

Memorandum



To: Katie Hite, NCDOT Division 3
From: RS&H Project Team
Subject: I-140 Impact on U-5731 Traffic Forecast
Date: December 17, 2018

Introduction

A project level traffic forecast was prepared by RS&H, and approved by North Carolina Department of Transportation (NCDOT) Transportation Planning Division (TPD), in November 2017 for State Transportation Improvement Program (STIP) project U-5731. STIP project U-5731 proposes to improve the intersection of US 74 and US 17/US 421 in New Hanover County.

The traffic forecast was prepared for two scenarios, 2017 Base Year Conditions and 2040 Future Year Conditions. The 2017 Base Year Conditions traffic forecast scenario did not include STIP projects R-2633BA and R-2633BB, which connects the missing piece of I-140 from US 421 north of Wilmington to US 74/76 in Brunswick County. This stretch of I-140 opened to traffic in late December 2017. The 2040 Future Year Conditions traffic forecast scenario included STIP projects R-2633BA and R-2633BB. The purpose of this Memo is to document how the *U-5731 Traffic Forecast Report* (RS&H, November 2017) accounted for the STIP projects R-2633BA and R-2633BB.

Traffic Count Data

Traffic counts were collected as part of the U-5731 project in June 2017, prior to the opening of I-140. Additional traffic counts were provided by NCDOT Division 3 for this Memo that were collected before and after the opening of I-140. **Table 1** summarizes the traffic count volumes for locations that have data for both before and after the opening of I-140. As expected, the traffic counts indicate that volumes at each location decreased after the opening of I-140 because a majority of the traffic travelling through Wilmington would divert to I-140. The primary diverted traffic patterns include from south of Wilmington on US 17 and west on US 74/76, traveling to north of Wilmington along US 421, US 117, I-40 and US 17, and vice versa. The 24-hour count volumes indicate that the diversion is between approximately 5,000 and 12,000 vehicles per day.

The 13-hour and 14-hour traffic count volumes were expanded to 24-hour volumes using NCDOT Traffic Survey Group expansion factors based on the US Highway facility type. Note that the 24-hour volumes are not Annual Average Daily Traffic (AADT) volumes because they are not adjusted for seasonal variation. A seasonal adjustment factor was not applied since the purpose is to provide a general comparison of how the volumes changed before and after I-140 opened to traffic, and the traffic counts for each location were collected in generally the same time of the year.

TABLE 1 –TRAFFIC COUNT DATA

Location	Date	Count Duration	Raw Count Volume (A)	24-Hr Exp Factor ¹ (B)	24-Hr Volume (C = A*B)
US 17/74/421 south of Point Harbor Rd	Tuesday, June 13, 2017	24-Hour	44,529	1.000	44,500
	Wednesday, June 14, 2017	24-Hour	44,696	1.000	44,700
	Tuesday, June 13, 2017	13-Hour	40,715	1.211	49,300
	Tuesday, July 17, 2018	14-Hour	34,156	1.152	39,400
US 17/74/76 west of Alligator Creek	Monday, September 4, 2017	14-Hour	58,926	1.152	67,900
	Monday, September 3, 2018	14-Hour	48,138	1.152	55,500

1. Expansion factors based on NCDOT Traffic Survey Group partial weekday count expansion factors (11/24/15) for US Highways.
Note: Blue shaded count data were collected after I-140 opened to traffic.

Population and Employment Data

As shown in **Table 2**, historic and projected population and employment data shows substantial growth for the City of Wilmington and surrounding area, outpacing the statewide growth in North Carolina, one of the faster growing states in the country. Note that the data shown in this Memo does not match what was included in the *U-5731 Traffic Forecast Report* because more recent data was available at the time of this Memo. However, the population and employment growth rates are similar.

TABLE 2 – POPULATION AND EMPLOYMENT GROWTH RATES

Category	Annual Growth Rates	
	Historic (2000-2017)	Projected (2017-2035)
Population		
North Carolina	1.6%	1.1%
New Hanover County	2.5%	1.5%
Brunswick County	4.7%	2.3%
Pender County	2.8%	2.0%
Wilmington	3.5%	-
Employment		
North Carolina	1.2%	-
New Hanover County	2.5%	-
Brunswick County	3.3%	-
Pender County	3.2%	-
Wilmington	1.7%	-

Note: Data was not available for locations identified with a dash.
Source: North Carolina Office of State Budget and Management (OSBM) except for Wilmington employment data, which was obtained from the United States Census Bureau Quarterly Workforce Indicator (QWI)

Wilmington Travel Demand Model Data

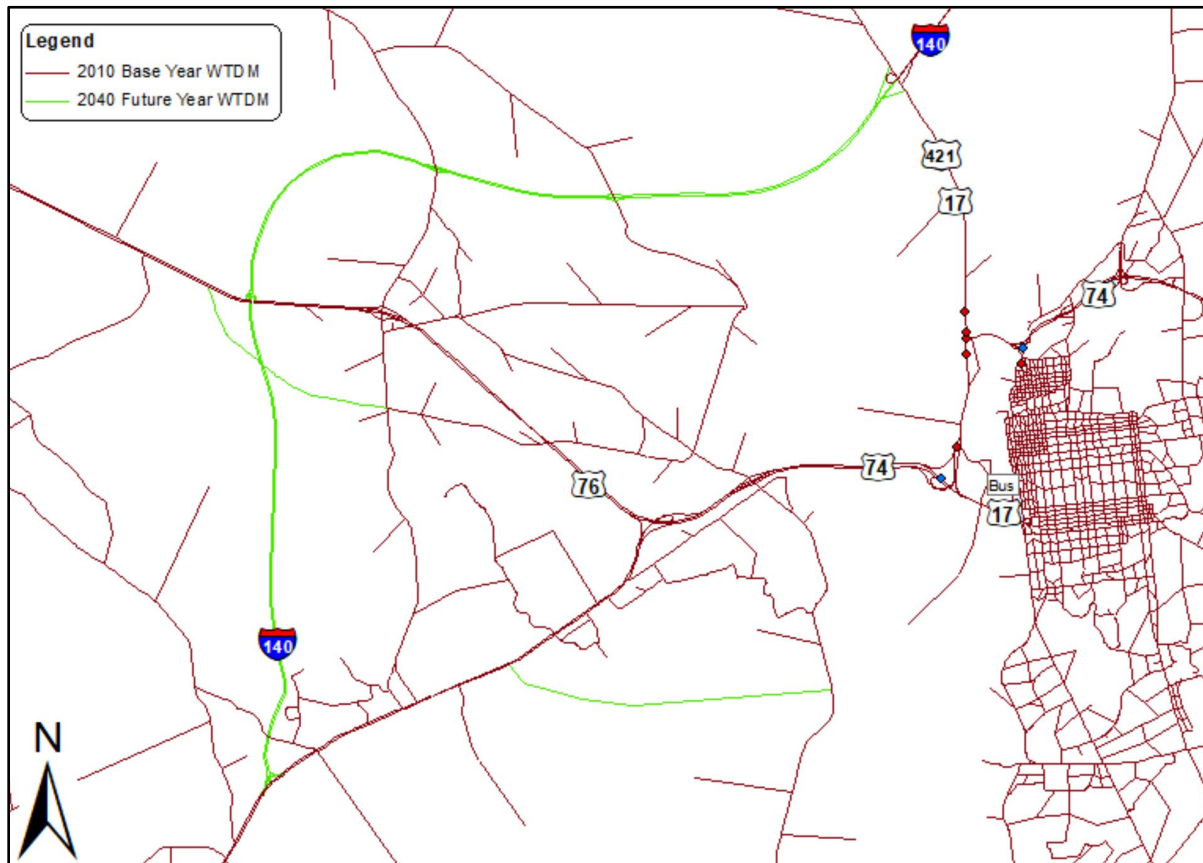
The Wilmington Travel Demand Model (WTDM) (Version 5.0 r4 Build 2110) was used as a tool in the development project level traffic forecast for U-5731. The WTDM uses a four step process to predict travel

patterns based on concentration of housing and employment, land uses, and density contained within transportation analysis zones (TAZs). The four step process includes trip generation (how many trips occur), trip distribution (where the trips will go), mode choice (how the trip will be made based on available modes of travel), and trip assignment (route the trip will take).

As shown in **Exhibit 1**, the future year 2040 WTDM includes STIP projects R-2633BA and R-2633BB, as well as all projects funded for construction in the 2018-2017 NCDOT STIP dated August 2017 and all fiscally constrained projects documented in the Cape Fear Transportation 2040 Metropolitan Transportation Plan (MTP) adopted by the Wilmington Urban Area Metropolitan Planning Organization (WMPO) on November 18, 2015. An exception is STIP Project U-4738 (New Route - Cape Fear Crossing), which is included in the MTP but was not included in the model because the STIP lists the construction of this project as unfunded for future years. The base year WTDM did not include the completion of I-140, nor the other fiscally constrained projects in the MTP and STIP.

Care should be used in determining growth rates from the WTDM. In particular, an understanding of how well the base year model is calibrated in the project study area as well as what roadways are included in the model and the size of the TAZs and location of their centroid connectors. In general, the model was used to assess changes in travel patterns and growth amongst various corridors.

EXHIBIT 1 – WTDM ROADWAY NETWORK



Conclusion

Since I-140 was not open to traffic when the traffic counts were collected for the development of the STIP project U-5731 traffic forecast, and the base year WTDM did not include I-140 while the future year model did include I-140, applying the model growth rates to the base year forecasts is applicable. When projecting out to the year 2040, the population and employment growth trend in the region leads to increases in traffic within the U-5731 project study area that outpaces the decrease in traffic due to the I-140 diversion. A summary of the study area roadways historical growth rates, WTDM projected volumes and growth rates, and the U-5731 selected traffic forecast volumes and growth rates are shown in **Table 3**. In reviewing all of this data, we conclude that the U-5731 project level traffic forecast provided reasonable and valid projections of the traffic volumes on study area roadways.

TABLE 3 – U-5731 STUDY AREA AADT VOLUMES AND GROWTH RATES

Location	Historic AADT		WTDM			U-5731 Traffic Forecast		
	10-Year AGR	20-Year AGR	2010 AADT Volume	2040 AADT Volume	AGR	2017 AADT Volume	2040 AADT Volume	AGR
US 17/US 421 north of S Terminal Rd	4.7%	4.9%	21,300	35,900	2.3%	26,400	41,600	2.5%
US 17/US 421 north of Shell Gas Station Driveway	3.1%	3.7%	21,300	35,900	2.3%	26,400	41,600	2.5%
US 17/US 421 north of US 74/Isabel Holmes Bridge	2.8%	4.6%	21,300	35,900	2.3%	26,700	42,100	2.5%
US 17/US 74 north of Point Harbor Rd	-	-	30,900	27,900	-0.3%	44,400	54,600	1.0%
US 17/US 74 north of USS North Carolina Rd	3.6%	4.9%	31,100	28,100	-0.3%	44,300	54,500	1.0%
US 17/US 74 north of US 74/US 17 Business	-	-	31,300	28,200	-0.3%	44,600	54,900	1.0%
US 17 Business east of US 17/US 74	-0.2%	0.7%	55,000	70,300	0.9%	60,000	73,800	1.0%
US 74 west of US 17/US 74	1.0%	2.0%	79,100	86,100	0.3%	80,000	98,500	1.0%
US 74/Isabel Holmes Bridge east of US 17/US 421	2.5%	3.9%	26,700	49,000	2.8%	30,900	48,900	2.5%
US 74/MLK Jr Pkwy north of US 74/Isabel Holmes Bridge	-	-	41,900	58,800	1.3%	39,500	62,300	2.5%
N 3rd St north of N Front St/Davis St	-2.0%	4.1%	27,700	51,100	2.8%	20,600	32,400	2.5%
N 3rd St south of N Front St/Davis St	4.2%	4.3%	24,100	42,600	2.6%	15,000	23,600	2.5%
S Terminal Rd east of US 17/US 421 *	-	-	300	500	2.7%	200	400	2.5%
Shell Gas Station Driveway east of US 17/US 421 *	-	-	300	500	2.7%	3,100	4,900	2.5%
Point Harbor Rd east of US 17/US 74 *	-	-	100	200	3.3%	300	300	1.0%
USS North Carolina Rd east of US 17/US 74	-	-	600	700	0.3%	1,500	1,800	1.0%
N Front St west of N 3rd St	6.0%	4.5%	3,400	7,900	4.4%	7,200	13,800	4.0%
Davis St east of N 3rd St *	-	-	500	1,700	7.6%	2,800	4,400	2.5%

* Segment is represented by a centroid connector in the WTDM