



7. Travel Demand Model Technical Summary

A regional travel demand model is a useful tool to analyze traffic patterns and evaluate future demand on the transportation network. Models are built on a set of mathematical assumptions in an attempt to simulate observed traffic patterns. The process for developing a model is complex and the variables required for a reliable model are extensive in nature.

The SDMPO MTP was developed using several tools, including the SDMPO MPO’s Travel Demand Model created by TxDOT’s Transportation Planning and Programming Division (TP&P). The SDMPO Model uses TransCAD travel demand model software to run the 4-step modeling process.

The Sherman-Denison MPO travel demand model was updated to reflect new demographics and network changes. The process for the model update is explained in detail below.

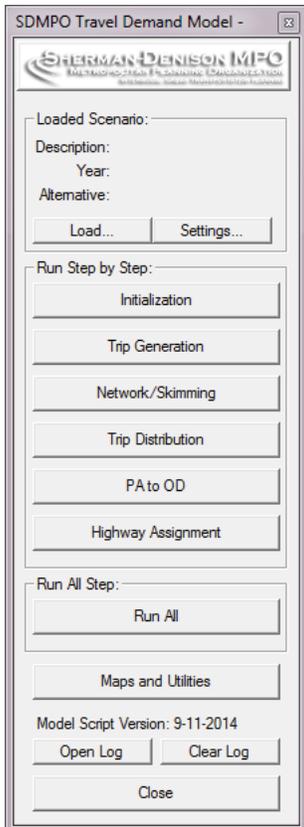
demographic data be as accurate as possible to ensure the results. The number and type of trips are a product of demographic inputs. Population and employment data from the previous TxDOT model was reviewed and updated with the coordination of the MPO staff, the Technical Advisory Committee and the Policy Board.

TRAFFIC ANALYSIS ZONES

The geographic area that the SDMPO model covers consists of Grayson County which is larger than the actual SDMPO boundary. Within the county, traffic analysis zones (TAZ) are the geographic units that demographic data is assigned. The TAZ units are typically consistent with the existing roadway network. The units typically get smaller as the network grid reduces in size. For this model update, the same TAZ structure maintained from the previous update. There are currently 473 TAZs in the SDMPO model with 24 external stations. External stations represent the trips that are going through the region, coming into the region or leaving the region. The 497 TAZ zone structure is consistent with the base year and all future year demographic projections.

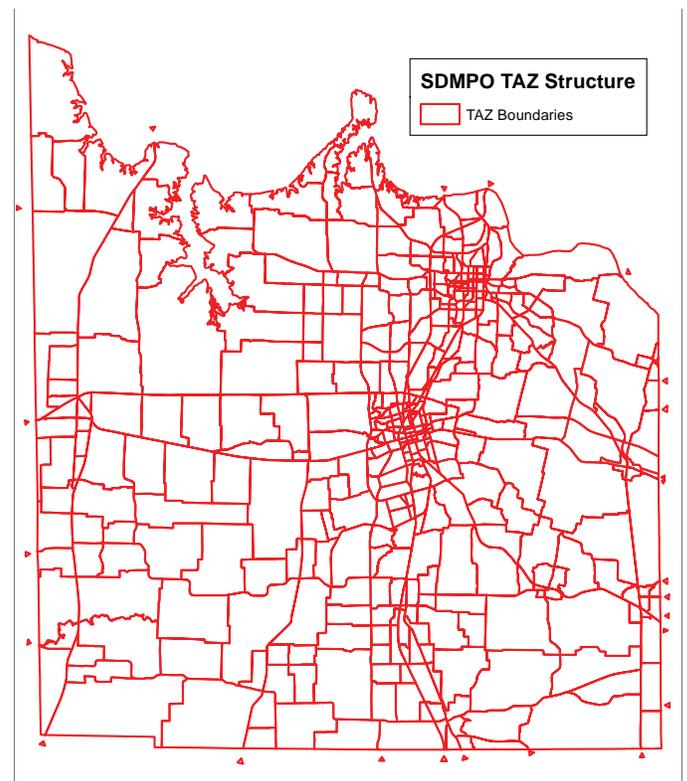
METHODOLOGY

As part of the MTP development, the SDMPO travel demand model was also updated to reflect changing travel patterns in the region. The SDMPO uses the TxDOT model to forecast future trips and determine transportation needs in the region. New demographics and network changes in the region required the model to be updated from the previous model completed in 2010. Updating the TxDOT travel demand model required modifications to the trip generation and trip distribution models, ATOM and TripCAL5. Travel demand models incorporate socioeconomic and network data as parameters to the model. As the foundation of the model, the accuracy of the data must be validated. Ensuring the completeness is crucial for model development and data must be of significant quality for the base year prior to forecasting future year demographics.



DEMOGRAPHIC UPDATE

The foundation of all travel demand models is part demographic and part network database. It is essential that





POPULATION

The previous model base year, 2003 was updated to reflect the 2010 base year data. U.S. Census data was used for 2010 and aggregated to the TAZ geographies in the model. There was an increase of 8,200 in population from the 2003 to the 2010 base years.

Summary of 2010 Demographic Data

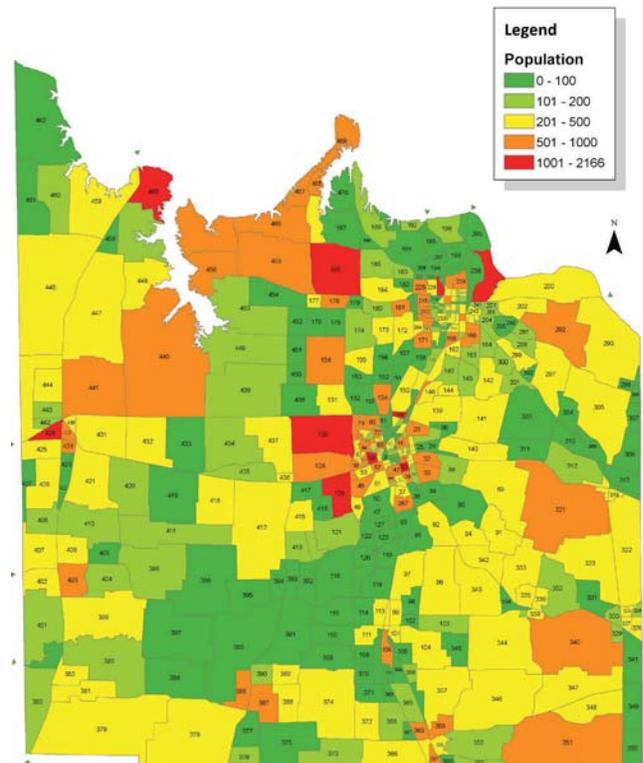
Population	120,937
Households	53,727
Household Size	2.25
Median HH Income	\$38,805
Basic Employment	11,643
Retail Employment	7,279
Service Employment	30,422
Education Employment	3,805
Total Employment	53,149

For the forecast years, population control totals were developed for the 2040 forecast year using Woods and Poole data. The new growth in population was distributed across the region based on local assumptions and known developments planned throughout the county. MPO staff, TAC and the Policy Board reviewed the recommended distribution of population in the following maps.

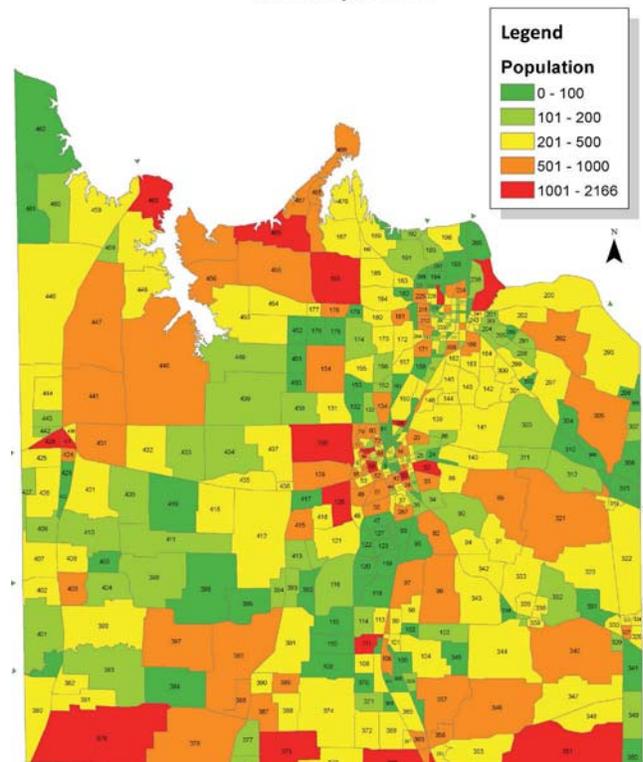
Summary of 2040 Demographic Data

Population	151,236
Households	67,216
Household Size	2.25
Median HH Income	\$38,805
Basic Employment	17,066
Retail Employment	9,520
Service Employment	46,823
Education Employment	3,805
Total Employment	77,214

2010 Population



2040 Population





EMPLOYMENT

Employment data is used as a means to determine where trips are ending. The base year employment data is based on information acquired from InfoUSA. The data contained address locations, NAICS information and number of employees at the location. The data was then aggregated to the TAZ and distributed based on the type of employment, basic, service, and retail.

The control totals for the forecast year of 2040 were based on a total population/employment ratio. The ratio used was based on national trends in comparing population to employment. 0.48 was used to develop the forecast year employment projections of 77,214.

New employment growth was allocated across the region based on local assumptions and known developments planned throughout the county. Particular attention was paid to the growth along key transportation corridors such as US 75 and also growth in the areas on the southern portion of Grayson County.

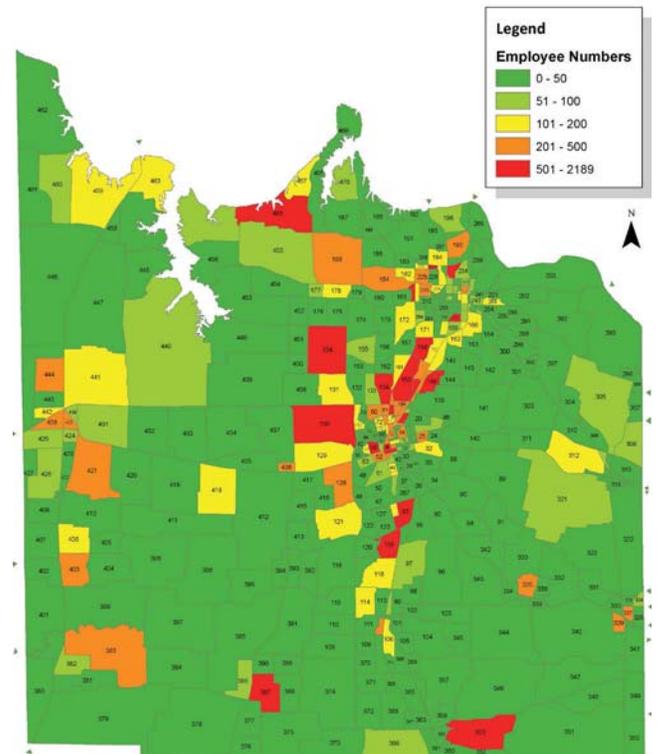
NETWORK DATABASE

The transportation network is the other important input the helps determine the outcomes in the SDMPMO travel demand model. The network determines the supply of infrastructure in the region and how much capacity is available. The capacity of each roadway is determined by its functional classification and the area type. The characteristics of a roadway in the travel demand model is also impacted by the speed. For example, a roadway that is an arterial in an urban area type will have a unique speed and lane capacity than a rural arterial. Typically the more rural the roadway the higher speeds and capacities. Also, roadways that have a higher functional classification typically have higher speeds and capacities assigned to them; Interstate Highways on the high side and collectors on the low side. Local streets are not used in the travel demand model because their volumes are traditionally low and a proper analysis of the local network is difficult to accomplish using a macro-model.

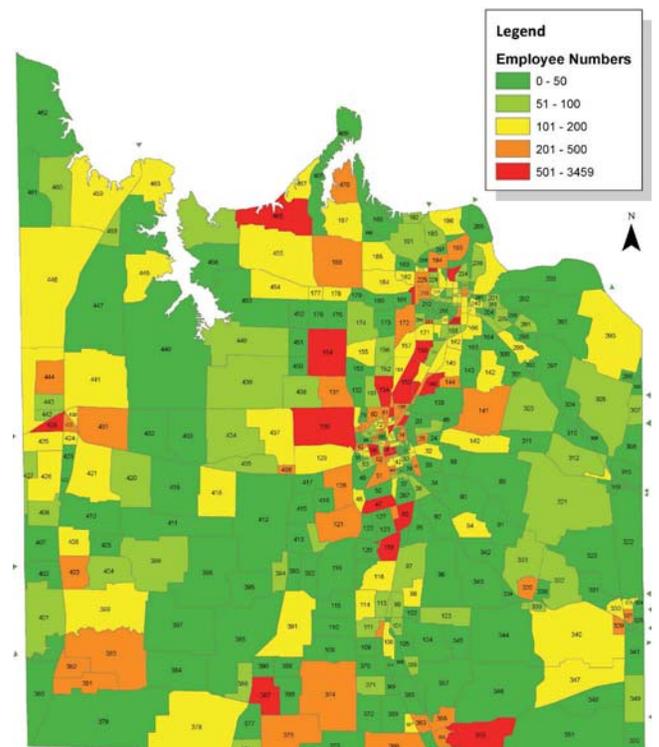
FUNCTIONAL CLASSIFICATION

As was mentioned, functional classification is the designation of the roadways within the MPO area. The functional class types include freeways & expressways, principal arterials, minor arterials, collector streets, rural minor collectors and local streets. The designation of each of these functional class types on the network gives each roadway link a unique set of characteristics.

2010 Employment Numbers



2040 Employment Numbers





MODEL VALIDATION

The model's validity is determined by analyzing the current traffic conditions with the base year model results. This is done by using actual traffic counts collected during a certain time period and comparing those counts with the model volumes produced from the 2010 base year traffic assignment.

A number of different statistics are used to compare the observed versus the model results. Appendix B includes the detailed model analysis and validation documentation associated with the 2040 model update.

MODEL APPLICATION

The 2010 SDMPO travel demand model replicates base year travel conditions reasonably well given the current demographic used in the analysis. The model should be a useful tool for identifying existing and future transportation system deficiencies and assessing proposed regional mobility improvements.

Towards that goal, the SDMPO model also includes a tool to observe not only 2010 and 2040 model outcomes, but also interim years of 2017, 2025, 2030, and 2035. This allows the MPO to analysis future traffic conditions for every 5 year increment.

FORECAST YEAR INPUTS

The primary change in the model forecast year inputs is the demographics. With an increase of population just over 30,000 and employment of 24,000, there will be an increased growth in number of trips in the region in the next 25 years. With an increase of population in the region of around 30,000, the region can expect to increase the number of daily trips in the region by almost 135,000 a day.

Trip rates in the model were based on a Texas A&M Transportation Institute (TTI) household travel survey to determine where trips were going in the region and forecast those trip patterns into the future.

Regarding the transportation network. The current base year network was updated to reflect the roadways in the region of a functional class higher than a local street. The network was also updated to reflect the current number of lanes. Additionally, the committed capacity projects from the Transportation Improvement Program (TIP) was incorporated into the forecast network. This existing plus committed (E+C) network was used to run traffic assignment with both the 2010 demographics and the 2040 demographics set that was allocated to the TAZ geographies.

TRAVEL DEMAND MODEL ASSIGNMENT RESULTS

After applying the new inputs and using the E+C network the results helped the MTP Update team to determine where the congested areas of the model network are located. This tool is effective in helping to determine the future transportation needs of a region. It is able to show the relationship between roadway supply and traffic demand.

