starting around Lake Boone Trail that starts around 4:45PM and lasts for about two hours.

Table 9-2: 2021 Design Year No-Build Freeway Measures of Effectiveness

Analysis ID	Analysis Segment	Type	AM Density				AM LOS ₅			
			6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00
1	I-440 EB - West of Lake Boone Trail Exit Ramp	Basic	11.7	21.8	21.3	15.3	B	C	C	B
2	I-440 EB - Lake Boone Trail Exit Ramp	Diverge	11.7	21.8	21.3	15.3	B	C	C	B
3	I-440 EB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	14.2	27.7	26.3	19.2	B	D	D	C
4	I-440 EB - Lake Boone Trail Entrance Ramp	Merge	11.9	24.7	23.8	19.3	B	C	C	B
5	I-440 EB - Lake Boone Trail to Ridge Road	Basic	15.0	30.3	29.3	22.6	B	D	D	C
6	I-440 EB - Ridge Rd Exit Ramp	Diverge	12.1	24.9	24.2	19.4	B	C	C	B
7	I-440 EB - Ridge Rd Exit Ramp to Ridge Rd Entrance Ramp	Basic	17.1	33.9	32.6	25.6	B	D	D	C
8	I-440 EB - Ridge Rd Entrance Ramp to Glenwood Ave Exit Ramp	Weaving	12.3	26.3	25.9	23.7	B	C	C	C
9	I-440 EB - Glenwood Ave Exit Ramp to Glenwood Ave Entrance Loop	Basic	15.4	30.2	30.3	25.3	B	D	D	C
10	I-440 EB - Glenwood Ave Entrance Loop	Merge	13.7	26.8	27.4	23.5	B	C	C	C
11	I-440 EB - Glenwood Ave Entrance Ramp to Six Forks Rd Exit Ramp	Basic	12.7	25.1	26.0	22.3	B	C	C	C
12	I-440 EB - Six Forks Rd Exit Ramp	Diverge	8.7	17.7	19.7	20.2	A	B	B	C
13	I-440 EB - Six Forks Exit Rd Loop	Diverge	14.5	28.6	29.7	30.0	B	D	D	D
14	I-440 EB - Six Forks Exit Rd Loop to Six Forks Rd Entrance Ramp	Basic	15.4	27.3	29.1	21.1	B	D	D	C
15	I-440 EB - Six Forks Rd Entrance Ramp	Merge	7.0	13.3	14.2	10.4	A	B	B	B
16	I-440 EB - East of Six Forks Rd Entrance Ramp	Basic	11.9	22.7	23.7	17.8	B	C	C	B
17	I-440 WB - East of Six Forks Rd Exit Ramp	Basic	49.4	106.4	96.4	79.1	F	F	F	F
18	I-440 WB - Six Forks Exit Rd Loop	Diverge	35.2	75.2	63.2	42.3	E	F	F	E
19	I-440 WB - Six Forks Rd Exit Loop to Six Forks Rd Entrance Ramp	Basic	44.8	95.4	77.6	52.3	E	F	F	F
20	I-440 WB - Six Forks Rd Entrance Ramp	Merge	26.3	55.4	45.9	32.8	C	F	F	D
21	I-440 WB - Six Forks Rd Entrance Ramp to Glenwood Ave Exit Ramp	Basic	41.0	81.7	71.3	47.7	E	F	F	F
22	I-440 WB - Glenwood Ave Exit Ramp to Glenwood Ave Entrance Loop	Basic	53.0	87.6	78.9	58.3	F	F	F	F
23	I-440 WB - Glenwood Ave Entrance Loop to Glenwood Ave/Ridge Rd Exit Ramp	Weaving	40.7	68.6	60.9	48.5	E	F	F	F
24	I-440 WB - Glenwood Ave/Ridge Rd Exit Ramp to Glenwood Entrance Ramp	Basic	53.2	88.0	78.7	49.1	F	F	F	F
25	I-440 WB - Glenwood Entrance Ramp	Merge	42.5	55.5	47.4	44.8	E	F	F	E
26	I-440 WB - Glenwood Ave Entrance Ramp to Lake Boone Trail Exit Ramp	Basic	46.3	56.3	49.5	51.6	F	F	F	F
27	I-440 WB - Lake Boone Trail Exit Ramp	Diverge	42.1	55.1	46.5	42.8	E	F	F	E
28	I-440 WB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	44.4	57.5	49.1	33.8	E	F	F	D
29	I-440 WB - Lake Boone Trail Entrance Ramp to Wade Ave Exit Ramp	Basic	23.0	28.8	29.1	26.6	C	D	D	D
30	I-440 WB - West of Wade Ave Exit Ramp	Basic	16.4	22.9	26.2	25.7	B	C	D	C
Analysis ID	Analysis Segment	Type	PM Density				PM LOS ₅			
			3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00	3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00
1	I-440 EB - West of Lake Boone Trail Exit Ramp	Basic	21.5	24.3	78.6	31.7	C	C	F	D
2	I-440 EB - Lake Boone Trail Exit Ramp	Diverge	21.5	24.3	78.6	31.7	C	C	F	D
3	I-440 EB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	28.8	36.2	74.1	46.0	D	E	F	F
4	I-440 EB - Lake Boone Trail Entrance Ramp	Merge	29.4	34.9	42.0	33.4	D	D	E	D
5	I-440 EB - Lake Boone Trail to Ridge Road	Basic	33.7	38.6	41.8	34.2	D	E	E	D
6	I-440 EB - Ridge Rd Exit Ramp	Diverge	29.5	34.4	40.6	32.5	D	D	E	D
7	I-440 EB - Ridge Rd Exit Ramp to Ridge Rd Entrance Ramp	Basic	37.2	44.2	49.3	42.1	E	E	F	E
8	I-440 EB - Ridge Rd Entrance Ramp to Glenwood Ave Exit Ramp	Weaving	28.9	35.5	38.0	32.9	D	E	E	D
9	I-440 EB - Glenwood Ave Exit Ramp to Glenwood Ave Entrance Loop	Basic	31.8	38.0	40.6	32.2	D	E	E	D
10	I-440 EB - Glenwood Ave Entrance Loop	Merge	28.8	32.9	35.3	28.9	D	D	E	D
11	I-440 EB - Glenwood Ave Entrance Ramp to Six Forks Rd Exit Ramp	Basic	28.2	33.2	36.1	28.5	D	D	E	D
12	I-440 EB - Six Forks Rd Exit Ramp	Diverge	21.0	24.4	26.7	20.8	C	C	C	C
13	I-440 EB - Six Forks Exit Rd Loop	Diverge	31.5	37.0	41.1	32.5	D	E	E	D
14	I-440 EB - Six Forks Exit Rd Loop to Six Forks Rd Entrance Ramp	Basic	32.8	40.3	46.1	33.4	D	E	F	D
15	I-440 EB - Six Forks Rd Entrance Ramp	Merge	17.9	21.9	24.3	17.0	B	C	C	B
16	I-440 EB - East of Six Forks Rd Entrance Ramp	Basic	26.6	31.4	33.5	26.7	D	D	D	D
17	I-440 WB - East of Six Forks Rd Exit Ramp	Basic	26.4	31.6	77.7	69.4	D	D	F	F
18	I-440 WB - Six Forks Exit Rd Loop	Diverge	27.5	31.5	52.0	48.1	C	D	F	F
19	I-440 WB - Six Forks Rd Exit Loop to Six Forks Rd Entrance Ramp	Basic	33.1	39.4	63.9	60.5	D	E	F	F
20	I-440 WB - Six Forks Rd Entrance Ramp	Merge	25.1	26.8	42.5	58.2	C	C	E	F
21	I-440 WB - Six Forks Rd Entrance Ramp to Glenwood Ave Exit Ramp	Basic	28.1	31.9	59.1	72.3	D	D	F	F
22	I-440 WB - Glenwood Ave Exit Ramp to Glenwood Ave Entrance Loop	Basic	37.1	43.5	69.4	62.0	E	E	F	F
23	I-440 WB - Glenwood Ave Entrance Loop to Glenwood Ave/Ridge Rd Exit Ramp	Weaving	29.9	36.9	54.8	48.2	D	E	F	F
24	I-440 WB - Glenwood Ave/Ridge Rd Exit Ramp to Glenwood Entrance Ramp	Basic	33.9	42.5	68.9	63.6	D	E	F	F
25	I-440 WB - Glenwood Entrance Ramp	Merge	30.7	37.9	54.1	49.9	D	E	F	F
26	I-440 WB - Glenwood Ave Entrance Ramp to Lake Boone Trail Exit Ramp	Basic	36.9	44.5	59.9	56.0	E	E	F	F
27	I-440 WB - Lake Boone Trail Exit Ramp	Diverge	31.3	38.1	53.9	48.8	D	E	F	F
28	I-440 WB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	38.6	47.1	58.1	51.6	E	F	F	F
29	I-440 WB - Lake Boone Trail Entrance Ramp to Wade Ave Exit Ramp	Basic	27.1	30.2	31.4	29.2	D	D	D	D
30	I-440 WB - West of Wade Ave Exit Ramp	Basic	22.6	27.4	28.5	27.9	C	D	D	D

Figure 9-1: 2021 Design Year No-Build Eastbound Freeway Speeds

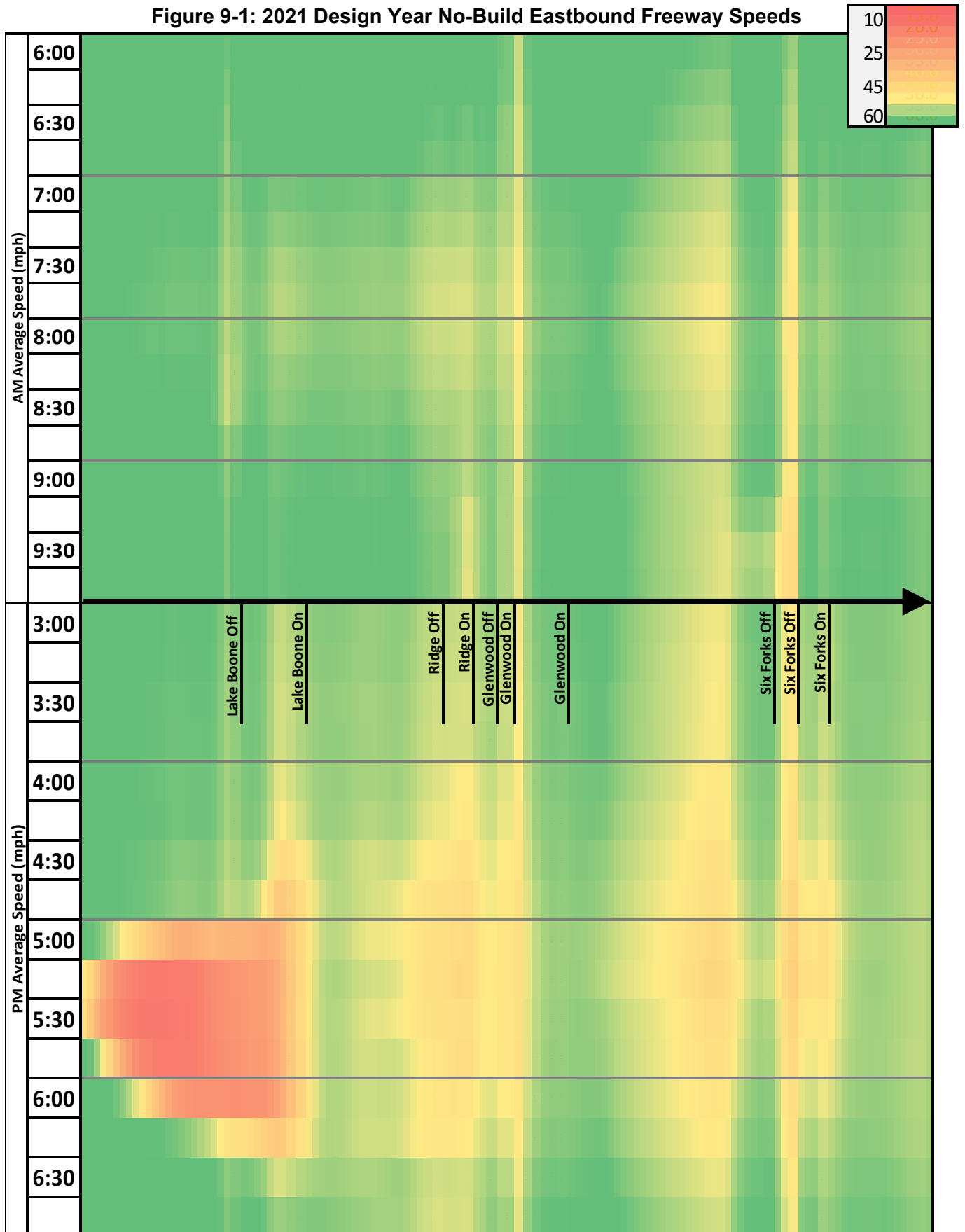
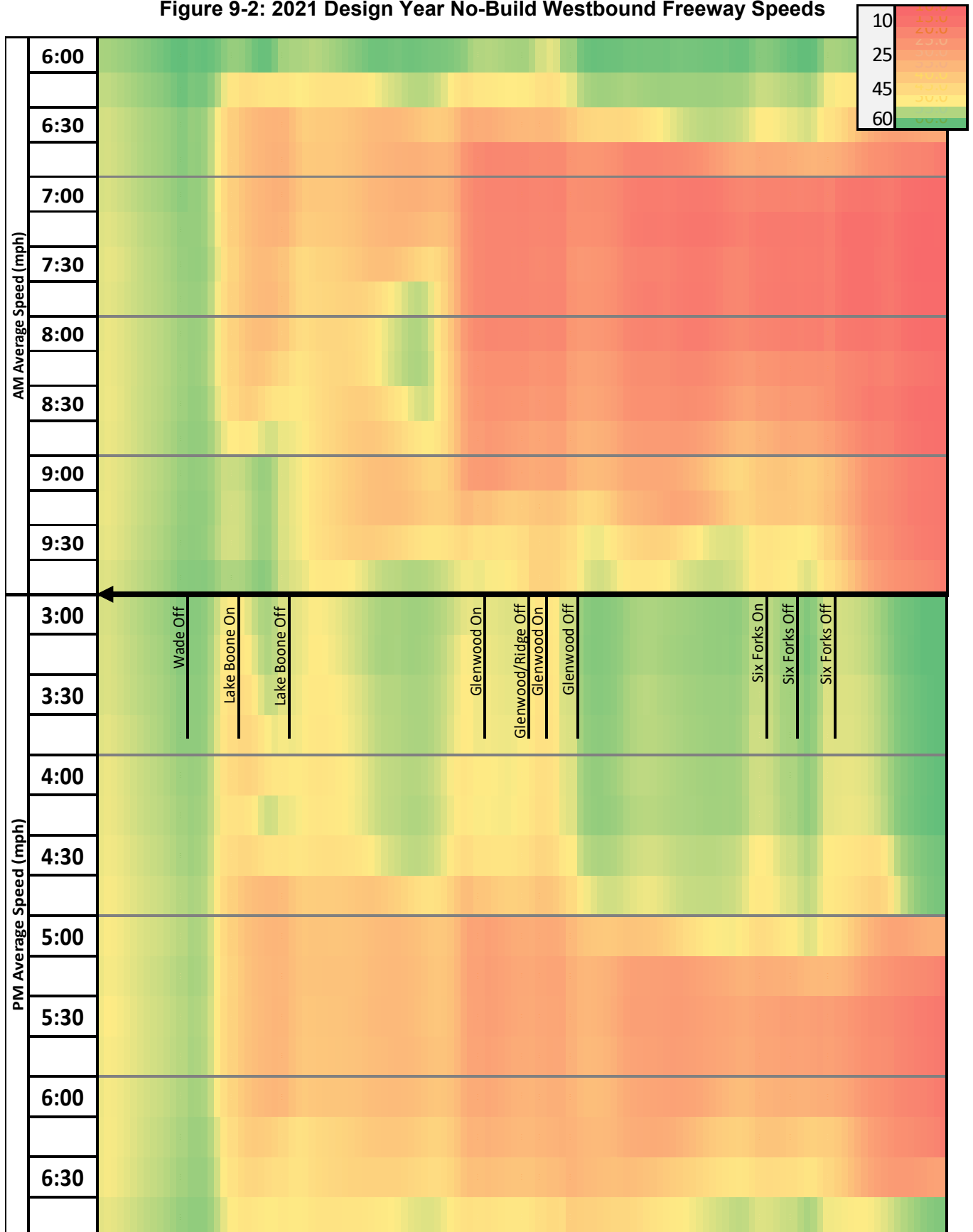


Figure 9-2: 2021 Design Year No-Build Westbound Freeway Speeds



9.8.3 ARTERIAL/INTERSECTION RESULTS

The results of the intersection analysis along the arterial portions of the study area are included in in Table 9-3 and Figure 9-3. It should be noted that the tables and figures include the results of the analysis for intersections along Lake Boone Trail and Six Forks Road; however, only the intersections in the I-5870 project study area will be summarized below.

The overall intersection LOS_s for the signalized intersections in the 2021 Design Year No-Build scenario shows that seven of the 12 project study area intersections are operating at LOS_s E or F in either the AM or PM peak period. These intersections are listed below and include the number of lane groups that are E or F.

AM peak hour

- Glenwood Ave at Creedmoor Rd operates at LOS_s E or F for four hours
 - 10 lane groups operate at LOS_s E or F
- Glenwood Ave at Blue Ridge Rd/Lead Mine Rd operates at LOS_s E one hour
 - 7 lane groups operate at LOS_s E or F
- Lead Mine Rd at North Hills Dr operates at LOS_s F for three hours
 - 7 lane groups operate at LOS_s E or F
- Blue Ridge Rd at Crabtree Valley Ave/Summit Park Ln operates at LOS_s E or F for three hours
 - 5 lane groups operate at LOS_s E or F
- Blue Ridge Rd at Crabtree Valley Mall Entrance
 - 4 lane groups operate at LOS_s E or F

PM peak hour

- Glenwood Ave at Creedmoor Rd operates at LOS_s F for four hours
 - 11 lane groups operate at LOS_s E or F
- Glenwood Ave at Blue Ridge Rd/Lead Mine Rd operates at LOS_s E or F for four hours
 - 10 lane groups operate at LOS_s E or F
- Glenwood Ave at I-440 WB off-ramp operates at LOS_s E for one hour
 - 2 lane groups operate at LOS_s E or F
- Creedmoor Rd at Crabtree Valley Ave/Bank Drwy operates at LOS_s F for three hours
 - 7 lane groups operate at LOS_s E or F
- Blue Ridge Rd at Crabtree Valley Ave/Summit Park Ln operates at LOS_s F for two hours
 - 7 lane groups operate at LOS_s E or F
- Blue Ridge Rd at Crabtree Valley Mall entrance operates at LOS_s F for two hours
 - 4 lane groups operate at LOS_s E or F
- Lead Mine Rd at North Hills Dr operates at LOS_s F for four hours
 - 7 lane groups operate at LOS_s E or F

The overall intersection LOS for signalized intersections in the 2021 Design Year No-Build scenario shows that multiple intersections are operating at LOS_s D or better in both the AM and PM peak periods; however, these locations have at least one lane group with a LOS_s E or F. These intersections are listed below and include the number of lane groups that are E or F.

AM peak hour

- Glenwood Ave at Fairhill Dr/Rembert Dr operates at a LOS_s A and B
 - 5 lane groups operate at LOS_s E or F for four hours

- Glenwood Ave at Marriot Dr/Crabtree Valley Mall Entrance operates at a LOS_s A
 - 5 lane groups operate at LOS_s E or F for at least three hours
- Glenwood Ave at Woman's Club Dr operates at LOS_s A
 - 6 lane groups operate at LOS_s E or F for at least one hour
- Creedmoor Rd at BB&T Driveway/Crabtree Valley Avenue operates at LOS_s A
 - 2 lane groups operate at LOS_s E or F for at least two hours
- Creedmoor Rd at Office Center Driveway/Crabtree Valley Mall Entrance operates at LOS_s A
 - 5 lane groups operate at LOS_s E or F for at least two hours

PM peak hour

- Glenwood Ave at Fairhill Dr/Rembert Dr operates at a LOS_s B
 - 5 lane groups operate at LOS_s E or F for four hours
- Glenwood Ave at Marriot Dr/Crabtree Valley Mall Entrance operates at a LOS_s B and D
 - 7 lane groups operate at LOS_s E or F for four hours
- Glenwood Ave at I-440 EB off-ramp operates at a LOS_s C and D
 - 1 lane group operates at LOS_s F for one hour
- Glenwood Ave at Woman's Club Dr operates at LOS_s A and B
 - 6 lane groups operate at LOS_s E or F for at least two hours
- Creedmoor Rd at Office Center Driveway/Crabtree Valley Mall Entrance operates at LOS_s B and D
 - 7 lane groups operate at LOS_s E or F for at least two hours

Based on a review of the unsignalized intersections, there are 12 intersections that have at least one movement that operates at LOS_s E or F in either of the peak periods. These intersections are listed below and include the movements that operates at E or F.

AM peak hour

- Glenwood Ave at Morehead Dr
 - Westbound left-turn operates at LOS_s E or F for three hours
 - Southbound left-turn operates at LOS_s E for two hours
- Glenwood Ave at Crabtree Valley Mall Entrance
 - Westbound right-turn operates at LOS_s F for two hours
- Glenwood Ave at Crabtree View Place
 - Westbound right-turn operates at LOS_s F for three hours
- Glenwood Ave at Arrow Dr
 - Westbound right-turn operates at LOS_s E or F for three hours
- Glenwood Ave at I-440 WB Off-Loop
 - Eastbound right-turn/right-turn operates at LOS_s F for one hour
- Creedmoor Rd at Riverwood Circle
 - Northbound left-turn operates at LOS_s F for two hours
- Blue Ridge Rd at Homewood Banks Dr
 - Southbound left-turn operates at LOS_s F for one hour
- Blue Ridge Rd at Arinto Dr
 - Eastbound left-turn operates at LOS_s F for one hour

PM peak hour

- Glenwood Ave at Morehead Dr
 - Westbound left-turn/right-turn operates at LOS_s F for four hours
 - Southbound left-turn operates at LOS_s E or F for four hours
- Glenwood Ave at Crabtree Valley Mall Entrance
 - Westbound right-turn operates at LOS_s F for two hours
- Glenwood Ave at Crabtree View Place
 - Westbound right-turn operates at LOS_s F for four hours
- Glenwood Ave at Arrow Dr
 - Westbound right-turn operates at LOS_s E for three hours
- Glenwood Ave at I-440 WB Off-Loop
 - Eastbound right-turn/right-turn operates at LOS_s E for two hours
- Glenwood Ave at Varnell Ave/National Dr
 - Westbound right-turn operates at LOS_s E for one hour
- Creedmoor Rd at Riverwood Circle
 - Northbound left-turn operates at LOS_s F for two hours
- Edwards Mill Rd at Apt Drwy/Mall Entrance
 - Southbound left-turn operates at LOS_s F for two hours
 - Southbound right-turn operates at LOS_s F for two hours
 - Eastbound left-turn/through operates at LOS_s F for two hours
- Crabtree Valley Ave at Edwards Mill Rd
 - Northbound right-turn operates at LOS_s F for two hours
- Crabtree Valley Ave at Homewood Banks Dr/Crabtree Valley Mall Entrance
 - Westbound left-turn operates at LOS_s F for two hours
 - Westbound through/right-turn operates at LOS_s F for two hours
 - Eastbound left-turn operates at LOS_s F for two hours
 - Eastbound through/right-turn operates at LOS_s F for two hours
 - Southbound left-turn operates at LOS_s E for two hours
 - Southbound through/right-turn operates at LOS_s F for two hours
- Blue Ridge Rd at Homewood Banks Dr/Crabtree Valley Mall Entrance
 - Southbound left-turn operates at LOS_s F for two hours
 - Eastbound left-turn operates at LOS_s F for two hours
 - Eastbound though operates at LOS_s F for two hours
- Blue Ridge Rd at Arinto Dr
 - Eastbound left-turn operates at LOS_s F for two hours
 - Eastbound through operates at LOS_s F for two hours
 - Southbound left-turn operates at LOS_s F for two hours
 - Southbound right-turn operates at LOS_s F four one hour

Table 9-3: 2021 Design Year No-Build Intersection Measures of Effectiveness

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
1	Lake Boone Trail & Wycliff Rd	Overall		17.3	19.6	22.1	19.1	B	B	C	B
		Wycliff Rd SB	L	55.7	57.6	63.5	64.1	E	E	E	E
			R	38.6	39.7	40.2	38.2	D	D	D	D
		Lake Boone Trail WB	T	9.6	12.5	14.5	12.3	A	B	B	B
			R	4.2	6.7	8.4	6.8	A	A	A	A
		Lake Boone Trail EB	L	9.7	14.1	23.4	14.1	A	B	C	B
T	4.6		4.6	4.7	4.7	A	A	A	A		
2	Lake Boone Trail & I-440 WB Ramps	Overall		24.7	20.6	20.3	24.6	C	C	C	C
		I-440 WB Off-Ramp SB	LT	54.4	52.0	51.0	47.6	D	D	D	D
			R	47.5	47.3	47.9	43.9	D	D	D	D
		Lake Boone Trail WB	L	18.3	20.5	24.5	27.4	B	C	C	C
			T	11.5	11.0	12.5	15.1	B	B	B	B
		Lake Boone Trail EB	T	8.7	11.4	12.5	18.8	A	B	B	B
R	9.7		10.3	11.2	16.1	A	B	B	B		
3	Lake Boone Trail & Ridge Rd	Overall		12.2	16.8	16.4	14.9	B	B	B	B
		Ridge Rd SB	L	27.4	22.0	27.8	23.9	C	C	C	C
			TR	22.8	19.2	18.9	20.7	C	B	B	C
		Lake Boone WB	L	10.2	18.9	16.9	14.7	B	B	B	B
			T	3.8	9.3	9.5	7.7	A	A	A	A
		Ridge Rd NB	TR	4.2	9.1	9.0	7.0	A	A	A	A
			L	38.0	86.3	77.8	59.5	D	F	E	E
		Lake Boone Trail EB	TR	23.0	14.7	15.9	16.3	C	B	B	B
			L	10.7	21.1	24.0	18.6	B	C	C	B
4	Ridge Rd & Glen Eden Dr	Lake Boone Trail EB	T	6.9	14.0	13.8	13.2	A	B	B	B
			TR	5.0	10.2	10.1	8.1	A	B	B	A
		Overall		20.5	23.6	25.3	21.1	C	C	C	C
		Ridge Rd SB	L	10.2	20.0	20.2	16.1	B	B	C	B
			TR	6.2	11.5	13.9	11.5	A	B	B	B
		Glen Eden Dr WB	L	50.4	44.8	52.8	41.2	D	D	D	D
			TR	41.6	37.1	41.7	34.6	D	D	D	C
		Ridge Rd NB	L	9.4	22.3	22.7	19.8	A	C	C	B
			TR	7.3	10.7	12.0	10.7	A	B	B	B
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Glen Eden Dr EB	L	58.3	47.1	54.1	48.1	E	D	D	D
			TR	32.2	23.6	22.5	25.3	C	C	C	C
		Overall		5.6	9.7	12.5	10.4	A	A	B	B
		Rembert Dr SWB	LTR	94.8	79.4	79.4	79.0	F	E	E	E
			L	94.9	89.6	87.7	88.1	F	F	F	F
		Glenwood Ave NWB	T	3.0	6.3	7.9	6.4	A	A	A	A
			TR	2.8	6.8	8.2	6.3	A	A	A	A
		Fairhill Dr NEB	L	92.8	79.8	91.6	93.4	F	E	F	F
			TR	86.7	80.2	82.1	82.6	F	F	F	F
6	Glenwood Ave & Creedmoor Rd	Glenwood Ave SEB	L	124.5	107.4	109.3	116.3	F	F	F	F
			T	2.4	5.8	7.8	5.3	A	A	A	A
		TR	3.2	6.5	8.5	6.2	A	A	A	A	
		Overall		64.2	88.3	142.9	76.9	E	F	F	E
		Creedmoor Rd SWB	L	85.7	142.7	172.9	85.1	F	F	F	F
			T	77.7	101.0	135.7	72.0	E	F	F	E
		Glenwood WB	TR	71.2	96.6	129.1	70.9	E	F	F	E
			L	87.5	86.4	78.6	72.8	F	F	E	E
		Creedmoor Rd NEB	T	71.2	85.0	93.6	89.3	E	F	F	F
L	77.4		87.6	86.0	74.5	E	F	F	E		
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Glenwood Ave EB	T	68.0	63.9	62.7	65.4	E	E	E	E
			R	49.3	52.6	54.7	53.4	D	D	D	D
		Marriott Dr SWB	L	106.1	115.9	241.4	101.6	F	F	F	F
			TR	42.3	71.7	210.0	70.8	D	E	F	E
		Overall		2.4	3.1	3.9	3.9	A	A	A	A
		Crabtree Valley Mall Entrance NEB	L	93.3	83.3	83.8	86.6	F	F	F	F
			TR	--	--	--	--	--	--	--	--
		Glenwood Ave NWB	L	104.0	98.5	77.1	62.6	F	F	E	E
			T	0.5	1.4	1.6	1.4	A	A	A	A
Glenwood Ave SEB	TR	0.7	0.9	1.3	1.4	A	A	A	A		
	LT	--	141.2	108.3	95.8	--	F	F	F		
	R	98.6	95.5	85.4	79.6	F	F	F	E		

Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²					
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM		
8	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd	Overall		30.3	46.7	52.7	66.6	C	D	D	E		
		Overall		11.8	9.7	10.5	13.4	B	A	B	B		
		9	Genwood Ave & I-440 WB Off-Ramp	I-440 WB Off-Ramp	T	26.1	25.7	24.8	27.3	C	C	C	C
				Glenwood Ave NWB	T	17.5	17.5	20.2	24.1	B	B	C	C
				Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
				Overall		15.9	16.8	19.0	18.4	B	B	B	B
		10	Genwood Ave & I-440 EB Off-Ramp	Glenwood Ave NWB	T	5.8	7.6	7.8	7.4	A	A	A	A
				I-440 EB Off-Ramp	L	43.4	42.8	43.0	43.2	D	D	D	D
				Glenwood Ave SEB	T	11.4	14.9	17.9	17.5	B	B	B	B
				Overall		5.0	7.3	9.8	10.1	A	A	A	B
		11	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	L	60.9	54.8	52.4	53.2	E	D	D	D
					T	0.3	2.5	4.1	3.6	A	A	A	A
					R	0.0	2.5	4.4	3.6	A	A	A	A
				Womans Club Dr WB	LT	116.8	84.6	73.2	72.4	F	F	E	E
R	82.4				46.8	54.1	50.8	F	D	D	D		
Glenwood Ave NB	L			--	89.0	82.9	84.6	--	F	F	F		
	T			2.6	5.7	9.4	8.3	A	A	A	A		
	TR			2.7	6.7	9.3	8.7	A	A	A	A		
Parking Deck EB	L			--	97.9	83.9	71.0	--	F	F	E		
	TR			--	123.9	103.8	104.9	--	F	F	F		
	Overall				3.1	4.0	3.6	5.2	A	A	A	A	
12	Creedmoor Rd & Crabtree Valley Ave / Bank Drwy			Creedmoor Rd SWB	L	0.7	1.9	2.2	2.3	A	A	A	A
		T	1.2		1.3	1.2	1.1	A	A	A	A		
		TR	0.9		1.3	1.1	1.1	A	A	A	A		
		Crabtree Valley Ave NWB	LT	92.0	54.4	62.2	67.5	F	D	E	E		
			R	67.1	57.7	51.7	54.4	E	E	D	D		
		Creedmoor Rd NEB	L	--	--	--	--	--	--	--	--		
			T	1.4	3.6	3.8	4.4	A	A	A	A		
			TR	2.0	4.8	4.9	5.6	A	A	A	A		
		Bank Drwy SEB	LT	--	--	110.0	61.1	--	--	F	E		
			R	--	--	104.6	92.1	--	--	F	F		
			Overall		4.9	4.2	8.2	8.2	A	A	A	A	
		13	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	L	67.3	65.0	51.4	58.5	E	E	D	E
T	0.5				1.7	5.4	1.0	A	A	A	A		
TR	0.4				1.8	5.5	1.2	A	A	A	A		
Crabtree Valley Mall Entrance NWB	LT			60.3	56.4	53.4	46.8	E	E	D	D		
	R			37.2	39.0	39.5	29.6	D	D	D	C		
Creedmoor Rd NEB	L			--	81.6	67.7	78.3	--	F	E	E		
	T			3.9	4.3	7.4	7.6	A	A	A	A		
	TR			4.1	6.2	10.8	9.9	A	A	B	A		
Office Drwy SEB	LT			--	--	80.5	89.6	--	--	F	F		
	R			--	77.6	72.6	85.2	--	E	E	F		
	Overall				13.4	67.7	112.9	141.2	B	E	F	F	
14	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln			Blue Ridge Rd SWB	LT	5.8	16.7	21.2	19.6	A	B	C	B
					R	6.0	19.6	19.7	17.0	A	B	B	B
				Summit Park Ln NWB	L	55.5	111.3	98.2	35.1	E	F	F	D
		TR	53.3		210.0	202.5	198.5	D	F	F	F		
		Blue Ridge Rd NEB	LTR	5.4	147.6	319.5	334.5	A	F	F	F		
			L	51.4	58.5	128.7	304.3	D	E	F	F		
		Crabtree Valley Ave SEB	TR	65.2	41.7	37.0	195.1	E	D	D	F		
			Overall		2.3	5.8	49.7	58.9	A	A	D	E	
15	Crabtree Valley Mall Entrance & Blue Ridge Rd	Blue Ridge Rd SB	T	1.5	3.7	6.2	12.6	A	A	A	B		
			R	0.0	0.0	0.0	0.2	A	A	A	A		
		Blue Ridge Rd NB	LT	0.6	6.2	47.5	59.1	A	A	D	E		
			T	0.7	12.6	179.2	227.9	A	B	F	F		
		Crabtree Valley Mall Entrance EB	L	71.1	55.7	82.5	74.3	E	E	F	E		
			R	--	71.8	54.6	60.3	--	E	D	E		
			Overall		15.0	164.9	206.5	214.6	B	F	F	F	
			L	12.3	138.9	204.4	210.8	B	F	F	F		
16	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	T	11.7	172.2	235.1	246.0	B	F	F	F		
			TR	18.1	177.1	222.3	198.3	B	F	F	F		
			L	46.6	606.4	856.3	991.5	D	F	F	F		
		North Hills Dr WB	LTR	44.1	400.6	532.7	532.1	D	F	F	F		
			L	20.2	34.6	35.0	35.1	C	C	D	D		
		Lead Mine Rd NB	T	8.1	13.8	11.6	11.2	A	B	B	B		
			R	1.4	2.1	2.5	2.0	A	A	A	A		
		North Hills Dr EB	LT	--	108.5	97.0	81.7	--	F	F	F		
			R	69.4	93.0	104.0	101.4	E	F	F	F		
			Overall		15.0	164.9	206.5	214.6	B	F	F	F	

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
17	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	Overall	21.3	43.6	82.2	46.5	C	D	F	D
			L	71.3	235.6	284.1	258.2	E	F	F	F
			T	85.6	123.0	165.3	131.7	F	F	F	F
			R	72.6	128.7	161.8	134.9	E	F	F	F
		Six Forks Rd NWB	L	57.6	83.4	82.3	76.3	E	F	F	E
			T	5.8	10.9	11.1	11.3	A	B	B	B
			R	3.6	5.3	4.8	5.4	A	A	A	A
			L	90.3	85.2	83.2	80.3	F	F	F	F
		Main Street NEB	TR	76.8	83.8	86.6	67.6	E	F	F	E
			L	83.3	76.7	206.4	73.8	F	E	F	E
			T	15.8	38.2	95.7	24.9	B	D	F	C
			TR	18.7	46.8	76.1	28.0	B	D	E	C
18	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	Overall	12.9	19.2	19.8	15.4	B	B	B	B
			L	73.8	63.2	62.1	64.4	E	E	E	E
			T	69.6	64.3	62.9	65.5	E	E	E	E
			R	66.9	54.0	47.5	53.6	E	D	D	D
		Six Forks Rd NWB	L	70.4	93.1	80.3	70.3	E	F	F	E
			T	7.0	6.8	6.8	8.9	A	A	A	A
			R	2.1	3.3	3.5	4.6	A	A	A	A
			R	6.6	11.7	14.9	13.1	A	B	B	B
		I-440 WB Off Loop	L	78.7	49.1	54.5	48.7	E	D	D	D
			T	6.4	11.3	15.0	9.3	A	B	B	A
			R	6.6	24.8	24.0	13.5	A	C	C	B
			Six Forks Rd SEB	Overall	14.5	18.6	14.4	4.8	B	B	B
I-440 WB Off-Ramp	T	64.8		60.3	71.5	72.6	E	E	E	E	
Six Forks Rd NWB	T	3.1		17.2	14.6	4.6	A	B	B	A	
Six Forks SEB	T	0.0		0.0	0.0	0.0	A	A	A	A	
20	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	Overall	24.4	31.6	30.8	26.4	C	C	C	C
			L	106.0	81.3	81.4	79.5	F	F	F	E
			T	9.3	21.1	22.9	19.9	A	C	C	B
			TR	9.3	21.3	23.2	19.4	A	C	C	B
		Ramblewood Dr NEB	L	73.4	100.4	96.1	72.0	E	F	F	E
			T	72.2	97.6	95.4	78.7	E	F	F	E
			R	59.9	88.8	84.7	67.1	E	F	F	E
			L	63.7	61.8	64.0	64.8	E	E	E	E
		Six Forks Rd SEB	T	11.5	15.8	17.1	14.3	B	B	B	B
			TR	7.8	13.9	14.1	13.0	A	B	B	B
			Overall	19.1	28.9	19.4	14.0	B	C	B	B
			21	Six Forks Rd & Barrett Dr	Six Forks Rd SB	L	751.8	1025.6	245.5	119.9	F
T	3.0	15.8				14.2	6.8	A	B	B	A
Barrett Dr WB	L	141.6			102.8	87.7	85.9	F	F	F	F
	R	155.9			135.0	83.6	75.8	F	F	F	E
Six Forks Rd NB	T	0.8			3.5	6.7	7.7	A	A	A	A
	TR	0.7			3.6	6.6	7.5	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
61	Lake Boone Trail, Shopping Center Drwy & Myron Dr	Shopping Center Drwy SB	R	11.5	15.3	19.6	16.9	B	C	C	C
		Lake Boone Trail WB	L	5.5	12.9	13.7	13.7	A	B	B	B
			T	0.1	0.3	1.0	0.5	A	A	A	A
			TR	0.0	0.2	0.7	0.3	A	A	A	A
		Myron Dr NB	R	9.4	10.8	13.4	13.6	A	B	B	B
		Lake Boone Trail EB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
			L	14.3	36.1	167.8	39.2	B	E	F	E
62	Lake Boone Trail & I-440 EB Ramps	I-440 EB Off-Loop	R	8.7	17.0	145.1	13.1	A	C	F	B
		L	4.7	7.4	7.8	7.5	A	A	A	A	
63	Ridge Rd & I-440 EB Ramps	I-440 WB Off-Ramp/Ridge Rd	T	0.0	0.0	0.0	0.0	A	A	A	A
		Ridge Rd NB	T	--	0.0	0.0	0.0	--	A	A	A
			LT	0.0	0.0	0.0	24.3	A	A	A	C
64	Ridge Rd & Varnell Ave	I-440 WB Off-Ramp/Ridge Rd	T	0.0	0.0	0.0	33.6	A	A	A	D
		Varnell Ave WB	L	8.2	7.3	9.0	42.0	A	A	A	E
			NB	R	--	--	0.0	0.0	--	--	A
65	Ridge Rd & Manuel St	Ridge Rd SB	LT	0.0	0.1	0.2	0.1	A	A	A	A
		Manuel St WB	LR	7.7	7.5	8.7	7.7	A	A	A	A
		Ridge Rd NB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			LR	30.8	54.9	82.5	48.4	D	F	F	E
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	TR	0.0	0.0	0.0	0.0	A	A	A	A
		Glenwood Ave NWB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			L	36.2	--	49.2	30.8	E	--	E	D
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			L	36.2	--	49.2	30.8	E	--	E	D

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
67	Glenwood Ave & Crabtree Valley Mall Entrance	Glenwood Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
		Crabtree Valley Mall Entrance NEB	R	20.4	51.2	90.2	24.5	C	F	F	C
		Glenwood Ave SEB	T	0.0	0.6	0.3	0.1	A	A	A	A
			TR	0.0	0.6	0.3	0.0	A	A	A	A
68	Glenwood Ave & Crabtree View Place	Glenwood Ave NWB	T	0.2	1.5	3.3	6.9	A	A	A	A
		Crabtree View Place NEB	R	23.9	451.8	398.8	179.5	C	F	F	F
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
69	Glenwood Ave & Arrow Dr	Glenwood Ave NWB	T	0.0	0.1	0.1	0.3	A	A	A	A
		Arrow Dr NEB	R	17.3	48.8	66.0	35.7	C	E	F	E
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
70	Glenwood Ave & I-440 WB Off-Loop	I-440 WB Off-Loop EB	T	16.4	25.3	32.1	61.7	C	D	D	F
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
71	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	0.1	0.7	1.0	0.5	A	A	A	A
			TR	0.0	0.0	0.0	0.3	A	A	A	A
		National Dr WB	R	6.9	9.6	12.2	9.2	A	A	B	A
			L	11.6	21.5	29.1	21.9	B	C	D	C
		Glenwood Ave NB	T	0.0	0.0	0.1	0.0	A	A	A	A
			R	--	0.0	0.0	0.0	--	A	A	A
		Varnell Ave EB	LR	26.6	168.9	183.8	92.4	D	F	F	F
			L	--	8.1	9.2	8.6	--	A	A	A
72	Creedmoor Rd & Riverwood Cir	Creedmoor Rd SWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			L	30.9	63.0	53.0	--	D	F	F	--
		Riverwood Cir NWB	R	6.9	12.7	10.9	9.8	A	B	B	A
			L	6.3	6.3	6.8	7.4	A	A	A	A
73	Edwards Mill Rd & Apartment Drwy/Mall Entrance	Apt Drwy/ Mall Entrance SB	R	7.6	8.8	6.2	6.6	A	A	A	A
		Edwards Mill Rd WB	TR	0.0	0.0	0.0	0.0	A	A	A	A
		Edwards Mill Rd EB	LT	0.1	0.2	0.2	0.4	A	A	A	A
			L	0.1	0.5	0.3	0.6	A	A	A	A
74	Crabtree Valley Ave & Edwards Mill Rd	Crabtree Valley Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			L	12.4	13.6	13.5	12.7	B	B	B	B
		Edwards Mill Rd NEB	R	11.2	11.4	11.3	11.6	B	B	B	B
		Crabtree Valley Ave SEB	TR	0.0	0.0	0.0	0.0	A	A	A	A
75	Crabtree Valley Ave, Homewood Banks Dr & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance SWB	L	4.4	5.8	6.3	5.7	A	A	A	A
			TR	4.2	5.6	5.9	5.8	A	A	A	A
		Crabtree Valley Ave NWB	L	--	--	--	--	--	--	--	--
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Homewood Banks Dr NEB	L	6.7	8.0	9.3	9.4	A	A	A	A
			TR	8.3	8.1	8.7	8.1	A	A	A	A
		Crabtree Valley Ave SEB	L	0.9	1.3	2.2	1.6	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
76	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks Dr SB	L	13.5	21.6	19.1	61.0	B	C	C	F
		Blue Ridge Rd WB	T	0.0	0.0	0.0	0.0	A	A	A	A
		Blue Ridge Rd EB	L	5.8	12.7	8.3	6.8	A	B	A	A
			T	0.0	0.2	0.2	0.2	A	A	A	A
77	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd SWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			R	--	0.0	0.0	0.0	--	A	A	A
		Blue Ridge Rd NEB	L	--	--	--	--	--	--	--	--
			T	0.0	0.0	0.0	0.0	A	A	A	A
78	Browning & Six Forks Rd	Arinto Dr SEB	L	8.5	18.3	33.3	94.3	A	C	D	F
			R	--	--	--	--	--	--	--	--
		Browning SWB	L	9.6	36.2	61.1	43.4	A	E	F	E
			R	6.1	9.8	9.7	9.6	A	A	A	A
		Six Forks Rd NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Six Forks Rd SEB	L	3.5	10.7	13.1	11.7	A	B	B	B
			T	0.1	0.9	1.6	1.1	A	A	A	A

Notes:

- 1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations
- 2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies
- 3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
			3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	Overall	29.9	91.8	174.0	73.1	C	F	F	E
			L	47.5	177.9	325.1	97.6	D	F	F	F
		Lake Boone Trail WB	R	20.1	67.7	171.2	43.4	C	E	F	D
			T	26.1	24.5	23.5	26.6	C	C	C	C
		Lake Boone Trail EB	R	11.8	10.4	8.9	11.6	B	B	A	B
			L	33.8	104.2	231.8	113.8	C	F	F	F
2	Lake Boone Trail & I-440 WB Ramps	I-440 WB Off-Ramp SB	T	30.0	112.3	217.5	103.2	C	F	F	F
			Overall	33.5	45.0	48.9	33.3	C	D	D	C
		Lake Boone Trail WB	LT	47.2	51.6	53.9	49.9	D	D	D	D
			R	44.7	44.4	44.9	43.8	D	D	D	D
		Lake Boone Trail EB	L	33.1	38.8	37.8	39.0	C	D	D	D
			T	6.2	6.0	6.7	6.3	A	A	A	A
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	T	50.3	72.0	79.5	44.1	D	E	E	D
			R	20.5	28.6	37.6	23.6	C	C	D	C
		Lake Boone WB	Overall	13.4	15.2	23.0	12.5	B	B	C	B
			L	35.7	34.0	32.7	28.0	D	C	C	C
		Ridge Rd NB	TR	18.9	19.6	21.5	20.0	B	B	C	B
			L	16.4	21.4	34.1	15.3	B	C	C	B
4	Ridge Rd & Glen Eden Dr	Glen Eden Dr WB	T	6.9	8.3	15.1	6.2	A	A	B	A
			TR	7.2	8.8	14.7	6.3	A	A	B	A
		Ridge Rd NB	L	34.4	54.7	69.5	36.7	C	D	E	D
			TR	18.8	16.7	12.1	19.4	B	B	B	B
		Lake Boone Trail EB	L	14.5	18.9	92.7	12.4	B	B	F	B
			T	11.1	13.6	24.1	11.7	B	B	C	B
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Ridge Rd SB	T	7.5	10.0	20.8	7.4	A	A	C	A
			Overall	22.5	33.7	87.9	82.0	C	C	F	F
		Glen Eden Dr WB	L	19.4	27.8	35.5	18.6	B	C	D	B
			TR	12.0	16.3	19.9	16.1	B	B	B	B
		Ridge Rd NB	L	42.7	94.0	571.9	228.6	D	F	F	F
			TR	36.4	50.6	394.8	204.0	D	D	F	F
6	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	L	18.0	27.7	43.4	26.9	B	C	D	C
			TR	11.9	14.8	18.6	14.3	B	B	B	B
		Glenwood WB	L	40.0	66.6	84.7	43.7	D	E	F	D
			TR	22.8	32.0	47.1	21.0	C	C	D	C
		Creedmoor Rd NEB	Overall	10.9	13.1	15.3	10.7	B	B	B	B
			LTR	85.5	86.9	86.8	88.9	F	F	F	F
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Marriott Dr SWB	L	107.2	112.3	111.5	111.1	F	F	F	F
			T	7.2	10.0	14.4	9.0	A	B	B	A
		Glenwood Ave NWB	TR	8.5	11.6	15.3	10.5	A	B	B	B
			L	95.0	110.4	107.0	94.6	F	F	F	F
		Crabtree Valley Mall Entrance NEB	TR	88.4	85.4	90.4	96.8	F	F	F	F
			L	99.3	105.4	91.6	113.7	F	F	F	F
8	Glenwood Ave & Fairhill Dr / Rembert Dr	Fairhill Dr NEB	T	5.3	6.2	6.9	4.8	A	A	A	A
			TR	5.8	6.8	7.7	5.3	A	A	A	A
		Glenwood Ave SEB	Overall	95.3	112.5	135.9	130.0	F	F	F	F
			L	349.9	461.4	560.9	542.2	F	F	F	F
		Glenwood Ave EB	T	98.2	144.3	217.2	188.5	F	F	F	F
			TR	93.9	127.3	199.1	180.4	F	F	F	F
9	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	L	114.6	115.3	114.4	114.7	F	F	F	F
			T	49.3	58.9	98.4	65.6	D	E	F	E
		Glenwood WB	L	126.9	131.4	134.3	135.0	F	F	F	F
			T	88.5	125.9	129.7	129.9	F	F	F	F
		Creedmoor Rd NEB	R	67.7	100.1	100.7	106.5	E	F	F	F
			L	162.2	193.2	198.1	205.1	F	F	F	F
10	Glenwood Ave & Fairhill Dr / Rembert Dr	Fairhill Dr NEB	T	56.7	65.3	74.5	93.2	E	E	E	F
			TR	68.8	76.0	85.5	116.7	E	E	F	F
		Glenwood Ave NWB	Overall	15.1	14.5	39.0	45.1	B	B	D	D
			L	110.4	106.4	117.3	114.0	F	F	F	F
		Marriott Dr SWB	TR	116.5	120.7	179.4	121.2	F	F	F	F
			L	110.3	107.4	90.0	108.8	F	F	F	F
11	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NEB	T	0.6	1.0	26.2	11.8	A	A	C	B
			TR	1.7	1.8	46.3	15.5	A	A	D	B
		Glenwood Ave SEB	LT	105.5	108.4	395.4	214.9	F	F	F	F
			R	64.5	63.6	57.7	122.9	E	E	E	F
		Glenwood Ave NWB	L	--	--	--	--	--	--	--	--
			T	12.2	15.0	30.1	67.0	B	B	C	E
12	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Glenwood Ave SEB	TR	16.1	17.0	31.5	70.2	B	B	C	E

Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²					
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM		
8	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd	Lead Mine Rd SWB	Overall	58.2	61.1	87.3	100.2	E	E	F	F		
			L	199.4	197.6	197.6	195.0	F	F	F	F		
			T	157.8	164.4	205.9	320.3	F	F	F	F		
		Glenwood Ave NWB	TR	154.5	154.4	141.8	148.4	F	F	F	F		
			L	99.2	106.0	353.5	518.0	F	F	F	F		
			T	36.2	44.8	65.8	48.4	D	D	E	D		
		Blue Ridge Rd NEB	R	34.2	26.1	30.2	25.2	C	C	C	C		
			L	234.9	230.4	234.1	235.8	F	F	F	F		
			T	102.1	115.2	136.2	143.3	F	F	F	F		
		Glenwood Ave SEB	R	50.0	42.2	33.4	33.2	D	D	C	C		
			L	138.1	125.5	127.6	185.8	F	F	F	F		
			T	24.2	22.8	49.0	109.4	C	C	D	F		
9	Genwood Ave & I-440 WB Off-Ramp	TR	40.3	37.1	64.4	66.1	D	D	E	E			
		Overall	19.5	20.2	49.1	67.2	B	C	D	E			
		I-440 WB Off-Ramp	T	34.8	35.1	121.5	183.7	C	D	F	F		
		Glenwood Ave NWB	T	32.8	34.8	60.9	62.1	C	C	E	E		
10	Genwood Ave & I-440 EB Off-Ramp	Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A		
		Overall	27.0	26.6	36.1	49.3	C	C	D	D			
		Glenwood Ave NWB	T	14.0	17.9	36.7	46.2	B	B	D	D		
		I-440 EB Off-Ramp	L	52.4	51.5	51.6	86.5	D	D	D	F		
11	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SEB	T	22.9	20.7	23.3	20.0	C	C	C	C		
		Overall	11.5	13.8	15.5	9.0	B	B	B	A			
		Glenwood Ave SB	L	77.5	84.1	88.8	95.5	E	F	F	F		
			T	5.4	6.1	7.6	4.2	A	A	A	A		
			R	9.6	1.3	--	--	A	A	--	--		
		Womans Club Dr WB	LT	83.2	73.4	70.4	75.5	F	E	E	E		
			R	59.8	50.4	52.8	104.2	E	D	D	F		
			Glenwood Ave NB	L	133.8	187.5	122.5	--	F	F	F	--	
		T		8.6	11.4	13.9	8.1	A	B	B	A		
		TR		9.4	12.3	15.2	11.0	A	B	B	B		
		Parking Deck EB	L	84.7	78.6	77.2	97.7	F	E	E	F		
			T	76.6	73.2	73.1	92.1	E	E	E	F		
12	Creedmoor Rd & Crabtree Valley Ave / Bank Drwy		Overall	11.2	88.9	181.8	211.1	B	F	F	F		
		Creedmoor Rd SWB	L	14.3	33.3	41.5	37.0	B	C	D	D		
			T	6.2	5.7	2.7	3.5	A	A	A	A		
			TR	5.5	4.9	2.6	3.2	A	A	A	A		
		Crabtree Valley Ave NWB	LT	63.0	68.1	70.5	79.4	E	E	E	E		
			R	51.4	884.1	1946.8	1514.9	D	F	F	F		
			L	13.7	84.4	263.7	--	B	F	F	--		
		Creedmoor Rd NEB	T	9.7	109.3	254.1	288.8	A	F	F	F		
			TR	13.8	169.7	343.0	343.1	B	F	F	F		
			LT	117.7	156.4	810.8	--	F	F	F	--		
		Bank Drwy SEB	R	122.1	113.8	130.1	--	F	F	F	--		
			13	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Overall	19.8	41.1	43.9	48.8	B	D	D	D
Creedmoor Rd SWB	L				59.1	61.4	58.7	62.1	E	E	E	E	
	T	12.0			14.6	14.0	10.6	B	B	B	B		
	TR	11.3			14.1	15.1	10.6	B	B	B	B		
Crabtree Valley Mall Entrance NWB	LT	43.8			49.0	51.4	46.1	D	D	D	D		
	R	35.4			75.0	58.0	72.9	D	E	E	E		
	L	102.4			113.3	108.2	86.6	F	F	F	F		
Creedmoor Rd NEB	T	15.9			47.8	56.0	59.4	B	D	E	E		
	TR	23.3			61.2	67.4	71.5	C	E	E	E		
	LT	108.2			153.9	132.4	149.9	F	F	F	F		
Office Drwy SEB	R	103.8			84.4	75.5	111.0	F	F	E	F		
	14	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln			Overall	19.5	39.5	191.3	218.6	B	D	F	F
			Blue Ridge Rd SWB	LT	12.4	14.2	28.4	74.2	B	B	C	E	
R				10.5	12.0	23.3	61.4	B	B	C	E		
Summit Park Ln NWB			L	55.9	51.2	45.3	88.8	E	D	D	F		
			TR	69.0	75.8	121.7	130.3	E	E	F	F		
Blue Ridge Rd NEB			LTR	13.1	47.3	241.6	254.5	B	D	F	F		
			L	48.4	70.5	571.7	507.2	D	E	F	F		
Crabtree Valley Ave SEB			TR	42.1	60.0	452.7	438.1	D	E	F	F		
			Overall	17.4	40.7	94.0	88.2	B	D	F	F		
15			Crabtree Valley Mall Entrance & Blue Ridge Rd	Blue Ridge Rd SB	T	6.3	14.2	31.6	48.1	A	B	C	D
					R	0.1	0.2	0.1	3.1	A	A	A	A
				Blue Ridge Rd NB	LT	11.6	71.9	172.2	173.9	B	E	F	F
	T	15.9			56.8	146.7	137.5	B	E	F	F		
	Crabtree Valley Mall Entrance EB	L		54.8	105.7	216.1	183.3	D	F	F	F		
		R		44.6	59.5	153.3	148.8	D	E	F	F		
		Overall		184.5	208.3	293.3	446.1	F	F	F	F		
		L		310.4	329.8	338.0	319.5	F	F	F	F		
16	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	T	387.0	397.2	348.7	338.0	F	F	F	F		
			TR	286.2	295.3	339.9	597.7	F	F	F	F		
			L	4034.5	7275.9	11915.3	15594.7	F	F	F	F		
		North Hills Dr WB	LTR	3963.0	6688.4	10870.1	8550.2	F	F	F	F		
			L	40.2	15.1	32.7	38.2	D	B	C	D		
		Lead Mine Rd NB	T	12.0	10.4	10.4	11.1	B	B	B	B		
			R	10.1	3.8	3.3	4.1	B	A	A	A		
		North Hills Dr EB	LT	120.0	666.0	2330.7	3215.7	F	F	F	F		
R	516.9		1062.7	2493.4	3897.2	F	F	F	F				

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
17	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	Overall	50.3	50.6	99.2	65.5	D	D	F	E
			L	90.7	107.8	298.3	286.9	F	F	F	F
			T	78.3	75.1	132.2	128.1	E	E	F	F
			R	79.1	79.7	135.5	142.1	E	E	F	F
		Six Forks Rd NWB	L	40.3	40.3	38.3	36.2	D	D	D	D
			T	15.9	14.8	17.1	19.1	B	B	B	B
			R	12.6	11.0	14.8	13.3	B	B	B	B
			L	135.6	129.8	161.0	126.1	F	F	F	F
		Main Street NEB	TR	90.5	97.2	141.0	89.2	F	F	F	F
			L	86.1	90.7	108.5	92.2	F	F	F	F
			T	58.9	58.9	136.3	67.1	E	E	F	E
			TR	88.8	86.2	192.5	82.1	F	F	F	F
18	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	Overall	24.2	25.1	32.7	21.3	C	C	C	C
			L	78.3	74.5	76.7	83.9	E	E	E	F
			T	81.6	85.9	127.4	104.9	F	F	F	F
			R	65.9	69.7	125.8	81.4	E	E	F	F
		Six Forks Rd NWB	L	133.4	127.8	132.2	128.0	F	F	F	F
			T	9.8	10.5	11.8	10.4	A	B	B	B
			R	4.6	5.0	5.0	4.8	A	A	A	A
			R	10.9	11.6	11.0	10.5	B	B	B	B
		I-440 WB Off Loop	L	46.2	47.5	44.9	52.2	D	D	D	D
			T	8.3	8.4	12.1	6.3	A	A	B	A
			R	24.8	23.4	34.1	13.3	C	C	C	B
			Six Forks Rd SEB	Overall	22.6	23.3	29.1	20.4	C	C	C
I-440 WB Off-Ramp	T	88.8		89.9	120.0	92.9	F	F	F	F	
Six Forks Rd NWB	T	21.6		22.4	25.6	15.4	C	C	C	B	
Six Forks SEB	T	0.0		0.0	0.0	0.0	A	A	A	A	
20	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	Overall	33.3	32.2	34.2	31.0	C	C	C	C
			L	104.4	100.2	93.8	97.4	F	F	F	F
			T	27.9	27.7	27.5	23.6	C	C	C	C
			TR	26.7	27.1	27.9	22.4	C	C	C	C
		Ramblewood Dr NEB	L	94.2	96.9	92.0	93.6	F	F	F	F
			T	92.0	87.1	91.3	92.7	F	F	F	F
			R	81.0	73.1	73.4	84.3	F	E	E	F
			L	75.8	75.4	83.9	70.5	E	E	F	E
		Six Forks Rd SEB	T	11.6	10.8	10.4	11.4	B	B	B	B
			TR	11.4	10.1	11.5	11.7	B	B	B	B
			Overall	9.7	10.9	10.2	7.1	A	B	B	A
			21	Six Forks Rd & Barrett Dr	Six Forks Rd SB	L	65.2	65.9	60.1	186.4	E
T	4.1	4.5				4.1	4.0	A	A	A	A
Barrett Dr WB	L	43.2			43.7	44.7	48.2	D	D	D	D
	R	34.1			34.2	33.8	48.0	C	C	C	D
Six Forks Rd NB	T	9.0			9.6	9.1	5.1	A	A	A	A
	TR	8.7			9.2	9.0	5.0	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
61	Lake Boone Trail, Shopping Center Drwy & Myron Dr	Shopping Center Drwy SB	R	12.4	10.3	10.5	10.8	B	B	B	B
		Lake Boone Trail WB	L	34.7	85.8	39.8	25.3	D	F	E	D
			T	0.8	0.5	0.4	0.3	A	A	A	A
			TR	0.4	0.2	0.2	0.1	A	A	A	A
		Myron Dr NB	R	133.3	1883.7	3747.2	1217.6	F	F	F	F
		Lake Boone Trail EB	T	0.1	2.7	10.3	0.0	A	A	B	A
			TR	0.0	0.7	2.2	0.0	A	A	A	A
		62	Lake Boone Trail & I-440 EB Ramps	I-440 EB Off-Loop	L	141.5	190.5	164.6	400.9	F	F
R	16.9			10.5	36.9	145.2	C	B	E	F	
63	Ridge Rd & I-440 EB Ramps	I-440 WB Off-Ramp/Ridge Rd	L	7.0	11.0	12.7	7.8	A	B	B	A
		Ridge Rd NB	T	0.0	0.0	0.0	0.0	A	A	A	A
			T	0.0	0.0	0.0	0.0	A	A	A	A
64	Ridge Rd & Varnell Ave	I-440 WB Off-Ramp/Ridge Rd	LT	0.0	0.0	14.6	4.7	A	A	B	A
		T	0.0	0.1	23.1	9.4	A	A	C	A	
		Varnell Ave WB	L	9.0	10.2	52.3	10.2	A	B	F	B
65	Ridge Rd & Manuel St	NB	R	0.0	0.0	0.0	0.0	A	A	A	A
		Ridge Rd SB	LT	0.1	0.2	0.2	0.1	A	A	A	A
		Manuel St WB	LR	8.2	12.0	13.7	11.2	A	B	B	B
		Ridge Rd NB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			Morehead Dr SWB	LR	72.8	102.3	117.4	140.1	F	F	F
66	Glenwood Ave & Morehead Dr	Glenwood Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Glenwood Ave SEB	L	37.7	69.7	59.9	61.4	E	F	F	F
			T	0.0	0.0	0.0	0.0	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
67	Glenwood Ave & Crabtree Valley Mall Entrance	Glenwood Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
		Crabtree Valley Mall Entrance NEB	R	23.2	25.5	103.9	66.6	C	D	F	F
		Glenwood Ave SEB	T	0.0	0.0	0.1	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
68	Glenwood Ave & Crabtree View Place	Glenwood Ave NWB	T	1.9	2.6	4.0	2.8	A	A	A	A
		Crabtree View Place NEB	R	74.4	76.5	112.7	145.2	F	F	F	F
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
69	Glenwood Ave & Arrow Dr	Glenwood Ave NWB	T	0.1	0.0	0.1	0.0	A	A	A	A
		Arrow Dr NEB	R	35.1	40.6	47.6	24.6	E	E	E	C
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
70	Glenwood Ave & I-440 WB Off-Loop	I-440 WB Off-Loop EB	T	34.3	41.3	43.0	32.1	D	E	E	D
			T	0.0	0.0	0.0	0.0	A	A	A	A
71	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	0.2	0.2	4.8	0.2	A	A	A	A
			TR	0.0	0.0	0.0	0.5	A	A	A	A
		National Dr WB	R	17.2	24.4	38.2	19.1	C	C	E	C
			L	19.3	20.6	22.3	23.9	C	C	C	C
		Glenwood Ave NB	T	0.1	0.1	0.1	0.0	A	A	A	A
			R	0.1	0.0	0.0	0.0	A	A	A	A
		Varnell Ave EB	LR	154.6	75.7	119.4	83.7	F	F	F	F
			L	37.1	46.9	55.4	68.8	E	E	F	F
72	Creedmoor Rd & Riverwood Cir	Creedmoor Rd SWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			L	49.0	86.8	74.0	127.3	E	F	F	F
		Riverwood Cir NWB	R	18.3	63.6	86.6	91.2	C	F	F	F
			L	6.7	7.6	223.8	376.8	A	A	F	F
73	Edwards Mill Rd & Apartment Drwy/Mall Entrance	Apt Drwy/ Mall Entrance SB	R	5.6	5.5	100.9	229.8	A	A	F	F
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Edwards Mill Rd WB	LT	0.3	0.4	39.9	49.2	A	A	E	E
			L	1.5	1.3	1.5	1.2	A	A	A	A
74	Crabtree Valley Ave & Edwards Mill Rd	Crabtree Valley Ave NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			L	14.1	13.6	21.0	23.0	B	B	C	C
		Edwards Mill Rd NEB	R	11.8	12.1	82.1	121.1	B	B	F	F
			TR	0.0	0.0	0.0	0.0	A	A	A	A
75	Crabtree Valley Ave, Homewood Banks Dr & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance SWB	L	8.6	9.2	611.6	1243.9	A	A	F	F
			TR	8.6	10.0	206.2	442.4	A	B	F	F
		Crabtree Valley Ave NWB	L	--	--	--	6.2	--	--	--	A
			TR	0.0	0.0	0.0	0.1	A	A	A	A
		Homewood Banks Dr NEB	L	10.5	12.4	678.7	903.8	B	B	F	F
			TR	12.2	13.6	837.4	1333.7	B	B	F	F
		Crabtree Valley Ave SEB	L	3.8	2.3	34.3	31.1	A	A	D	D
			TR	0.0	0.0	96.1	111.4	A	A	F	F
76	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks Dr SB	L	18.1	20.8	735.7	1234.7	C	C	F	F
		Blue Ridge Rd WB	T	0.0	0.0	0.0	0.0	A	A	A	A
			L	4.8	5.3	134.2	379.7	A	A	F	F
		Blue Ridge Rd EB	T	0.3	0.3	146.1	163.7	A	A	F	F
77	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd SWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			R	0.0	0.0	0.0	0.0	A	A	A	A
		Blue Ridge Rd NEB	L	7.3	8.0	162.3	149.5	A	A	F	F
			T	0.1	0.1	175.4	155.0	A	A	F	F
78	Browning & Six Forks Rd	Arinto Dr SEB	L	13.2	16.1	442.2	492.3	B	C	F	F
			R	8.9	--	125.9	--	A	--	F	--
		Browning SWB	L	121.6	292.0	514.0	307.5	F	F	F	F
			R	34.6	184.8	366.7	229.2	D	F	F	F
		Six Forks Rd NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Six Forks Rd SEB	L	15.7	14.8	12.0	8.5	C	B	B	A
			T	0.4	0.3	0.2	0.1	A	A	A	A

Notes:

- 1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations
- 2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies
- 3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

Based on the queue data output and visual observations during the simulation, there are multiple intersections where traffic queues beyond the existing storage or affects the operations of adjacent locations. Table 9-4 shows the maximum queue lengths on each approach of all the study intersections. The areas of excessive queuing are listed below:

AM peak hour

- Glenwood Ave at Blue Ridge Rd/Lead Mine Rd
 - All approaches, except the eastbound approach, have excessive queuing. Queuing from the Blue Ridge Rd/Lead Mine Rd intersection extends along Glenwood Ave and effects operations at adjacent intersections in both directions for more than one hour

- Lead Mine Rd at North Hills Drive
 - The southbound approach has a queue of more than 1,000' for two hours. This is due to the left-turn queuing at Glenwood Ave at Blue Ridge Rd/Lead Mine Rd intersection extending beyond North Hills Drive.
 - The westbound approach of North Hills Drive has a queue of more than 1,100' for two hours
- Blue Ridge at Crabtree Valley Ave/Summit Park Ln
 - All approaches, except the westbound approach, have long queues. The queues on northbound Blue Ridge and eastbound Crabtree Valley Ave are due to the spillback from the intersection of Glenwood Ave at Blue Ridge Rd.

PM peak hour

- Glenwood Ave at Creedmoor Rd
 - The southbound approach of Creedmoor Rd is projected to queue more than 1,200' for three hours
 - The northbound approach of Creedmoor Rd is projected to queue more than 1,200' for three hours
- Glenwood Ave at Blue Ridge Rd/Lead Mine Rd
 - All approaches at this intersection have excessive queuing. Queuing from the Blue Ridge Rd/Lead Mine Rd intersection extends along Glenwood Ave and effects operations at adjacent intersections in both directions.
 - The queuing in the westbound direction extends back through the I-440 interchange and the queuing in the southbound direction extends past the North Hills Dr intersection
- Ridge Rd at I-440 Ramp
 - The eastbound approach of this stop-controlled intersection of Ridge Rd and the I-440 Ramp is projected to queue 400' for one hour
- Glenwood Ave at I-440 Westbound Off-Ramp
 - The I-440 westbound off-ramp queues beyond the ramp gore and cause spillback onto I-440 which would likely affect freeway operations
- Lead Mine Rd at North Hills Dr
 - The southbound approach has a queue of more than 1,000' for four hours. This is due to the left-turn queuing at Glenwood Ave at Blue Ridge Rd/Lead Mine Rd extending beyond North Hills Dr.
 - The westbound approach of North Hills Dr has a queue almost 1,300' for four hours
- Blue Ridge at Crabtree Valley Ave/Summit Park Ln
 - All approaches, except the westbound approach, have long queues. The queues on northbound Blue Ridge and eastbound Crabtree Valley Ave are due to the spillback from the intersection of Glenwood Ave at Blue Ridge Rd.

Table 9-4: 2021 Design Year No-Build Intersection Volumes and Queue Lengths

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	L	252	384	460	412	80.3	107.3	139.8	121.6
			R	182	316	300	213				
		Lake Boone Trail WB	T	890	1,133	1,339	1,223	28.1	49.6	76.0	47.5
			R	102	184	176	139				
		Lake Boone Trail EB	L	96	211	259	231	4.7	16.7	39.7	23.3
			T	258	528	604	703				
2	Lake Boone Trail & I-440 WB Ramps	I-440 WB Off-Ramp SB	LT	30	44	36	39	142.4	152.9	151.5	168.8
			R	698	678	709	864				
		Lake Boone Trail WB	L	47	90	80	91	25.9	37.2	54.8	47.0
			T	494	872	1,044	699				
		Lake Boone Trail EB	T	297	645	740	784	21.7	35.1	44.0	82.5
			R	243	303	365	366				
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	L	40	85	102	63	2.0	35.3	25.5	14.1
			TR	143	489	416	367				
		Lake Boone WB	L	10	36	26	23	5.2	14.2	18.1	11.8
			T	74	200	262	160				
		Ridge Rd NB	TR	84	232	302	199	1.1	42.8	49.0	22.6
			L	13	80	95	69				
		Lake Boone Trail EB	TR	24	155	243	164	6.8	18.2	19.4	21.9
			L	18	39	62	67				
			T	39	71	75	62				
			TR	102	214	231	218				
4	Ridge Rd & Glen Eden Dr	Ridge Rd SB	L	15	18	22	27	5.9	33.3	39.4	17.3
			TR	171	354	364	350				
		Glen Eden Dr WB	L	21	83	78	77	10.7	84.3	101.3	41.9
			TR	36	269	299	154				
		Ridge Rd NB	L	16	39	69	49	1.1	9.2	15.2	7.3
			TR	28	123	161	138				
		Glen Eden Dr EB	L	30	115	122	83	20.1	42.8	59.9	35.8
			TR	109	293	379	276				
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Rembert Dr SWB	LTR	17	52	85	51	7.2	26.3	47.2	25.1
			L	20	57	84	68				
		Glenwood Ave NWB	T	622	873	963	968	14.5	45.5	56.4	51.1
			TR	291	401	446	438				
		Fairhill Dr NEB	L	18	42	45	39	11.4	20.9	22.3	21.3
			TR	21	26	29	30				
		Glenwood Ave SEB	L	5	14	16	13	9.7	37.0	50.0	29.3
			T	664	1,318	1,427	1,034				
			TR	243	532	591	406				
			L	643	851	784	766				
6	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	T	210	528	597	402	175.1	618.0	973.2	204.1
			TR	226	577	670	411				
			L	85	240	290	308				
		Glenwood WB	T	853	1,181	1,295	1,310	202.2	322.0	341.8	358.5
			L	36	98	116	108				
			T	138	318	409	456				
		Creedmoor Rd NEB	R	56	176	148	170	37.7	90.3	111.5	131.4
			L	37	43	100	86				
			T	659	1,370	1,569	1,124				
		Glenwood Ave EB	TR	172	369	361	323	89.4	231.1	747.2	183.0
			L	39	96	117	68				
			TR	0	0	0	0				
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Marriott Dr SWB	L	19	23	37	71	9.9	13.3	16.8	21.7
			T	710	1,117	1,237	1,252				
		Glenwood Ave NWB	TR	499	680	735	815	1.9	4.2	5.0	9.4
			LT	0	5	8	10				
		Crabtree Valley Mall Entrance NEB	R	7	10	16	22				
			L	6	9	14	15				
		Glenwood Ave SEB	T	1,215	2,167	2,230	1,818	4.1	12.7	13.7	16.4
			TR	247	467	423	394				
		Lead Mine Rd SWB	L	656	1,123	1,124	1,218	164.3	874.4	1,154.6	1,082.6
			T	178	523	439	417				
8	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd	Glenwood Ave NWB	TR	43	127	131	134	80.7	235.9	481.1	883.8
			L	113	242	266	317				
			T	1,160	1,688	1,871	1,987				
		Blue Ridge Rd NEB	R	198	442	538	478	15.2	114.8	770.3	1,199.4
			L	14	12	19	17				
			T	28	100	96	116				
		Glenwood Ave SEB	R	8	172	234	227	86.7	210.5	188.4	127.8
			L	15	53	45	65				
			T	1,000	1,986	2,141	1,630				
		Lead Mine Rd SWB	TR	457	649	564	487				
			L	457	649	564	487				

Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length					
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM		
9	Genwood Ave & I-440 WB Off-Ramp	I-440 WB Off-Ramp	T	948	1,080	1,334	1,533	80.9	106.8	112.9	176.1		
		Glenwood Ave NWB	T	534	1,299	1,351	1,278	14.0	33.5	59.2	70.6		
		Glenwood Ave SEB	T	1,372	2,668	3,020	2,553	0.0	4.0	7.7	1.2		
10	Genwood Ave & I-440 EB Off-Ramp	Glenwood Ave NWB	T	357	981	953	936	3.8	10.0	12.4	10.8		
		I-440 EB Off-Ramp	L	256	506	572	551	28.3	55.8	62.1	59.9		
		Glenwood Ave SEB	T	595	1,433	1,647	1,550	17.3	19.3	34.1	32.1		
11	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	L	70	171	224	247	17.6	53.8	74.2	82.2		
			T	578	1,455	1,642	1,449						
			R	4	6	11	13						
		Womans Club Dr WB	LT	4	13	20	14	2.5	4.4	6.4	4.4		
			R	6	13	16	16						
			L	0	8	11	11						
		Glenwood Ave NB	T	285	791	799	711	0.1	5.4	5.4	5.9		
			TR	118	346	389	341						
			L	0	2	6	15						
Parking Deck EB	TR	0	2	4	3	0.0	0.5	1.7	4.2				
	L	20	47	47	81								
12	Creedmoor Rd & Crabtree Valley Ave / Bank Drwy	Creedmoor Rd SWB	T	238	652	779	480	4.8	5.4	11.5	0.8		
			TR	261	727	851	550						
			LT	6	24	19	13						
		Crabtree Valley Ave NWB	R	22	67	85	87	8.6	30.9	34.9	35.7		
			L	0	0	0	0						
			T	170	425	507	517						
		Creedmoor Rd NEB	TR	47	148	144	171	0.2	5.3	6.3	6.6		
			LT	0	0	3	11						
			R	0	0	2	3						
13	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	L	35	30	54	122	12.9	15.0	29.3	33.3		
			T	250	684	797	542						
			TR	255	712	832	536						
		Crabtree Valley Mall Entrance NWB	LT	12	16	28	26	5.0	6.1	8.9	10.0		
			R	14	11	13	35						
			L	0	4	10	3						
		Creedmoor Rd NEB	T	155	394	477	491	1.8	11.2	22.4	15.5		
			TR	67	208	214	255						
			LT	0	0	1	2						
Office Drwy SEB	R	0	12	25	7	0.0	4.8	10.7	4.0				
	L	0	12	25	7								
	LT	194	557	481	434								
14	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Blue Ridge Rd SWB	R	62	108	121	99	10.7	43.5	80.3	111.5		
			L	5	53	47	20						
			TR	43	91	75	33						
		Summit Park Ln NWB	LTR	104	290	279	288	1.5	322.0	956.6	1,141.2		
			L	42	82	109	139						
			TR	6	12	20	9						
		Blue Ridge Rd NEB	T	246	667	591	497	13.1	99.5	110.0	350.6		
			R	39	86	122	219						
			LT	25	51	74	93						
15	Crabtree Valley Mall Entrance & Blue Ridge Rd	Blue Ridge Rd NB	T	20	231	256	243	3.6	550.7	1,009.0	1,313.1		
			L	7	25	50	73						
			R	0	6	6	15						
		Crabtree Valley Mall Entrance EB	L	26	83	101	78	2.3	6.8	23.6	31.0		
			T	550	991	966	1,054						
			TR	144	424	336	322						
		16	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	L	94	138	154	163	41.7	912.9	1,139.6	1,175.4
					LTR	88	249	259	262				
					L	5	10	8	9				
Lead Mine Rd NB	T			194	425	562	514	6.3	20.7	20.5	19.9		
	R			42	152	115	133						
	LT			0	5	4	1						
North Hills Dr EB	LT			0	5	4	1	7.8	10.6	12.9	8.4		
	R			24	20	21	14						
	L			128	320	361	324						
17	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	T	8	40	60	63	53.7	527.1	660.9	518.7		
			R	17	79	92	78						
			L	101	129	215	245						
		Six Forks Rd NWB	T	551	1,481	1,281	1,358	25.5	66.7	84.9	90.3		
			R	52	185	238	202						
			L	10	26	27	34						
		Main Street NEB	TR	60	103	119	140	33.0	63.1	69.7	72.0		
			L	41	189	260	167						
			T	442	1,135	997	922						
Six Forks Rd SEB	TR	663	901	929	762	86.8	211.4	635.2	129.8				
	L	41	189	260	167								

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
18	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	L	28	93	122	82	33.3	63.1	65.7	52.3
			T	76	148	164	126				
			R	10	40	60	41				
		Six Forks Rd NWB	L	161	361	362	328	44.3	135.9	115.8	101.4
			T	695	1,754	1,671	1,758				
			R	158	406	479	419				
		I-440 WB Off Loop	R	36	62	101	144	240.1	2,221.9	1,420.0	375.7
			L	17	51	99	45				
			T	467	1,250	1,330	1,193				
19	Six Forks Rd & I-440 EB Ramps	I-440 WB Off-Ramp	R	752	1,002	841	796	29.8	171.1	149.3	84.8
			T	324	733	455	132				
			R	690	1,799	2,054	2,389				
		Six Forks SEB	T	525	1,400	1,552	1,416	0.0	0.0	0.0	0.0
20	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	L	8	27	26	35	9.5	75.6	80.8	72.9
			T	145	426	502	464				
			TR	139	406	506	466				
		Ramblewood Dr NEB	L	61	160	143	117	32.9	177.5	183.8	78.3
			T	20	58	64	53				
			R	22	101	122	74				
		Six Forks Rd SEB	L	200	482	505	430	54.1	106.2	118.4	109.1
			T	324	922	1,084	1,001				
			TR	160	375	440	399				
21	Six Forks Rd & Barrett Dr	Six Forks Rd SB	L	25	46	91	94	126.2	314.6	174.2	102.0
			T	412	1,203	1,374	1,214				
		Barrett Dr WB	L	3	30	62	92	1.7	20.2	50.8	71.4
			R	2.9	9.6	34.1	40.6				
		Six Forks Rd NB	T	151.0	485.9	560.9	512.2	0.2	4.4	5.0	5.3
			TR	171.5	573.9	655.2	596.5				

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
61	Lake Boone Trail, Shopping Center Drwy & Myron Dr	Shopping Center Drwy SB	R	35	70	71	50	1.6	6.0	7.3	4.5
			L	24	41	62	38				
		Lake Boone Trail WB	T	539	659	772	706	0.3	5.6	14.0	5.9
			TR	645	860	945	846				
		Myron Dr NB	R	50	66	74	83	1.8	3.9	4.5	6.1
			T	175	366	428	443				
62	Lake Boone Trail & I-440 EB Ramps	I-440 EB Off-Loop	TR	339	557	657	676	0.0	0.0	0.3	3.1
63	Ridge Rd & I-440 EB Ramps	I-440 WB Off-Ramp/Ridge Rd	L	11	17	21	15	21.6	59.6	702.9	28.5
			R	360	402	454	342				
		Ridge Rd NB	L	185	359	358	354	5.5	23.9	31.3	428.9
			T	52	232	272	200				
64	Ridge Rd & Varnell Ave	I-440 WB Off-Ramp/Ridge Rd	T	0	17	22	13	0.0	0.0	0.0	272.5
			LT	130	196	279	566				
		Varnell Ave WB	T	70	156	117	386	0.0	0.5	0.4	2.0
			L	3	23	15	11				
		NB	R	0	0	8	2	0.0	0.0	0.0	0.0
			LT	185	372	376	366				
65	Ridge Rd & Manuel St	Manuel St WB	LR	4	18	24	10	0.0	0.8	1.1	0.4
			TR	51	223	265	199				
		Ridge Rd NB	TR	51	223	265	199	0.0	0.0	0.0	0.0
			LR	8	20	22	30				
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	8	20	22	30	1.2	5.0	9.2	6.8
			T	632	948	1,034	1,050				
		Glenwood Ave NWB	TR	286	388	431	428	0.0	0.0	0.0	0.0
			L	3	0	2	4				
		Glenwood Ave SEB	T	873	1,805	1,979	1,420	0.0	0.0	0.0	0.2
67	Glenwood Ave & Crabtree Valley Mall Entrance	Glenwood Ave NWB	T	1,208	1,809	1,992	2,107	0.0	0.0	0.0	0.0
			TR	9	5	4	33				
		Crabtree Valley Mall Entrance NEB	T	1,193	2,111	2,187	1,773	0.0	0.7	0.7	3.6
			TR	315	584	551	458				
68	Glenwood Ave & Crabtree View Place	Glenwood Ave NWB	T	1,477	2,367	2,678	2,794	2.8	55.6	379.1	806.3
			R	123	143	121	89				
		Crabtree View Place NEB	T	1,284	2,566	2,864	2,464	14.8	885.7	638.3	1,065.4
			TR	826	1,291	1,056	993				
69	Glenwood Ave & Arrow Dr	Glenwood Ave NWB	T	1,477	2,367	2,677	2,794	0.0	5.8	248.9	653.2
			R	61	66	66	55				
		Arrow Dr NEB	T	1,352	2,637	2,942	2,517	4.9	17.8	24.3	10.4
			TR	871	1,343	1,085	988				
70	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	638	1,616	1,804	1,653	0.0	0.0	0.0	0.0
			TR	7	13	24	35				
		National Dr WB	R	7	19	31	104	0.4	1.1	1.9	6.0
			L	3	15	20	19				
		Glenwood Ave NB	T	370	1,039	1,032	931	0.0	0.0	0.0	0.0
			R	0	4	4	6				
		Varnell Ave EB	TR	31.6	50.1	59.9	47.3	5.2	61.3	66.5	27.6
			LR								

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
71	Creedmoor Rd & Riverwood Cir	Creedmoor Rd SWB	L	0	13	17	14	0.0	0.0	0.0	0.0
			T	488	1,348	1,597	997				
		Riverwood Cir NWB	L	3	1	4	0	0.8	0.6	0.9	0.0
			R	15	8	13	10				
		Creedmoor Rd NEB	T	81	205	246	253	0.0	0.0	0.0	0.0
			TR	131	363	402	437				
72	Edwards Mill Rd & Apartment Drwy/Mall Entrance	Apt Drwy/ Mall Entrance SB	L	17	32	31	35	0.5	1.0	1.2	1.3
			R	2	5	6	3				
		Edwards Mill Rd WB	TR	69	129	147	173	0.0	0.0	0.0	6.3
			LT	54	96	135	156				
		Edwards Mill Rd EB	LT	54	96	135	156	0.0	0.0	0.0	0.1
73	Crabtree Valley Ave & Edwards Mill Rd	Crabtree Valley Ave NWB	L	54	99	108	100	0.0	0.0	0.0	0.0
			T	12	56	68	67				
		Edwards Mill Rd NEB	L	16	39	37	31	1.1	2.4	2.1	2.9
			R	51	84	125	136				
		Crabtree Valley Ave SEB	T	16	47	35	66	0.0	0.0	0.0	0.2
			TR	9	21	23	25				
74	Crabtree Valley Ave, Homewood Banks Dr & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance SWB	TR	14	36	40	51	0.8	1.6	1.3	1.8
			L	0	0	0	0				
		Crabtree Valley Ave NWB	TR	69	144	151	121	0.0	0.0	0.0	0.0
			L	2	7	17	27				
		Homewood Banks Dr NEB	TR	9	19	29	54	13.6	44.8	56.3	93.7
			L	24.4	25.2	33.3	52.8				
		Crabtree Valley Ave SEB	TR	43.7	104.5	123.0	127.7	0.0	0.0	0.0	0.0
			L	3	16	30	20				
75	Blue Ridge Rd & Homewood Banks Dr	Blue Ridge Rd WB	T	170	541	429	380	0.0	0.0	0.0	0.0
			L	9	22	34	58				
		Blue Ridge Rd EB	T	95	263	227	243	0.0	0.4	0.3	43.8
			L	179	567	468	415				
76	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd SWB	R	0	3	7	10	0.0	0.0	0.0	0.0
			L	0	0	0	0				
		Blue Ridge Rd NEB	T	96	277	256	256	0.0	0.0	36.6	225.8
			L	10	12	17	17				
		Arinto Dr SEB	R	0	0	0	0	0.7	1.3	2.3	14.4
			L	4	25	67	87				
77	Browning & Six Forks Rd	Browning SWB	R	7	15	41	46	0.6	4.6	23.0	26.3
			T	141	456	535	509				
		Six Forks Rd NWB	TR	145	416	486	460	0.0	0.0	0.0	0.0
			L	33	115	172	152				
		Six Forks Rd SEB	T	435	1,215	1,397	1,215	0.1	9.2	12.7	4.6
			L	464	584	627	427				
		Lake Boone Trail WB	R	176	132	237	190	108.2	501.6	995.8	173.0
			T	883	822	762	785				
1	Lake Boone Trail & Wycliff Rd	Lake Boone Trail WB	R	91	93	90	92	103.5	76.5	79.4	88.2
			L	233	217	235	246				
		Lake Boone Trail EB	T	1,287	1,334	1,138	1,103	165.3	698.7	1,200.5	557.2
			LT	80	100	120	74				
		I-440 WB Off-Ramp SB	R	484	429	382	492	96.0	85.6	81.0	88.5
			L	48	42	125	44				
2	Lake Boone Trail & I-440 WB Ramps	Lake Boone Trail WB	T	699	681	708	580	20.6	20.3	40.0	17.7
			T	1,305	1,416	1,392	1,439				
		Lake Boone Trail EB	R	519	542	398	312	453.7	1,086.5	1,388.3	681.1
			L	52	77	113	58				
		Ridge Rd SB	TR	239	445	708	246	8.4	24.3	57.9	13.5
			L	35	48	53	20				
3	Lake Boone Trail & Ridge Rd	Lake Boone WB	T	162	160	232	119	12.7	14.9	21.0	9.1
			TR	212	235	319	163				
		Ridge Rd NB	L	86	55	47	44	20.9	18.2	19.1	9.0
			TR	300	327	424	192				
		Lake Boone Trail EB	L	88	124	164	163	24.5	37.5	111.8	33.9
			T	97	156	239	143				
		Glen Eden Dr WB	TR	330	386	436	389	18.1	54.2	82.9	39.3
			L	27	40	36	36				
4	Ridge Rd & Glen Eden Dr	Ridge Rd SB	TR	252	397	503	357	60.0	131.4	917.8	690.2
			L	59	113	109	148				
		Ridge Rd NB	TR	216	236	297	370	13.7	33.3	71.6	21.3
			L	99	97	117	84				
		Glen Eden Dr EB	TR	189	257	392	155	36.9	184.0	294.4	41.2
			L	132	245	214	143				
		Glen Eden Dr WB	TR	249	371	552	314	0.0	0.0	0.0	0.0
			L	3	16	30	20				

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	L	464	584	627	427	108.2	501.6	995.8	173.0
			R	176	132	237	190				
		Lake Boone Trail WB	T	883	822	762	785	103.5	76.5	79.4	88.2
			R	91	93	90	92				
		Lake Boone Trail EB	L	233	217	235	246	165.3	698.7	1,200.5	557.2
			T	1,287	1,334	1,138	1,103				
2	Lake Boone Trail & I-440 WB Ramps	I-440 WB Off-Ramp SB	LT	80	100	120	74	96.0	85.6	81.0	88.5
			R	484	429	382	492				
		Lake Boone Trail WB	L	48	42	125	44	20.6	20.3	40.0	17.7
			T	699	681	708	580				
		Lake Boone Trail EB	T	1,305	1,416	1,392	1,439	453.7	1,086.5	1,388.3	681.1
			R	519	542	398	312				
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	L	52	77	113	58	8.4	24.3	57.9	13.5
			TR	239	445	708	246				
		Lake Boone WB	L	35	48	53	20	12.7	14.9	21.0	9.1
			T	162	160	232	119				
		Ridge Rd NB	TR	212	235	319	163	20.9	18.2	19.1	9.0
			L	86	55	47	44				
		Lake Boone Trail EB	TR	300	327	424	192	24.5	37.5	111.8	33.9
			L	88	124	164	163				
4	Ridge Rd & Glen Eden Dr	Ridge Rd SB	T	27	40	36	36	18.1	54.2	82.9	39.3
			TR	252	397	503	357				
		Glen Eden Dr WB	L	59	113	109	148	60.0	131.4	917.8	690.2
			TR	216	236	297	370				
		Ridge Rd NB	L	99	97	117	84	13.7	33.3	71.6	21.3
			TR	189	257	392	155				
		Glen Eden Dr EB	L	132	245	214	143	36.9	184.0	294.4	41.2
			TR	249	371	552	314				

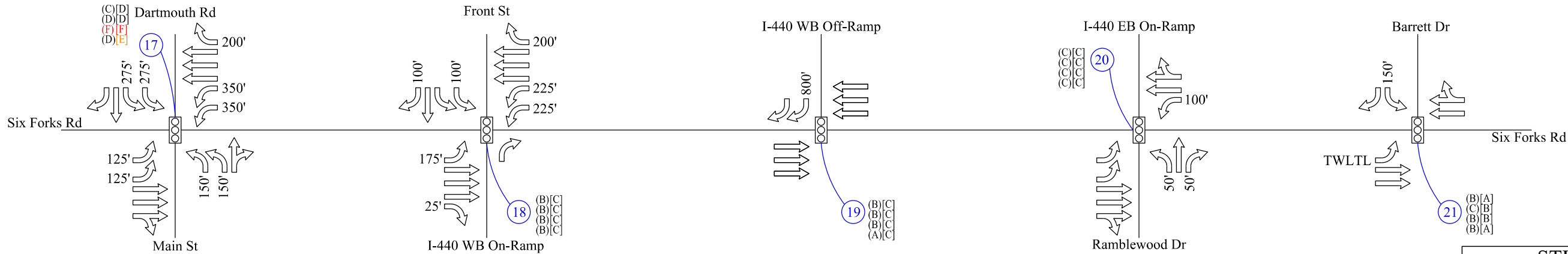
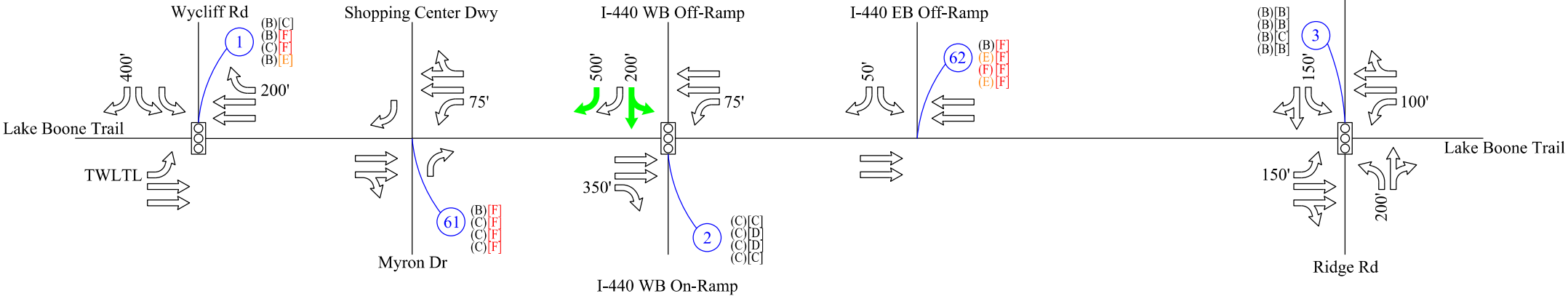
Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Rembert Dr SWB	LTR	54	62	44	39	27.0	33.6	19.4	18.4
		Glenwood Ave NWB	L	53	46	43	35	75.1	92.8	129.6	72.6
			T	1,097	1,422	1,637	1,380				
			TR	450	579	736	531				
		Fairhill Dr NEB	L	44	78	92	58	22.6	58.0	64.7	32.6
			TR	21	43	46	27				
		Glenwood Ave SEB	L	26	27	41	20	57.6	71.3	86.5	51.7
			T	1,180	1,453	1,524	1,255				
			TR	464	576	595	478				
6	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	L	511	548	518	596	835.7	1,183.3	1,451.7	1,310.4
			T	326	345	354	248				
			TR	349	380	417	314				
		Glenwood WB	L	160	170	196	214	141.1	212.1	472.7	229.0
			T	1,207	1,630	2,001	1,555				
		Creedmoor Rd NEB	L	303	325	340	332	450.8	1,153.9	1,407.7	1,487.6
			T	869	965	955	971				
			R	200	249	260	251				
		Glenwood Ave EB	L	106	118	138	108	219.8	290.5	333.1	651.3
			T	1,187	1,435	1,537	1,379				
			TR	359	442	469	408				
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Marriott Dr SWB	L	39	62	104	78	27.6	48.6	141.0	76.7
			TR	21	39	83	71				
		Glenwood Ave NWB	L	216	140	196	288	110.2	77.1	264.8	166.2
			T	1,177	1,537	2,038	1,426				
			TR	956	1,057	1,006	1,096				
		Crabtree Valley Mall Entrance NEB	LT	74	102	74	92	74.4	79.8	171.8	119.9
			R	121	103	88	66				
			L	0	0	0	0				
		Glenwood Ave SEB	T	1,624	1,918	1,990	1,978	35.8	73.9	200.0	823.2
			TR	420	531	595	507				
			L	605	603	617	645				
8	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd	Lead Mine Rd SWB	T	107	150	201	230	1,829.9	1,871.9	1,859.7	1,869.6
			TR	78	96	115	137				
			L	570	540	511	623				
		Glenwood Ave NWB	T	2,275	2,583	3,065	2,595	402.8	421.5	1,086.3	2,417.5
			R	648	703	684	652				
			L	18	64	111	141				
		Blue Ridge Rd NEB	T	339	437	403	409	242.6	571.9	1,889.1	4,647.0
			R	387	273	224	222				
			L	77	123	146	123				
		Glenwood Ave SEB	T	1,688	1,907	2,024	2,027	135.2	167.7	294.0	1,356.9
			TR	407	479	554	464				
			L	84	62	28	14				
9	Genwood Ave & I-440 WB Off-Ramp	I-440 WB Off-Ramp	T	1,482	1,505	1,517	1,604	124.8	125.1	583.8	1,599.4
		Glenwood Ave NWB	T	2,023	2,330	2,738	2,238	152.1	159.6	231.4	1,220.2
		Glenwood Ave SEB	T	2,498	2,618	2,685	2,781	43.5	88.4	67.1	42.5
10	Genwood Ave & I-440 EB Off-Ramp	Glenwood Ave NWB	T	1,318	1,647	1,973	1,225	26.9	58.9	218.0	257.4
		I-440 EB Off-Ramp	L	931	985	1,073	1,062	210.1	215.4	219.4	963.2
		Glenwood Ave SEB	T	1,092	1,118	1,208	1,199	83.7	99.6	149.1	85.5
11	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	L	84	62	28	14	40.8	26.7	35.6	12.9
			T	1,176	1,224	1,307	1,349				
			R	4	3	0	0				
		Womans Club Dr WB	LT	62	104	155	51	34.2	58.7	82.3	20.7
			R	29	41	41	6				
			L	7	3	4	0				
		Glenwood Ave NB	T	1,044	1,230	1,501	965	35.5	52.4	82.2	34.7
			TR	448	527	643	362				
			L	29	39	25	5				
		Parking Deck EB	TR	15	29	33	14	13.6	21.9	16.1	7.9
			L	93	93	74	100				
			T	345	370	422	314				
12	Creedmoor Rd & Crabtree Valley Ave / Bank Drwy	Creedmoor Rd SWB	TR	435	455	481	374	25.7	61.4	42.5	52.3
			L	93	93	74	100				
			T	345	370	422	314				
		Crabtree Valley Ave NWB	LT	52	62	58	62	59.3	551.7	501.9	256.8
			R	123	86	31	43				
			L	5	8	3	0				
		Creedmoor Rd NEB	T	871	993	1,008	953	16.2	570.8	1,111.0	986.3
			TR	307	469	502	482				
			L	2	18	4	0				
		Bank Drwy SEB	LT	2	18	4	0	2.7	18.2	10.9	0.0
			R	5	4	3	0				

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
13	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	L	120	111	131	118	24.3	33.5	29.0	24.1
			T	407	429	456	384				
			TR	413	435	446	363				
		Crabtree Valley Mall Entrance NWB	LT	54	44	47	31	38.8	81.7	73.4	101.9
			R	210	200	215	254				
		Creedmoor Rd NEB	L	3	4	2	3	91.7	878.4	1,296.6	1,215.3
			T	809	926	905	865				
			TR	433	556	568	534				
14	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Blue Ridge Rd SWB	LT	317	346	442	496	39.3	134.8	401.3	2,504.1
			R	124	99	125	120				
		Summit Park Ln NWB	L	13	17	23	18	17.7	21.4	42.4	111.8
			TR	40	42	49	48				
		Blue Ridge Rd NEB	LTR	480	530	440	473	42.5	250.6	1,686.4	1,421.0
			L	204	260	230	324				
		Crabtree Valley Ave SEB	TR	16	17	18	57	74.6	148.2	1,755.9	4,541.9
15	Crabtree Valley Mall Entrance & Blue Ridge Rd	Blue Ridge Rd SB	T	354	360	467	528	41.8	106.6	282.7	2,124.8
			R	365	388	345	432				
		Blue Ridge Rd NB	LT	156	220	230	242	25.3	254.2	1,517.8	4,254.8
			T	375	379	279	323				
		Crabtree Valley Mall Entrance EB	L	265	238	249	228	158.0	239.0	516.4	363.4
			R	115	85	81	78				
		Lead Mine Rd SB	L	47	35	71	73	1,053.2	1,083.9	1,127.1	1,298.7
			T	601	586	603	642				
16	Lead Mine Rd & North Hills Dr	North Hills Dr WB	TR	171	231	307	331	1,288.1	1,284.7	1,289.7	1,281.9
			L	5	6	21	52				
		Lead Mine Rd NB	LTR	15	18	21	55	106.4	24.7	56.1	81.1
			L	11	9	10	10				
		North Hills Dr EB	T	777	930	900	889	42.3	364.4	599.3	617.0
			R	277	326	317	284				
		Dartmouth Rd SWB	LT	5	8	7	11	130.7	172.9	653.6	562.4
			R	15	28	27	30				
17	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	L	235	264	333	312	101.5	107.3	104.5	113.7
			T	72	89	146	127				
		Six Forks Rd NWB	R	144	173	218	200	138.3	135.1	197.1	118.7
			L	285	326	376	358				
		Main Street NEB	T	1,688	1,651	1,577	1,395	414.9	362.0	784.2	332.5
			R	139	164	182	162				
		Six Forks Rd SEB	L	62	60	58	66	174.1	162.4	293.1	84.9
			TR	185	171	166	167				
18	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	L	127	140	165	145	127.3	163.1	351.4	142.1
			T	1,188	1,148	1,203	966				
		Six Forks Rd NWB	TR	794	802	754	749	264.1	266.8	293.8	168.6
			L	194	220	312	189				
		I-440 WB Off Loop	T	195	222	307	142	8.8	7.6	278.2	155.9
			R	67	103	98	116				
		Six Forks Rd SEB	L	355	360	366	250	174.1	162.4	293.1	84.9
			T	2,042	2,030	2,025	1,773				
19	Six Forks Rd & I-440 EB Ramps	I-440 WB Off-Ramp	R	296	356	410	395	223.7	222.8	361.1	225.2
			L	115	104	120	121				
		Six Forks SEB	R	195	222	307	142	131.6	133.7	146.3	81.1
20	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	L	1,534	1,543	1,630	1,444				
			T	602	590	641	547	151.9	135.3	156.1	81.7
		Ramblewood Dr NEB	L	93	56	76	38				
			T	611	674	646	439	64.3	49.3	52.6	77.6
		Six Forks Rd SEB	TR	654	707	681	470				
			L	50	51	46	81	187.3	188.2	213.2	151.4
		Six Forks Rd NB	T	63	63	67	71				
			R	67	37	46	38	37.0	23.7	14.7	16.8
21	Lake Boone Trail & Wycliff Rd	Six Forks Rd SB	L	660	672	689	586				
			T	899	872	920	829	30.0	53.5	47.5	20.5
		Barrett Dr WB	TR	409	420	462	447				
			L	78	48	32	15	40.4	40.5	36.7	16.9
		Six Forks Rd NB	T	1,209	1,233	1,292	1,210				
			L	97	186	151	78				

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
61	Lake Boone Trail, Shopping Center Drwy & Myron Dr	Shopping Center Drwy SB	R	52	58	56	82	3.1	3.1	3.1	5.0
		Lake Boone Trail WB	L	52	39	40	31	10.7	13.7	7.4	8.0
			T	487	454	423	414				
			TR	679	642	647	642				
		Myron Dr NB	R	84	58	56	232	130.6	1,253.0	1,381.0	1,353.3
		Lake Boone Trail EB	T	673	651	615	638	209.1	562.3	1,008.8	267.2
			TR	1,089	1,293	1,125	869				
62	Lake Boone Trail & I-440 EB Ramps	I-440 EB Off-Loop	L	15	12	31	14	48.8	27.8	81.9	979.4
			R	329	318	225	292	48.8	27.8	81.9	979.4
63	Ridge Rd & I-440 EB Ramps	I-440 WB Off-Ramp/Ridge Rd	L	266	407	469	345	12.2	83.4	394.4	86.9
			T	275	454	495	249	0.0	0.0	0.0	0.0
		Ridge Rd NB	T	4	22	32	15				
			T	4	22	32	15				
64	Ridge Rd & Varnell Ave	I-440 WB Off-Ramp/Ridge Rd	LT	229	336	401	273	0.0	0.0	67.5	15.5
			T	67	121	216	115				
		Varnell Ave WB	L	8	17	9	10	0.6	0.7	1.7	0.7
			R	3	8	27	7	0.0	0.0	0.0	0.0
65	Ridge Rd & Manuel St	Ridge Rd SB	LT	269	426	498	358	0.0	0.0	0.5	0.0
		Manuel St WB	LR	10	23	65	15	0.4	1.0	4.7	1.0
		Ridge Rd NB	TR	284	464	525	264	0.0	0.0	0.0	0.0
			TR	284	464	525	264	0.0	0.0	0.0	0.0
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	16	24	11	5	4.6	10.7	6.0	2.0
			T	1,192	1,579	1,838	1,492	0.0	0.0	0.0	0.0
		Glenwood Ave NWB	TR	406	482	588	451				
			L	5	4	5	3	0.0	0.0	0.0	0.0
		Glenwood Ave SEB	T	1,608	1,991	2,104	1,707				
			T	2,318	2,689	3,216	2,708	0.0	0.0	366.9	70.0
67	Glenwood Ave & Crabtree Valley Mall Entrance	Glenwood Ave NWB	T	2,318	2,689	3,216	2,708	0.0	0.0	366.9	70.0
		Crabtree Valley Mall Entrance NEB	R	188	149	141	119	29.3	26.4	111.9	55.6
		Glenwood Ave SEB	T	1,668	1,953	2,052	1,795	0.0	0.0	32.6	57.2
			TR	402	499	603	467				
68	Glenwood Ave & Crabtree View Place	Glenwood Ave NWB	T	3,481	3,804	4,233	3,679	120.5	157.2	590.2	1,419.0
		Crabtree View Place NEB	R	162	178	180	210	106.2	138.2	671.8	1,077.7
		Glenwood Ave SEB	T	2,350	2,465	2,514	2,324	0.0	0.0	0.8	1.6
			TR	716	772	819	657				
69	Glenwood Ave & Arrow Dr	Glenwood Ave NWB	T	3,483	3,806	4,234	3,673	46.6	83.5	487.8	1,224.6
		Arrow Dr NEB	R	74	72	90	47	16.7	17.6	26.1	4.7
		Glenwood Ave SEB	T	2,465	2,568	2,630	2,470	5.0	5.5	5.8	1.6
			TR	748	796	842	699				
70	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	1,247	1,250	1,300	1,201	393.8	386.6	491.8	396.0
			TR	31	32	31	31				
		National Dr WB	R	163	207	175	44	17.0	37.2	46.6	3.0
			L	25	19	25	20				
		Glenwood Ave NB	T	1,417	1,753	2,108	1,268	0.1	0.0	0.0	0.2
			R	11	12	10	5				
71	Creedmoor Rd & Riverwood Cir	Varnell Ave EB	LR	47.0	37.9	48.4	43.0	27.9	14.5	52.1	27.5
			LR	47.0	37.9	48.4	43.0	27.9	14.5	52.1	27.5
		Creedmoor Rd SWB	L	11	25	51	67	0.0	2.1	8.5	16.0
			T	794	830	906	653				
		Riverwood Cir NWB	L	11	3	8	12	4.5	8.1	6.4	16.9
			R	26	26	16	27				
72	Edwards Mill Rd & Apartment Drwy/Mall Entrance	Creedmoor Rd NEB	T	503	726	772	735	23.7	511.2	1,339.8	1,165.3
			TR	687	731	672	663				
		Apt Drwy/ Mall Entrance SB	L	79	80	88	99	2.6	3.2	246.1	263.0
			R	39	38	49	47				
		Edwards Mill Rd WB	TR	165	156	144	179	5.2	0.0	27.3	47.6
			LT	141	209	250	123				
73	Crabtree Valley Ave & Edwards Mill Rd	Edwards Mill Rd EB	L	141	209	250	123	0.3	0.0	117.9	44.5
			TR	141	209	250	123				
		Crabtree Valley Ave NWB	L	102	94	79	97	1.0	0.1	0.1	0.0
			T	127	97	68	81				
		Edwards Mill Rd NEB	L	50	43	18	35	4.0	5.8	391.3	370.1
			R	155	215	283	187				
74	Crabtree Valley Ave, Homewood Banks Dr & Crabtree Valley Mall Entrance	Crabtree Valley Ave SEB	T	122	129	68	81	0.0	0.0	13.3	15.1
			TR	122	129	68	81				
		Crabtree Valley Mall Entrance SWB	L	61	66	28	105	7.4	10.4	337.3	541.1
			TR	104	120	113	141				
		Crabtree Valley Ave NWB	L	1	0	0	11	0.0	0.0	0.0	0.0
			TR	183	126	138	116				
75	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks Dr NEB	L	38	42	36	62	86.9	54.4	988.9	2,129.7
			TR	44	64	97	153				
		Crabtree Valley Ave SEB	L	51.6	64.3	126.0	64.0	0.2	0.4	662.3	638.0
			TR	178.4	240.0	227.2	199.2				
		Homewood Banks Dr SB	L	43	27	16	14	34.1	21.3	271.4	664.3
			T	238	279	372	440				
76	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd WB	L	109	109	169	160	0.1	0.3	557.2	630.7
			T	423	504	460	446				
		Blue Ridge Rd EB	T	290	313	396	475	0.0	0.0	11.2	705.5
			R	19	16	20	33				
		Blue Ridge Rd NEB	L	7	8	18	15	0.0	2.0	884.9	783.8
			T	456	521	431	444				
77	Browning & Six Forks Rd	Arinto Dr SEB	L	28	10	20	17	1.7	0.6	45.3	48.7
			R	3	0	2	0				
		Browning SWB	L	123	159	151	152	120.2	707.1	1,013.1	550.8
			R	170	212	192	141				
		Six Forks Rd NWB	T	645	640	619	411	0.0	0.0	0.0	0.0
			TR	615	653	634	423				
		Six Forks Rd SEB	L	65	42	30	18	3.0	2.1	0.9	0.3
			T	1,161	1,122	1,170	1,074				



Legend for Figures 9-3A to 9-3C



LOS - 4 Hour Peak

(6:00-7:00 AM)	[3:00-4:00 PM]
(7:00-8:00 AM)	[4:00-5:00 PM]
(8:00-9:00 AM)	[5:00-6:00 PM]
(9:00-10:00 AM)	[6:00-7:00 PM]

STIP I-5870
2021 Design Year No-Build
Figure 9-3A

Existing Laneage

Laneage Built By U-2719

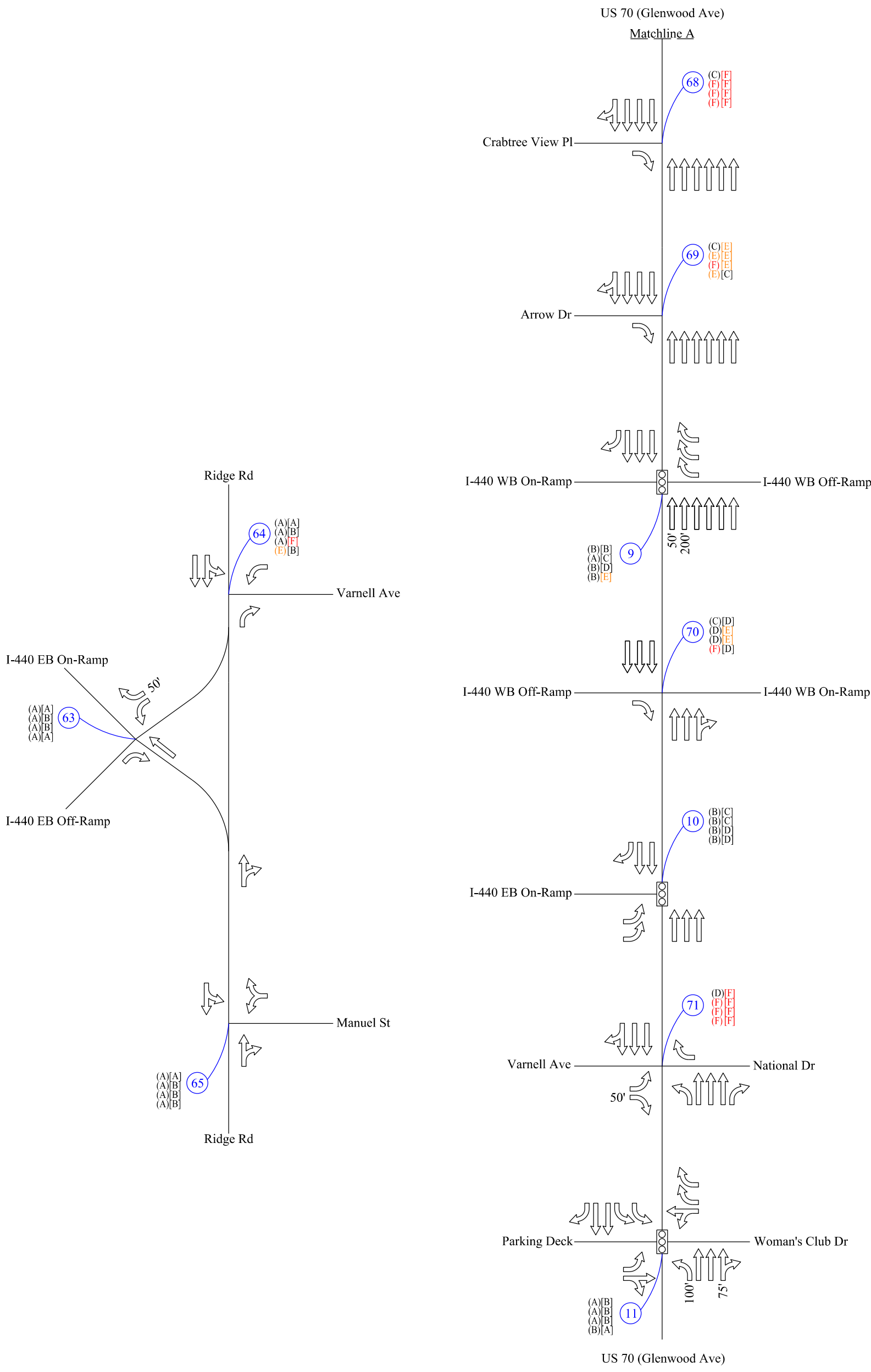
Existing Signal

Intersection Number

Overall Intersection LOS
(E in Orange)(F in Red)

XXX' Storage Length





LOS - 4 Hour Peak	
(6:00-7:00 AM)	[3:00-4:00 PM]
(7:00-8:00 AM)	[4:00-5:00 PM]
(8:00-9:00 AM)	[5:00-6:00 PM]
(9:00-10:00 AM)	[6:00-7:00 PM]

STIP I-5870
2021 Design Year No-Build
Figure 9-3C

Existing Laneage

Existing Signal

Intersection Number

Overall Intersection LOS
(AM) [PM]
(E in Orange)(F in Red)

XXX'
Storage Length

10. 2021 DESIGN YEAR BUILD ANALYSIS

This section presents a summary of the model development and results for the 2021 Design Year Build scenario and includes two alternatives. The following alternatives were evaluated for the subject project:

- Alternative 1 – 2011 City of Raleigh Study Preferred Alternative, with echelon intersection at Glenwood Avenue and Blue Ridge Road/Lead Mine Road
- Alternative 1 with I-440 Auxiliary Lane– 2011 City of Raleigh Study Preferred Alternative, with echelon intersection at Glenwood Avenue and Blue Ridge Road/Lead Mine Road and auxiliary lanes on I-440 between Ridge Road/Glenwood Ave and Lake Boone Trail off-ramp
- Alternative 2 – DDI Conceptual Alternative, with a Continuous Flow Intersection (CFI) option at Glenwood Avenue and Blue Ridge Road/Lead Mine Road
- Alternative 2 with I-440 Auxiliary Lane – DDI Conceptual Alternative, with a Continuous Flow Intersection (CFI) option at Glenwood Avenue and Blue Ridge Road/Lead Mine Road and auxiliary lanes on I-440 between Ridge Road/Glenwood Ave and Lake Boone Trail off-ramp

The build analyses were based on the conceptual designs for each alternative which are included in Appendix A.

The following sections describe the development of the build models for all alternatives. The results shown are for Alternative 1 with auxiliary lanes and Alternative 2 with auxiliary lanes. The results for both alternatives without auxiliary lanes are included in Appendices G and H.

10.1 MODEL PARAMETERS

All of the driver behaviors and parameters used in the design year no-build model were reviewed and it was determined that they would be carried forward to the design year build network.

10.2 VOLUME DATA

The development of the volume data for the 2021 build model was described in Section 6. The O-D matrices for the 2021 Design Year Build analyses are included in Appendix E. The vehicle loading and matrix settings were identical to those used in the 2017 Base Year No-Build and 2021 Design Year No-Build models.

10.3 MODEL NETWORK

The 2021 scenarios assume that all improvements in the Capital Area Metropolitan Planning Organization (CAMPO) *Metropolitan Transportation Plan (MTP)* 2025 horizon year adopted in February 2018 are included in the analysis. For the study area included in this analysis, the following projects were assumed to be completed.

- U-2719 – Widen I-440/US 1 from south of SR 1313 (Walnut Street) to north of SR 1728 (Wade Avenue)

U-2719 proposes to widen I-440 from just west of the Lake Boone Trail interchange and to construct an additional right-turn lane on the Lake Boone Trail westbound off-ramp.

10.4 SIGNAL TIMINGS AND OPERATIONS

The signal timings and operations for the 2021 Build models were re-optimized based on the new traffic volumes and design configurations. New signals include NCDOT default timings and detectors. Only the signals within the I-5870 project study area were re-optimized for the 2021 build networks. The signals at the intersections of Glenwood Ave at Fairhill Dr/Rembert Dr and Glenwood Ave at Woman's Club Dr are not currently coordinated with the rest of the Glenwood corridor within the project limits; therefore, those intersections were not reoptimized in the build models

and remain running with their current timing plans. The signals on Lake Boone Trail and Six Forks Road were analyzed using the existing timings that were used in the No-Build scenarios. The signal optimization on the Glenwood, Creedmoor, Blue Ridge, and Crabtree Valley corridors utilized the corridor optimization tool in TransModeler as a starting point. After visual assessment of the simulation, timing tweaks were made at the necessary intersections to ensure that the delay was realistically spread across all legs of the intersections. Once the timings were updated, the corridors were manually optimized using time-space diagrams and visual assessment of the simulation.

10.5 VISUAL VALIDATION OF MODEL

Quality control was performed for the 2021 Build models to ensure it was developed in a manner consistent with the current guidelines and best practices being utilized for TransModeler. The model was then visually validated by observing the model animations in the same manner that was described in Section 5. Following the conclusion of the model review process it was determined that 2021 Build models were visually valid and ready for developing detailed MOEs.

10.6 MEASURES OF EFFECTIVENESS

The MOEs extracted for the 2021 Build scenario are identical to those utilized for the 2017 Base Year No-Build and 2021 Design Year No-Build models and are discussed in detail in Section 4.

10.7 SIMULATION RUN CONTROL

The simulation model runs controls for the future year build models were identical to those included in Section 8.6 for the 2017 Base Year No-Build model.

10.8 2021 DESIGN YEAR ALTERNATIVE 1 BUILD MODEL RESULTS

The output data was extracted from the TransModeler model via the Output Manager. The outputs were collected in accordance with the MOEs defined in Section 4 and are summarized in the following sections. The results shown in this section include auxiliary lanes on I-440 between Lake Boone Trail and Crabtree Valley Ave/Ridge Rd. The results for the analysis of Alternative 1 with no auxiliary lanes on I-440 are included in Appendix G.

10.8.1 NETWORK RESULTS – ALTERNATIVE 1 WITH AUXILIARY LANES

Network-level MOEs were developed for Vehicle Hours Traveled (VHT), Vehicle Miles Traveled (VMT), Average Speed, and Total Delay. These statistics were calculated for every vehicle included in the peak hour of the simulation runs and are averaged over the ten runs performed for each scenario. For the VMT, VHT, and Total Delay, the average was calculated from completed trips, incomplete trips, queued vehicles, and loaded vehicles. The Average Speed was based only on vehicles that made completed trips. The network results the Design Year Build Alternative 1 scenario are shown in Table 10-1.

Table 10-1: 2021 Design Year Build Alternative 1 Network Wide Measures of Effectiveness

2021 Design Year Build Alt 1	Time	VHT	VMT	Average Speed (mph)	Total Delay (hr)
AM	6:00-7:00	2,074.6	71,669.3	41.0	905.9
	7:00-8:00	6,296.7	104,427.3	28.2	4,552.8
	8:00-9:00	8,533.5	101,673.1	25.3	6,817.5
	9:00-10:00	2,983.7	55,889.6	38.0	2,017.2
PM	3:00-4:00	2,691.1	102,567.1	43.4	959.4
	4:00-5:00	3,352.6	105,332.2	40.2	1,566.9
	5:00-6:00	5,624.2	113,903.8	29.6	3,688.3
	6:00-7:00	3,694.5	83,177.5	34.5	2,336.3

Travel times and average speeds through the length of the network between the major entry and exit point of the network were extract and provided in Appendix I.

10.8.2 FREEWAY RESULTS – ALTERNATIVE 1 WITH AUXILIARY LANES

The results of the freeway analysis are included in Table 10-2. The 2021 Design Year Build Alternative 1 with auxiliary lanes scenario shows that during the AM peak period, all segments on I-440 eastbound are operating at LOS_s D or better and 10 segments operating at LOS_s F in the westbound direction for two hours with seven segments operating at LOS_s F for at least three hours. Included in those 10 failing segments, five are operating at an unacceptable LOS_s E for one hour. The PM peak period shows four segments on I-440 eastbound operating at LOS_s F for one hour with nine segments operating at an unacceptable LOS_s E for at least one hour and nine segments operating at LOS_s F in the westbound direction for one hour with six segments operating at LOS_s F for at least two hours. Included in those nine failing westbound segments, three are operating at an unacceptable LOS_s E for at least one hour. The density is reported for the collector/distributor segments on westbound I-440. However, as this is just a one lane facility, the HCM freeway LOS methodology cannot be applied.

Figure 10-1 and Figure 10-2 show the average speeds for each 15-minute period in each peak across the I-440 corridor. Compared to the 2021 No-Build model and the Alternative 1 model, the eastbound direction of I-440 is projected to operate similarly during AM peak period and better in in the PM peak period. The eastbound auxiliary lane is expected to only have 30 to 45 minutes of reduced speeds around 35 mph at the Lake Boone Trail interchange, instead of 75 to 90 minutes of 15 to 25 mph speeds. Since vehicles are able to travel faster with less delay, there is expected to be some delay and reduced speeds further downstream at the Ridge Rd/Glenwood Ave off-ramp during the PM peak period.

The westbound direction is projected to operate better during both peak periods with the addition of an auxiliary lane between the Glenwood Ave/Crabtree Valley Ave on-ramp and the Lake Boone Trail off-ramp. Traffic is projected to start queuing back from the Lake Boone Trail interchange to upstream of the Six Forks Rd interchange and queue off the network with speeds under 30mph. The queuing is projected to last over two hours during the AM peak period and for one hour during the PM peak period.

Table 10-2: 2021 Design Year Build Alternative 1 with Auxiliary Lanes Freeway Measures of Effectiveness

Analysis ID	Analysis Segment	Type	AM Density				AM LOS ₅			
			6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00
1	I-440 EB - West of Lake Boone Trail Exit Ramp	Basic	12.1	22.3	22.0	15.6	B	C	C	B
2	I-440 EB - Lake Boone Trail Exit Ramp	Diverge	12.1	22.3	22.0	15.6	B	C	C	B
3	I-440 EB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	14.9	28.3	27.4	19.9	B	D	D	C
4	I-440 EB - Lake Boone Trail Entrance Ramp	Merge	11.0	22.3	21.6	16.6	B	C	C	B
5	I-440 EB - Lake Boone Trail to Ridge Road	Basic	11.0	22.3	21.6	16.6	B	C	C	B
6	I-440 EB - Ridge Rd/Glenwood Ave Exit Ramp	Diverge	11.0	22.3	21.6	16.6	B	C	C	B
7	I-440 EB - Ridge Rd/Glenwood Ave Exit Ramp to Crabtree Valley Ave Entrance Ramp	Basic	15.0	28.6	28.4	21.3	B	D	D	C
8	I-440 EB - Crabtree Valley Ave Entrance Ramp	Merge	10.3	22.4	22.4	16.8	B	C	C	B
9	I-440 EB - Crabtree Valley Ave Entrance Ramp to Glenwood Ave Entrance Loop	Basic	10.3	22.4	22.4	16.8	A	C	C	B
10	I-440 EB - Glenwood Ave Entrance Loop	Merge	14.3	26.6	26.2	21.2	B	C	C	C
11	I-440 EB - Glenwood Ave Entrance Ramp to Six Forks Rd Exit Ramp	Basic	12.7	25.3	26.1	19.8	B	C	D	C
12	I-440 EB - Six Forks Rd Exit Ramp	Diverge	9.0	18.2	19.7	15.8	A	B	B	B
13	I-440 EB - Six Forks Exit Rd Loop	Diverge	14.3	28.3	29.8	23.0	B	D	D	C
14	I-440 EB - Six Forks Exit Rd Loop to Six Forks Rd Entrance Ramp	Basic	15.4	28.5	28.7	21.7	B	D	D	C
15	I-440 EB - Six Forks Rd Entrance Ramp	Merge	7.2	13.5	13.8	10.9	A	B	B	B
16	I-440 EB - East of Six Forks Rd Entrance Ramp	Basic	11.7	22.7	23.4	17.9	B	C	C	B
17	I-440 WB - East of Six Forks Rd Exit Ramp	Basic	47.3	98.9	87.8	72.1	F	F	F	F
18	I-440 WB - Six Forks Exit Rd Loop	Diverge	31.7	74.3	63.2	38.9	D	F	F	E
19	I-440 WB - Six Forks Rd Exit Loop to Six Forks Rd Entrance Ramp	Basic	39.4	87.8	74.3	48.0	E	F	F	F
20	I-440 WB - Six Forks Rd Entrance Ramp	Merge	26.5	65.6	57.8	33.9	C	F	F	D
21	I-440 WB - Six Forks Rd Entrance Ramp to Glenwood Ave Exit Ramp	Basic	32.1	79.8	71.3	39.3	D	F	F	E
22	I-440 WB - C/D Exit Ramp to C/D Entrance Ramp	Basic	42.2	88.3	81.5	55.4	E	F	F	F
23	I-440 WB C/D - Glenwood Ave Exit Ramp	Basic	13.3	14.8	18.1	22.3				
24	I-440 WB C/D - Glenwood Ave Exit Ramp to Glenwood Entrance Loop	Basic	7.6	9.2	12.9	15.7				
25	I-440 WB C/D - Glenwood Ave Exit Loop	Diverge	3.9	7.3	8.5	10.3				
26	I-440 WB C/D - Glenwood Ave Exit Loop to Crabtree Valley Ave Entrance Ramp	Basic	2.2	5.5	6.5	6.8				
27	I-440 WB C/D - Crabtree Valley Ave Exit Ramp to Glenwood Ave Entrance Ramp	Basic	2.5	4.9	3.7	5.0				
28	I-440 WB C/D - Glenwood Ave Entrance Ramp to Crabtree Valley Entrance Ramp	Basic	10.2	16.2	13.8	12.7				
29	I-440 WB C/D - Crabtree Valley Entrance Ramp	Basic	7.0	11.5	10.2	9.0				
30	I-440 WB - C/D Entrance Ramp	Merge	38.7	76.5	67.1	51.6	E	F	F	F
31	I-440 WB - Glenwood Ave Entrance Ramp to Lake Boone Trail Exit Ramp	Basic	47.3	82.0	77.9	67.4	F	F	F	F
32	I-440 WB - Lake Boone Trail Exit Ramp	Diverge	47.3	82.0	77.9	67.4	F	F	F	F
33	I-440 WB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	47.2	61.8	59.9	59.3	F	F	F	F
34	I-440 WB - Lake Boone Trail Entrance Ramp to Wade Ave Exit Ramp	Basic	24.3	31.0	32.2	32.0	C	D	D	D
35	I-440 WB - West of Wade Ave Exit Ramp	Basic	17.3	24.4	28.7	29.6	B	C	D	D
Analysis ID	Analysis Segment	Type	Density				PM LOS ₅			
			3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00	3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00
1	I-440 EB - West of Lake Boone Trail Exit Ramp	Basic	22.0	24.9	34.3	20.7	C	C	D	C
2	I-440 EB - Lake Boone Trail Exit Ramp	Diverge	22.0	24.9	34.3	20.7	C	C	D	C
3	I-440 EB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	28.8	33.2	41.5	27.8	D	D	E	D
4	I-440 EB - Lake Boone Trail Entrance Ramp	Merge	24.7	27.5	42.4	31.8	C	C	E	D
5	I-440 EB - Lake Boone Trail to Ridge Road	Basic	24.7	27.5	42.4	31.8	C	D	E	D
6	I-440 EB - Ridge Rd/Glenwood Ave Exit Ramp	Diverge	24.7	27.5	42.4	31.8	C	C	E	D
7	I-440 EB - Ridge Rd/Glenwood Ave Exit Ramp to Crabtree Valley Ave Entrance Ramp	Basic	30.2	35.3	61.1	29.3	D	E	F	D
8	I-440 EB - Crabtree Valley Ave Entrance Ramp	Merge	23.3	32.5	46.0	24.7	C	D	F	C
9	I-440 EB - Crabtree Valley Ave Entrance Ramp to Glenwood Ave Entrance Loop	Basic	23.3	32.5	46.0	24.7	C	D	F	C
10	I-440 EB - Glenwood Ave Entrance Loop	Merge	28.2	31.4	35.3	28.3	D	D	E	D
11	I-440 EB - Glenwood Ave Entrance Ramp to Six Forks Rd Exit Ramp	Basic	28.5	33.8	39.6	28.0	D	D	E	D
12	I-440 EB - Six Forks Rd Exit Ramp	Diverge	21.6	25.0	28.9	20.3	C	C	D	C
13	I-440 EB - Six Forks Exit Rd Loop	Diverge	31.9	36.7	43.8	32.3	D	E	E	D
14	I-440 EB - Six Forks Exit Rd Loop to Six Forks Rd Entrance Ramp	Basic	32.5	40.0	49.7	32.7	D	E	F	D
15	I-440 EB - Six Forks Rd Entrance Ramp	Merge	17.6	21.5	25.0	16.4	B	C	C	B
16	I-440 EB - East of Six Forks Rd Entrance Ramp	Basic	26.6	30.6	33.8	26.0	D	D	D	D
17	I-440 WB - East of Six Forks Rd Exit Ramp	Basic	26.4	32.3	76.5	89.8	D	D	F	F
18	I-440 WB - Six Forks Exit Rd Loop	Diverge	28.3	33.2	50.6	57.5	D	D	F	F
19	I-440 WB - Six Forks Rd Exit Loop to Six Forks Rd Entrance Ramp	Basic	33.9	41.0	63.2	70.8	D	E	F	F
20	I-440 WB - Six Forks Rd Entrance Ramp	Merge	30.2	33.2	61.9	74.4	D	D	F	F
21	I-440 WB - Six Forks Rd Entrance Ramp to Glenwood Ave Exit Ramp	Basic	29.0	32.6	57.2	67.7	D	D	F	F
22	I-440 WB - C/D Exit Ramp to C/D Entrance Ramp	Basic	31.1	35.4	61.6	36.1	D	E	F	E
23	I-440 WB C/D - Glenwood Ave Exit Ramp	Basic	18.9	21.1	58.1	58.3				
24	I-440 WB C/D - Glenwood Ave Exit Ramp to Glenwood Entrance Loop	Basic	10.1	13.6	11.5	9.1				
25	I-440 WB C/D - Glenwood Ave Exit Loop	Diverge	6.6	9.3	9.2	6.1				
26	I-440 WB C/D - Glenwood Ave Exit Loop to Crabtree Valley Ave Entrance Ramp	Basic	4.6	5.7	4.8	2.6				
27	I-440 WB C/D - Crabtree Valley Ave Exit Ramp to Glenwood Ave Entrance Ramp	Basic	3.6	6.2	7.2	2.9				
28	I-440 WB C/D - Glenwood Ave Entrance Ramp to Crabtree Valley Entrance Ramp	Basic	12.1	10.0	9.4	10.2				
29	I-440 WB C/D - Crabtree Valley Entrance Ramp	Basic	9.6	7.3	6.3	6.2				
30	I-440 WB - C/D Entrance Ramp	Merge	20.1	27.2	59.5	24.5	C	C	F	C
31	I-440 WB - Glenwood Ave Entrance Ramp to Lake Boone Trail Exit Ramp	Basic	28.7	39.8	76.6	39.1	D	E	F	E
32	I-440 WB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	49.7	55.9	59.6	48.6	F	F	F	F
33	I-440 WB - Lake Boone Trail Entrance Ramp to Wade Ave Exit Ramp	Basic	28.8	31.4	32.8	28.9	D	D	D	D
34	I-440 WB - Wade Ave Exit Ramp	Diverge	28.8	31.4	32.8	28.9	D	D	D	D
35	I-440 WB - West of Wade Ave Exit Ramp	Basic	23.5	27.8	29.8	27.5	C	D	D	D

Figure 10-1: 2021 Design Year Build Alternative 1 with Aux Lanes Eastbound Freeway Speeds

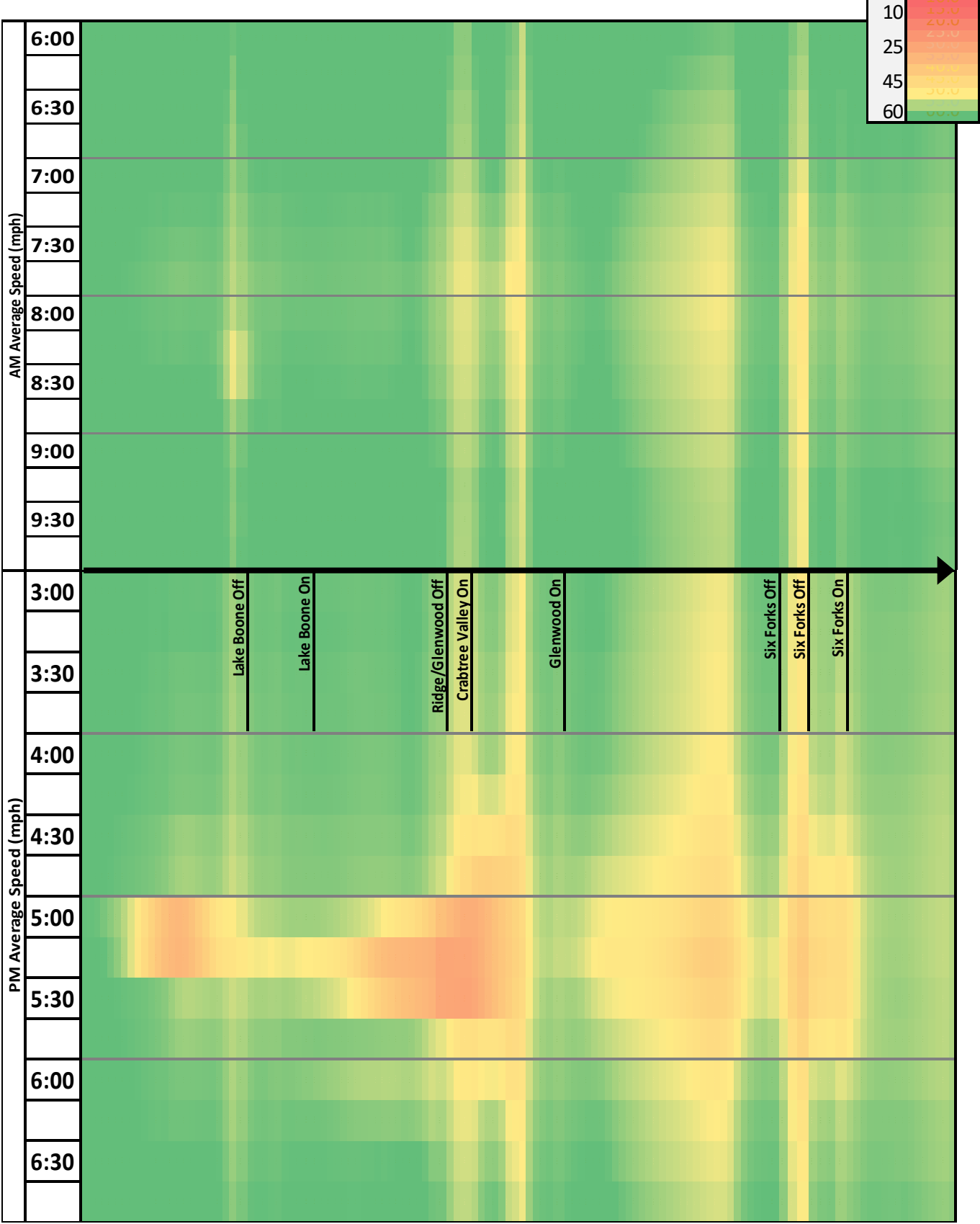
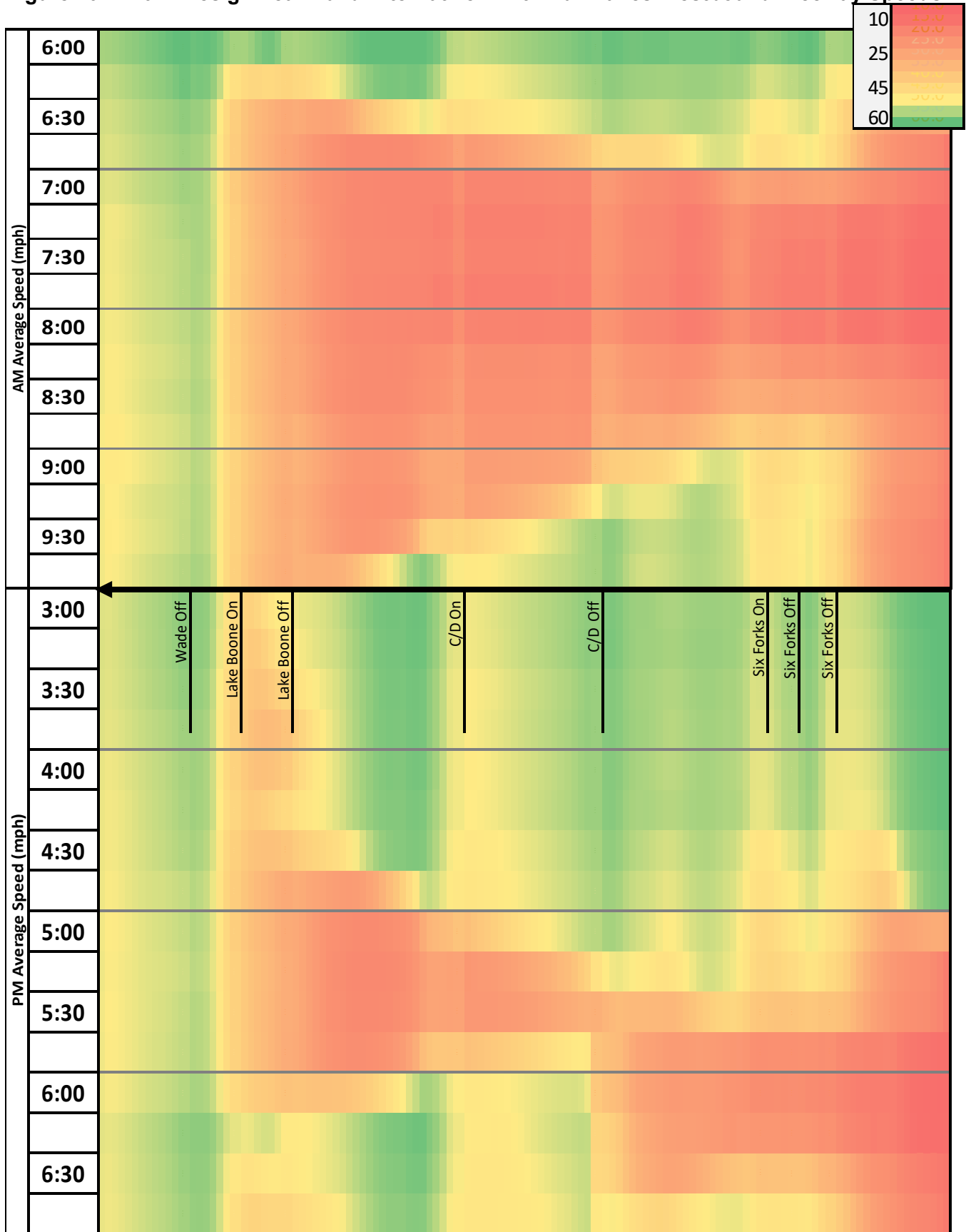


Figure 10-2: 2021 Design Year Build Alternative 1 with Aux Lanes Westbound Freeway Speeds



10.8.3 ARTERIAL/INTERSECTION RESULTS – ALTERNATIVE 1 WITH AUXILIARY LANES

The results of the intersection analysis along the arterial portions of the study area are included in Table 10-3 and Figure 10-3. It should be noted that the tables and figures include the results of the analysis for intersections along Lake Boone Trail and Six Forks Road; however, only the intersections in the I-5870 project study area will be summarized below.

The overall intersection LOS for signalized intersections in the 2021 Design Year Build Alternative 1 scenario shows that eight of the 13 project study area intersections are operating at LOS_s E or F in either the AM or PM peak period. These intersections are listed below and include the number of lane groups that are E or F.

AM peak hour

- Glenwood Ave at Creedmoor Rd operates at LOS_s E or F for three hours
 - 11 lane groups operate at LOS_s E or F
- Glenwood Ave EB at Blue Ridge Rd/Lead Mine Rd (lower echelon) operates at LOS_s E for one hour
 - 3 lane groups operate at LOS_s E or F

PM peak hour

- Glenwood Ave at Creedmoor Rd operates at LOS_s F for four hours
 - 11 lane groups operate at LOS_s E or F
- Glenwood Ave at Marriott Dr/Crabtree Valley Mall Entrance operates at LOS_s E or F for two hours
 - 8 lane groups operate at LOS_s E or F
- Glenwood Ave EB at Blue Ridge Rd/Lead Mine Rd (lower echelon) operates at LOS_s E or F for two hours
 - 5 lane groups operate at LOS_s E or F
- Glenwood Ave WB at Blue Ridge Rd/Lead Mine Rd NB (upper echelon) operates at LOS_s E for one hour
 - 2 lane groups operate at LOS_s E or F
- Creedmoor Rd at Crabtree Valley Ave operates at LOS_s F for one hour
 - 5 lane groups operate at LOS_s E or F
- Creedmoor Rd at Crabtree Valley Mall Entrance/Office Drwy operates at LOS_s F for one hour
 - 7 lane groups operate at LOS_s E or F
- Blue Ridge Rd at Crabtree Valley Ave/Summit Park Ln operates at LOS_s E for two hours
 - 7 lane groups operate at LOS_s E or F
- Lead Mine Rd at North Hills Dr operates at LOS_s E for one hour
 - 8 lane groups operate at LOS_s E or F

The overall intersection LOS for signalized intersections in the 2021 Design Year Build Alternative 1 scenario shows that multiple intersections are operating at LOS_s D or better in both the AM and PM peak periods; however, these locations have at least one lane group with a LOS_s E or F. These intersections are listed below and include the number of lane groups that are E or F.

AM peak hour

- Glenwood Ave at Fairhill Dr/Rembert Dr operates at a LOS_s A and B
 - 5 lane groups operate at LOS_s E or F for four hours
- Glenwood Ave at Marriot Dr/Crabtree Valley Mall Entrance operates at a LOS_s A
 - 5 lane groups operate at LOS_s E or F for four hours
- Glenwood Ave WB at Blue Ridge Rd/Lead Mine Rd NB (upper echelon) operates at a LOS_s A
 - 1 lane group operates at LOS_s E for one hour

- Glenwood Ave at I-440 EB Ramps/Ridge Rd operates at a LOS_s A and B
 - 1 lane group operates at LOS_s F for two hours
- Glenwood Ave at Woman's Club Dr operates at LOS_s A
 - 6 lane groups operate at LOS_s E or F for at least two hours
- Creedmoor Rd at Crabtree Valley Ave operates at LOS_s A and B
 - 1 lane group operates at LOS_s E for four hours
- Creedmoor Rd at Office Driveway/Crabtree Valley Mall Entrance operates at LOS_s A
 - 5 lane groups operate at LOS_s E or F for at least two hours
- Crabtree Valley Ave at Homewood Banks Dr/Crabtree Valley Mall Entrance operates at a LOS_s C
 - 5 lane groups operate at LOS_s E or F for at least two hours
- Blue Ridge Rd at Crabtree Valley Ave/Summit Park Ln operates at a LOS_s B
 - 5 lane groups operate at LOS_s E for at least one hour
- Lead Mine Rd at North Hills Dr operates at a LOS_s B, C and D
 - 6 lane groups operate at LOS_s E or F for at least two hours

PM peak hour

- Glenwood Ave at Fairhill Dr/Rembert Dr operates at a LOS_s A and B
 - 5 lane groups operate at LOS_s F for four hours
- Glenwood Ave at I-440WB off-ramp operates at a LOS_s A, C, and D
 - 1 lane group operates at LOS_s F for two hours
- Glenwood Ave at I-440 EB off-ramp operates at a LOS_s D
 - 4 lane groups operate at LOS_s E or F for at least two hours
- Glenwood Ave at Woman's Club Dr operates at LOS_s A and B
 - 6 lane groups operate at LOS_s E or F for at least three hours
- Crabtree Valley Ave at Homewood Banks Dr/Crabtree Valley Mall Entrance operates at LOS_s C and D
 - 6 lane groups operate at LOS_s E or F for at least one hour
- Blue Ridge Rd at Crabtree Valley Ave Quadrant operates at a LOS_s A, B, and D
 - 3 lane groups operate at LOS_s E or F for at least one hour

Based on a review of the unsignalized intersections, there are six intersections that have at least one movement that operates at LOS_s E or F in either of the peak periods. These intersections are listed below and include the movements that operates at E or F.

AM peak hour

- Glenwood Ave at Morehead Dr
 - Westbound left-turn/right-turn operates at LOS_s E or F for four hours
 - Southbound left-turn operates at LOS_s E for one hour
- Glenwood Ave at Crabtree Valley Mall Entrance
 - Northbound right-turn operates at LOS_s E or F for three hours
- Glenwood Ave at Arrow Dr
 - Northbound right-turn operates at LOS_s F for three hours
- Glenwood Ave at Varnell Ave/National Dr
 - Eastbound left-turn/right-turn operates at LOS_s F for three hours
- Creedmoor Rd at Bank Drwy
 - Southbound left-turn operates at LOS_s E for one hour
 - Southbound right-turn operates at LOS_s E or F for two hours

PM peak hour

- Glenwood Ave at Morehead Dr
 - Westbound left-turn/right-turn operates at LOS_s F for four hours
 - Southbound left-turn operates at LOS_s E for three hours
- Glenwood Ave at Crabtree Valley Mall Entrance
 - Northbound right-turn operates at LOS_s F for three hours
- Glenwood Ave at Arrow Dr
 - Northbound right-turn operates at LOS_s F for four hours
- Glenwood Ave at Varnell Ave/National Dr
 - Westbound right-turn operates at LOS_s E or F for two hours
 - Eastbound left-turn/right-turn operates at LOS_s F for four hours
- Creedmoor Rd at Bank Drwy
 - Southbound left-turn operates at LOS_s F for two hours
 - Southbound right-turn operates at LOS_s E for one hour
- Blue Ridge Rd at Crabtree Valley Mall Entrance
 - Eastbound right-turn operates at LOS_s E or F for three hours

Table 10-3: 2021 Design Year Build Alternative 1 with Aux Lanes Intersection Delay and LOS

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
1	Lake Boone Trail & Wycliff Rd	Overall		16.6	19.1	20.3	17.9	B	B	C	B
		Wycliff Rd SB	L	54.6	57.1	60.9	61.6	D	E	E	E
			R	38.3	38.9	39.5	38.9	D	D	D	D
		Lake Boone Trail WB	T	9.3	12.2	12.6	11.4	A	B	B	B
			R	4.1	6.2	6.5	5.4	A	A	A	A
		Lake Boone Trail EB	L	8.6	12.7	23.2	14.8	A	B	C	B
T	4.9		4.4	4.8	4.9	A	A	A	A		
2	Lake Boone Trail & I-440 WB Ramps	Overall		25.3	21.5	21.5	26.0	C	C	C	C
		SB	LT	55.3	56.3	54.3	47.5	E	E	D	D
			R	49.6	51.6	48.1	43.7	D	D	D	D
		Lake Boone Trail WB	L	17.2	19.5	23.6	29.7	B	B	C	C
			T	11.7	10.8	13.2	15.8	B	B	B	B
		Lake Boone Trail EB	T	9.6	10.6	13.2	19.8	A	B	B	B
R	8.7		10.1	11.8	18.7	A	B	B	B		
3	Lake Boone Trail & Ridge Rd	Overall		12.2	17.3	16.0	15.0	B	B	B	B
		Ridge Rd SB	L	24.3	20.9	28.7	24.2	C	C	C	C
			TR	23.8	19.3	19.4	19.8	C	B	B	B
		WB	L	10.9	17.8	20.9	17.3	B	B	C	B
			T	4.3	9.7	9.7	6.9	A	A	A	A
		TR	4.4	9.8	9.6	7.3	A	A	A	A	
		Ridge Rd NB	L	34.3	88.9	68.5	61.3	C	F	E	E
			TR	26.7	15.8	15.7	16.2	C	B	B	B
		Lake Boone Trail EB	L	10.5	19.6	22.5	15.5	B	B	C	B
			T	5.1	14.4	13.0	12.9	A	B	B	B
4	Ridge Rd & Glen Eden Dr	TR		5.5	10.6	9.4	8.0	A	B	A	A
		Overall		20.6	25.1	24.8	22.2	C	C	C	C
		SB	L	7.7	20.7	17.4	17.7	A	C	B	B
			TR	7.6	14.1	14.7	13.1	A	B	B	B
		Glen Eden Dr WB	L	48.8	43.3	45.1	43.6	D	D	D	D
			TR	39.9	39.2	38.3	35.7	D	D	D	D
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Ridge Rd NB	L	9.4	20.0	24.2	20.5	A	C	C	C
			TR	7.6	12.3	12.9	10.4	A	B	B	B
		Glen Eden Dr EB	L	55.6	49.8	55.1	50.4	E	D	E	D
			TR	34.0	23.5	23.4	26.2	C	C	C	C
		Overall		6.0	9.7	12.1	10.4	A	A	B	B
6	Glenwood Ave & Creedmoor Rd	Rembert Dr SWB	LTR	101.2	79.0	83.3	85.5	F	E	F	F
		Glenwood Ave NWB	L	102.2	92.6	85.4	85.3	F	F	F	F
			T	3.1	5.8	8.1	6.1	A	A	A	A
		Fairhill Dr NEB	TR	3.7	5.8	8.6	6.6	A	A	A	A
			L	99.4	86.8	97.0	86.2	F	F	F	F
		Glenwood Ave SEB	TR	92.7	81.0	72.2	81.0	F	F	E	F
			L	132.3	114.3	107.3	114.5	F	F	F	F
		Creedmoor Rd NEB	T	2.8	5.9	8.0	5.6	A	A	A	A
			TR	3.3	6.6	8.4	6.2	A	A	A	A
		7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Overall		53.9	76.3	127.1	71.5	D	E
Creedmoor Rd SWB	L			84.0	133.2	198.9	107.6	F	F	F	F
	T			77.3	92.0	160.5	90.2	E	F	F	F
Glenwood Ave WB	TR			67.9	86.1	152.6	84.3	E	F	F	F
	L			104.3	88.7	84.9	85.6	F	F	F	F
Creedmoor Rd NEB	T			40.1	53.8	64.9	60.8	D	D	E	E
	L			72.1	79.6	80.7	67.4	E	E	F	E
Glenwood Ave EB	T			62.6	57.1	57.8	59.3	E	E	E	E
	R			76.6	58.3	61.1	61.0	E	E	E	E
8	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd (Lower)			Overall		5.3	4.9	7.9	6.6	A	A
		Marriott Dr SWB	L	103.8	87.9	84.5	90.2	F	F	F	F
			TR	--	--	--	--	--	--	--	--
		Glenwood Ave NWB	L	112.1	109.2	100.8	97.7	F	F	F	F
			T	5.3	6.2	8.9	6.4	A	A	A	A
		Crabtree Valley Mall Entrance NEB	TR	5.5	6.0	8.9	6.5	A	A	A	A
			LT	--	114.6	116.3	116.0	--	F	F	F
		Glenwood Ave SEB	R	107.8	84.5	80.3	78.0	F	F	F	E
			L	97.9	122.9	120.5	104.2	F	F	F	F
		9	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd (Lower)	Lead Mine Rd SWB	T	1.8	0.1	2.4	1.0	A	A
TR	1.9				0.3	2.8	1.3	A	A	A	A
Lead Mine Rd SWB	L			33.2	36.4	70.0	48.0	C	D	E	D
	LT			35.0	52.7	112.5	63.7	D	D	F	E
Glenwood Ave SEB	T			50.8	41.3	92.6	69.5	D	D	F	E
	L			10.5	9.6	20.6	10.9	B	A	C	B

Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²					
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM		
9	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd (Upper)	Glenwood Ave NWB	Overall	5.5	7.1	7.6	8.5	A	A	A	A		
			L	5.7	6.8	7.7	7.7	A	A	A	A		
			T	4.1	4.8	5.8	7.1	A	A	A	A		
		Blue Ridge Rd NEB	R	3.7	3.9	4.1	4.0	A	A	A	A		
			L	63.4	53.9	48.4	47.9	E	D	D	D		
10	Glenwood Ave & I-440 WB Off-Ramp	Glenwood Ave NWB	T	53.3	42.0	40.8	42.3	D	D	D	D		
			Overall	10.5	6.6	6.6	8.2	B	A	A	A		
			T	30.2	29.7	27.5	25.0	C	C	C	C		
11	Glenwood Ave & I-440 EB Ramps/Ridge Rd	Glenwood Ave NWB	T	4.7	4.5	5.0	6.9	A	A	A	A		
			Overall	7.7	15.7	19.1	15.8	A	B	B	B		
			L	103.8	--	--	92.5	F	--	--	F		
		I-440 EB Off-Ramp/Ridge Rd EB	T	5.0	8.0	8.0	7.4	A	A	A	A		
			R	7.8	8.0	8.7	7.9	A	A	A	A		
			L	36.9	34.0	34.6	34.0	D	C	C	C		
			T	27.8	23.1	25.8	24.4	C	C	C	C		
			R	38.2	35.2	34.9	34.4	D	D	C	C		
			T	4.5	8.1	10.6	8.5	A	A	B	A		
		Glenwood Ave SEB	R	3.1	24.1	33.7	24.1	A	C	C	C		
			12	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	Overall	5.0	7.2	9.7	10.3	A	A	A
L	58.2	54.8				51.5	56.2	E	D	D	E		
T	0.4	2.5				4.0	3.7	A	A	A	A		
Womans Club Dr WB	R	2.5			4.2	5.9	4.7	A	A	A	A		
	LT	103.4			82.6	75.7	69.5	F	F	E	E		
Glenwood Ave NB	R	73.8			62.8	43.8	49.0	E	E	D	D		
	L	--			83.1	80.0	86.4	--	F	E	F		
Parking Deck EB	T	2.4			6.3	8.8	8.5	A	A	A	A		
	TR	3.2			6.7	8.9	8.9	A	A	A	A		
13	Creedmoor Rd & Crabtree Valley Avenue	Creedmoor Rd SWB			L	--	150.6	94.6	75.9	--	F	F	E
					TR	--	144.6	86.1	115.0	--	F	F	F
			Overall	7.2	7.9	10.6	9.3	A	A	B	A		
		NWB	L	77.7	59.3	73.4	79.1	E	E	E	E		
			T	0.4	2.1	3.7	1.5	A	A	A	A		
		Creedmoor Rd NEB	L	40.7	33.0	29.1	30.5	D	C	C	C		
			R	45.7	29.5	25.0	32.4	D	C	C	C		
		Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	T	4.1	7.2	8.7	6.7	A	A	A	A	
				TR	4.2	8.0	10.2	7.9	A	A	B	A	
				Overall	5.2	3.1	7.9	7.9	A	A	A	A	
			Crabtree Valley Mall Entrance NWB	L	67.7	57.4	48.9	55.4	E	E	D	E	
T	0.3			0.9	5.1	1.5	A	A	A	A			
TR	0.3	0.9		5.1	1.7	A	A	A	A				
Creedmoor Rd NEB	LT	58.3		57.4	49.1	49.9	E	E	D	D			
	R	39.3		41.6	39.3	31.4	D	D	D	C			
Office Drwy SEB	L	--		79.6	52.6	55.6	--	E	D	E			
	T	2.7	3.3	7.6	6.4	A	A	A	A				
14	Crabtree Valley Ave, & Homewood Banks Dr / Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NWB	TR	4.4	4.2	8.8	8.7	A	A	A	A		
			LT	--	--	84.1	76.9	--	--	F	E		
			R	--	81.4	68.2	77.7	--	F	E	E		
		Creedmoor Rd NEB	Overall	21.4	21.6	21.0	22.1	C	C	C	C		
			L	61.1	51.9	58.6	52.5	E	D	E	D		
			TR	51.7	44.3	42.6	44.4	D	D	D	D		
		Crabtree Valley Ave NWB	L	85.5	92.6	89.0	74.7	F	F	F	E		
			T	13.2	16.2	16.4	16.1	B	B	B	B		
			R	12.9	17.8	17.3	18.5	B	B	B	B		
		Crabtree Valley Ave SEB	L	135.7	88.5	119.1	112.0	F	F	F	F		
			TR	61.0	55.8	62.9	68.8	E	E	E	E		
L	52.3		62.0	59.0	60.6	D	E	E	E				
15	Blue Ridge Rd & Crabtree Valley Ave Quadrant	Blue Ridge Rd SWB	T	8.5	8.8	8.9	10.9	A	A	A	B		
			TR	17.4	10.4	12.4	11.5	B	B	B	B		
			Overall	3.4	5.3	6.5	5.6	A	A	A	A		
		Blue Ridge Rd NEB	T	0.4	1.2	1.6	0.8	A	A	A	A		
			R	8.0	17.7	16.1	12.7	A	B	B	B		
16	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Blue Ridge Rd SWB	L	60.2	41.6	40.5	38.7	E	D	D	D		
			T	0.2	0.3	0.4	0.4	A	A	A	A		
			CR	117.1	105.2	63.1	47.8	F	F	E	D		
		Summit Park Ln NWB	LR	117.1	105.2	63.1	47.8	F	F	E	D		
			Overall	12.9	12.0	13.6	14.2	B	B	B	B		
17	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Blue Ridge Rd SWB	L	63.3	62.6	64.8	72.5	E	E	E	E		
			T	1.0	1.9	1.9	2.4	A	A	A	A		
			TR	3.9	12.8	14.8	12.0	A	B	B	B		
		Summit Park Ln NWB	L	51.0	44.8	45.6	46.8	D	D	D	D		
			TR	57.5	47.1	49.1	49.7	E	D	D	D		
			L	73.5	54.2	48.6	46.0	E	D	D	D		
		Blue Ridge Rd NEB	T	6.5	7.2	7.1	6.1	A	A	A	A		
			TR	4.9	6.3	6.6	5.8	A	A	A	A		
		Crabtree Valley Ave SEB	L	62.7	46.5	47.3	47.0	E	D	D	D		
			TR	59.3	50.0	40.1	51.5	E	D	D	D		

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
18	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	Overall	14.2	20.7	44.6	24.0	B	C	D	C
			L	69.2	74.1	110.3	74.0	E	E	F	E
			T	5.2	15.7	60.9	24.0	A	B	E	C
			TR	4.8	14.3	36.8	16.6	A	B	D	B
		North Hills Dr WB	L	53.8	43.1	68.0	59.2	D	D	E	E
			LTR	48.3	42.1	43.6	47.2	D	D	D	D
		Lead Mine Rd NB	L	99.3	92.9	109.9	92.1	F	F	F	F
			T	8.0	14.6	16.8	12.7	A	B	B	B
		North Hills Dr EB	R	19.9	26.8	25.7	19.1	B	C	C	B
			L	--	67.7	61.0	--	--	E	E	--
19	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	Overall	22.2	41.5	74.4	50.6	C	D	E	D
			L	74.2	179.8	321.1	283.8	E	F	F	F
			T	60.9	98.5	185.2	149.6	E	F	F	F
			R	79.6	94.9	182.6	140.5	E	F	F	F
		Six Forks Rd NWB	L	66.0	85.4	88.2	84.5	E	F	F	F
			T	6.3	10.1	10.2	9.8	A	B	B	A
		Main Street NEB	R	3.3	5.3	4.6	4.6	A	A	A	A
			L	87.2	84.3	78.0	78.6	F	F	E	E
		Six Forks Rd SEB	TR	79.4	77.8	73.2	72.9	E	E	E	E
			L	81.4	75.1	198.7	74.2	F	E	F	E
20	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	T	15.9	38.6	91.4	26.8	B	D	F	C
			TR	18.4	46.6	71.7	29.6	B	D	E	C
		Six Forks NWB	Overall	13.4	19.6	19.4	16.3	B	B	B	B
			L	78.6	66.1	63.4	65.6	E	E	E	E
		I-440 WB Off-Loop	T	64.5	63.8	63.9	65.2	E	E	E	E
			R	67.2	57.0	49.2	49.5	E	E	D	D
		Six Forks Rd SEB	L	72.8	89.7	92.7	94.4	E	F	F	F
			T	7.2	6.8	7.1	6.9	A	A	A	A
		Six Forks Rd SEB	R	2.2	3.6	3.6	3.0	A	A	A	A
			L	6.7	12.1	14.1	13.0	A	B	B	B
21	Six Forks Rd & I-440 WB Off-Ramp	I-440 WB Off-Ramp	L	84.9	47.0	55.7	56.1	F	D	E	E
			T	6.3	11.2	14.6	8.8	A	B	B	A
		Six Forks Rd NWB	R	7.0	25.8	24.6	13.0	A	C	C	B
22	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	Overall	13.8	19.1	31.5	17.1	B	B	C	B
			L	62.2	62.7	94.1	63.8	E	E	F	E
			T	3.1	18.0	25.7	16.2	A	B	C	B
			TR	3.1	18.0	25.7	16.2	A	B	C	B
		Ramblewood Dr NEB	Overall	25.2	31.1	31.4	25.3	C	C	C	C
			L	103.9	82.3	74.8	71.4	F	F	E	E
		Six Forks Rd SEB	T	10.0	21.1	22.2	19.3	A	C	C	B
			TR	9.1	22.8	23.2	18.5	A	C	C	B
		Six Forks Rd SEB	L	76.6	95.9	97.4	70.7	E	F	F	E
			T	76.4	93.4	103.5	69.5	E	F	F	E
23	Six Forks Rd & Barrett Dr	Six Forks Rd SB	R	61.1	86.9	86.1	59.4	E	F	F	E
			L	65.1	63.2	66.9	66.8	E	E	E	E
		Barrett Dr WB	T	12.0	16.6	18.1	13.7	B	B	B	B
			TR	8.7	14.3	14.9	13.2	A	B	B	B
		Six Forks Rd NB	Overall	17.7	26.0	28.2	15.4	B	C	C	B
			L	952.2	1170.2	445.7	125.6	F	F	F	F
		Six Forks Rd NB	T	3.8	19.1	14.1	8.9	A	B	B	A
			L	150.1	96.1	89.9	85.6	F	F	F	F
		Six Forks Rd NB	R	200.9	116.7	77.9	72.1	F	F	E	E
			T	0.4	3.8	6.6	7.9	A	A	A	A
61	Lake Boone Trail & Shopping Center Drwy / Myron Dr	Lake Boone Trail WB	TR	0.4	3.8	6.9	7.6	A	A	A	A
			L	13.5	33.7	172.6	43.1	B	D	F	E
62	Lake Boone Trail & I-440 EB Off-Loop	I-440 EB Off-Loop	R	8.4	16.7	149.2	11.5	A	C	F	B
			LR	6.7	5.3	5.0	5.4	A	A	A	A
63	Manuel St & Varnell Ave	Manuel St WB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			LT	0.0	0.1	0.3	0.1	A	A	A	A
64	Ridge Rd & Manuel St	Ridge Rd SB	LT	0.0	0.1	0.1	0.1	A	A	A	A
			LR	9.5	10.1	8.7	9.4	A	B	A	A
65	Glenwood Ave & Morehead Dr	Glenwood Ave NWB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			L	15.9	--	43.6	21.0	C	--	E	C
65	Glenwood Ave & Morehead Dr	Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
61	Lake Boone Trail & Shopping Center Drwy / Myron Dr	Shopping Center Drwy SB	R	12.5	14.9	25.2	17.2	B	B	D	C
			L	4.8	9.6	13.5	11.9	A	A	B	B
		Lake Boone Trail WB	T	0.2	0.4	1.2	0.4	A	A	A	A
			TR	0.1	0.2	0.9	0.2	A	A	A	A
		Myron Dr NB	R	8.6	11.0	13.2	13.0	A	B	B	B
			T	0.0	0.0	0.0	0.0	A	A	A	A
62	Lake Boone Trail & I-440 EB Off-Loop	I-440 EB Off-Loop	TR	0.0	0.0	0.0	0.0	A	A	A	A
			L	13.5	33.7	172.6	43.1	B	D	F	E
63	Manuel St & Varnell Ave	Manuel St WB	R	8.4	16.7	149.2	11.5	A	C	F	B
			LR	6.7	5.3	5.0	5.4	A	A	A	A
64	Ridge Rd & Manuel St	Ridge Rd SB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			LT	0.0	0.1	0.3	0.1	A	A	A	A
65	Glenwood Ave & Morehead Dr	Glenwood Ave NWB	LR	9.5	10.1	8.7	9.4	A	B	A	A
			LT	0.0	0.1	0.1	0.1	A	A	A	A
65	Glenwood Ave & Morehead Dr	Glenwood Ave SEB	LR	39.9	56.9	92.6	60.3	E	F	F	F
			T	0.0	0.0	0.0	0.0	A	A	A	A
65	Glenwood Ave & Morehead Dr	Glenwood Ave SEB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			L	15.9	--	43.6	21.0	C	--	E	C
65	Glenwood Ave & Morehead Dr	Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
66	Glenwood Ave & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NEB	R	12.9	35.8	128.2	81.5	B	E	F	F
		Glenwood Ave SEB	T	0.2	0.2	0.0	0.1	A	A	A	A
			TR	0.2	0.2	0.1	0.1	A	A	A	A
67	Glenwood Ave & Crabtree View Place	Crabtree View Place NEB	R	18.2	207.3	385.5	90.5	C	F	F	F
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
68	Glenwood Ave & Arrow Dr	Arrow Dr NEB	R	19.2	256.5	1944.6	1037.9	C	F	F	F
		Glenwood Ave SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
69	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	0.0	0.1	0.5	0.3	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		National Dr WB	R	12.0	16.2	10.4	10.3	B	C	B	B
		Glenwood Ave NB	L	14.9	29.6	34.2	23.3	B	D	D	C
			T	0.0	0.0	0.1	0.1	A	A	A	A
			R	--	0.0	0.0	0.0	--	A	A	A
		Varnell Ave EB	LR	25.4	369.4	1190.0	878.1	D	F	F	F
70	Creedmoor Rd & Bank Drwy	Creedmoor Rd SWB	T	0.0	0.1	0.2	0.1	A	A	A	A
			TR	0.0	0.1	0.2	0.0	A	A	A	A
		Creedmoor Rd NEB	LT	0.1	0.0	0.0	0.0	A	A	A	A
			T	0.0	0.0	0.1	0.0	A	A	A	A
		Bank Drwy SEB	L	--	--	47.9	27.5	--	--	E	D
			R	--	--	51.0	37.1	--	--	F	E
71	Crabtree Valley Ave & Crabtree Apt/Mall Entrance	Apt Drwy/ Mall Entrance SB	L	7.4	11.4	11.8	12.2	A	B	B	B
			R	6.4	6.8	7.7	7.0	A	A	A	A
		Crabtree Valley Ave WB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Crabtree Valley Ave EB	L	2.4	2.3	3.2	3.9	A	A	A	A
			T	0.0	0.0	0.0	0.0	A	A	A	A
72	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks Dr SB	L	13.6	23.3	19.8	17.3	B	C	C	C
			T	0.0	0.0	0.0	0.0	A	A	A	A
		Blue Ridge Rd EB	LT	1.5	4.0	1.1	0.4	A	A	A	A
73	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd SWB	T	0.3	1.3	0.3	0.2	A	A	A	A
			T	0.0	0.0	0.0	0.0	A	A	A	A
		Blue Ridge Rd NEB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			LT	0.0	0.0	0.0	0.0	A	A	A	A
		Arinto Dr SEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			L	9.7	22.0	20.3	15.2	A	C	C	C
74	Blue Ridge Rd & Crabtree Valley Mall Entrance	Blue Ridge Rd SB	R	--	--	--	--	--	--	--	--
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Crabtree Valley Mall Entrance EB	R	6.7	12.9	11.8	8.4	A	B	B	A
75	Lead Mine Rd & North Hills Dr	North Hills Dr WB	R	8.8	11.8	12.2	13.6	A	B	B	B
		Lead Mine Rd NB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
76	North Hills Dr & Lead Mine Connector	Lead Mine Connector SB	L	5.9	8.8	9.8	9.8	A	A	A	A
			R	--	--	--	--	--	--	--	--
		North Hills Dr WB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			L	2.4	4.4	7.3	2.9	A	A	A	A
		North Hills Dr EB	T	0.0	0.0	0.0	0.0	A	A	A	A
77	Browning & Six Forks Rd	Browning SWB	L	14.4	36.4	73.2	56.7	B	E	F	F
			R	7.3	8.2	11.6	11.6	A	A	B	B
		Six Forks Rd NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Six Forks Rd SEB	L	3.5	9.3	13.8	12.2	A	A	B	B
			T	0.1	1.4	2.1	1.2	A	A	A	A

Notes:

- 1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations
- 2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies
- 3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	Overall	22.7	47.1	153.5	50.5	C	D	F	D
			L	37.4	64.1	235.0	38.7	D	E	F	D
		Lake Boone Trail WB	R	20.3	23.8	120.8	21.3	C	C	F	C
			T	24.2	23.3	22.5	25.0	C	C	C	C
		Lake Boone Trail EB	R	10.3	9.1	6.8	9.0	B	A	A	A
			L	23.2	54.8	215.8	76.5	C	D	F	E
		T	19.0	61.0	216.7	77.7	B	E	F	E	
2	Lake Boone Trail & I-440 WB Ramps	Overall	23.5	29.9	32.9	22.2	C	C	C	C	
		SB	LT	47.9	47.6	60.0	48.0	D	D	E	D
			R	45.1	44.3	43.5	44.2	D	D	D	D
		Lake Boone Trail WB	L	36.8	39.0	39.0	26.7	D	D	D	C
			T	6.2	5.9	7.1	6.2	A	A	A	A
		Lake Boone Trail EB	T	29.7	44.1	48.3	24.3	C	D	D	C
			R	15.6	15.1	15.5	14.7	B	B	B	B
3	Lake Boone Trail & Ridge Rd	Overall	13.4	15.0	24.2	12.5	B	B	C	B	
		Ridge Rd SB	L	34.2	32.7	32.6	28.8	C	C	C	C
			TR	18.8	19.1	20.0	21.5	B	B	C	C
		Lake Boone Trail WB	L	14.7	19.2	37.2	16.5	B	B	D	B
			T	7.1	8.9	15.6	5.7	A	A	B	A
		Ridge Rd NB	TR	6.9	8.5	15.2	5.7	A	A	B	A
			L	34.5	50.8	73.7	35.7	C	D	E	D
		Lake Boone Trail EB	TR	18.9	16.5	12.1	19.3	B	B	B	B
			L	14.1	18.3	115.4	14.1	B	B	F	B
			T	12.8	14.4	24.3	11.4	B	B	C	B
TR	7.4		10.4	21.4	7.3	A	B	C	A		
4	Ridge Rd & Glen Eden Dr	Overall	23.3	44.5	93.7	82.2	C	D	F	F	
		SB	L	18.9	23.9	37.5	20.5	B	C	D	C
			TR	13.4	17.3	20.1	18.6	B	B	C	B
		Glen Eden Dr WB	L	39.7	150.2	581.5	229.7	D	F	F	F
			TR	39.9	85.7	381.5	201.0	D	F	F	F
		Ridge Rd NB	L	16.9	26.2	51.6	26.9	B	C	D	C
			TR	12.4	14.3	17.4	15.2	B	B	B	B
		Glen Eden Dr EB	L	41.5	73.4	89.9	43.9	D	E	F	D
TR	22.1		36.2	49.6	20.8	C	D	D	C		
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Overall	8.8	9.8	10.3	7.5	A	A	B	A	
		Rembert Dr SWB	LTR	86.6	94.5	87.3	94.3	F	F	F	F
			L	90.5	87.1	82.1	83.8	F	F	F	F
		Glenwood Ave NWB	T	3.5	4.1	4.8	3.8	A	A	A	A
			TR	4.3	4.5	5.4	4.1	A	A	A	A
		Fairhill Dr NEB	L	99.1	105.3	121.5	92.6	F	F	F	F
			TR	94.8	87.8	82.2	92.0	F	F	F	F
		Glenwood Ave SEB	L	111.2	99.7	98.3	119.2	F	F	F	F
T	5.2		6.9	6.7	5.1	A	A	A	A		
6	Glenwood Ave & Creedmoor Rd	Overall	87.0	112.1	136.3	139.0	F	F	F	F	
			L	472.7	654.8	631.9	475.0	F	F	F	F
		Creedmoor Rd SWB	T	140.0	209.8	224.5	604.7	F	F	F	F
			TR	133.0	193.2	195.4	305.1	F	F	F	F
		Glenwood Ave WB	L	102.5	113.5	197.4	607.5	F	F	F	F
			T	45.1	78.4	110.2	96.8	D	E	F	F
		Creedmoor Rd NEB	L	68.9	121.2	286.9	266.7	E	F	F	F
			T	40.4	65.8	95.3	60.9	D	E	F	E
		Glenwood Ave EB	R	23.2	48.0	81.1	37.1	C	D	F	D
			L	93.4	128.1	147.6	138.6	F	F	F	F
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Overall	16.4	20.4	97.9	77.1	B	C	F	E	
			L	254.2	396.9	733.6	581.0	F	F	F	F
		Marriott Dr SWB	TR	111.8	218.1	564.0	484.4	F	F	F	F
			L	94.1	104.6	175.1	203.4	F	F	F	F
		Glenwood Ave NWB	T	11.3	13.4	155.1	107.9	B	B	F	F
			TR	12.4	17.4	165.3	118.0	B	B	F	F
		Crabtree Valley Mall Entrance NEB	LT	77.4	75.0	79.7	84.2	E	E	E	F
			R	61.0	74.6	73.6	59.7	E	E	E	E
		Glenwood Ave SEB	L	--	--	144.6	172.6	--	--	F	F
			T	6.8	11.1	17.3	6.2	A	B	B	A
8	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd (Lower)	Overall	15.9	63.9	99.1	51.9	B	E	F	D	
			L	34.4	120.0	167.5	91.8	C	F	F	F
		Lead Mine Rd SWB	LT	41.7	109.6	294.6	154.0	D	F	F	F
			T	49.7	74.3	214.1	107.9	D	E	F	F
		Glenwood Ave SEB	L	10.3	12.7	12.6	10.9	B	B	B	B
			T	5.8	57.9	74.5	21.5	A	E	E	C
		TR	7.7	45.0	55.3	25.1	A	D	E	C	
9	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd (Upper)	Overall	12.4	13.5	61.1	36.0	B	B	E	D	
			L	7.0	8.0	11.9	11.5	A	A	B	B
		Glenwood Ave NWB	T	12.3	12.8	86.0	46.5	B	B	F	D
			R	6.1	8.1	20.6	15.2	A	A	C	B
		Blue Ridge Rd NEB	L	43.5	37.5	81.1	55.2	D	D	F	E
			T	29.0	38.4	33.3	31.0	C	D	C	C

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
10	Glenwood Ave & I-440 WB Off-Ramp	Overall		8.7	8.8	34.6	41.6	A	A	C	D
		I-440 WB Off-Ramp	T	31.7	31.2	143.7	152.8	C	C	F	F
		Glenwood Ave NWB	T	4.2	4.1	8.7	6.0	A	A	A	A
11	Glenwood Ave & I-440 EB Ramps/Ridge Rd	Overall		48.2	49.7	49.0	54.4	D	D	D	D
		Glenwood Ave NWB	L	136.9	86.5	82.7	137.4	F	F	F	F
			T	7.8	9.5	25.0	19.2	A	A	C	B
			R	8.5	9.3	19.0	16.1	A	A	B	B
		I-440 EB Off-Ramp/Ridge Rd EB	L	129.9	198.8	167.6	248.9	F	F	F	F
			T	50.5	55.3	64.4	79.1	D	E	E	E
			R	54.8	66.5	66.6	81.1	D	E	E	F
		Glenwood Ave SEB	T	10.5	11.5	11.4	9.3	B	B	B	A
			R	34.3	38.2	38.1	34.7	C	D	D	C
12	Glenwood Ave & Parking Deck / Womans Club Dr	Overall		10.5	12.9	14.8	6.6	B	B	B	A
		Glenwood Ave SB	L	80.3	76.0	91.4	85.8	F	E	F	F
			T	4.1	4.7	6.5	3.1	A	A	A	A
			R	4.1	2.8	--	--	A	A	--	--
		Womans Club Dr WB	LT	79.3	71.8	68.6	77.8	E	E	E	E
			R	64.1	56.4	51.3	127.1	E	E	D	F
		Glenwood Ave NB	L	110.9	135.5	141.9	198.3	F	F	F	F
			T	8.5	11.2	14.0	6.6	A	B	B	A
		Parking Deck EB	TR	9.1	11.8	14.7	7.6	A	B	B	A
			L	86.1	75.7	76.0	100.7	F	E	E	F
			TR	84.3	78.7	76.1	90.9	F	E	E	F
13	Creedmoor Rd & Crabtree Valley Avenue	Overall		17.9	32.6	97.1	49.2	B	C	F	D
		Creedmoor Rd SWB	L	133.4	116.5	158.8	157.8	F	F	F	F
			T	2.0	3.9	10.3	11.0	A	A	B	B
		Crabtree Valley Ave NWB	L	75.2	65.1	53.5	55.2	E	E	D	E
			R	60.6	65.7	83.3	66.2	E	E	F	E
		Creedmoor Rd NEB	T	9.7	24.6	123.1	40.2	A	C	F	D
			TR	10.3	33.7	160.3	46.2	B	C	F	D
		Overall		14.5	15.6	51.7	121.6	B	B	D	F
14	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	L	77.6	79.3	125.3	289.8	E	E	F	F
			T	1.7	2.0	100.1	516.5	A	A	F	F
			TR	1.8	2.3	13.0	23.0	A	A	B	C
		Crabtree Valley Mall Entrance NWB	LT	82.3	77.3	808.0	2460.3	F	E	F	F
			R	59.6	59.0	472.7	279.2	E	E	F	F
		Creedmoor Rd NEB	L	146.1	176.9	176.0	181.9	F	F	F	F
			T	5.0	9.8	28.4	15.0	A	A	C	B
			TR	7.2	13.1	33.5	19.8	A	B	C	B
		Office Drwy SEB	LT	153.9	101.7	170.7	128.1	F	F	F	F
			R	168.6	113.7	150.7	164.4	F	F	F	F
15	Crabtree Valley Ave, & Homewood Banks Dr / Crabtree Valley Mall Entrance	Overall		28.8	34.8	44.8	37.4	C	C	D	D
		Crabtree Valley Mall Entrance SWB	L	50.4	53.2	57.9	91.5	D	D	E	F
			TR	39.1	40.4	44.1	62.4	D	D	D	E
		Crabtree Valley Ave NWB	L	69.2	72.0	75.4	67.7	E	E	E	E
			T	19.7	23.8	24.8	19.9	B	C	C	B
		Homewood Banks Dr NEB	R	20.4	27.4	25.6	22.1	C	C	C	C
			L	90.9	75.3	84.5	64.8	F	E	F	E
		Crabtree Valley Ave SEB	TR	57.0	68.4	95.0	66.3	E	E	F	E
			L	65.9	70.5	216.3	101.4	E	E	F	F
			T	18.4	19.5	21.8	25.9	B	B	C	C
			R	28.4	20.8	16.9	23.2	C	C	B	C
16	Blue Ridge Rd & Crabtree Valley Ave Quadrant	Overall		6.1	54.7	10.9	8.2	A	D	B	A
		Blue Ridge Rd SWB	T	0.5	0.9	0.8	1.2	A	A	A	A
			R	1.7	4.1	2.0	5.0	A	A	A	A
		Blue Ridge Rd NEB	L	89.5	109.4	94.9	89.5	F	F	F	F
			T	0.8	111.9	15.8	2.3	A	F	B	A
		Crabtree Valley Connector SEB	LR	102.9	648.7	149.8	113.1	F	F	F	F
17	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Overall		22.3	76.2	63.2	45.1	C	E	E	D
		Blue Ridge Rd SWB	L	116.2	119.8	114.1	119.5	F	F	F	F
			T	3.9	14.5	18.1	6.4	A	B	B	A
			TR	11.3	26.0	25.1	10.6	B	C	C	B
		Summit Park Ln NWB	L	90.2	77.0	89.0	97.3	F	E	F	F
			TR	92.6	125.2	103.3	94.2	F	F	F	F
		Blue Ridge Rd NEB	L	99.1	103.3	113.6	147.4	F	F	F	F
			T	10.0	48.9	31.6	17.2	A	D	C	B
		Crabtree Valley Ave SEB	TR	11.3	364.2	129.7	68.5	B	F	F	E
			L	98.4	820.1	432.0	413.8	F	F	F	F
			TR	108.6	567.2	373.1	277.4	F	F	F	F
18	Lead Mine Rd & North Hills Dr	Overall		17.4	19.1	74.3	46.9	B	B	E	D
		Lead Mine Rd SB	L	82.3	91.5	252.9	168.2	F	F	F	F
			T	7.0	8.5	161.8	74.9	A	A	F	E
			TR	7.3	8.4	76.1	34.0	A	A	E	C
		Blue Ridge Rd SWB	L	82.9	79.4	222.2	109.5	F	E	F	F
			LTR	76.3	75.0	76.5	72.1	E	E	E	E
		Lead Mine Rd NB	L	82.2	97.0	109.4	97.8	F	F	F	F
			T	9.6	11.3	18.8	16.4	A	B	B	B
		Blue Ridge Rd SWB	R	9.2	14.6	24.0	20.1	A	B	C	C
			L	119.2	103.5	124.9	101.9	F	F	F	F
			TR	87.7	71.2	124.4	78.7	F	E	F	E

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
19	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	Overall	54.0	53.2	100.4	65.8	D	D	F	E
			L	95.7	100.4	284.6	276.2	F	F	F	F
			T	75.9	74.6	122.2	121.3	E	E	F	F
		Six Forks Rd NWB	R	75.3	84.5	126.7	133.4	E	F	F	F
			L	40.5	39.0	38.6	37.3	D	D	D	D
			T	16.4	14.5	17.9	19.8	B	B	B	B
		Main Street NEB	R	13.2	11.2	14.8	14.1	B	B	B	B
			L	161.4	128.5	225.9	137.7	F	F	F	F
			TR	118.3	98.8	191.6	99.9	F	F	F	F
		Six Forks Rd SEB	L	89.7	91.2	115.0	92.9	F	F	F	F
			T	64.2	65.8	135.1	69.4	E	E	F	E
			TR	99.4	98.1	192.9	88.2	F	F	F	F
20	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	Overall	25.3	26.1	33.3	21.4	C	C	C	C
			L	82.1	76.7	76.7	82.2	F	E	E	F
			T	78.1	83.3	121.6	109.8	E	F	F	F
		Six Forks NWB	R	67.9	69.2	120.4	88.4	E	E	F	F
			L	135.4	128.5	126.4	126.2	F	F	F	F
			T	10.1	10.9	11.7	10.0	B	B	B	B
		I-440 WB Off-Loop	R	4.8	4.8	5.1	4.6	A	A	A	A
			L	11.7	11.5	11.3	10.6	B	B	B	B
			T	48.6	48.6	44.2	47.5	D	D	D	D
		Six Forks Rd SEB	T	8.7	9.0	12.3	6.5	A	A	B	A
			R	27.4	27.0	35.9	13.9	C	C	D	B
			Overall	25.8	24.2	29.5	18.6	C	C	C	B
21	Six Forks Rd & I-440 WB Off-Ramp	I-440 WB Off-Ramp	R	107.5	91.0	122.4	84.9	F	F	F	F
		Six Forks Rd NWB	T	22.3	24.3	25.2	15.1	C	C	C	B
22	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	Overall	33.0	32.0	34.0	31.3	C	C	C	C
			L	102.3	95.9	92.6	97.9	F	F	F	F
			T	26.9	28.6	27.9	24.6	C	C	C	C
		Ramblewood Dr NEB	TR	25.7	27.8	26.9	22.5	C	C	C	C
			L	95.5	92.2	94.4	93.5	F	F	F	F
			T	89.5	92.0	84.9	92.8	F	F	F	F
		Six Forks Rd SEB	R	73.1	80.3	76.9	76.0	E	F	E	E
			L	75.9	74.6	85.1	74.0	E	E	F	E
			T	11.7	11.2	9.6	12.0	B	B	A	B
			TR	11.2	10.8	11.2	11.7	B	B	B	B
			Overall	9.8	11.0	10.2	6.9	A	B	B	A
			Six Forks Rd SB	L	57.9	66.0	63.4	175.4	E	E	E
T	4.2	4.6		4.4	4.1	A	A	A	A		
Barrett Dr WB	L	43.6		44.9	44.7	45.6	D	D	D	D	
	R	35.9	31.8	32.4	45.3	D	C	C	D		
	T	9.0	9.5	9.2	5.4	A	A	A	A		
23	Six Forks Rd & Barrett Dr	Six Forks Rd NB	TR	8.9	9.5	9.2	5.0	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
61	Lake Boone Trail & Shopping Center Drwy / Myron Dr	Shopping Center Drwy SB	R	12.0	11.1	9.3	10.4	B	B	A	B
			L	32.4	64.1	41.3	20.9	D	F	E	C
		Lake Boone Trail WB	T	0.7	0.4	0.4	0.6	A	A	A	A
			TR	0.4	0.1	0.1	0.4	A	A	A	A
		Myron Dr NB	R	125.8	1599.0	3425.5	1176.7	F	F	F	F
			T	0.0	0.2	0.1	0.0	A	A	A	A
62	Lake Boone Trail & I-440 EB Off-Loop	I-440 EB Off-Loop	R	112.7	184.6	149.4	168.4	F	F	F	F
			L	10.4	10.9	19.4	17.8	B	B	C	C
63	Manuel St & Varnell Ave	Varnell Ave SWB	LR	5.0	5.5	5.6	5.4	A	A	A	A
		Manuel St WB	TR	0.0	0.0	0.0	0.0	A	A	A	A
		Manuel St EB	LT	0.1	0.1	0.4	0.1	A	A	A	A
64	Ridge Rd & Manuel St	Ridge Rd SB	LT	0.2	0.9	1.3	0.5	A	A	A	A
		Manuel St WB	LR	8.5	9.8	15.3	9.1	A	A	C	A
		Ridge Rd NB	TR	0.0	0.0	0.0	0.0	A	A	A	A
65	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	80.7	168.7	181.2	147.6	F	F	F	F
			T	0.0	0.0	0.0	0.0	A	A	A	A
		Glenwood Ave NWB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			L	28.7	43.0	45.3	42.8	D	E	E	E
66	Glenwood Ave & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.1	0.0	0.0	0.0	A	A	A	A
		Glenwood Ave SEB	R	22.4	427.5	1288.4	182.6	C	F	F	F
67	Glenwood Ave & Crabtree View Place	Crabtree View Place NEB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.1	0.0	0.0	0.0	A	A	A	A
68	Glenwood Ave & Arrow Dr	Arrow Dr NEB	R	137.0	1024.1	2267.6	2402.5	F	F	F	F
			T	0.0	0.0	0.0	0.0	A	A	A	A
		Glenwood Ave SEB	TR	0.0	0.0	0.0	0.0	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
69	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	0.1	0.1	0.4	0.1	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		National Dr WB	R	17.0	39.8	66.9	22.6	C	E	F	C
			L	19.6	18.7	20.6	18.1	C	C	C	C
		Glenwood Ave NB	T	0.1	0.1	0.2	0.0	A	A	A	A
			R	0.0	0.0	0.0	0.0	A	A	A	A
70	Creedmoor Rd & Bank Drwy	Varnell Ave EB	LR	875.2	447.5	546.9	525.9	F	F	F	F
		Creedmoor Rd SWB	T	8.3	1.8	2.3	0.1	A	A	A	A
			TR	0.0	0.1	0.1	0.1	A	A	A	A
		Creedmoor Rd NEB	LT	0.2	1.1	0.4	0.2	A	A	A	A
			T	0.1	0.5	0.3	0.1	A	A	A	A
		BankDrwy SEB	L	26.0	94.2	209.7	--	D	F	F	--
71	Crabtree Valley Ave & Crabtree Apt/Mall Entrance	Apt Drwy/ Mall Entrance SB	R	14.0	36.9	12.9	--	B	E	B	--
			L	13.7	22.9	34.0	29.2	B	C	D	D
		Crabtree Valley Ave WB	R	7.0	9.4	13.0	10.9	A	A	B	B
			T	0.0	0.0	0.0	0.0	A	A	A	A
		Crabtree Valley Ave EB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			L	3.6	5.3	9.3	11.3	A	A	A	B
72	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks Dr SB	T	0.0	0.0	0.0	0.0	A	A	A	A
			LT	2.2	3.9	5.4	4.6	A	A	A	A
		Blue Ridge Rd EB	T	1.0	2.0	2.9	1.6	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Blue Ridge Rd SWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
73	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd NEB	LT	0.3	0.5	1.0	0.7	A	A	A	A
			T	0.0	0.3	0.1	0.1	A	A	A	A
		Arinto Dr SEB	L	13.2	31.5	19.0	12.7	B	D	C	B
			R	16.2	--	11.6	--	C	--	B	--
		Blue Ridge Rd SB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			R	0.0	0.0	0.0	0.0	A	A	A	A
74	Blue Ridge Rd & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance EB	R	4.9	42.7	263.0	85.0	A	E	F	F
		North Hills Dr WB	R	16.4	23.6	25.7	18.0	C	C	D	C
		Lead Mine Rd NB	T	0.0	0.0	0.0	0.0	A	A	A	A
75	Lead Mine Rd & North Hills Dr	Lead Mine Rd NB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			T	0.0	0.0	0.0	0.0	A	A	A	A
		Lead Mine Connector SB	L	9.7	9.4	11.3	12.5	A	A	B	B
76	North Hills Dr & Lead Mine Connector	North Hills Dr WB	R	--	--	--	--	--	--	--	--
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		North Hills Dr EB	L	2.7	2.6	3.1	2.9	A	A	A	A
			T	0.0	0.0	0.0	0.0	A	A	A	A
		Browning SWB	L	138.3	372.2	533.6	308.0	F	F	F	F
			R	35.5	248.5	388.2	239.0	E	F	F	F
77	Browning & Six Forks Rd	Six Forks Rd NWB	T	0.0	0.0	0.0	0.0	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		Six Forks Rd SEB	L	14.2	14.6	13.2	7.1	B	B	B	A
			T	0.3	0.2	0.1	0.1	A	A	A	A
		Six Forks Rd SEB	L	14.2	14.6	13.2	7.1	B	B	B	A
			T	0.3	0.2	0.1	0.1	A	A	A	A

Notes:

- 1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations
- 2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies
- 3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

Based on the queue data output and visual observations during the simulation, there are multiple intersections where traffic queues beyond the existing storage or affects the operations of adjacent locations. Table 10-4 shows the maximum queue lengths on each approach of all the study intersections. The areas of excessive queuing are listed below:

AM peak hour

- Glenwood Ave at Creedmoor Rd
 - The southbound approach of Creedmoor Rd is projected to queue more than 1,100' for one hour
- Glenwood Ave at Marriott Dr/Crabtree Valley Mall Entrance
 - The westbound approach of Glenwood Ave is projected to queue about 1,000' for two hours
- Creedmoor Rd at Crabtree Valley Ave
 - The northbound approach of Creedmoor is projected to queue about 1,000' for three hours

PM peak hour

- Glenwood Ave at Creedmoor Rd
 - The southbound approach of Creedmoor Rd is projected to queue more than 1,000' for four hours
 - The westbound approach of Glenwood Ave is projected to queue about 600' for two hours
 - The northbound approach of Creedmoor Rd is projected to queue more than 1,000' for one hour
- Glenwood Ave at Marriott Dr/Crabtree Valley Mall Entrance
 - The westbound approach of Glenwood Ave is projected to queue more than 1,100' for one hour
- Glenwood Ave EB at Blue Ridge Rd/Lead Mine Rd (lower echelon)
 - The southbound approach on Lead Mine Rd is projected to queue about 1,000' for one hour
 - The eastbound approach on Glenwood Ave is projected to queue more than 1,200' for one hour
- Glenwood Ave at Ridge Rd/I-440 EB Ramps
 - The eastbound approach of Ridge Rd/I-440 EB Off-Ramp is projected to queue over 1,100' for three hours
 - The southbound approach of Glenwood Ave is projected to queue over 1,100' for three hours
- Creedmoor Rd at Crabtree Valley Ave
 - The southbound approach on Creedmoor Rd is projected to queue over 1,000' for two hours
 - The northbound approach on Creedmoor Rd is projected to queue over 1,000' for four hours
- Creedmoor Rd at Crabtree Valley Mall Entrance/Office Drwy
 - The southbound approach of Creedmoor Rd is projected to queue over 2,000' for one hour

The interchange configuration on I-440 at Glenwood Ave was determined to not be feasible. Southbound Glenwood Ave queues from the I-440 eastbound ramps/Ridge Rd intersection back through several of the upstream signals due to the high volume that is now being processed through a signal in Alternative 1. The I-440 westbound off-loop to southbound Glenwood Ave queues back on to the collector-distributor due to the lack of acceptable gaps on southbound Glenwood Ave. This movement was modeled as a free flow movement to determine if removing the stop control would help, but it is the downstream signal that is causing vehicles to queue up in the right lane of Glenwood Ave.

The intersection of Creedmoor Rd at Glenwood Ave shows a degradation in operations, compared to the no-build model. This is partly due to the improvements made by the echelon intersection allowing more traffic to flow through that intersection, and partly due to the shift in trip patterns to and from the mall. Any improvements along Glenwood Ave will most likely result in worse operations at this intersection, unless Creedmoor Rd is included in the improvements.

Table 10-4: 2021 Design Year Build Alternative 1 Intersection Volume and Queue Length

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	L	242	369	449	395	74.8	101.3	126.9	119.3
			R	168	296	278	197				
		Lake Boone Trail WB	T	896	1,120	1,358	1,244	31.9	50.9	61.6	54.7
			R	100	174	165	134				
		Lake Boone Trail EB	L	87	192	236	210	5.3	16.3	33.6	23.5
			T	259	530	610	706				
2	Lake Boone Trail & I-440 WB Ramps	SB	LT	33	59	52	50	164.8	197.5	155.6	174.3
			R	705	664	738	897				
		Lake Boone Trail WB	L	47	94	81	97	27.0	38.9	58.6	50.1
			T	504	869	1,036	700				
		Lake Boone Trail EB	T	282	629	727	769	18.8	37.0	52.5	82.8
			R	243	306	362	368				
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	L	40	85	105	65	2.0	35.9	22.2	13.3
			TR	144	488	415	369				
		WB	L	10	36	28	23	4.3	15.8	18.9	10.7
			T	74	205	257	163				
		Ridge Rd NB	TR	87	225	299	203	1.4	46.0	42.3	26.3
			L	14	80	94	67				
		Lake Boone Trail EB	TR	25	154	246	163	6.7	15.9	20.3	17.1
			L	18	38	62	68				
			T	35	76	72	59				
			TR	102	215	229	217				
4	Ridge Rd & Glen Eden Dr	SB	L	15	19	25	33	6.7	40.0	48.6	30.3
			TR	174	379	378	387				
		Glen Eden Dr WB	L	21	83	77	77	11.1	87.6	93.6	47.2
			TR	38	270	304	157				
		Ridge Rd NB	L	15	41	69	50	1.3	8.1	16.4	7.5
			TR	26	123	164	134				
		Glen Eden Dr EB	L	30	113	120	85	20.5	42.7	63.7	36.6
			TR	110	293	379	275				
		Rembert Dr SWB	LTR	17	51	85	54	8.4	24.5	46.1	28.3
			L	22	57	82	67				
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Glenwood Ave NWB	T	723	975	1,041	1,104	14.6	44.1	56.7	54.5
			TR	264	403	443	459				
		Fairhill Dr NEB	L	18	42	44	40	11.7	22.7	24.0	23.7
			TR	21	25	28	29				
		Glenwood Ave SEB	L	5	12	16	12	11.8	37.9	49.3	30.7
			T	680	1,374	1,493	1,064				
		Creedmoor Rd SWB	TR	253	539	607	427	183.1	578.3	1,179.4	373.6
			L	694	892	780	828				
		Glenwood Ave WB	T	196	468	613	396	103.7	207.8	246.6	248.2
			TR	222	567	689	424				
6	Glenwood Ave & Creedmoor Rd	Glenwood Ave WB	L	33	185	197	121	31.1	67.5	94.2	100.6
			T	908	1,279	1,381	1,460				
		Creedmoor Rd NEB	L	34	81	91	92	80.5	227.6	482.1	165.2
			T	125	293	379	429				
		Glenwood Ave EB	R	13	74	118	117	44.7	71.4	563.6	182.5
			L	41	45	109	92				
			T	674	1,383	1,603	1,129	87.9	273.1	647.8	304.4
			TR	184	385	384	340				
		Marriott Dr SWB	L	39	96	114	70	29.7	75.6	86.2	53.2
			TR	0	0	0	0				
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Glenwood Ave NWB	L	14	16	32	63	373.9	982.3	1,127.6	497.4
			T	920	1,404	1,495	1,511				
		Crabtree Valley Mall Entrance NEB	TR	299	483	519	597	4.3	7.6	8.5	14.1
			LT	0	7	6	9				
		Glenwood Ave SEB	R	10	12	21	31	4.9	5.4	30.9	14.8
			L	8	9	12	14				
		Lead Mine Rd SWB	T	1,230	2,149	2,218	1,812	87.9	273.1	647.8	304.4
			TR	260	489	496	425				
		Glenwood Ave SEB	L	406	1,057	1,203	799	44.7	71.4	563.6	182.5
			LT	393	920	862	704				
8	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd (Lower)	Lead Mine Rd SWB	T	40	104	189	110	87.9	273.1	647.8	304.4
			L	14	24	25	37				
		Glenwood Ave SEB	T	1,131	2,027	2,097	1,818	44.7	71.4	563.6	182.5
			TR	375	675	602	512				
		Glenwood Ave NWB	L	53	94	86	108	2.0	5.4	7.1	10.9
			T	1,173	1,680	1,768	1,948				
		Blue Ridge Rd NEB	R	211	444	542	504	13.8	36.6	33.4	39.2
			L	18	37	44	45				
			T	35	134	120	140	108.3	106.6	114.6	128.9
			TR	904	934	1,122	1,372				
10	Glenwood Ave & I-440 WB Off-Ramp	I-440 WB Off-Ramp	T	904	934	1,122	1,372	108.3	106.6	114.6	128.9
		Glenwood Ave NWB	T	541	1,280	1,283	1,187				

Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length					
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM		
11	Glenwood Ave & I-440 EB Ramps/Ridge Rd	Glenwood Ave NWB	L	3	0	0	4	4.0	24.1	21.8	24.2		
			T	381	1,040	1,002	978						
			R	37	99	135	126						
		I-440 EB Off-Ramp/Ridge Rd EB	L	235	473	510	455	46.7	88.7	93.7	78.6		
			T	42	175	201	151						
			R	52	217	221	148						
		Glenwood Ave SEB	T	629	1,618	2,052	1,661	46.7	88.7	93.7	78.6		
			R	938	1,362	1,418	1,334						
12	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	L	68	181	267	257	18.8	63.1	103.3	89.5		
			T	611	1,644	1,977	1,543						
			R	4	7	12	14						
		Womans Club Dr WB	LT	5	12	20	14	3.4	6.0	6.6	4.5		
			R	8	15	12	13						
			L	0	7	11	10						
		Glenwood Ave NB	T	303	838	838	758	0.1	3.4	7.4	8.3		
			TR	124	354	409	361						
			L	0	3	7	13						
		Parking Deck EB	TR	0	2	4	4	0.0	1.4	2.4	3.8		
		13	Creedmoor Rd & Crabtree Valley Avenue	Creedmoor Rd SWB	L	8	59	128	49	3.1	32.0	83.5	28.8
T	421				1,220	1,464	855						
NWB	L			88	155	208	170	18.3	28.4	34.2	35.1		
	R			30	77	129	127						
Creedmoor Rd NEB	T			76	208	253	266	890.8	1,035.5	995.1	1,172.8		
	TR			171	394	466	515						
14	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	L	30	26	47	105	11.7	9.3	33.3	28.7		
			T	213	609	798	433						
			TR	223	663	767	471						
		Crabtree Valley Mall Entrance NWB	LT	11	16	27	25	4.9	5.1	7.7	9.3		
			R	15	11	15	37						
			L	0	5	13	4						
		Creedmoor Rd NEB	T	105	270	332	349	2.4	7.2	20.6	16.4		
			TR	74	190	286	308						
			LT	0	1	2	4						
		Office Drwy SEB	R	0	10	24	7	0.0	4.3	10.5	3.4		
		15	Crabtree Valley Ave, & Homewood Banks Dr / Crabtree Valley Mall Entrance	SWB	L	17	34	33	48	10.0	22.2	27.8	31.1
TR	22				59	77	76						
Crabtree Valley Ave NWB	L			8	11	20	16	11.9	24.8	42.4	64.8		
	T			110	204	292	298						
	R			80	125	180	319						
Homewood Banks Dr NEB	L			3	6	4	2	22.2	54.6	72.2	52.4		
	TR			18	59	33	25						
Crabtree Valley Ave SEB	L			39	42	57	64	9.4	15.3	25.2	20.8		
	T			74	209	273	220						
	R			6	33	19	17						
16	Blue Ridge Rd & Crabtree Valley Ave Quadrant			Blue Ridge Rd SWB	T	211	797	662	557	1.4	8.9	8.0	3.8
					R	29	46	51	24				
		Blue Ridge Rd NEB	L	19	113	130	118	5.3	30.1	32.6	28.0		
			T	105	195	203	258						
		Crabtree Valley Ave Quadrant SEB	LR	2	1	3	2	0.7	0.3	0.5	0.3		
		17	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Blue Ridge Rd SWB	L	20	27	36	30	7.0	14.0	17.3	18.3
					T	206	742	616	539				
TR	30				17	43	84						
Summit Park Ln NWB	L			34	100	85	35	11.2	38.6	26.8	10.5		
	TR			21	44	35	16						
	L			11	45	71	119						
Blue Ridge Rd NEB	T			16	38	43	49	4.4	16.2	20.3	35.7		
	TR			86	125	101	104						
	L			20	53	40	65					6.3	15.3
TR	8			13	19	10							
18	Lead Mine Rd & North Hills Dr			Lead Mine Rd SB	L	26	78	88	79	10.6	151.7		
					T	446	1,012	1,087	792				
		TR	284		806	944	648						
		North Hills Dr WB	L	104	236	251	159	49.7	101.6	141.0	83.3		
			LTR	82	222	232	149						
			L	6	11	10	6						
		Lead Mine Rd NB	T	206	444	589	528	4.1	45.8	63.8	36.3		
			R	11	17	13	14						
			L	0	2	2	0					8.1	6.0
		TR	22	20	23	12							
		19	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	L	127	329	354	334	56.4	409.6		
					T	9	40	59	67				
R	17				79	91	81						
Six Forks Rd NWB	L			100	129	272	252	30.2	73.6	111.1	91.5		
	T			550	1,486	1,681	1,371						
	R			60	194	275	199						
Main Street NEB	L			10	25	27	34	31.1	57.5	60.9	75.9		
	TR			56	100	126	145						
	L			40	184	258	164					85.5	201.5
T	430			1,113	1,008	926							
TR	674			900	926	762							

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
20	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	L	29	91	123	83	29.8	64.6	70.1	49.7
			T	76	152	168	127				
			R	10	39	60	40				
		Six Forks NWB	L	163	366	361	336	47.9	135.1	137.6	128.1
			T	698	1,774	2,168	1,776				
			R	152	409	585	390				
		I-440 WB Off-Loop	R	38	70	107	160	82.2	2,005.1	1,336.2	110.6
			L	16	49	99	43				
			T	457	1,247	1,334	1,191				
Six Forks Rd SEB	R	761	1,020	848	816	35.8	177.3	156.7	84.3		
	L	315	722	1,031	669						
	T	699	1,830	2,073	1,833						
21	Six Forks Rd & I-440 WB Off-Ramp	I-440 WB Off-Ramp	R	315	722	1,031	669	95.2	606.1	700.3	226.8
		Six Forks Rd NWB	T	699	1,830	2,073	1,833	6.4	106.0	183.4	97.5
22	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	L	8	26	26	34	11.8	72.8	83.3	73.8
			T	135	427	506	480				
			TR	137	403	490	461				
		Ramblewood Dr NEB	L	61.1	159.0	149.8	115.4	32.6	173.7	171.7	75.2
			T	18.7	54.9	62.9	50.0				
			R	22.5	103.5	121.7	74.2				
		Six Forks Rd SEB	L	189.7	465.2	485.4	418.5	45.5	107.7	122.4	113.6
			T	324.7	950.3	1,110.1	1,033.3				
			TR	162.4	398.0	471.1	425.6				
23	Six Forks Rd & Barrett Dr	Six Forks Rd SB	L	21	51	109	100	197.5	401.9	188.5	114.4
			T	418	1,228	1,410	1,245				
		Barrett Dr WB	L	4	30	65	90	1.9	18.2	51.0	72.5
			R	3.2	8.4	31.7	44.8				
		Six Forks Rd NB	T	149.8	487.1	564.2	520.3	0.0	2.8	8.6	7.1
			T	180.6	593.6	656.6	607.3				
			TR	180.6	593.6	656.6	607.3				
Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
61	Lake Boone Trail & Shopping Center Drwy / Myron Dr	Shopping Center Drwy SB	R	34	70	70	49	1.9	6.7	8.7	4.4
			L	28	44	63	38				
		Lake Boone Trail WB	T	538	659	784	721	1.0	4.1	15.6	7.2
			TR	646	843	936	860				
		Myron Dr NB	R	50	68	76	82	2.0	5.2	3.5	4.2
			T	166	360	424	439				
		Lake Boone Trail EB	TR	343	552	649	680	0.0	0.0	0.0	2.7
62	Lake Boone Trail & I-440 EB Off-Loop	I-440 EB Off-Loop	L	10	20	22	14	21.4	53.2	702.7	32.4
R	368	406	453	346							
63	Manuel St & Varnell Ave	Varnell Ave SWB	LR	3	24	15	10	0.3	0.6	0.1	0.2
		Manuel St WB	TR	3	17	25	11	0.0	0.0	0.0	0.0
		Manuel St EB	LT	11	7	17	18	0.0	0.0	0.0	0.0
64	Ridge Rd & Manuel St	Ridge Rd SB	LT	193	383	392	423	0.0	0.0	0.0	0.1
		Manuel St WB	LR	5	40	32	18	0.4	2.5	2.1	0.9
		Ridge Rd NB	TR	49	226	265	199	0.0	0.0	0.0	0.0
		Morehead Dr SWB	LR	7	21	25	29	1.1	4.9	12.2	8.7
65	Glenwood Ave & Morehead Dr	Glenwood Ave NWB	T	747	1,065	1,149	1,211	0.0	0.0	0.0	0.0
			TR	230	353	406	421				
		Glenwood Ave SEB	L	3	0	2	3	0.0	0.0	0.0	0.0
			T	903	1,862	2,041	1,470				
66	Glenwood Ave & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NEB	R	9	10	6	46	0.5	1.5	2.5	23.3
		Glenwood Ave SEB	T	1,177	2,051	2,079	1,778	0.2	12.7	364.1	118.1
67	Glenwood Ave & Crabtree View Place	Crabtree View Place NEB	R	75	58	27	37				
		Glenwood Ave SEB	T	2,109	4,003	4,241	3,311	0.0	4.5	497.7	174.3
68	Glenwood Ave & Arrow Dr	Arrow Dr NEB	R	64	62	46	95	7.7	174.5	847.2	464.1
		Glenwood Ave NEB	T	1,390	2,761	3,135	2,458	0.0	6.0	471.8	177.9
		Glenwood Ave SEB	TR	796	1,313	1,129	906				
69	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	666	1,796	2,206	1,762	0.0	1.7	1.9	2.0
			TR	11	25	67	55				
		National Dr WB	R	7	19	31	105	0.3	1.2	1.7	8.3
			L	3	14	20	19				
		Glenwood Ave NB	T	396	1,100	1,084	978	0.0	0.0	0.0	0.0
			R	0	3	4	7				
		Varnell Ave EB	LR	34	49	55	62	4.9	140.8	483.7	304.9
			70	Creedmoor Rd & Bank Drwy	Creedmoor Rd SWB	T	213	637	844	459	0.0
TR	227	662			775	480					
Creedmoor Rd NEB	LT	64			159	189	181	0.0	0.0	0.0	0.0
	T	116			304	435	482				
BankDrwy SEB	L	0		0	4	11	0.0	0.0	0.7	1.1	
	R	0		0	2	2					
71	Crabtree Valley Ave & Crabtree Apt/Mall Entrance	Apt Drwy/ Mall Entrance SB	L	27	31	34	40	1.2	1.8	2.4	2.6
			R	17	22	29	20				
		Crabtree Valley Ave WB	T	34	80	118	116	0.0	0.0	0.0	0.0
			TR	97	170	242	240				
		Crabtree Valley Ave EB	L	9	29	31	49	0.0	0.0	0.0	0.4
			T	89	253	313	258				
72	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks Dr SB	L	11	11	25	33	6.8	9.8	23.6	18.5
			T	203	773	638	510				
		Blue Ridge Rd EB	LT	74	221	216	256	0.0	2.1	0.4	0.1
			T	48	125	114	108				

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
73	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd SWB	T	202	769	633	505	0.0	0.0	0.0	0.0
			TR	10	32	39	56				
		Blue Ridge Rd NEB	LT	68	215	252	306	0.0	0.0	0.0	0.0
			T	47	92	67	66				
		Arinto Dr SEB	L	12	13	17	19	0.7	1.6	1.8	1.9
			R	0	0	0	0				
74	Blue Ridge Rd & Crabtree Valley Mall Entrance	Blue Ridge Rd SB	TR	197	680	580	498	0.0	0.0	6.6	0.0
			R	7	23	25	68				
		Crabtree Valley Mall Entrance EB	R	4	10	30	43	0.2	0.8	2.2	2.0
75	Lead Mine Rd & North Hills Dr	North Hills Dr WB	R	10	17	35	20	0.5	0.8	2.1	1.5
			T	198	429	553	493				
		Lead Mine Rd NB	TR	47	147	108	152	0.0	0.0	0.0	0.0
76	North Hills Dr & Lead Mine Connector	Lead Mine Connector SB	L	36	93	102	94	1.7	0.2	1.3	1.1
			R	0	0	0	0				
		North Hills Dr WB	TR	180	460	491	275	0.0	0.0	0.0	0.0
			L	13	8	6	31				
		North Hills Dr EB	T	36	140	103	124	0.1	0.0	0.0	0.1
			L	4	26	65	89				
77	Browning & Six Forks Rd	Browning SWB	R	5	16	40	44	0.5	5.1	31.8	35.5
			T	144	466	531	522				
		Six Forks Rd NWB	TR	149	419	482	472	0.0	0.0	0.0	0.0
			L	30	118	176	154				
		Six Forks Rd SEB	T	442	1,240	1,436	1,256	0.3	7.2	11.1	7.8
			T								

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	L	446	580	586	353	88.4	184.3	699.2	61.6
			R	164	125	213	165				
		Lake Boone Trail WB	T	879	805	740	769	110.0	75.2	77.1	83.1
			R	90	91	84	91				
		Lake Boone Trail EB	L	213	198	219	212	109.2	371.1	1,142.7	376.9
			T	1,257	1,322	1,184	1,050				
2	Lake Boone Trail & I-440 WB Ramps	SB	LT	85	104	133	85	95.7	86.1	84.6	90.7
			R	474	416	351	469				
		Lake Boone Trail WB	L	52	44	128	47	20.8	20.0	38.6	15.4
			T	695	680	699	605				
		Lake Boone Trail EB	T	1,274	1,436	1,379	1,338	348.3	906.9	1,297.7	471.4
			R	522	554	390	296				
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	L	53	79	116	59	8.1	30.6	56.6	10.0
			TR	239	447	708	245				
		WB	L	36	48	53	19	11.5	13.0	22.6	8.1
			T	154	162	233	126				
		Ridge Rd NB	TR	213	236	316	159	21.1	16.7	22.1	8.2
			L	84	55	45	45				
		Lake Boone Trail EB	TR	301	326	424	191	25.0	35.0	145.2	33.0
			L	87	132	164	160				
			T	99	156	241	133				
			TR	327	399	437	386				
4	Ridge Rd & Glen Eden Dr	SB	L	27	34	42	40	17.5	57.8	86.3	51.0
			TR	245	380	517	344				
		Glen Eden Dr WB	L	57	112	107	146	66.7	255.2	898.3	739.9
			TR	215	237	301	371				
		Ridge Rd NB	L	100	99	116	85	16.5	32.2	74.4	23.2
			TR	195	257	402	152				
		Glen Eden Dr EB	L	133	249	217	141	37.7	238.7	330.3	44.0
			TR	249	373	554	314				
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Rembert Dr SWB	LTR	56	62	46	35	28.5	34.7	25.8	16.7
		Glenwood Ave NWB	L	51	45	41	41	24.4	31.1	46.0	24.2
			T	1,167	1,461	1,589	1,553				
			TR	422	580	663	616				
		Fairhill Dr NEB	L	45	79	92	58	24.1	55.6	70.5	30.9
			TR	19	44	47	26				
		Glenwood Ave SEB	L	25	28	43	21	63.8	77.6	89.6	58.4
			T	1,219	1,504	1,585	1,292				
			TR	496	580	637	499				
6	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	L	462	481	452	456	1,067.3	1,471.7	1,404.6	1,249.2
			T	301	381	477	300				
			TR	365	463	557	487				
		Glenwood Ave WB	L	171	89	26	41	170.0	336.6	639.0	592.2
			T	1,259	1,666	1,813	1,746				
		Creedmoor Rd NEB	L	297	341	383	425	157.4	387.8	1,025.6	525.6
			T	769	1,020	1,203	948				
			R	182	263	255	243				
		Glenwood Ave EB	L	115	133	152	106	163.6	212.9	247.5	614.3
			T	1,204	1,482	1,660	1,673				
			TR	368	458	499	267				

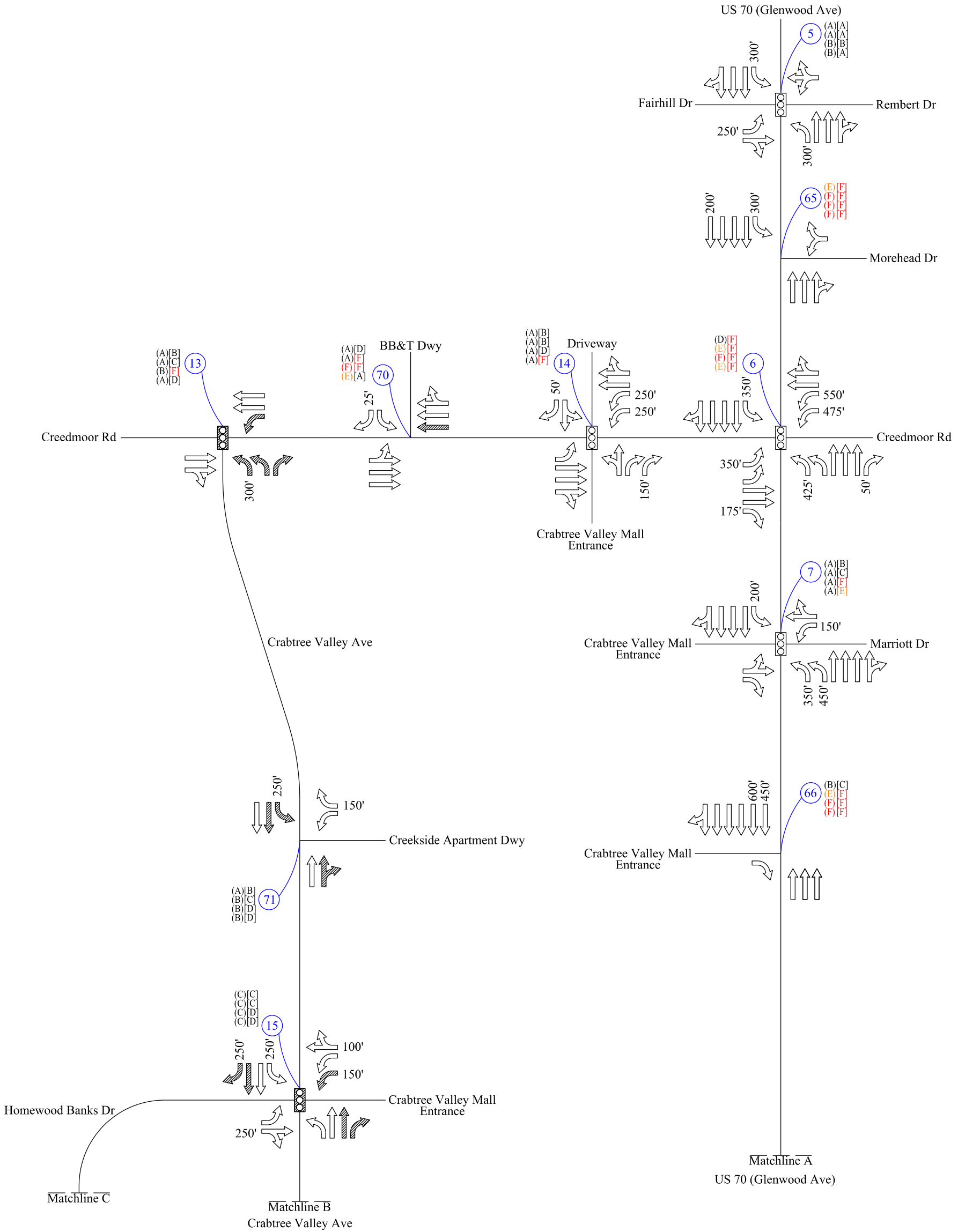
Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Marriott Dr SWB	L	43	73	102	128	89.9	266.5	547.7	547.6
			TR	19	26	37	38				
		Glenwood Ave NWB	L	154	96	125	201	308.2	398.1	1,102.8	709.6
			T	1,426	1,737	1,781	1,697				
		Crabtree Valley Mall Entrance NEB	TR	858	828	704	789	55.0	68.5	52.6	39.3
			LT	66	92	61	62				
		Glenwood Ave SEB	R	156	141	115	97	6.9	157.5	243.6	18.1
			L	0	1	14	5				
			T	1,628	1,932	2,067	1,951				
			TR	415	619	613	468				
8	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd (Lower)	Lead Mine Rd SWB	L	581	497	532	764	92.8	343.3	1,025.1	600.5
			LT	402	472	584	550				
			T	88	137	147	148				
		Glenwood Ave SEB	L	139	197	206	184	37.4	772.7	1,255.4	243.9
			T	1,759	1,717	1,798	1,816				
			TR	401	715	803	681				
			L	224	160	393	400				
			T	2,271	2,508	2,512	2,431				
9	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd (Upper)	Glenwood Ave NWB	R	649	727	719	693	94.2	96.5	913.9	414.0
			L	82	71	121	83				
			T	288	409	442	270				
		Blue Ridge Rd NEB	L	224	160	393	400	95.9	916.9	648.8	273.6
			T	2,271	2,508	2,512	2,431				
			R	649	727	719	693				
10	Glenwood Ave & I-440 WB Off-Ramp	I-440 WB Off-Ramp	T	1,274	1,302	1,330	1,552	131.4	118.3	655.9	761.0
		Glenwood Ave NWB	T	1,876	2,090	2,391	1,935				
11	Glenwood Ave & I-440 EB Ramps/Ridge Rd	Glenwood Ave NWB	L	3	19	17	3	33.2	52.7	265.0	190.2
			T	1,382	1,725	2,082	1,274				
			R	288	319	343	174				
		I-440 EB Off-Ramp/Ridge Rd EB	L	762	770	603	713	1,177.1	1,604.9	654.3	1,137.4
			T	196	337	327	200				
			R	192	183	143	142				
		Glenwood Ave SEB	T	1,242	1,223	1,292	1,349	1,177.1	1,604.9	654.3	1,137.4
			R	1,409	1,368	1,365	1,422				
			L	82	65	27	19				
			T	1,321	1,326	1,418	1,513				
12	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	R	4	2	0	0	48.9	36.6	47.5	21.7
			LT	63	105	155	53				
			R	27	44	43	6				
		Womans Club Dr WB	L	7	2	4	1	30.5	59.0	79.6	22.9
			T	1,087	1,314	1,604	1,010				
			TR	452	548	667	379				
		Glenwood Ave NB	L	27	43	27	6	34.9	55.8	93.3	20.9
			T	17	27	35	15				
			TR	17	27	35	15				
		Parking Deck EB	L	27	43	27	6	12.7	22.9	18.2	8.3
			T	17	27	35	15				
			TR	17	27	35	15				
13	Creedmoor Rd & Crabtree Valley Avenue	Creedmoor Rd SWB	L	107	160	221	239	176.3	193.2	1,071.0	2,348.3
			T	726	722	696	483				
		NWB	L	133	186	282	296	62.6	110.7	223.3	126.7
			R	147	324	544	408				
		Creedmoor Rd NEB	T	498	691	783	488	1,274.3	1,190.8	1,518.7	1,009.7
			TR	707	942	993	649				
			L	119	106	131	87				
			T	395	464	450	222				
14	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	TR	408	417	584	475	29.9	24.9	715.3	2,172.6
			LT	50	40	75	56				
			R	211	206	135	368				
		Crabtree Valley Mall Entrance NWB	L	4	4	2	3	67.0	62.7	554.6	651.6
			T	642	921	1,133	759				
			TR	480	675	732	574				
		Creedmoor Rd NEB	L	4	14	20	9	22.6	73.8	180.5	70.7
			T	7	13	16	7				
			TR	4	14	20	9				
		Office Drwy SEB	L	4	14	20	9	6.5	14.3	26.5	10.0
			R	7	13	16	7				
15	Crabtree Valley Ave, & Homewood Banks Dr / Crabtree Valley Mall Entrance	SWB	L	151	137	141	120	61.7	58.5	97.1	97.8
			TR	128	179	161	188				
		Crabtree Valley Ave NWB	L	70	50	57	93	83.6	74.8	300.7	104.2
			T	213	408	755	578				
			R	381	343	455	365				
		Homewood Banks Dr NEB	L	12	39	50	51	86.9	132.6	158.7	91.3
			TR	75	172	187	149				
		Crabtree Valley Ave SEB	L	67	97	157	84	38.0	57.8	253.3	73.8
			T	271	354	464	359				
			R	27	35	46	39				
TR	27		35	46	39						
16	Blue Ridge Rd & Crabtree Valley Ave Quadrant	Blue Ridge Rd SWB	T	380	434	571	499	0.0	17.8	13.2	36.2
			R	93	274	349	215				
		Blue Ridge Rd NEB	L	61	51	48	74	53.3	391.3	118.0	46.7
			T	547	518	581	306				
		Crabtree Valley Ave Quadrant SEB	LR	10	13	20	11	6.3	53.5	106.4	140.1
			TR	10	13	20	11				

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
17	Blue Ridge Rd & Crabtree Valley Ave / Summit Park Ln	Blue Ridge Rd SWB	L	27	32	43	40	24.1	133.9	389.5	136.0
			T	365	429	551	489				
			TR	282	463	829	758				
		Summit Park Ln NWB	L	24	28	36	32	25.6	36.4	37.0	30.1
			TR	29	31	39	26				
			L	99	40	101	13				
		Blue Ridge Rd NEB	T	122	466	361	132	112.7	661.3	322.2	91.8
			TR	376	354	389	242				
			L	70	55	122	95				
		Crabtree Valley Ave SEB	L	70	55	122	95	64.4	403.4	418.9	260.2
TR	10		16	22	20						
18	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	L	50	29	70	71	29.7	27.8	495.1	325.4
			T	560	564	711	664				
			TR	366	334	439	591				
		North Hills Dr WB	L	116	137	121	132	69.1	92.2	208.9	104.2
			LTR	105	112	107	120				
			L	21	20	17	13				
		Lead Mine Rd NB	T	800	955	1,003	859	24.8	58.6	130.2	76.2
			R	82	96	99	80				
			L	2	3	5	4				
		North Hills Dr EB	L	2	3	5	4	6.7	15.7	40.5	21.3
TR	19		48	58	51						
19	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	L	242	258	341	304	130.4	163.0	577.3	541.4
			T	74	89	148	130				
			R	143	170	219	203				
		Six Forks Rd NWB	L	293	328	376	364	116.6	100.7	107.6	112.5
			T	1,693	1,651	1,573	1,402				
			R	137	161	177	166				
		Main Street NEB	L	62	61	57	65	180.6	131.5	290.9	143.4
			TR	186	168	171	175				
			L	126	137	164	143				
		Six Forks Rd SEB	T	1,201	1,205	1,214	990	432.5	416.1	814.6	349.1
TR	795		786	717	760						
L	190		219	308	186						
20	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	T	198	228	313	143	124.7	163.8	343.0	139.7
			R	66	98	95	113				
			L	367	375	392	260				
		Six Forks NWB	T	2,049	2,022	2,014	1,788	299.5	304.5	297.0	163.6
			R	296	354	404	398				
			L	111	103	111	121				
		I-440 WB Off-Loop	R	111	103	111	121	7.1	7.5	467.7	288.0
			L	38	47	38	59				
			T	1,229	1,226	1,198	1,134				
		Six Forks Rd SEB	R	1,039	1,007	1,018	839	182.4	177.7	347.6	77.2
L	38		47	38	59						
T	1,229		1,226	1,198	1,134						
21	Lake Boone Trail & Wycliff Rd	I-440 WB Off-Ramp	R	594	576	630	524	264.3	227.9	347.6	220.9
		Six Forks Rd NWB	T	2,123	2,174	2,166	1,910	143.2	156.5	153.5	86.3
22	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	L	93	54	76	38	145.2	137.7	144.7	90.9
			T	625	672	657	436				
			TR	659	695	688	486				
		Ramblewood Dr NEB	L	48.1	53.0	46.5	79.5	62.0	46.7	55.0	69.2
			T	64.1	63.1	67.0	69.1				
			R	69.5	37.7	47.1	38.9				
		Six Forks Rd SEB	L	646.2	662.6	664.6	573.8	169.8	179.0	207.2	159.3
			T	898.8	875.6	912.2	839.3				
			TR	421.1	431.9	468.5	477.1				
23	Six Forks Rd & Barrett Dr	Six Forks Rd SB	L	76	42	27	15	27.2	21.8	14.7	17.3
			T	1,241	1,245	1,303	1,245				
		Barrett Dr WB	L	97	186	152	77	30.5	53.3	43.9	19.2
			R	134.4	148.4	167.5	35.9				
		Six Forks Rd NB	T	587.1	579.5	576.3	406.2	42.2	39.4	36.5	18.6
			TR	645.5	635.5	607.7	443.2				
			L	97	186	152	77				

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
61	Lake Boone Trail & Shopping Center Drwy / Myron Dr	Shopping Center Drwy SB	R	51	57	56	84	3.6	2.7	3.0	4.7
			L	51	37	37	35				
		Lake Boone Trail WB	T	465	446	410	408	11.5	9.8	6.2	8.7
			TR	666	624	622	641				
		Myron Dr NB	R	100	123	52	228	139.1	1,148.0	1,422.1	1,111.0
			T	735	748	643	608				
62	Lake Boone Trail & I-440 EB Off-Loop	I-440 EB Off-Loop	L	13	13	25	12	40.7	27.7	353.5	600.4
			R	331	318	230	300				
63	Manuel St & Varnell Ave	Varnell Ave SWB	LR	9	15	9	9	0.3	0.2	0.4	0.4
		Manuel St WB	TR	10	21	68	15	0.0	0.0	0.0	0.0
		Manuel St EB	LT	31	60	123	65	0.0	0.0	0.0	0.0
64	Ridge Rd & Manuel St	Ridge Rd SB	LT	280	439	579	407	1.1	2.3	4.2	0.7
		Manuel St WB	LR	18	36	75	22	0.5	1.8	5.7	1.1
		Ridge Rd NB	TR	291	470	546	265	0.0	0.0	0.0	0.0

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
65	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	17	20	14	6	5.6	17.8	12.3	4.0
		Glenwood Ave NWB	T	1,252	1,554	1,695	1,641	0.0	0.0	0.0	0.0
			TR	419	541	615	564				
		Glenwood Ave SEB	L	4	5	4	4	0.0	0.0	0.0	0.0
			T	1,651	2,059	2,174	1,757				
66	Glenwood Ave & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NEB	R	253	150	173	335	49.5	317.0	410.1	486.7
		Glenwood Ave SEB	T	1,693	1,950	2,064	1,837	0.0	414.3	887.2	78.4
			TR	429	653	725	604				
67	Glenwood Ave & Crabtree View Place	Crabtree View Place NEB	R	138	48	47	66	388.8	1,862.9	1,534.1	841.4
		Glenwood Ave SEB	T	2,816	2,767	2,809	3,056	96.3	1,074.9	1,627.1	518.5
68	Glenwood Ave & Arrow Dr	Arrow Dr NEB	R	68	54	49	111	76.6	558.8	851.8	853.6
		Glenwood Ave SEB	T	2,332	2,182	2,259	2,392	310.6	1,874.3	1,981.6	747.0
			TR	604	626	592	731				
69	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	1,383	1,348	1,418	1,482	0.4	0.0	3.6	1.9
			TR	34	69	73	55				
		National Dr WB	R	163	211	175	43	17.2	61.7	90.3	3.0
			L	26	17	25	21				
		Glenwood Ave NB	T	1,481	1,854	2,229	1,335	0.5	0.0	3.1	0.0
			R	10	11	10	5				
		Varnell Ave EB	LR	47	46	49	46	300.3	96.6	185.5	149.7
70	Creedmoor Rd & Bank Drwy	Creedmoor Rd SWB	T	429	492	489	294	55.9	45.1	960.8	2,248.5
			TR	427	426	541	429				
		Creedmoor Rd NEB	LT	327	492	636	410	0.3	33.9	68.2	12.6
			T	814	1,108	1,320	1,003				
		Bank Drwy SEB	L	2	16	2	0	0.6	6.8	0.2	0.0
			R	4	4	3	0				
		Apt Drwy/ Mall Entrance SB	L	95	85	88	70	7.7	14.3	21.2	15.1
71	Crabtree Valley Ave & Crabtree Apt/Mall Entrance	Crabtree Valley Ave WB	R	92	97	110	132	0.0	0.0	0.0	0.0
			T	70	211	388	263				
		Crabtree Valley Ave EB	TR	198	324	483	441	0.1	1.1	1.7	1.9
			L	52	65	62	61				
			T	272	414	576	401				
72	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks Dr SB	L	86	50	55	62	41.1	40.0	43.7	45.5
			T	322	394	496	445				
		Blue Ridge Rd EB	LT	395	449	522	298	0.2	1.4	3.0	1.1
			T	230	288	297	171				
73	Blue Ridge Rd & Arinto Dr	Blue Ridge Rd SWB	T	321	390	495	442	0.0	0.0	0.0	0.0
			TR	61	50	80	60				
		Blue Ridge Rd NEB	LT	354	341	331	201	0.6	61.6	3.5	1.1
			T	251	317	327	184				
		Arinto Dr SEB	L	28	11	21	18	1.8	1.4	2.5	1.2
74	Blue Ridge Rd & Crabtree Valley Mall Entrance	Blue Ridge Rd SB	R	2	0	4	0	0.0	50.3	402.2	71.3
			TR	299	643	884	762				
		Crabtree Valley Mall Entrance EB	R	73	78	79	85	10.0	67.9	275.8	70.9
75	Lead Mine Rd & North Hills Dr	North Hills Dr WB	R	168	143	145	117	3.3	2.7	6.0	2.7
			T	49	27	47	34				
		Lead Mine Rd NB	T	709	848	869	736	0.0	1.8	1.7	0.0
76	North Hills Dr & Lead Mine Connector	Lead Mine Connector SB	L	225	289	280	219	13.8	7.4	15.2	15.7
			R	132	129	173	157				
		North Hills Dr WB	R	1	0	0	0	0.0	0.0	0.0	0.0
			TR	229	213	236	239				
		North Hills Dr EB	L	31	58	34	33	0.6	0.2	0.2	0.6
			T	192	238	247	186				
77	Browning & Six Forks Rd	Browning SWB	L	126	159	159	161	153.3	753.3	973.2	532.2
			R	168	209	196	153				
		Six Forks Rd NWB	T	644	631	630	420	0.2	0.0	0.0	0.0
			TR	613	649	643	418				
		Six Forks Rd SEB	L	64	40	26	19	2.6	1.4	0.7	0.1
			T	1,192	1,129	1,177	1,107				





LOS - 4 Hour Peak

(6:00-7:00 AM)	[3:00-4:00 PM]
(7:00-8:00 AM)	[4:00-5:00 PM]
(8:00-9:00 AM)	[5:00-6:00 PM]
(9:00-10:00 AM)	[6:00-7:00 PM]

STIP I-5870
2021 Design Year - Alt 1
Figure 10-3B

Existing Laneage

Laneage Built By I-5870

Existing Signal

Signal Built by I-5870

Intersection Number

(AM) [PM]

Overall Intersection LOS
(E in Orange)(F in Red)

XXX' Storage Length

10.9 2021 DESIGN YEAR ALTERNATIVE 2 BUILD MODEL RESULTS

The output data was extracted from the TransModeler model via the Output Manager. The outputs were collected in accordance with the MOEs defined in Section 4 and are summarized in the following sections. The results shown in this section include four lanes in each direction on Glenwood Ave through the DDI and auxiliary lanes on I-440 between Lake Boone Trail and Crabtree Valley Ave/Ridge Rd. The results for the analysis of Alternative 2 with three lanes in each direction on Glenwood Ave through the DDI and no auxiliary lanes on I-440 are included in Appendix H.

10.9.1 NETWORK RESULTS – ALTERNATIVE 2 WITH AUXILIARY LANES

Network-level MOEs were developed for Vehicle Hours Traveled (VHT), Vehicle Miles Traveled (VMT), Average Speed, and Total Delay. These statistics were calculated for every vehicle included in the peak hour of the simulation runs and are averaged over the ten runs performed for each scenario. For the VMT, VHT, and Total Delay, the average was calculated from completed trips, incomplete trips, queued vehicles, and loaded vehicles. The Average Speed was based only on vehicles that made completed trips. The network results the Design Year Build Alternative 2 scenario are shown in Table 10-5.

Table 10-5: 2021 Design Year Build Alternative 2 Network Wide Measures of Effectiveness

2021 Design Year Build Alt 2	Time	VHT	VMT	Average Speed (mph)	Total Delay (hr)
AM	6:00-7:00	2,138.0	72,504.0	40.3	948.6
	7:00-8:00	6,656.0	105,285.9	27.1	4,874.0
	8:00-9:00	8,829.6	101,895.1	25.1	7,090.0
	9:00-10:00	3,961.6	57,598.6	34.8	2,955.2
PM	3:00-4:00	2,779.1	104,071.1	42.7	1,003.8
	4:00-5:00	3,621.4	106,447.0	40.0	1,799.6
	5:00-6:00	7,571.9	115,103.0	31.8	5,591.7
	6:00-7:00	4,483.9	88,325.8	37.8	3,189.9

Travel times and average speeds through the length of the network between the major entry and exit point of the network were extract and provided in Appendix I.

10.9.2 FREEWAY RESULTS – ALTERNATIVE 2 WITH AUXILIARY LANES

The results of the freeway analysis are included in Table 10-6 . The 2021 Design Year Build Alternative 2 scenario shows that during the AM peak period, all segments on I-440 eastbound are operating at LOS_s D or better and 11 segments operating at LOS_s F in the westbound direction for one hour with 10 segments operating at LOS_s F for two hours and four segments operating at LOS_s F for at least three hours. Included in those 11 failing segments, seven are operating at an unacceptable LOS_s E for at least one hour. The PM peak period shows two segments on I-440 eastbound operating at LOS_s F for one hour with six segments operating at an unacceptable LOS_s E for at least one hour and 11 segments operating at LOS_s F in the westbound direction for one hour with nine segments operating at LOS_s F for two hours and two segments operating at LOS_s F for at least three hours. Included in those 11 failing segments, six are operating at an unacceptable LOS_s E for one hour.

Figure 10-4 and Figure 10-5 shows the average speed for each 15-minute period in each peak across the I-440 corridor. Compared the 2021 No-Build scenario, the eastbound direction of I-440 looks fairly similar in the AM peak period and shows a smaller reduction in speed for a shorted period of time in the PM peak period. Speeds are expected to reduce to 45mph upstream of the Lake Boone Trail off-ramp for 30 minutes and reduce to 35-40mph downstream of the Glenwood Ave on -ramp for 45 minutes in the PM.

The westbound direction of I-440 is still expected to experience reduce speeds in the AM peak period, but for only two hours instead of three. The PM peak is expected to have some queuing back from Lake Boone Trail, but this queuing is not anticipated to extend past Crabtree Valley Ave. During the 5PM hour, there is expected to be queueing back from the Glenwood Ave and Crabtree Valley Ave interchanges that will extend back through Six Forks and off the network for a little over an hour.

Table 10-6: 2021 Design Year Build Alternative 2 with Auxiliary Lanes Freeway Measures of Effectiveness

Analysis ID	Analysis Segment	Type	AM Density				AM LOS _s			
			6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00
1	I-440 EB - West of Lake Boone Trail Exit Ramp	Basic	11.9	21.9	21.4	15.3	B	C	C	B
2	I-440 EB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	14.5	28.3	27.2	20.3	B	D	D	C
3	I-440 EB - Lake Boone Trail to Ridge Road	Basic	11.1	22.2	21.2	16.4	B	C	C	B
4	I-440 EB - Ridge Rd Exit Ramp	Diverge	7.6	15.7	15.5	13.2	A	B	B	B
5	I-440 EB - Ridge Rd to Glenwood Ave Exit Ramp	Basic	10.7	21.4	20.8	15.9	A	C	C	B
6	I-440 EB - Glenwood Ave Exit Ramp to Crabtree Valley Ave Entrance Ramp	Basic	13.9	27.4	26.0	21.0	B	D	C	C
7	I-440 EB - Crabtree Valley Ave Entrance Ramp to Glenwood Ave Entrance Loop	Basic	11.4	22.5	22.5	17.3	B	C	C	B
8	I-440 EB - Glenwood Ave Entrance Ramp to Six Forks Rd Exit Ramp	Basic	12.7	25.8	27.1	19.8	B	C	D	C
9	I-440 EB - Six Forks Rd Exit Ramp	Diverge	9.9	20.5	23.1	17.4	A	C	C	B
10	I-440 EB - Six Forks Exit Rd Loop	Diverge	14.8	28.8	29.5	22.8	B	D	D	C
11	I-440 EB - Six Forks Exit Rd Loop to Six Forks Rd Entrance Ramp	Basic	15.4	28.1	29.6	20.4	B	D	D	C
12	I-440 EB - Six Forks Rd Entrance Ramp	Merge	7.2	14.0	14.7	11.7	A	B	B	B
13	I-440 EB - East of Six Forks Rd Entrance Ramp	Basic	11.9	22.8	23.5	17.7	B	C	C	B
14	I-440 WB - East of Six Forks Rd Exit Ramp	Basic	47.1	94.7	83.6	71.4	F	F	F	F
15	I-440 WB - Six Forks Exit Rd Loop	Diverge	30.6	65.1	54.9	37.0	D	F	F	E
16	I-440 WB - Six Forks Rd Exit Loop to Six Forks Rd Entrance Ramp	Basic	37.9	82.2	69.5	45.7	E	F	F	F
17	I-440 WB - Six Forks Rd Entrance Ramp	Merge	20.7	52.4	42.7	39.2	C	F	E	E
18	I-440 WB - Six Forks Rd Entrance Ramp to Glenwood Ave Exit Ramp	Basic	30.9	80.2	65.0	43.6	D	F	F	E
19	I-440 WB - Glenwood Ave Exit Ramp to Crabtree Valley Ave Exit Ramp	Diverge	32.5	65.1	53.6	29.7	D	F	F	D
20	I-440 WB - Crabtree Valley Ave Exit Ramp to Glenwood Entrance Ramp	Basic	40.9	79.6	65.9	37.9	E	F	F	E
21	I-440 WB - Glenwood Ave Entrance Ramp to Crabtree Valley Ave Entrance Ramp	Basic	35.9	82.1	65.2	33.6	E	F	F	D
22	I-440 WB - Crabtree Valley Ave Entrance Ramp	Merge	37.2	79.1	71.5	40.2	E	F	F	E
23	I-440 WB - Crabtree Valley Ave Exit Ramp to Lake Boone Trail Exit Ramp	Basic	45.9	83.6	79.1	55.5	F	F	F	F
24	I-440 WB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	47.6	62.4	60.1	59.8	F	F	F	F
25	I-440 WB - Lake Boone Trail Entrance Ramp to Wade Ave Exit Ramp	Basic	24.3	31.1	32.0	31.2	C	D	D	D
26	I-440 WB - West of Wade Ave Exit Ramp	Basic	17.3	24.8	28.9	28.8	B	C	D	D
Analysis ID	Analysis Segment	Type	PM Density				PM LOS _s			
			3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00	3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00
1	I-440 EB - West of Lake Boone Trail Exit Ramp	Basic	21.7	24.5	29.9	20.3	C	C	D	C
2	I-440 EB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	27.6	31.7	37.0	26.7	D	D	E	D
3	I-440 EB - Lake Boone Trail Entrance Ramp	Merge	24.1	27.1	30.0	23.0	C	C	D	C
4	I-440 EB - Lake Boone Trail to Ridge Road	Basic	24.1	27.1	30.0	23.0	C	D	D	C
4	I-440 EB - Ridge Rd Exit Ramp	Diverge	20.0	21.9	22.6	19.4	C	C	C	B
5	I-440 EB - Ridge Rd to Glenwood Ave Exit Ramp	Basic	23.3	26.1	29.2	23.3	C	D	D	C
6	I-440 EB - Glenwood Ave Exit Ramp to Crabtree Valley Ave Entrance Ramp	Basic	27.4	31.3	40.7	26.8	D	D	E	D
7	I-440 EB - Crabtree Valley Ave Entrance Ramp to Glenwood Ave Entrance Loop	Basic	23.1	27.0	41.4	22.4	C	D	E	C
8	I-440 EB - Glenwood Ave Entrance Ramp to Six Forks Rd Exit Ramp	Basic	29.2	34.3	59.7	30.7	D	D	F	D
9	I-440 EB - Six Forks Rd Exit Ramp	Diverge	24.9	28.6	43.7	25.8	C	D	E	C
10	I-440 EB - Six Forks Exit Rd Loop	Diverge	32.5	36.9	44.6	32.3	D	E	E	D
11	I-440 EB - Six Forks Exit Rd Loop to Six Forks Rd Entrance Ramp	Basic	32.8	40.7	50.5	33.2	D	E	F	D
12	I-440 EB - Six Forks Rd Entrance Ramp	Merge	18.7	22.0	26.0	18.1	B	C	C	B
13	I-440 EB - East of Six Forks Rd Entrance Ramp	Basic	27.1	30.7	34.2	26.4	D	D	D	D
14	I-440 WB - East of Six Forks Rd Exit Ramp	Basic	26.3	31.9	114.2	92.2	D	D	F	F
15	I-440 WB - Six Forks Exit Rd Loop	Diverge	28.0	32.2	88.8	51.9	D	D	F	F
16	I-440 WB - Six Forks Rd Exit Loop to Six Forks Rd Entrance Ramp	Basic	33.5	41.0	112.3	65.5	D	E	F	F
17	I-440 WB - Six Forks Rd Entrance Ramp	Merge	24.6	29.7	70.1	42.5	C	D	F	E
18	I-440 WB - Six Forks Rd Entrance Ramp to Glenwood Ave Exit Ramp	Basic	28.2	41.1	97.9	69.0	D	E	F	F
19	I-440 WB - Glenwood Ave Exit Ramp to Crabtree Valley Ave Exit Ramp	Diverge	26.2	49.4	87.7	64.9	C	F	F	F
20	I-440 WB - Crabtree Valley Ave Exit Ramp to Glenwood Entrance Ramp	Basic	32.8	35.9	53.0	51.1	D	E	F	F
21	I-440 WB - Glenwood Ave Entrance Ramp to Crabtree Valley Ave Entrance Ramp	Basic	28.7	30.7	48.4	46.3	D	D	F	F
22	I-440 WB - Crabtree Valley Ave Entrance Ramp	Merge	19.7	26.1	68.7	62.7	B	C	F	F
23	I-440 WB - Crabtree Valley Ave Exit Ramp to Lake Boone Trail Exit Ramp	Basic	28.2	39.5	85.9	78.4	D	E	F	F
24	I-440 WB - Lake Boone Trail Exit Ramp to Lake Boone Trail Entrance Ramp	Basic	48.5	56.9	66.3	60.6	F	F	F	F
25	I-440 WB - Lake Boone Trail Entrance Ramp to Wade Ave Exit Ramp	Basic	28.4	31.3	35.1	31.6	D	D	E	D
26	I-440 WB - West of Wade Ave Exit Ramp	Basic	23.4	27.8	31.3	29.8	C	D	D	D

Figure 10-4: 2021 Design Year Build Alternative 2 with Aux Lanes Eastbound Freeway Speeds

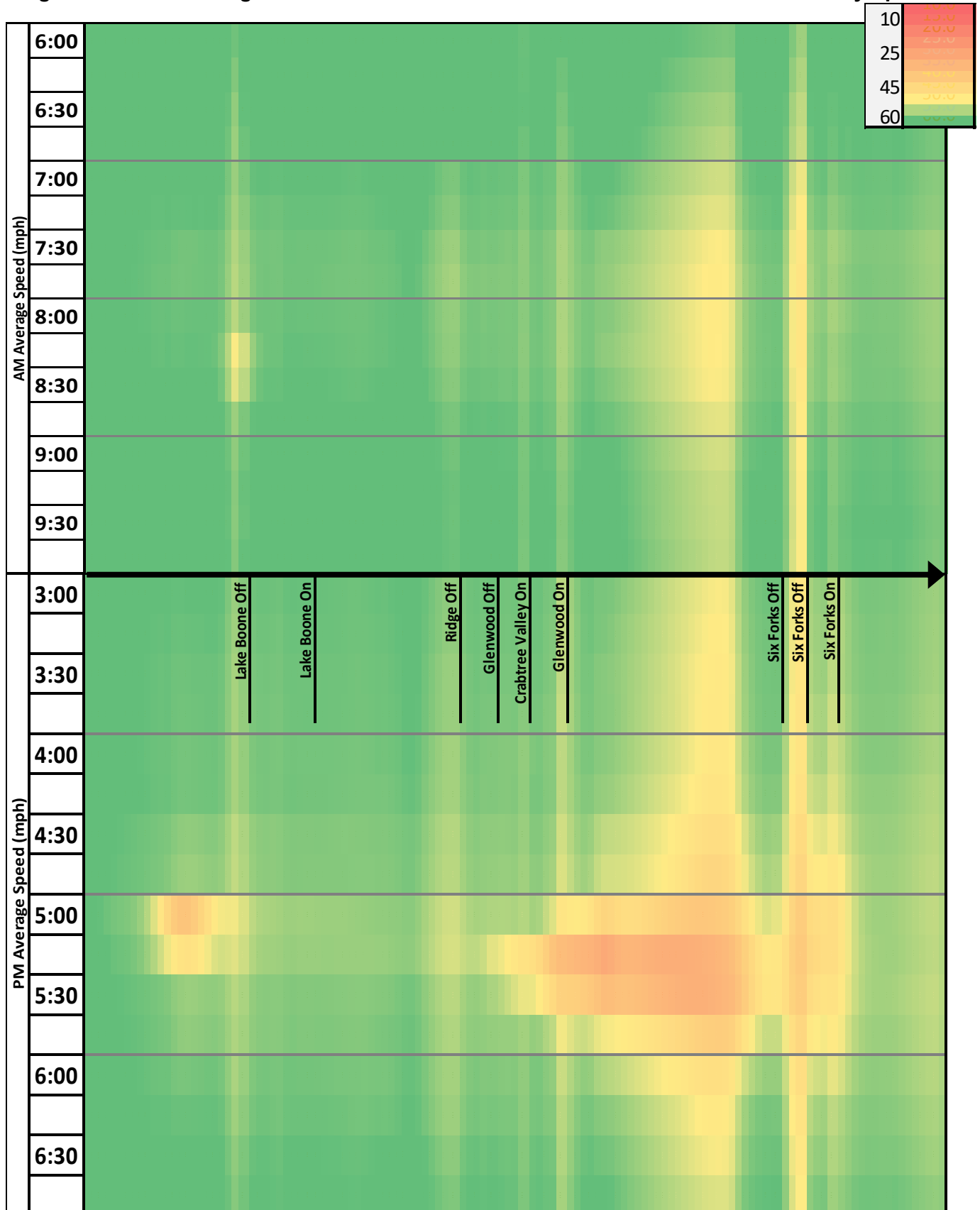
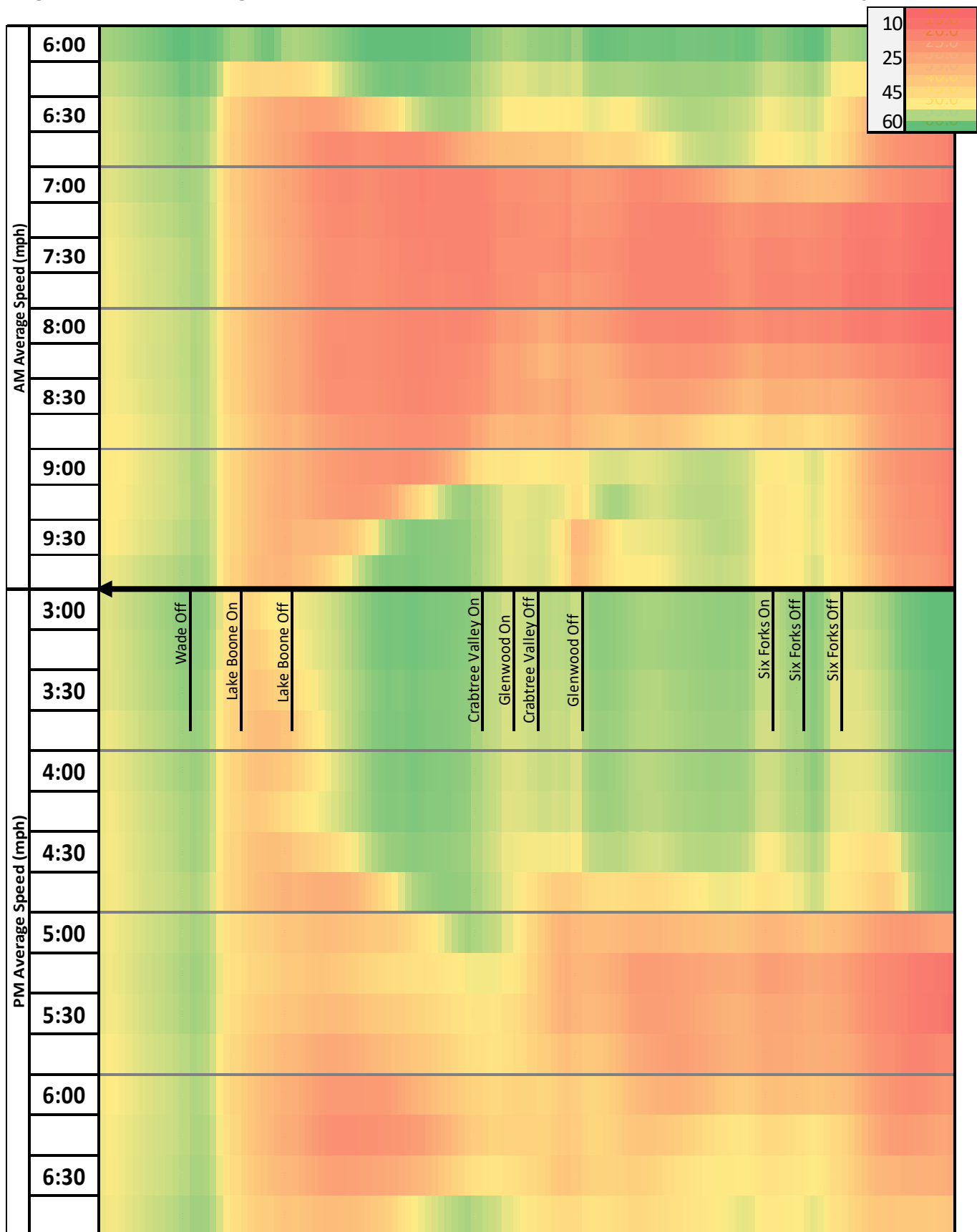


Figure 10-5: 2021 Design Year Build Alternative 2 with Aux Lanes Westbound Freeway Speeds



10.9.3 ARTERIAL/INTERSECTION RESULTS – ALTERNATIVE 2 WITH AUXILIARY LANES

The results of the intersection analysis along the arterial portions of the study area are included in Table 10-7 and Figure 10-6. It should be noted that the tables and figures include the results of the analysis for intersections along Lake Boone Trail and Six Forks Road; however, only the intersections in the I-5870 project study area will be summarized below.

The overall intersection LOS for signalized intersections in the 2021 Design Year Build Alternative 2 scenario shows that seven of the 18 project study area intersections are operating at LOS_s E or F in either the AM or PM peak period. These intersections are listed below and include the number of lane groups that are E or F.

AM peak hour

- Glenwood Ave at Creedmoor Rd operates at LOS_s E or F for four hours
 - 8 lane groups operate at LOS_s E or F
- Creedmoor Rd at Crabtree Valley Ave operates at LOS_s E or F for two hours
 - 5 lane groups operate at LOS_s E or F
- Crabtree Valley Ave at Homewood Banks Dr/Crabtree Valley Mall Entrance operates at a LOS_s E or F for two hours
 - 3 lane groups operate at LOS_s E or F
- Crabtree Valley Ave at I-440 EB Ramps operates at LOS_s F for one hour
 - 4 lane groups operate at LOS_s E or F
- Lead Mine Rd at North Hills Drive operates at LOS_s E or F for three hours
 - 5 lane groups operate at LOS_s E or F

PM peak hour

- Glenwood Ave at Creedmoor Rd operates at LOS_s F for four hours
 - 11 lane groups operate at LOS_s E or F
- Creedmoor Rd at Crabtree Valley Ave operates at LOS_s F for three hours
 - 5 lane groups operate at LOS_s E or F
- Crabtree Valley Ave at Homewood Banks Dr/Crabtree Valley Mall Entrance operates at a LOS_s E for three hours
 - 6 lane groups operate at LOS_s E or F
- Crabtree Valley Ave at Arrow Dr operates at a LOS_s F for two hours
 - 5 lane groups operate at LOS_s E or F
- Crabtree Valley Ave at I-440 WB Ramps operates at LOS_s E or F for two hours
 - 3 lane groups operate at LOS_s E or F
- Crabtree Valley Ave at I-440 EB Ramps operates at LOS_s E or F for two hours
 - 3 lane groups operate at LOS_s E or F

The overall intersection LOS for signalized intersections in the 2021 Design Year Build Alternative 2 scenario shows that multiple intersections are operating at LOS_s D or better in both the AM and PM peak periods; however, these locations have at least one lane group with a LOS_s E or F. These intersections are listed below and include the number of lane groups that are E or F.

AM peak hour

- Glenwood Ave at Fairhill Dr/Rembert Dr operates at a LOS_s A and B
 - 5 lane groups operate at LOS_s E or F for four hours

- Glenwood Ave at Marriot Dr/Crabtree Valley Mall Entrance operates at a LOS_s A and B
 - 5 lane groups operate at LOS_s E or F for four hours
- Glenwood Ave WB at Blue Ridge Rd/Lead Mine Rd NB operates at a LOS_s C and D
 - 8 lane group operates at LOS_s E or F for at least one hour
- Glenwood Ave at Crabtree Valley Ave operates at a LOS_s A, B and C
 - 1 lane group operates at LOS_s E for one hour
- Glenwood Ave at Woman's Club Dr operates at LOS_s A and B
 - 6 lane groups operate at LOS_s E or F for at least one hour
- Creedmoor Rd at Office Driveway/Crabtree Valley Mall Entrance operates at LOS_s B, C and D
 - 7 lane groups operate at LOS_s E or F for at least two hours
- Crabtree Valley Ave at Arrow Dr operates at a LOS_s A and B
 - 4 lane groups operate at LOS_s E or F for at least two hours
- Crabtree Valley Ave at I-440 WB ramps operates at a LOS_s B and C
 - 3 lane groups operate at LOS_s E or F for four hours
- Blue Ridge at Crabtree Valley Mall Entrance operates at a LOS_s A and D
 - 3 lane groups operate at LOS_s E or F for at least one hour

PM peak hour

- Glenwood Ave at Fairhill Dr/Rembert Dr operates at a LOS_s B
 - 5 lane groups operate at LOS_s F for four hours
- Glenwood Ave at Marriot Dr/Crabtree Valley Mall Entrance operates at a LOS_s A, B and C
 - 4 lane groups operate at LOS_s E or F for four hours
- Glenwood Ave WB at Blue Ridge Rd/Lead Mine Rd NB operates at a LOS_s D
 - 9 lane group operates at LOS_s E or F for at least one hour
- Glenwood Ave at I-440WB off-ramp operates at a LOS_s C and D
 - 1 lane group operates at LOS_s E for two hours
- Glenwood Ave at Crabtree Valley Ave operates at a LOS_s A, B and C
 - 1 lane group operates at LOS_s E for two hours
- Glenwood Ave at Woman's Club Dr operates at LOS_s A and B
 - 6 lane groups operate at LOS_s E or F for at least three hours
- Creedmoor Rd at Office Driveway/Crabtree Valley Mall Entrance operates at LOS_s C
 - 7 lane groups operate at LOS_s E or F for at least two hours
- Blue Ridge at Crabtree Valley Mall Entrance operates at a LOS_s A and B
 - 1 lane groups operate at LOS_s E for one hour

These intersections are listed below and include the movements that operates at E or F.

AM peak hour

- Glenwood Ave at Morehead Dr
 - Westbound left-turn/right-turn operates at LOS_s F for three hours
 - Southbound left-turn operates at LOS_s E for one hour
- Glenwood Ave at Crabtree Valley Mall Entrance
 - Northbound right-turn operates at LOS_s E for one hour
- Crabtree Valley Ave at Apartment Driveway
 - Southbound right-turn operates at LOS_s F for two hours
- Crabtree Valley Ave at Edwards Mill Rd

- Southbound left-turn operates at LOS_s F for two hours
- Southbound right-turn operates at LOS_s F for two hours
- Eastbound left-turn operates at LOS_s F for two hours
- Blue Ridge Rd at Crabtree View Place
 - Westbound left-turn/right-turn operates at LOS_s E or F for three hours
- Creedmoor Rd at Bank Drwy
 - Southbound left-turn operates at LOS_s F for two hours
 - Southbound right-turn operates at LOS_s F for two hours
 - Eastbound through/left-turn lane operates at LOS_s F for one hour

PM peak hour

- Glenwood Ave at Morehead Dr
 - Westbound left-turn/right-turn operates at LOS_s F for four hours
 - Southbound left-turn operates at LOS_s E for two hours
- Glenwood Ave at Varnell Ave/National Dr
 - Westbound right-turn operates at LOS_s F for two hours
- Crabtree Valley Ave at Edwards Mill Rd
 - Southbound left-turn operates at LOS_s E for two hours
- Creedmoor Rd at Bank Drwy
 - Southbound left-turn operates at LOS_s F for two hours
 - Southbound right-turn operates at LOS_s F for one hour

Table 10-7: 2021 Design Year Build Alternative 2 Intersection Delay and LOS

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
1	Lake Boone Trail & Wycliff Rd	Overall		17.4	19.9	22.9	18.9	B	B	C	B
		Wycliff Rd SB	L	55.1	58.6	70.4	62.2	E	E	E	E
			R	40.7	40.6	40.8	39.6	D	D	D	D
		Lake Boone Trail WB	T	9.2	13.3	15.3	12.4	A	B	B	B
			R	4.1	7.5	9.1	6.4	A	A	A	A
		Lake Boone Trail EB	L	8.5	13.2	29.2	17.7	A	B	C	B
T	4.1		4.9	4.5	5.0	A	A	A	A		
2	Lake Boone Trail & I-440 WB Ramps	Overall		24.8	22.9	22.9	25.5	C	C	C	C
		I-440 WB Off-Ramp SB	LT	53.9	50.3	52.5	51.2	D	D	D	D
			R	49.1	50.6	48.3	45.0	D	D	D	D
		Lake Boone Trail WB	L	16.2	25.7	29.3	30.8	B	C	C	C
			T	10.9	13.4	15.5	15.6	B	B	B	B
		Lake Boone Trail EB	T	9.2	13.7	15.2	19.7	A	B	B	B
R	9.8		13.0	13.2	17.4	A	B	B	B		
3	Lake Boone Trail & Ridge Rd	Overall		12.4	17.2	16.3	14.4	B	B	B	B
		Ridge Rd SB	L	26.6	20.5	26.6	23.1	C	C	C	C
			TR	23.8	19.7	19.1	20.2	C	B	B	C
		Lake Boone Trail WB	L	11.8	18.7	15.7	14.1	B	B	B	B
			T	4.1	10.1	9.3	8.1	A	B	A	A
		TR	4.3	9.5	8.9	7.3	A	A	A	A	
		Ridge Rd NB	L	37.5	92.7	73.3	58.2	D	F	E	E
			TR	26.0	14.8	15.3	16.7	C	B	B	B
		Lake Boone Trail EB	L	10.0	19.6	23.2	13.6	A	B	C	B
T	7.2		15.1	15.1	10.6	A	B	B	B		
TR	5.7		10.7	9.4	7.2	A	B	A	A		
4	Ridge Rd & Glen Eden Dr	Overall		21.2	25.1	65.0	27.8	C	C	E	C
		Ridge Rd SB	L	9.4	22.4	24.6	18.2	A	C	C	B
			TR	8.5	17.3	20.2	15.6	A	B	C	B
		Glen Eden Dr WB	L	50.0	41.0	102.4	54.5	D	D	F	D
			TR	41.3	35.9	58.8	36.5	D	D	E	D
		Ridge Rd NB	L	12.5	27.9	36.6	21.4	B	C	D	C
			TR	7.3	12.2	27.6	11.2	A	B	C	B
		Glen Eden Dr EB	L	54.5	49.0	171.4	65.1	D	D	F	E
TR	32.0		22.5	103.7	37.3	C	C	F	D		
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Overall		5.7	9.0	11.5	10.2	A	A	B	B
		Rembert Dr SWB	LTR	87.4	78.6	76.1	77.6	F	E	E	E
			L	113.6	87.6	88.6	88.6	F	F	F	F
		Glenwood Ave NWB	T	2.7	5.3	6.0	5.9	A	A	A	A
			TR	3.4	5.8	6.4	6.4	A	A	A	A
		Fairhill Dr NEB	L	98.4	81.8	92.9	85.5	F	F	F	F
			TR	101.1	87.0	79.2	83.3	F	F	E	F
		Glenwood Ave SEB	L	162.3	111.1	102.8	109.4	F	F	F	F
T	2.6		5.6	7.7	5.7	A	A	A	A		
6	Glenwood Ave & Creedmoor Rd	Overall		59.9	121.3	102.6	87.0	E	F	F	F
		Creedmoor Rd SWB	L	70.5	137.9	212.3	216.8	E	F	F	F
			T	67.9	181.1	213.5	211.7	E	F	F	F
			TR	55.7	149.7	196.2	189.4	E	F	F	F
		Glenwood Ave NWB	L	188.0	211.0	100.4	112.6	F	F	F	F
			T	22.1	21.3	20.1	24.4	C	C	C	C
		Creedmoor Rd NEB	L	144.7	515.8	549.0	62.7	F	F	F	E
			T	51.3	40.0	45.9	21.6	D	D	D	C
Glenwood Ave EB	R	49.5	23.3	31.7	14.0	D	C	C	B		
	L	82.8	103.1	100.4	75.9	F	F	F	E		
	T	35.8	71.7	49.2	39.8	D	E	D	D		
	TR	116.4	419.4	89.4	86.8	F	F	F	F		
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Overall		5.5	7.6	12.8	11.3	A	A	B	B
		Marriott Dr SWB	L	75.1	68.3	78.3	67.2	E	E	E	E
			TR	--	--	--	--	--	--	--	--
		Glenwood Ave NWB	L	110.1	118.8	109.8	95.2	F	F	F	F
			T	6.2	12.3	16.1	14.8	A	B	B	B
		Crabtree Valley Mall Entrance NEB	TR	7.3	14.9	17.8	14.7	A	B	B	B
			LT	94.7	94.3	81.2	71.2	F	F	F	E
		Glenwood Ave SEB	R	109.5	96.0	67.3	58.1	F	F	E	E
L	87.7		79.1	71.3	81.0	F	E	E	F		
8	Glenwood Ave CFI West Crossover	Overall		2.0	2.9	3.4	2.5	A	A	A	A
		Glenwood Ave NWB	T	1.6	2.0	1.8	1.7	A	A	A	A
			Glenwood Ave SEB	T	42.8	30.9	45.3	31.6	D	C	D

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
9	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd	Lead Mine Rd SWB	Overall	29.9	47.8	55.7	42.3	C	D	E	D
			L	47.8	68.5	78.0	69.9	D	E	E	E
			T	57.0	72.8	68.2	70.1	E	E	E	E
		Glenwood Ave NWB	TR	50.0	75.1	61.6	67.4	D	E	E	E
			L	113.7	112.4	93.8	91.3	F	F	F	F
			T	23.0	28.9	31.5	31.3	C	C	C	C
		Blue Ridge Rd NEB	R	5.8	12.0	14.8	13.7	A	B	B	B
			L	88.2	97.3	145.4	97.1	F	F	F	F
			T	65.7	190.8	276.1	124.6	E	F	F	F
		Glenwood Ave EB	T	14.4	31.4	50.7	23.9	B	C	D	C
R	21.0		24.7	35.2	26.0	C	C	D	C		
L	53.5		52.6	60.2	41.6	D	D	E	D		
10	Glenwood Ave CFI East Crossover	Overall	1.7	3.2	4.0	5.6	A	A	A	A	
		Glenwood Ave NWB	T	91.5	91.6	82.9	80.0	F	F	F	E
		Glenwood Ave SEB	T	1.3	2.2	2.1	2.2	A	A	A	A
11	Glenwood Ave at I-440 WB Ramps	I-440 WB Off-Ramp WB	Overall	14.8	27.6	35.5	25.9	B	C	D	C
			R	7.5	10.4	11.4	20.7	A	B	B	C
			L	22.5	27.3	36.1	22.7	C	C	D	C
		Glenwood Ave NWB	T	13.6	17.2	24.8	23.0	B	B	C	C
		Glenwood Ave EB	T	25.7	38.8	50.9	32.6	C	D	D	C
12	Glenwood Ave at I-440 EB Ramps	Overall	13.5	25.7	27.8	22.1	B	C	C	C	
		Glenwood Ave NWB	T	32.5	32.6	32.1	32.3	C	C	C	C
		Glenwood Ave SEB	T	10.2	23.6	26.3	17.4	B	C	C	B
		I-440 EB Off-Ramp	L	--	12.8	13.7	13.6	--	B	B	B
13	Glenwood Ave & Crabtree Valley Ave	Overall	12.6	21.9	8.4	3.5	B	C	A	A	
		Glenwood Ave NWB	L	33.8	74.9	57.0	52.1	C	E	E	D
		Glenwood Ave SEB	T	4.6	8.8	5.7	2.5	A	A	A	A
14	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	Overall	5.7	8.4	10.5	10.7	A	A	B	B
			L	62.3	53.6	53.0	51.8	E	D	D	D
			T	0.4	2.4	4.7	3.9	A	A	A	A
		Womans Club Dr WB	R	0.0	1.9	6.0	7.9	A	A	A	A
			LT	94.1	89.7	76.1	84.3	F	F	E	F
			R	97.0	58.0	45.0	58.8	F	E	D	E
		Glenwood Ave NB	L	--	92.9	75.1	83.3	--	F	E	F
			T	2.8	9.0	9.0	8.7	A	A	A	A
			TR	2.9	7.1	9.0	9.2	A	A	A	A
		Parking Deck EB	L	--	109.4	83.3	76.1	--	F	F	E
TR	--	124.9	95.3	80.5	--	F	F	F			
15	Creedmoor Rd & Crabtree Valley Ave	Overall	48.7	95.6	84.3	35.2	D	F	F	D	
		Creedmoor Rd SWB	L	99.8	101.3	84.8	84.7	F	F	F	F
			T	13.6	18.2	12.9	13.1	B	B	B	B
		Crabtree Valley Ave NWB	L	32.0	198.6	135.6	35.8	C	F	F	D
			R	27.2	303.9	252.8	22.5	C	F	F	C
		Creedmoor Rd NEB	T	32.3	90.3	67.4	26.1	C	F	E	C
			TR	41.0	108.5	93.4	40.9	D	F	F	D
16	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Overall	26.9	45.8	36.2	18.4	C	D	D	B	
		Creedmoor Rd SWB	L	108.6	103.8	93.8	104.0	F	F	F	F
			T	53.3	45.4	22.3	29.9	D	D	C	C
			TR	10.7	12.9	10.4	9.7	B	B	B	A
		Crabtree Valley Mall Entrance NWB	LT	97.1	88.8	84.1	75.3	F	F	F	E
			R	58.1	76.7	63.5	48.6	E	E	E	D
		Creedmoor Rd NEB	L	--	425.4	175.0	136.0	--	F	F	F
			T	3.8	151.2	117.7	1.5	A	F	F	A
			TR	4.7	7.3	11.7	3.9	A	A	B	A
		Office Drwy SEB	LT	--	417.5	195.9	130.3	--	F	F	F
R	--	206.9	122.0	149.6	--	F	F	F			
17	Crabtree Valley Ave & Homewood Banks Dr / Crabtree Valley Mall Entrance	Overall	22.3	93.5	113.6	32.7	C	F	F	C	
		Crabtree Valley Mall Entrance SWB	L	72.8	222.6	164.6	76.5	E	F	F	E
			TR	57.6	208.2	184.4	47.7	E	F	F	D
			L	95.5	125.0	156.8	113.7	F	F	F	F
		Crabtree Valley Ave NWB	T	24.7	201.6	234.6	32.9	C	F	F	C
			R	14.3	271.8	249.9	29.8	B	F	F	C
		Homewood Banks Dr NEB	L	103.1	267.8	178.0	93.9	F	F	F	F
			TR	74.3	57.8	62.1	68.7	E	E	E	E
		Crabtree Valley Ave SEB	L	61.7	59.1	60.7	65.4	E	E	E	E
			T	2.4	9.2	8.7	5.9	A	A	A	A
R	5.1		15.7	22.7	25.9	A	B	C	C		
18	Crabtree Valley Ave & Arrow Dr	Overall	5.1	18.8	17.0	20.8	A	B	B	C	
		Arrow Dr SWB	LTR	95.3	178.0	194.6	160.8	F	F	F	F
			L	72.5	73.4	82.9	81.6	E	E	F	F
		Crabtree Valley Ave NWB	T	2.8	10.9	15.0	4.0	A	B	B	A
			TR	2.6	17.0	18.0	4.0	A	B	B	A
		Arrow Dr NEB	LTR	79.2	145.0	103.6	140.1	E	F	F	F
			L	--	45.5	140.5	222.6	--	D	F	F
		Crabtree Valley Ave SEB	T	3.6	31.2	14.2	30.5	A	C	B	C
TR	3.2		6.1	4.1	12.9	A	A	A	B		

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
19	Crabtree Valley Ave & I-440 WB Ramps	I-440 WB Off-Ramp	Overall	14.0	18.4	36.1	17.4	B	B	D	B
			L	69.9	89.0	126.1	97.2	E	F	F	F
		Crabtree Valley Ave NWB	R	62.4	75.9	112.2	61.9	E	E	F	E
			L	137.0	77.8	115.3	149.8	F	E	F	F
		Crabtree Valley Ave SEB	T	3.2	17.8	31.8	3.5	A	B	C	A
			R	7.5	15.7	16.8	17.4	A	B	B	B
20	Crabtree Valley Ave & I-440 EB Ramps	Crabtree Valley Ave WB	Overall	22.2	62.8	113.0	60.9	C	E	F	E
			L	62.0	81.6	71.8	61.6	E	F	E	E
		Ridge Rd NEB	T	12.9	69.6	80.6	21.1	B	E	F	C
			LTR	82.4	108.5	514.1	197.7	F	F	F	F
		Crabtree Valley Ave EB	L	62.2	79.2	75.1	79.3	E	E	E	E
			T	6.0	23.3	17.9	23.9	A	C	B	C
21	Blue Ridge Rd & Crabtree Valley Mall Entrance	Blue Ridge Rd SWB	R	5.9	13.0	16.4	16.0	A	B	B	B
			Overall	0.8	10.7	45.6	6.5	A	B	D	A
		Blue Ridge Rd NEB	T	0.8	4.5	5.1	6.6	A	A	A	A
			R	0.0	0.0	0.0	0.0	A	A	A	A
		Crabtree Valley Mall Entrance EB	LT	0.4	20.3	92.5	4.6	A	C	F	A
			T	0.5	20.6	122.2	4.0	A	C	F	A
22	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	L	63.9	57.3	68.4	39.6	E	E	E	D
			R	6.8	15.2	11.0	9.3	A	B	B	A
		North Hills Dr WB	Overall	11.6	68.2	146.8	232.6	B	E	F	F
			L	5.2	39.3	101.3	70.6	A	D	F	E
		Lead Mine Rd NB	T	3.0	54.0	136.6	96.0	A	D	F	F
			TR	3.5	76.0	119.1	139.1	A	E	F	F
23	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	L	64.1	714.3	5407.6	7185.1	E	F	F	F
			LR	64.9	1037.3	4018.3	6495.3	E	F	F	F
		Six Forks Rd NWB	T	1.8	10.3	16.4	19.2	A	B	B	B
			R	0.5	0.9	1.1	1.4	A	A	A	A
		Main Street NEB	R	14.2	468.7	326.4	269.4	B	F	F	F
			Overall	21.9	48.1	68.3	44.0	C	D	E	D
24	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	L	72.7	190.7	279.7	243.4	E	F	F	F
			T	82.9	84.3	176.6	121.2	F	F	F	F
		Six Forks Rd NWB	R	86.3	84.2	158.6	129.4	F	F	F	F
			L	74.1	85.7	87.6	81.2	E	F	F	F
		Six Forks Rd SEB	T	6.1	10.9	9.7	9.0	A	B	A	A
			R	3.5	5.4	4.4	4.4	A	A	A	A
25	Six Forks Rd & I-440 WB Ramps	I-440 WB Off-Ramp	L	85.4	76.2	78.6	83.5	F	E	E	F
			TR	74.0	81.3	79.1	71.7	E	F	E	E
		Six Forks Rd NWB	L	82.4	82.8	198.8	77.1	F	F	F	E
			T	15.9	47.0	77.2	25.9	B	D	E	C
		Six Forks Rd SEB	TR	18.6	55.1	56.1	28.8	B	E	E	C
			Overall	13.0	20.6	19.2	16.3	B	C	B	B
26	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Front Street SWB	L	73.7	62.5	63.4	62.3	E	E	E	E
			T	65.8	68.1	62.8	61.2	E	E	E	E
		Six Forks NWB	R	62.6	52.9	47.6	50.0	E	D	D	D
			L	72.8	90.3	93.0	92.8	E	F	F	F
		I-440 WB Off-Loop EB	T	8.5	6.7	6.7	6.9	A	A	A	A
			R	2.3	3.3	3.6	3.1	A	A	A	A
27	Six Forks Rd & Barrett Dr	Six Forks Rd SEB	R	6.5	12.2	16.1	12.2	A	B	B	B
			L	75.7	48.3	52.2	51.5	E	D	D	D
		Six Forks Rd NWB	T	6.7	12.4	14.2	8.8	A	B	B	A
			R	7.2	27.9	23.4	13.2	A	C	C	B
		Six Forks Rd SEB	Overall	13.9	17.3	24.0	17.2	B	B	C	B
			I-440 WB Off-Ramp	R	62.5	61.2	72.1	E	E	E	E
28	Six Forks Rd & Barrett Dr	Six Forks Rd NWB	T	3.1	15.4	23.1	16.8	A	B	C	B
			Overall	24.2	30.5	31.7	26.5	C	C	C	C
		Ramblewood Dr NEB	L	120.6	73.8	84.8	79.6	F	E	F	E
			T	10.5	20.6	21.2	19.3	B	C	C	B
		Six Forks Rd SEB	TR	8.5	20.4	21.9	18.9	A	C	C	B
			L	72.1	92.6	103.4	80.1	E	F	F	F
29	Six Forks Rd & Barrett Dr	Six Forks Rd NWB	T	74.8	90.7	97.9	77.8	E	F	F	E
			R	63.7	79.0	93.9	65.4	E	E	F	E
		Six Forks Rd SEB	L	64.7	64.2	63.4	67.6	E	E	E	E
			T	10.8	16.4	16.9	13.5	B	B	B	B
		Six Forks Rd NWB	TR	7.7	14.2	14.4	12.4	A	B	B	B
			Overall	21.5	21.9	26.6	14.6	C	C	C	B
30	Six Forks Rd & Barrett Dr	Six Forks Rd SB	L	828.3	753.8	399.0	129.4	F	F	F	F
			T	2.8	16.2	13.8	8.0	A	B	B	A
		Barrett Dr WB	L	187.1	97.6	90.3	90.4	F	F	F	F
			R	357.0	116.2	83.7	69.8	F	F	F	E
		Six Forks Rd NB	T	0.6	3.6	6.7	7.2	A	A	A	A
			TR	0.6	3.7	6.6	7.4	A	A	A	A

Unsignalized Intersections³

Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
61	Lake Boone Trail & Shopping Center Drwy / Myron Dr	Shopping Center Drwy SB	R	14.5	16.3	19.7	16.3	B	C	C	C
		Lake Boone Trail WB	L	4.6	10.3	14.2	10.8	A	B	B	B
			T	0.1	0.8	1.4	0.7	A	A	A	A
			TR	0.0	0.6	1.0	0.3	A	A	A	A
		Myron Dr NB	R	9.6	12.3	13.6	14.3	A	B	B	B
		Lake Boone Trail EB	T	0.0	0.0	0.0	0.0	A	A	A	A
TR	0.0		0.0	0.0	0.0	A	A	A	A		
62	Lake Boone Trail & I-440 EB Ramps	Lake Boone Trail SWB	T	0.0	0.0	0.0	0.0	A	A	A	A
		I-440 EB Off-Loop SEB	L	15.4	39.0	155.0	38.1	C	E	F	E
R	9.1		18.5	119.5	11.2	A	C	F	B		
63	Manuel St & Varnell Ave	Varnell Ave SB	LR	6.9	5.5	6.0	5.6	A	A	A	A
		Manuel St WB	TR	0.0	0.0	0.0	0.0	A	A	A	A
		Manuel St EB	LT	0.0	0.0	0.1	0.0	A	A	A	A
64	Ridge Rd & Manuel St	Ridge Rd SB	LT	0.1	0.2	1.1	0.5	A	A	A	A
		Manuel St WB	LR	9.8	11.8	42.0	12.6	A	B	E	B
		Ridge Rd NB	TR	0.0	0.0	0.0	0.0	A	A	A	A
65	Ridge Rd & I-440 EB Off-Ramp	I-440 EB Off-Ramp	T	18.4	27.9	21.2	23.0	C	D	C	C
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	39.1	59.3	76.4	50.0	E	F	F	F
		Glenwood Ave SEB	L	15.4	--	50.4	33.2	C	--	F	D
67	Glenwood Ave & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NEB	R	9.3	39.5	26.4	15.8	A	E	D	C
			T	0.1	0.7	0.6	0.1	A	A	A	A
		Glenwood Ave SEB	TR	0.0	0.0	0.0	0.0	A	A	A	A
68	Glenwood Ave & Arrow Dr	Arrow Dr NEB	R	5.2	6.6	13.8	13.6	A	A	B	B
		Glenwood Ave EB	TR	0.0	0.0	0.7	0.0	A	A	A	A
			T	0.0	0.0	0.0	0.0	A	A	A	A
69	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	0.0	0.2	0.2	0.1	A	A	A	A
			TR	0.0	0.0	0.0	0.0	A	A	A	A
		National Dr NWB	R	9.1	25.6	12.3	11.1	A	D	B	B
			L	18.5	27.1	24.1	25.7	C	D	C	D
		Glenwood Ave NB	T	0.0	3.8	0.1	0.1	A	A	A	A
			R	--	0.0	0.0	0.0	--	A	A	A
70	Creedmoor Rd & Bank Drwy	Creedmoor Rd NEB	LT	0.0	55.7	9.1	0.0	A	F	A	A
		Bank Drwy SEB	L	--	--	172.7	110.6	--	--	F	F
			R	--	--	174.5	210.8	--	--	F	F
71	Crabtree Valley Ave & Apt Drwy	Apt Drwy SWB	R	11.5	90.1	33.8	7.0	B	F	D	A
72	Crabtree Valley Ave & Edwards Mill Rd	Edwards Mill SB	L	20.6	54.1	43.0	23.5	C	F	E	C
		R	8.6	116.5	56.9	8.6	A	F	F	A	
73	Blue Ridge Rd & Homewood Banks Dr	Crabtree Valley Ave EB	L	5.8	146.7	85.1	3.8	A	F	F	A
		Homewood Banks SB	L	14.5	28.0	19.4	20.6	B	D	C	C
		Blue Ridge Rd NEB	L	3.0	8.9	6.8	6.4	A	A	A	A
74	Blue Ridge Rd & Arinto Dr	Arinto Dr SEB	L	9.8	21.1	13.7	16.4	A	C	B	C
			R	13.7	17.0	13.4	14.9	B	C	B	B
		Blue Ridge Rd NEB	L	--	--	5.2	17.3	--	--	A	C
75	Blue Ridge Rd & Summit Park Ln	Blue Ridge Rd SWB	LT	0.1	0.1	0.2	0.1	A	A	A	A
		Summit Park Ln NWB	LR	7.4	12.0	9.0	11.8	A	B	A	B
76	Blue Ridge Rd & Crabtree View Place	Blue Ridge Rd SWB	L	4.8	--	--	--	A	--	--	--
		Crabtree View Place NWB	LR	8.7	19.7	32.4	14.5	A	C	D	B
77	Six Forks Rd & Browning Pl	Browning SWB	L	13.1	38.9	55.3	51.7	B	E	F	F
			R	6.7	9.3	9.9	10.1	A	A	A	B
		Six Forks Rd SEB	L	3.6	11.2	14.7	11.0	A	B	B	B

Notes:

- 1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations
- 2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies
- 3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	Overall	28.1	86.2	179.6	81.5	C	F	F	F
			L	45.4	166.7	327.1	127.7	D	F	F	F
		Lake Boone Trail WB	R	20.5	71.7	171.9	58.1	C	E	F	E
			T	25.7	24.8	23.9	26.4	C	C	C	C
		Lake Boone Trail EB	R	12.0	9.6	8.3	12.0	B	A	A	B
			L	31.7	94.3	232.0	117.1	C	F	F	F
			T	26.0	100.0	225.1	107.2	C	F	F	F
2	Lake Boone Trail & I-440 WB Ramps	I-440 WB Off-Ramp SB	Overall	31.0	46.2	50.2	33.7	C	D	D	C
			LT	51.1	50.7	52.2	49.0	D	D	D	D
		Lake Boone Trail WB	R	43.7	46.4	45.7	46.0	D	D	D	D
			L	36.4	35.0	37.7	34.0	D	D	D	C
		Lake Boone Trail EB	T	6.4	6.1	6.8	6.0	A	A	A	A
			T	45.4	74.9	82.7	43.5	D	E	F	D
			R	19.8	28.2	37.0	24.1	B	C	D	C
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	Overall	13.7	15.2	23.8	12.9	B	B	C	B
			L	35.3	33.8	36.0	26.6	D	C	D	C
		Lake Boone Trail WB	TR	20.0	19.1	22.2	20.4	B	B	C	C
			L	14.4	19.7	38.0	18.1	B	B	D	B
			T	6.5	8.9	15.2	5.7	A	A	B	A
		Ridge Rd NB	TR	7.1	8.8	15.1	6.3	A	A	B	A
			L	36.1	57.3	74.6	44.8	D	E	E	D
		Lake Boone Trail EB	TR	18.7	16.7	12.2	18.0	B	B	B	B
			L	15.7	18.7	100.9	14.7	B	B	F	B
			T	11.5	14.7	23.1	11.8	B	B	C	B
4	Ridge Rd & Glen Eden Dr	Ridge Rd SB	Overall	23.8	53.6	119.5	99.3	C	D	F	F
			L	22.1	30.2	43.9	25.2	C	C	D	C
		Glen Eden Dr WB	TR	15.4	21.3	28.1	21.1	B	C	C	C
			L	41.3	185.5	836.2	301.5	D	F	F	F
		Ridge Rd NB	TR	40.2	99.7	492.2	248.4	D	F	F	F
			L	18.7	36.4	113.9	50.9	B	D	F	D
		Glen Eden Dr EB	TR	12.1	15.0	39.2	24.9	B	B	D	C
			L	38.8	91.5	154.4	54.5	D	F	F	D
			TR	21.7	52.2	108.8	27.4	C	D	F	C
		5	Glenwood Ave & Fairhill Dr / Rembert Dr	Rembert Dr SWB	Overall	10.4	12.1	13.3	9.8	B	B
LTR	96.1				89.2	91.4	90.4	F	F	F	F
Glenwood Ave NWB	L			99.7	104.9	119.9	114.9	F	F	F	F
	T			6.6	8.9	11.0	7.2	A	A	B	A
Fairhill Dr NEB	TR			7.1	9.0	11.5	7.6	A	A	B	A
	L			94.0	99.5	109.3	103.4	F	F	F	F
Glenwood Ave SEB	TR			103.3	81.6	91.4	82.8	F	F	F	F
	L			115.5	110.1	93.1	107.0	F	F	F	F
	T			5.4	6.7	6.8	5.2	A	A	A	A
6	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	Overall	62.7	133.2	144.6	138.6	E	F	F	F
			L	80.2	225.3	278.3	280.6	F	F	F	F
		Glenwood Ave NWB	T	79.2	286.0	331.9	354.5	E	F	F	F
			TR	71.7	253.8	305.5	309.4	E	F	F	F
			L	98.5	106.8	103.0	181.2	F	F	F	F
		Creedmoor Rd NEB	T	32.1	34.8	89.9	55.8	C	C	F	E
			L	65.3	176.0	200.0	156.7	E	F	F	F
			T	30.7	55.0	62.6	55.0	C	D	E	D
		Glenwood Ave EB	R	25.5	45.6	54.6	43.6	C	D	D	D
			L	93.3	152.3	383.2	195.2	F	F	F	F
T	44.8		82.2	95.1	82.3	D	F	F	F		
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Marriott Dr SWB	Overall	9.5	7.5	31.9	24.3	A	A	C	C
			L	79.4	80.6	78.6	72.8	E	F	E	E
		Glenwood Ave NWB	TR	81.4	67.5	63.5	64.7	F	E	E	E
			L	98.0	97.9	94.1	96.5	F	F	F	F
		Crabtree Valley Mall Entrance NEB	T	1.4	2.4	41.6	27.5	A	A	D	C
			TR	1.5	2.4	56.5	31.6	A	A	E	C
		Glenwood Ave SEB	LT	65.8	70.6	93.6	79.1	E	E	F	E
			R	50.7	53.5	50.8	53.0	D	D	D	D
			L	--	--	197.7	49.7	--	--	F	D
		8	Glenwood Ave CFI West Crossover	Glenwood Ave NWB	T	7.8	3.8	5.0	7.7	A	A
TR	12.9				10.7	10.7	12.4	B	B	B	B
Glenwood Ave SEB	Overall			1.9	3.7	3.9	3.0	A	A	A	A

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
9	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd	Lead Mine Rd SWB	Overall	38.1	41.1	54.3	41.5	D	D	D	D
			L	58.9	60.7	61.1	61.3	E	E	E	E
			T	66.8	63.8	61.8	61.2	E	E	E	E
		Glenwood Ave NWB	TR	65.0	63.4	64.2	61.1	E	E	E	E
			L	29.9	27.2	32.0	62.5	C	C	C	E
			T	27.9	29.8	61.8	32.7	C	C	E	C
		Blue Ridge Rd NEB	R	23.4	28.0	39.3	25.8	C	C	D	C
			L	73.3	80.6	88.4	86.1	E	F	F	F
			T	74.2	76.6	74.0	77.2	E	E	E	E
		Glenwood Ave EB	T	36.1	45.0	46.7	41.3	D	D	D	D
			R	35.0	37.6	32.5	31.6	D	D	C	C
			L	35.2	57.4	58.6	47.7	D	E	E	D
10	Glenwood Ave CFI East Crossover	Overall	6.2	6.4	4.5	6.1	A	A	A	A	A
		Glenwood Ave NWB	T	79.5	69.8	64.7	70.6	E	E	E	E
		Glenwood Ave SEB	T	1.9	1.3	1.1	2.1	A	A	A	A
11	Glenwood Ave at I-440 WB Ramps	Overall	30.8	32.7	38.7	31.9	C	C	D	C	C
		I-440 WB Off-Ramp WB	R	16.5	17.0	17.8	16.3	B	B	B	B
			L	15.2	15.4	15.8	14.2	B	B	B	B
		Glenwood Ave NWB	T	20.8	22.8	33.2	21.7	C	C	C	C
		Glenwood Ave EB	T	51.2	55.3	60.2	53.2	D	E	E	D
12	Glenwood Ave at I-440 EB Ramps	Overall	17.3	20.4	27.3	18.8	B	C	C	C	B
		Glenwood Ave NWB	T	24.1	26.9	35.2	25.4	C	C	D	C
		Glenwood Ave SEB	T	9.5	10.6	11.6	10.4	A	B	B	B
		I-440 EB Off-Ramp	L	21.7	22.3	22.2	21.7	C	C	C	C
13	Glenwood Ave & Crabtree Valley Ave	Overall	18.6	22.8	11.8	4.0	B	C	B	A	A
		Glenwood Ave NWB	L	53.1	73.6	59.9	49.8	D	E	E	D
		Glenwood Ave SEB	T	9.1	7.1	3.8	2.4	A	A	A	A
14	Glenwood Ave & Parking Deck / Womans Club Dr	Overall	11.8	16.9	15.5	5.3	B	B	B	A	A
		Glenwood Ave SB	L	74.5	80.3	94.4	90.6	E	F	F	F
			T	5.0	4.2	7.0	2.3	A	A	A	A
			R	12.0	0.0	38.1	--	B	A	D	--
		Womans Club Dr WB	LT	76.0	73.5	67.8	78.9	E	E	E	E
			R	63.8	57.5	59.6	107.8	E	E	E	F
		Glenwood Ave NB	L	128.0	157.5	136.0	--	F	F	F	--
			T	9.5	21.2	14.5	4.3	A	C	B	A
			TR	9.5	13.9	15.2	4.8	A	B	B	A
		Parking Deck EB	L	88.3	74.9	75.5	108.2	F	E	E	F
			TR	86.8	74.4	71.4	81.8	F	E	E	F
15	Creedmoor Rd & Crabtree Valley Ave	Overall	35.3	78.7	99.6	106.1	D	E	F	F	F
		Creedmoor Rd SWB	L	99.4	89.3	89.7	103.2	F	F	F	F
			T	4.5	3.2	3.2	3.1	A	A	A	A
			L	62.5	59.5	81.6	60.1	E	E	F	E
		Crabtree Valley Ave NWB	R	16.0	37.7	86.8	24.7	B	D	F	C
			T	29.2	122.7	148.0	159.9	C	F	F	F
			TR	39.0	168.2	204.1	196.8	D	F	F	F
16	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Overall	22.6	28.4	32.8	30.0	C	C	C	C	C
		Creedmoor Rd SWB	L	87.8	108.3	102.4	118.4	F	F	F	F
			T	49.9	75.6	58.4	89.4	D	E	E	F
			TR	11.1	13.6	12.3	13.3	B	B	B	B
		Crabtree Valley Mall Entrance NWB	LT	63.0	63.3	64.2	71.1	E	E	E	E
			R	45.5	65.0	62.6	50.5	D	E	E	D
		Creedmoor Rd NEB	L	140.8	146.2	150.4	127.4	F	F	F	F
			T	5.0	13.4	22.2	6.7	A	B	C	A
			TR	8.8	16.0	32.5	11.6	A	B	C	B
		Office Drwy SEB	LT	169.0	111.5	105.4	120.6	F	F	F	F
			R	109.9	108.9	103.1	107.6	F	F	F	F
17	Crabtree Valley Ave & Homewood Banks Dr / Crabtree Valley Mall Entrance	Overall	50.7	57.5	60.5	59.5	D	E	E	E	E
		Crabtree Valley Mall Entrance SWB	L	173.5	223.5	217.7	192.6	F	F	F	F
			TR	82.7	113.3	107.6	110.4	F	F	F	F
			L	73.2	98.7	89.6	98.4	E	F	F	F
		Crabtree Valley Ave NWB	T	40.4	34.3	39.3	17.6	D	C	D	B
			R	20.8	22.9	32.6	24.6	C	C	C	C
		Homewood Banks Dr NEB	L	79.1	94.1	84.1	78.8	E	F	F	E
			TR	65.5	72.9	57.1	57.1	E	E	E	E
		Crabtree Valley Ave SEB	L	96.7	99.1	111.4	105.7	F	F	F	F
			T	24.9	27.1	27.1	27.1	C	C	C	C
			R	16.7	31.2	27.1	25.0	A	C	C	C
18	Crabtree Valley Ave & Arrow Dr	Overall	5.5	26.2	69.1	46.1	A	C	E	D	D
		Arrow Dr SWB	LTR	93.0	105.8	245.0	264.8	F	F	F	F
			L	38.8	57.5	68.0	74.6	D	E	E	E
			T	2.2	1.8	5.3	13.9	A	A	A	B
		Crabtree Valley Ave NWB	TR	2.7	3.9	7.5	15.7	A	A	A	B
			LTR	80.7	239.3	547.5	149.6	F	F	F	F
		Arrow Dr NEB	L	65.4	--	313.7	--	E	--	F	--
			T	4.9	44.8	93.7	57.6	A	D	F	E
			TR	6.0	16.3	37.6	18.1	A	B	D	B

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
19	Crabtree Valley Ave & I-440 WB Ramps	I-440 WB Off-Ramp	Overall	14.9	31.5	56.5	44.8	B	C	E	D
			L	67.7	123.5	200.6	148.5	E	F	F	F
		Crabtree Valley Ave NWB	R	62.8	69.5	123.4	88.0	E	E	F	F
			L	53.3	76.0	76.2	71.8	D	E	E	E
		Crabtree Valley Ave SEB	T	1.7	6.5	8.6	8.4	A	A	A	A
			R	6.8	20.6	25.7	24.6	A	C	C	C
20	Crabtree Valley Ave & I-440 EB Ramps	Crabtree Valley Ave WB	L	10.4	18.4	18.2	17.5	B	B	B	B
			R	28.4	46.9	83.0	59.6	C	D	F	E
		Ridge Rd NEB	L	152.1	83.7	81.2	133.1	F	F	F	F
			T	27.6	40.4	38.6	35.6	C	D	D	D
		Crabtree Valley Ave EB	LTR	61.0	98.0	285.0	164.9	E	F	F	F
			L	70.5	74.6	88.1	84.4	E	E	F	F
21	Blue Ridge Rd & Crabtree Valley Mall Entrance	Blue Ridge Rd SWB	T	4.5	15.2	18.4	14.5	A	B	B	B
			R	2.6	15.8	15.1	10.1	A	B	B	B
		Blue Ridge Rd NEB	L	12.6	9.8	9.6	8.6	B	A	A	A
			T	7.8	7.1	5.6	5.0	A	A	A	A
		Crabtree Valley Mall Entrance EB	R	0.0	0.1	0.0	0.0	A	A	A	A
			LT	7.2	4.2	3.6	4.2	A	A	A	A
22	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	T	3.8	3.9	3.2	3.6	A	A	A	A
			L	57.6	55.8	59.6	56.9	E	E	E	E
		North Hills Dr WB	R	17.6	13.7	15.3	8.5	B	B	B	A
			L	9.7	9.7	11.0	11.5	A	A	B	B
		Lead Mine Rd NB	L	7.2	8.4	9.4	5.9	A	A	A	A
			T	3.2	3.5	3.8	3.6	A	A	A	A
23	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	TR	3.3	3.6	6.5	16.7	A	A	A	B
			L	71.0	74.2	62.8	66.4	E	E	E	E
		Six Forks Rd NWB	LR	68.4	66.5	66.8	69.0	E	E	E	E
			T	4.1	6.4	8.3	6.5	A	A	A	A
		Main Street NEB	R	1.8	2.8	2.7	2.9	A	A	A	A
			R	13.0	12.1	23.8	17.7	B	B	C	B
24	Six Forks Rd & I-440 WB Ramps / Front St	Six Forks Rd SEB	L	52.7	46.5	95.7	63.0	D	D	F	E
			L	93.6	128.1	294.9	255.1	F	F	F	F
		Six Forks Rd SWB	T	76.6	75.6	122.0	113.1	E	E	F	F
			R	79.5	79.4	126.4	132.0	E	E	F	F
		Six Forks Rd NWB	L	41.5	40.1	38.3	35.9	D	D	D	D
			T	16.6	13.9	17.3	20.0	B	B	B	B
25	Six Forks Rd & I-440 WB Ramps	Six Forks Rd SEB	R	13.5	10.5	14.7	14.2	B	B	B	B
			L	135.8	132.4	165.1	124.9	F	F	F	F
		Main Street NEB	TR	98.8	95.7	137.4	92.8	F	F	F	F
			L	89.0	89.3	108.8	90.6	F	F	F	F
		Six Forks Rd SEB	T	62.0	52.1	131.1	61.9	E	D	F	E
			TR	95.2	74.3	183.2	74.8	F	E	F	E
26	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Front Street SWB	Overall	24.7	25.6	33.0	21.8	C	C	C	C
			L	78.2	77.3	78.5	81.0	E	E	E	F
		Six Forks NWB	T	79.9	88.3	126.2	108.6	E	F	F	F
			R	69.3	73.2	127.5	87.2	E	E	F	F
		I-440 WB Off-Loop EB	L	132.0	131.8	132.4	127.3	F	F	F	F
			T	10.1	10.6	12.1	10.3	B	B	B	B
27	Six Forks Rd & Barrett Dr	Six Forks Rd SEB	R	4.4	4.8	5.0	4.4	A	A	A	A
			L	12.4	11.5	11.0	10.9	B	B	B	B
		Six Forks Rd SWB	L	49.6	47.6	47.9	49.6	D	D	D	D
			T	8.1	8.6	12.0	5.9	A	A	B	A
		Six Forks Rd NWB	R	26.6	24.6	34.7	11.4	C	C	C	B
			Overall	25.8	31.6	54.6	34.5	C	C	D	C
28	Six Forks Rd & I-440 WB Ramps	I-440 WB Off-Ramp	T	81.7	83.0	159.6	82.3	F	F	F	F
			R	20.8	22.3	26.6	14.3	C	C	C	B
		Six Forks Rd NWB	Overall	32.5	31.2	34.6	31.4	C	C	C	C
			L	101.6	96.5	95.1	105.1	F	F	F	F
		Ramblewood Dr NEB	T	28.5	28.5	27.5	24.2	C	C	C	C
			TR	26.0	27.5	26.6	22.4	C	C	C	C
29	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	L	95.7	88.3	97.0	90.6	F	F	F	F
			T	91.3	94.0	90.2	91.0	F	F	F	F
		Ramblewood Dr NEB	R	76.7	77.6	73.3	79.9	E	E	E	E
			L	78.1	71.2	87.9	71.8	E	E	F	E
		Six Forks Rd SEB	T	11.1	10.7	10.2	11.6	B	B	B	B
			TR	11.3	11.2	11.8	12.0	B	B	B	B
30	Six Forks Rd & Barrett Dr	Six Forks Rd SB	Overall	10.0	11.0	9.7	6.8	B	B	A	A
			L	63.8	62.0	56.9	194.1	E	E	E	F
		Barrett Dr WB	T	4.6	4.6	4.2	4.0	A	A	A	A
			L	44.7	43.7	43.8	49.5	D	D	D	D
		Six Forks Rd NB	R	34.1	32.0	31.3	48.6	C	C	C	D
			T	8.8	9.7	9.0	5.1	A	A	A	A
31			TR	8.8	9.4	8.5	5.1	A	A	A	A

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Delay ¹ (s)				Level of Service ²			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
61	Lake Boone Trail & Shopping Center Drwy / Myron Dr	Shopping Center Drwy SB	R	12.3	11.0	11.4	9.8	B	B	B	A
		Lake Boone Trail WB	L	37.6	68.9	51.9	44.0	E	F	F	E
			T	0.8	0.4	0.3	0.4	A	A	A	A
			TR	0.6	0.2	0.2	0.2	A	A	A	A
		Myron Dr NB	R	61.4	1639.0	3791.7	1362.8	F	F	F	F
		Lake Boone Trail EB	T	0.0	0.0	0.0	0.0	A	A	A	A
TR	0.0		0.0	0.0	0.0	A	A	A	A		
62	Lake Boone Trail & I-440 EB Ramps	Lake Boone Trail SWB	T	0.0	0.0	0.0	0.0	A	A	A	A
		I-440 EB Off-Loop SEB	L	146.6	200.7	179.9	227.0	F	F	F	F
			R	10.3	16.9	19.9	15.5	B	C	C	C
63	Manuel St & Varnell Ave	Varnell Ave SB	LR	5.6	5.6	6.0	5.8	A	A	A	A
		Manuel St WB	TR	0.0	0.0	0.0	0.0	A	A	A	A
		Manuel St EB	LT	0.1	0.1	0.3	0.1	A	A	A	A
64	Ridge Rd & Manuel St	Ridge Rd SB	LT	0.4	1.0	5.7	3.1	A	A	A	A
		Manuel St WB	LR	10.2	13.4	51.6	21.6	B	B	F	C
		Ridge Rd NB	TR	0.0	0.0	0.0	0.0	A	A	A	A
65	Ridge Rd & I-440 EB Off-Ramp	I-440 EB Off-Ramp	T	26.3	20.9	24.4	23.4	D	C	C	C
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	69.5	199.4	243.8	78.5	F	F	F	F
		Glenwood Ave SEB	L	29.0	25.8	43.2	69.7	D	D	E	F
67	Glenwood Ave & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NEB	R	14.1	27.1	32.8	21.1	B	D	D	C
		Glenwood Ave SEB	T	0.3	0.7	1.4	0.2	A	A	A	A
			TR	0.0	0.0	0.2	0.0	A	A	A	A
68	Glenwood Ave & Arrow Dr	Arrow Dr NEB	R	8.5	6.5	16.0	26.1	A	A	C	D
		Glenwood Ave EB	TR	0.0	0.0	0.0	0.0	A	A	A	A
			T	0.0	0.0	0.0	0.0	A	A	A	A
69	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	0.2	0.1	0.5	0.1	A	A	A	A
			TR	0.0	0.0	0.1	0.0	A	A	A	A
		National Dr NWB	R	24.9	181.3	54.5	12.2	C	F	F	B
			L	19.8	24.2	20.2	17.6	C	C	C	C
		Glenwood Ave NB	T	0.4	5.5	1.0	0.1	A	A	A	A
			R	0.0	0.3	0.2	0.0	A	A	A	A
70	Creedmoor Rd & Bank Drwy	Creedmoor Rd NEB	LT	0.5	1.1	0.6	0.2	A	A	A	A
		Bank Drwy SEB	L	73.7	176.4	--	--	F	F	--	--
			R	11.7	85.3	23.0	--	B	F	C	--
71	Crabtree Valley Ave & Apt Drwy	Apt Drwy SWB	R	7.9	24.5	22.7	6.3	A	C	C	A
72	Crabtree Valley Ave & Edwards Mill Rd	Edwards Mill SB	L	30.0	46.0	46.6	31.0	D	E	E	D
			R	8.6	11.3	14.3	10.8	A	B	B	B
		Crabtree Valley Ave EB	L	4.8	8.5	5.8	5.3	A	A	A	A
73	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks SB	L	32.2	30.9	32.4	21.4	D	D	D	C
		Blue Ridge Rd NEB	L	5.1	6.1	7.0	5.3	A	A	A	A
74	Blue Ridge Rd & Arinto Dr	Arinto Dr SEB	L	14.3	15.8	13.9	10.9	B	C	B	B
			R	8.0	12.4	11.8	--	A	B	B	--
		Blue Ridge Rd NEB	L	8.8	8.6	5.0	6.2	A	A	A	A
75	Blue Ridge Rd & Summit Park Ln	Blue Ridge Rd SWB	LT	0.5	0.4	0.5	0.5	A	A	A	A
		Summit Park Ln NWB	LR	10.2	9.3	8.3	7.5	B	A	A	A
76	Blue Ridge Rd & Crabtree View Place	Blue Ridge Rd SWB	L	5.5	4.0	4.3	18.8	A	A	A	C
		Crabtree View Place NWB	LR	8.9	10.3	8.4	7.0	A	B	A	A
77	Six Forks Rd & Browning Pl	Browning SWB	L	116.4	392.0	533.3	340.9	F	F	F	F
			R	33.7	273.6	382.1	260.2	D	F	F	F
		Six Forks Rd SEB	L	13.0	13.6	14.5	7.8	B	B	B	A

Notes:

- 1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations
- 2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies
- 3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

Based on the queue data output and visual observations during the simulation, there are multiple intersections where traffic queues beyond the existing storage or affects the operations of adjacent locations. Table 10-8 shows the maximum queue lengths on each approach of all the study intersections. The areas of excessive queuing are listed below:

AM peak hour

- Glenwood Ave at Creedmoor Rd
 - The southbound approach of Creedmoor Rd is projected to queue more than 1,100' for two hours
 - The northbound approach of Creedmoor Rd is projected to queue more than 1,500' for one hour

- Glenwood Ave at Lead Mine Rd/Blue Ridge Rd
 - The southbound approach of Lead Mine Rd is projected to queue about 1,200' for three hours
- Creedmoor Rd at Crabtree Valley Ave
 - The westbound approach of Crabtree Valley Ave is projected to queue about 1,000' for two hours
- Lead Mine Rd at North Hills Dr
 - The westbound approach of North Hills Dr is projected to queue more than 1,000' for three hours

PM peak hour

- Glenwood Ave at Creedmoor Rd
 - The southbound approach of Creedmoor Rd is projected to queue more than 1,000' for three hours
 - The eastbound approach of Glenwood Ave is projected to queue more than 1,700' for three hours, spilling back through the upstream intersection
- Creedmoor Rd at Crabtree Valley Ave
 - The northbound approach of Creedmoor Rd is projected to queue over 1,100' for three hours
- Crabtree Valley Ave at I-440 WB Ramps
 - The westbound approach of the I-440 Off-Ramp is projected to queue about 1,900' for one hour
 - The southbound approach of Crabtree Valley Ave is projected to queue more than 600' for two hours
- Crabtree Valley Ave at Ridge Rd/I-440 EB On-Ramp
 - The northbound approach of the Ridge Rd is projected to queue about 1,300' for one hour
 - The eastbound approach of Crabtree Valley Ave is projected to queue about 1,100' for one hour

Based on the analysis of the Alternative 2 design, several locations will need additional improvements. The intersection of Glenwood Ave at Creedmoor Rd will need additional improvements due to the new trip patterns and operations improved along Glenwood allowing traffic to reach this intersection at new rates.

The following improvements should be considered if this design is carried forward:

- Crabtree Valley Ave at Ridge Rd/I-440 EB On-Ramp
 - Two lane on-ramp onto I-440 EB
 - Additional eastbound left-turn lane onto the I-440 EB On-Ramp
 - Additional northbound through lane on Ridge Rd
- Creedmoor Rd at Crabtree Valley Ave
 - Additional southbound left-turn lane on Creedmoor Rd
- Crabtree Valley Ave at Homewood Banks Dr/Crabtree Valley Mall Entrance
 - Northbound right-turn lane on Homewood Banks Dr
- Crabtree Valley Ave at Arrow Dr
 - Southbound left-turn lane on Arrow Dr

The diverging diamond interchange is expected to improve operations at the Glenwood Ave and I-440 interchange when compared to the 2021 no-build scenario. However, the drawbacks of a DDI not being able to progress both sides of the corridor simultaneously causes some minor queuing in both directions. But overall, the operations are expected to be much better than the existing configuration or the Alternative 1 configuration.

The continuous flow intersection at Glenwood Ave and Lead Mine Rd/Blue Ridge Rd is expected to operate much better than the existing intersection. However, with the direct access to Crabtree Valley Ave from westbound I-440 and northbound Glenwood Ave proposed in Alternative 2, the northbound left turn volume onto Blue Ridge Rd is not expected to increase. Therefore, the full benefit of a CFI is not experienced with the trip patterns in Alternative 2.

Table 10-8: 2021 Design Year Build Alternative 2 Intersection Volume and Queue Length

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	L	258	385	463	409	80.7	109.6	157.9	120.6
			R	177	307	289	204				
		Lake Boone Trail WB	T	888	1,128	1,372	1,230	25.7	49.7	66.8	48.3
			R	103	183	176	138				
		Lake Boone Trail EB	L	94	207	252	228	5.3	17.0	47.4	27.3
			T	261	538	612	709				
2	Lake Boone Trail & I-440 WB Ramps	I-440 WB Off-Ramp SB	LT	39	109	78	46	217.5	197.9	168.5	173.8
			R	700	686	761	879				
		Lake Boone Trail WB	L	47	96	80	97	26.6	49.6	65.5	53.0
			T	497	866	1,032	692				
		Lake Boone Trail EB	T	295	641	736	780	17.6	47.4	57.7	82.6
			R	254	313	372	377				
3	Lake Boone Trail & Ridge Rd	Ridge Rd SB	L	40	84	102	63	3.6	45.1	24.6	17.4
			TR	143	485	421	367				
		Lake Boone Trail WB	L	10	35	26	22	4.7	14.5	18.1	14.1
			T	77	204	254	165				
		Ridge Rd NB	TR	89	236	293	203	1.2	48.8	46.2	20.7
			L	14	81	90	65				
		Lake Boone Trail EB	TR	25	154	245	164	8.3	16.2	18.7	18.3
			L	17	38	63	67				
			T	41	73	74	61				
			TR	105	215	230	224				
4	Ridge Rd & Glen Eden Dr	Ridge Rd SB	L	18	20	35	41	9.6	49.9	64.2	26.8
			TR	180	391	398	390				
		Glen Eden Dr WB	L	20	85	74	74	11.9	88.0	162.5	56.2
			TR	41	299	333	176				
		Ridge Rd NB	L	15	41	74	52	1.0	8.6	36.4	7.6
			TR	26	119	160	133				
		Glen Eden Dr EB	L	33	120	133	96	20.9	40.4	410.6	74.3
			TR	119	314	418	312				
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Rembert Dr SWB	LTR	19	56	83	57	7.9	25.4	42.1	29.5
		Glenwood Ave NWB	L	19	45	87	70	15.8	39.1	64.4	49.2
			T	699	937	1,089	1,060				
			TR	245	367	449	456				
		Fairhill Dr NEB	L	18	42	44	41	10.1	22.7	22.8	21.9
			TR	22	25	29	31				
			L	4	12	16	13				
		Glenwood Ave SEB	T	678	1,360	1,475	1,053	12.8	37.5	53.3	29.8
			TR	252	536	606	417				
			L	382	345	197	317				
6	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	T	367	764	798	760	170.9	849.8	1,188.7	1,121.5
			TR	335	686	720	687				
			L	140	73	119	74				
		Glenwood Ave NWB	T	749	1,039	1,371	1,402	141.9	73.7	77.7	75.5
			L	181	248	220	100				
			T	230	501	663	488				
		Creedmoor Rd NEB	R	28	58	99	87	120.7	1,749.0	1,285.3	45.1
			L	39	49	105	93				
			T	565	1,507	1,619	1,128				
		Glenwood Ave EB	TR	340	403	433	327	295.8	879.6	251.3	201.8
			L	38	96	114	72				
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Marriott Dr SWB	TR	0	0	0	0	17.4	47.2	69.4	34.0
		Glenwood Ave NWB	L	10	13	25	59	21.6	47.4	70.6	79.8
			T	832	991	1,343	1,385				
			TR	204	256	415	564				
		Crabtree Valley Mall Entrance NEB	LT	2	4	7	10	2.1	3.3	5.5	8.2
			R	7	8	14	20				
			L	9	14	19	16				
		Glenwood Ave SEB	T	917	1,784	1,779	1,388	5.6	7.8	35.4	12.6
			TR	65	171	272	214				
			L	568	1,258	1,363	1,249				
8	Glenwood Ave CFI West Crossover	Glenwood Ave NWB	T	916	1,199	1,680	1,872	4.8	8.5	10.1	12.0
		Glenwood Ave SEB	T	20	55	83	67	3.5	18.7	23.6	11.5
9	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd	Lead Mine Rd SWB	T	194	477	364	453	169.9	1,122.8	1,288.5	1,273.6
			TR	127	60	101	98				
			L	8	41	89	122				
		Glenwood Ave NWB	T	845	1,112	1,589	1,782	72.3	120.9	185.8	199.7
			R	94	267	453	426				
			L	73	105	110	86				
		Blue Ridge Rd NEB	T	131	228	208	152	49.8	257.8	376.0	87.3
			T	923	1,980	2,074	1,450				
			R	25	8	14	65				
		Glenwood Ave EB	L	20	57	82	68	5.1	14.7	17.0	15.7
			T	9	41	90	128				
10	Glenwood Ave CFI East Crossover	Glenwood Ave NWB	T	9	41	90	128	3.3	18.9	37.4	45.7
		Glenwood Ave SEB	T	1,486	3,173	3,342	2,655	12.3	27.8	22.2	24.9

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
11	Glenwood Ave at I-440 WB Ramps	I-440 WB Off-Ramp WB	R	907	937	1,240	1,421	10.1	206.7	221.7	539.1
			L	85	341	296	528	12.4	243.0	244.8	822.9
		Glenwood Ave NWB	T	51	474	890	951	2.5	20.7	58.3	54.9
		Glenwood Ave EB	T	674	2,193	2,589	1,882	51.5	288.1	252.7	140.4
12	Glenwood Ave at I-440 EB Ramps	Glenwood Ave NWB	T	52	494	812	875	60.8	274.4	82.3	61.9
		Glenwood Ave SEB	T	260	1,614	1,851	1,659	8.4	383.9	259.0	120.0
		I-440 EB Off-Ramp	L	1	54	252	283	0.0	268.3	652.3	11.9
13	Glenwood Ave & Crabtree Valley Ave	Glenwood Ave NWB	L	321	489	168	63	--	--	--	--
		Glenwood Ave SEB	T	321	489	168	63	--	--	--	--
14	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	L	71	182	279	267	20.1	55.1	88.5	74.0
			T	574	1,515	1,774	1,420				
		Womans Club Dr WB	R	4	10	18	17	2.5	5.8	6.6	4.7
			LT	3	13	21	13				
		Glenwood Ave NB	R	5	14	13	12	0.1	22.2	8.2	9.7
			L	0	8	13	14				
			T	328	863	806	729				
		Parking Deck EB	TR	77	258	362	329	0.0	1.3	1.9	4.0
			L	0	3	7	16				
			TR	0	3	4	4				
15	Creedmoor Rd & Crabtree Valley Ave	Creedmoor Rd SWB	L	598	671	568	591	661.1	868.7	491.0	565.2
			T	473	1,080	1,233	977				
		Crabtree Valley Ave NWB	L	45	212	280	213	59.3	1,576.7	1,053.8	45.3
			R	314	463	442	149				
		Creedmoor Rd NEB	T	99	162	276	355	720.6	607.6	738.1	771.3
			TR	152	493	562	466				
16	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	L	32	26	41	93	360.5	702.0	288.9	413.7
			T	697	925	992	857				
			TR	445	930	871	769				
		Crabtree Valley Mall Entrance NWB	LT	11	16	27	26	5.9	8.1	12.5	12.6
			R	14	11	13	35				
			L	0	3	14	8				
		Creedmoor Rd NEB	T	370	457	574	522	8.4	1,650.1	1,149.6	6.4
			TR	93	375	459	188				
			LT	0	1	2	3				
		Office Drwy SEB	R	0	12	23	8	0.0	11.2	15.8	5.8
			L	16	39	53	56				
			TR	32	91	107	115				
17	Crabtree Valley Ave & Homewood Banks Dr / Crabtree Valley Mall Entrance	Crabtree Valley Ave NWB	L	20	32	42	19	44.6	1,142.3	783.4	58.1
			T	343	677	585	296				
			R	57	70	105	143				
		Homewood Banks Dr NEB	L	8	35	33	60	105.8	137.8	124.4	223.3
			TR	182	196	198	279				
			L	53	55	74	92				
		Crabtree Valley Ave SEB	T	577	787	724	713	20.3	39.0	44.0	42.0
			R	64	60	26	21				
			L	117	65	185	98				
			R	112	81	119	78				
18	Crabtree Valley Ave & Arrow Dr	Crabtree Valley Ave NWB	L	11	18	23	16	16.9	563.4	480.0	14.7
			T	269	576	390	254				
			TR	409	691	442	348				
		Arrow Dr NEB	LTR	37	42	42	37	17.6	39.3	24.0	31.9
			L	0	4	3	2				
			T	630	714	668	715				
19	Crabtree Valley Ave & I-440 WB Ramps	Crabtree Valley Ave NWB	TR	107	301	261	305	17.0	174.1	77.2	158.3
			L	4	34	22	5				
			T	572	1,209	731	528				
		Crabtree Valley Ave SEB	T	729	837	767	854	45.5	219.8	167.3	227.7
			R	28	123	179	154				
			L	36	215	192	253				
20	Crabtree Valley Ave & I-440 EB Ramps	Crabtree Valley Ave WB	T	569	1,188	652	473	51.3	724.0	944.0	130.2
			LTR	52	254	304	268				
			L	303	398	439	428				
		Crabtree Valley Ave EB	T	375	386	304	350	154.8	413.9	388.9	434.7
			R	173	112	227	173				
			L	218	507	425	558				
21	Blue Ridge Rd & Crabtree Valley Mall Entrance	Blue Ridge Rd SWB	R	4	23	42	81	2.0	18.5	6.9	117.0
			LT	151	234	210	168				
			T	99.4	183.8	150.0	133.2				
		Blue Ridge Rd NEB	L	4.0	11.7	29.4	45.5	0.4	68.2	165.5	10.2
			R	2.8	6.0	3.9	10.7				
			T	99.4	183.8	150.0	133.2				
22	Lead Mine Rd & North Hills Dr	Crabtree Valley Mall Entrance EB	L	4.0	11.7	29.4	45.5	1.2	3.3	9.7	8.4
			R	2.8	6.0	3.9	10.7				
			T	99.4	183.8	150.0	133.2				
		Lead Mine Rd SB	L	28.0	84.7	81.8	98.5	14.9	507.3	1,041.0	953.2
			T	474.6	1,246.4	1,354.7	1,200.5				
			TR	225.5	520.2	423.6	511.5				
		North Hills Dr WB	L	85.3	57.6	9.6	91.0	54.7	1,102.6	1,306.4	1,262.9
			LR	97.3	46.6	36.1	55.0				
			T	196.3	404.0	610.9	518.4				
		Lead Mine Rd NB	R	43.7	139.1	127.5	125.8	1.5	14.8	26.2	31.8
			L	21.8	5.3	23.8	4.5				

Signalized Intersections													
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length					
			6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM			
23	Six Forks Rd & Main Street / Dartmouth Rd	Dartmouth Rd SWB	L	130.4	319.7	370.6	307.7	59.7	406.4	655.3	483.1		
			T	8.8	40.7	61.6	62.3						
			R	16.7	78.3	92.9	76.6						
		Six Forks Rd NWB	L	101.4	126.8	256.8	245.1	29.9	67.1	104.5	90.5		
			T	552.6	1,427.6	1,595.5	1,344.1						
			R	58.6	183.9	264.6	196.6						
		Main Street NEB	L	11.0	25.5	27.5	34.9	30.9	62.6	63.5	75.2		
			TR	58.1	102.4	120.0	139.9						
		Six Forks Rd SEB	L	38.8	185.7	260.9	166.8	83.0	248.9	553.1	130.7		
			T	440.4	1,131.4	995.1	922.0						
			TR	668.7	886.2	940.0	763.7						
		24	Six Forks Rd & I-440 WB Ramps / Front St	Front Street SWB	L	29.0	91.3	123.9	83.4	27.5	67.2	70.7	48.0
T	75.4				155.9	168.6	126.9						
R	11.0				40.4	61.2	39.2						
Six Forks NWB	L			163.1	364.7	360.8	325.7	46.9	142.7	148.5	133.6		
	T			696.5	1,700.7	2,048.3	1,738.5						
	R			156.8	395.6	563.6	406.5						
I-440 WB Off-Loop EB	R			36.2	72.6	116.0	160.2	78.8	1,019.2	622.1	88.0		
	L			16.7	48.5	97.2	44.2						
Six Forks Rd SEB	T			464.0	1,246.5	1,331.6	1,188.0	35.7	207.0	151.7	79.1		
	R			767.2	1,005.6	853.0	784.6						
	25			Six Forks Rd & I-440 WB Ramps	I-440 WB Off-Ramp	R	321.2					651.5	903.3
Six Forks Rd NWB					T	698.8	1,816.4	2,060.3	1,813.3	6.2	97.0	153.3	84.4
26	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks Rd NWB	L	8.3	27.5	23.5	34.6	9.8	68.4	80.7	69.5		
			T	138.7	427.0	504.6	475.9						
			TR	140.0	405.7	503.2	460.1						
		Ramblewood Dr NEB	L	66.6	158.0	145.0	113.9	32.3	156.5	183.1	86.3		
			T	18.9	54.3	61.8	51.9						
			R	22.5	102.5	122.7	71.5						
		Six Forks Rd SEB	L	195.1	467.6	491.9	417.4	45.5	109.3	118.5	109.6		
			T	325.2	948.2	1,113.2	1,026.2						
			TR	161.6	399.8	472.7	426.4						
		27	Six Forks Rd & Barrett Dr	Six Forks Rd SB	L	23.5	49.1	96.8	89.9	149.4	307.0	207.4	107.6
					T	411.8	1,227.5	1,415.9	1,247.3				
				Barrett Dr WB	L	3.9	30.1	63.1	90.8	2.6	16.4	49.5	74.9
R	4.4				9.1	30.2	40.6						
Six Forks Rd NB	T			151.2	483.4	562.7	522.6	0.5	3.0	5.0	6.5		
	TR			175.8	590.2	655.6	600.1						

Unsignalized Intersections ³													
Intersection No.	Intersection	Approach	Lane	Volume				Maximum Queue Length					
			Group	6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM		
61	Lake Boone Trail & Shopping Center Drwy / Myron Dr	Shopping Center Drwy SB	R	33	68	72	50	3.3	6.0	8.6	4.7		
		Lake Boone Trail WB	L	24	44	64	37	3.6	10.1	19.6	10.3		
			T	538	643	797	710						
			TR	645	876	971	844						
		Myron Dr NB	R	48	67	74	77	1.7	3.9	4.0	4.9		
		Lake Boone Trail EB	T	178	365	431	448	0.0	0.0	0.9	1.3		
TR	344		567	659	686								
62	Lake Boone Trail & I-440 EB Ramps	Lake Boone Trail SWB	T	186	564	657	453	0.0	0.0	0.0	0.0		
		I-440 EB Off-Loop SEB	L	10	17	23	15	20.3	60.4	551.8	26.5		
			R	358	402	449	340						
63	Manuel St & Varnell Ave	Varnell Ave SB	LR	4	23	16	10	0.2	0.8	0.5	0.0		
		Manuel St WB	TR	4	18	24	11	0.0	0.0	0.0	0.0		
		Manuel St EB	LT	12	10	19	18	0.0	0.0	0.0	0.0		
			Ridge Rd SB	LT	199	382	426	415	0.0	0.0	2.4	0.0	
64	Ridge Rd & Manuel St	Manuel St WB	LR	7	39	33	19	0.6	3.3	6.7	1.3		
		Ridge Rd NB	TR	52	234	285	215						
		I-440 EB Off-Ramp	T	258	369	515	536					0.1	8.5
65	Ridge Rd & I-440 EB Off-Ramp	Ridge Rd NB	T	52	246	302	216	0.0	59.9	455.6	0.0		
		Morehead Dr SWB	LR	9	21	25	31	1.2	5.8	8.7	6.9		
	Glenwood Ave & Morehead Dr	Glenwood Ave NWB	T	748	983	1,216	1,173	0.0	0.0	0.0	0.0		
			TR	232	352	436	411						
		Glenwood Ave & Crabtree Valley Mall Entrance	R	7	6	5	20					0.3	0.6
Crabtree Valley Mall Entrance NEB	T	944	1,910	1,993	1,459								
66	Glenwood Ave & Arrow Dr	Glenwood Ave SEB	TR	31	29	53	118	0.8	30.2	26.3	1.2		
		Arrow Dr NEB	R	68	123	30	3	2.7	8.3	4.1	2.1		
		Glenwood Ave EB	TR	25	44	44	43	205.4	685.0	703.4	322.2		
			T	1,486	3,173	3,341	2,656						
			Glenwood Ave SB	T	631	1,643	1,965					1,646	0.0
TR	9	28	34	42									
67	Glenwood Ave & Varnell Ave / National Dr	National Dr NWB	R	9	20	33	106	0.5	1.9	2.1	8.1		
			L	3	14	19	22						
		Glenwood Ave NB	T	371	1,035	1,026	926	0.0	42.1	0.5	1.6		
			R	0	4	3	6						
		70	Creedmoor Rd & Bank Drwy	Creedmoor Rd NEB	LT	211	167	212	279	0.0	1,116.7	254.3	0.0
				Bank Drwy SEB	L	0	0	3	11	0.0	0.0	1.7	5.3
R	0				0	2	2						
71	Crabtree Valley Ave & Apt Drwy	Apt Drwy SWB	R	15.6	8.0	15.5	9.6	0.8	3.5	1.7	0.4		

Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
72	Crabtree Valley Ave & Edwards Mill Rd	Edwards Mill SB	L	22.8	31.3	36.7	38.2	1.5	17.4	10.2	5.3
			R	7.3	19.7	17.4	16.5				
73	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks SB	L	10.1	24.3	34.1	58.5	0.0	1,014.0	392.8	0.0
			L	21.2	26.5	46.7	39.1				
74	Blue Ridge Rd & Arinto Dr	Arinto Dr SEB	L	74.8	192.5	191.4	199.1	0.0	4.9	2.0	2.0
			L	8.9	12.4	14.2	15.0				
75	Blue Ridge Rd & Summit Park Ln	Blue Ridge Rd SWB	R	4.3	2.9	6.0	6.4	0.4	1.0	1.3	1.9
			L	0.0	0.0	0.9	2.8				
76	Blue Ridge Rd & Crabtree View Place	Summit Park Ln NWB	LT	118.2	277.4	236.2	311.1	0.0	0.0	0.0	0.1
			LR	22.9	57.2	50.1	20.6				
77	Six Forks Rd & Browning Pl	Blue Ridge Rd SWB	L	2.9	0.0	0.0	0.0	0.1	0.0	0.0	0.0
			T	213.8	516.5	424.7	559.7				
78	Blue Ridge Rd & Crabtree View Place	Crabtree View Place NWB	LR	197.0	288.5	184.3	148.0	13.4	59.2	57.0	15.5
			T	47.6	107.6	128.0	145.8				
79	Blue Ridge Rd & Crabtree View Place	Blue Ridge Rd NEB	TR	19.9	35.0	24.8	8.6	0.0	1.0	1.1	0.0
			L	4.0	25.0	67.2	88.5				
80	Six Forks Rd & Browning Pl	Browning SWB	R	5.5	13.9	39.1	44.1	0.5	4.8	22.6	31.9
			T	141.8	465.6	538.5	507.2				
81	Six Forks Rd & Browning Pl	Six Forks Rd NWB	TR	149.3	410.2	489.9	463.4	0.0	0.0	0.0	0.0
			L	30.7	114.1	175.1	149.3				
82	Six Forks Rd & Browning Pl	Six Forks Rd SEB	T	437.5	1,235.1	1,438.2	1,248.3	0.2	9.3	14.5	6.8
			L	4.0	25.0	67.2	88.5				

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
1	Lake Boone Trail & Wycliff Rd	Wycliff Rd SB	L	464	585	616	437	106.8	514.9	987.6	246.4
			R	170	126	224	193				
		Lake Boone Trail WB	T	870	805	748	759	101.0	69.7	77.3	90.5
			R	91	95	90	92				
2	Lake Boone Trail & I-440 WB Ramps	Lake Boone Trail EB	L	226	213	224	251	155.6	629.2	1,211.3	598.4
			T	1,285	1,347	1,124	1,119				
		I-440 WB Off-Ramp SB	LT	78	105	119	85	94.6	91.2	98.0	105.6
			R	484	425	369	475				
3	Lake Boone Trail & Ridge Rd	Lake Boone Trail WB	L	52	42	131	47	21.6	20.1	33.7	17.5
			T	687	677	701	575				
		Lake Boone Trail EB	L	1,283	1,434	1,361	1,444	396.9	1,069.6	1,428.4	721.5
			R	529	559	407	334				
4	Ridge Rd & Glen Eden Dr	Ridge Rd SB	L	53	77	114	58	9.1	30.5	67.1	12.1
			TR	237	444	711	245				
		Lake Boone Trail WB	L	34	48	53	20	12.8	13.4	27.5	9.8
			T	158	157	234	119				
5	Glenwood Ave & Fairhill Dr / Rembert Dr	Ridge Rd NB	TR	216	236	316	160	21.7	17.8	24.3	10.1
			L	89	54	47	46				
		Lake Boone Trail EB	TR	304	327	424	193	28.2	36.5	124.2	35.2
			L	87	123	155	166				
6	Ridge Rd & Glen Eden Dr	Glen Eden Dr WB	T	96	167	236	145	38.4	335.5	759.5	81.9
			TR	330	389	430	409				
7	Ridge Rd & Glen Eden Dr	Glen Eden Dr EB	L	37	49	53	52	29.3	69.4	126.1	56.6
			TR	254	406	561	325				
8	Ridge Rd & Glen Eden Dr	Glenwood Ave NWB	L	52	94	73	138	71.2	309.7	966.3	937.7
			TR	241	269	245	432				
9	Glenwood Ave & Fairhill Dr / Rembert Dr	Ridge Rd NB	L	106	106	122	94	17.7	42.9	169.2	34.6
			TR	190	256	395	156				
10	Glenwood Ave & Fairhill Dr / Rembert Dr	Glenwood Ave EB	L	144	264	236	152	38.4	335.5	759.5	81.9
			TR	265	398	606	350				
11	Glenwood Ave & Fairhill Dr / Rembert Dr	Rembert Dr SWB	LTR	56	64	47	38	31.8	32.9	25.1	20.8
			L	54	48	40	39				
12	Glenwood Ave & Fairhill Dr / Rembert Dr	Glenwood Ave NWB	T	1,105	1,423	1,695	1,369	57.6	85.3	124.2	75.8
			TR	477	638	774	592				
13	Glenwood Ave & Fairhill Dr / Rembert Dr	Fairhill Dr NEB	L	44	80	92	58	24.0	52.9	66.3	35.0
			TR	19	43	45	23				
14	Glenwood Ave & Fairhill Dr / Rembert Dr	Glenwood Ave SEB	L	26	28	42	21	64.3	75.7	88.8	57.0
			T	1,216	1,492	1,571	1,280				
15	Glenwood Ave & Creedmoor Rd	Creedmoor Rd SWB	TR	478	590	625	501	223.4	1,042.5	1,181.8	1,194.9
			L	309	199	227	365				
16	Glenwood Ave & Creedmoor Rd	Glenwood Ave NWB	T	447	532	536	551	106.5	117.4	403.7	239.7
			TR	422	448	459	435				
17	Glenwood Ave & Creedmoor Rd	Creedmoor Rd NEB	L	199	197	218	182	116.6	382.6	470.8	326.0
			T	1,218	1,639	2,026	1,504				
18	Glenwood Ave & Creedmoor Rd	Glenwood Ave EB	L	338	412	406	394	867.2	2,332.8	1,294.4	1,476.7
			T	899	1,123	1,041	1,028				
19	Glenwood Ave & Creedmoor Rd	Glenwood Ave EB	R	137	221	236	180	867.2	2,332.8	1,294.4	1,476.7
			L	114	132	150	116				
20	Glenwood Ave & Creedmoor Rd	Glenwood Ave EB	T	1,100	1,626	1,703	1,386	867.2	2,332.8	1,294.4	1,476.7
			TR	464	436	460	325				

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
7	Glenwood Ave & Marriott Dr / Crabtree Valley Mall Entrance	Marriott Dr SWB	L	41	64	105	77	20.5	37.5	62.7	47.7
			TR	21	38	81	66				
		Glenwood Ave NWB	L	110	62	121	167	45.3	29.6	298.4	178.2
			T	1,352	1,673	2,117	1,544				
			TR	765	708	884	836				
		Crabtree Valley Mall Entrance NEB	LT	77	109	70	69	44.9	54.5	45.1	37.1
			R	96	77	67	53				
		Glenwood Ave SEB	L	1	0	1	1	25.9	19.4	24.3	39.1
			T	1,332	1,800	1,943	1,676				
			TR	249	266	260	234				
8	Glenwood Ave CFI West Crossover	Glenwood Ave NWB	T	2,109	2,312	3,120	2,432	4.1	3.4	9.5	4.6
		Glenwood Ave SEB	T	112	228	255	179	10.2	36.9	40.9	28.0
9	Glenwood Ave & Blue Ridge Rd / Lead Mine Rd	Lead Mine Rd SWB	L	792	680	659	847	197.6	173.2	222.5	238.2
			T	177	262	356	270				
			TR	136	152	168	174				
		Glenwood Ave NWB	L	135	203	163	173	244.9	266.9	426.2	253.2
			T	2,004	2,247	2,951	2,340				
			R	633	692	676	613				
		Blue Ridge Rd NEB	L	112	74	69	58	100.9	116.6	113.3	72.1
			T	326	386	384	229				
		Glenwood Ave EB	T	1,438	1,690	1,922	1,652	136.5	194.4	197.9	174.8
			R	58	92	62	72				
			L	110	227	260	182				
10	Glenwood Ave CFI East Crossover	Glenwood Ave NWB	T	136	200	159	173	49.1	66.9	93.0	63.3
		Glenwood Ave SEB	T	2,205	2,356	2,559	2,488	21.0	12.6	13.5	25.5
11	Glenwood Ave at I-440 WB Ramps	I-440 WB Off-Ramp WB	R	1,312	1,408	1,497	1,292	43.6	50.5	144.7	61.6
			L	83	87	98	74	8.9	8.9	88.3	21.2
		Glenwood Ave NWB	T	1,458	1,723	2,330	1,788	66.1	84.4	177.2	80.5
			T	1,764	1,823	2,039	1,852	194.1	221.7	278.3	209.9
12	Glenwood Ave at I-440 EB Ramps	Glenwood Ave NWB	T	768	1,170	1,719	1,109	236.4	333.5	193.8	67.4
			T	637	731	851	777	25.7	21.6	28.1	29.7
		I-440 EB Off-Ramp	L	695	784	852	750	35.7	45.9	50.1	39.9
			L	548	523	286	74	--	--	--	--
13	Glenwood Ave & Crabtree Valley Ave	Glenwood Ave NWB	L	548	523	286	74	--	--	--	--
		Glenwood Ave SEB	T	548	523	286	74	--	--	--	--
14	Glenwood Ave & Parking Deck / Womans Club Dr	Glenwood Ave SB	L	86	61	34	14	53.2	33.5	49.8	11.4
			T	1,224	1,266	1,366	1,259				
			R	4	3	2	1				
		Womans Club Dr WB	LT	64	103	157	50	31.0	59.4	79.4	23.5
			R	32	41	44	6				
		Glenwood Ave NB	L	11	4	4	1	42.0	127.7	86.2	12.0
			T	1,087	1,304	1,527	997				
			TR	368	511	593	347				
		Parking Deck EB	L	27	42	26	6	15.4	23.3	15.4	7.2
			TR	15	28	34	16				
15	Creedmoor Rd & Crabtree Valley Ave	Creedmoor Rd SWB	L	561	633	614	615	596.9	819.5	594.6	917.4
			T	754	763	843	663				
		Crabtree Valley Ave NWB	L	149	158	172	185	54.6	137.6	200.0	67.2
			R	290	523	386	193				
		Creedmoor Rd NEB	T	585	756	794	820	1,033.2	1,214.8	1,456.3	1,430.1
			TR	681	779	823	790				
16	Creedmoor Rd & Crabtree Valley Mall Entrance / Office Drwy	Creedmoor Rd SWB	L	116	105	138	118	260.6	523.3	361.0	710.9
			T	807	711	788	611				
			TR	625	721	745	638				
		Crabtree Valley Mall Entrance NWB	LT	58	45	49	33	56.0	74.5	74.5	64.0
			R	205	196	211	248				
			L	4	4	3	3				
		Creedmoor Rd NEB	T	943	1,085	1,015	1,049	26.7	97.8	143.9	52.9
			TR	327	635	577	483				
			LT	4	8	13	9				
		Office Drwy SEB	R	8	16	26	10	5.3	11.8	16.1	6.8
			L	148	169	169	165				
17	Crabtree Valley Ave & Homewood Banks Dr / Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance SWB	TR	211	198	226	284	325.7	444.1	429.4	420.0
			L	60	56	67	63				
		Crabtree Valley Ave NWB	T	308	493	346	166	67.6	94.4	119.1	64.7
			R	212	213	327	263				
			L	48	78	59	59				
		Homewood Banks Dr NEB	TR	187	246	255	175	127.4	146.3	119.2	91.4
			L	85	121	201	129				
		Crabtree Valley Ave SEB	T	720	803	711	710	108.6	131.6	192.6	128.8
			R	42	42	77	47				
			L	14	13	14	17				
18	Crabtree Valley Ave & Arrow Dr	Arrow Dr SWB	L	14	13	14	17	10.3	50.2	226.1	171.4
			TR	370	407	325	193				
		Crabtree Valley Ave NWB	TR	531	413	399	291	3.6	7.3	14.2	30.3
			L	51	49	59	28				
			L	5	0	1	0				
		Crabtree Valley Ave SEB	T	710	740	633	695	20.7	235.6	350.6	271.5
			TR	249	406	377	334				
			L	14	13	14	17				

Signalized Intersections											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
19	Crabtree Valley Ave & I-440 WB Ramps	I-440 WB Off-Ramp	L	221	308	392	240	128.1	316.9	899.8	424.8
			R	134	105	163	210				
		Crabtree Valley Ave NWB	L	19	25	22	22	6.9	27.2	26.3	9.7
			T	771	719	561	283				
		Crabtree Valley Ave SEB	T	898	998	967	948	46.8	304.9	379.0	367.7
			R	89	120	110	72				
20	Crabtree Valley Ave & I-440 EB Ramps	Crabtree Valley Ave WB	L	4	24	20	4	90.5	128.1	82.0	37.1
			T	688	603	391	177				
		Ridge Rd NEB	LTR	308	499	508	349	129.5	405.7	1,345.7	421.9
			L	313	421	349	429				
		Crabtree Valley Ave EB	T	526	444	429	398	161.8	484.8	592.6	575.7
			R	299	441	592	371				
21	Blue Ridge Rd & Crabtree Valley Mall Entrance	Blue Ridge Rd SWB	T	298	425	459	379	20.1	26.7	20.7	15.8
			R	94	154	161	176				
		Blue Ridge Rd NEB	LT	265	231	200	129	17.2	11.2	7.9	4.7
			T	344.5	246.0	241.0	154.6				
		Crabtree Valley Mall Entrance EB	L	162.7	128.3	127.5	96.3	63.9	44.9	49.8	32.2
			R	59.6	52.1	59.4	52.5				
22	Lead Mine Rd & North Hills Dr	Lead Mine Rd SB	L	55.4	36.9	80.7	76.4	40.4	42.5	100.3	110.1
			T	712.0	591.8	597.6	766.8				
			TR	195.3	274.9	377.5	328.7				
		North Hills Dr WB	L	85.7	75.1	75.1	94.8	77.6	73.7	84.0	78.0
			LR	147.2	142.5	165.6	150.3				
		Lead Mine Rd NB	T	779.7	963.1	988.0	773.1	7.7	22.3	23.9	16.4
R	273.9		329.7	329.9	242.9						
23	Six Forks Rd & Main Street / Dartmouth Rd	North Hills Dr EB	R	20.0	63.3	28.0	10.6	34.7	63.6	69.1	59.1
			L	236.2	262.1	332.5	299.8				
			T	74.9	88.4	146.7	124.0				
		Dartmouth Rd SWB	R	144.9	169.5	213.4	198.2	129.0	202.6	638.5	490.9
			L	290.3	327.1	386.9	352.5				
			T	1,673.3	1,655.2	1,580.7	1,365.5				
24	Six Forks Rd & I-440 WB Ramps / Front St	Six Forks Rd NWB	R	142.0	165.1	184.5	162.7	108.5	104.9	116.7	110.2
			L	63.0	59.7	55.9	64.3				
			TR	186.5	168.3	172.4	172.1				
		Main Street NEB	L	126.6	137.3	162.5	144.2	155.7	135.8	205.5	127.2
			T	1,214.7	1,149.0	1,210.7	959.9				
			TR	790.7	795.2	714.4	758.2				
25	Six Forks Rd & I-440 WB Ramps	Six Forks Rd SEB	L	126.6	137.3	162.5	144.2	419.8	342.1	772.3	294.6
			T	1,214.7	1,149.0	1,210.7	959.9				
			TR	790.7	795.2	714.4	758.2				
		Front Street SWB	L	192.5	217.8	312.6	185.9	115.8	157.8	329.6	144.4
			T	195.1	225.6	307.4	149.5				
			R	66.1	97.9	96.5	116.7				
26	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Six Forks NWB	L	360.3	367.5	377.0	253.0	308.6	288.6	337.3	163.6
			T	2,048.9	2,030.8	2,060.4	1,750.6				
			R	294.9	362.9	418.2	389.1				
		I-440 WB Off-Loop EB	R	113.1	102.6	125.4	120.6	7.7	6.5	556.5	80.8
			L	39.5	46.9	39.2	56.8				
			T	1,241.3	1,231.5	1,209.4	1,125.6				
27	Six Forks Rd & Barrett Dr	Six Forks Rd SEB	R	1,031.6	993.3	1,019.9	814.0	171.5	148.3	307.9	79.8
			L	595.1	587.9	647.6	526.3				
			T	2,103.2	2,175.5	2,205.1	1,850.4				
		Six Forks Rd NWB	L	92.7	53.4	77.2	38.1	156.4	133.8	143.2	86.6
			T	629.5	675.9	665.5	437.0				
			TR	657.8	700.2	684.9	479.2				
28	Six Forks Rd & Ramblewood Dr / I-440 EB On Ramp	Ramblewood Dr NEB	L	46.8	51.0	47.6	78.6	65.1	48.0	53.3	77.9
			T	63.7	62.7	67.5	68.6				
			R	66.2	39.0	47.0	38.1				
		Six Forks Rd SEB	L	655.3	659.2	672.5	572.9	181.7	175.0	227.7	145.2
			T	911.4	874.1	925.3	842.9				
			TR	421.7	441.7	482.9	451.7				
29	Six Forks Rd & Barrett Dr	Six Forks Rd SB	L	77.0	48.1	28.3	14.6	32.7	18.8	15.8	15.5
			T	1,231.8	1,244.0	1,319.6	1,217.5				
			L	96.6	185.2	153.8	76.2				
		Barrett Dr WB	R	128.9	150.9	170.3	34.1	29.0	49.6	45.1	20.2
			T	602.7	590.6	571.0	410.8				
			TR	641.0	633.7	613.7	438.3				

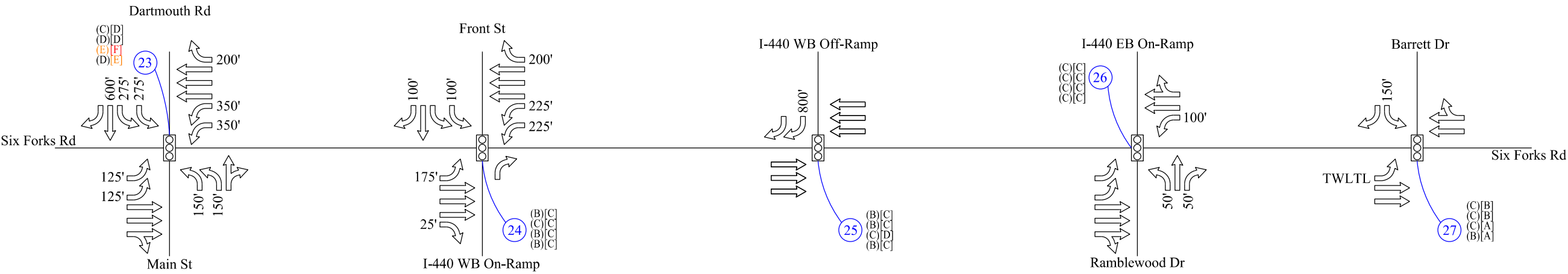
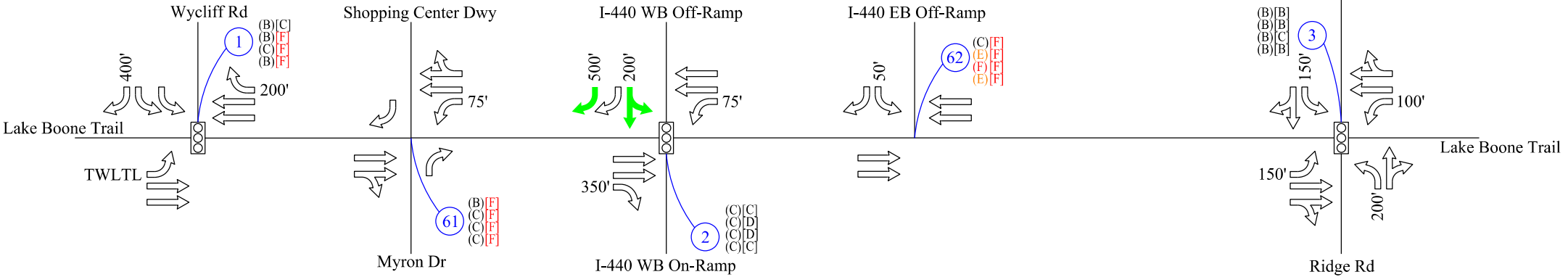
Unsignalized Intersections ³											
Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
61	Lake Boone Trail & Shopping Center Drwy / Myron Dr	Shopping Center Drwy SB	R	50	56	56	83	2.9	3.5	2.9	3.9
			L	55	35	41	33				
		Lake Boone Trail WB	T	468	437	408	413	12.4	10.0	9.6	10.3
			TR	660	644	640	650				
		Myron Dr NB	R	96	108	53	216	58.4	1,238.2	1,414.1	1,354.0
			T	694	709	626	645				
62	Lake Boone Trail & I-440 EB Ramps	Lake Boone Trail EB	TR	1,077	1,286	1,139	941	99.2	490.9	1,139.7	285.8
			L	416	403	612	333				
		I-440 EB Off-Loop SEB	L	14	15	24	12	27.7	48.2	46.6	37.1
			R	323	318	221	287				

Unsignalized Intersections³

Intersection No.	Intersection	Approach	Lane Group	Volume				Maximum Queue Length			
				3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
63	Manuel St & Varnell Ave	Varnell Ave SB	LR	8	17	10	10	0.3	0.7	0.5	0.2
		Manuel St WB	TR	11	22	68	15	0.0	0.0	0.0	0.0
			LT	30	62	131	62	0.0	0.0	0.0	0.0
64	Ridge Rd & Manuel St	Ridge Rd SB	LT	306	478	694	454	0.0	0.0	16.5	6.4
			LR	18	39	75	26	0.6	2.4	23.3	1.7
		Ridge Rd NB	TR	314	502	550	324				
65	Ridge Rd & I-440 EB Off-Ramp	I-440 EB Off-Ramp	T	392	551	765	511	0.3	0.7	2.2	0.9
			T	311	504	522	328	0.0	0.0	399.8	86.6
66	Glenwood Ave & Morehead Dr	Morehead Dr SWB	LR	16	22	12	7	5.3	23.9	12.9	1.7
			T	1,197	1,558	1,870	1,487	0.0	0.0	0.0	0.0
			TR	433	604	695	521				
67	Glenwood Ave & Crabtree Valley Mall Entrance	Crabtree Valley Mall Entrance NEB	R	102	82	83	67	10.4	16.5	14.9	9.2
			T	1,342	1,638	1,818	1,580				
		Glenwood Ave SEB	TR	117	147	102	112	2.0	31.5	44.8	17.1
68	Glenwood Ave & Arrow Dr	Arrow Dr NEB	R	219	56	9	9	33.7	11.8	292.3	276.2
			TR	240	87	93	75	461.2	487.3	462.8	406.0
		Glenwood Ave EB	T	2,206	2,355	2,559	2,490				
69	Glenwood Ave & Varnell Ave / National Dr	Glenwood Ave SB	T	1,269	1,305	1,328	1,244	1.8	0.0	4.3	0.0
			TR	30	33	34	49				
		National Dr NWB	R	159	215	178	38	35.6	324.3	69.3	2.7
			T	24	20	26	21				
		Glenwood Ave NB	T	1,381	1,769	2,087	1,293	7.5	107.1	19.9	0.6
			R	10	12	10	5				
70	Creedmoor Rd & Bank Drwy	Creedmoor Rd NEB	LT	467	544	537	619	1.7	15.8	53.8	31.1
			L	3	11	1	0	0.6	11.1	0.2	0.0
		Bank Drwy SEB	R	5	11	2	0				
71	Crabtree Valley Ave & Apt Drwy	Apt Drwy SWB	R	37.8	27.8	23.9	36.7	1.3	2.3	2.0	0.8
72	Crabtree Valley Ave & Edwards Mill Rd	Edwards Mill SB	L	74.4	77.2	74.9	71.9	15.0	24.4	24.7	14.7
			R	82.2	92.3	116.6	108.5				
		Crabtree Valley Ave EB	L	66.4	98.2	122.6	134.7	0.0	0.0	5.3	0.0
73	Blue Ridge Rd & Homewood Banks Dr	Homewood Banks SB	L	96.6	49.9	18.6	12.2	37.8	42.0	54.3	29.3
		Blue Ridge Rd NEB	L	176.6	220.0	333.5	178.2	0.9	1.1	3.7	1.1
74	Blue Ridge Rd & Arinto Dr	Arinto Dr SEB	L	25.1	8.4	19.6	15.4	1.4	0.8	1.2	1.0
			R	6.1	5.0	3.1	0.0				
		Blue Ridge Rd NEB	L	7.4	11.9	19.9	11.1	0.0	0.2	0.2	0.1
75	Blue Ridge Rd & Summit Park Ln	Blue Ridge Rd SWB	LT	186.9	232.4	219.6	183.8	0.7	0.1	0.5	0.5
			LR	25.2	28.8	34.3	28.0	1.2	1.1	1.7	0.9
		Summit Park Ln NWB	L	9.5	38.4	119.7	88.9				
76	Blue Ridge Rd & Crabtree View Place	Blue Ridge Rd SWB	T	347.6	440.9	401.6	345.7	0.1	0.3	20.1	49.7
			LR	129.1	13.7	26.3	11.3				
		Crabtree View Place NWB	T	345.5	431.4	372.3	234.5	123.6	16.2	1.5	0.3
			TR	131.9	20.1	34.8	28.1				
		Blue Ridge Rd NEB	L	123.4	156.7	162.6	168.4				
77	Six Forks Rd & Browning Pl		R	168.0	203.6	205.3	164.9	146.5	792.0	953.7	643.7
		Browning SWB	T	643.8	632.6	642.1	412.0				
		Six Forks Rd NWB	TR	599.3	646.7	649.5	418.3	0.2	0.0	0.0	0.0
			L	68.2	41.0	28.9	15.5				
		Six Forks Rd SEB	T	1,187.4	1,136.3	1,238.0	1,129.1				



Legend for Figures 10-6A to 10-6C



LOS - 4 Hour Peak

(6:00-7:00 AM)	[3:00-4:00 PM]
(7:00-8:00 AM)	[4:00-5:00 PM]
(8:00-9:00 AM)	[5:00-6:00 PM]
(9:00-10:00 AM)	[6:00-7:00 PM]

STIP I-5870
2021 Design Year - Alt 2
Figure 10-6A

Existing Laneage

Laneage Built By U-2719

Laneage Built By I-5870

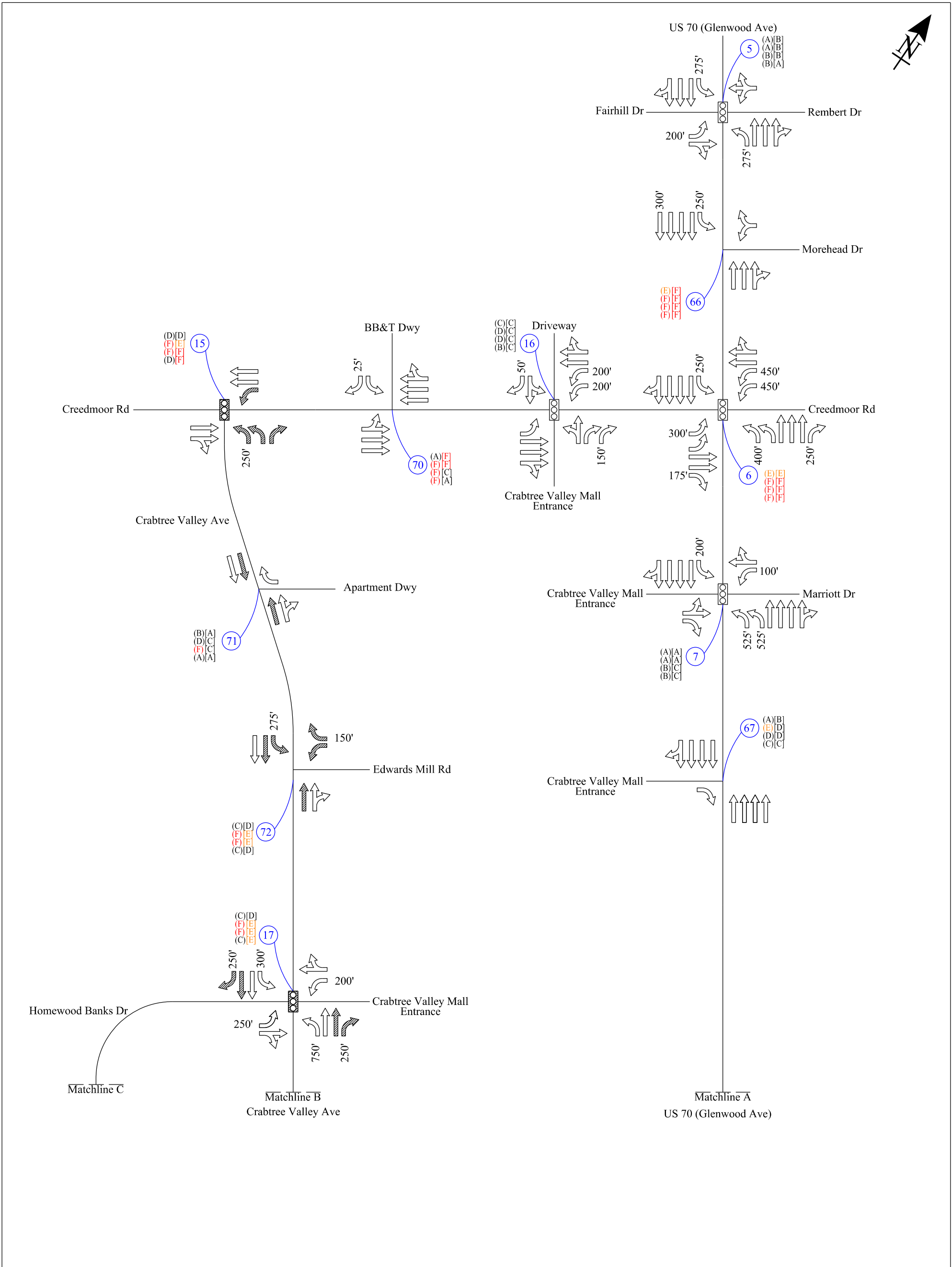
Existing Signal

Signal Built by I-5870

Intersection Number

Overall Intersection LOS
(E in Orange)(F in Red)

XXX' Storage Length



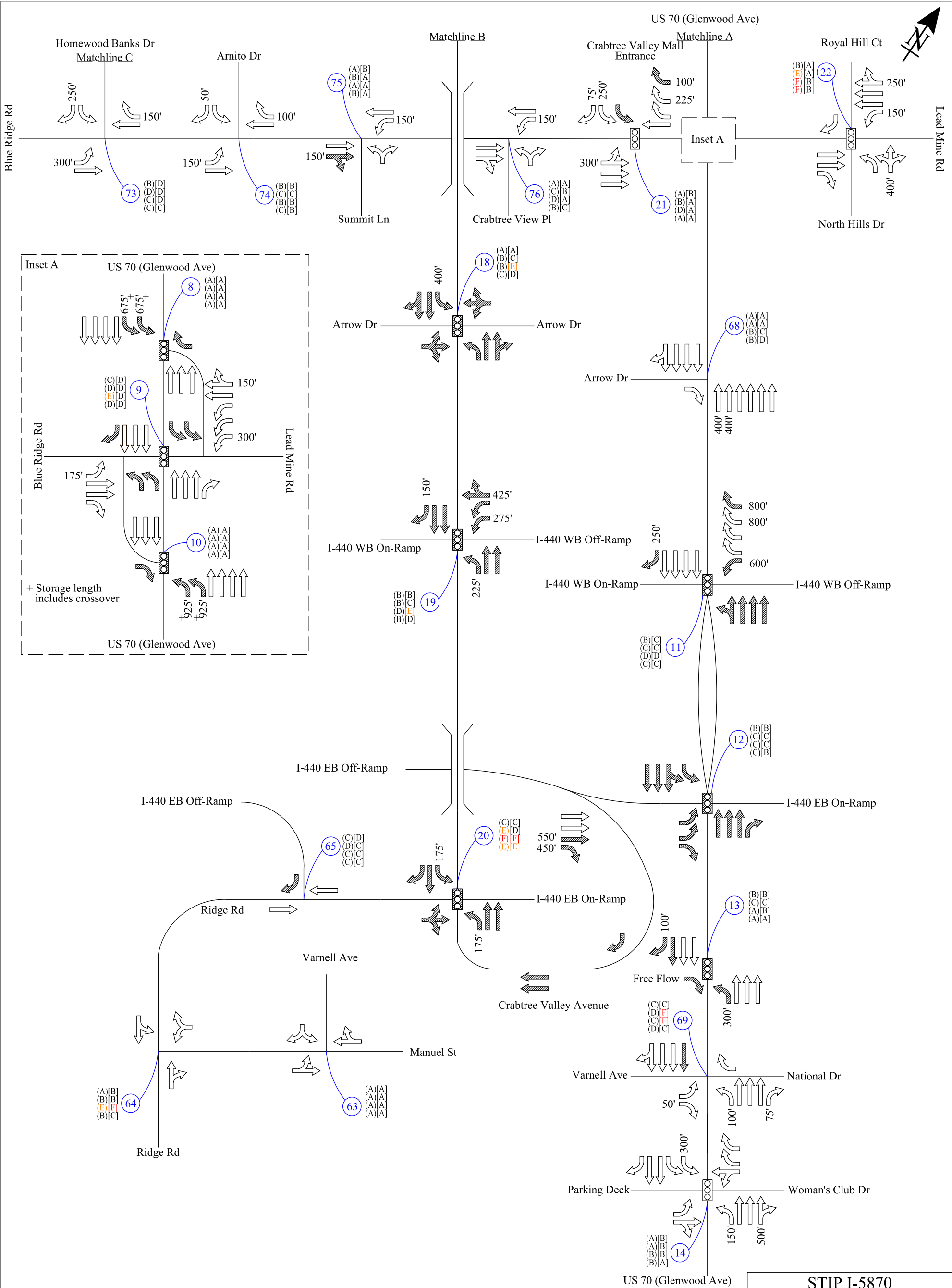
LOS - 4 Hour Peak	
(6:00-7:00 AM)	[3:00-4:00 PM]
(7:00-8:00 AM)	[4:00-5:00 PM]
(8:00-9:00 AM)	[5:00-6:00 PM]
(9:00-10:00 AM)	[6:00-7:00 PM]

STIP I-5870

2021 Design Year - Alt 2

Figure 10-6B

- Existing Laneage
- Laneage Built By I-5870
- Existing Signal
- Signal Built by I-5870
- Intersection Number
- Overall Intersection LOS
(E in Orange)(F in Red)
- XXX' Storage Length



LOS - 4 Hour Peak

(6:00-7:00 AM)	[3:00-4:00 PM]
(7:00-8:00 AM)	[4:00-5:00 PM]
(8:00-9:00 AM)	[5:00-6:00 PM]
(9:00-10:00 AM)	[6:00-7:00 PM]

STIP I-5870
2021 Design Year - Alt 2
Figure 10-6C

	Existing Laneage
	Laneage Built By I-5870
	Existing Signal
	Signal Built by I-5870
	Intersection Number
(AM) [PM]	Overall Intersection LOS (E in Orange)(F in Red)
XXX'	Storage Length

11. CONCLUSIONS

Based on the results of the analysis, the Alternative 1 I-440 interchange configuration is projected to have worse operations than the no-build option in 2021. Keeping a similar interchange design in place results in the same queuing problem spilling back onto westbound I-440 in the PM peak. The loop configuration does not work well, since it does not eliminate the weaving movement on southbound Glenwood Ave and creates queues in the southbound right lanes similar to current traffic patterns. Joining the I-440 eastbound on-loop and Ridge Rd access together and tying those movements into the signal on Glenwood Ave seems to exacerbate this issue, as vehicles are queued back to Creedmoor Rd. The echelon interchange at Glenwood Ave and Lead Mine Rd/Blue Ridge Rd is expected to operate well in 2021, but it is difficult to fully assess its operations due to the queues that are extending through it in both directions. The northbound direction is queuing back from Creedmoor Rd and the southbound direction is queuing back from the I-440 interchange in the PM peak period.

Alternative 2 is projected to improve traffic operations along Glenwood Ave. The DDI on Glenwood Ave in conjunction with the diamond interchange on Crabtree Valley Ave allows traffic to exit I-440 without spilling back on the freeway through travel lanes. The DDI spreads the lane utilization on southbound Glenwood Ave, eliminating the long queues of vehicles in the right lanes. Compared to the 2021 No-Build scenario, the continuous flow intersection is expected to improve operations at Glenwood Ave and Lead Mine Rd/Blue Ridge Rd, but will still experience some queuing on Glenwood Ave.

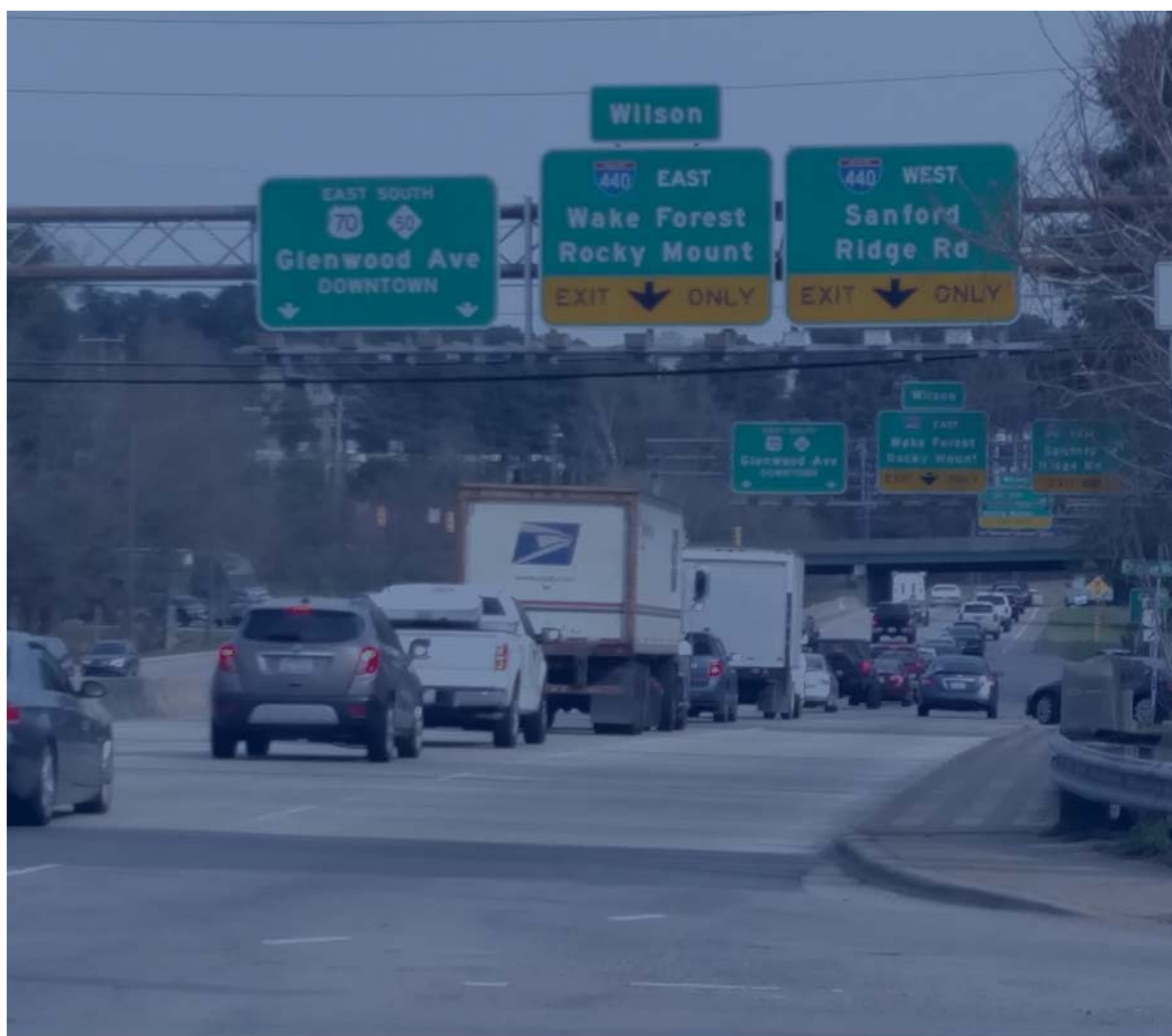
Both build analyses identified the need for auxiliary lanes in both directions I-440 between the Lake Boone Trail interchange and the Glenwood Ave/Crabtree Valley Ave/Ridge Rd interchanges. With any improvements made along Glenwood Ave, consideration needs to be given to improving the intersection at Creedmoor Rd, as this becomes the new bottleneck once operations improve along the Glenwood Ave corridor between I-440 and Creedmoor Rd. Future analyses should consider operation with the echelon interchange on Glenwood Ave at Lead Mine Rd/Blue Ridge Rd and the DDI at Glenwood Ave and I-440.

Because it is now recommended that the I-440 bridges be replaced, it is recommended that an enhanced Partial Cloverleaf – Type B interchange be considered as additional alternatives are developed.

Table 11-1 shows the network wide MOEs comparison for the AM and PM peak hour of each 2021 scenarios analyzed.

Table 11-1: 2021 Design Year Network Wide Measures of Effectiveness Comparison

AM	Time	VHT	VMT	Average Speed (mph)	Total Delay (hr)
2021 NB	8:00-9:00	10,906.7	101,039.2	24.6	9,212.6
2021 Alt 1	8:00-9:00	8,940.8	95,883.0	26.5	7,318.5
2021 Alt 1 with Aux Lane	8:00-9:00	8,533.5	101,673.1	25.3	6,817.5
2021 Alt 2	8:00-9:00	10,541.5	98,009.0	25.1	8,859.9
2021 Alt 2 with Aux Lane	8:00-9:00	8,970.5	101,852.1	25.9	7,229.7
PM	Time	VHT	VMT	Average Speed (mph)	Total Delay (hr)
2021 NB	5:00-6:00	6,199.9	111,259.0	27.9	4,322.0
2021 Alt 1	5:00-6:00	6,471.1	113,882.0	25.4	4,534.5
2021 Alt 1 with Aux Lane	5:00-6:00	5,624.2	113,903.8	29.6	3,688.3
2021 Alt 2	5:00-6:00	10,895.0	114,277.1	23.9	8,941.1
2021 Alt 2 with Aux Lane	5:00-6:00	5,911.2	115,087.7	31.3	3,926.1



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