



**BUSINESS I-40/US 421/NC 150 AT SR 2662
(LINVILLE RD) INTERCHANGE UPGRADE & BRIDGE
No. 211 REPLACEMENT**

FORSYTH COUNTY

STIP PROJECT No. U-6059 & B-5948

WBS No. 47483.1.1



TRAFFIC FORECAST REPORT



PREPARED FOR:
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

PREPARED BY:
PATRIOT TRANSPORTATION ENGINEERING, PLLC



MARCH 2018

TRAFFIC FORECAST COVER LETTER

March 12, 2018

MEMORANDUM TO: Al Blanton, PE, PLS
NCDOT Division 9 Project Engineer

FROM: Peter Trencansky, PE, PTOE, AICP
Patriot Transportation Engineering, PLLC

SUBJECT: Traffic Forecast for U-6059/B-5948
Forsyth County
Business I-40/US 421/NC 150 at SR 2662 (Linville Rd) interchange; and Bridge No. 211

Please find attached the 2017 and 2040 traffic forecast for STIP Project Numbers U-6059/B-5948 in Forsyth County. The proposed projects will upgrade the Business I-40/US 421/NC 150 at SR 2662 (Linville Road) interchange including the replacement of Bridge No. 211 over Norfolk Southern Railroad. This forecast was requested for use in the project development activities associated with the project, including the NEPA documentation and Preliminary Roadway Design.

This is the first forecast for this project. The project is located within the boundaries of the Winston-Salem Urban Area Metropolitan Planning Organization (WSUAMPO). The following two scenarios are provided in this forecast:

- 2017 Base Year No-Build
- 2040 Future Year Build

Diane Hampton (NCDOT – Division 9, Division Planning Engineer), J.P. Couch (NCDOT – Division 9, Division Traffic Engineer), Margaret Bessette (City of Winston-Salem, City-County Planning Board, Assistant Director), Byron Brown (Winston-Salem DOT, Principal Planner), and Jeff Hatling (Town of Kernersville, Community Development Director) were consulted during the development of this forecast.

Fiscal Constraint

The project is located within the WSUAMPO boundaries; therefore, the travel demand model and traffic forecast is fiscally constrained to match the assumptions of the corresponding Metropolitan Transportation Plan (MTP) in addition to the proposed project.

The project is listed in the 2018-2027 Metropolitan Transportation Improvement Plan (MTIP); however, the *Winston-Salem Urban Area Metropolitan Planning Organization 2040 Metropolitan Transportation Plan* (2040 MTP) adopted on September 17, 2015 does not include the proposed project.

The following additional projects that may affect the proposed project are included in the 2040 MTP and is assumed to be constructed prior to 2040:

- U-2579B/C – Winston-Salem Northern Beltway, Eastern Section (Future I-74) – US 52 to US 311. Multi-Lane Freeway on New Location. (Section B – Business 40 to US 158/Section C – US 158 to US 311) – MTP Project WS-T016 (Map Codes 21-03 and 21-05)

- U-2579A/D/E/F – Winston-Salem Northern Beltway, Eastern Section (Future I-74) – US 52 to US 311. Multi-Lane Freeway on New Location. (Section A – US 311 to Business 40/US 321/Section D/E/F – US 311 to US 52) – MTP Project WS-T016 (Map Codes 30-07 and 30-08)
- R-2577A – US 158 Multi-Lanes North of US 421/Business 40 in Winston-Salem to US 220 (Part A to Belews Creek Road (SR 1965)). Widen to Multi-Lanes – MTP Project T018 (Map Code 30-05)
- WS-L009 – Interstate 40 – Widen to 6-lane freeway from US 311 to Guilford County (MPT Map Code 30-10)
- WS-L020 – Business Interstate 40 (US 421/NC 150) – Widen to 6-lane freeway from Northern Beltway to Guilford County (MTP Map Code 40-08)

Travel Demand Model

The Piedmont Triad Regional Model v4.2 (provided by Piedmont Area Regional Transit (PART) on 05/04/2017 as authorized by NCDOT) was utilized as a tool in the development of the forecast.

Forecast Methodology

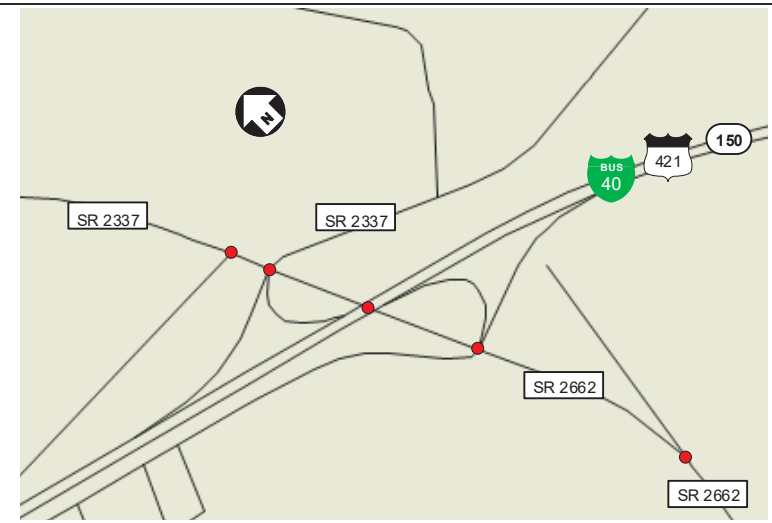
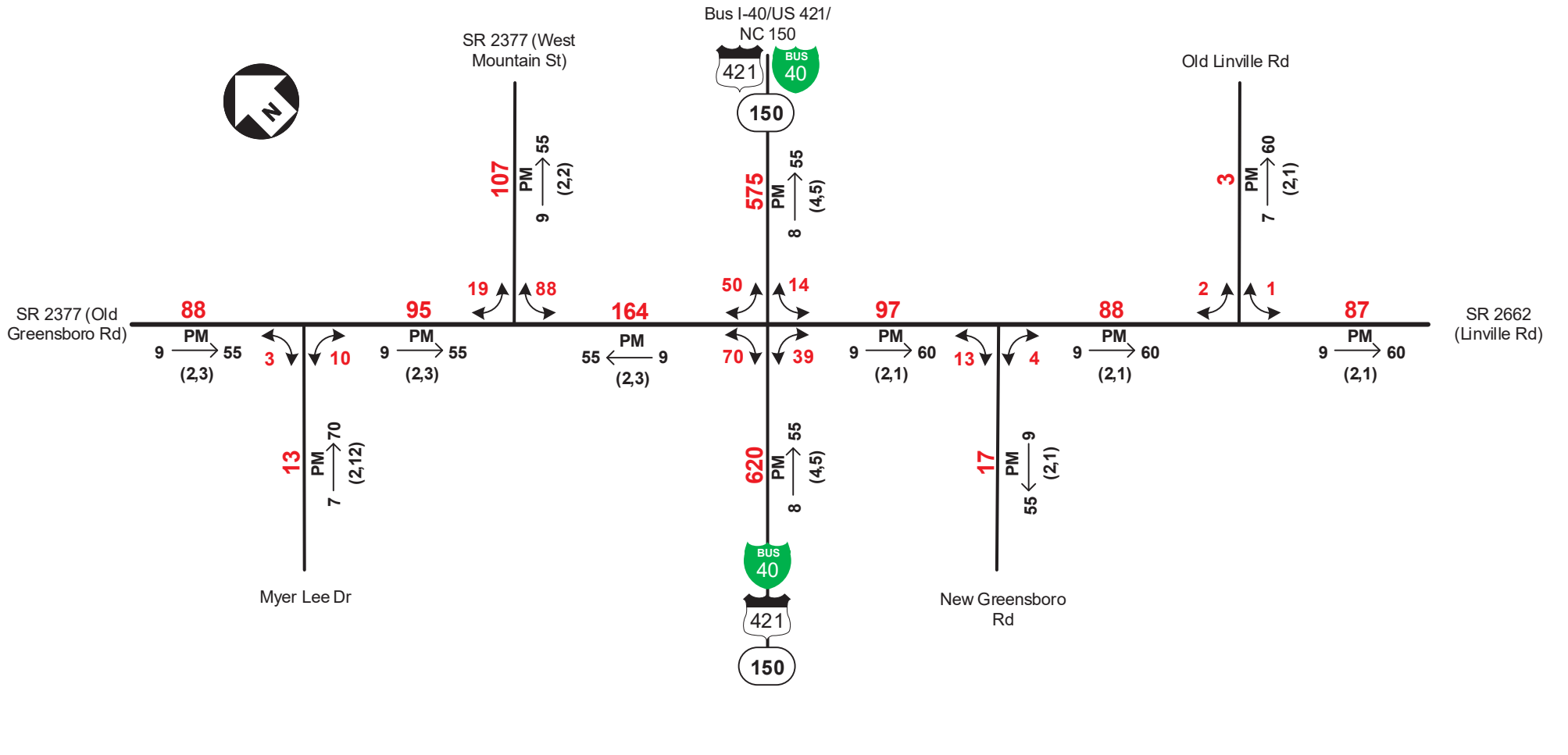
The 2017 Base Year No-Build traffic volumes and design factors were developed based upon current counts and historic AADT trend projections. The 2040 future year build traffic volumes generally included the development of compound annual growth rates between two model years. The compound annual growth rates were then applied to the AADT volumes from the base scenario to develop initial volumes for the future scenario. Engineering judgment adjustments were applied as needed in finalizing the volumes in order to develop a balanced forecast.

Interpolation/Extrapolation

To estimate AADT volumes between 2017 and 2040, straight line interpolation between the 2017 Base Year and the 2040 Future Year scenario is acceptable. The 2017 Base Year No-Build volumes may be used as a surrogate for the 2017 Base Year Build volumes and the 2040 Build volumes as surrogate for the 2040 No-Build volumes for interpolation and extrapolation purposes. AADT volumes may be extrapolated for up to two years immediately following 2040. If it is determined that any of these assumptions have become inconsistent with the project and surrounding area activity, please request updated projections at this location.

This forecast has been reviewed and approved by the NCDOT Transportation Planning Branch on March 12, 2018.

cc: (Final distribution for your records via e-mail as PDF attachments):
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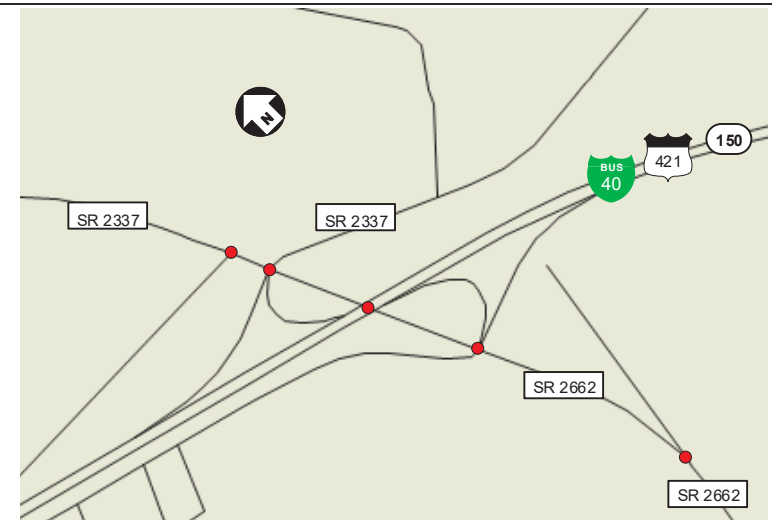
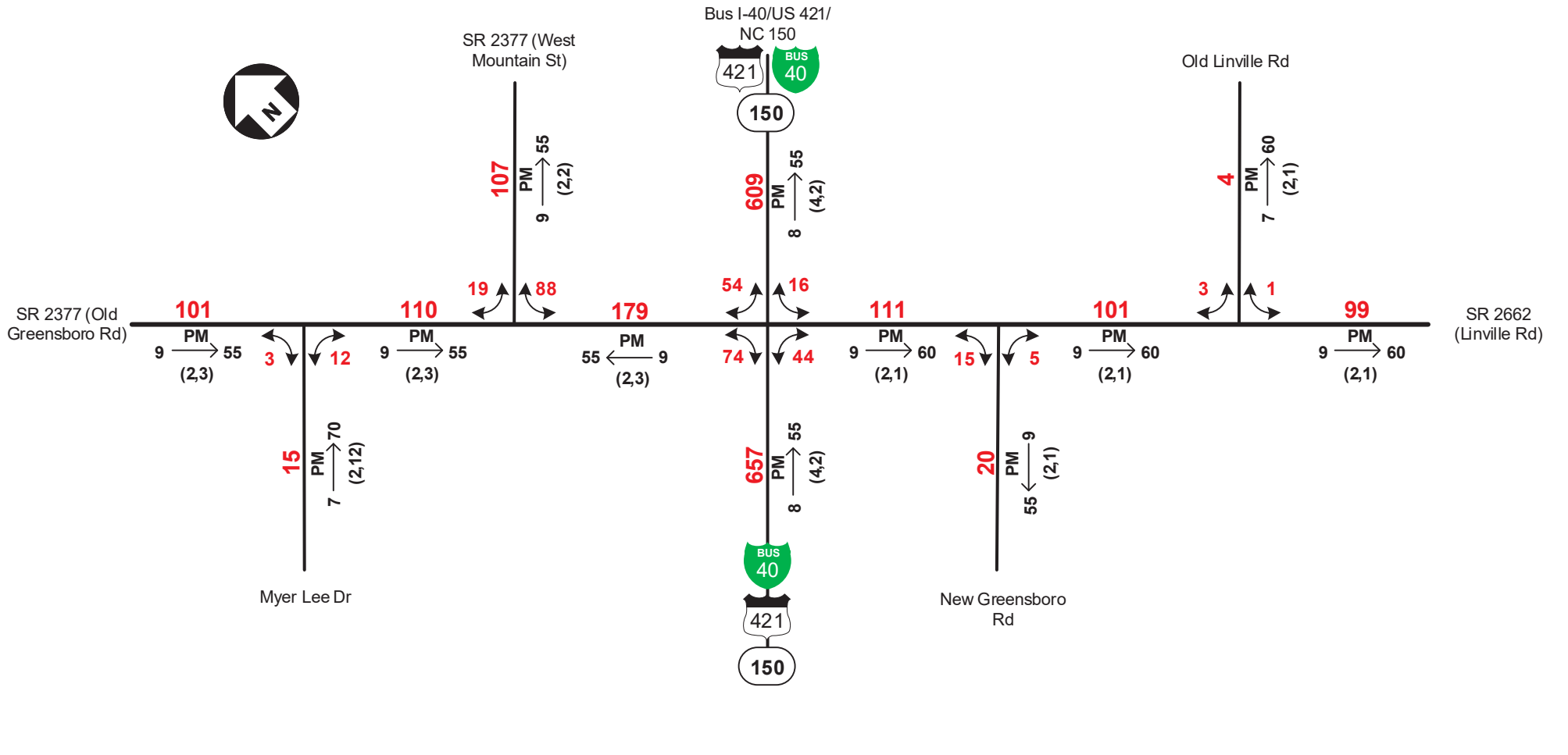
2017 AVERAGE ANNUAL DAILY TRAFFIC

NO BUILD SCENARIO SHEET 1 OF 1

TIP: U-6059/B-5948	WBS: 47483.1.1
COUNTY: Forsyth	DIVISION: 9
DATE: 03-13-2018	
PREPARED BY: Patriot Transportation Engineering, PLLC	
LOCATION: Linville Rd/Business 40/US 421 Interchange	
PROJECT: Linville Rd/Business 40/US 421 Interchange Upgrade	

LEGEND

- ### No. of Vehicles Per Day in 100s
- 1- Less than 50 vpd
- X Movement Prohibited
- K $\frac{PM}{(d, t)} \rightarrow D$ Design Hour Factor (%)
- PM PM Peak Period
- D Peak Hour Directional Split (%)
- ➔ Indicates Direction of D
- (d, t) Duals, TT-STs (%)



2040 AVERAGE ANNUAL DAILY TRAFFIC

BUILD SCENARIO SHEET 1 OF 1

LEGEND

- ### No. of Vehicles Per Day in 100s
- 1- Less than 50 vpd
- X Movement Prohibited
- K $\frac{PM}{(d, t)} \rightarrow D$ Design Hour Factor (%)
- PM PM Peak Period
- D Peak Hour Directional Split (%)
- ➔ Indicates Direction of D
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1. PROJECT BACKGROUND

Patriot Transportation Engineering, PLLC (Patriot) has been contracted by the North Carolina Department of Transportation (NCDOT) to develop base and future year traffic forecasts for NCDOT State Transportation Improvement Program (STIP) Project Numbers U-6059 and B-5948; Business I-40/US 421/NC 150 at SR 2662 (Linville Road) interchange and Bridge No. 211 in Forsyth County.

1.1 PROJECT REQUEST INFORMATION

The traffic forecast for this project was requested by NCDOT Division 9 in support of project development activities, including environmental documentation and Preliminary Design for the project. The scope of work for the traffic forecast was finalized in October 2017.

For the purposes of the environmental document, it was decided through project scoping with NCDOT that Base Year scenarios would use 2017 and Future Year scenario would use 2040. The 2017 Base Year traffic forecast includes only the No-Build scenario. The 2040 Future Year traffic forecast includes only the Build scenario for a single alternative.

1.2 FORECAST HISTORY

This is the first request for a traffic forecast at this location.

1.3 PROJECT DESCRIPTION

NCDOT proposes to upgrade the interchange of Business I-40/US 421/NC 150 at SR 2662 (Linville Road) and replace Bridge No. 211 over Norfolk Southern Railroad.

1.4 AREA INFORMATION

Forsyth County has an estimated population of 350,670 citizens based on 2010 census data and a 2017 population of 373,100 according to the North Carolina Office of State Budget and Management (NCOSBM). The county covers approximately 413 square miles and consists of several cities and towns including: Winston-Salem, Bethania, Kernersville, Lewisville, Rural Hall, and Walkertown. Winston-Salem is the county seat of Forsyth County.

The project area is in the central-eastern portion of Forsyth County, about midway between Winston-Salem and Kernersville.

The project location map for the U-6059/B-5948 forecast is shown on Figure 1-1: Project Vicinity Map.

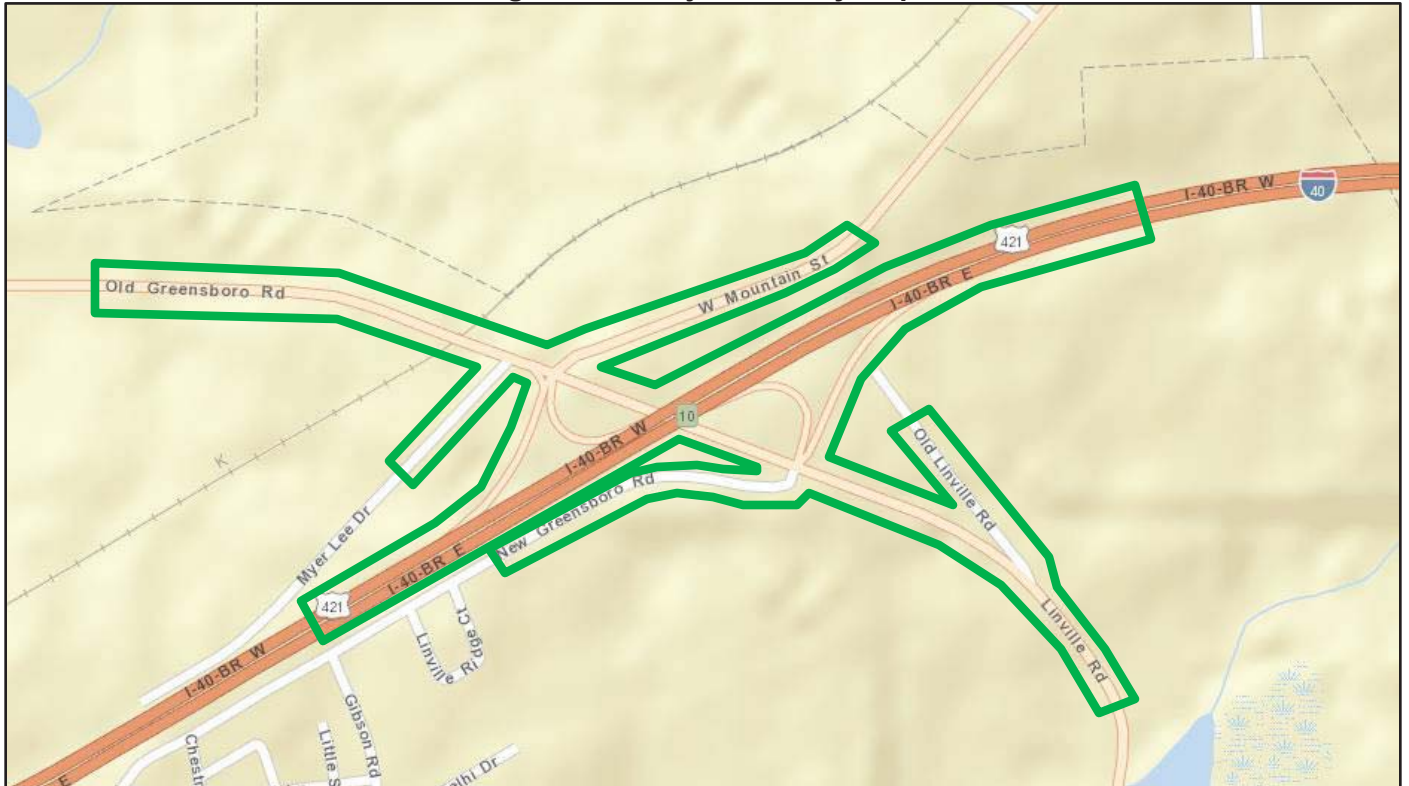
1.5 ROUTE INFORMATION

The following roadways within the study area are classified by the Federal Highway Administration (FHWA):

The **Linville Rd (SR 2662)/Old Greensboro Rd (SR 2377)** corridor is classified as a *Local Street* within the traffic forecast study area and primarily serves to provide access to developed areas within the vicinity of the interchange. Old Greensboro Rd connects to US 158 (Reidsville Rd) to the west, and Linville Rd connects to SR 4315 (Kernersville Rd) to the east. Both Linville Road and Old Greensboro Road are two-lane roads with some direct-access driveways from businesses.

The land use along the corridor is a mix of commercial, institutional, and distribution/warehousing. There appears to be room for future development near the interchange, but some limitations also may be present such as railroad ROW and watershed restrictions. The speed limit along Linville Road and Old Greensboro Road is 45 miles per hour.

Figure 1-1: Project Vicinity Map



Business Interstate 40/US 421/NC 150 is classified as a *Freeway* and travels from Interstate 40 on the west side of Winston-Salem, through downtown Winston-Salem, to Interstate 40 on the east side of Kernersville in Guilford County. Business 40 provides access to locations within Forsyth County, in particular Winston-Salem and Kernersville. The nearest full interchange to the west of the study area is with Martin Luther King Jr Drive, 3.8 miles away, although there are two directionally restricted interchanges before Business 40 reaches MLK Drive. To the east the nearest interchange is with Kernersville Road/Main Street, 4.2 miles away. An interchange that will eventually be a part of the Northern Beltway project is currently being constructed approximately 2.0 miles to the east of the study area. The speed limit along Business 40 is 60 mph.

West Mountain Street (SR 2377) is designated as a *Major Collector* within the study area. The speed limit along W Mountain St is 45 miles per hour. Access to East Forsyth High School and East Forsyth Middle School is provided via W Mountain St.

All other roadways included in the project forecast are classified as *Local Roads*.

1.6 FUTURE AREA ROADWAY IMPROVEMENTS – FISCAL CONSTRAINT

The project is located within the WSUAMPO boundaries; therefore, the travel demand model and traffic forecast is fiscally constrained to match the assumptions of the corresponding Metropolitan Transportation Plan (MTP) in addition to the proposed project.

The project is listed in the 2018-2027 Metropolitan Transportation Improvement Plan (MTIP); however, the *Winston-Salem Urban Area Metropolitan Planning Organization 2040 Metropolitan Transportation Plan (2040 MTP)* adopted on September 17, 2015 does not include the proposed project.

Additionally, the following additional projects that may affect the proposed project are included in the 2040 MTP and is assumed to be constructed prior to 2040:

- U-2579B/C – Winston-Salem Northern Beltway, Eastern Section (Future I-74) – US 52 to US 311. Multi-Lane Freeway on New Location. (Section B – Business 40 to US 158/Section C – US 158 to US 311) – MTP Project WS-T016 (Map Codes 21-03 and 21-05)
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- R-2577A – US 158 Multi-Lanes North of US 421/Business 40 in Winston-Salem to US 220 (Part A to Belews Creek Road (SR 1965)). Widen to Multi-Lanes – MTP Project T018 (Map Code 30-05)
- WS-L009 – Interstate 40 – Widen to 6-lane freeway from US 311 to Guilford County (MPT Map Code 30-10)
- WS-L020 – Business Interstate 40 (US 421/NC 150) – Widen to 6-lane freeway from Northern Beltway to Guilford County (MTP Map Code 40-08)

2. SOURCES OF INFORMATION AND DATA

The following sections describe the various information and data sources used in the development of the forecast.

2.1 RELATED FORECASTS

Past traffic forecasts in the vicinity of the proposed project can potentially be utilized as a tool when preparing the traffic forecast. Two past traffic forecasts that were less than ten years old and included some study area roadways were used in the process. The previous forecasts are:

- U-5760 – I-40 Business & Big Mill Farm Road Interchange, December 2016
- U-2579/R-2247EB – Winston-Salem Northern Beltway East, April 2016

These previous forecasts include roadway facilities that play a major role in the development of this current forecasting effort. It was a valuable asset in determining design data and providing reasonable checks for the traffic volumes developed in the traffic forecast for the proposed project

2.2 HISTORIC AADT

Existing traffic count data for study area roadways from 1997 to 2016 was provided by the NCDOT Traffic Survey Group (TSG). Data sources included:

- NCDOT TSG Average Annual Daily Traffic (AADT) history from 1997 to 2016

The locations of the historic traffic data counts are shown in Figure 2-1. The complete 20-year AADT history for each location is found in Appendix A.

2.3 FIELD DATA COLLECTION

New project-specific counts were taken in November 2017 through the NCDOT TSG on-call contract and included four 13-hour turning movement counts, one 14-hour manual classification count, and one 48-hour classification count. (Two of the turning movement counts were for the two ramp intersections of the Linville Rd/Old Greensboro Rd/Business 40 interchange, but the interchange itself was analyzed as a single location, with the local streets that connect to the study corridor opposite of the interchange ramps also split out and analyzed separately.) The traffic count locations are listed in Table 2-1 and are displayed in Figure 2-1.

A request was made to NCDOT TSG to determine the ATR groups for the study roadways that would conform to those used by TSG. According to that correspondence, the traffic count locations fall under the following TSG ATR classifications:

- ATR Group 1 (Non-Interstate Group) – The most dominant group in the State. Mostly rural in nature and is predominantly used for count locations on nonurban primary routes and all rural and most urban secondary roads.
- ATR Group 11 (Interstate Group) – Applies to urban interstate and some rural locations strongly influenced by nearby large urban areas.

The 48-hour classification count was converted to 24-Hour volumes by dividing the 48-Hour counts by two and then applying the correct seasonal adjustment factors. The turning movement counts (TMCs) and manual classification count were converted to 24-Hour volumes by utilizing the NCDOT Traffic Survey Partial Weekday Count Expansion Factors (November 2015). The count expansion factors were also compared to the count data from the 48-hour volume, speed, classification count and determined to be adequate.

Figure 2-1: Traffic Volume Data Locations

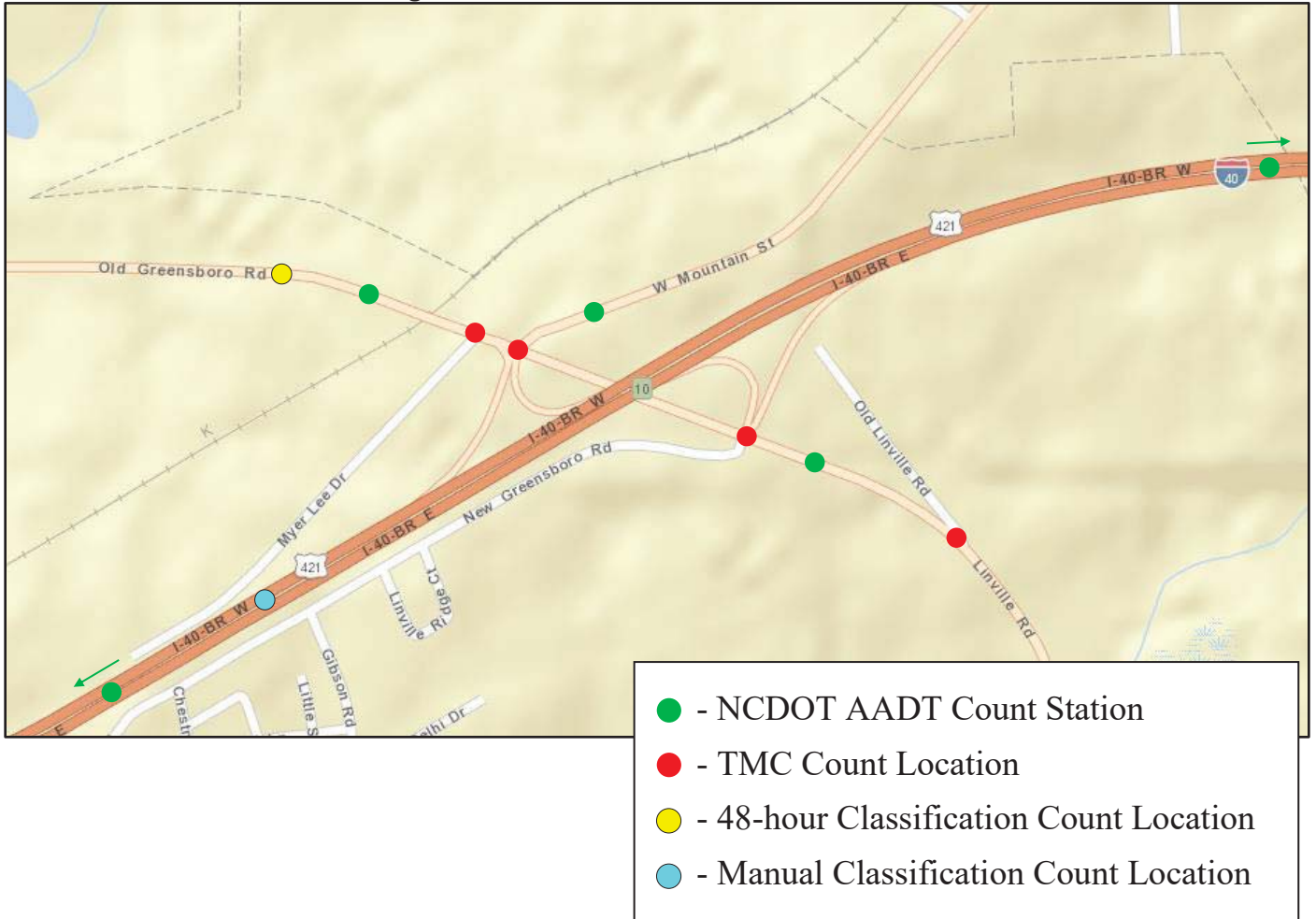


Table 2-1: Collected Traffic Count Locations

Location	Count Type	TSG Count ID	Count Contractor	Date(s)	County	ATR Group	Seasonal Adjustment Factor
Old Greensboro Rd (SR 2377) at Myer Lee Dr	13-hour TMC	17-03631	Greenlight	11/13/17	Forsyth	1	0.99
Old Greensboro Rd (SR 2377)/Linville Rd (SR 2662) at W Mountain St (SR 2377)/Business 40 SB Ramps	13-hour TMC	17-03632	Greenlight	11/14/17	Forsyth	1/11	0.97/0.95
Linville Rd (SR 2662) at Business 40 NB Ramps/New Greensboro Rd	13-hour TMC	17-03633	Greenlight	11/14/17	Forsyth	1/11	0.97/0.95
Linville Rd (SR 2662) at Old Linville Rd	13-hour TMC	17-03634	Greenlight	11/14/17	Forsyth	1	0.97
Business 40/US 421/NC 150 south of Linville Rd (SR 2662)	14-hour MCC	17-05592	VHB	11/14/17	Forsyth	11	0.95
Old Greensboro Rd (SR 2377) west of Myer Lee Dr	48-hour VSC	17-02627	Davenport	11/14/17-11/15/17	Forsyth	1	0.97/0.92

Note: TMC = turning movement count; MCC = manual classification count; VSC = volumes, speed, classification count

2.4 FIELD INVESTIGATION

An orientation field trip was taken as part of the traffic forecast initiation process. The field trip was taken on January 25, 2018. The following observations were noted:

- The land use along Old Greensboro Rd / Linville Rd is a mix of suburban residential and light commercial. There are many residences that have direct access to Old Greensboro Rd / Linville Rd. These residences are primarily located on small lots.
- There are currently no signs of new development along the study corridor.
- The PM peak direction of travel on Old Greensboro Rd / Linville Rd is eastbound.
- The PM traffic peaked at around 5:15 to 5:30. There was congestion at the intersection of Old Greensboro Rd / Linville Rd and W Mount St/ I-40 Business WB Ramps throughout the PM peak. The I-40 Business Westbound off ramp was consistently queuing back to the interstate. Traffic was also queuing on W Mountain St during the PM peak.

2.5 INFORMATION FROM LOCAL PLANNERS

Questionnaires were sent to, completed by or discussed with the following individuals to assist in understanding the project and traffic forecast study area:

- *Diane Hampton, NCDOT Division 9 – Division Planning Engineer
- *J.P. Couch, NCDOT Division 9 – Division Traffic Engineer
- Jeremy Guy, NCDOT Division 9 – District 2, District Engineer
- James Upchurch, NCDOT Transportation Planning Branch
- *Margaret Bessette, Winston-Salem City-County Planning Board – Assistant Director
- *Byron Brown, Winston-Salem DOT – Principal Planner
- *Jeff Hatling, Town of Kernersville – Community Development Director

Individuals who provided a response are denoted with an *. Detailed information from the questionnaires is included in Appendix B.

2.6 OTHER SOURCES

Data sources used that are not listed in Sections 2.1 through 2.5 include:

North Carolina Department of Transportation. *State Transportation Improvement Program*. January 2018. Available: https://connect.ncdot.gov/projects/planning/STIPDocuments1/LIVE_STIP.pdf

Winston-Salem Urban Area Metropolitan Planning Organization. *2040 Metropolitan Transportation Plan*. Adopted September 17, 2015. Available: <http://www.cityofws.org/Departments/Transportation/Planning/Plans-and-Studies/2040-Metro-Transportation-Plan>

NCDOT Functional Classification Maps. Available:

<http://ncdot.maps.arcgis.com/home/webmap/viewer.html?layers=029a9a9fe26e43d687d30cd3c08b1792>

3. BASE YEAR 2017 NO-BUILD TRAFFIC FORECAST

3.1 METHODOLOGY

A review of previous traffic forecasts, field-collected traffic counts, area AADT history, and engineering judgment serve as the basis for the 2017 Base Year No-Build traffic forecast. After careful review for reasonableness checks, the 48-Hour classification counts, 14-hour manual classification count, and 13-Hour TMCs were first converted to AADT volumes by using the appropriate NCDOT TSG seasonal adjustment factors based on the month and day of the week the counts were collected.

A variation of the NCDOT Traffic Forecast Utility (TFU) spreadsheet was also a major tool used in the determination of the traffic forecast volumes. The NCDOT TFU spreadsheet includes the calculation of a validation score that considers the approach volumes and design factors for each intersection. The score is utilized as a tool in selecting the appropriate volumes and factors with a score that is less than 2.0 being valid. All scores for the 2017 Base Year forecast were less than 2.0. Ultimately, the approach volumes and factors were selected based on engineering judgment such that the AADTs and turning movements can be converted to peak hour volumes.

The interchange of Business 40 with Linville Rd/Old Greensboro Rd presents some challenges from a forecasting perspective because of its folded cloverleaf design which allows each on-/off-ramp location to share an intersection with a surface street on the other side of Linville Rd/Old Greensboro Rd. Typically, the ramp movements at an interchange are combined to present the interchange as a single intersection location. In order to do that at the Business 40/Linville Rd/Old Greensboro Rd interchange, the movements to and from the surface streets that connect opposite the on-/off-ramps (W Mountain St on the west side and New Greensboro Rd on the east) were separated out from the TMC counts. So, although W Mountain St and New Greensboro Rd share intersections with the ramps for the Business 40 interchange, W Mountain St, New Greensboro Rd, and the Business 40 interchange are presented in the forecast as separate locations.

The data from the field-collected traffic counts were incorporated into the spreadsheet to replicate volumes as closely as possible for each intersection in the traffic forecast. The traffic forecast volumes in the 2017 Base-Year traffic forecast mimic the observed patterns as closely as possible. Once the traffic forecast volumes were determined, they were compared to historic AADT trends and interpolated model volumes for reasonableness. Table C1 found in Appendix C provides a comparison of historic AADT trends, field collected data, interpolated model volumes, and the selected traffic forecast volumes for all locations within the study area.

3.2 DESIGN FACTORS

Design factors are a very important aspect of traffic forecasting. The truck percentages, peak hour factor (or K-Factor), and directional distribution are all used along with forecasted traffic volumes when designing a roadway. The methodology and chosen values for each of the aforementioned factors are described below.

3.2.1 TRUCK PERCENTAGES

Truck Percentages were determined using the 48-Hour mainline classification count data, 14-hour manual classification count, and the 13-Hour TMC data. Overall truck percentages were then separated into the two NCDOT standard classifications: Duals (single-unit trucks with at least one dual-tire axle) and TTSTs (multi-unit trucks with single or twin trailers). Attempts were made to maintain consistent truck percentages along a roadway facility unless circumstances warranted a change. Data used to determine the truck percentages and the chosen values are found in Table C2 in Appendix C. A discussion of the truck percentages for the project is also included as follows:

- Truck percentages along the Linville Rd/Old Greensboro Rd corridor were fairly consistent on either side of the Business 40 interchange. On the east side of the interchange ramps the truck percentages were lower than on the west side. The classification count, located on the west end of the study corridor, showed a slightly higher percentage of trucks than the turning movements. Given the consistency of the turning movement data across several locations, the truck percentages from the turning movements were given more weight. The forecast utilizes two percent duals and three percent TTSTs along the corridor to the west of the interchange, and two percent duals and one percent TTSTs to the east of the interchange.
- The truck percentages for Business 40 were based on the 14-hour manual classification count. The forecast utilizes four percent duals and five percent TTSTs.
- Y-lines –The forecast utilizes truck percentages that are consistent with the count percentages as much as possible.
- Myer Lee Drive – the truck percentage recorded Myer Lee Drive was fairly high, measuring at 11 percent TTSTs. The presence of a distribution center and overall low traffic volumes accounts for the higher percentage. The forecast uses 2 percent Duals and 12 percent TTSTs.

3.2.2 DIRECTIONAL DISTRIBUTION

The directional distribution (D) provides information on the direction of traffic flow in the peak period and is a percentage (rounded to the nearest 5 percent) based on the percent of traffic traveling in each direction along the roadway. In addition to the directional distribution percentage, the direction of the peak travel during the PM peak period is selected and included on the forecast figures. For the forecast study area, generally D was in the 50% to 53% range for Old Greensboro Rd west of the Business 40 interchange; and D was in the 57% to 65% range for Linville Rd east of the interchange. The D values recorded for Business 40 was 50% and 52%. The D values for the y-lines varied by location and land use. The D values were measured from 56% to 69%. Table C3 in Appendix C provides the D value information used for this traffic forecast. A discussion of the D values for the project is also included as follows:

- Linville Rd/Old Greensboro Rd Corridor – On the west side of the Business 40 interchange, the directional distribution along the corridor was measured at 50 to 53 percent, with the direction towards W Mountain St. It was determined that a directional distribution of 55 percent would be the most appropriate distribution with the PM peak direction towards W Mountain St, like the data collection indicated. On the east side of the interchange, the directional distribution along the corridor was measured at 57 to 65 percent (with an average of 59.6 percent) in the eastbound direction. It was determined that a directional distribution of 60 percent would be the most appropriate distribution with the PM peak direction in the eastbound direction
- Business 40 – the directional distribution along Business 40 was measured at 50 to 52 percent in the northbound direction. It was determined that a directional distribution of 55 percent would be the most appropriate distribution with the PM peak direction in the northbound direction.
- Y-lines along Linville Rd/Old Greensboro Rd – the directional distributions for Y-lines along the study corridor ranged from 56 to 69 percent and the selected directional distributions were largely in line with the turning movement count percentages

3.2.3 PEAK HOUR FACTOR

The peak hour factor (K) is the percentage of AADT that occurs during the peak time period of the day. The K-factor is meant to approximate what percentage of daily traffic would be present during the 30th highest peak hour of a given

year, which is commonly referred to as K30. To determine the K-value for the classification counts the highest hourly volume was divided by the daily average of the 48-Hour counts. For turning movement counts the K-factor was developed by dividing the peak hour of the count by the daily volume. The K-factors in this traffic forecast range from 3% to 9%. The K-factor information used for this forecast is found in Table C4 in Appendix C. A discussion of the K values for the project is also included as follows:

- Linville Rd/Old Greensboro Rd Corridor – the peak hour factor along the study corridor ranged from nine to ten percent and was very consistent along its length. The peak hour factor for the corridor was determined to be nine percent, which is consistently maintained along the corridor.
- Business 40 – the peak hour factor for Business 40 was eight percent. A peak hour factor of eight percent was selected for Business 40.
- Y-lines along Linville Rd/Old Greensboro Rd – the peak hour factors for Y-lines along the study corridor ranged from three to nine percent and the selected peak hour factors were largely in line with the turning movement count percentages, except that a minimum K factor of 7 was utilized.

3.3 TRAFFIC FORECAST VOLUMES

Based on the methodology described in Section 3.1, traffic forecasts for the 2017 Base Year No-Build Scenario were calculated. Adjusted counts were compared to trend line analyses and the extrapolation of data to 2017 during the process. Utilizing a variation of the NCDOT Traffic Forecast Utility spreadsheet, bidirectional turning movements were also forecasted at intersections to replicate observed daily turning movement volumes as closely as possible. Comparisons of trend line analyses, volume extrapolation, observed counts, and selected forecast volumes are shown in Table C1 in Appendix C.

The volumes on I-40 Business for 2017 were approximately 10,000 vpd higher than the 2016 volume from the U-2579 forecast. The U-2579 forecast did not include a traffic count at this location; therefore, greater reliance on the field collected count was utilized in determining the 2017 AADT.

4. BASE YEAR 2017 BUILD TRAFFIC FORECAST

During the scoping process for this forecast, it was determined that a base year 2017 build traffic forecast would not be prepared. The proposed project would not alter the overall roadway network. Therefore, no diversion of traffic is anticipated and no Build forecast would be required. The 2017 Base Year No-Build volumes can be used as a proxy for 2017 Base Year Build volumes for analysis purposes.

5. MODEL DATA

The study area for the forecast is included the Piedmont Triad Regional Travel Demand Model. The study area is located in the western area of the model and has relatively good connectivity, with the model including all of the major roadways (Old Greensboro Rd (SR 2377), Linville Rd (SR 2662), Business 40/US 421, and W Mountain St (SR 2377)), but none of the minor y-line roadways. The Piedmont Triad Regional Model v4.2 (provided by Piedmont Area Regional Transit (PART) on 05/04/2017 as authorized by NCDOT) was utilized as a tool in the development of the forecast to determine the Future year scenario traffic volumes.

The Piedmont Triad Model was developed in TransCAD (version 5 Build 2110) and was calibrated based on a base year of 2013, and has models for a future year of 2040.

Table C5 can be found in Appendix C and displays the model performance for the 2013 model against 2013 AADTs, the 2040 model volumes, and an extrapolated volume for 2017 based on the 2013 and 2040 model output. A discussion of the model performance for the project study area corridors is included as follows:

- Old Greensboro Rd (SR 2377)/Linville Rd (SR 2662) Corridor – the 2013 model volumes for the corridor were higher than the corresponding AADT on the west side of the Business 40 interchange (by about 1,500 vehicles per day), and they were lower than the corresponding AADT on the east side of the Business 40 interchange (by about 500 vehicles per day). The 2017 interpolated model volumes varied from the extrapolated AADT counts in a similar way.
- Business 40/US 421/NC 150 – the 2013 model volumes on Business 40 were noticeably higher than the corresponding AADT (by about 20,000 vehicles per day). The 2017 interpolated model volumes varied from the extrapolated AADT counts in a similar way.
- W Mountain St (SR 2377) – the 2013 model volumes on W Mountain Street were slightly lower than the corresponding AADT (by about 1,000 vehicles per day). The 2017 interpolated model volumes grew a small amount in discrepancy from the extrapolated AADT because the model predicts a decrease in traffic by 2040.

6. FUTURE YEAR 2040 NO-BUILD TRAFFIC FORECAST

During the scoping process for this forecast, it was determined that a future year 2040 no-build traffic forecast would not be prepared. The proposed project would not alter the study area roadway network connectivity. Therefore, no diversion of traffic is anticipated between No-Build and Build conditions. The 2040 Future Year Build volumes can be used as a proxy for 2040 Future Year No-Build volumes for analysis purposes.

7. FUTURE YEAR 2040 BUILD TRAFFIC FORECAST

7.1 ASSUMPTIONS

Future development activity in the forecast area is adequately contained in the socio-economic data within the PTRM. No additional development beyond the amount input into the PTRM is expected before 2040.

All projects planned to be complete by 2040 in the *Winston-Salem Urban Area Metropolitan Planning Organization 2040 Metropolitan Transportation Plan (2040 MTP)* are assumed to be complete and open to traffic in this traffic forecast

7.2 FISCAL CONSTRAINT AND MODEL APPLICATION

A Future Year of 2040 was chosen for the U-6059 traffic volume examination as it is the latest year available in the Piedmont Triad Regional Travel Demand Model and to correspond with the horizon year of the MTP. All 2040 fiscally-constrained projects listed in the 2040 MTP were included in the 2040 Build model run.

The modeling aspects for the 2040 Build scenario include utilizing the Piedmont Triad Regional Travel Demand Model fiscally constrained model. The first step was to review the model and determine if the changes included in the fiscally constrained MTP have been properly included in the model. Based on this review, no revisions were made to the 2040 future year model.

7.3 METHODOLOGY

The Piedmont Triad Regional Travel Demand Model was utilized as a tool in the development of the 2040 Future Year Build traffic volumes.

2040 Future Year Build model runs were completed with all MTP projects in place. The Compound Annual Growth Rate (CAGR) for each traffic volume location was calculated using the following equation:

$$((2040 \text{ Model Value}/2013 \text{ Model Value}) ^{1/27}) -1$$

Additionally, the raw model volumes were compared to determine the total change in model volume between 2013 and 2040. The CAGR rates and total volume changes were reviewed and adjusted during this phase using engineering judgment where needed. The selected CAGR rates were then determined and applied to the 2017 No-Build traffic volumes and extrapolated to determine the 2040 traffic volumes.

7.4 DESIGN FACTORS

The 2040 model network was reviewed to see if any of the corridors experienced changes in the percent of traffic occurring in the peak hour, direction of peak travel, or directional split. Based on a review of the model data it was determined that all of the 2017 Base Year factors for all factors except truck percentages were still adequate and that none of the design factors (except truck percentages) would change from those included in the 2017 Base Year forecast.

Based upon the NCSTM version 2.3 supplied by Wongoo Lee of the TPD in October 2017, by 2040, with the addition of the Winston-Salem Northern Beltway, there is a substantial decrease in Multi-Unit trucks on I-40 Business. The NCSTM data, included below, showed the percentage of single unit trucks dropping from 3.4 percent to 2.8 percent and multi-unit trucks dropping from 6.5 percent to 2.3 percent. Based on this information, the 2040 TTST truck percentage for I-40 Business reduced from 5 percent to 2 percent.

NCSTM Model Data

Route	2015	2040
I-40 Bus E of Linville Rd – Tot Vol	54240	41618
SU Vol	1839 (3.4%)	1171 (2.8%)
MU Vol	3578 (6.6%)	1024 (2.5%)
I-40 Bus W of Linville Rd – Tot Vol	53991	48970
SU Vol	1772 (3.3%)	1328 (2.7%)
MU Vol	3513 (6.5%)	1109 (2.3%)

7.5 TRAFFIC FORECAST VOLUMES

Based on the methodology described in Section 7.3, traffic volumes for the 2040 Future Year Build Scenario were calculated. Table C6 in Appendix C shows the comparisons of historic growth rates, model output, CAGRs, and selected volumes. Some of the volumes were modified slightly to allow for the development of a balanced network.

A brief summary of the key observations and considerations from the development of the 2040 Build volumes are as follows:

- The 2040 model volumes along study area roadways show a CAGR of less than one percent, with no rates above 0.7 percent. This is likely the result of planned major improvements (such as the Winston-Salem Beltway and the widening of I-40) that provide alternate routes for traffic. Input from local planners regarding this growth rate was fairly consistent with most believing it to be reasonable. Some local planners also note that the study area exists in a protected watershed which may hinder development potential. The 10-year rate is about 0.15% to 1.0% per year, and the 20-year rate is 0.2 to 2.3% per year. Based on the available information, a future year growth rate of approximately 0.6% was chosen for the Old Greensboro Rd/Linville Rd corridor. It can be seen in Table C6 that one segment of the corridor has a lower chosen growth rate (about 0.4%); but this segment is part of the splitting out of the interchange and Y-line volumes, and the growth rate is the result of maintaining a consistent change in absolute traffic volumes “between” the interchange and Y-line locations.
- The model CAGRs for Business 40/US 421/NC 150 were just above 0.2%, with the selected growth rates largely matching the model rates.
- Myer Lee Drive and New Greensboro Road – Myer Lee Drive and New Greensboro Road are not directly represented in the model. Growth rates of approximately 0.6% to 0.7% were selected based on the overall growth in the area.
- W Mountain St (SR 2377) – the 2040 model volume shows a negative CAGR. For the forecast a growth rate of 0 percent was chosen, so that the future volumes would not drop below the 2017 volumes.
- Old Linville Rd – Old Linville Rd is not directly represented in the model. A growth rate of approximately 1.25% was chosen, which is slightly higher than the rates at other locations, but which is the result of the addition of only 100 vehicles.

APPENDIX A:

HISTORIC AADT COUNT DATA

Table A1: NCDOT Historic AADT

Location	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
SR 2377 W OF MYER LEE DR		8,300		7,400		7,200		7,400		7,500
SR 2377 E OF SR 2662		11,000		10,000		10,000		9,800		11,000
LINVILLE RD S OF I-40 BUS		7,800		7,200		6,900		7,100		7,200
I-40 BUS FROM EXIT 10 TO EXIT 14	<i>53,000</i>	47,000	46,000	48,000	46,000	47,000	45,000	45,000	44,000	47,000
I-40 BUS FROM EXIT 8 TO EXIT 10	<i>57,000</i>	52,000	51,000	52,000	50,000	51,000	50,000	50,000	48,000	51,000

Location	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
SR 2377 W OF MYER LEE DR		<i>10,000</i>		7,800		7,000			6,600	
SR 2377 E OF SR 2662		11,000		9,700		10,000			10,000	
LINVILLE RD S OF I-40 BUS		6,500		5,600		5,700			5,200	
I-40 BUS FROM EXIT 10 TO EXIT 14				42,000	42,000	41,000				
I-40 BUS FROM EXIT 8 TO EXIT 10						51,000				

Note: *Red Italics* denote numbers removed from data set due to being greater than two standard deviations away from the trend line data.

APPENDIX B:
PROJECT CORRESPONDENCE

Lee Klieman

From: contact us admin <noreply@ncdot.gov>
Sent: Thursday, January 04, 2018 1:26 PM
To: Lee Klieman
Subject: A response to your comment has been posted.

A Subject Matter Expert associated with the 'Traffic Analysis' Unit has responded to the comment you posted. Please do not respond to this email directly.

Instead, click on the following link to view the response.

<https://apps.ncdot.gov/ContactUS/Home/CommentDetails?TrackingNum=7HCH7D4J3A&Email=lee@pt-engineering.net>

Record of Phone Conversation with TSG

01/05/17

Marek Wiktor – by phone call

All roads use ATR code 1, even Business 40 (which I asked about for verification). The local roads they don't have any coverage for.

Subsequent phone call (same day, from Marek Wiktor), indicates that Business 40 should use ATR code 11 (the ramps as well).

Study Area Questionnaire Sent to Local Planners

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-6059, which would upgrade the interchange of Business I-40 at Old Greensboro Rd (SR 2377)/Linville Road (SR 2662) in Forsyth County. The forecast includes base year (2017) and design year (2040) forecasts. The forecast study area is shown in the following figure:



We have reviewed the Winston-Salem Urban Area MPO 2040 Metropolitan Transportation Plan (October, 2015) and are seeking input from local planners and engineers who are familiar with the area. We have identified you as a local representative. I have listed a few questions below that will help us in the development in the traffic forecast. We would greatly appreciate your time in answering these questions. You may answer the questions in text format below and return them to me at: lee@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call later next week. Thank you in advance for your time and please let me know if you have any questions.

- 1) Current and historical traffic trends indicate that the traffic growth over the last 20 years in the study area has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there remained relatively stable. Thus, the 20-year growth rates across the study area range from 0.2% to 2.3% per year, while the 10-year growth rates are all 1.0% or less per year.
 - a. Do you agree with this statement?
 - b. What growth patterns have you noticed?
 - c. Would you expect the growth rate to change substantially in the next 20 years?
 - d. Do you expect the growth rate to increase in the future? If so, by what percent per year?

Study Area Questionnaire Sent to Local Planners

- 2) The last two traffic counts on Business 40 (in 2016 performed by NCDOT Traffic Survey Group and in 2017 for this forecast) show a substantial jump in volume from the previous years' volumes. Is this something that you have noticed? To what circumstances could such a change in traffic be attributable?
- 3) Aside from school being in session, are there any noticeable seasonal differences in traffic?
- 4) According to the North Carolina Office of State Budget and Management (OSBM) the current population of Forsyth County is approximately 373,100 and is projected to grow by 1.0% per year to 449,900 in 2036. The population projections for the entire Winston-Salem Urban Area (county breakdowns were not available) that are contained within the MTP show a projected population growth rate of approximately 1.1% per year to the year 2040.
 - a. Do you think that the 1.0% to 1.1% population growth rate is reasonable for this area? If not, what is a more likely rate for the study area?
 - b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area?
- 5) The Winston-Salem Urban Area Travel Demand Model data shows that Linville Rd has a growth rate of roughly 0.5% per year between 2013 and 2040 and that Business 40/US 421/NC 150 has a growth rate of roughly 0.2% per year between 2013 and 2040.
 - a. Do you think that the 0.5% traffic volume growth rate is reasonable for Linville Rd or do you think it will be higher or lower?
 - b. Do you think that the 0.2% traffic volume growth rate is reasonable for Business 40 or do you think it will be higher or lower?
- 6) The Metropolitan Transportation Plan (MTP) includes four projects in the vicinity of the forecast that has the potential to affect the traffic volumes in the traffic forecast study area:
 - i. Winston-Salem Northern Beltway, Eastern Section (Future I-74) – US 52 to US 311; Multi-Lane Freeway on New Location (MTP Projects 21-03, 21-05, 30-07, and 30-08; and STIP Project U-2579A/B/C/D/E/F)
 - ii. US 158 Widening – US 421/Business 40 to US 220; Widen to Multi-Lanes (MTP Project 30-05 and STIP Project R-2577A)
 - iii. Business Interstate 40 Widening – Northern Beltway to Guilford County; Widen to 6-lane freeway (MTP Project 40-08)
 - iv. I-40 widening – US 311 to Guilford County; Widen to 6-lane freeway (MTP Project 30-10)
 - a. How do you think these projects will affect traffic volumes in the study area?
 - b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area?
- 7) Are you aware of any previous traffic forecasts that were performed in or near the study area?
- 8) Do you know of developments in the vicinity of the traffic forecast area that may affect our traffic forecast?

Study Area Questionnaire Sent to Local Planners

- 9) Do you have any additional comments that would be helpful in our development of the traffic forecast?

- 10) This questionnaire is being sent to the following individuals:
 - i. Diane Hampton, Division 9 Division Planning Engineer
 - ii. J.P. Couch, Division 9 Division Traffic Engineer
 - iii. Jeremy Guy, Division 9, District 2 District Engineer
 - iv. James Upchurch, NCDOT Transportation Planning Division
 - v. Margaret Besette, City-County Planning Board Assistant Director
 - vi. Byron Brown, Winston-Salem DOT Principal Planner

- a. Are there any other individuals whom you think we should contact to discuss this forecast?

Comments completed by Byron Brown via email – 01/26/2018

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-6059, which would upgrade the interchange of Business I-40 at Old Greensboro Rd (SR 2377)/Linville Road (SR 2662) in Forsyth County. The forecast includes base year (2017) and design year (2040) forecasts. The forecast study area is shown in the following figure:



We have reviewed the Winston-Salem Urban Area MPO 2040 Metropolitan Transportation Plan (October, 2015) and are seeking input from local planners and engineers who are familiar with the area. We have identified you as a local representative. I have listed a few questions below that will help us in the development in the traffic forecast. We would greatly appreciate your time in answering these questions. You may answer the questions in text format below and return them to me at: lee@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call later next week. Thank you in advance for your time and please let me know if you have any questions.

- 1) Current and historical traffic trends indicate that the traffic growth over the last 20 years in the study area has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there remained relatively stable. Thus, the 20-year growth rates across the study area range from 0.2% to 2.3% per year, while the 10-year growth rates are all 1.0% or less per year.
 - a. Do you agree with this statement?
 - b. What growth patterns have you noticed? **The majority of development occurs outside of the study area shown. Both areas north and south of this intersection are experiencing growth or roadway improvements which may lend its self to greater development. Both areas with more residential type developments.**

Comments completed by Byron Brown via email – 01/26/2018

- c. Would you expect the growth rate to change substantially in the next 20 years? **No, the majority of the study area is also located in a protected watershed which may hinder development potential.**

[http://www.cityofws.org/Portals/0/pdf/planning/publications/area-](http://www.cityofws.org/Portals/0/pdf/planning/publications/area-plans/Southeast_Suburban_Area_Plan_Final_20160708.pdf?ver=2016-07-08-134930-000)

[plans/Southeast_Suburban_Area_Plan_Final_20160708.pdf?ver=2016-07-08-134930-000](http://www.cityofws.org/Portals/0/pdf/planning/publications/area-plans/Southeast_Suburban_Area_Plan_Final_20160708.pdf?ver=2016-07-08-134930-000)

- d. Do you expect the growth rate to increase in the future? If so, by what percent per year? **No not substantially**

- 2) The last two traffic counts on Business 40 (in 2016 performed by NCDOT Traffic Survey Group and in 2017 for this forecast) show a substantial jump in volume from the previous years' volumes. Is this something that you have noticed? To what circumstances could such a change in traffic be attributable? **Transportation improvements and construction related to Business 40 and Northern Beltway. Kernersville has also continued to grow and increase in population thus vehicles.**
- 3) Aside from school being in session, are there any noticeable seasonal differences in traffic? **No**
- 4) According to the North Carolina Office of State Budget and Management (OSBM) the current population of Forsyth County is approximately 373,100 and is projected to grow by 1.0% per year to 449,900 in 2036. The population projections for the entire Winston-Salem Urban Area (county breakdowns were not available) that are contained within the MTP show a projected population growth rate of approximately 1.1% per year to the year 2040.
- a. Do you think that the 1.0% to 1.1% population growth rate is reasonable for this area? If not, what is a more likely rate for the study area? **Yes**
- b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area? **No**
- 5) The Winston-Salem Urban Area Travel Demand Model data shows that Linville Rd has a growth rate of roughly 0.5% per year between 2013 and 2040 and that Business 40/US 421/NC 150 has a growth rate of roughly 0.2% per year between 2013 and 2040.
- a. Do you think that the 0.5% traffic volume growth rate is reasonable for Linville Rd or do you think it will be higher or lower? **Lower with the opening of the northern beltway.**
- b. Do you think that the 0.2% traffic volume growth rate is reasonable for Business 40 or do you think it will be higher or lower? **Same**
- 6) The Metropolitan Transportation Plan (MTP) includes four projects in the vicinity of the forecast that has the potential to affect the traffic volumes in the traffic forecast study area:
- Winston-Salem Northern Beltway, Eastern Section (Future I-74) – US 52 to US 311; Multi-Lane Freeway on New Location (MTP Projects 21-03, 21-05, 30-07, and 30-08; and STIP Project U-2579A/B/C/D/E/F)
 - US 158 Widening – US 421/Business 40 to US 220; Widen to Multi-Lanes (MTP Project 30-05 and STIP Project R-2577A)
 - Business Interstate 40 Widening – Northern Beltway to Guilford County; Widen to 6-lane freeway (MTP Project 40-08)
 - I-40 widening – US 311 to Guilford County; Widen to 6-lane freeway (MTP Project 30-10)
- a. How do you think these projects will affect traffic volumes in the study area? **Decreased use of Linville Road.**

Comments completed by Byron Brown via email – 01/26/2018

- b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area? **No**
- 7) Are you aware of any previous traffic forecasts that were performed in or near the study area? **No**
- 8) Do you know of developments in the vicinity of the traffic forecast area that may affect our traffic forecast? **No**
- 9) Do you have any additional comments that would be helpful in our development of the traffic forecast? **NA**
- 10) This questionnaire is being sent to the following individuals:
 - i. Diane Hampton, Division 9 Division Planning Engineer
 - ii. J.P. Couch, Division 9 Division Traffic Engineer
 - iii. Jeremy Guy, Division 9, District 2 District Engineer
 - iv. James Upchurch, NCDOT Transportation Planning Division
 - v. Margaret Besette, City-County Planning Board Assistant Director
 - vi. Byron Brown, Winston-Salem DOT Principal Planner
- a. Are there any other individuals whom you think we should contact to discuss this forecast?

Comments completed by Connie James and submitted by Diane Hampton via email – 01/16/2018

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-6059, which would upgrade the interchange of Business I-40 at Old Greensboro Rd (SR 2377)/Linville Road (SR 2662) in Forsyth County. The forecast includes base year (2017) and design year (2040) forecasts. The forecast study area is shown in the following figure:



We have reviewed the Winston-Salem Urban Area MPO 2040 Metropolitan Transportation Plan (October, 2015) and are seeking input from local planners and engineers who are familiar with the area. We have identified you as a local representative. I have listed a few questions below that will help us in the development in the traffic forecast. We would greatly appreciate your time in answering these questions. You may answer the questions in text format below and return them to me at: lee@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call later next week. Thank you in advance for your time and please let me know if you have any questions.

- 1) Current and historical traffic trends indicate that the traffic growth over the last 20 years in the study area has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there remained relatively stable. Thus, the 20-year growth rates across the study area range from 0.2% to 2.3% per year, while the 10-year growth rates are all 1.0% or less per year.
 - a. Do you agree with this statement? **Not necessarily. It seems that traffic has increased significantly recently. Construction has picked up for the housing market and the economy has improved.**
 - b. What growth patterns have you noticed? **A lot of residential multi-family units are under construction in the Kernersville area.**

Comments completed by Connie James and submitted by Diane Hampton via email – 01/16/2018

- c. Would you expect the growth rate to change substantially in the next 20 years? **Yes.**
 - d. Do you expect the growth rate to increase in the future? If so, by what percent per year? **3 percent per year**
- 2) The last two traffic counts on Business 40 (in 2016 performed by NCDOT Traffic Survey Group and in 2017 for this forecast) show a substantial jump in volume from the previous years' volumes. Is this something that you have noticed? To what circumstances could such a change in traffic be attributable? **Innovation Quarter is open - Wake Forest Medical School is now downtown and other new businesses.**
- 3) Aside from school being in session, are there any noticeable seasonal differences in traffic? **no**
- 4) According to the North Carolina Office of State Budget and Management (OSBM) the current population of Forsyth County is approximately 373,100 and is projected to grow by 1.0% per year to 449,900 in 2036. The population projections for the entire Winston-Salem Urban Area (county breakdowns were not available) that are contained within the MTP show a projected population growth rate of approximately 1.1% per year to the year 2040. **WSUA MTP is available online and the population, household and employment data are available in Table 2.2 on page 13. <http://www.cityofws.org/Portals/0/pdf/transportation/forms-reports/mtp/ch2%20%20triadoverview2040MTP.pdf>. This supports the 1.1% overall growth rate, but does not account for the more recent increase in housing construction. Check City/County Inspections for the total house building permits Issued annually for trends.**

Table 2.2 below shows estimated and projected population, households and employment for the Winston-Salem Urban Area for 2013, 2021, 2030 and 2040 prepared for the socioeconomic forecast and used in the Piedmont Triad Regional Model for this 2040 Metropolitan Transportation Plan.

Table 2.2 Winston-Salem Urban Area MPO Population, Households and Employment

	2013	2021	2030	2040	Increase 2013-2040	% Increase 2013-2040
Population	414,092	442,471	474,413	552,867	95,799	23%
Households	166,585	179,977	195,027	211,744	45,159	27%
Employment	186,358	205,015	226,122	249,802	63,444	34%

- a. Do you think that the 1.0% to 1.1% population growth rate is reasonable for this area? If not, what is a more likely rate for the study area? **3 percent**
 - b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area? **no**
- 5) The Winston-Salem Urban Area Travel Demand Model data shows that Linville Rd has a growth rate of roughly 0.5% per year between 2013 and 2040 and that Business 40/US 421/NC 150 has a growth rate of roughly 0.2% per year between 2013 and 2040.
- a. Do you think that the 0.5% traffic volume growth rate is reasonable for Linville Rd or do you think it will be higher or lower? **Higher, see WSUA MPO Historic Traffic Count Table that includes 2015 data. <http://www.cityofws.org/Portals/0/pdf/transportation/2015%20Historic%20ADT%20Table.pdf?ver=2017-03-29-141203-470>**
 - b. Do you think that the 0.2% traffic volume growth rate is reasonable for Business 40 or do you think it will be higher or lower? **Higher (after it reopens)**

Comments completed by Connie James and submitted by Diane Hampton via email – 01/16/2018

- 6) The Metropolitan Transportation Plan (MTP) includes four projects in the vicinity of the forecast that has the potential to affect the traffic volumes in the traffic forecast study area:
 - i. Winston-Salem Northern Beltway, Eastern Section (Future I-74) – US 52 to US 311; Multi-Lane Freeway on New Location (MTP Projects 21-03, 21-05, 30-07, and 30-08; and STIP Project U-2579A/B/C/D/E/F)
 - ii. US 158 Widening – US 421/Business 40 to US 220; Widen to Multi-Lanes (MTP Project 30-05 and STIP Project R-2577A)
 - iii. Business Interstate 40 Widening – Northern Beltway to Guilford County; Widen to 6-lane freeway (MTP Project 40-08)
 - iv. I-40 widening – US 311 to Guilford County; Widen to 6-lane freeway (MTP Project 30-10)
 - a. How do you think these projects will affect traffic volumes in the study area? **Increase it**
 - b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area? **no**
- 7) Are you aware of any previous traffic forecasts that were performed in or near the study area? **no**
- 8) Do you know of developments in the vicinity of the traffic forecast area that may affect our traffic forecast? **No, but Winston-Salem/Forsyth County Planning and Kernersville Planning are the best sources for approved developments.**
- 9) Do you have any additional comments that would be helpful in our development of the traffic forecast? **Business 40 will be closed for construction in the Fall of this year (2018) for 20 months.**
- 10) This questionnaire is being sent to the following individuals:
 - i. Diane Hampton, Division 9 Division Planning Engineer
 - ii. J.P. Couch, Division 9 Division Traffic Engineer
 - iii. Jeremy Guy, Division 9, District 2 District Engineer
 - iv. James Upchurch, NCDOT Transportation Planning Division
 - v. Margaret Bessette, City-County Planning Board Assistant Director
 - vi. Byron Brown, Winston-Salem DOT Principal Planner
 - a. Are there any other individuals whom you think we should contact to discuss this forecast? **Jeff Hatling – Town of Kernersville.**

Comments completed by Diane Hampton and JP Couch via email – 01/12/2018

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-6059, which would upgrade the interchange of Business I-40 at Old Greensboro Rd (SR 2377)/Linville Road (SR 2662) in Forsyth County. The forecast includes base year (2017) and design year (2040) forecasts. The forecast study area is shown in the following figure:



We have reviewed the Winston-Salem Urban Area MPO 2040 Metropolitan Transportation Plan (October, 2015) and are seeking input from local planners and engineers who are familiar with the area. We have identified you as a local representative. I have listed a few questions below that will help us in the development in the traffic forecast. We would greatly appreciate your time in answering these questions. You may answer the questions in text format below and return them to me at: lee@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call later next week. Thank you in advance for your time and please let me know if you have any questions.

- 1) Current and historical traffic trends indicate that the traffic growth over the last 20 years in the study area has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there remained relatively stable. Thus, the 20-year growth rates across the study area range from 0.2% to 2.3% per year, while the 10-year growth rates are all 1.0% or less per year.
 - a. Do you agree with this statement? Yes, the traffic remains steady in this area and this area is primarily used to access the High School and local business located around the interchange.
 - b. What growth patterns have you noticed? A lot of residential multi-family units are under construction in the Kernersville area.
 - c. Would you expect the growth rate to change substantially in the next 20 years? Yes.

Comments completed by Diane Hampton and JP Couch via email – 01/12/2018

- d. Do you expect the growth rate to increase in the future? If so, by what percent per year? **Expect traffic to increase at the current rate stated earlier.**
- 2) The last two traffic counts on Business 40 (in 2016 performed by NCDOT Traffic Survey Group and in 2017 for this forecast) show a substantial jump in volume from the previous years' volumes. Is this something that you have noticed? To what circumstances could such a change in traffic be attributable? **Innovation Quarter is open - Wake Forest Medical School is now downtown and other businesses.**
- 3) Aside from school being in session, are there any noticeable seasonal differences in traffic? **no**
- 4) According to the North Carolina Office of State Budget and Management (OSBM) the current population of Forsyth County is approximately 373,100 and is projected to grow by 1.0% per year to 449,900 in 2036. The population projections for the entire Winston-Salem Urban Area (county breakdowns were not available) that are contained within the MTP show a projected population growth rate of approximately 1.1% per year to the year 2040.
- a. Do you think that the 1.0% to 1.1% population growth rate is reasonable for this area? If not, what is a more likely rate for the study area? **Yes**
- b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area? **no**
- 5) The Winston-Salem Urban Area Travel Demand Model data shows that Linville Rd has a growth rate of roughly 0.5% per year between 2013 and 2040 and that Business 40/US 421/NC 150 has a growth rate of roughly 0.2% per year between 2013 and 2040.
- a. Do you think that the 0.5% traffic volume growth rate is reasonable for Linville Rd or do you think it will be higher or lower? **1 -2 %**
- b. Do you think that the 0.2% traffic volume growth rate is reasonable for Business 40 or do you think it will be higher or lower? **1% growth**
- 6) The Metropolitan Transportation Plan (MTP) includes four projects in the vicinity of the forecast that has the potential to affect the traffic volumes in the traffic forecast study area:
- i. Winston-Salem Northern Beltway, Eastern Section (Future I-74) – US 52 to US 311; Multi-Lane Freeway on New Location (MTP Projects 21-03, 21-05, 30-07, and 30-08; and STIP Project U-2579A/B/C/D/E/F)
 - ii. US 158 Widening – US 421/Business 40 to US 220; Widen to Multi-Lanes (MTP Project 30-05 and STIP Project R-2577A)
 - iii. Business Interstate 40 Widening – Northern Beltway to Guilford County; Widen to 6-lane freeway (MTP Project 40-08)
 - iv. I-40 widening – US 311 to Guilford County; Widen to 6-lane freeway (MTP Project 30-10)
- a. How do you think these projects will affect traffic volumes in the study area? **Expect most through traffic using US 52 to access Bus. 40 and I-40 will utilize the new Beltway connection so this area should benefit from this.**
- b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area? **no**

Comments completed by Diane Hampton and JP Couch via email – 01/12/2018

- 7) Are you aware of any previous traffic forecasts that were performed in or near the study area?
no
- 8) Do you know of developments in the vicinity of the traffic forecast area that may affect our traffic forecast? no
- 9) Do you have any additional comments that would be helpful in our development of the traffic forecast? Business 40 will be closed for construction in the Fall of this year (2018) for 20 months.
- 10) This questionnaire is being sent to the following individuals:
 - i. Diane Hampton, Division 9 Division Planning Engineer
 - ii. J.P. Couch, Division 9 Division Traffic Engineer
 - iii. Jeremy Guy, Division9, District 2 District Engineer
 - iv. James Upchurch, NCDOT Transportation Planning Division
 - v. Margaret Besette, City-County Planning Board Assistant Director
 - vi. Byron Brown, Winston-Salem DOT Principal Planner
- a. Are there any other individuals whom you think we should contact to discuss this forecast? Jeff Hatling – Town of Kernersville.

Comments completed by Margaret Bessette via email – 01/26/2018

Patriot Transportation Engineering is currently in the process of developing a traffic forecast for NCDOT STIP Project No. U-6059, which would upgrade the interchange of Business I-40 at Old Greensboro Rd (SR 2377)/Linville Road (SR 2662) in Forsyth County. The forecast includes base year (2017) and design year (2040) forecasts. The forecast study area is shown in the following figure:



We have reviewed the Winston-Salem Urban Area MPO 2040 Metropolitan Transportation Plan (October, 2015) and are seeking input from local planners and engineers who are familiar with the area. We have identified you as a local representative. I have listed a few questions below that will help us in the development in the traffic forecast. We would greatly appreciate your time in answering these questions. You may answer the questions in text format below and return them to me at: lee@pt-engineering.net.

If you would rather discuss the questions over the phone, I will be following up with a phone call later next week. Thank you in advance for your time and please let me know if you have any questions.

- 1) Current and historical traffic trends indicate that the traffic growth over the last 20 years in the study area has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there remained relatively stable. Thus, the 20-year growth rates across the study area range from 0.2% to 2.3% per year, while the 10-year growth rates are all 1.0% or less per year.
 - a. Do you agree with this statement? *Seems reasonable.*
 - b. What growth patterns have you noticed? *This interchange and the surrounding area are in the Salem Lake Watershed, a water supply source for City-County Utilities customers. The development pace in the surrounding area has been fairly slow. Nonresidential development is significantly limited by water quality protection regulations. Residential development has been generally slow on the eastern side of Winston-Salem, including this area. The watershed development limitations and stormwater management*

Comments completed by Margaret Bessette via email – 01/26/2018

requirements/costs have probably further constrained residential development in this area. In addition, the City of Winston-Salem owns a considerable amount of land around the lake that serves as a water quality buffer and recreation area.

- c. Would you expect the growth rate to change substantially in the next 20 years? *It should pick up somewhat as site developers become more comfortable with on-site stormwater management and as sites in this area become more attractive due to limited land availability elsewhere.*
- d. Do you expect the growth rate to increase in the future? If so, by what percent per year? *While I think the pace will increase, I can't estimate a percent.*
- 2) The last two traffic counts on Business 40 (in 2016 performed by NCDOT Traffic Survey Group and in 2017 for this forecast) show a substantial jump in volume from the previous years' volumes. Is this something that you have noticed? To what circumstances could such a change in traffic be attributable? *I have not noticed and don't know why it's increased.*
- 3) Aside from school being in session, are there any noticeable seasonal differences in traffic? *My gut feeling is that due to Salem Lake Park, there is some increase during the warmer months, but I have no specific data on this.*
- 4) According to the North Carolina Office of State Budget and Management (OSBM) the current population of Forsyth County is approximately 373,100 and is projected to grow by 1.0% per year to 449,900 in 2036. The population projections for the entire Winston-Salem Urban Area (county breakdowns were not available) that are contained within the MTP show a projected population growth rate of approximately 1.1% per year to the year 2040.
- a. Do you think that the 1.0% to 1.1% population growth rate is reasonable for this area? If not, what is a more likely rate for the study area? *I think the rate of population growth for this area will be less than the community as a whole. Perhaps more like .05%.*
- b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area? *Just the SE Data prepared for the Travel Demand Model.*
- 5) The Winston-Salem Urban Area Travel Demand Model data shows that Linville Rd has a growth rate of roughly 0.5% per year between 2013 and 2040 and that Business 40/US 421/NC 150 has a growth rate of roughly 0.2% per year between 2013 and 2040.
- a. Do you think that the 0.5% traffic volume growth rate is reasonable for Linville Rd or do you think it will be higher or lower? *Seems reasonable.*
- b. Do you think that the 0.2% traffic volume growth rate is reasonable for Business 40 or do you think it will be higher or lower? *I think it will be higher.*
- 6) The Metropolitan Transportation Plan (MTP) includes four projects in the vicinity of the forecast that has the potential to affect the traffic volumes in the traffic forecast study area:
- Winston-Salem Northern Beltway, Eastern Section (Future I-74) – US 52 to US 311; Multi-Lane Freeway on New Location (MTP Projects 21-03, 21-05, 30-07, and 30-08; and STIP Project U-2579A/B/C/D/E/F)
 - US 158 Widening – US 421/Business 40 to US 220; Widen to Multi-Lanes (MTP Project 30-05 and STIP Project R-2577A)
 - Business Interstate 40 Widening – Northern Beltway to Guilford County; Widen to 6-lane freeway (MTP Project 40-08)

Comments completed by Margaret Bessette via email – 01/26/2018

- iv. I-40 widening – US 311 to Guilford County; Widen to 6-lane freeway (MTP Project 30-10)
 - a. How do you think these projects will affect traffic volumes in the study area? *I think the Northern Beltway could reduce traffic in this area, but that will likely be offset by increases due to local area development. The other projects could have an impact on this area during construction, but not likely permanently.*
 - b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area? *No.*
- 7) Are you aware of any previous traffic forecasts that were performed in or near the study area? *No.*
- 8) Do you know of developments in the vicinity of the traffic forecast area that may affect our traffic forecast? *No, as stated above, the development pace in this area has been fairly slow, due likely to development limitations and City ownership/permanent open space. We have seen some residential development south of the interchange (off Linville and Kernersville Roads), but its been very gradual.*
- 9) Do you have any additional comments that would be helpful in our development of the traffic forecast? *No.*
- 10) This questionnaire is being sent to the following individuals:
 - i. Diane Hampton, Division 9 Division Planning Engineer
 - ii. J.P. Couch, Division 9 Division Traffic Engineer
 - iii. Jeremy Guy, Division 9, District 2 District Engineer
 - iv. James Upchurch, NCDOT Transportation Planning Division
 - v. Margaret Bessette, City-County Planning Board Assistant Director
 - vi. Byron Brown, Winston-Salem DOT Principal Planner
- a. Are there any other individuals whom you think we should contact to discuss this forecast? *Not that I can recommend.*

Comments provided by:
Margaret C. Bessette, AICP
Assistant Planning Director
City-County Planning Board
P.O. Box 2511
Winston-Salem, NC 27102
Direct: 336.747-7058
margb@cityofws.org

Lee Klieman

From: Jeff Hatling <JHatling@toknc.com>
Sent: Wednesday, January 17, 2018 8:55 AM
To: Lee Klieman
Cc: Rochelle Joseph
Subject: RE: NCDOT STIP U-6059/B-5948 Traffic Forecast Questionnaire

Lee:
See responses below:

- 1) Current and historical traffic trends indicate that the traffic growth over the last 20 years in the study area has increased overall, although traffic levels have appeared to plateau around the year 2007 and from there remained relatively stable. Thus, the 20-year growth rates across the study area range from 0.2% to 2.3% per year, while the 10-year growth rates are all 1.0% or less per year.
 - a. Do you agree with this statement? **yes**
 - b. What growth patterns have you noticed? **The area the interchange serves is fairly built out.**
 - c. Would you expect the growth rate to change substantially in the next 20 years? **Stay the same**
 - d. Do you expect the growth rate to increase in the future? **No** If so, by what percent per year?

- 2) The last two traffic counts on Business 40 (in 2016 performed by NCDOT Traffic Survey Group and in 2017 for this forecast) show a substantial jump in volume from the previous years' volumes. Is this something that you have noticed? **yes** To what circumstances could such a change in traffic be attributable? **Growing employment in the central Triad. Commuters use B-40 to travel to the job centers of Winston-Salem, Kernersville, Greensboro and High Point.**

- 3) Aside from school being in session, are there any noticeable seasonal differences in traffic? **Holiday traffic that consist of shoppers and travelers.**

- 4) According to the North Carolina Office of State Budget and Management (OSBM) the current population of Forsyth County is approximately 373,100 and is projected to grow by 1.0% per year to 449,900 in 2036. The population projections for the entire Winston-Salem Urban Area (county breakdowns were not available) that are contained within the MTP show a projected population growth rate of approximately 1.1% per year to the year 2040.
 - a. Do you think that the 1.0% to 1.1% population growth rate is reasonable for this area? **Yes** If not, what is a more likely rate for the study area?

 - b. Do you know of any other population projections for this area that may be helpful as we review the growth in the area? **Triad population growth will further increase the commuter traffic.**

- 5) The Winston-Salem Urban Area Travel Demand Model data shows that Linville Rd has a growth rate of roughly 0.5% per year between 2013 and 2040 and that Business 40/US 421/NC 150 has a growth rate of roughly 0.2% per year between 2013 and 2040.
 - a. Do you think that the 0.5% traffic volume growth rate is reasonable for Linville Rd or do you think it will be higher or lower? **I see an increase in employment that will create more commuters on this section of interstate and interchange.**

 - b.

- c. Do you think that the 0.2% traffic volume growth rate is reasonable for Business 40 or do you think it will be higher or lower? **I see an increase in employment that will create more commuters on this section of interstate and interchange.**
- 6) The Metropolitan Transportation Plan (MTP) includes four projects in the vicinity of the forecast that has the potential to affect the traffic volumes in the traffic forecast study area:
- i. Winston-Salem Northern Beltway, Eastern Section (Future I-74) – US 52 to US 311; Multi-Lane Freeway on New Location (MTP Projects 21-03, 21-05, 30-07, and 30-08; and STIP Project U-2579A/B/C/D/E/F)
 - ii. US 158 Widening – US 421/Business 40 to US 220; Widen to Multi-Lanes (MTP Project 30-05 and STIP Project R-2577A)
 - iii. Business Interstate 40 Widening – Northern Beltway to Guilford County; Widen to 6-lane freeway (MTP Project 40-08)
 - iv. I-40 widening – US 311 to Guilford County; Widen to 6-lane freeway (MTP Project 30-10)
- a. How do you think these projects will affect traffic volumes in the study area? **Will not, Linville has local traffic and Business 40 is the primary east west route.**
 - b. Do you know of any reasonably foreseeable transportation projects that are not identified above that may affect traffic volumes in the traffic forecast study area? **no**
- 7) Are you aware of any previous traffic forecasts that were performed in or near the study area? **no**
- 8) Do you know of developments in the vicinity of the traffic forecast area that may affect our traffic forecast? **no**
- 9) Do you have any additional comments that would be helpful in our development of the traffic forecast? **no**
- 10) This questionnaire is being sent to the following individuals:
- i. Diane Hampton, Division 9 Division Planning Engineer
 - ii. J.P. Couch, Division 9 Division Traffic Engineer
 - iii. Jeremy Guy, Division9, District 2 District Engineer
 - iv. James Upchurch, NCDOT Transportation Planning Division
 - v. Margaret Bessette, City-County Planning Board Assistant Director
 - vi. Byron Brown, Winston-Salem DOT Principal Planner
- a. Are there any other individuals whom you think we should contact to discuss this forecast? **no**

From: Lee Klieman [<mailto:Lee@pt-engineering.net>]
Sent: Friday, January 12, 2018 4:32 PM
To: Jeff Hatling <JHatling@toknc.com>
Subject: NCDOT STIP U-6059/B-5948 Traffic Forecast Questionnaire

Mr. Hatling,

My name is Lee Klieman and my firm, Patriot Transportation Engineering, is in the process of preparing a traffic forecast for the upgrade of the interchange of Business I-40/US 421/NC 150 at SR 2662 (Linville Road) and the replacement Bridge No. 211 over Norfolk Southern Railroad in Forsyth County (NCDOT STIP U-6059 & B-5948). During the development of the forecast we utilize numerous resources, one of which is to gain a better understanding of the study

area through discussing the project with local planners and engineers. I have attached a brief questionnaire that will help us gain a better understanding of the study area as we prepare the forecast. Besides local knowledge (represented by responses to the questionnaire), several other data sources will be consulted in shaping the forecast, so that engineering judgment will sometimes be necessary in determining the traffic forecast submitted to NCDOT.

If you would please review the attached questionnaire, we would greatly appreciate your time in answering these questions. You may answer the questions in text format in the attached file (or simply within an email) and return them to me at: lee@pt-engineering.net. If you would rather discuss the questions over the phone, I will be following up with a phone call next week. Thank you in advance for your time and please let me know if you have any questions.

Lee Klieman, P.E., PTOE

Patriot Transportation Engineering, PLLC

<u>Mailing Address</u>	<u>Physical Address</u>
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	Raleigh, NC 27609

lee@pt-engineering.net

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APPENDIX C:
TRAFFIC FORECAST TABLES

Table C1: 2017 Base Year No-Build Traffic Volumes

Forecast Location	NCDOT Historic Count Data							AADT Extrapolated to 2017 (1)	Project Specific Count Data ⁽²⁾		2017 No-Build Traffic Forecast
	2010	2011	2012	2013	2014	2015	2016		TMC	Mainline	
SR 2377 (Old Greensboro Road) - West of Myer Lee Drive		7,200		7,400		8,300		8,100	8,800 (3)	8,700 (5)	8,800
SR 2377 (Old Greensboro Road) - Myer Lee Drive to SR 2377 (West Mountain St)									9,600 (3) 9,300 (3)		9,500
SR 2662 (Linville Rd) - SR 2377 (West Mountain St) to I-40 Business/US 421									16,300 (3) 16,300 (3)		16,400
SR 2662 (Linville Rd) - I-40 Business/US 421 to New Greensboro Rd									9,600 (3) 9,600 (3)		9,700
SR 2662 (Linville Rd) - New Greensboro Rd to Old Linville Rd		6,900		7,200		7,800		7,700	9,000 (3) 8,100 (3)		8,800
SR 2662 (Linville Rd) - East of Old Linville Rd									8,100 (3)		8,700
Myer Lee Drive - South of SR 2377 (Old Greensboro Road)									1,300 (3)		1,300
SR 2377 (West Mountain St) - North of SR 2662 (Linville Rd)/SR 2377 (Old Greensboro Rd)		10,000		10,000		11,000		10,400	10,700 (3)		10,700
I-40 Business/US 421 - North of SR 2662 (Linville Rd)	45,000	47,000	46,000	48,000	46,000	47,000	53,000	47,600	58,200 (4)		57,500
I-40 Business/US 421 - South of SR 2662 (Linville Rd)	50,000	51,000	50,000	52,000	51,000	52,000	57,000	52,500	62,600 (4)		62,000
New Greensboro Rd - South of SR 2662 (Linville Rd)									1,600 (3)		1,700
Old Linville Rd - North of SR 2662 (Linville Rd)									200 (3)		300

Notes:

- (1) Data extrapolated to 2017 based on linear regression of 2006-2016 data
- (2) All Project Specific Counts were converted to AADT based on the NCDOT Traffic Survey Unit ATR Seasonal Factors as described in Section 2.3
- (3) 2017 13-hour Turning Movement Count - factored to 24-hour volumes and adjusted to AADT.
- (4) 2017 14-hour Manual Classification Count - factored to 24-hour volumes and adjusted to AADT.
- (5) 2017 Project Specific Mainline Count - Adjusted to AADT.

Table C2: 2017 Base Year No-Build Design Data – Truck Percentages

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2017 BY NB Value
	Truck Percentage	STIP Project	TMC	Mainline	
SR 2377 (Old Greensboro Road) - West of Myer Lee Drive	3 , 4	U-5760	2 , 2 (1)	4 , 2 (3)	2 , 3
SR 2377 (Old Greensboro Road) - Myer Lee Drive to SR 2377 (West Mountain St)	3 , 4	U-5760	2 , 3 (1) 2 , 3 (1)		2 , 3
SR 2662 (Linville Rd) - SR 2377 (West Mountain St) to I-40 Business/US 421	2 , 2	U-5760	1 , 1 (1) 1 , 1 (1)		2 , 3
SR 2662 (Linville Rd) - I-40 Business/US 421 to New Greensboro Rd	2 , 2	U-5760	1 , 1 (1) 1 , 1 (1)		2 , 1
SR 2662 (Linville Rd) - New Greensboro Rd to Old Linville Rd	2 , 1	U-5760	1 , 1 (1) 1 , 1 (1)		2 , 1
SR 2662 (Linville Rd) - East of Old Linville Rd	2 , 1	U-5760	1 , 1 (1)		2 , 1
Myer Lee Drive - South of SR 2377 (Old Greensboro Road)			1 , 11 (1)		2 , 12
SR 2377 (West Mountain St) - North of SR 2662 (Linville Rd)/SR 2377 (Old Greensboro Rd)	2 , 2	U-5760	2 , 2 (1)		2 , 2
I-40 Business/US 421 - North of SR 2662 (Linville Rd)	3 , 4	U-5760/U-2579	4 , 5 (2)		4 , 5
I-40 Business/US 421 - South of SR 2662 (Linville Rd)	3 , 4	U-5760	4 , 5 (2)		4 , 5
New Greensboro Rd - South of SR 2662 (Linville Rd)	2 , 1	U-5760	2 , 1 (1)		2 , 1
Old Linville Rd - North of SR 2662 (Linville Rd)			3 , 0 (1)		2 , 1

Notes:

- (1) 2017 13-hour Turning Movement Count
- (2) 2017 14-hour Manual Classification Count
- (3) 2017 Volume, Speed, Class Mainline Count

Table C3: 2017 Base Year No-Build Design Data – Directional Distribution

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2017 BY NB Value
	Directional Distribution	STIP Project	TMC	Mainline	
SR 2377 (Old Greensboro Road) - West of Myer Lee Drive	55 WB	U-5760	50 EB (1)	55 EB (3)	55 EB
SR 2377 (Old Greensboro Road) - Myer Lee Drive to SR 2377 (West Mountain St)	55 WB	U-5760	52 EB (1) 53 EB (1)		55 EB
SR 2662 (Linville Rd) - SR 2377 (West Mountain St) to I-40 Business/US 421	60 WB	U-5760	51 WB (1) 52 EB (1)		55 WB
SR 2662 (Linville Rd) - I-40 Business/US 421 to New Greensboro Rd	60 WB	U-5760	65 EB (1) 58 EB (1)		60 EB
SR 2662 (Linville Rd) - New Greensboro Rd to Old Linville Rd	55 EB	U-5760	57 EB (1) 59 EB (1)		60 EB
SR 2662 (Linville Rd) - East of Old Linville Rd	55 EB	U-5760	59 EB (1)		60 EB
Myer Lee Drive - South of SR 2377 (Old Greensboro Road)			69 NB (1)		70 NB
SR 2377 (West Mountain St) - North of SR 2662 (Linville Rd)/SR 2377 (Old Greensboro Rd)	55 NB	U-5760	55 NB (1)		55 NB
I-40 Business/US 421 - North of SR 2662 (Linville Rd)	60 NB	U-5760/U-2579	50 NB (2)		55 NB
I-40 Business/US 421 - South of SR 2662 (Linville Rd)	60 NB	U-5760	52 NB (2)		55 NB
New Greensboro Rd - South of SR 2662 (Linville Rd)	65 NB	U-5760	56 SB (1)		55 SB
Old Linville Rd - North of SR 2662 (Linville Rd)			60 NB (1)		60 NB

Notes:

- (1) 2017 13-hour Turning Movement Count
- (2) 2017 14-hour Manual Classification Count
- (3) 2017 Volume, Speed, Class Mainline Count

Table C4: 2017 Base Year No-Build Design Data – Peak Hour Factor

Forecast Location	Previous Forecast		Project Specific Count Data		Selected 2017 BY NB Value
	Peak Hour Factor	STIP Project	TMC	Mainline	
SR 2377 (Old Greensboro Road) - West of Myer Lee Drive	9	U-5760	9 (1)	10 (3)	9
SR 2377 (Old Greensboro Road) - Myer Lee Drive to SR 2377 (West Mountain St)	9	U-5760	9 (1) 9 (1)		9
SR 2662 (Linville Rd) - SR 2377 (West Mountain St) to I-40 Business/US 421	11	U-5760	9 (1) 9 (1)		9
SR 2662 (Linville Rd) - I-40 Business/US 421 to New Greensboro Rd	11	U-5760	9 (1) 9 (1)		9
SR 2662 (Linville Rd) - New Greensboro Rd to Old Linville Rd	10	U-5760	9 (1) 9 (1)		9
SR 2662 (Linville Rd) - East of Old Linville Rd	10	U-5760	9 (1)		9
Myer Lee Drive - South of SR 2377 (Old Greensboro Road)			6 (1)		7
SR 2377 (West Mountain St) - North of SR 2662 (Linville Rd)/SR 2377 (Old Greensboro Rd)	9	U-5760	9 (1)		9
I-40 Business/US 421 - North of SR 2662 (Linville Rd)	9	U-5760/U-2579	8 (2)		8
I-40 Business/US 421 - South of SR 2662 (Linville Rd)	9	U-5760	8 (2)		8
New Greensboro Rd - South of SR 2662 (Linville Rd)	11	U-5760	9 (1)		9
Old Linville Rd - North of SR 2662 (Linville Rd)			3 (1)		7

Notes:

- (1) 2017 13-hour Turning Movement Count
- (2) 2017 14-hour Manual Classification Count
- (3) 2017 Volume, Speed, Class Mainline Count

Table C5: Model Validation

Forecast Location	Model 2013		2017 No-Build		FY Build Volumes	
	Model Volume	AADT	Interpolated Model ⁽¹⁾	Forecast Volume	2040 Model	2040 Forecast
SR 2377 (Old Greensboro Road) - West of Myer Lee Drive	8,890	7,400	9,100	8,800	10,242	10,100
SR 2377 (Old Greensboro Road) - Myer Lee Drive to SR 2377 (West Mountain St)	8,890		9,100	9,500	10,242	11,000
SR 2662 (Linville Rd) - I-40 Business/US 421 to New Greensboro Rd	6,711		6,900	9,700	7,655	11,100
SR 2662 (Linville Rd) - New Greensboro Rd to Old Linville Rd	6,711	7,200	6,900	8,800	7,655	10,100
SR 2662 (Linville Rd) - East of Old Linville Rd	5,713		5,900	8,700	6,847	9,900
SR 2377 (West Mountain St) - North of SR 2662 (Linville Rd)/SR 2377 (Old Greensboro Rd)	9,048	10,000	9,000	10,700	8,670	10,700
I-40 Business/US 421 - North of SR 2662 (Linville Rd)	68,023	48,000	68,600	57,500	71,849	60,900
I-40 Business/US 421 - South of SR 2662 (Linville Rd)	71,644	52,000	72,300	62,000	75,893	65,700
New Greensboro Rd - South of SR 2662 (Linville Rd)	<i>1,943</i>		<i>1,900</i>	1,700	<i>1,959</i>	2,000

Notes: (1) Interpolated volume between 2013 and 2040 model data

Numbers in *Grey Italics* are taken from a centroid connector that is geographically analogous to a project roadway.

Table C6: 2040 Build Traffic Volumes

Forecast Location	Forecast 2017 Base Year NB	Historic Growth Rate		Model Growth Rate ⁽¹⁾	Chosen Growth Rate ⁽¹⁾	Model Volume Delta ⁽²⁾	Chosen Volume Delta ⁽²⁾	Future Year Build Volumes	
	AADT	2007-2016	1997-2016	2013-2040	2017-2040	2013-2040	2017-2040	2040 Model	2040 Forecast
SR 2377 (Old Greensboro Road) - West of Myer Lee Drive	8,800	1.06%	0.78%	0.53%	0.60%	1,352	1,300	10,242	10,100
SR 2377 (Old Greensboro Road) - Myer Lee Drive to SR 2377 (West Mountain St)	9,500			0.53%	0.64%	1,352	1,500	10,242	11,000
SR 2662 (Linville Rd) - SR 2377 (West Mountain St) to I-40 Business/US 421	16,400				0.38%		1,500		17,900
SR 2662 (Linville Rd) - I-40 Business/US 421 to New Greensboro Rd	9,700			0.53%	0.59%	1,352	1,400	10,242	11,100
SR 2662 (Linville Rd) - New Greensboro Rd to Old Linville Rd	8,800	0.90%	2.30%	0.49%	0.60%	944	1,300	7,655	10,100
SR 2662 (Linville Rd) - East of Old Linville Rd	8,700			0.67%	0.56%	1,134	1,200	6,847	9,900
Myer Lee Drive - South of SR 2377 (Old Greensboro Road)	1,300				0.62%		200		1,500
SR 2377 (West Mountain St) - North of SR 2662 (Linville Rd)/SR 2377 (Old Greensboro Rd)	10,700	0.10%	0.27%	-0.16%	0.00%	-378	0	8,670	10,700
I-40 Business/US 421 - North of SR 2662 (Linville Rd)	57,500	0.47%	0.96%	0.20%	0.25%	3,826	3,400	71,849	60,900
I-40 Business/US 421 - South of SR 2662 (Linville Rd)	62,000	0.56%	0.17%	0.21%	0.25%	4,249	3,700	75,893	65,700
New Greensboro Rd - South of SR 2662 (Linville Rd)	1,700			0.03%	0.71% ⁽³⁾	16	300 ⁽³⁾	1,959	2,000
Old Linville Rd - North of SR 2662 (Linville Rd)	300				1.26%		100		400

Notes:

- (1) Growth rate shown is the Compound Annual Growth Rate (CAGR).
- (2) Volume Delta is the raw change in volume between either the model volumes or the forecast volumes
- (3) Growth rate and model volumes shown are for a centroid connector that is geographically analogous to a project roadway



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