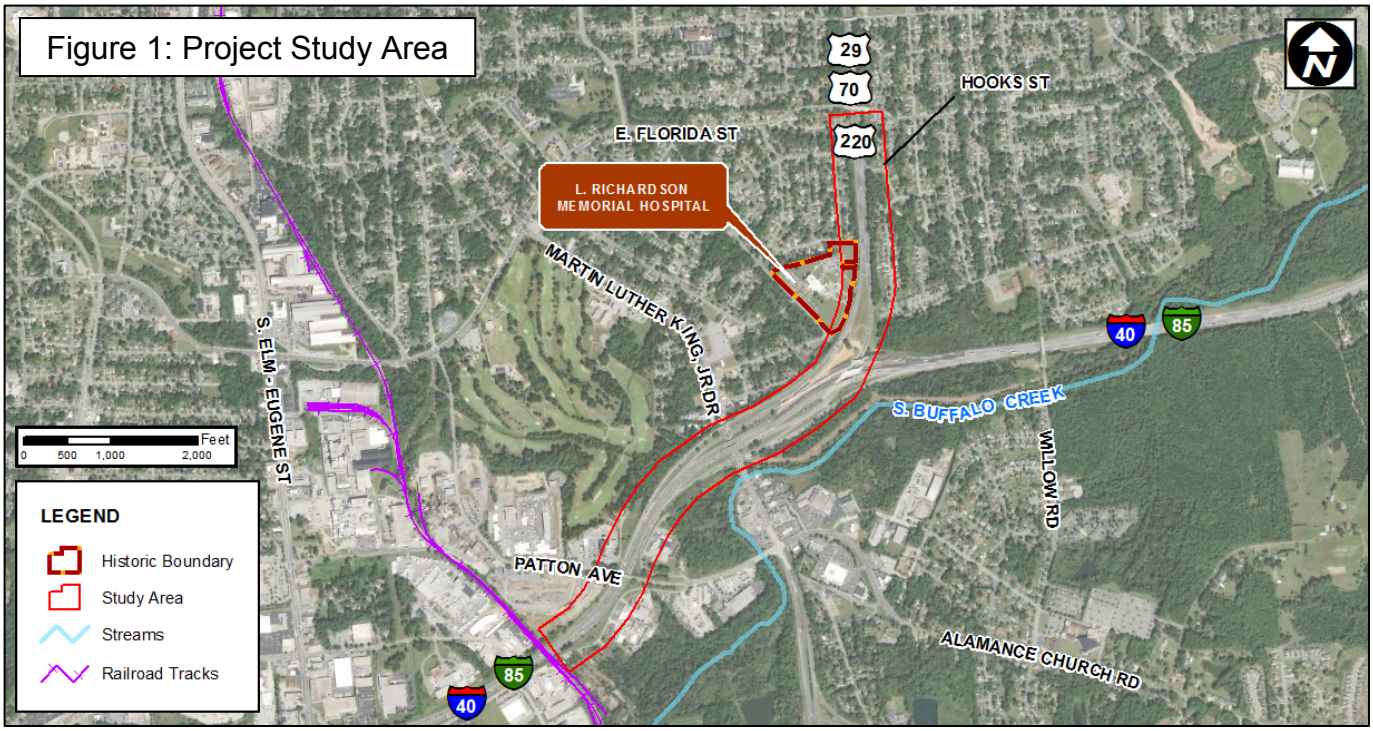
Type I and II Ground Disturbing Categorical Exclusion Action Classification Form

STIP Project No.	**U-5754**
WBS Element	**54034.1.1**
Federal Project No.	**NHP-0029(065)**

A. Project Description: The North Carolina Department of Transportation (NCDOT) proposes to construct improvements to the I-40/I-85 Business – US 29/70/220 interchange. The project is identified in the State Transportation Improvement Program (STIP) as project number U-5754 and is in Greensboro, Guilford County. The length of the project is approximately 1.5 miles.



B. Description of Need and Purpose: The purpose of U-5754 project is to improve traffic operations and safety within the I-40/I-85 Business – US 29/70/220 interchange area in eastern Greensboro. I-40/I-85 Business and US 20/70/220 are two of Greensboro's busiest highway corridors and they converge within the project study area. On the western end of the study area, traffic is funneled to and from Winston-Salem, High Point, and Charlotte. On the eastern end, traffic is funneled from Greensboro's northern suburbs, Danville, VA, and the Raleigh-Durham area. Also, Martin Luther King, Jr. Drive connects Downtown Greensboro, via the study area, to US 421, providing a conduit for traffic between Greensboro, Chatham County, and Sanford. Existing and Future Year (2040) traffic volumes are shown in Table 1.

Table 1: Current and Future Year Traffic Volumes (vpd)

	2017 Base Year (vpd)	2040 No-Build (vpd)
Martin Luther King, Jr. Drive (north of I-40/I-85 Business)	12,600	14,800
Martin Luther King, Jr. Drive (south) of I-40/I-85 Business)	30,400	34,200
I-40/I-85 Business (West of Martin Luther King, Jr. Drive)	134,000	151,000
I-40/I-85 Business (East of Martin Luther King, Jr. Drive)	76,000	84,000
US 29/70/220 (I-40/I-85 Business to E. Florida Street)	64,200	74,000

The current interchange configuration at the eastern end of the study area provides inadequate lane capacity for traffic volumes to and from US 29/70/220, resulting in traffic backups and creating safety issues.

- Southbound traffic from US 29/70/220 to I-40/I-85 Business (West) is forced to quickly merge from a two-lane roadway into a single-lane ramp.
- In the eastbound direction, traffic headed to US 29/70/220 (North) from I-40/I-85 Business (East) is only allotted a one-lane exit. The current laneage is not adequate to accommodate existing and future traffic volumes making this movement. The inadequate ramp capacity results in significant back-ups, impacting exit and on-ramps to the west of this interchange.
- The off-ramp from US 29/70/220 (South) to Martin Luther King Jr., Drive experiences significant back-ups during peak period, resulting in traffic queuing into one of the US 29/70/220 (South) through lanes.

The Capacity Analysis Report is included in Appendix A. The traffic volume development and Highway Capacity Software outputs are not included in Appendix A. However, this information can be viewed on the NCDOT Project SharePoint website.

C. Categorical Exclusion Action Classification: (Check one)

☒ TYPE I A

D. Proposed Improvements – Delete Action Classifications that do not apply.

22. Projects, as defined in 23 U.S.C. 101, which would take place entirely within the existing operational right-of-way. Existing operational right-of-way refers to right-of-way that has been disturbed for an existing transportation facility or is maintained for a transportation purpose. This area includes the features associated with the physical footprint of the transportation facility (including the roadway, bridges, interchanges, culverts, drainage, fixed guideways, mitigation areas, etc.) and other areas maintained for transportation purposes such as clear zone, traffic control signage, landscaping, any rest areas with direct access to a controlled access highway, areas maintained for safety and security of a transportation facility, parking facilities with direct access to an existing transportation facility, transit power substations, transit venting structures, and transit maintenance facilities. Portions of the right-of-way that have not been disturbed or that are not maintained for transportation purposes are not in the existing operational right-of-way.

E. Special Project Information: (Provide a description of relevant project information, which may include: vicinity map, costs, alternative analysis (if any), traffic control and staging, and resource agency/public involvement).

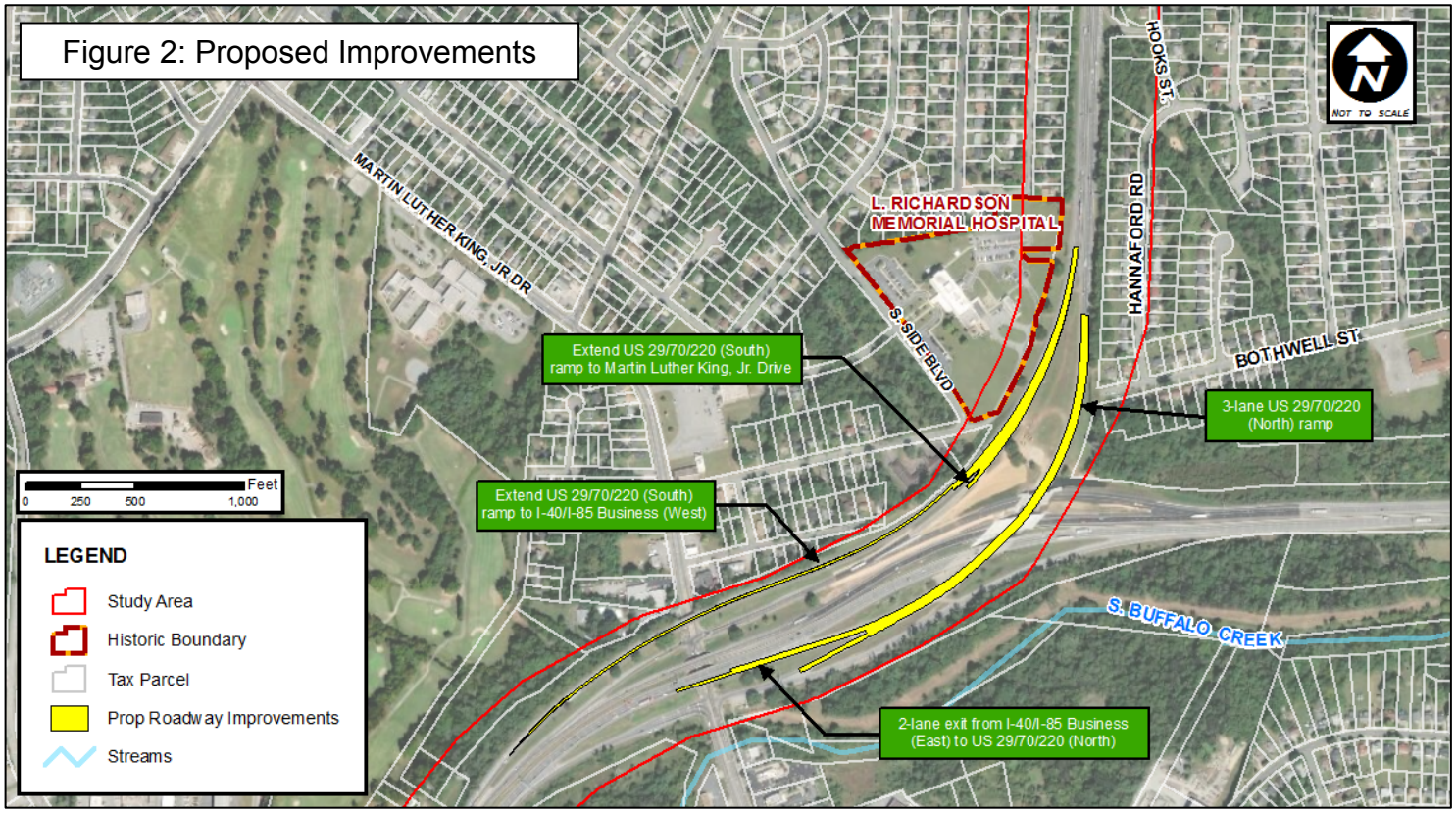
Project Components
The project consists of the following improvements:

- Add a second lane to the exit ramp from I-40/I-85 Business (east) to US 29/70/220 (north) to provide a total of three northbound lanes under I-40/I-85 Business.
  - The additional lane to US 29/70/220 (north) will tie into the existing lane-drop at the access for E. Florida Street via Hooks Street.
- Extend the outside lane on the US 29/70/220 (south) ramp to I-40/I-85 Business (west) ramp by restriping the existing pavement.
  - The additional lane for US 29/70/220 (south) to I-40/I-85 Business (west) will merge just west of the Martin Luther King, Jr. Drive overpass.
- Extend the deceleration lane of the US 29/70/220 (south) to Martin Luther King Jr. Drive.

The proposed improvements will not modify the existing gore points on the ramps that will be improvement. Thus, an Interchange Access Report (IAR) is not required for this project.

The project components are shown in Figure 2.

Figure 2: Proposed Improvements



Other STIP Projects: There are several other STIP projects near U-5754 that are included in the NCDOT 2018 – 2027 STIP. These projects are summarized in Table 2.

Table 2: Adjacent STIP Projects

STIP Project Number	Description	Schedule
I-5965	I-40/US 220/SR 1398 (Freeman Mill Road) to US 29/70/220: Add lanes, improve the SR 1007 (Randleman Road) and the Elm-Eugene Street interchanges, and replace the Norfolk Southern Railway Bridge east of Elm-Eugene Street.	Right of Way: FY 2022 Construction: FY 2022
I-5964	I-40/I-85 Business – US 29/70/220, Elm-Eugene Street Interchange Improvements.	Right of Way: FY 2018 Construction: FY 2019
B-5718	Patton Avenue – Replacement Bridge Number 329 over I-40/I-85 Business – US 29/70/220	*project included in STIP Project I-5965
B-5356	I-40/I-85 Business: Replace Bridge Number 339 over South Buffalo Creek.	Right of Way: N/A Construction: FY 20200

Right-of-Way and Utility Impacts

The improvements proposed by the project consists primarily of restriping and reconstructing existing lanes. These improvements are contained within the existing operational right-of-way. The proposed improvements will not result in impacts to or the need to relocate any utilities within the project study area.

Public Involvement

Due to the nature of the traffic patterns in the study area, the recommended improvements, and the lack of controversy related to the project, the NCDOT determined that an informational public meeting was not warranted. In lieu of a public meeting, a newsletter was prepared to inform the surrounding neighborhoods and the local traveling public of the proposed project improvements.

Over 500 copies of the newsletter were distributed via the United States Postal Service Every Door Direct Mailing (EDDM). A copy of this newsletter is included in Appendix C.

Two inquiries were received based off the distribution of the project newsletter. Both inquiries were from citizens living in the community bounded to the west by US 29/70/220 and to the south by I-40/I-85 Business. Both citizens requested clarity on the scope of the project and questioned if it would result in direct impacts to their property.

Agency Coordination

NCDOT coordinated with the following federal, state, and local government agencies throughout the development of the project:

- Federal Highway Administration
- United States Army Corps of Engineers
- United States Environmental Protection Agency
- United States Fish and Wildlife Service
- North Carolina Division of Water Resources
- North Carolina Department of Cultural Resources
- North Carolina Wildlife Resources Commission
- City of Greensboro
- Greensboro Urban Area Metropolitan Planning Organization

Construction Costs

Preliminary construction costs estimates were developed for the recommended improvements. Table 3 summarizes the estimate construction costs.

Table 3: Cost for the Recommended Improvements

Right-of- Way Cost	N/A
Utilities Cost	N/A
Construction Costs*	$16,449,000
Total Construction Costs	$16,449,000

*Current 2018 – 2027 STIP Estimate

Project Impact Summary

As previously noted, the improvements proposed by the project consists primarily of restriping and reconstructing existing lanes. These improvements are contained within the existing operational right-of-way. Table 4 summarizes the likely impacts to the natural and human environment due to the proposed improvements:

Table 4: Impact Matrix for Recommended Improvements

Resource		**Recommended Alternative (Impacts)**
Length (miles)		1.5
Relocations	Residential	0
	Business	0
	Non-profit	0
	Total	0
Minority/Low-Income Populations (Disproportionate Impacts)		0
Historic Properties (Adverse Effects)		No Effect
Community Facilities		0
Section 4(f) Resources		0
Noise Receptor Impacts		0
Prime Farmlands (acres)		N/A
Riparian Buffers (square feet)		0
Streams (linear feet)		0
Wetlands (acres)		0
Federally Protected Species *Small whorled pogonia*		No Effect

F. Project Impact Criteria Checklists:

Type I & II - Ground Disturbing Actions			
FHWA APPROVAL ACTIVITIES THRESHOLD CRITERIA			
If any of questions 1-7 are marked "yes" then the CE will require FHWA approval.		Yes	No
1	Does the project require formal consultation with U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS)?	☐	☒
2	Does the project result in impacts subject to the conditions of the Bald and Golden Eagle Protection Act (BGPA)?	☐	☒
3	Does the project generate substantial controversy or public opposition, for any reason, following appropriate public involvement?	☐	☒
4	Does the project cause disproportionately high and adverse impacts relative to low-income and/or minority populations?	☐	☒
5	Does the project involve a residential or commercial displacement, or a substantial amount of right of way acquisition?	☐	☒
6	Does the project require an Individual Section 4(f) approval?	☐	☒
7	Does the project include adverse effects that cannot be resolved with a Memorandum of Agreement (MOA) under Section 106 of the National Historic Preservation Act (NHPA) or have an adverse effect on a National Historic Landmark (NHL)?	☐	☒
If any of questions 8 through 31 are marked "yes" then additional information will be required for those questions in Section G.			
Other Considerations		Yes	No
8	Does the project result in a finding of "may affect not likely to adversely affect" for listed species, or designated critical habitat under Section 7 of the Endangered Species Act (ESA)?	☐	☒
9	Is the project located in anadromous fish spawning waters?	☐	☒
10	Does the project impact waters classified as Outstanding Resource Water (ORW), High Quality Water (HQW), Water Supply Watershed Critical Areas, 303(d) listed impaired water bodies, buffer rules, or Submerged Aquatic Vegetation (SAV)?	☐	☒
11	Does the project impact waters of the United States in any of the designated mountain trout streams?	☐	☒
12	Does the project require a U.S. Army Corps of Engineers (USACE) Individual Section 404 Permit?	☐	☒
13	Will the project require an easement from a Federal Energy Regulatory Commission (FERC) licensed facility?	☐	☒
14	Does the project include a Section 106 of the NHPA effects determination other than a no effect, including archaeological remains?	☐	☒

Other Considerations (continued)		Yes	No
15	Does the project involve hazardous materials and/or landfills?	☐	☒
16	Does the project require work encroaching and adversely affecting a regulatory floodway or work affecting the base floodplain (100-year flood) elevations of a water course or lake, pursuant to Executive Order 11988 and 23 CFR 650 subpart A?	☐	☒
17	Is the project in a Coastal Area Management Act (CAMA) county and substantially affects the coastal zone and/or any Area of Environmental Concern (AEC)?	☐	☒
18	Does the project require a U.S. Coast Guard (USCG) permit?	☐	☒
19	Does the project involve construction activities in, across, or adjacent to a designated Wild and Scenic River present within the project area?	☐	☒
20	Does the project involve Coastal Barrier Resources Act (CBRA) resources?	☐	☒
21	Does the project impact federal lands (e.g. U.S. Forest Service (USFS), USFWS, etc.) or Tribal Lands?	☐	☒
22	Does the project involve any changes in access control?	☐	☒
23	Does the project have a permanent adverse effect on local traffic patterns or community cohesiveness?	☐	☒
24	Will maintenance of traffic cause substantial disruption?	☐	☒
25	Is the project inconsistent with the STIP or the Metropolitan Planning Organization's (MPO's) Transportation Improvement Program (TIP) (where applicable)?	☐	☒
26	Does the project require the acquisition of lands under the protection of Section 6(f) of the Land and Water Conservation Act, the Federal Aid in Fish Restoration Act, the Federal Aid in Wildlife Restoration Act, Tennessee Valley Authority (TVA), or other unique areas or special lands that were acquired in fee or easement with public-use money and have deed restrictions or covenants on the property?	☐	☒
27	Does the project involve Federal Emergency Management Agency (FEMA) buyout properties under the Hazard Mitigation Grant Program (HMGP)?	☐	☒
28	Does the project include a *de minimis* or programmatic Section 4(f)?	☐	☒
29	Is the project considered a Type I under the NCDOT's Noise Policy?	☐	☒
30	Is there prime or important farmland soil impacted by this project as defined by the Farmland Protection Policy Act (FPPA)?	☐	☒
31	Are there other issues that arose during the project development process that affected the project decision?	☐	☒

G. Additional Documentation as Required from Section F

Mobile Source Air Toxins

The purpose of this project is to improve traffic operations and safety within the I-40/I-85 Business – US 29/70/220 interchange area in eastern Greensboro, by constructing improvements to the ramps to and from US 29/70/220 and Dr. Martin Luther King, Jr. Boulevard. This project has been determined to generate minimal air quality impacts for Clean Air Act criteria pollutants and has not been linked with any special mobile source air toxic (MSAT) concerns.

As such, this project will not result in changes in traffic volumes, vehicle mix, basic project location, or any other factor that would cause a meaningful increase in MSAT impacts of the project from that of the no-build alternative.

Highway Traffic Noise Impacts

Introduction

In accordance with Title 23 Code of Federal Regulations Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise (Title 23 CFR 772) and the North Carolina Department of Transportation Traffic Noise Policy, each Type I highway project must be analyzed for predicted traffic noise impacts. In general, Type I projects are proposed State or Federal highway projects for construction of a highway or interchange on new location, improvements of an existing highway which substantially change the horizontal or vertical alignment or add new through lanes, or projects that involve new construction or substantial alteration of transportation facilities such as weigh stations, rest stops, ride-share lots or toll plazas.

The proposed project does not meet the criteria of a Type I project under Title 23 CFR 772 and the North Carolina Department of Transportation Traffic Noise Policy. No traffic noise analysis will be required unless warranted by a substantial change in the project's design concept or scope.

In accordance with NCDOT Traffic Noise Policy, the Federal/State governments are not responsible for providing noise abatement measures for new development for which building permits are issued after the Date of Public Knowledge. The Date of Public Knowledge of the proposed highway project will be the approval date of the Categorical Exclusion (CE). NCDOT strongly advocates the planning, design and construction of noise-compatible development and encourages its practice among planners, building officials, developers and others.

H. Project Commitments

Guilford County
US 29/70/220 and I-40 / I-85 Business Improvements
NHP-0029(065)
WBS No. 54034.1.1
STIP No. U-5754

Environmental Policy Unit

No project commitments are required.

I. Categorical Exclusion Approval

STIP Project No.	**U-5754**
WBS Element	**54034.1.1**
Federal Project No.	**NHP-0029(065)**

Prepared By:

11/30/2018
Date

DocuSigned by:
Ryan White
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Ryan White, P.E.
Consultant Project Manager
Stantec Consulting Services, Inc.

Prepared For:

United States Department of Transportation
Federal Highway Administration
And
North Carolina Department of Transportation
Division of Highways

Reviewed By:

11/30/2018
Date

DocuSigned by:
Karen Reynolds
512F0E5DF1024CB...

Karen Reynolds
NCDOT Project Manager
NCDOT Project Management Unit

☒ **Approved** — If all of the threshold questions (1 through 7) of Section F are answered "no," NCDOT approves this Categorical Exclusion.

☐ **Certified** — If any of the threshold questions (1 through 7) of Section F are answered "yes," NCDOT certifies this Categorical Exclusion.

11/30/2018
Date

DocuSigned by:
John Jamison, for
89183F75ED11458...

Derrick Weaver, P.E.
Environmental Policy Unit Head
North Carolina Department of Transportation

FHWA Approved: For Projects Certified by NCDOT (above), FHWA signature required.

Date

John F. Sullivan, III, PE, Division Administrator
Federal Highway Administration

APPENDIX A

TRAFFIC FORECAST & CAPACITY ANAYLSIS

Project Level Traffic Forecast

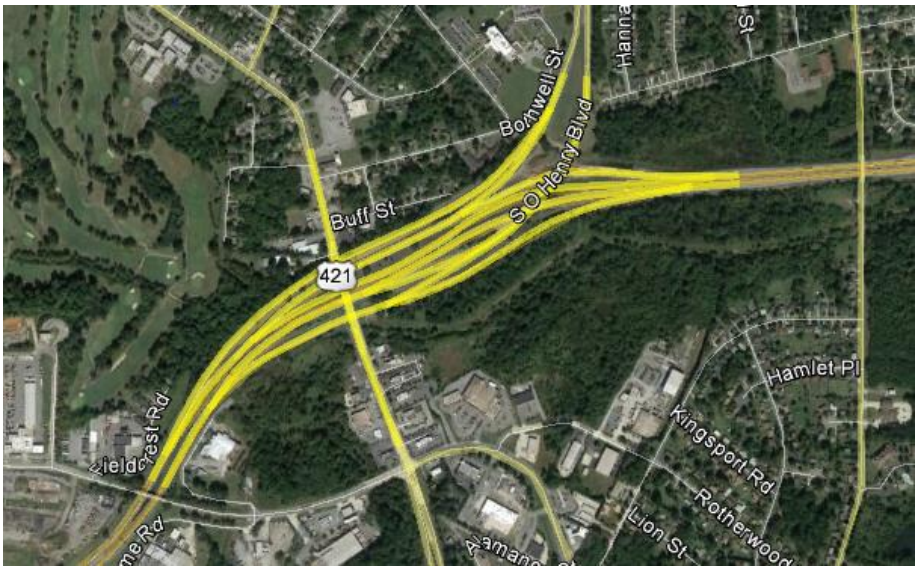
STIP Project U-5754

Ramp Improvements between US 29 / US 70 / US 220 and I-40 / Business 85

WBS # 54034.1.1

Prepared by

WSP USA Inc.
434 Fayetteville Street, Suite 1500
Raleigh, North Carolina 27601



Prepared for:

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Transportation Planning Branch
Raleigh, North Carolina

August 09, 2017

Traffic Forecast Cover Letter

MEMORANDUM TO: **Donnie Huffines**
Division 7 Project Manager, NCDOT

FROM: **Shashank Shekhar, PE**
WSP

DATE: **August 9, 2017**

SUBJECT: **Traffic Forecast for STIP Project U-5754**
Guilford County
Ramp improvements between US 29 / US 70 / US 220 and I-40 / Business 85

Please find attached the 2017 (Base Year) / 2040 (Future Year) Traffic Forecast for STIP project U-5754 located in Guilford County. This forecast is the first forecast done for this project.

This forecast was requested by Michael Wray of NCDOT Project Development & Environmental Analysis Unit on May 18, 2017.

STIP project U-5754 is the addition of a new lane on I-40 / Business 85 eastbound ramp onto northbound US 29 / US 70 / US 220 and add another lane from US 29 / US 70 / US 220 southbound ramp onto I-40 / Business 85.

The project lies within the Greensboro Metropolitan Planning Organization (MPO) and is included in the official 2040 Metropolitan Transportation Plan (MTP) of Greensboro MPO. The project is included in the Piedmont Triad Regional Model (PTRM) 2040 MTP scenario. The Piedmont Triad Regional Model version 4.2, adopted October 17, 2016, was utilized in development of the forecast along with project counts, and historical AADTs.

The following two (2) scenarios are provided in the forecast:

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

This forecast was approved by the NCDOT Transportation Planning Branch on August 9, 2017.

Certain assumptions were made in the development of the forecast

No Build and Build Forecast:

Improvements to the ramps without substantial improvements to the connecting roadways are not expected to increase daily travel demand on the ramps, therefore, it is assumed that there is no substantial difference between the No Build and Build AADT in this forecast.

Fiscal Constraint:

For projects falling within an MPO, forecasts are fiscally constrained to match the assumptions of the MPO's Metropolitan Transportation Plan (MTP). The amended MTP was adopted by the Greensboro MPO on September 23, 2015. This forecast assumes that all of the projects within the 2040 MTP are constructed and open to traffic in 2040. This would include the widening of Alamance Church Road from Martin Luther King Jr. Drive to the city limit.

Interpolation:

To determine any intermediate years, straight-line interpolation may be used. 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 information.

If you have any questions, or I can be of further assistance, please do not hesitate to call me at 919-836-4052, or e-mail me at shashank.shekhar@wsp.com. Thank you.

cc: FILE (Guilford County, Project U-5754)

cc: (*via e-mail as PDF attachments*):

Doumit Y. Ishak, NCDOT Congestion Management Section (dishak@ncdot.gov)

Glenn W. Mumford, PE, NCDOT Roadway Design Unit (roadwaydesign@ncdot.gov)

Clark Morrison, PhD, PE, NCDOT Pavement Management Unit (cmorrison@ncdot.gov)

Ed Lewis, NCDOT Division 7 (elewis@ncdot.gov)

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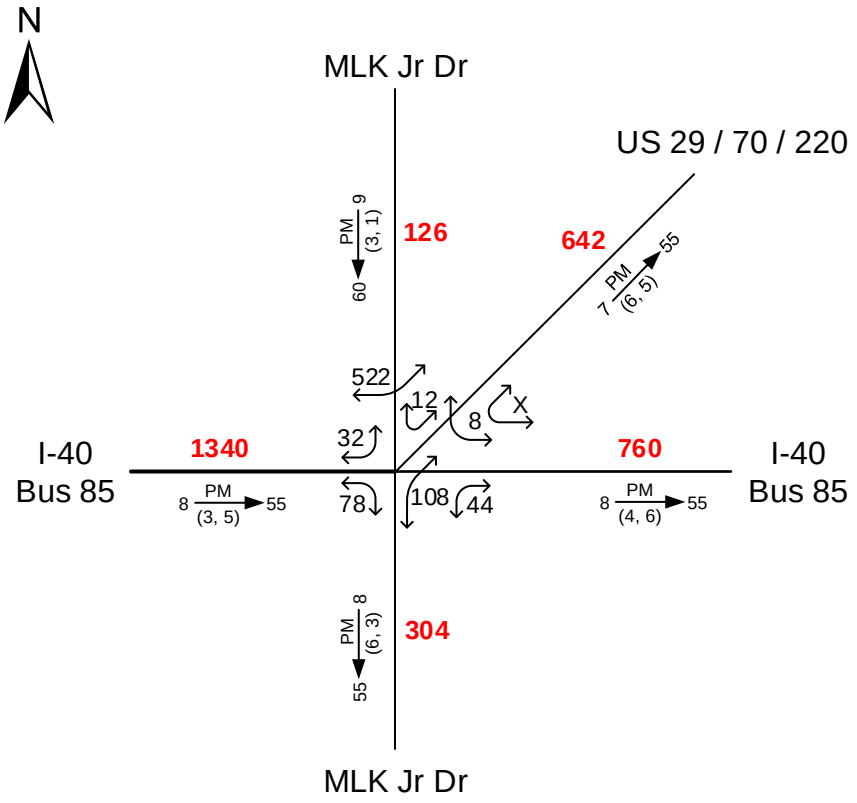
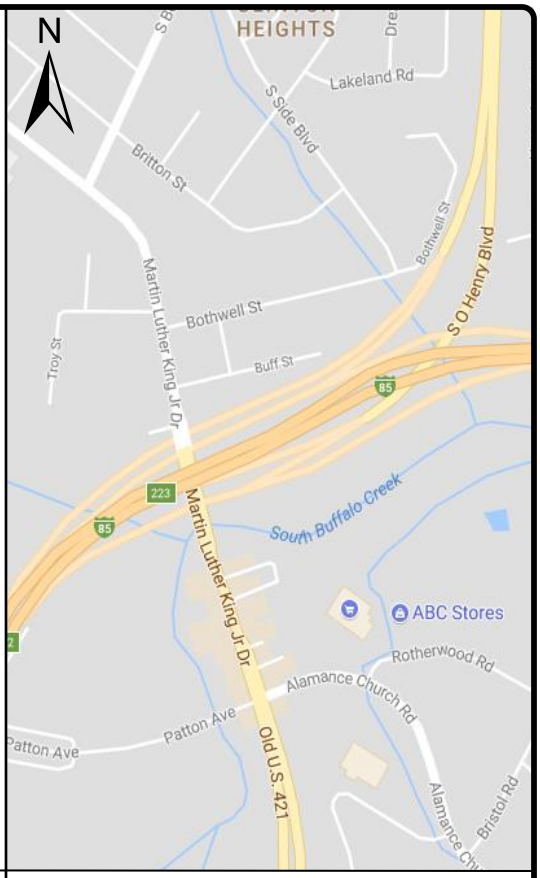
Beverly Robinson, NCDOT Project Development and Environmental Analysis Unit (brobinson@ncdot.gov)

Michael G. Wray, PE, NCDOT Project Development and Environmental Analysis Unit (mgwray@ncdot.gov)

Verrol Mcleary, NCDOT Project Development and Environmental Analysis Unit (vmcleary1@ncdot.gov)

Keith Dixon, NCDOT Transportation Planning Branch (kgdixon@ncdot.gov)

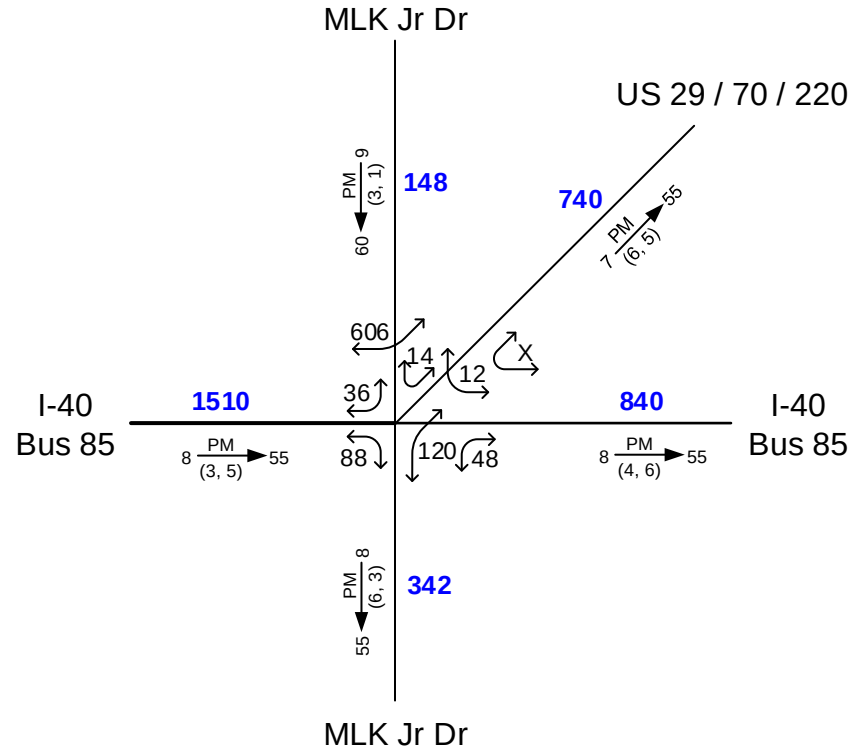




2017 Base Year No Build / Build

AVERAGE ANNUAL DAILY TRAFFIC

SHEET 1 OF 1



L E G E N D

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

TIP: U-5754

COUNTY: Guilford | **DIVISION:** 7

DATE: August 09, 2017

PREPARED BY: WSP USA

LOCATION: I-40/I-85 Business, US 29 and SR 3763

PROJECT: Add lanes to northbound ramps

2040 Future Year No Build / Build

1) Project Background

Project Request Information

This forecast was requested by Michael Wray in the Western Region of the Project Development & Environmental Analysis (PDEA) Unit at North Carolina Department of Transportation (NCDOT) Transportation Planning Branch.

Project Description

Project U-5754 involves addition of lanes to northbound and southbound ramps connecting I-40 / Business 85 and SR 3762 (Martin Luther King Jr. Drive). This project is located in Greensboro, North Carolina. U-5754 is scheduled for construction in 2021 as per the 2016-2025 Statewide Transportation Improvement Program (STIP) dated June 2017. The 2018-2027 Draft STIP, dated January 2017, has the start of construction moved up to 2020.

As per latest plans, U-5754 involves adding exit lanes on to I-40 to US-29 northbound. Because of availability of existing pavement, the project will primarily be a pavement marking project with minimal asphalt added.

Forecast Scenarios

The following two (2) scenarios are provided in the forecast:

- 2017 Base Year No-Build / Build
- 2040 Horizon Year No-Build / Build

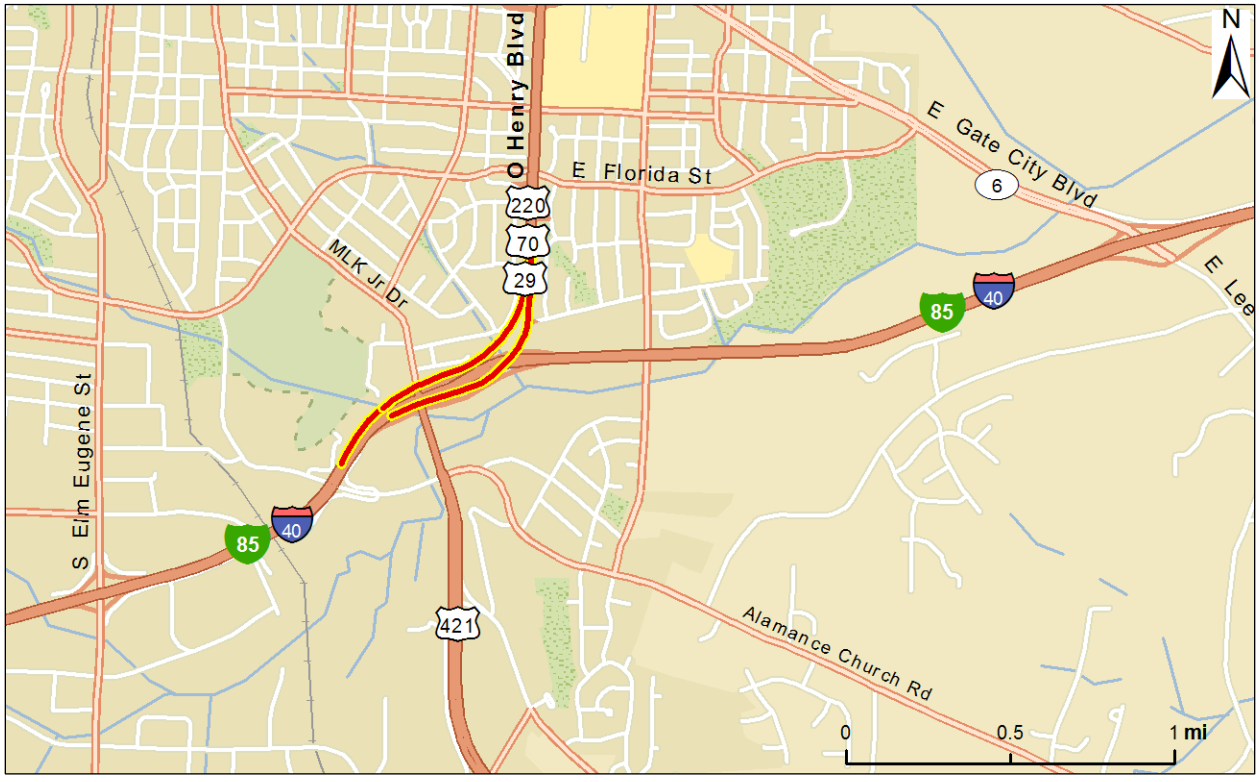


Figure 1 – Study Area Map

2) Sources of Information and Data

Travel Demand Model

The Piedmont Triad Regional Model (PTRM) V4.2, adopted October 17, 2016, was a key tool in preparing the forecast for this project. The PTRM was developed cooperatively by NCDOT, Piedmont Authority for Regional Transportation (PART), and the four regional Metropolitan Planning Organizations (MPOs) located in the modeled area. The model utilizes TransCAD platform and has:

- BY 2013 – the validated Baseline Year 2013, and
- FY 2040 – Future Year 2040 MTP scenario

The model was edited to remove TIP Project U-5754 from the 2040 MTP scenario. This was done to create a Future Year No Build (FY NB) scenario, which could be compared to the Base Year No Build (BY NB) scenario.

Table 4 documents key locations in the project corridor. This table shows a comparison of the model validation year volumes with that year's AADTs. Table 5 includes a comparison of the growth rate that was calculated from the model's output with the growth rate used in this forecast.

Model Issues and Correction

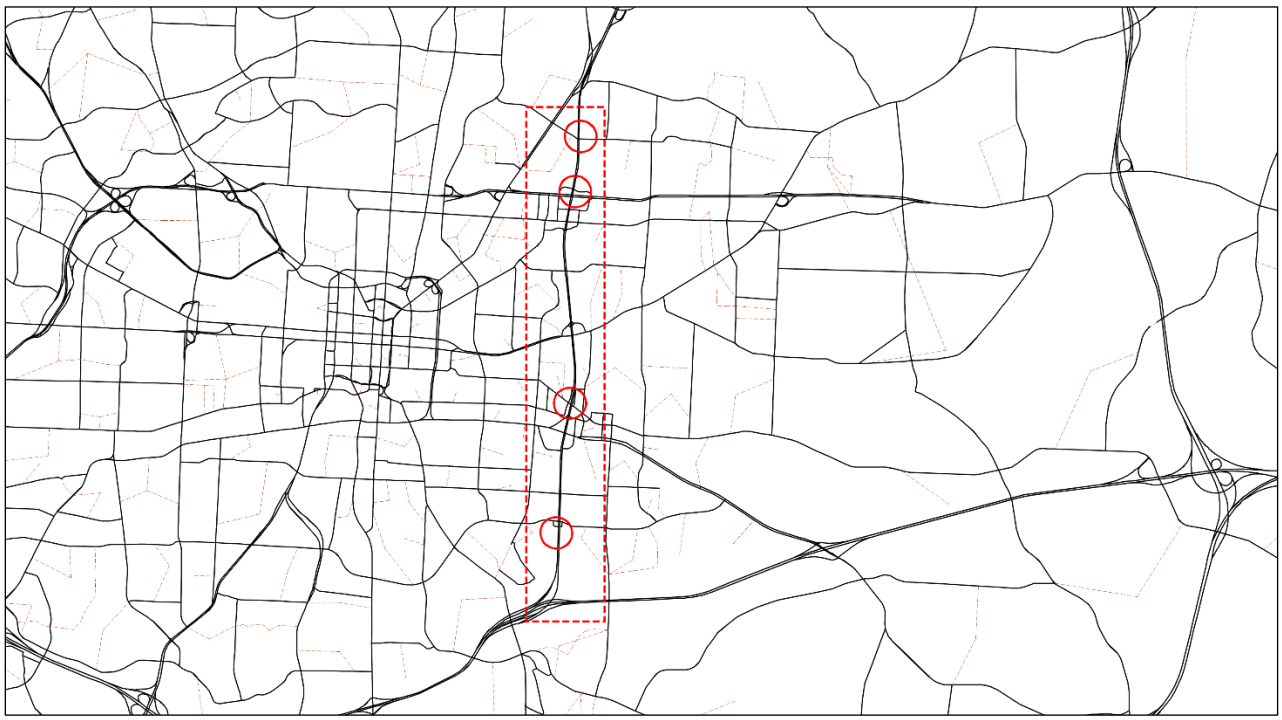


Figure 2 – Model Highway Network Issues

Multiple issues were noted in the highway network and deemed significant enough to affect model volumes in the study area. These are:

- Florida St Access – the model shows an interchange at US 29 and Florida St. In reality, this interchange does not exist; there is no way to directly access Florida St from US 29.

- McConnell Rd Access – the model shows a road that connects US 29 (S O Henry Blvd) to McConnell Rd and continues through to Gorrell St. In reality, these roads no longer connect. Both the US 29 & McConnell Rd intersection, and the McConnell Rd & Gorrell St intersection have been removed. The model also shows an intersection of S O Henry Blvd Service Rd to McConnell Rd. This intersection has also been removed.

- Sullivan Street Access – the model shows that Sullivan Street connects directly to US 29 (N O Henry Blvd). In reality this connection does not exist.

- Wendover Avenue Access – the model shows only an on-ramp in northeast quadrant and an off-ramp in the northwest quadrant. However, both quadrants have an on-ramp and off-ramp.

- Textile Drive Access – the model shows that Textile Drive is connected across US 29 and provides full access. In reality there is no connection east-west on Textile Drive and it has right-in-right-out only access to northbound and southbound US 29 (N O Henry Blvd).

- Ramp Speed – It was noted that the posted speed and free flow speed was lower on some of the ramps. The posted speed and free flow speed were updated

Figure 2 shows a map of where these issues are located.

These issues in effect add interchanges that do not exist to US 29. It should be noted that the model showed a large imbalance in the southbound (7,722 vpd) and northbound (20,692 vpd) volumes on US 29. The Base Year (2013) model was underestimating daily volumes (28,414 vpd) when compared with the historic 2013 AADT (60,000).

The highway network was updated to correct the inaccuracies mentioned above. Posted Speed and Free Flow Speed were also updated for ramps within the red rectangle shown in Figure 2. Free flow speed for these ramps were assumed equal to the posted speed instead of 50% of posted speed in the original model.

Similar highway network changes were made to both the Base Year (2013) and the Future Year (2040) No Build model. The full model run was completed for both scenarios. The revised model provided a better match with 2013 AADTs in the study area.

The model validation results for study area is provided in Table 4 of the Appendix.

Historic AADT

There were five AADT stations taken into consideration for this traffic forecast. These stations provided information used to determine historic growth rates in the area. Twenty years' worth of data, from 1995-2015, was considered. The data is summarized in Table 1 and Figure 3.

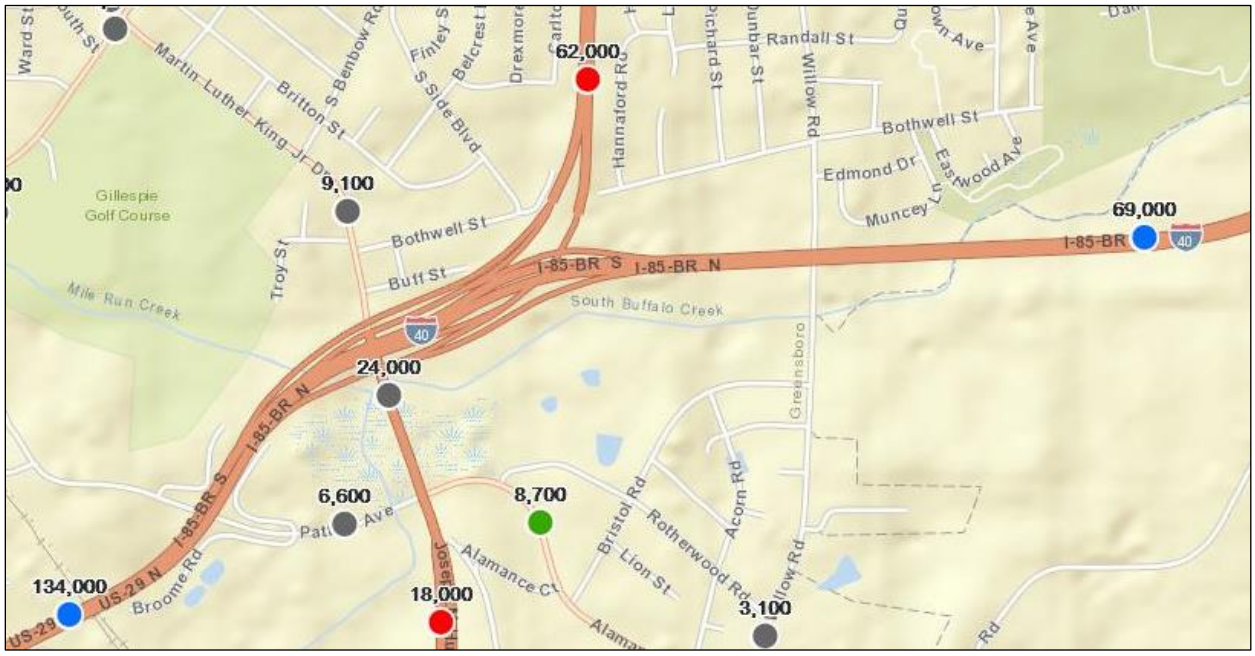


Figure 3 – 2015 AADT Map

Field Data Collection

Turning movement and class counts were collected by Quality Counts, LLC in June 2017. All counts taken on roads in the project area are in ATR Group 1. The counts were converted to AADTs by using the appropriate seasonal adjustment factor based on the ATR Group and the month and day of week the count was taken. Ten classification counts and two turning movement counts were collected for this project.

A summary of field collected data is provided in Table 2. A map of the field collected data showing ramp and mainline AADT (after applying seasonal adjustment factor) is provided in Figure 4

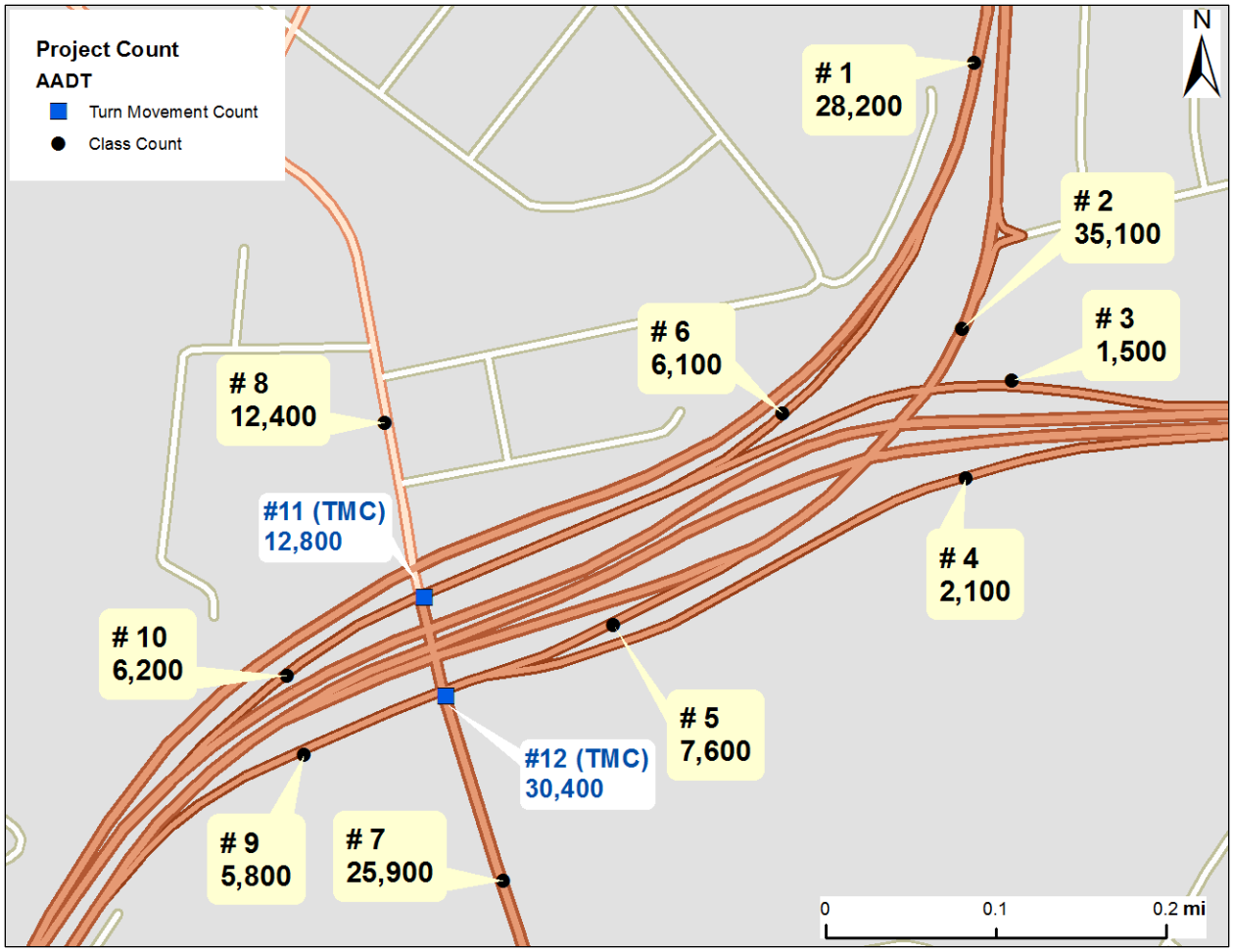


Figure 4 – Project Count Map with Adjusted AADT

3) Base Year (2017) No-Build / Build Forecast

Assumptions

The 2017 Base Year Forecast represents existing conditions. Improvements to the ramps without substantial improvements to the connecting roadways is not expected to increase daily travel demand on the ramps, therefore, there is no substantial difference between the No Build and Build AADT in this forecast. There is no substantial new development or redevelopment anticipated to open in 2017 and affect the 2017 forecast.

Methodology

The 2017 AADT was based on a review of previous traffic forecasts, field data collected for this project, area AADT history extrapolated to 2017, and engineering judgement. Turning movements were developed from the turning movement counts and volume counts collected on the ramps that were taken in the project area. To ensure the intersection would have whole numbers if broken out, turning movements were rounded to the nearest 200. The AADT volumes and turning movements were balanced throughout the network.

The intersection balancing was completed utilizing a variation of the NCDOT Traffic Forecast Utility (TFU) spreadsheet. The TFU considers the approach volumes and design factors for each intersection and calculates a validation score. This score is utilized as a tool in selecting the appropriate volumes and factors. A score that is less than 1.0 is considered valid; however, if a score greater than 1.0 is returned, additional evaluation is done to determine if the selected volumes and factors are acceptable. This may be considered acceptable for intersections that are based on count data and well established travel patterns or trends.

Data from the traffic counts taken for this project were incorporated into the TFU to replicate volumes as closely as possible for each intersection in the traffic forecast. The volumes in the 2017 estimate are representative of patterns observed in the field data. The BY TFU output is shown in the Appendix. Note that on the east side, the two legs (I-40/ 85 Bus and US 29/70/220) were added together. The NE and SE quadrant volumes were also added for checking in TFU.

Table 1 displays a summary of recent historical data with a comparison of the traffic counts that were taken for this project.

Design Factors

The 2017 Estimate includes design factors for traffic flow including truck percentages, Directional Splits (D), and Design Hour Volumes (k factor). These factors are used to convert daily traffic volumes to peak hour volumes for capacity analysis. These factors are based on class and turning movement counts taken in the project area. The k factor represents the percentage of traffic that occurs in the peak hour of traffic flow. The directional split provides information on the direction of traffic flow in the peak period. Refer to Table 3 regarding data used to determine the design factors.

Truck percentages were separated into the two NCDOT standard classifications, Duals (single-unit trucks with at least one dual-tired axle) and TTSTs (multi-unit trucks with single or twin trailers). Refer to Table 3 for a summary of truck percentages. Values were checked in the TFU to ensure the intersection balanced properly.

Vehicle classification (VC) data, published by NCDOT for year 2015 was utilized to determine design factors for I-40 / Business I-85. This data included K, D and truck percentages. NCDOT data and the selected value is shown below:

LOCATION	VC K FACTOR	APPLIED K FACTOR	VC D	APPLIED D	VC HEAVY VEHICLES	APPLIED HEAVY VEHICLES
I-40 west of S Elm-Eugene St	8.3%	**8%**	55.8%	**55%**	3.3 / 4.6	**3 / 5**
I-40 east of E Lee St	7.7%	**8%**	58.5%	**55%**	3.2 / 6.3	**3 / 6**

4) Future Year (2040) No-Build / Build Forecast

Assumptions

Improvements to the ramps without substantial improvements to the connecting roadways is not expected to increase daily travel demand on the ramps, therefore, there is no substantial difference between the No Build and Build AADT in this forecast. It was assumed that there will be no new links or new alignment roadways in the highway link network for the study area under the 2040 scenario. Therefore, the 2040 scenario has the same roadway network as the 2017 scenario. It is assumed that all roadways will experience growth, even if historically there has been a decline in AADT.

Fiscal Constraints

For projects falling within an MPO, forecasts are fiscally constrained to match the assumptions of the MPO's Metropolitan Transportation Plan (MTP). The 2040 MTP was adopted on September 23, 2015. This forecast assumes that all projects in the 2040 MTP are constructed and open to traffic by 2040. This would include the widening of Alamance Church Road from Martin Luther King Jr. Dr. to the city limit.

Development Activity

It is assumed that all new development that will increase vehicle trips per day is accounted for in the background growth of the model.

Methodology

Growth rates were calculated from the historic AADT data collected and compared to the growth rates from the PTRM. For the forecast, turning movements were rounded to the nearest 200, to ensure the intersection would have whole numbers if broken out. Table 5 shows the calculated 10 and 20-year historical growth rates, the calculated growth rate between the 2013 and 2040 No Build model scenarios, and the growth rate applied for 2017 to 2040 forecast.

Using the TFU, mainline and quadrant volumes were adjusted to ensure that the system AADTs balance. The FY TFU output is shown in the Appendix. Note that on the east side, the two legs (I-40/ 85 Bus and US 29/70/220) were added together. The NE and SE quadrant volumes were also added for checking in TFU.

Design Factors

Design Factors for the 2040 scenario are the same as design factors for the 2017 Base Year scenario since no substantial change in the function or character of traffic is expected in the project area.

APPENDIX

Forecast Documentation Tables

1. **Historic AADT Table (1995 – 2015)**
2. **Data Collection Table**
3. **Design Factor Table (D, K, and HV)**
4. **Model Validation Table**
5. **Growth Rate Comparison**

Traffic Forecast Utility (TFU) Analysis

1. **Base Year (2017) TFU**
2. **Future Year (2040) TFU**

Table 1 – Historic AADT Table (1995 – 2015)

CVRG VLM ID	LOCATION	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
4000340	I-85 BUS FROM EXIT 37 TO EXIT 39		139,000		144,000	142,000	148,000	145,000	142,000	143,000	154,000	117,000
4000343	I-85 BUS FROM EXIT 39 TO EXIT 41		67,000		84,000	78,000	79,000	79,000	76,000	78,000	84,000	57,000
4009277	ML KING JR DR N OF TROY ST											
4009362	ML KING JR DR S OF I-40											
4000098	US 29-70-220 (N OHENRY BLVD) N OF BOTHWELL ST	58,000		62,000		60,000		60,000				

(Table 1 continued)

CVRG VLM ID	LOCATION	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Project Class Count 2017	Project TMC 2017	Base Year Forecast 2017
4000340	I-85 BUS FROM EXIT 37 TO EXIT 39	118,000	121,000		118,000	117,000	121,000	120,000	124,000	133,000	134,000	*n/a*	*n/a*	134,000
4000343	I-85 BUS FROM EXIT 39 TO EXIT 41	57,000	60,000		55,000	55,000	56,000	59,000	61,000	68,000	69,000	*n/a*	*n/a*	76,000
4009277	ML KING JR DR N OF TROY ST				9,800				9,600		9,100	*12,400*	*12,800*	12,600
4009362	ML KING JR DR S OF I-40				25,000				25,000		24,000	*25,900*	*30,400*	30,400
4000098	US 29-70-220 (N OHENRY BLVD) N OF BOTHWELL ST				64,000	69,000	63,000		60,000		62,000	*63,300*	*n/a*	64,200

Table 2 – Data Collection Table

Location	Key Map #	Type of Count	Date(s)	Day	County	ATR Group	Raw Count	Seasonal Adjustment Factor	AADT
S O Henry Blvd WB Ramp to I-40	1	48-Hour Class	6/7/17-6/8/17	Wed - Thu	Guilford	1	***29,680***	0.95	**28,200**
I-40 Ramp EB to S O Henry Blvd	2	48-Hour Class	6/20/17-6/21/17	Tue - Wed	Guilford	1	***36,352***	0.965	**35,100**
I-40 WB Ramp to MLK	3	48-Hour Class	6/7/17-6/8/17	Wed - Thu	Guilford	1	***1,528***	0.95	**1,500**
MLK EB Ramp to I-40	4	48-Hour Class	6/7/17-6/8/17	Wed - Thu	Guilford	1	***2,252***	0.95	**2,100**
MLK EB Ramp to S O Henry Blvd	5	48-Hour Class	6/7/17-6/8/17	Wed - Thu	Guilford	1	***8,039***	0.95	**7,600**
S O Henry Blvd WB to MLK	6	48-Hour Class	6/7/17-6/8/17	Wed - Thu	Guilford	1	***6,416***	0.95	**6,100**
Martin Luther King Jr Dr S of EB Ramps	7	48-Hour Class	6/20/17-6/21/17	Tue - Wed	Guilford	1	***26,807***	0.965	**25,900**
Martin Luther King Jr Dr N of Buff St	8	48-Hour Class	6/7/17-6/8/17	Wed - Thu	Guilford	1	***13,037***	0.95	**12,400**
I-40 EB Ramp to MLK	9	48-Hour Class	6/7/17-6/8/17	Wed - Thu	Guilford	1	***6,081***	0.95	**5,800**
MLK WB Ramp to I-40	10	48-Hour Class	6/7/17-6/8/17	Wed - Thu	Guilford	1	***6,499***	0.95	**6,200**
MLK and WB Ramps	11	16-Hour TMC	6/7/2017	Wed	Guilford	1		0.97	
MLK and EB Ramps	12	16-Hour TMC	6/7/2017	Wed	Guilford	1		0.97	

Table 3 – Design Factor Table (D, K, and HV)

Location	AADT	D - Directional Distribution			K- Peak Hour Factor			Heavy Vehicles - (Dual / TTST)	
	2017 Count	2017 Class Count	2017 TMC	Selected Value BY	2017 Class Count	2017 TMC	Selected Value BY	2017 Class Count	Selected Value BY
S O Henry Blvd WB Ramp to I-40	**28,196**	100%			6.5%			6.6 / 5.4	
I-40 Ramp EB to S O Henry Blvd	**35,080**	100%			7.0%			6.1 / 5.4	
S O Henry Blvd	**63,276**	55%		**55%**	6.8%		**7%**	6.3 / 5.4	**6 / 5**
I-40 WB Ramp to MLK	**1,452**	100%			7.6%			8.6 / 3.7	
MLK EB Ramp to I-40	**2,139**	100%			8.5%			11.5 / 2.5	
MLK EB Ramp to S O Henry Blvd	**7,637**	100%			7.4%			8.0 / 2.5	
S O Henry Blvd WB to MLK	**6,095**	100%			9.6%			6.3 / 4.5	
Martin Luther King Jr Dr S of EB Ramps	**25,869**	53%	52%	**55%**	7.9%	8.5%	**8%**	5.9 / 2.4	**6 / 3**
Martin Luther King Jr Dr N of Buff St	**12,385**	63%	63%	**60%**	9.2%	8.9%	**9%**	3.4 / 0.6	**3 / 1**
I-40 EB Ramp to MLK	**5,777**	100%	100%		8.9%	6.3%		8.9 / 1.6	
MLK WB Ramp to I-40	**6,174**	100%	100%		7.1%	7.7%		6.2 / 1.4	
EB Ramps east of MLK	**7,500**		100%			8.0%			
WB Ramps east of MLK	**9,800**		100%			9.1%			

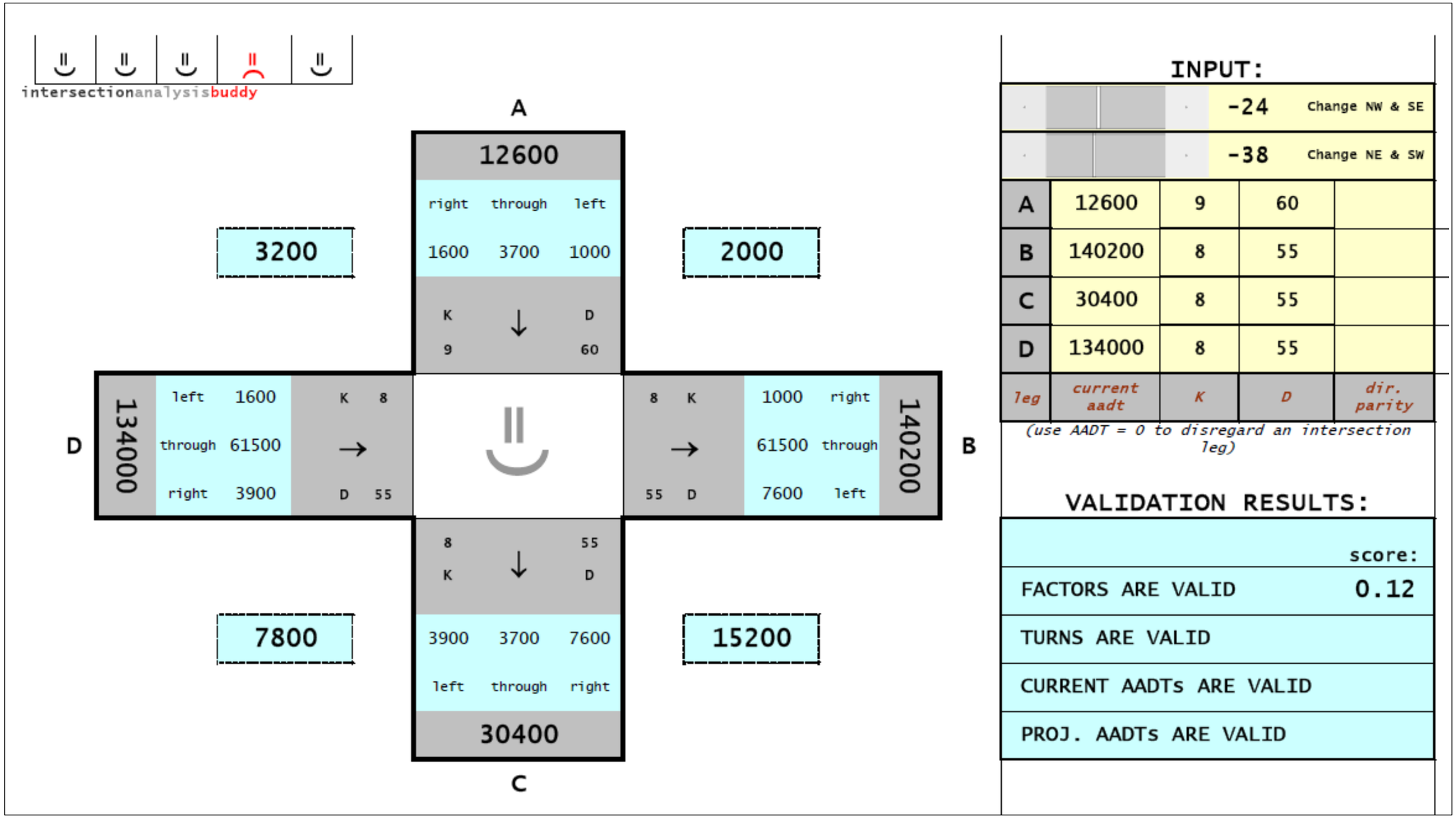
Table 4 – Model Validation Table

KEY LOCATIONS	2013 No Build (Model)	2013 AADT (Historic)	2040 FY No Build (Model)	2017 Interpolated (Model)	2017 BY (Forecast)
I-85 BUS FROM EXIT 37 TO EXIT 39	130,322	124,000	138,822	131,581	134,000
I-85 BUS FROM EXIT 39 TO EXIT 41	91,911	61,000	93,200	92,102	76,000
ML KING JR DR N OF TROY ST	21,859	9,600	27,708	22,726	12,600
ML KING JR DR S OF I-40	30,319	25,000	33,605	30,806	30,400
US 29-70-220 (N OHENRY BLVD) N OF BOTHWELL ST	52,835	60,000	61,850	54,171	64,200

Table 5 – Growth Rate Comparison

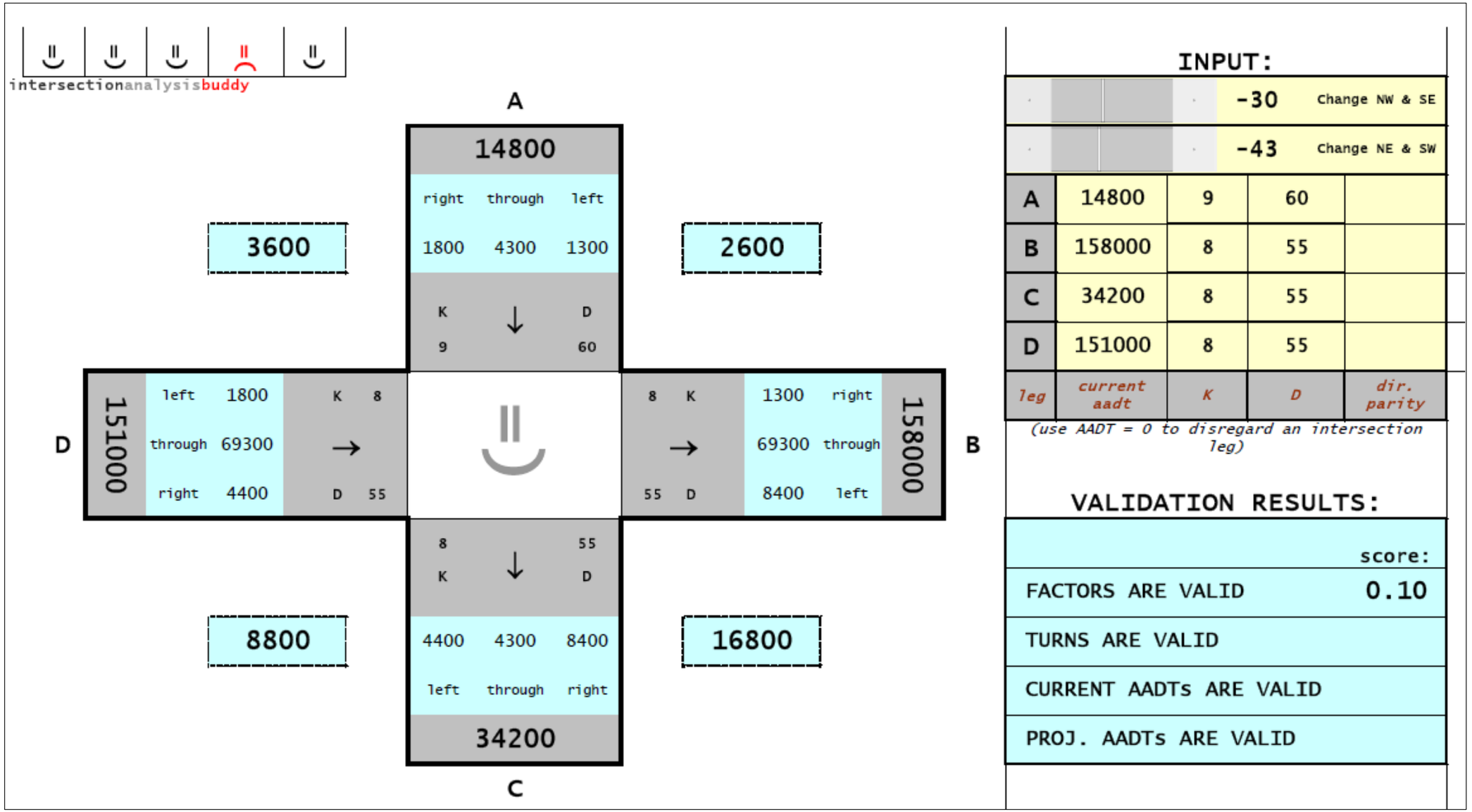
KEY LOCATIONS	10-Yr Growth Rate 1995 – 2005 Historical AADT	10-Yr Growth Rate 2005 – 2015 Historical AADT	20-Yr Growth Rate 1995 – 2015 Historical AADT	Model Growth Rate 2013 - 2040	Applied Growth Rate	BY 2017 Forecast	FY 2040 Forecast
I-85 BUS FROM EXIT 37 TO EXIT 39	-1.7%	1.4%	-0.2%	0.2%	0.5%	134,000	151,000
I-85 BUS FROM EXIT 39 TO EXIT 41	-1.6%	1.9%	0.1%	0.1%	0.4%	76,000	84,000
ML KING JR DR N OF TROY ST	n/a	-0.7%	-0.4%	0.9%	0.7%	12,600	14,800
ML KING JR DR S OF I-40	n/a	-0.4%	-0.2%	0.4%	0.5%	30,400	34,200
US 29-70-220 (N OHENRY BLVD) N OF BOTHWELL ST	0.3%	-0.3%	-0.2%	0.6%	0.6%	64,200	74,000

Base Year (2017) TFU



Note that on the east side, the two legs (I-40/ 85 Bus and US 29/70/220) have been added together. The northeast and southeast quadrant volumes have also been added together.

Future Year (2040) TFU



Note that on the east side, the two legs (I-40/ 85 Bus and US 29/70/220) have been added together. The northeast and southeast quadrant volumes have also been added together.

U-5754 I-40/I-85 Business and US 29-70-220 Interchange Improvements
Capacity Analysis Report

US 29-70-220 interchange from I-40 / I-85 Business to South of Florida Street in Greensboro, North Carolina

Prepared for:
North Carolina Department of Transportation

Prepared by:
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May 21, 2018

Sign-off Sheet

This document entitled U-5754 I-40/I-85 Business and US 29-70-220 Interchange Improvements was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of North Carolina Department of Transportation (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

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5/21/2018

Table of Contents

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) is investigating the possibility of various improvements to the Interstate-40 (I-40)/Interstate-85 Business (I-85 Bus.) corridor in southern Greensboro, North Carolina through multiple projects. The subject project, identified in the State Transportation Improvement Program (STIP) as U-5754, includes adding a lane on I-40/I-85 Business eastbound ramp onto northbound US 29-70-220 interchange and adding and extending the US 29-70-220 interchange southbound ramp to I-40/I-85 Bus. westbound in Greensboro. The project location travels through an area that is, in large part, moderately developed residential property. Additional projects include I-5964 and I-5965 which propose to widen the I-40/I-85 Bus. corridor west of the U-5754 project limits and improve the SR 1007 (Randleman Road) and Elm-Eugene Street interchanges, as well as replacing the Norfolk Southern railroad bridge. The current State Transportation Improvement Program lists the following construction timeframes for each project:

- U-5754 Construction: Fiscal Year (FY) 2018 – FY 2021
- I-5964 (Elm/Eugene St. Interchange Improvements) Construction: FY 2018
- I-5965 (I-40/I-85 Bus. Widening & Other Improvements) Construction: FY 2022 – FY 2026

The purpose of this study is to evaluate the operation of the modified ramps for the 2040 build scenario provided in the forecast. Included in this report are the methodology used, the scenarios analyzed, and the results of each analysis.

1.1 STUDY AREA

This study provides analysis for U-5754. The study area is shown in Figure 1 and consists of an evaluation of Existing I-40/I-85 Bus. within the influence area of the interchange with US 29-70-220 and the merge/diverge points on ramps within the I-40/I-85 Bus. at US 29-70-220 interchange for the following scenarios:

- 2017 Existing;
- 2025 No-Build;
- 2025 Build with Proposed Laneage;
- 2040 No-Build; and
- 2040 Build with Proposed Laneage.

Figure 1: Vicinity Map

2.0 STUDY METHODOLOGY

2.1 INTERCHANGE IMPROVEMENTS

The U-5754 project proposes to make three improvements to ramps within the I-40/I-85 Bus. and US 29-70-220 interchange. Those are as follows:

- An additional lane to the southbound US 29-70-220 ramp to I-40/I-85 Bus. westbound;
- An additional lane to the eastbound I-40/I-85 Bus. ramp to US 29-70-220 northbound; and
- Extending the deceleration length of the southbound US 29-70-220 ramp to the at-grade intersection with Martin Luther King Jr. Drive.

The additional lane for the southbound US 20-70-220 ramp to I-40/I-85 Bus. westbound will merge in the area of Patton Avenue east of (i.e. upstream) the railroad bridge.

The additional lane for the eastbound I-40/I-85 Bus. ramp to US 29-70-220 northbound will tie into the existing lane-drop at the access for Florida Street via Hooks Street.

2.2 TRAFFIC DEMAND

The traffic volumes used in this study were taken from the U-5754 forecast dated August 9, 2017. Average Annual Daily Traffic (AADT) volumes and other required data from the forecast were entered in to NCDOT's Intersection Analysis Utility (IAU) to obtain AM and PM peak hour volumes for the 2017 and 2040 scenarios. These volumes were used in the HCS analyses and shown in Figure 2 and Figure 4.

In-order to perform the intermittent year (2025) analyses, linear interpolation was used to develop 2025 hourly volumes from the traffic forecast. These volumes are shown in Figure 3. Refer to Section 3.0 for the justification and discussion of the intermittent year analysis.

Appendix A: Traffic Volume Development contains the traffic forecast, volume breakouts using NCDOT's IAU spreadsheet, and traffic volume interpolations used in this analysis.

Figure 2: 2017 Existing Traffic Volumes

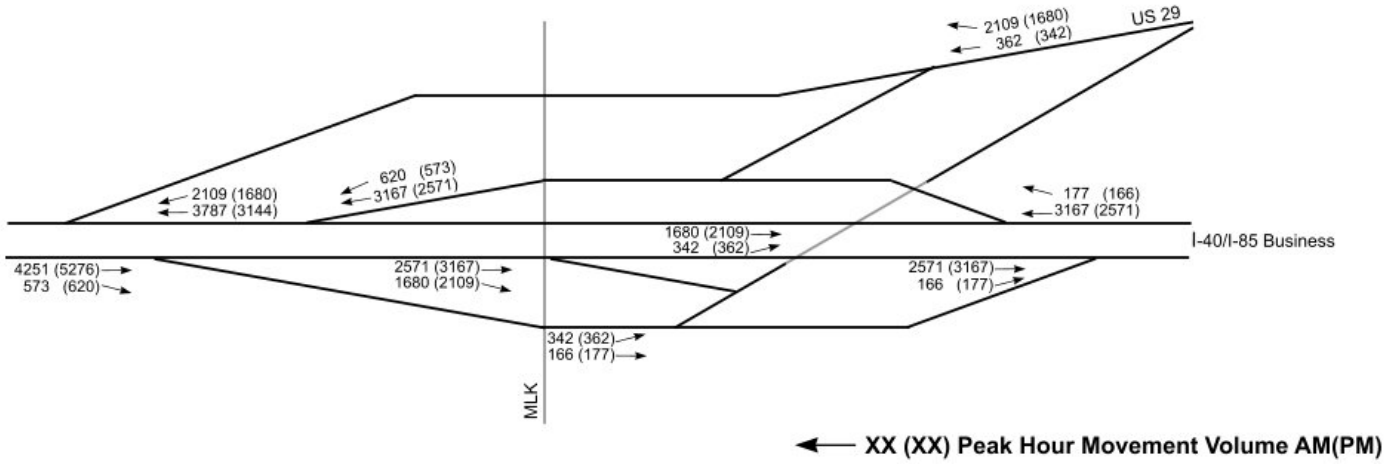


Figure 3: 2025 No-Build/Build Traffic Volumes

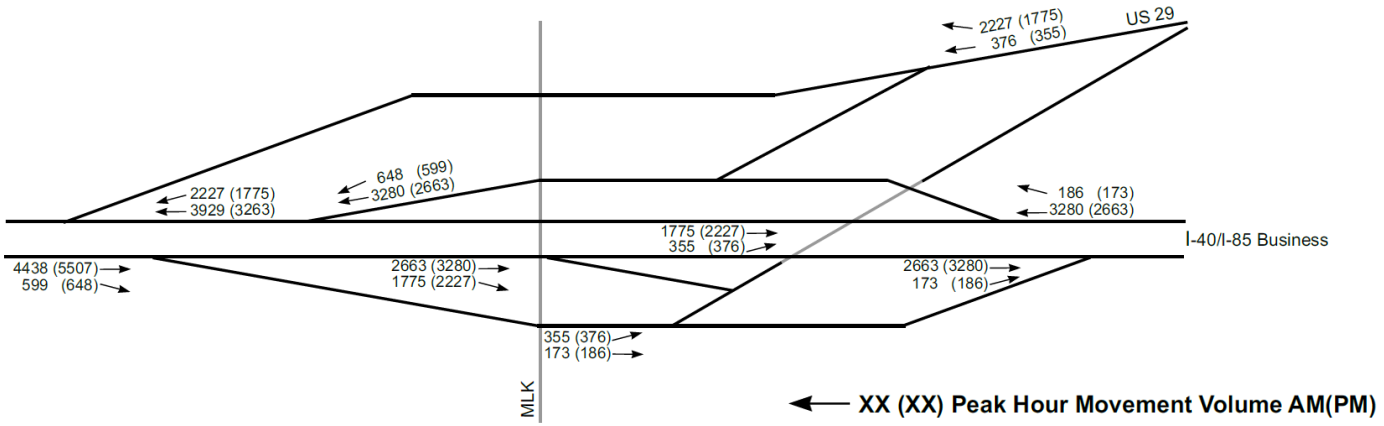
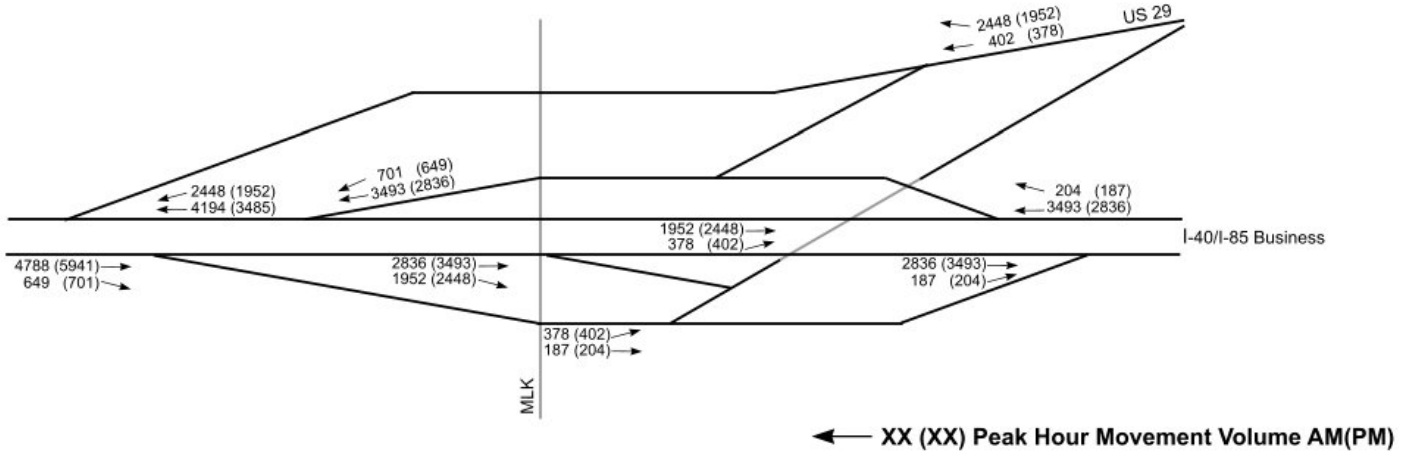


Figure 4: 2040 No-Build/Build Traffic Volumes



3.0 HCS ANALYSIS

Capacity and level of service (LOS) analyses were conducted for the I-40/I-85 Bus. at US 29-70-220 interchange according to HCM 6th Edition methodology which is utilized by the Highway Capacity Software 7th Edition (HCS7). Based on this, the merge / diverge points along I-40 / I-85 Bus. were analyzed as "Facilities" and the merge/diverge points not on the mainline were analyzed as "Ramps". The HCM Facilities method analyzes highway corridors that are composed of basic freeway segments, ramp segments and weaving segments. While the vehicular inputs are typically at 15-minute intervals, only peak hour volumes were used in this analysis. The LOS is conveyed in terms of density based on passenger cars per mile per lane (pc/mi/ln), where LOS A represents the lowest possible density and LOS F represents heavy congestion. Table 1 presents the criteria of each LOS for both Facilities and Ramp analyses. The v_d/c symbol represents the density to capacity ratio; where values above 1.0 indicate that the density exceeds the available capacity of the segment.

Table 1: Level of Service Criteria

Level of Service	Density (pc/mi/ln)	
	Urban Freeway Facilities	Freeway Merge/Diverge
A	< 11	< 10
B	>11 and < 18	>10 and < 20
C	>18 and < 26	>20 and < 28
D	>26 and < 35	>28 and < 35
E	>35 and < 45	>35
F	>45 or v_d/c >1.0	v_d/c >1.0

Analyses were performed for the 2017 existing, 2040 no-build and 2040 build scenarios using the 2017 volumes shown in Figure 2 and the 2040 volumes shown in Figure 4. The analysis showed that the 2040 traffic volumes result in over-saturated conditions for the I-40/I-85 Bus. mainline. Therefore, no-build and build analyses were performed for an intermittent year of 2025. 2025 was selected as it is the year during which straight-line interpolation yielded volumes that would allow the I-40/I-85 Bus. mainline to operate at capacity.

As the facilities methodology accounts for the interrelationships between segments, caution should be used when examining results when endpoints of the facility are over-saturated. This is true of the 2040 no-build and build analyses as the mainline I-40/I-85 Bus. section is over-saturated at the endpoints. Expanding both the study area and performing multi-period analysis beyond the over-saturation time and area for the 2040 no-build and build scenarios would provide suitable results.

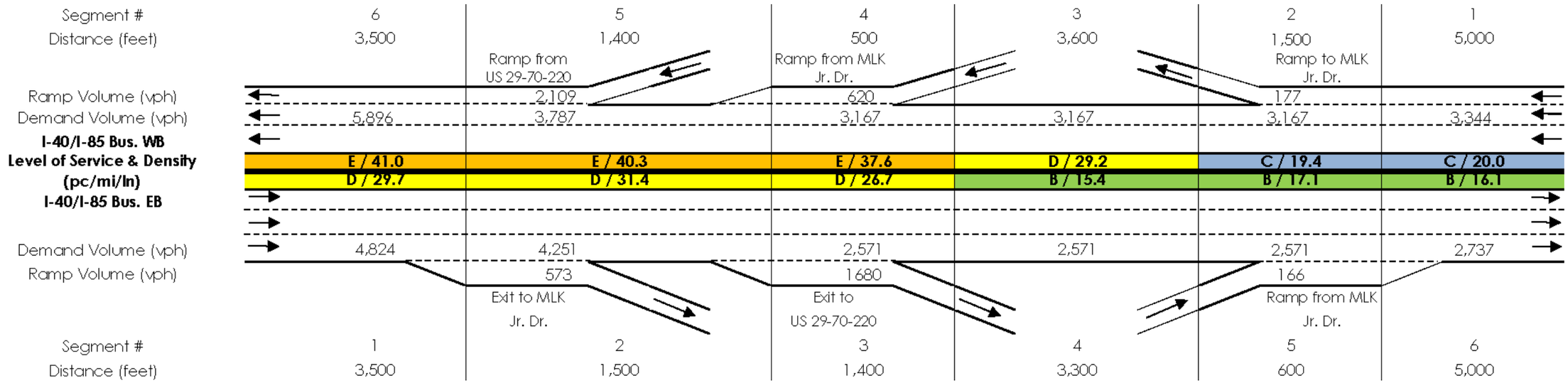
It should be noted that projects I-5964 and I-5965 propose to widen the I-40/I-85 Bus. corridor west of the U-5754 project limits and improve the SR 1007 (Randleman Road) and Elm-Eugene

Street interchanges, as well as replacing the Norfolk Southern railroad bridge. These projects seek to improve operations along I-40/I-85 Bus. and are not accounted for in the HCS analyses. Construction funding as shown in the STIP for each project is listed in Section 1.0. While U-5754 is scheduled to be constructed ahead of the mainline widening of I-40/I-85 Bus., all three projects are scheduled to begin before the intermittent year analysis shows the facility is over-saturated.

For the I-40/I-85 Bus. facilities analysis, the study area, from west of the Patton Avenue bridge to approximately the Willow Road bridge, was separated into 6 separate analysis segments in both the eastbound and westbound directions. The geometry, volumes analyzed, and the LOS/density results of the HCS analysis are shown in Figure 5 through Figure 14. It should be noted that the density and LOS reported for the facilities analysis corresponds to the freeway section. Results for the ramps analyzed using the facilities methodology can be found in the appendix.

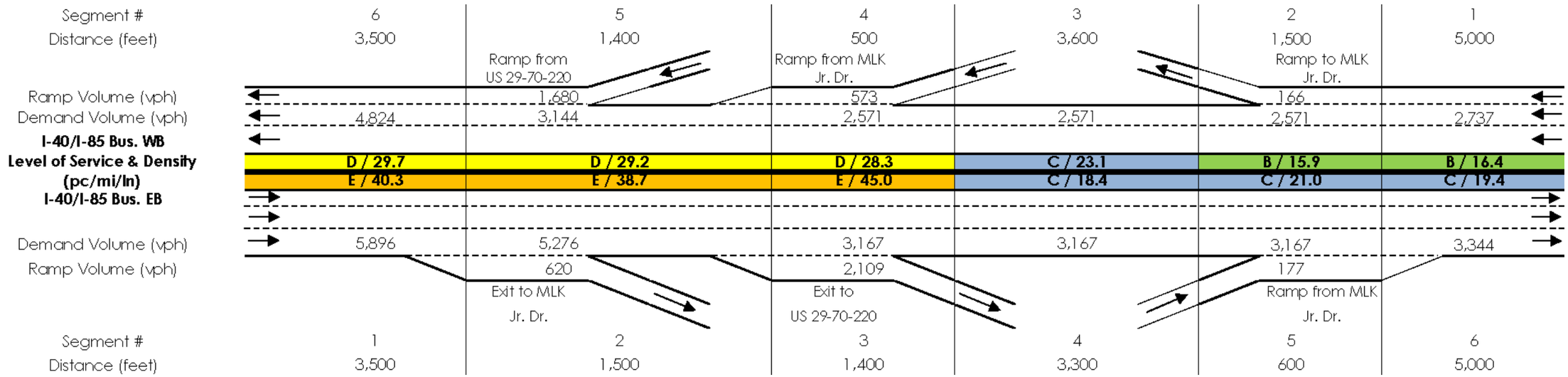
The merge/diverge areas within the interchange were isolated and analyzed independently as shown in Figure 15 through Figure 19. All HCS files can be found in Appendix B.

Figure 5: I-40/I-85 Bus. 2017 Existing AM HCS Analysis Results



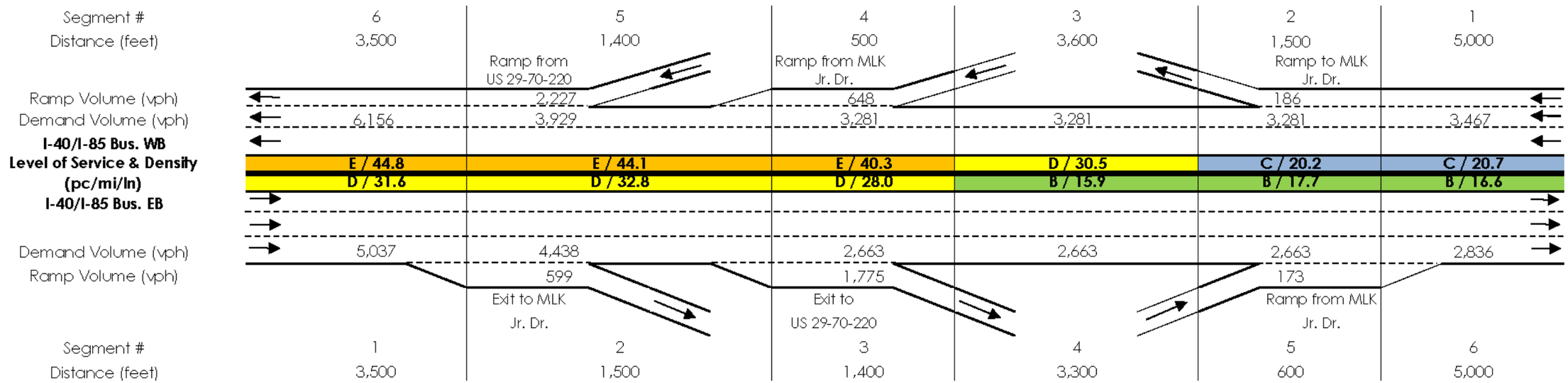
*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 6: I-40/I-85 Bus. 2017 Existing PM HCS Analysis Results



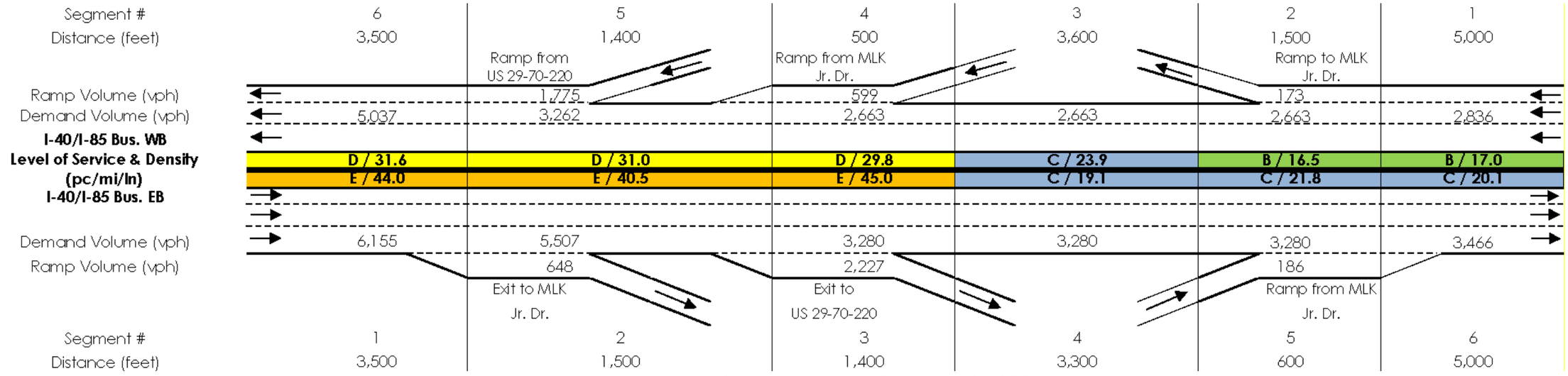
*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 7: I-40/I-85 Bus. 2025 No-Build AM HCS Analysis Results



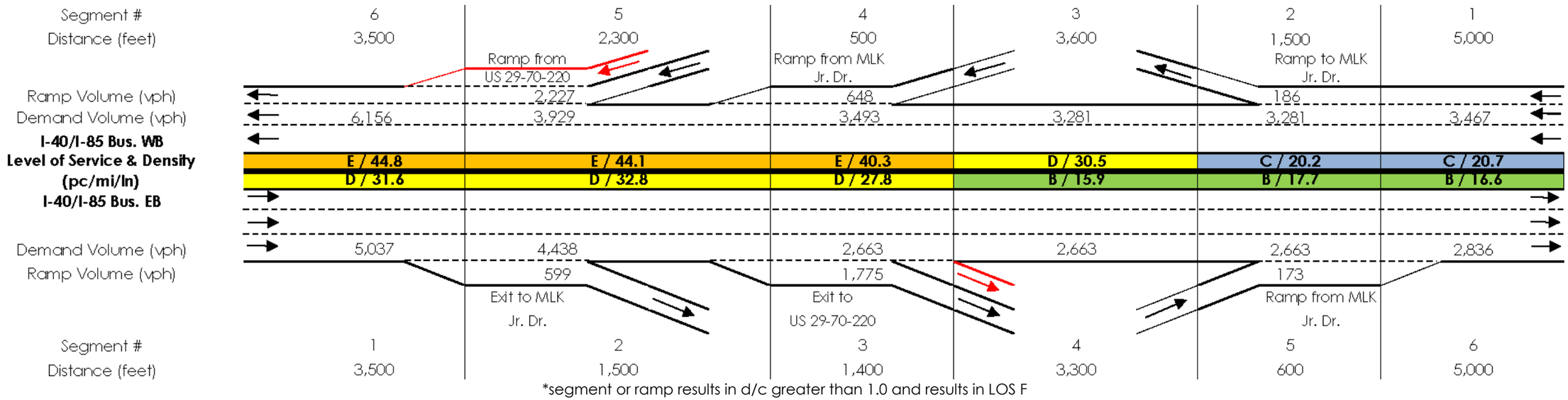
*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 8: I-40/I-85 Bus. 2025 No-Build PM HCS Analysis Results



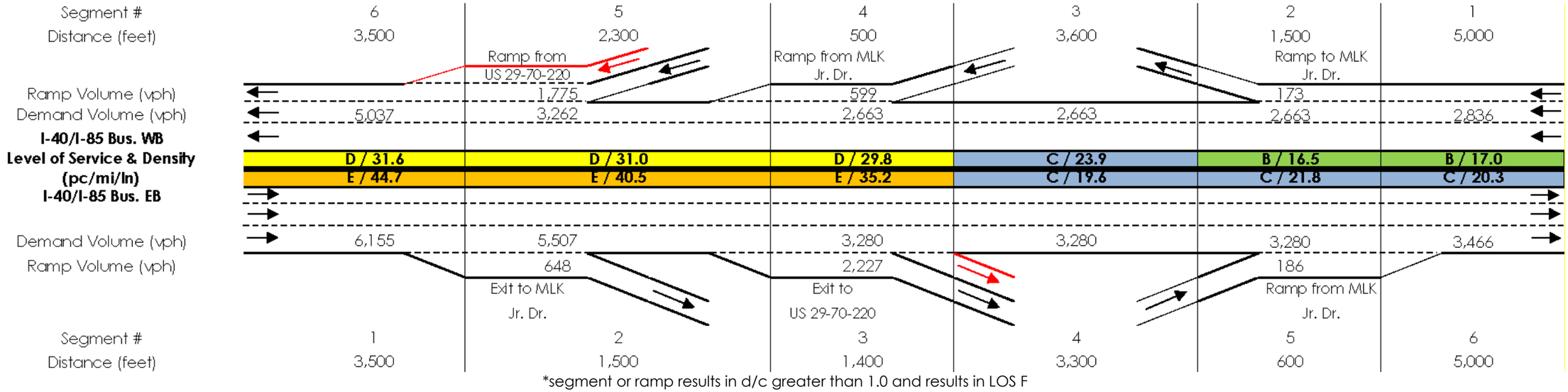
*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 9: I-40/I-85 Bus. 2025 Build AM HCS Analysis Results



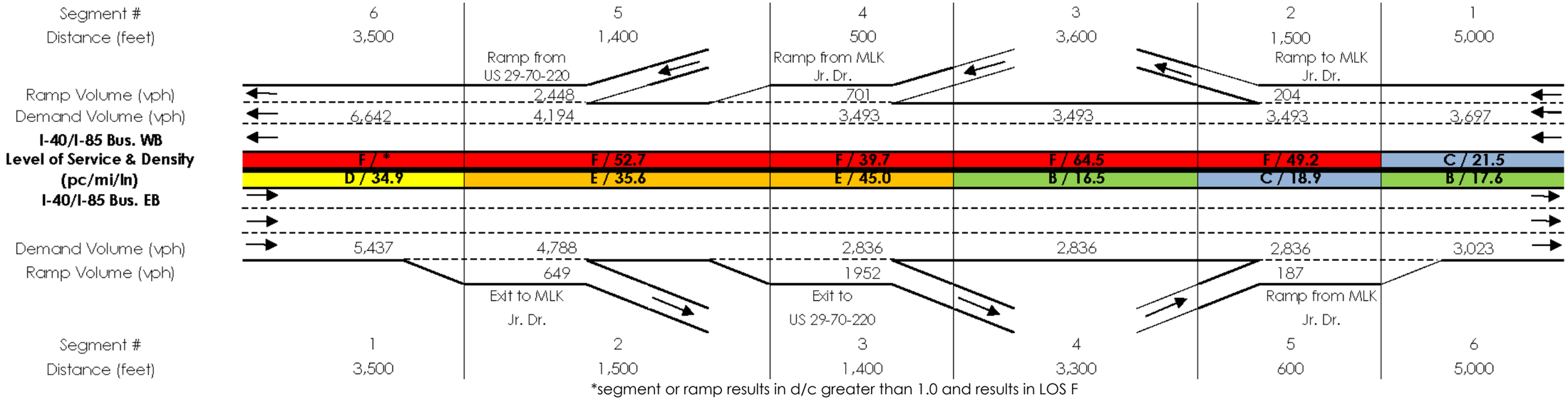
*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 10: I-40/I-85 Bus. 2025 Build PM HCS Analysis Results



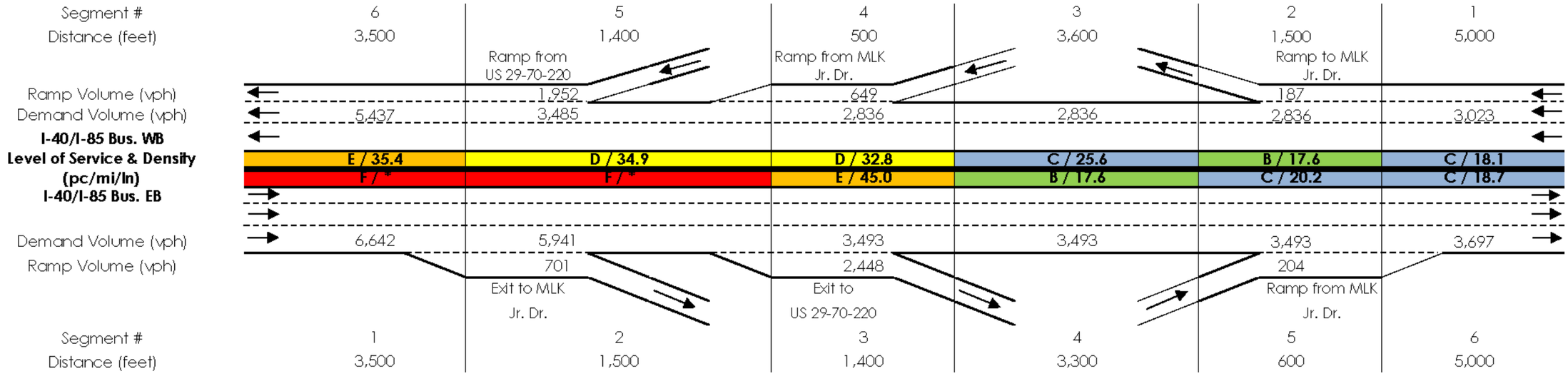
*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 11: I-40/I-85 Bus. 2040 No-Build AM HCS Analysis Results



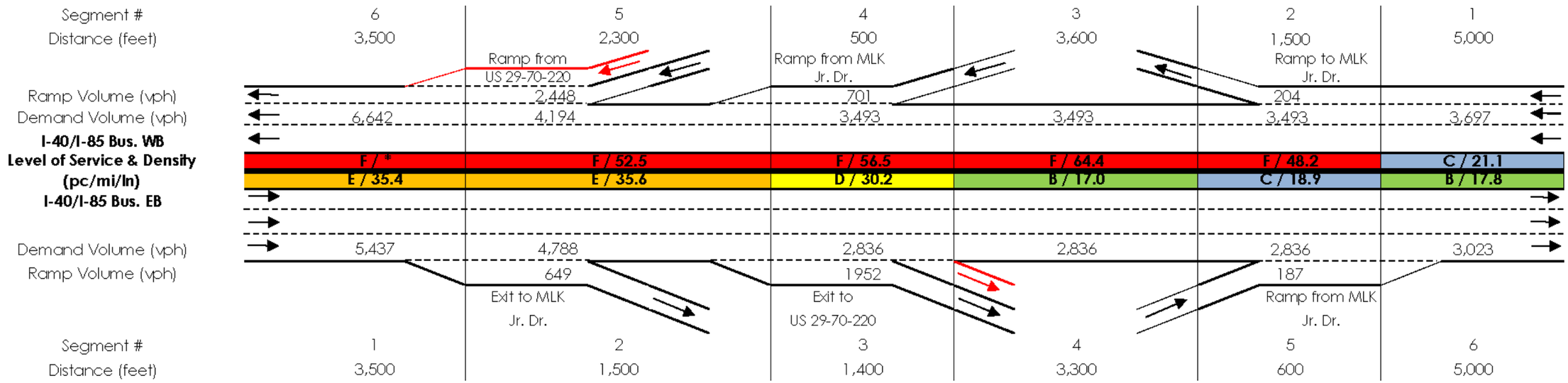
*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 12: I-40/I-85 Bus. 2040 No-Build PM HCS Analysis Results



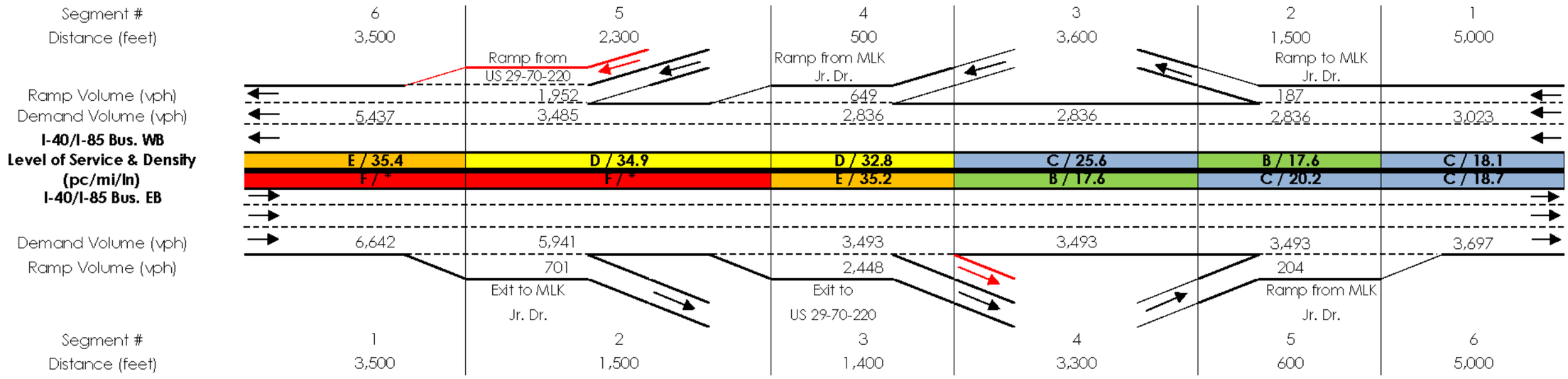
*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 13: I-40/I-85 Bus. 2040 Build AM HCS Analysis Results



*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 14: I-40/I-85 Bus. 2040 Build PM HCS Analysis Results



*segment or ramp results in d/c greater than 1.0 and results in LOS F

Figure 15: 2017 Existing HCS Ramp Analysis Results

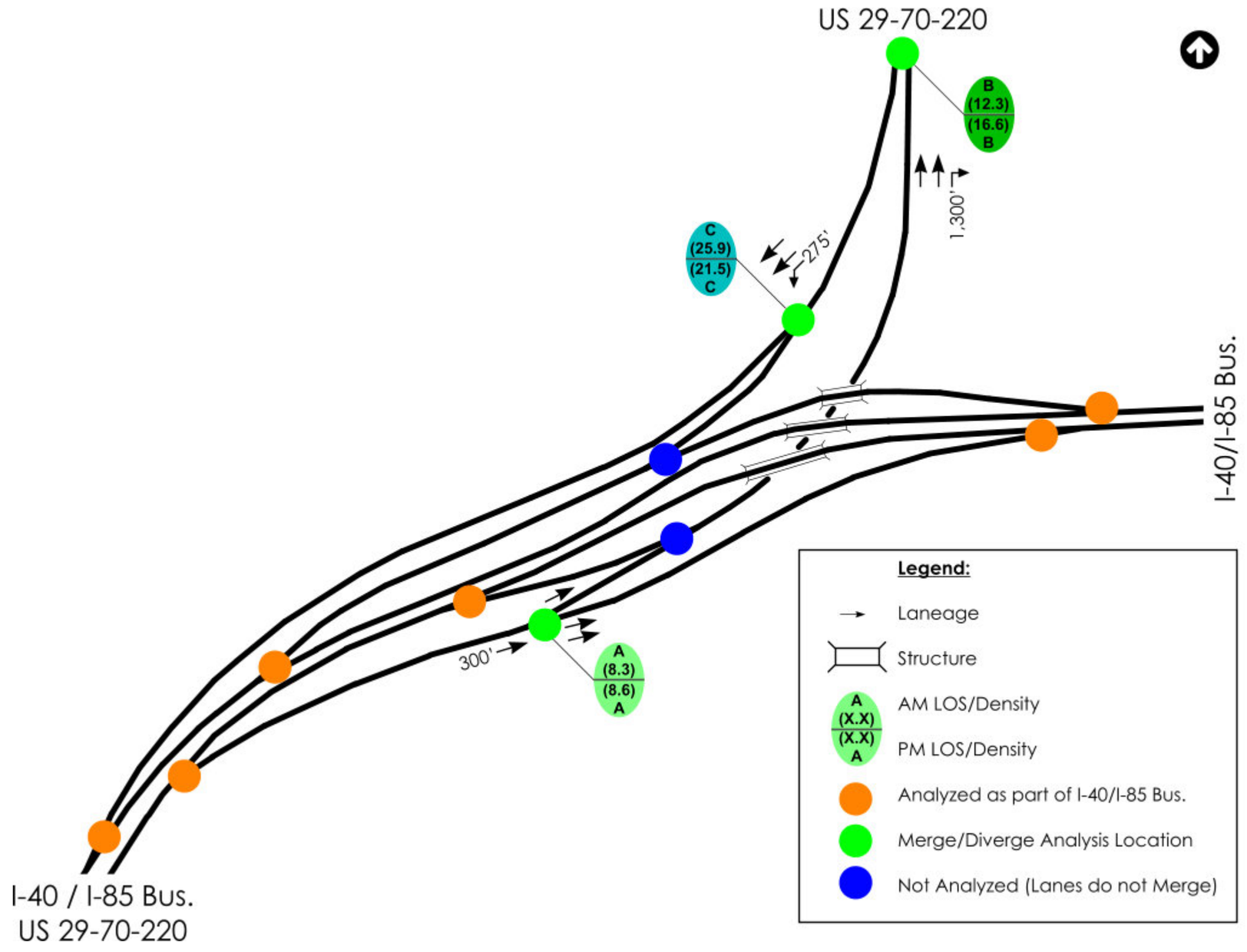


Figure 16: 2025 No-Build HCS Ramp Analysis Results

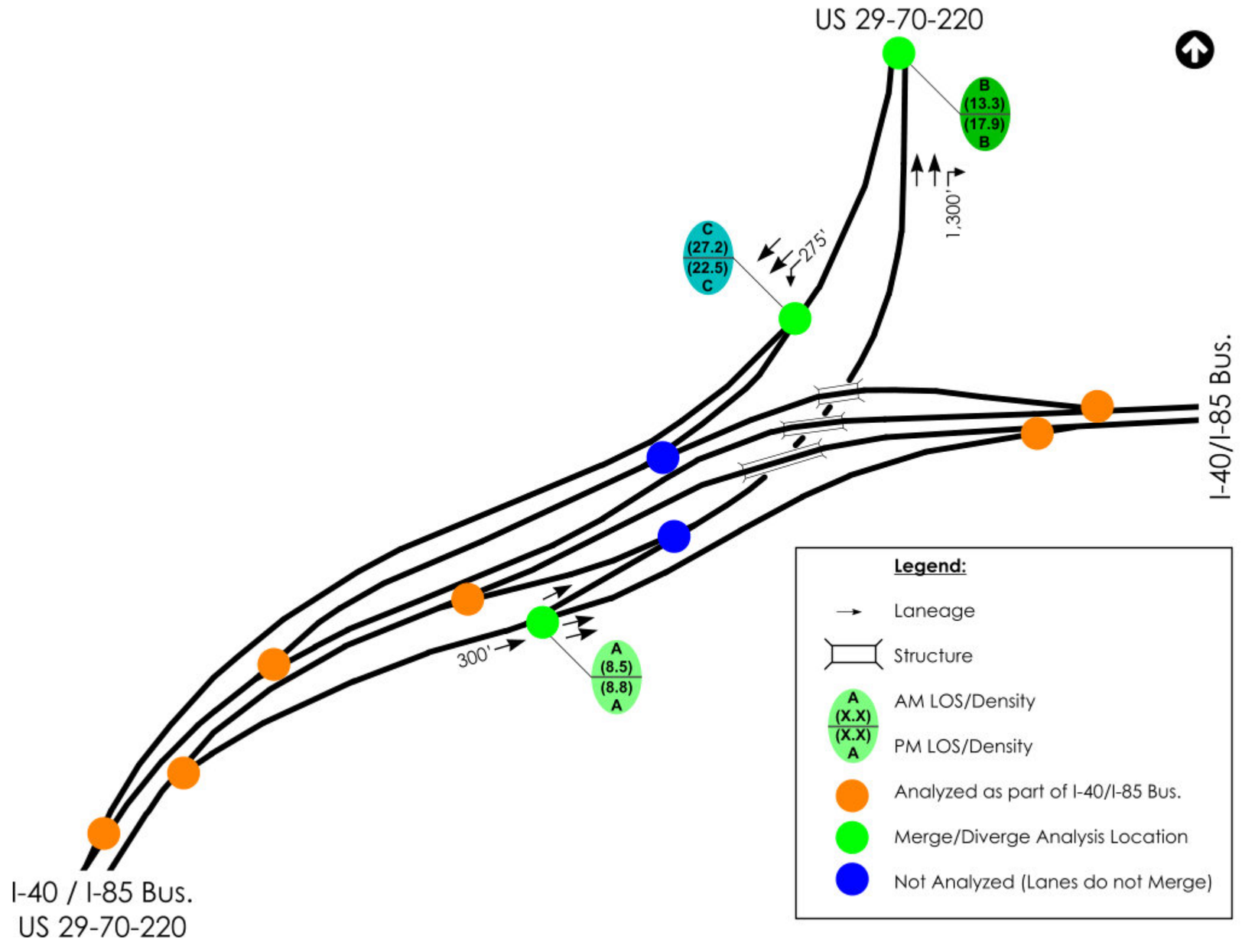


Figure 17: 2025 Build HCS Ramp Analysis Results

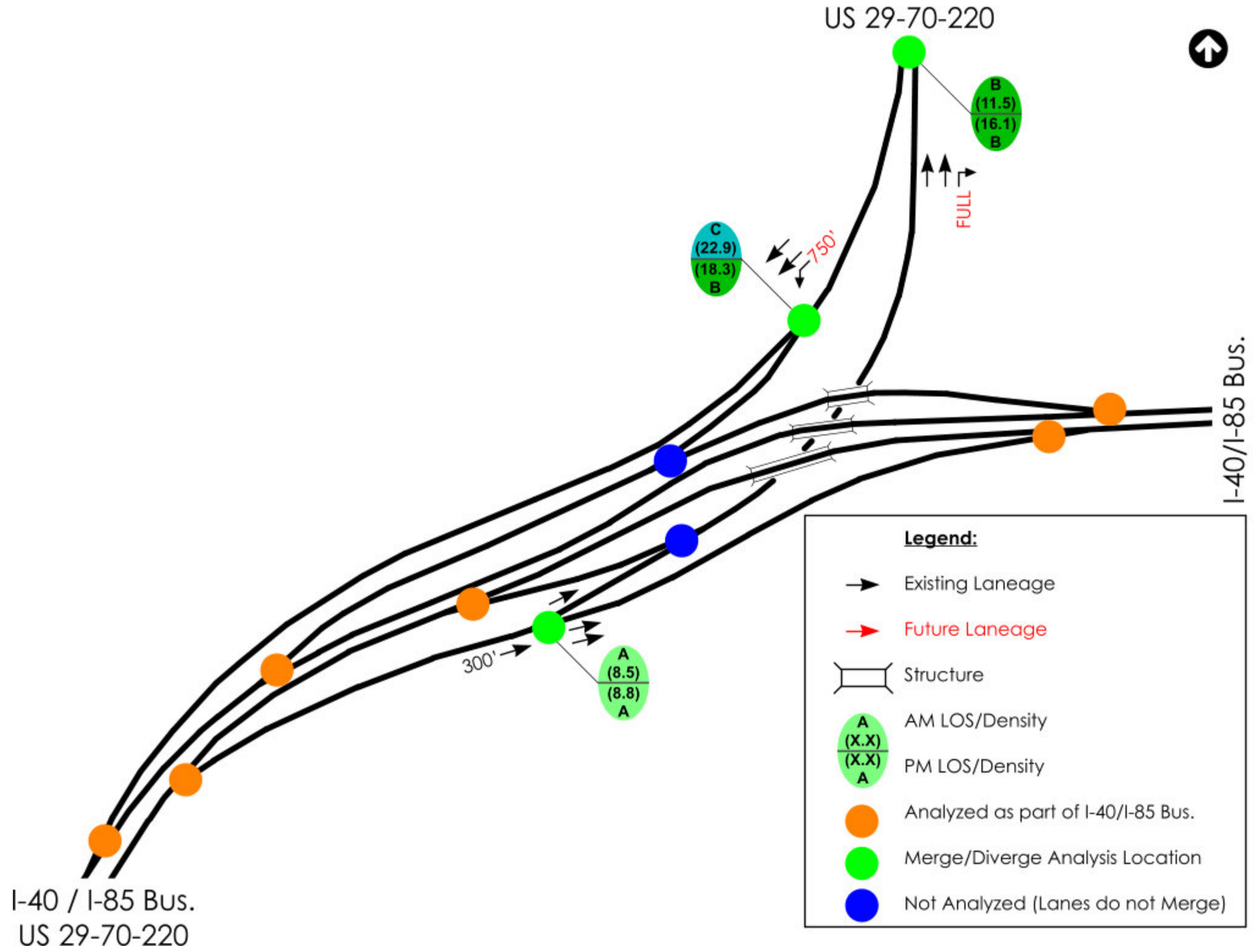


Figure 18: 2040 No-Build HCS Ramp Analysis Results

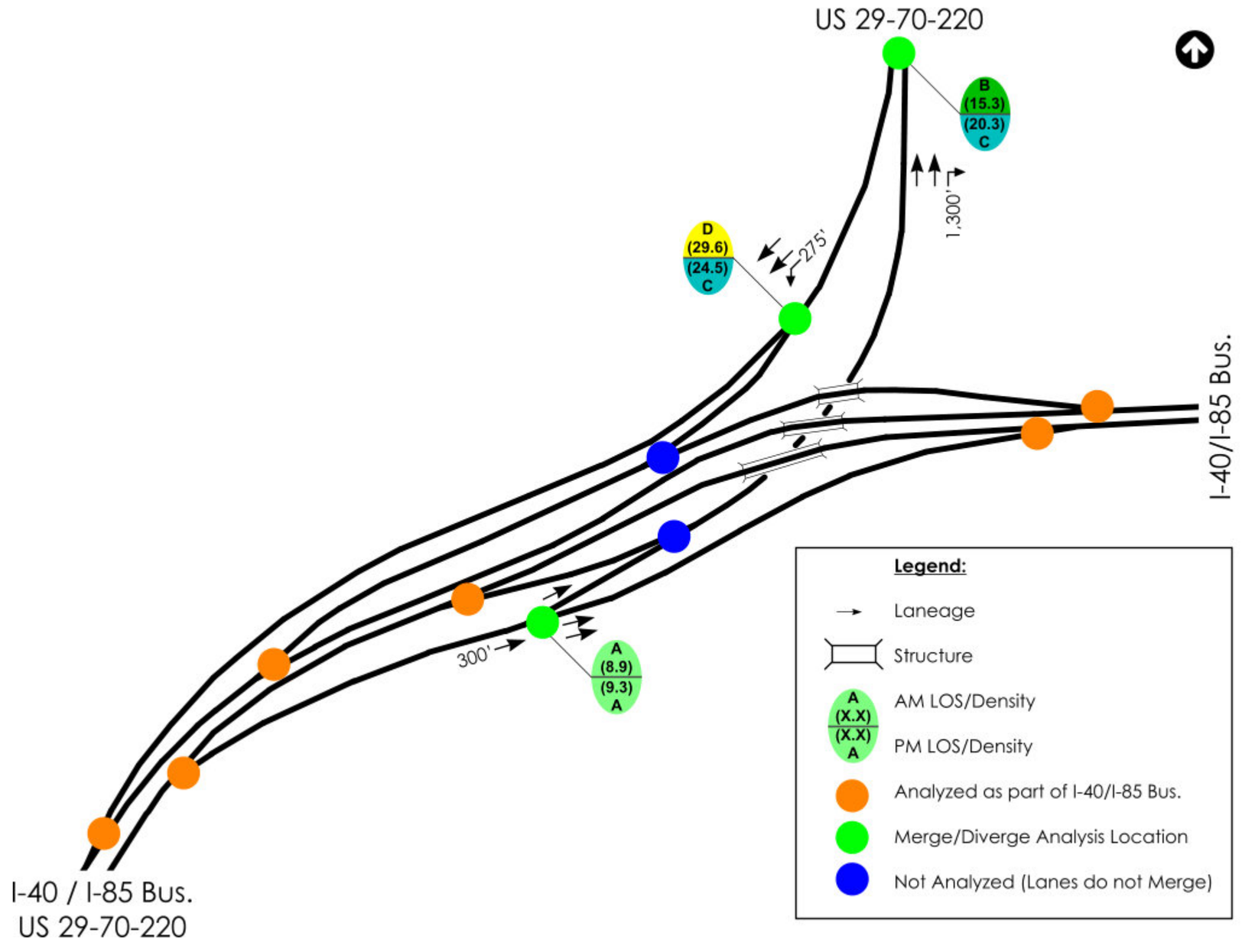
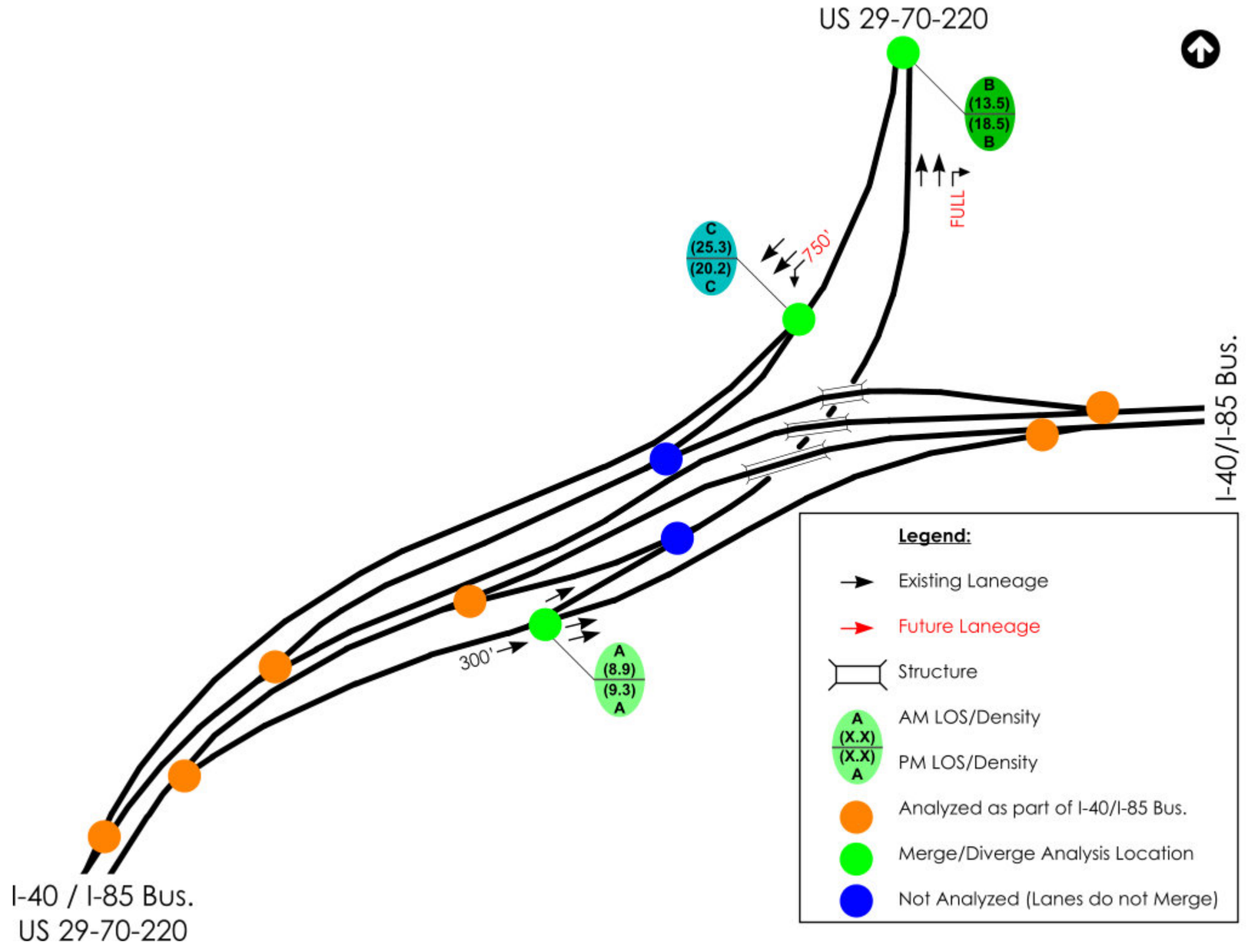


Figure 19: 2040 Build HCS Ramp Analysis Results



4.0 CONCLUSION

The results for the HCS analysis indicate that the 2017 mainline facility analysis of I-40/I-85 Bus. operate at varying LOS with the highest densities and poorest LOS (i.e. E) observed in the sections where the US 29-70-220 ramps merge or diverge from I-40/I-85 Bus. The same is true for the 2040 no-build analysis scenario; with multiple sections operating at LOS F along westbound I-40/I-85 Bus. in the AM peak hour. Linear interpolation of the forecasted volumes and sensitivity analyses found that the facility is anticipated to reach capacity in 2025.

High mainline traffic volumes on I-40/I-85 Bus. are creating the high densities shown in the facilities analyses. Therefore, the proposed modifications to the ramps will improve the operations, but are limited in their effectiveness to improve the facility's LOS. Limitations of the facility analysis with respect to the study area and time periods presented herein are presented in Section 3.0. As discussed, caution should be used when examining results when endpoints of the facility are over-saturated. Expanding both the study area and performing multi-period analysis beyond the over-saturation time and area for the 2040 no-build and build scenarios would provide suitable results.

Of note are the results of the no-build and build analyses of I-40/I-85 Bus. segment 4 in the 2040 AM peak hour. In this instance, the density along the mainline increases between the no-build and build scenarios. It can be postulated that the US 29-70-220 on-ramp in the no-build scenario is over-capacity and meters the flow onto the mainline. Improving the ramp removes this metering effect; which exacerbates the over-saturated conditions on the mainline and causes upstream densities to increase and speeds to decrease as a result.

For the isolated merge/diverge areas within the I-40/I-85 Bus. and US 29-70-220 interchange, the HCS results indicate that the ramp modifications improve operations with all areas analyzed anticipated to operate at LOS C or better in the 2040 build scenario.

Appendix A: Traffic Volume Development

Appendix B: HCS Files

APPENDIX B

PUBLIC INVOLVEMENT

North Carolina Department of Transportation

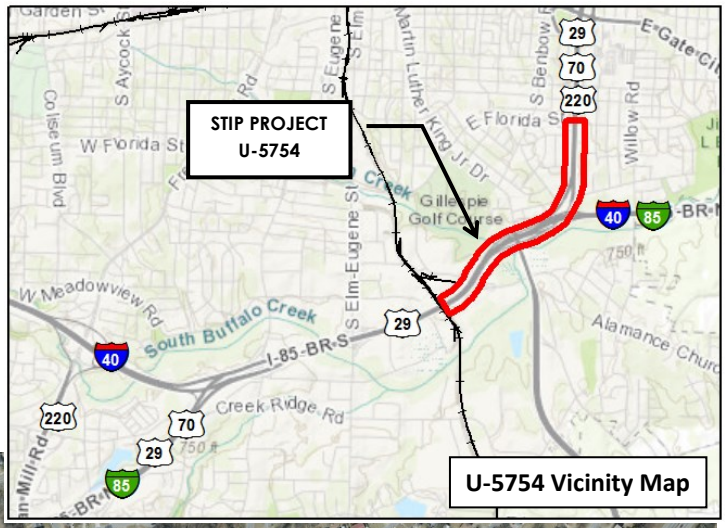
STIP Project No.: U-5754

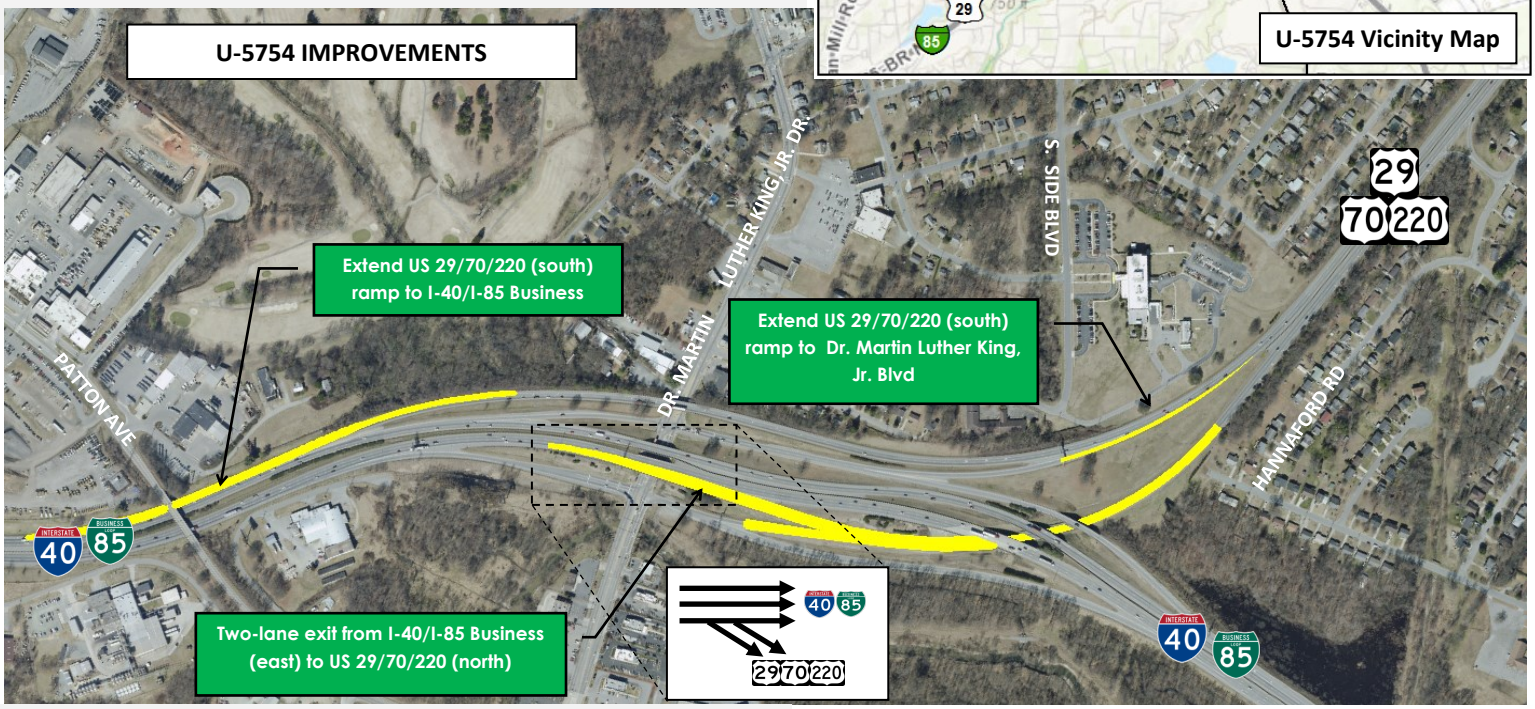
U.S. 29/70/220 Ramp Improvements at I-40/I-85 Business in Greensboro

PROJECT DESCRIPTION

The North Carolina Department of Transportation (NCDOT) proposes to improve traffic operations within the I-40/I-85 Business - US 29/70/220 interchange in east Greensboro. The project proposes the following improvements:

- Add a second lane to the exit ramp from I-40 / I-85 Business (east) to US 29/70/220 (north) to improve the flow of exiting traffic.
- Extend the outside lane on the US 29/70/220 (south) ramp onto I-40/I-85 Business (west) ramp by restriping, which will provide additional roadway for traffic to merge.
- Extend US 29/70/220 (south) to Dr. Martin Luther King, Jr. Blvd. ramp, to provide additional distance for exiting traffic to decelerate.





PROJECT PURPOSE

The purpose of the project is to improve traffic operations and safety within the I-40/I-85 Business—US 29/70/220 interchange area in eastern Greensboro.

PROJECT NEED

- Current traffic volumes within the interchange area result in traffic back-ups on I-40/I-85 Business and safety issues.
- Southbound traffic from US 29/70/220 in to I-40/I-85 Business (west), is forced to quickly merge into a one-lane ramp.
- In the eastbound direction, traffic headed to US 29/70/220 (north) from I-40/I-85 Business (east) is only allotted a one-lane exit. This distance is not adequate to accommodate existing and future traffic volumes using this interchange
- Traffic between US 29/70/220 (south) and Dr. Martin Luther, Jr. Blvd. backs up during rush hour, blocking access to one of the southbound lanes.

PROJECT SCHEDULE

Environmental Document.....September 2018

Construction.....July 2020

PROJECT CONTACTS

If you have questions or comments, please contact either of the following individuals:

Ryan L. White, P.E.
Consultant Project Manager
Stantec Consulting
801 Jones Franklin Road
Suite 300
Raleigh, NC 27606-3394
(919) 865-7374
Ryan.white@stantec.com

Karen Reynolds
NCDOT Project Manager
Project Management Unit
1548 Mail Service Center
Raleigh, NC 27699 –1548
(919) 707-6038
kreynolds@ncdot.gov

Karen Reynolds
RE: TIP Project U-5754
NCDOT Project Management Unit
1548 Mail Service Center
Raleigh, NC 27699-1548

APPENDIX C

CULTURAL RESOURCES CORRESPONDENCE

HISTORIC ARCHICTECTURE AND LANDSCAPES
SURVEY REQUIRED FORM

This form only pertains to Historic Architecture and Landscapes for this project. It is not valid for Archaeological Resources. You must consult separately with the Archaeology Group.

PROJECT INFORMATION

Project No:	U-5754	***County***:	Guilford
WBS No.:	54034.3.1	***Document Type:***	CE
Fed. Aid No:	NHP-0029(065)	***Funding***:	☐ State ☒ Federal
Federal Permit(s):	☐ Yes ☐ No	***Permit Type(s)***:	
Project Description: Provide a total of 3 lanes under I-40/I-85. Add Business Ramps to N&S Southern Railroad Bridge.			

SUMMARY OF HISTORIC ARCHICTECTURE AND LANDSCAPES REVIEW

Description of review activities, results, and conclusions:
On December 18, 2017 a search of NC HPOWEB GIS Service map reveals that the in the Area of Potential Effects for this project includes a property over 50 years of age that may be eligible for National Register listing. An architectural historian will need to conduct an eligibility evaluation to determine if the property meets the criteria.

SUPPORT DOCUMENTATION

☒Map(s) ☐Previous Survey Info. ☒Photos ☐Correspondence ☐Design Plans

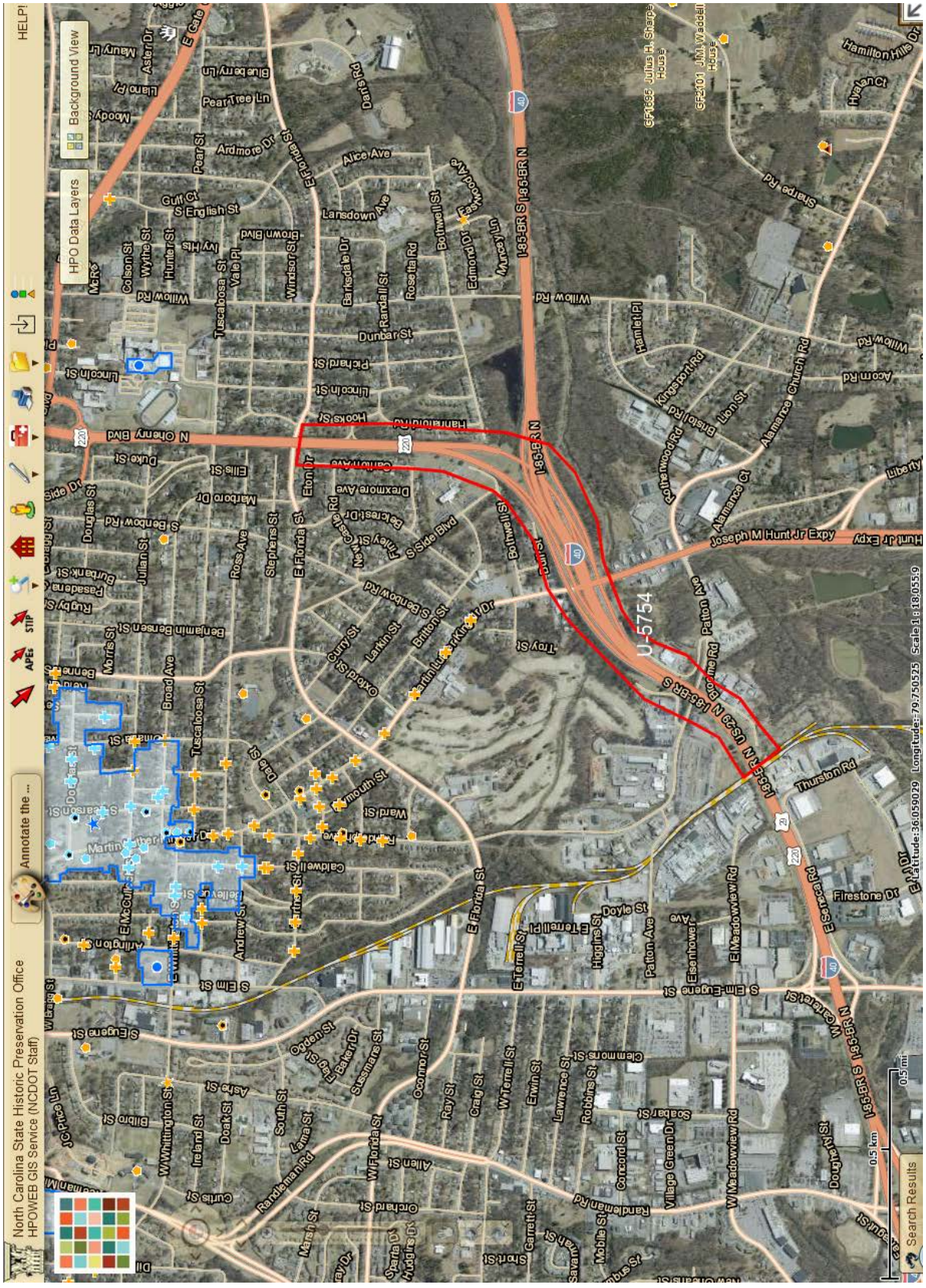
FINDING BY NCDOT ARCHITECTURAL HISTORIAN

Historic Architecture and Landscapes -- **SURVEY REQUIRED**

Shelby Reap **December 18, 2017**

NCDOT Architectural Historian Date

Anticipated Fieldwork Completion Date: June 18, 2018


HELP
Background View
HPO Data Layers
Annotate the ...
North Carolina State Historic Preservation Office
HPOWEB GIS Service (NCDOT Staff)
U-5754
I-85-BR S
I-85-BR N
Search Results

Project Tracking No.:

17-11-0019

NO ARCHAEOLOGICAL SURVEY REQUIRED FORM

This form only pertains to ARCHAEOLOGICAL RESOURCES for this project. It is not valid for Historic Architecture and Landscapes. You must consult separately with the Historic Architecture and Landscapes Group.

PROJECT INFORMATION

Project No:	**U-5754**	*County:*	**Guilford**
WBS No:	**54034.1.1**	*Document:*	**Federal CE**
F.A. No:	**NHP-0029(065)**	*Funding:*	☐ State ☒ Federal

Federal Permit Required? ☐ Yes ☒ No *Permit Type:* **N/A**

Project Description: NCDOT's Division 7 proposes to reconstruct and restripe the I-40/I-85 Business (East) to US 29-70-220 (North) ramps in order to provide a total of three lanes under I-40/I-85 Business. Division 7 also proposes to reconstruct and restripe the US 29-70-220 (South) to I-40/I-85 Business (West) ramps in order to provide an additional southbound lane to the Norfolk Southern Railway bridge, just west of the Patten Avenue overpass. Since Final Plans have not been developed yet, the Study Area for the project will be centered on US 29-70-220 and measure about 600 feet wide (i.e. 300 feet from centerline) and about 1.5 miles (7,920 feet) long. Overall, the Study Area will encompass about 105.5 acres, inclusive of all existing roadways and any development.

SUMMARY OF CULTURAL RESOURCES REVIEW

Brief description of review activities, results of review, and conclusions:

This project was accepted on Tuesday, November 21, 2017. A map review and site file search was conducted at the Office of State Archaeology (OSA) on Tuesday, November 21, 2017. An archaeological survey has never been conducted at this particular location; however, one (1) archaeological site has been recorded within one-half (1/2) mile of the project area. Digital copies of HPO's maps (Greensboro Quadrangle) as well as the HPOWEB GIS Service (http://gis.ncdcr.gov/hpoweb/) were last reviewed on Wednesday, November 22, 2017. There are no known historic architectural resources located within or adjacent to the Study Area for which intact archaeological deposits would be anticipated within the footprint of the proposed project. In addition, topographic maps, historic maps (NCMaps website), USDA soil survey maps, and aerial photographs were utilized and inspected to gauge environmental factors that may have contributed to historic or prehistoric settlement within the project limits, and to assess the level of modern, slope, agricultural, hydrological, and other erosive-type disturbances within and surrounding the Study Area.

Brief Explanation of why the available information provides a reliable basis for reasonably predicting that there are no unidentified historic properties in the APE:

This is a Federally-funded project for which a Federal permit will not be required. Permanent/temporary drainage and/or utility easements will be necessary; however, additional ROW should not be required. The size and shape of the Study Area have been drawn in a way to capture any possible impacts beyond the NCDOT's existing 240-foot ROW along the highway system. At this time, we are in compliance with NC GS 121-12a, since there are no eligible (i.e. National Register-listed) archaeological resources located within the project's Study Area that would require our attention. Based on the description of the proposed project, activities may take place beyond the NCDOT's existing ROW along the US 29-70-220 corridor,

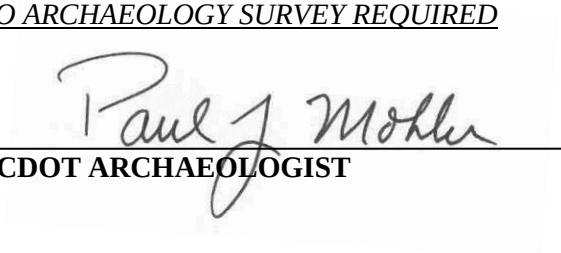
most likely within any area of a proposed easement. From an environmental perspective, the Study Area falls within a rather urban, industrial, and residential setting in the City of Greensboro within the Piedmont physiographic region of North Carolina and consists primarily of two (2) soil types: Urban land (Ur) and Enon-Urban land complex, 2-10% slopes (EuB). Such soil types consist of areas where the original soil has been cut, filled, graded, paved, or otherwise changed to the extent that most soil properties have been so altered that the soil series is not recognized. The preservation of intact archaeological resources would not be anticipated under such environmental conditions. The Office of State Archaeology (OSA) has reviewed several projects within the vicinity of the Study Area for environmental compliance, including a hazardous waste site (ER 99-7465), a cell tower (CT 01-0612), and a Brownfield property (ER 12-0941). OSA also reviewed the replacement of Bridge No. 291 and Bridge No. 349 on I-40/I-85 Business over US 29/70/220 (NCDOT TIP# B-5119), both of which fall within the Study Area for the currently proposed project. Stating a low probability for intact and significant archaeological sites to be present based on the disturbed contexts, OSA did not require an archaeological survey for any of these projects. Within five (5) miles of the Study Area, NCDOT's Archaeology Group has reviewed sixteen (16) transportation-related projects for environmental compliance under the Programmatic Agreement (PA) with the State Historic Preservation Office (NC-HPO), three of which are located within one (1) mile of the proposed project. An archaeological survey was recommended for only one (1) of these projects (PA 16-01-0126 [TIP# B-5717]), based on the presence of a previously recorded archaeological site. No archaeological sites were recorded as a result of that survey. Based on the nature of the proposed project, current soil conditions, and the heavily disturbed nature of the Study Area, it is believed that the current Study Area, as depicted, is unlikely to contain intact and significant archaeological resources. No archaeological survey is required for this project. If design plans change or are made available prior to construction, then additional consultation regarding archaeology will be required. At this time, no further archaeological work is recommended. If archaeological materials are uncovered during project activities, then such resources will be dealt with according to the procedures set forth for "unanticipated discoveries," to include notification of NCDOT's Archaeology Group.

SUPPORT DOCUMENTATION

See attached: ☒ Map(s) ☒ Previous Survey Info ☐ Photos ☐ Correspondence
☐ Photocopy of County Survey Notes Other:

FINDING BY NCDOT ARCHAEOLOGIST

NO ARCHAEOLOGY SURVEY REQUIRED



November 22, 2017

NCDOT ARCHAEOLOGIST **Date**

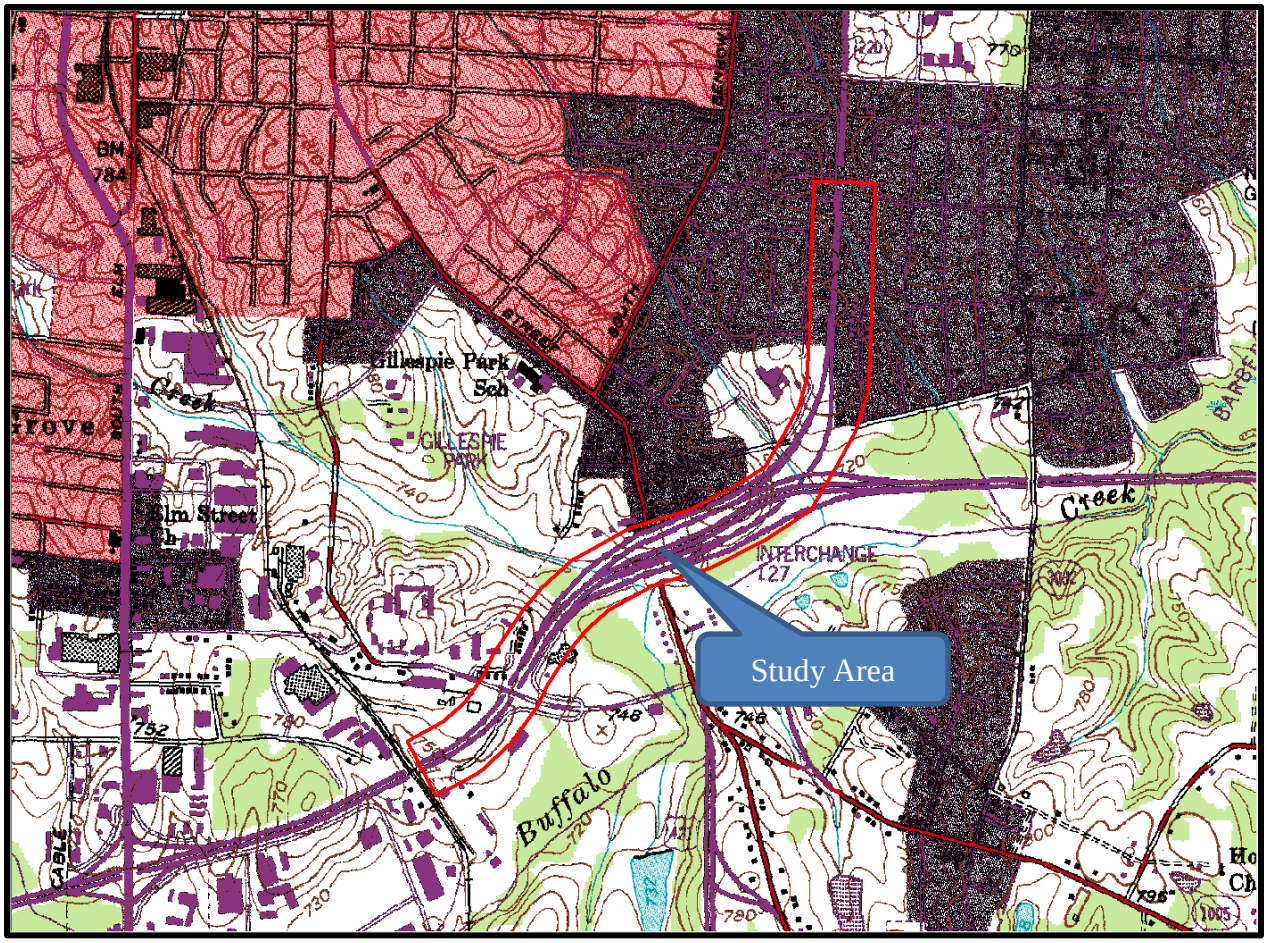
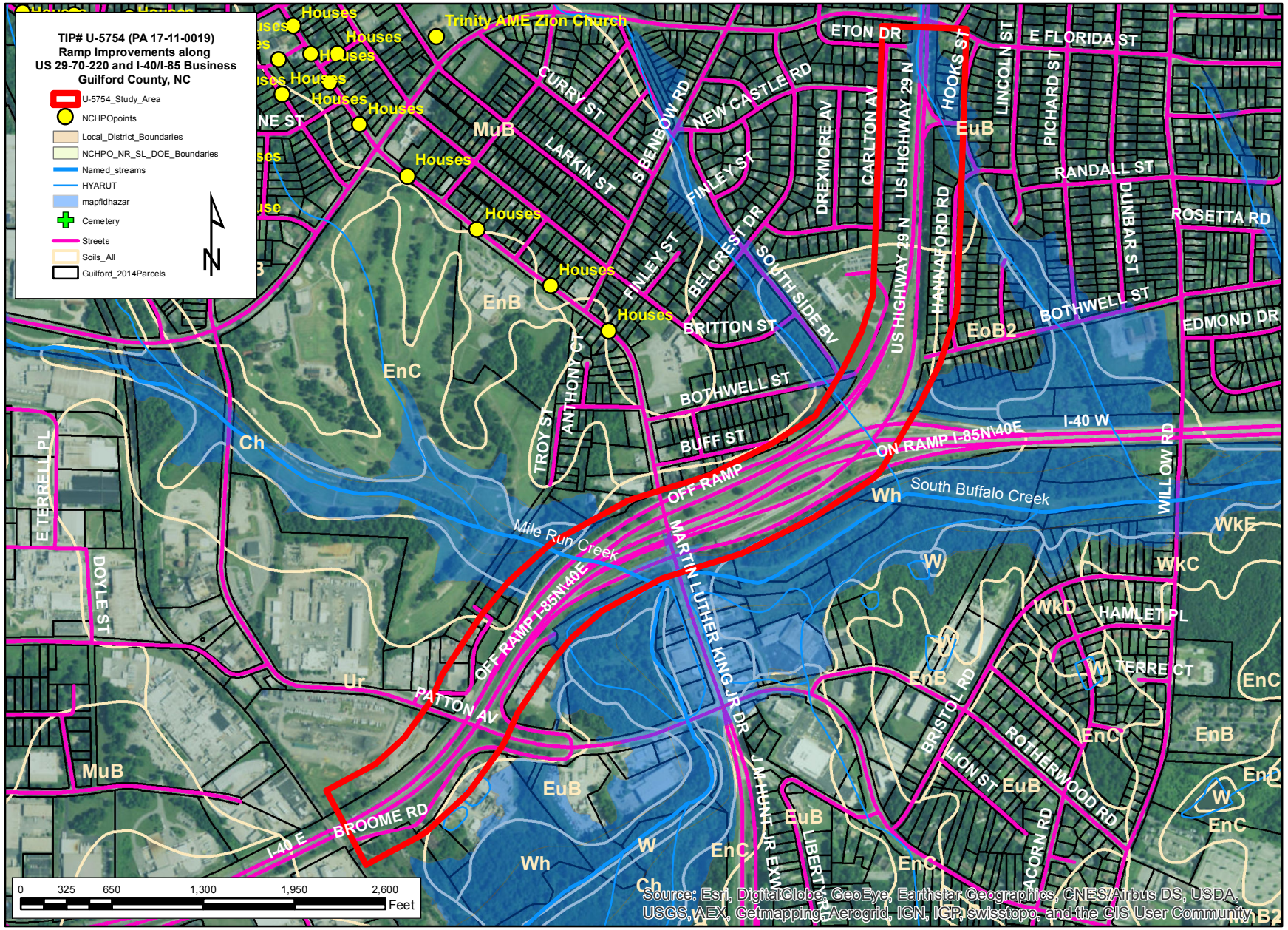


Figure 1: Greensboro, NC (USGS 1951 [PR68]).


TIP# U-5754 (PA 17-11-0019)
Ramp Improvements along
US 29-70-220 and I-40/I-85 Business
Guilford County, NC
U-5754_Study_Area
NCHPOpoints
Local_District_Boundaries
NCHPO_NR_SL_DOE_Boundaries
Named_streams
HYARUT
mapfldhazar
Cemetery
Streets
Soils_All
Guilford_2014Parcels
N
Houses
Trinity AME Zion Church
ETON DR
E FLORIDA ST
CURRY ST
S BENBOW RD
NEW CASTLE RD
LARKIN ST
FINLEY ST
DREXMORE AV
CARLTON AV
US HIGHWAY 29 N
HOOKS ST
LINCOLN ST
PICHARD ST
RANDALL ST
DUNBAR ST
ROSETTA RD
HANNAFORD RD
BELCREST DR
SOUTHSIDE BV
BOTHWELL ST
EDMOND DR
BRITTON ST
US HIGHWAY 29 N
ANTHONY CT
TROY ST
BUFF ST
ON RAMP I-85N\40E
I-40 W
WILLOW RD
OFF RAMP
South Buffalo Creek
Mile Run Creek
OFF RAMP I-85N\40E
MARTIN LUTHER KING JR DR
ETERRELL PL
DOYLE ST
PATTON AV
BRISTOL RD
HAMLET PL
TERRE CT
ROTHERWOOD RD
LION ST
ACORN RD
BROOME RD
I-40 E
JIM HUNT JR EXWY
LIBERTY
EnB
EnC
EuB
EoB2
MuB
Ch
Wh
W
Ur
WkC
WkD
WkE
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Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

HISTORIC ARCHICTECTURE AND LANDSCAPES
EFFECTS ASSESSMENT REQUIRED FORM

This form only pertains to Historic Architecture and Landscapes for this project. It is not valid for Archaeological Resources. You must consult separately with the Archaeology Group.

PROJECT INFORMATION

Project No:	U-5754	***County***:	Guilford
WBS No.:	50434.3.1	***Document Type:***	State EA/FONSI
Fed. Aid No:	NHP-0029(065)	***Funding***:	☐ State ☒ Federal
Federal Permit(s):	☐ Yes ☐ No	***Permit Type(s)***:	

Project Description:
Provide a total of 3 lanes under I-40/I-85. Add Business Ramps to N&S Southern Railroad Bridge.

SUMMARY OF HISTORIC ARCHICTECTURE AND LANDSCAPES REVIEW

Description of review activities, results, and conclusions:
On December 18, 2017 a search of NC HPOWEB GIS Service map reveals that the in the Area of Potential Effects for this project includes a property over 50 years of age that may be eligible for National Register listing. Architectural Historians conducted an eligibility evaluation and recommended one property meets the criteria for National Register eligibility: L. Richard Memorial Hospital II (GF6065). In a letter dated July 30, 2018, the agreed with our recommendations.

An Assessment of Effects will be required for this property.

SUPPORT DOCUMENTATION

☒Map(s) ☐Previous Survey Info. ☐Photos ☒Correspondence ☐Design Plans

FINDING BY NCDOT ARCHITECTURAL HISTORIAN

Historic Architecture and Landscapes -- **EFFECTS ASSESSMENT REQUIRED**

Shelby Reap **July 30, 2018**

NCDOT Architectural Historian Date

Project Tracking No. (Internal Use)

17-11-0019

HISTORIC ARCHICTECTURE AND LANDSCAPES ASSESSMENT OF EFFECTS FORM

This form only pertains to Historic Architecture and Landscapes for this project. It is not valid for Archaeological Resources. You must consult separately with the Archaeology Group.

PROJECT INFORMATION

Project No:	U-5754	***County***:	Guilford
WBS No.:	50434.3.1	***Document Type:***	CE
Fed. Aid No:	NHP-0029(065)	***Funding***:	☐ State ☒ Federal
Federal Permit(s):	☐ Yes ☒ No	***Permit Type(s)***:	
Project Description: Provide a total of 3 lanes under I-40/I-85 and add business ramps to N&S Southern Railroad bridge.			

SUMMARY OF HISTORIC ARCHICTECTURE AND LANDSCAPES REVIEW

Description of review activities, results, and conclusions:
On December 18, 2017 a review of NC HPOWEB GIS online map revealed that this project is in the in the vicinity of the L. Richard Memorial Hospital (GF6065), which was determined eligible in July 2018. An effects meeting conducted on November 27, 2018 resulting in the following findings.

ASSESSMENT OF EFFECTS

Property Name:	L. Richard Memorial Hospital	***Status***:	DE
Survey Site No.:	GF6065	***PIN***:	

Effects
☐ No Effect ☒ No Adverse Effect ☐ Adverse Effect

Effects Determination
Stays within ROW adjacent to hospital

List of Environmental Commitments:

SUPPORT DOCUMENTATION

☒Map(s) ☐Previous Survey Info. ☒Photos ☐Correspondence ☒Design Plans

FINDING BY NCDOT AND STATE HISTORIC PRESERVATION OFFICE

Historic Architecture and Landscapes – ASSESSMENT OF EFFECTS

Shelby Reap — Nov 27, 2018

NCDOT Architectural Historian — Date

Renee Gledhill-Earley — 11.27.18

State Historic Preservation Office Representative — Date

[signature] — 11-29-18

Representative, Federal Agency — Date


L. RICHARDSON MEMORIAL HOSPITAL
MARTIN LUTHER KING, JR. DR
S. SIDE BLVD
HANNAFORD RD
BOTHWELL ST
BOTHWELL ST
EXTEND SOUTHBOUND RAM TO MARTIN LUTHER KING, JR., DR
EXTEND SOUTHBOUND RAMP LANE
ADD THIRD NORTHBOUND LANE
South Buffalo Creek
MARTIN LUTHER KING, JR. DR
29
220
70
40
85
LEGEND
Historic Boundary
Prop Roadway Improvements
Study Area
Tax Parcel
0 200 400 Feet
1:4,800 (At Original document size of 11x17)
Project Location: Greensboro NC Guilford County, NC
Client/Project
US 29-70-220
I-40/ I-85 BUSINESS TO SOUTH OF FLORIDA STREET
STIP PROJECT # U-5754
Figure No.
MAP