MEMORANDUM

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TO:	Terry Hughes, Director of Capital Projects
	City of Weatherford, Texas
CC:	Chris Bosco, FNI
FROM:	Edmund Haas, AICP
SUBJECT:	Travel Demand Forecasting for Weatherford Thoroughfare Planning
DATE:	October 15, 2018

In 2013, Freese and Nichols assisted the City of Weatherford in the update of the Thoroughfare Plan. That Plan, which was vetted through the Transportation Advisory Board and a public hearing with the City Council, was unanimously adopted on April 9, 2013 (Ordinance 616-2013-10). Supporting documentation and plan mapping was submitted prior to and presented as part of the public hearing.

The plan document contains supporting information to the derivation of the plan including; the issues affecting Weatherford transportation, thoroughfare goals and objectives, growth factors affecting projected network conditions, and thoroughfare planning. The study concluded with an economic benefit analysis defining value capture of specific corridors and a capital improvements program defining prioritized projects for implementation.
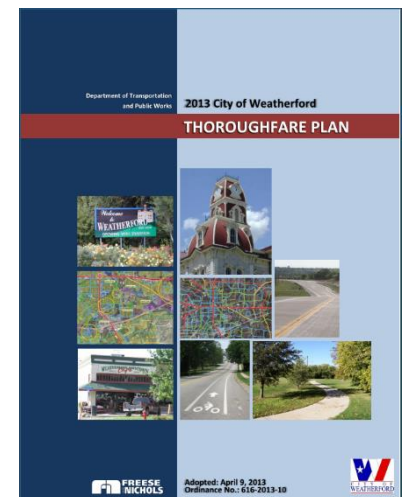
Planning Tools for Forecasting Travel Demand

Forecasting future traffic volumes require an understanding of future land use, demographics (population and employment characteristics), and changes in the transportation system. Most importantly, is the changes and/or shifts in land use, its demographics, and the expanding transportation system aimed at supporting such growth. Further, an understanding of not only local area changes, but the dynamics of such at a larger regional level particularly, because the roadway network is an "open" system of improvements available for both local and regional use – travel for development and employment centers from within the community, as well as to/from Weatherford.

Two general forecasting approaches include trend analyses and travel demand modeling.

Trend Analyses – the forecast of traffic volume growth using regression modeling. Daily traffic counts on roadways and intersections are obtained within a study area and balanced to formulate annual counts. Based on historic growth rates for the area, annual growth factors are applied to achieve a growth year forecast. It is important to note that the regression method is applicable for study corridors/areas that are established and have historical counts available over many years to develop appropriate growth trends for projecting forward. For corridors on new alignments, corridors of regional nature, or located in rapidly developing/redeveloping areas, where historical traffic data is either unavailable or inconsistently collected may yield variable results.

Forecasts prepared by TxDOT and used for sketch level planning are available using this method. Figures presented there in are generally based on a general growth rate of about 2% annually. The statewide planning map is available on-line.

Travel Demand Modeling – a gravity based using current travel behavior to predict future travel patterns from sampling of travel behavior data. Such models are more robust in that within geographic zones, origin-destination ("O-D" matrix) data are applied to changes in population and employment forming production and attraction trips over a transportation network. Both demographics and roadway networks correlate with a target year forecast and changes 10 or 20-year scenarios are used to evaluate system needs. Traditionally, a four-step process is used that includes:
1. Trip generation (the number of trips to be made)
2. Trip distribution (where those trips go)
3. Mode choice (how the trips will be divided among the available modes of travel)
4. Trip assignment (predicting the route trips will take)

Travel demand modeling offers a more robust understanding of the implications resulting from changes in land use relative to the roadway network - and improvements made to the transportation system. The North Central Texas Council of Governments (NCTCOG), which serves as the Metropolitan Planning Organization for the 16-county area in North Texas, has developed and used a travel demand model for almost 40-years to evaluate transportation investments as part of a variety of publications including; the Metropolitan Transportation Plan (MTP), the Transportation Improvement Program (TIP), Unified Public Works Program (UPWP), and a host of other published studies. Travel models are best suited to provide a comparison between horizon years or alternatives with traffic projections showing general travel trends over time or between alternatives. More on both processes is highlighted at the end of this memorandum.

The Weatherford Plan
Key to the thoroughfare planning process was the use of a travel demand modeling to assess impact of 20-year community growth on the thoroughfare network. For the development of the Weatherford Thoroughfare Plan, a sub-area model was built from the North Central Texas Council of Governments (NCTCOG) regional travel demand model for Year 2035. The benefit of the approach was that it enabled the ability to capture regional impacts of programmed transportation improvements in and around the city, while at the same

Figure 6.1
Weatherford Thoroughfare Plan
March 2013
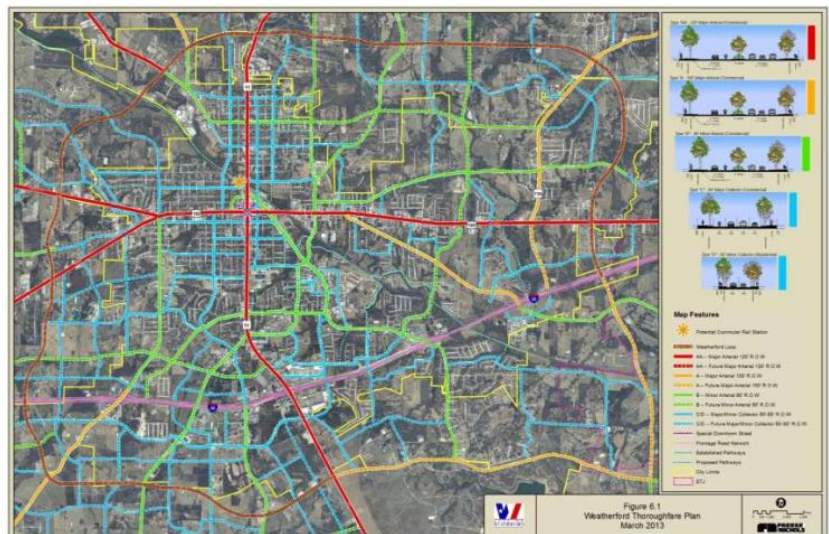
time incorporating local land use patterns experienced within the Weatherford area into the model. Travel demand forecasts were then used to asses thoroughfare needs to both the existing roadway network (functional class and lane sizing), as well as network development in emerging parts of the city.

Downtown Weatherford

Travel forecasts for the downtown area were based on the travel demand modeling process and have since been supplemented with the recent release of the 2045 travel demand model. The updated forecast reveals trends like those identified as part of the 2013 planning process; heavier east-west to north-south movement on the eastern and northern legs of approaches to the Courthouse Square area, a by-passing of "through" traffic around the courthouse square for motorists without a destination trip within the square, and reduction in volume on the approaches to the square. As conceptually contemplated, traffic volume into the square area is tempered such that smaller road sections (two-lane facilities) along Main Street and the Fort Worth Highway can accommodate traffic to provide the feel of a small-town walkable environment.
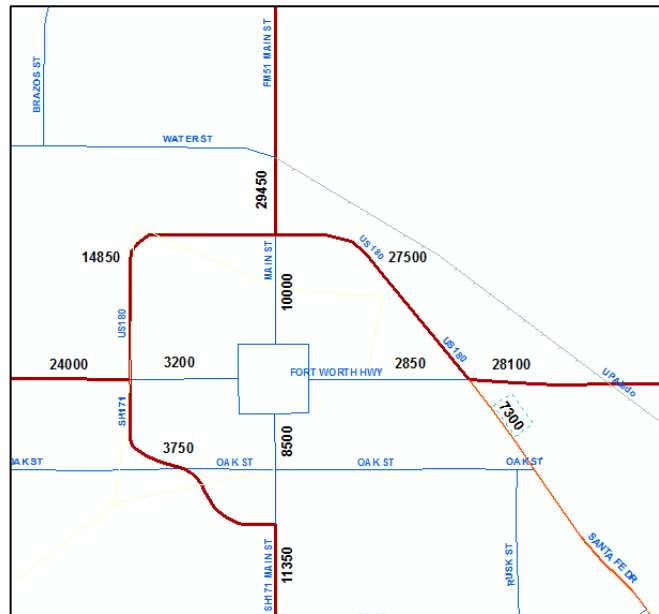
Comparative Forecasting Not Recommended
As anticipated, forecast data from the Statewide Planning Map and the NCTCOG travel demand model reveal significant differences primarily due to the methodological approaches. The Planning Map contains growth rates of about 2%, which is not consistent with occurring growth trends nor do these figures incorporate shifts in volumes as a result the planned downtown loop depicted in the Weatherford Thoroughfare Plan. Travel volume forecasts prepared with the regional travel demand model are recommended for future thoroughfare planning within the downtown area.

The North Central Texas Council of Governments (NCTCOG) Travel Demand Model Process

Summary
Traffic volumes generated by NCTCOG's travel demand model are based on the four-step traffic modeling process, which uses population and employment projections at the Traffic Survey Zone (TSZ) level to forecast trips/ traffic volumes within a roadway network.

NCTCOG Travel Demand Model Methodology
NCTCOG's travel demand model forecasts trips in the region based on a number of factors. These factors include:
- Trip purposes (work, home and shopping)
- Trip length
- Congestion
- Population and Employment

The primary method that trips are forecasted in the region is based on future population and employment projections. To better gauge the location and intensity of population and employment, the region is divided into traffic survey zones (TSZs) which have specific demographic and land use data associated with them. TSZ demographics are based on City, County, and other agency input on planned residential and commercial developments, as well as future land use maps and anticipated development density. The TSZ demographics help determine how many trips are going to be produced on a daily basis and where the trips are going. Dependent upon the anticipated density, each new residential unit is assigned a certain number of daily trips; new commercial developments are assigned daily trips based on the square footage of the development.

Coupled with the demographic forecast, the travel demand model uses the four-step modeling process to determine future traffic volumes. The modeling process includes the following four primary steps:

1. Trip Generation – The number of trips produced and attracted to a destination or TSZ based on trip purpose.
2. Trip Distribution – The estimation of the number of trips between each TSZ, i.e., where the trips are going.
3. Modal Split – The prediction of the number of trips made by each mode of transportation between each TSZ.
4. Traffic Assignment – The amount of travel (number of trips) loaded onto the transportation network through path-building. This is used to determine network performance.

The model not only provides traffic volumes for a forecast year, but roadway level-of-service (LOS) as well.

TxDOT's TPP Division Traffic Projections Methodology

Development of Growth Rate

Historical Average Annual Daily Traffic (AADT) data for up to past 20 years, available at various locations along the study corridor or on roadways near the study corridor are used to develop a regression model. The growth rate obtained using regression is applied to the traffic counts collected on the study corridor to develop projections for the first 20-year period. After the 20-year period, the growth rate will be reduced to a maximum of 2%.

Daily Traffic Forecast

Directional Average Annual Daily Traffic (AADT) projections for the study corridor are typically developed for use in Air and Noise analysis and pavement design for the corridor.

Projections - The daily traffic counts collected on roadway links and the turning movement counts collected at intersections within the study area are used to develop balanced directional AADT for the count year. Once the corridor AADT volumes for the count year are developed, the opening (base) year AADT would be developed by projecting the count year AADT using the growth rate developed by regression. The design year (20-year) and future year (30-year) forecast AADT volumes are developed by projecting the opening year 2020 volumes to the respective years using appropriate growth factors developed using regression.

It is important to note that the regression method is applicable for study corridors/areas that are established and have historical counts available to develop growth trends. For corridors on new alignments, corridors of regional nature, or located in rapidly developing areas, where historical traffic data is ether unavailable or irrelevant in forecasting future traffic demand, use of Regional Travel Demand Models is preferable to develop traffic forecasts.