

**Winston-Salem Urban Area Metropolitan Planning Organization
Transportation Advisory Committee
Action Request**

Meeting Date: November 21, 2019 **Agenda Item Number:** 3

Action Requested: Consideration of the Winston-Salem Urban Area Metropolitan Planning Organization (WSUAMPO) Socio-Economic Data 2017 Base Year Update

SUMMARY OF INFORMATION: **Attachments:** Yes X No

The Piedmont Authority for Regional Transportation (PART) houses and manages the Piedmont Triad Regional Model (Model) for the following Metropolitan Planning Organizations (MPOs): Winston-Salem Urban Area MPO, High Point MPO, Greensboro MPO, and Burlington - Graham MPO. The Model is the tool used for predicting transportation deficiencies and programming transportation needs. The resulting data informs the WSUAMPO's Metropolitan Transportation Plan (MTP) and Comprehensive Transportation Plan (CTP).

As part of our CTP and MTP update the WSUAMPO is required by the Federal Highway Administration (FHWA) to update the Regional Model for programing purposes. This effort has been a collaboration between PART and the MPOs consisting of the gathering and validation of data that feeds into the Model.

The report attached represents Socio-Economic (SE) 2017 Base Year data as well as the 2015, 2020, 2025, 2035, and 2045 horizon year estimates. SE data consists of employment, population, school, and household data. This report was prepared by PART and summarizes the methodology for obtaining base year data, estimates for the horizon years and how the validation process occurred.

The TAC is being asked to adopt this base year update.

Recommendations From:

TAC Vote: Motion by: _____ **Second by:** _____

Vote: For _____ **Against** _____

Motion Description:

**RESOLUTION APPROVING THE WINSTON-SALEM URBAN AREA
METROPOLITAN PLANNING ORGANIZATION (WSUAMPO) SOCIO-ECONOMIC
DATA 2017 BASE YEAR UPDATE**

A motion was made by TAC Member _____ and seconded by TAC Member _____ for the adoption of the following resolution, and upon being put to a vote was duly adopted.

WHEREAS, the Piedmont Authority for Regional Transportation (PART) houses and manages the Piedmont Triad Regional Model (Model) for the following Metropolitan Planning Organizations (MPOs): Winston-Salem Urban Area MPO, High Point MPO, Greensboro MPO, and Burlington - Graham MPO; and

WHEREAS, the Model is the tool used for predicting transportation deficiencies and programming transportation needs; and

WHEREAS, the resulting data informs the WSUAMPO's Metropolitan Transportation Plan (MTP) and Comprehensive Transportation Plan (CTP); and

WHEREAS, as part of our CTP and MTP update the WSUAMPO is required by the Federal Highway Administration (FHWA) to update the Model for programing purposes; and

WHEREAS, this effort has been a collaboration between PART and the MPOs gathering and validation of data that feeds into the Model; and

WHEREAS, the report attached represents Socio-Economic (SE) 2017 Base Year update as well as the 2015, 2020, 2025, 2035, and 2045 horizon year estimates; and

WHEREAS, SE data consists of employment, population, school, and household data; and

WHEREAS, this report was prepared by PART and also includes a summary of the origin of the data sets and how the validation process occurred.

NOW, THEREFORE, BE IT RESOLVED that the Transportation Advisory Committee of the Winston-Salem Urban Area Metropolitan Planning Organization adopts the Socio-Economic Data 2017 Base Year Update.

Adopted on this the 21st day of November, 2019.

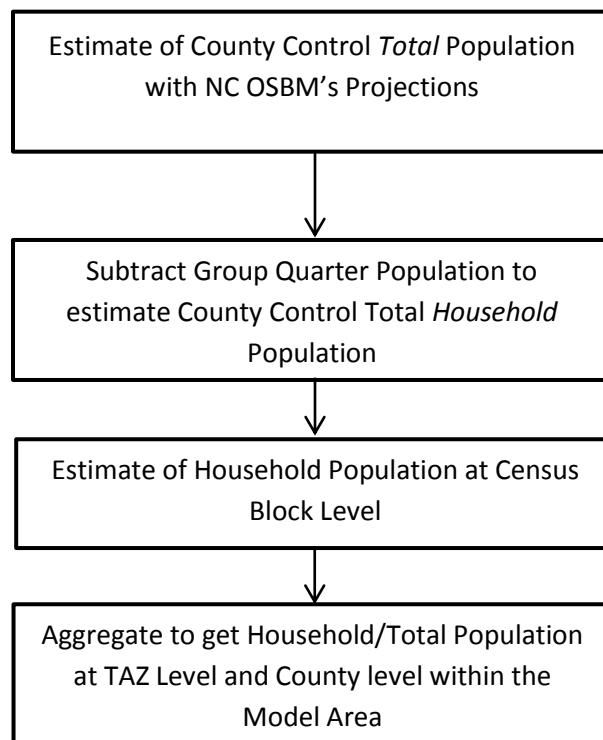
Larry T. Williams, Chairman
Transportation Advisory Committee

Margaret C. Bessette, Secretary
Transportation Advisory Committee

2017 BASE YEAR UPDATE

POPULATION

Since the NC OSBM (North Carolina Office of State Budget and Management) produces county control total population projections with complex mathematical computer models and a variety of data from federal, state, and local government sources for their effective budgeting, it was agreed upon that the OSBM's projections over the years from 2010 to 2035 was utilized to estimate the basic population of new horizon years (2025, 2035, 2045) through interpolation and extrapolation process within the PTRM model group. In addition, it was found out that the information about individual parcel with or without room for future development was available. The dataset was utilized in distributing the increased population of each horizon year at census block level as well as TAZ level. The details are described as follows.



STEP 1: Estimate County Control Totals

In Table 1, the population of 2015, 2020, 2025, 2030, and 2035 was borrowed from NC OSBM projections. The population of base year 2017 and another horizon year, 2045 was estimated through simple linear interpolation and extrapolation process. It is noted that the population projected by NC OSBM consists of household population and group quarter population as illustrated in the chart below and the group quarter population remains the same through the whole forecast years.

Table 1 County Control Total Population from NC OSBM & Estimated Population of 2017 thru 2045

County	2015	2017	2020	2025	2030	2035	2045	Annual growth Rate (%)
Alamance	157,522	161,463	167,375	177,741	188,157	198,573	217,475	1.3
Davidson	165,193	166,763	169,918	173,068	177,018	180,969	188,269	0.5
Davie	41,743	42,236	42,975	44,208	45,441	46,674	48,864	0.6
Forsyth	366,543	373,741	384,537	404,725	425, 225	445,765	483,310	1.1
Guilford	517,124	525,044	536,923	553,524	567,448	579,125	616,032	0.6
Orange	140,144	143,258	147,929	155,679	163,385	171,058	185,955	1.1
Randolph	142,943	143,239	143,683	144,423	145,163	145,902	147,476	0.1
Rockingham	93,651	91,936	91713	91,636	91,621	91,619	90,811	-0.1
Stokes	46,763	46,715	46,642	46,571	46,530	46,505	46,176	-0.1
Total	1,671,626	1,694,393	1,731,695	1,791,575	1,849,988	1,906,190	2,024,367	0.7

Figure 1 illustrates what consists of NC OSBM’s population. There are two subgroups: Group quarter population and Household population. The group quarter population again consists of two subgroups: *Institutionalized* and *Non-institutionalized*. Institutionalized group quarter facilities include correctional facilities for adults, juvenile facilities, nursing facilities/skilled-nursing facilities, others such as mental hospitals and psychiatric units in other hospitals, etc. Non-institutionalized ones include college/university student housing, military quarters, others such as emergency and transitional shelters for people experiencing homelessness, etc. It is noted that the institutionalized population was excluded for the modeling purpose.

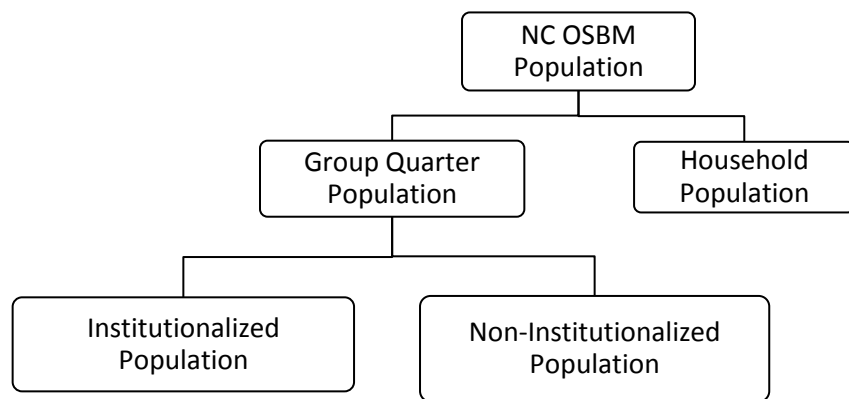


Figure 1 The Component of NC OSBM Population

STEP2: County Control Total Household Population

Since NC OSBM’s county total population consists of both household population and group quarter population as illustrated in Figure 1, the county control total household population was obtained by subtracting the group quarter population which is assumed to remain the same for all the future horizon years.

Table 2 County Control Total Household Population

County	2017	2025	2035	2045
Alamance	157,234	173,512	194,344	213,246
Davidson	165,072	171,377	179,278	186,578
Davie	41,871	43,843	46,309	48,499
Forsyth	363,890	394,874	435,914	473,459
Guilford	509,552	538,032	563,633	600,540
Orange	133,701	146,122	161,501	176,398
Randolph	141,941	143,125	144,604	146,178
Rockingham	90,881	90,581	90,564	89,756
Stokes	46,262	46,118	46,052	45,723
Total	1,650,402	1,747,584	1,862,199	1,980,376

STEP 3: Preprocess ‘development status’ of each parcel into census block level

Both datasets from Piedmont Together CommunityViz project and Triangle area’s CommunityViz project (for the Orange county area) were reviewed and utilized to prepare the parcel level development status data. Below is how the preprocessing task was performed.

- There are three different categories of development status in the Piedmont Together data set coded as ‘Dev’, ‘Undev’, and ‘Under’. While a parcel coded as ‘Dev’ is considered as a parcel with no more development allowed, ‘Undev’ and ‘Under’ represent the areas still capable of accommodating more population with land available for building.
- The Triangle’s data set defined the development status differently as listed at the first column of Table 3. Each status is interpreted as Yes (“O”) or No (“X”) in terms of the possibility of development in the future for this process.

Table 3 Triangle CV Development Status

Triangle CV Development Status		Accommodate Population increased
AGR	Agriculture	X
COMM	New growth buildings under construction	O
DEV	Built-out lots	X
POS	Permanent Open Space	X
REDEV	Can accept new growth	O
UNDER	Available for future development	O
UNDEV	Without permanent bldg.	O
WTR	Water	X

- Since the development status is categorical data, more caution was needed to aggregate the categorical data (i.e. ‘dev’, ‘undev’, etc.) unlike numeric data to maintain the consistency of the characteristic of the data itself. Two methodologies described below were tested and compared

for defining what the representative development status of census block consisting of multiple parcels is.

- Methodology 1: Calculated the total area of parcels by development status within a given census block and selected the development status with the largest parcel area to represent the development status of the census block. For example, a census block covering multiple parcels consists of 101k ft² of 'Dev' parcels, 483k ft² of 'Under' parcels, and 73k ft² of 'Undev'. Since 'Under' is the largest area, the census block is defined as 'Under' status. Although this methodology does not exactly explain the status of the census block, it is possibly considered as one way of defining them.

Census block ID	Dev	Under	Undev	Determined
370810101001000	101,112.8	483,250.6	73,008.53	Under

- Methodology 2: At first, calculated how much percentage of a census block is covered by developable parcels. Then, defined the census block as developable or not depending on whether or not the percentage was greater than a given threshold one that were tested out through repeated process. As a result, it was found that this methodology was inclined to overestimate the population of each census block because the number of census blocks unable to accommodate future household population was relatively increased in most cases.
- As a result, methodology 1 was selected even though methodology 2 was considered as valuable one for the future.

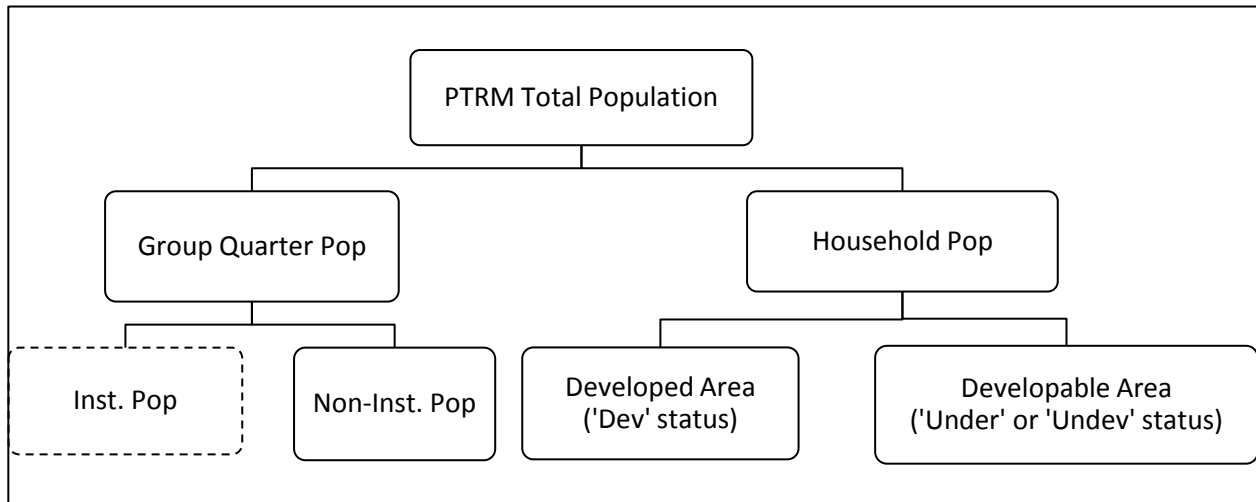


Figure 2 Two sub-groups of Household Population

STEP 4: County Control Total Household Population

Tagging census block with the development status resulting from the methodology 1 previously described, the increased household population was distributed into only the developable area such as 'Under' or 'Undev' by census block level population. There is exception for Forsyth county in the projection of

population which was provided by the county planning staff. A little discrepancy in Forsyth county total household population results from TAZs from other counties included which was not included in the Forsyth county estimate and forecast. As a result, county control total population in household by horizon year is calculated as below.

Table 4 County Control Total Household Population

County	2017	2025	2035	2045
Alamance	157,237	173,517	194,351	213,256
Davidson	165,004	171,311	179,205	186,506
Davie	41,871	43,843	46,309	48,499
Forsyth	364,006	395,093	436,282	473,960
Guilford	509,627	538,104	563,705	600,609
Orange	133,701	146,122	161,501	176,398
Randolph	141,941	143,125	144,604	146,178
Rockingham	90,881	90,581	90,564	89,756
Stokes	46,262	46,118	46,052	45,723
Total	1,650,530	1,747,814	1,862,573	1,980,885

STEP 5: County Control Total Population

Since the institutionalized group quarter population was excluded as addressed above, county control total population was obtained by adding the non-Institutionalized group quarter population onto the total household population as shown in Table 6 which shows some discrepancy compared with Table 1 due to the exclusion of institutionalized group quarter population.

Table 5 County Control Total Population

County	2017	2025	2035	2045
Alamance	160,624	176,904	197,738	216,643
Davidson	165,316	171,623	179,517	186,818
Davie	42,236	44,208	46,674	48,864
Forsyth	371,031	402,118	443,307	480,985
Guilford	521,651	550,129	575,730	612,634
Orange	143,258	155,679	171,058	185,955
Randolph	143,239	144,423	145,902	147,476
Rockingham	91,936	91,636	91,619	90,811
Stokes	46,715	46,571	46,505	46,176
Total	1,686,006	1,783,291	1,898,050	2,016,362

STEP 6

RESULT 1: County Control Household Population within Model Area

Focusing on model area, it is noted that there are a few counties partially belonging to model area. Aggregating the household population at census block level into TAZ level, total household population of

only the county area covered by model area was obtained as follows. It is noted that some counties in the bracket are the counties partially included in the model area.

Table 6 County Control Total Household Population of Model Area

HH Pop	2017	2025	2035	2045
Alamance	157,237	173,517	194,351	213,256
Davidson	165,004	171,311	179,205	186,506
[Davie]	11,820	12,381	13,080	13,702
Forsyth	364,006	395,093	436,282	473,960
Guilford	509,627	538,104	563,705	600,609
[Orange]	8,958	11,081	13,711	16,257
[Randolph]	39,733	40,056	40,458	40,887
[Rockingham]	4,109	4,096	4,095	4,060
[Stokes]	19,651	19,591	19,566	19,428
Total	1,280,146	1,365,230	1,464,454	1,571,887

RESULT 2: County Control Total Population of Model Area

Adding non-institutionalized group quarter population, county control total population within model area was obtained as follows. Annual growth rate between two years are included in the table.

Table 7 County Control Total Population of Model Area

County	2017	2025	2,035	2,045	Annual Growth Rate		
					'17-'25	'25-'35	'35-'45
Alamance	160,624	176,904	197,738	216,643	1.3%	1.2%	1.0%
Davidson	165,316	171,623	179,517	186,818	0.5%	0.5%	0.4%
[Davie]	11,820	12,381	13,080	13,702	0.6%	0.6%	0.5%
Forsyth	371,031	402,118	443,307	480,985	1.0%	1.0%	0.8%
Guilford	521,651	550,129	575,730	612,634	0.7%	0.5%	0.6%
[Orange]	8,958	11,081	13,711	16,257	3.0%	2.4%	1.9%
[Randolph]	39,735	40,058	40,460	40,889	0.1%	0.1%	0.1%
[Rockingham]	4,109	4,096	4,095	4,060	0.0%	0.0%	-0.1%
[Stokes]	19,683	19,623	19,598	19,460	0.0%	0.0%	-0.1%
Total	1,302,928	1,388,013	1,487,237	1,591,448	0.8%	0.7%	0.7%

Household

Total number of households of each TAZ was estimated with the household size of current TAZ and aggregated into to get total households by county and horizon year. Annual growth rate between two years are included in the table.

Table 8 Summary of total households by county

County	Household				Annual Growth Rate (%)		
	2017	2025	2035	2045	'17-'25	'25-'35	'35-'45
Alamance	64,433	71,693	81,034	89,704	1.4	1.3	1.1
Davidson	66,370	69,558	73,537	77,308	0.6	0.6	0.5
Davie	4,855	5,126	5,463	5,773	0.7	0.7	0.6
Forsyth	151,348	165,904	184,988	202,758	1.2	1.2	1.0
Guilford	212,570	226,157	238,835	256,349	0.8	0.6	0.7
Orange	3,572	4,355	5,322	6,245	2.7	2.2	1.7
Randolph	15,735	16,005	16,336	16,682	0.2	0.2	0.2
Rockingham	1,637	1,647	1,664	1,667	0.1	0.1	0.1
Stokes	8,060	8,106	8,178	8,202	0.1	0.1	0.1
Total	528,579	568,552	615,358	664,689	1.0	0.8	0.8

EMPLOYMENT DATA

The published employment forecasts from multiple sources were reviewed and compared to estimate and forecast the employment data of 2017 base year as well as new horizon years. The three different sources of forecasts were Bureau of Labor Statistics, Longitudinal Employer-Household Dynamics, and InfoUSA.

Bureau of Labor Statistics

One of the best sources for the control totals for employment is usually the Quarterly Census of Employment and Wages (QCEW) provided by Bureau of Labor Statistics. The advantage of using BLS is that the data is the most current available. The major disadvantage is that does not include proprietor employment. The county control totals employment in 2017 was projected with the data from 2010 to 2016.

Table 9 County Control Total Employment of 2017 from BLS

	2010	2011	2012	2013	2014	2015	2016	2017
Alamance	54,857	56,303	57,312	57,436	57,781	58,102	59,708	60,017
Davidson	38,782	39,062	40,492	41,020	41,302	41,837	43,106	43,562
Davie	9,479	9,577	9,487	10,085	10,756	11,770	12,316	12,519
Forsyth	172,627	170,954	173,967	175,280	177,865	180,365	182,452	183,672
Guilford	257,086	261,172	262,386	266,990	269,260	275,496	278,181	281,340
Orange	60,631	60,970	61,744	63,809	65,678	66,993	70,239	70,695
Randolph	44,333	44,601	44,682	43,507	43,934	44,398	44,812	44,364
Rockingham	26,545	26,452	26,754	25,925	26,164	26,037	26,535	26,137
Stokes	6,894	6,845	6,772	6,730	6,894	6,961	7,018	6,977

Longitudinal Employer-Household Dynamics

LEHD (Longitudinal Employer-Household Dynamics) data of US Census Bureau provides the number of jobs at workplace. The WAC (Workplace Area Characteristics) data set was downloaded and aggregated to get county totals of 2015 for the comparison. In particular, LEHD's employee data is classified by NAICS code. The employment data of initial version of PTRM was classified by SIC (Standard Industrial Classification) groups and then NAICS (North America Industry Classification System) was applied to later version. First of all, the crosswalk for the conversion of SIC code to NAICS code was required to convert and classify the number of employees into each employment type defined by PTRM from LEHD data. Below is the crosswalk from SIC to NAICS developed for the conversion procedure.

Table 10 Employment Data Crosswalk from SIC Code to NAICS Code

PTRM employment type	SIC	NAICS	LEHD File name
Industrial	1-49	11, 21, 22, 23, 31-33, 48-49	CNS01,02,03,04,05,08
Retail	50-54, 56, 57, 59	42, 44-45	CNS06, 07
Highway	55, 58, 70	72	CNS18
Office	60-67, 91-97	52, 53, 92	CNS10, 11, 20
Services	71-81, 83-89, 99	51, 54, 55, 56, 62, 71, 81	CNS09,12,13,14,16,17,19
School	82	61	CNS15

Source: <https://www.naics.com/wp-content/uploads/2014/10/SIC-to-NAICS-Crosswalk.pdf>

The latest LEHD data available now is 2015's. With the growth rate of each county from 2014 to 2015 LEHD data, 2017 LEHD county control total employment data was estimated.

	2010	2011	2012	2013	2014	2017
Alamance	54,509	56,751	59,198	59,187	61,089	58,325
Davidson	39,276	41,568	43,259	43,493	44,157	38,180
[Davie]	1,990	2,014	2,047	2,124	2,588	2,398
Forsyth	176,248	176,247	177,788	179,465	179,382	179,348
Guilford	264,529	268,046	267,848	272,115	275,322	272,140
[Orange]	1,813	1,980	2,366	2,189	2,345	2,204
[Randolph]	9,225	10,477	10,991	10,930	10,885	10,315
[Rockingham]	731	526	484	507	542	507
[Stokes]	3,237	3,106	3,421	3,437	3,407	3,552

2017 InfoUSA

Since there are 105,352 InfoUSA business data within PTRM model area which is too many to be directly contacted with limited resources and given time period, a group of data was selected for the verification process by MPO. For the selection process, two criteria were utilized: employment size of each business & absolute difference of employment size at TAZ level between existing PTRM's and InfoUSA's. With these criteria, two groups of data set were made. One group (2,227 data) was created with the businesses with only employment size greater than 50. The other group (1,853 data) was developed by selecting not only

the businesses with employment size greater than 20 and less or equal to 50 also the businesses within TAZ with the absolute difference of total employees of TAZ between InfoUSA and PTRM 2017 estimate greater than 200. Consequently, the total number of business to be verified by each MPO was 4,080.

Table 11 Selection Criteria for the Verification of InfoUSA

MPO	Emp. size >50	20<Emp. size<=50 & diff>200	Group total by MPO
BG	339	182	521
GB	718	746	1,464
HP	509	354	863
WS	661	571	1,232
Total	2,227	1,853	4,080

The verification process was challenging because of the difficulties in getting valid response from a local business as expected. For instance, there were businesses reluctant to share employment data over the phone. A few businesses expressed they would share the data when a formal letter was provided with the explanation of the nature of the project. In particular, large companies were more challenging to get in touch since the phone led surveyors to 800 numbers. In most cases, they ended up leaving voicemail.

PTRM Employment Forecast

Once the verification by each MPO was completed, a quality control process proceeded. Total number of employment at TAZ level was compared with the existing PTRM. There were some cases that XY coordinate does not exactly match with the physical address. It was found that outdated information still remained in the 2017 InfoUSA data set from the review. The percentage of incomplete contact in the verification process was significant. School employment was compared and verified from google earth and the school data provided by MPOs in terms of location and its name. Table 12 shows the total employment by year and county and annual growth rate.

For the forecast, calculated the annual growth rate of employment of current PTRM v4.2 by employment type and TAZ. Applied them to forecast 2025 with 2017 base year with separately forecasting School employment and University employment.

Table 12 Summary of Total Employment by County

County	Total Employment				Annual Growth Rate		
	2017	2025	2035	2045	'17-'25	'25-'35	'35-'45
Alamance	62878	73,203	85,317	103,972	2.1%	1.7%	2.2%
Davidson	54,413	62,501	71,513	85,689	1.9%	1.4%	2.0%
[Davie]	3,799	4,810	6,797	9,523	3.3%	4.1%	4.0%
Forsyth	195,907	233,441	281,209	355,527	2.4%	2.0%	2.6%
Guilford	304,168	352,479	404,256	487,160	2.0%	1.5%	2.1%
[Orange]	3,198	3,740	4,564	5,870	2.1%	2.2%	2.9%
[Randolph]	12,475	15,184	18,563	23,895	2.7%	2.2%	2.9%
[Rockingham]	788	840	888	955	0.8%	0.6%	0.8%
[Stokes]	4,636	5,508	6,507	8,293	2.4%	1.8%	2.7%
Total	642,262	751,705	879,614	1,080,884	2.1%	1.7%	2.3%

When the quality control process was completed, each business was to classified into employment type defined by PTRM by utilizing a crosswalk with SIC and NAICS code as shown in Table 13.

Table 13 Total employment by employment type

	2017	2025	2035	2045
EMP_HWYRET	52,451	59,899	68,177	80,759
EMP_IND	142,221	153,714	166,771	186,080
EMP_RETAIL	117,932	136,343	159,851	194,986
EMP_SERVICE	224,053	281,041	345,659	451,541
EMP_OFFICE	70,212	83,568	102,151	130,530
SCHOOL_EMP	25,701	26,285	26,285	26,285
UNIV_EMP	9,754	10,855	10,855	10,855
Total	642,262	751,705	879,614	1,080,884

School data

The school data collected and provided by MPO partners include the number of employees of K-12 school and college/university, K-12 students and part-time or full-time college/university students. The review process was followed to verify them through the comparison of existing TAZ level data within PTRM as well as google data. It was found that there were a few TAZs which indicate school employee but not shown in the list from MPOs. Or a few TAZs with school data were not indicating that there is school data in the existing data. The discrepancy was investigated and corrected by revisiting each of them. Table 14 summarizes the school data set.

Table 14 School and University Employment/Enrollment by Year

School Data	2017	2025	2035	2045
School Employment	25,701	26,285	26,285	26,285
University Employment	9,754	10,855	10,855	10,855
K-12 Students	216,733	222,012	222,012	222,012
University Students (Part-time)	28,729	32,520	32,520	32,520
University Students (Full-time)	76,190	85,980	85,980	85,980

More details about students are presented as follows. The number of K-12 students remains the same in the future horizon years. The annual growth rate between 2017 and 2025 is calculated at the last column.

Table 15 K-12 Students by County

County	2017	2025	2035	2045	'17-'25 (%)
Alamance	23,607	24,131	24,131	24,131	0.3
Davidson	30,427	30,942	30,942	30,942	0.2
[Davie]	997	1,055	1,055	1,055	0.7
Forsyth	70,447	72,623	72,623	72,623	0.4
Guilford	82,251	83,937	83,937	83,937	0.3
[Orange]	0	0	0	0	0
[Randolph]	6,084	6,236	6,236	6,236	0.3
[Rockingham]	70	72	72	72	0.4
[Stokes]	2,850	3,016	3,016	3,016	0.7
Total	216,733	222,012	222,012	222,012	0.3

University students by county were forecasted as shown in the following table. The university students remain the same in the future horizon years. The annual growth rate between 2017 and 2025 was calculated to be 1.6-1.7%.

Table 16 University Students by County

County	2017		2025		2035		2045	
	PT	FT	PT	FT	PT	FT	PT	FT
Alamance	12,256	8,758	13,929	9,954	13,929	9,954	13,929	9,954
Davidson	2,297	1,805	2,610	2,051	2,610	2,051	2,610	2,051
[Davie]	0	0	0	0	0	0	0	0
Forsyth	0	26,252	0	29,832	0	29,832	0	29,832
Guilford	14,176	39,375	15,981	44,143	15,981	44,143	15,981	44,143
[Orange]	0	0	0	0	0	0	0	0
[Randolph]	0	0	0	0	0	0	0	0
[Rockingham]	0	0	0	0	0	0	0	0
[Stokes]	0	0	0	0	0	0	0	0
Total	28,729	76,190	32,520	85,980	32,520	85,980	32,520	85,980

Note: PT-Part Time Students, FT-Full Time Students