Traffic Forecast

STIP No. B – 5803

Mecklenburg County, North Carolina

Prepared For:
North Carolina Department of Transportation

Prepared By:
AECOM Technical Services of North Carolina, Inc.

September 2016

Project Level Traffic Forecast Report

TIP PROJECT B-5803

SR 1138 (W Arrowood Rd) Bridge No. 001
over Sugar Creek in Charlotte

Mecklenburg County

WBS # 45757.1.1

September 2016
Prepared By: AECOM

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M E M O R A N D U M

September 2016

TO: Brian Wert, PE
Transportation Planning Branch (TPB)

FROM: Ivo Dernev, PE
AECOM, Technical Services of North Carolina, Inc.

SUBJECT: TIP Project No. B-5803
Replace Bridge No. 001 (northbound direction) over Sugar Creek
Division 10, Mecklenburg County

Please find attached the 2016/2040 Traffic Forecast for the above mentioned project. This forecast was reviewed and approved by NCDOT on 09/13/2016.

Project B-5803 is defined as the replacement of Bridge No. 001 (northbound direction) on SR 1138 (W Arrowood Rd) over Sugar Creek in Charlotte. B-5803 is scheduled for construction in the year 2022 in the 2016-2025 NCDOT STIP. This project lies within the Charlotte Regional Transportation Planning Organization (CRTPO) area. The segment of SR 1138 (W Arrowood Rd), subject to this forecast analysis, is part of the Metrolina Regional Travel Demand Model (MRM) adopted in October 2015.

Included in the traffic forecast is the analysis for two scenarios, the 2016 Base Year and 2040 Future Year scenario:

- 2016 Base Year No-Build Scenario (Existing Conditions)
- 2040 Future Year Build Scenario

Certain assumptions were made in the development of the forecast:

Fiscal Constraint: The project is located within the boundaries of a MPO; therefore the travel demand model and traffic forecasts are fiscally-constrained to match the assumptions of the CRTPO 2040 Metropolitan Transportation Plan (MTP).

STIP Projects I-5718A (Widen I-77 from I-485 (Exit 1) to Woodlawn Rd (Exit 6) to ten lanes) and U-5766 (Widen NC 160 to multi-lanes from SC line to SR 1116 (Shopton Rd)) are scheduled for construction in future years 2025 and 2023. The projects are expected to affect travel demand on SR 1138 (W Arrowood Rd) within the project forecast area. The projects were included in the Future 2040 Year travel demand model run.

If it is determined that any of these assumptions have become inconsistent with the project and surrounding area, please request updated traffic projections at this location.

B-5803 Traffic Forecast

Development Activity: Based upon information provided by interviewees, there are currently no specific plans for development that would significantly affect traffic within the project area.

Travel Demand Model: The MRM 15 Version 1.0 (adopted on October 1st, 2015) was used as a tool in the development of the forecast.

Forecast Methodology: The 2016 traffic volumes and design factors were developed based upon current project counts and historic AADT trend projections.

Model outputs were relied on in the calculation of the 2040 Future Year Build traffic volumes. Engineering judgment adjustments were applied as needed in finalizing the volumes in order to develop a balanced forecast.

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 projections at this location.

If you have any questions or if I can be of further assistance, please do not hesitate to call me at (919) 239-7203, or e-mail me at ivo.dernev@aecom.com.

cc: FILE (Mecklenburg, TIP Project B-5803)

cc: (*via e-mail as PDF attachments)*
Earlene Thomas, PE, Transportation Planning Branch
James Dunlop, PE, Congestion Management Section
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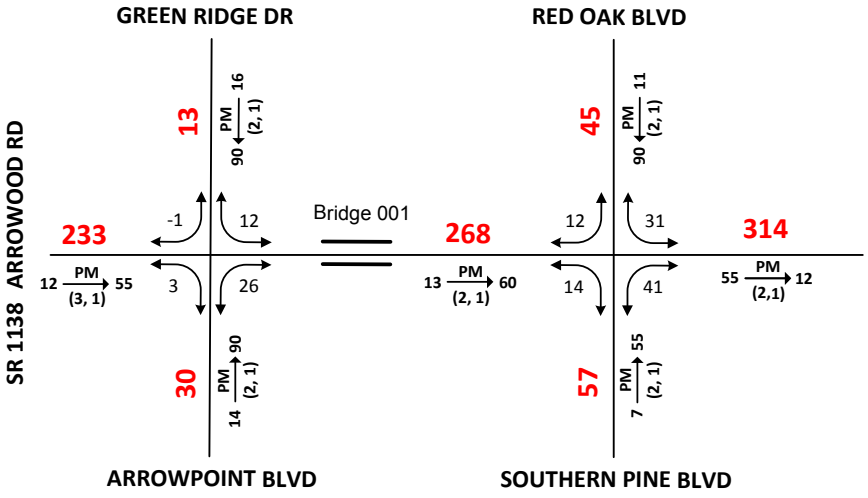
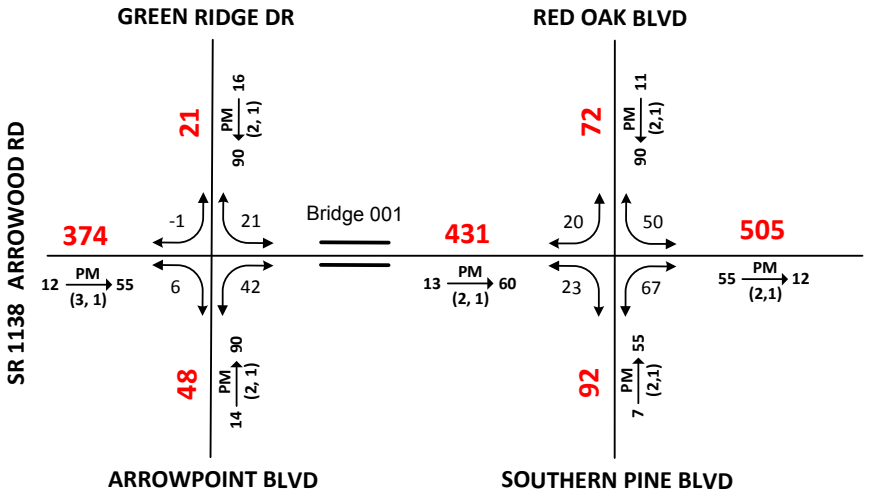
Clark Morrison, PE, Pavement Management Unit
Louis Mitchell, PE, NCDOT Division 10 Engineer
Stuart Basham, Planning Engineer, NCDOT Division 10
Robert W. Cook, AICP, Regional Planner, Charlotte Regional TPO



2016 No-Build



2040 Build

2016/2040 AVERAGE ANNUAL DAILY TRAFFIC

LEGEND

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

TIP: B-5803	**WBS:** 45743.1.1
COUNTY: Mecklenburg	**DIVISION:** 10
DATE: September 2016	
PREPARED BY: AECOM	
LOCATION: SR 1138 (Arrowood Rd)	
PROJECT: Replace Bridge 001 over Sugar Creek	

Traffic Forecast Report

1. Project Background

Project Request Information

This forecast was requested by the Project Development and Environmental Analysis Branch of NCDOT in January 2016.

STIP Project B-5803 is described as the replacement of bridge no. 001 (northbound direction) over Sugar Creek on SR 1138 (W Arrowood Rd) in Mecklenburg County. Construction is scheduled for year 2022 in the NCDOT STIP document, adopted August 2016.

Area Information

The project is located in southwestern Mecklenburg County in the City of Charlotte. Land use in the project vicinity is urban with a mix of commercial and residential development.

Route Information

SR 1138 (W Arrowood Rd) is a four-lane divided boulevard, which serves as a connector between the Charlotte Beltline I-485 and I-77. It collects and distributes traffic from an area in southwest Charlotte enclosed between the two interstates. It is classified as Minor Arterial in the Federal Highway Classification System.

Routes	Federal Functional Classification	Roadway Characteristics	
		Current	Future / Proposed
SR 1138 (W Arrowood Rd)	Minor Arterial	4-lanes	4-lanes

2. Sources of Information and Data

Historic AADT

Two AADT count stations located along SR 1138 (W Arrowood Rd) in the project vicinity were used in the preparation of the 2016 forecast. Historic AADT data for a 10-year period was collected and analyzed. Even-year AADTs are shown in **Table 1**.

Table 1: Historic AADT

Location	NCDOT Historic Traffic Count Data						
	2004	2006	2008	2009	2010	2012	2014
SR 1138 (W Arrowood Rd) east of Altacrest Pl	21,000	22,000	23,000	-	20,000	21,000	24,000
SR 1138 (W Arrowood Rd) west of I-77	-	-	-	26,000	-	27,000	29,000

Table 1 (continued): Historic AADT

Location	Historic data projected to 2016[1]	Annual Growth Rate[2]
SR 1138 (W Arrowood Rd) east of Altacrest Pl	22,700	0.6%
SR 1138 (W Arrowood Rd) west of I-77	29,800	2.2%

[1] *Extrapolation of the 10-year (2004–2014) linear regression line*

[2] *Based on linear regression for the years 2004–2014*

Field Data Collection

Turning movement counts for this project were taken by a Transportation Mobility & Safety Division contractor. See **Table 2**.

Table 2: Project Traffic Counts

Location	Type of Count	Date	Count Number	Contractor
SR 1138 (W Arrowood Rd) and Green Ridge Rd/Arrowpoint Blvd	13-hour Turning Movement Counts	3/22/16	13755311	SEPI
SR 1138 (W Arrowood Rd) and Red Oak Blvd/Southern Pine Blvd	13-hour Turning Movement Counts	3/22/16	13755310	SEPI

AECOM reviewed the turning movement counts taken for this project and converted them to 24-hour (daily) traffic estimates by applying Partial Weekday Count Expansion Factors. Seasonal Adjustment Factors were then used to provide AADT. **Table 3** shows the processed counts.

Table 3: Conversion of Project Counts to AADT

Location	Daily Estimate	Seasonal Adjustment*	AADT	AADT Rounded
SR 1138 (W Arrowood Rd) west of Green Ridge Rd/Arrowpoint Blvd	25,071	0.93	23,316	23,300
SR 1138 (W Arrowood Rd) east of Green Ridge Rd/Arrowpoint Blvd	28,779	0.93	26,765	26,800
Green Ridge Rd north of SR 1138 (W Arrowood Rd)	1,426	0.93	1,326	1,300
Arrowpoint Blvd south of SR 1138 (W Arrowood Rd)	3,215	0.93	2,990	3,000
SR 1138 (W Arrowood Rd) west of Red Oak Blvd/Southern Pine Blvd	28,964	0.93	26,937	26,900
SR 1138 (W Arrowood Rd) east of Red Oak Blvd/Southern Pine Blvd	33,813	0.93	31,447	31,400
Red Oak Blvd north of SR 1138 (W Arrowood Rd)	4,886	0.93	4,545	4,500
Southern Pine Blvd south of SR 1138 (W Arrowood Rd)	6,093	0.93	5,667	5,700

** Seasonal adjustment factors from ATR Group 4 for Tuesday in March.*

Field Investigation

Aerial view images of the area were reviewed:
https://www.google.com/maps/place/35%C2%B008'21.8%22N+80%C2%B054'39.6%22W/@35.1393841,-80.9125576,17z/data=!3m1!4b1!4m5!3m4!1s0x0:0x0!8m2!3d35.139381!4d-80.91101

Transportation Plans

A Comprehensive Transportation Plan (CTP) for the Charlotte Regional Transportation Planning Organization (CRTPO) is currently under development. The CRTPO 2040 Metropolitan Transportation Plan (MTP) adopted in April 2016 was reviewed and two projects within the plan were found to have possible effect on traffic on SR 1138 (W Arrowood Rd) after their implementation.

The two projects were I-5507 (Adding express lanes on I-485 from I-77 south of Charlotte to US 74 (Independence Blvd)) and While I-5507 was listed under projects having horizon year 2025, project R-4902 is already under construction.

County Population Estimates

Mecklenburg County population estimates were obtained from the State Demographics Branch of the Office of Budget and Management, accessed on July 2013. Results are shown in **Table 4**.

Table 4: County Population Data

County Population					Annual Growth Rate (AGR)*		
2000	2010	2020	2030	2035	2000-2010	2010-2020	2020-2030
695,427	923,417	1,142,325	1,361,732	1,471,436	2.9%	2.2%	1.8%

* *Based on Compound Annual Growth Rate (CAGR)*

Other Sources

NCDOT and local planning staff were consulted regarding new and planned development within the forecast area. Persons contacted for information were:

- Louis Mitchell, PE, NCDOT Division 10 Engineer
- Stuart Basham, Planning Engineer, NCDOT Division 10
- Linda Dosse, PE, NCDOT Transportation Planning Branch
- Robert W. Cook, AICP, Regional Planner, Charlotte Regional TPO
- Curtis Bridges, City of Charlotte Planning Department

No information pertaining to future plans for development in the area was provided.

3. Base Year (2016) Estimate

Assumptions

No known new development in the immediate vicinity of the project that affects the base year estimate has recently been permitted, is under construction or is currently considered. Replacement of the bridge is not expected to have an effect on current travel; therefore 2016 volumes represent both the project's Base Year No-Build and Build conditions (i.e., travel demand is assumed to be the same).

Methodology

Base Year AADT was determined by comparison of conducted project traffic counts with historical count trends. See **Table 5**. The estimated 2016 Base Year volume represents traffic traveling in both directions of SR 1138 (W Arrowood Rd). Half of this volume should be used to determine traffic on a single bridge serving one direction of the roadway.

Table 5: 2016 AADT Calculations

Location	Historic data projected to 2016 (from Table 1)	Project Specific Count Data (from Table 3)	2016 Forecast Estimate
SR 1138 (W Arrowood Rd) west of Green Ridge Rd/Arrowpoint Blvd	22,700	23,300	23,300
SR 1138 (W Arrowood Rd) east of Green Ridge Rd/Arrowpoint Blvd	-	26,800	26,800
Green Ridge Rd north of SR 1138 (W Arrowood Rd)	-	1,300	1,300
Arrowpoint Blvd south of SR 1138 (W Arrowood Rd)	-	3,000	3,000
SR 1138 (W Arrowood Rd) west of Red Oak Blvd/Southern Pine Blvd	-	26,900	26,800
SR 1138 (W Arrowood Rd) east of Red Oak Blvd/Southern Pine Blvd	29,800	31,400	31,400
Red Oak Blvd north of SR 1138 (W Arrowood Rd)	-	4,500	4,500

Southern Pine Blvd south of SR 1138 (W Arrowood Rd)	**-**	**5,700**	**5,700**

Design Factors

Duals, TTSTs, Directional distribution (D), and Peak Hour Factor (K) were determined by analysis of turning movement / class counts obtained for this project. See Section 2, Field Data Collection.

Where truck factors were less than the minimum values used by NCDOT Transportation Planning Branch (TPB), a minimum of 2 (two) percent Duals and 1 (one) percent TTSTs was used. Design Factors are shown in **Table 6** and **Table 7**.

Table 6: Design Factors (D, K)

Location	D – Directional Distribution		K – Peak Hour Factor	
	Project Count Data	Selected 2016 Value	Project Count Data	Selected 2016 Value
SR 1138 (W Arrowood Rd) west of Green Ridge Rd/Arrowpoint Blvd	**52%**	**55%**	**12%**	**12%**
SR 1138 (W Arrowood Rd) east of Green Ridge Rd/Arrowpoint Blvd	**57%**	**60%**	**13%**	**12%**
Green Ridge Rd north of SR 1138 (W Arrowood Rd)	**97%**	**90%**	**16%**	**16%**
Arrowpoint Blvd south of SR 1138 (W Arrowood Rd)	**95%**	**90%**	**14%**	**14%**
SR 1138 (W Arrowood Rd) west of Red Oak Blvd/Southern Pine Blvd	**57%**	**60%**	**13%**	**13%**
SR 1138 (W Arrowood Rd) east of Red Oak Blvd/Southern Pine Blvd	**64%**	**65%**	**11%**	**12%**
Red Oak Blvd north of SR 1138 (W Arrowood Rd)	**89%**	**90%**	**11%**	**11%**
Southern Pine Blvd south of SR 1138 (W Arrowood Rd)	**53%**	**55%**	**3%**	**7%**

Table 7: Design Factors (Trucks)

Location	Dual / TTST	
	Project Count Data	Selected 2016 Value
SR 1138 (W Arrowood Rd) west of Green Ridge Rd/Arrowpoint Blvd	**3/0**	**3/1**
SR 1138 (W Arrowood Rd) east of Green Ridge Rd/Arrowpoint Blvd	**2/0**	**2/1**
Green Ridge Rd north of SR 1138 (W Arrowood Rd)	**1/1**	**2/1**
Arrowpoint Blvd south of SR 1138 (W Arrowood Rd)	**1/0**	**2/1**
SR 1138 (W Arrowood Rd) west of Red Oak Blvd/Southern Pine Blvd	**2/0**	**2/1**
SR 1138 (W Arrowood Rd) east of Red Oak Blvd/Southern Pine Blvd	**2/0**	**2/1**
Red Oak Blvd north of SR 1138 (W Arrowood Rd)	**2/0**	**2/1**
Southern Pine Blvd south of SR 1138 (W Arrowood Rd)	**2/1**	**2/1**

4. Travel Demand Model Data

SR 1138 (W Arrowood Rd) is part of the Metrolina Regional Model (MRM) roadway network. The model runs were developed with a Base Year 2010 and horizon Future Year 2040. Two model runs were used during preparation of this forecast and the results are shown in **Table 8**:

- Interim 2015 Loaded Network
- 2040 Loaded Network

Table 8: Model Output Data

Location	2015 Interim Year	2040 Future Year	AGR*
SR 1138 (W Arrowood Rd) west of Green Ridge Rd/Arrowpoint Blvd	**17,731**	**31,574**	**2.3%**
SR 1138 (W Arrowood Rd) west of Southern Pine Blvd/Red Oak Blvd	**37,562**	**55,322**	**1.6%**
SR 1138 (W Arrowood Rd) east of Red Oak Blvd/Southern Pine Blvd	**43,842**	**62,987**	**1.5%**

* *Based on Compound Annual Growth Rate (CAGR)*

5. Future Year Build (2040) Forecast

The 2040 forecast provides a traffic estimate that is 18 years beyond the tentative construction date (2022) for the project.

Assumptions

Replacement of the bridge is not expected to have an effect on future travel patterns in the general project vicinity; therefore 2040 volumes represent both the project's Future Year No-Build and Build conditions (i.e., travel demand is assumed to be the same).

Fiscal Constraint

STIP Projects I-5718A (Widen I-77 from I-485 (Exit 1) to Woodlawn Rd (Exit 6) to ten lanes) and U-5766 (Widen NC 160 to multi-lanes from SC line to SR 1116 (Shopton Rd)) are scheduled for construction in future years 2025 and 2023 respectively. The projects are expected to affect travel demand on SR 1138 (W Arrowood Rd) within the project forecast area. The projects were included in the Future 2040 Year travel demand model run.

Two additional projects from the CRTPO MTP were found to have possible effect on future travel demand within the project vicinity. The two projects were I-5507 (Adding express lanes on I-485 from I-77 south of Charlotte to US 74 (Independence Blvd)). While I-5507 was listed under projects having horizon year 2025, project R-4902 is already under construction.

All projects were included in the Future Year 2040 MRM run used to estimate 2040 AADT volumes.

Methodology

Historic AADTs indicate an increase in traffic between 0.6% and 2.2% along SR 1138 (W Arrowood Rd) in the project vicinity. According to the model runs, the traffic will continue to grow at a rate from 1.5% to 2.3% by the year 2040. This is further validated by the projected county population growth rates for the next decades. Based on this information it was decided that a positive growth rate of 2.0% will be used to estimate 2040 AADT. Summary of the results is shown in **Table 9**. The estimated 2040 Future Year volume represents traffic traveling in both directions of SR 1138 (W Arrowood Rd). Half of this volume should be used to determine traffic on a single bridge serving one direction of the roadway.

Table 9: Growth Rate Comparison and Determination of 2040 AADT

Location	2016 Forecast AADT	Historic Annual Growth Rate (from Table 1)	Model Growth Rate (from Table 8)	Applied Rate*	2040 Forecast AADT
SR 1138 (W Arrowood Rd) west of Green Ridge Rd/Arrowpoint Blvd	23,300	0.6%	2.3%	2.0%	37,400
SR 1138 (W Arrowood Rd) east of Green Ridge Rd/Arrowpoint Blvd	26,800	-	1.6%	2.0%	43,100
Green Ridge Rd north of SR 1138 (W Arrowood Rd)	1,300	-	-	2.0%	2,100
Arrowpoint Blvd south of SR 1138 (W Arrowood Rd)	3,000	-	-	2.0%	4,800
SR 1138 (W Arrowood Rd) west of Red Oak Blvd/Southern Pine Blvd	26,800	-	1.6%	2.0%	43,100
SR 1138 (W Arrowood Rd) east of Red Oak Blvd/Southern Pine Blvd	31,400	2.2%	1.5%	2.0%	50,500
Red Oak Blvd north of SR 1138 (W Arrowood Rd)	4,500	-	-	2.0%	7,200
Southern Pine Blvd south of SR 1138 (W Arrowood Rd)	5,700	-	-	2.0%	9,200

* *Based on Compound Annual Growth Rate (CAGR)*

Determination of Design Factors

Since no substantial change in the function or character of traffic using along SR 1138 (W Arrowood Rd) is expected, Base Year 2016 design factors were used for Future Year 2040.

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