



SH 201 Extension Needs Assessment Study

April 2015

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Executive Summary

The purpose of this study is to evaluate the need for an additional east-west facility between State Highway (SH) 195 and Interstate 35 (I-35) south of US Highway (US) 190 in Bell County. The study analysed the need for a facility based on existing conditions and forecasted traffic. The study considered the following:

- Existing and forecasted demographics,
- Existing and projected traffic volumes (including a reassessment with the recently updated Killeen-Temple Urban Transportation Study [KTUTS] Traffic Forecasting Model),
- Existing traffic bandwidths and turning movements,
- Available free capacity of the existing facilities,
- Bottleneck analysis using INRIX speed data,
- Travel time and route options with Google maps, and
- Existing system architecture analysis.

Based on this study's analysis, the following can be concluded.

- Although there is significant population growth projected to occur in the southern portion of Bell County, potential growth is substantially lower than that along US 190.
- There are several existing arterial facilities with at least 50 percent free capacity available to support additional growth in east-west movements throughout southern Bell County.
- The projected population for 2040 in Fort Hood is expected to remain at 2012 levels per projections from the Killeen-Temple Metropolitan Planning Organization's (KTMPPO's) *Mobility 2040 Plan*.
- The traffic movements between the Killeen/Fort Hood area and I-35 primarily use US 190 (to and from Temple) or SH 195 (to and from Austin/Georgetown).
- At the intersection of US 190 and I-35, a majority of the demand appears to be to and from Temple (north). Similarly, at the intersection of SH 195 and I-35, a majority of the demand appears to be to and from Austin/Georgetown (south).
- The major attractors in the study area are Killeen, Fort Hood, and Temple. There does not appear to be a substantial traffic demand between the Killeen-Fort Hood area and the section of I-35 between US 190 and SH 195 in southern Bell County.
- Even during the most congested hours of the day, the existing east-west facilities are not congested to the point of creating major delays based on an assessment of existing vehicle speeds. The existing facilities provide adequate mobility for current travel needs and will continue to do so for those anticipated over the next decade.
- A system architecture analysis revealed that the spacing between east-west arterials varies between 5 and 8 miles, providing sufficient alternative routes for the rural area of Bell County.

The study has also developed a series of recommendations.

- Based on the traffic analyses and system architecture analysis, there is no need for another east-west facility at this time or within the next 10 years.
- Factors that could trigger a need for an additional east-west facility include:
 - Major increases in Fort Hood population that fuel rapid growth and development in southern Bell County;
 - Severe congestion along US 190 and SH 195, leading to increased travel times for motorists traveling to and from Temple/Dallas/Fort Worth and Austin/Georgetown; and/or
 - Increased demand for travel to or from the section of I-35 between US 190 and SH 195 because of population growth or emergence of a major activity generator.
- Local governments should monitor development trends and traffic conditions within the study area to provide advanced warning if anticipated trends begin to change towards those more favorable to the development of this sort of transportation improvement.
- Targeting resources and funding improvements along the existing facilities (e.g., US 190, SH 195, and FM 2484) would provide more benefits to area motorists at present.

Study Background

In 2004, the State Highway (SH) 201 Extension project received \$750,000 in National Corridor Planning and Border Development funds to study the feasibility of extending SH 201 from SH 195 to Interstate 35 (I-35) south of US Highway (US) 190 in Bell County. The proposed extension of SH 201 was included in the *Mobility 2030 Metropolitan Transportation Plan* developed by the Killeen-Temple Urban Transportation Study (KTUTS), known since 2009 as the Killeen-Temple Metropolitan Planning Organization (KTMPPO). The project was listed in the 2035 plan under the long-term projects, with funding from Category 3 (Urban Area Corridor Projects), and a score of 23.0 with scores ranging between 17.8 and 51.1 for all long-range projects. The project is currently listed in KTMPPO's current plan, *2040 Metropolitan Transportation Plan (Mobility 2040)*, under the Regionally Significant Unfunded Projects, where it is ranked 100 out of 145 total projects. The project is described as a 4-lane, divided highway with shoulders and has an estimated cost of \$157,350,000.

The purpose of the SH 201 Extension project would be to:

- Provide improved east-west mobility in southern Bell County by directly connecting I-35 and SH 195.
- Provide a high-speed, east-west facility as an alternative to Farm-to-Market Road (FM) 2484, which was considered inadequate to support traffic volumes expected from population growth in southern Bell County.
- Provide relief to US Route (US) 190 by establishing an alternate route between the fast growing area of southern Bell County and the developing corridor of I-35 near the community of Salado.¹

In October 2006, TxDOT began its feasibility study for the project and held a series of four public meetings throughout 2007. The first two meetings were held on March 26th in Salado and March 27th in the City of Killeen, during which TxDOT presented the project's purpose, coordination plan, study area limits, and an initial set of possible route alignments. Between May and September 2007, the project's Environmental Impact Statement (EIS) Advisory Committee met three times. Based on both social and environmental constraints and public comments, the EIS Advisory Committee narrowed down the route alignment options, which the committee presented to the public at the remaining two public meetings held on November 13th in Salado and November 15th in the City of Harker Heights. Additional public comments were received in December 2007, but the project's intended schedule after that date was never realized. This schedule anticipated additional EIS Advisory Committee meetings in 2008, public meetings in 2008 and 2011, and the completion of a detailed environmental study by 2012.² In May 2014, TxDOT initiated this Needs Assessment Study for the project.

¹ TxDOT. 2007. SH 201 Route Study, Scoping Meetings Handout. November 13-15, 2007.

² According to Verbatim Transcript, SH 201 Extension Scoping Meeting, November 13, 2007.

Needs Examination

The purpose of the study is to determine whether the SH 201 Extension project is needed based on anticipated growth projections for southern Bell County. The scope of this study extends into the greater Killeen-Temple area in order to understand demographic and traffic patterns throughout the entire region. The study area boundary used for the report corresponds to the expanded KTMPPO planning area, which encompasses all of Bell County, portions of Lampasas and Coryell counties, and portions of Fort Hood.

Two approaches were used to determine the need for the project. First, an analysis of current and future demand on the area's existing facilities was performed based on demographic and travel demand information from KTMPPO's 2040 Travel Demand Model, KTMPPO's *Mobility 2040*, traffic data from the Road and Highway Network Inventory (RHiNo 2013) as maintained by TxDOT, INRIX speed data, and various Google maps. Second, a system architecture analysis was performed based on spacing between SH 195 and US 190 connecting to I-35 in Bell County.

Current and Future Demand Analysis

Socioeconomic Projections

Between 2000 and 2010, the population of the Killeen-Temple-Fort Hood Metropolitan Statistical Area (MSA) increased by 74,586 people.³ As shown in Exhibit 1, it is expected that by 2040 the area will add an additional 200,000 people and close to 90,000 jobs.

Exhibit 1: Existing and Projected Population and Employment within the KTMPPO Planning Area

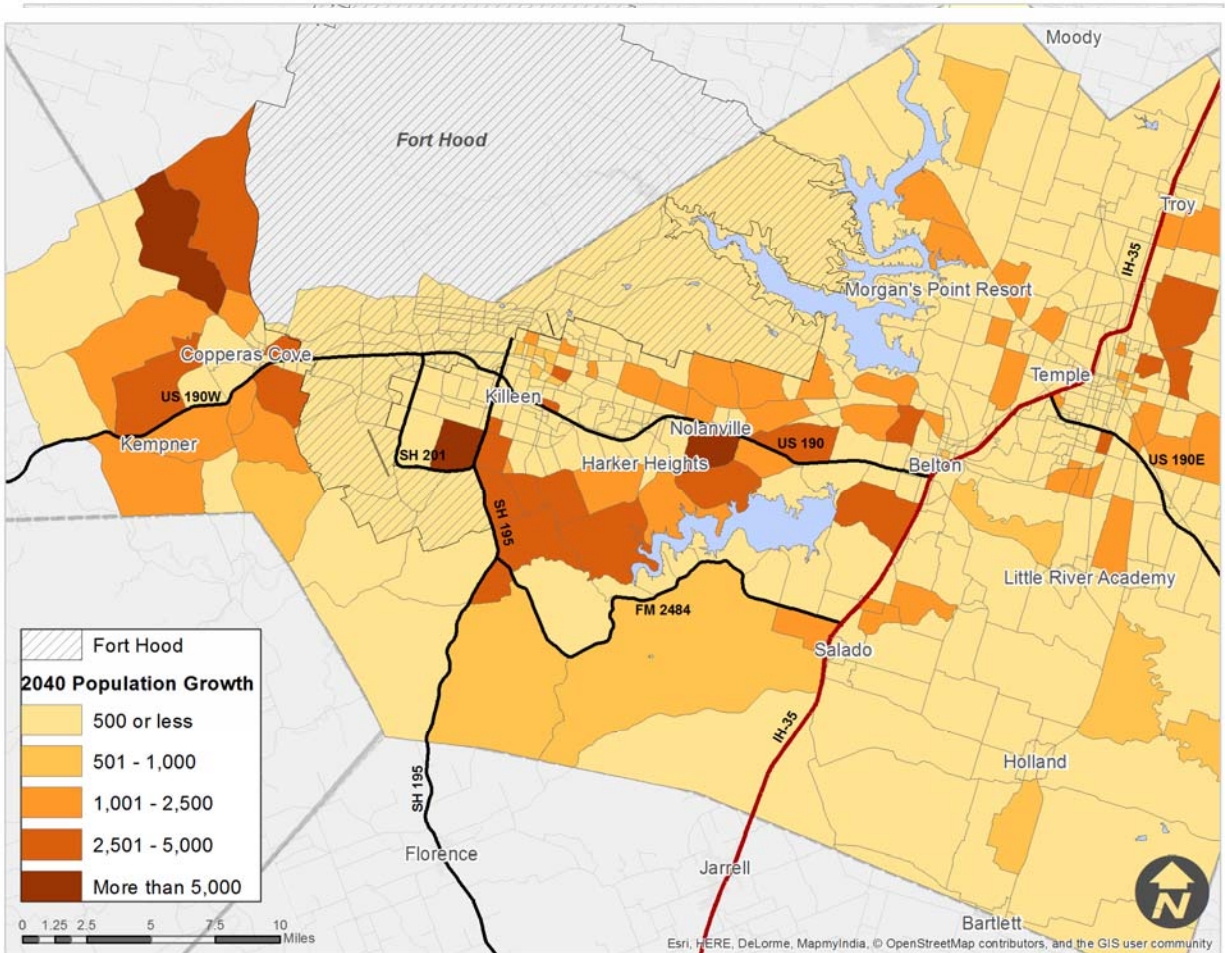
KTMPPO Planning Area	2010	2040 Projection	Absolute Growth	Compound Annual Growth Rate
Population	339,326	538,460	199,134	1.55%
Employment	159,518	249,000	89,482	1.50%

Source: KTMPPO *Mobility 2040*.

Data from KTMPPO's 2040 Travel Demand Model was studied in ArcGIS as it related to the study area's travel demands (traffic analysis zones or TAZs). Exhibit 2 depicts that most of the population growth is expected to occur around Fort Hood in the far west and south-central portions of the KTMPPO planning area. Exhibit 3 focuses on the south-central area where the proposed extension of SH 201 would potentially connect to I-35. The exhibit illustrates that population growth is expected to occur from 2010 to 2040 within each of the identified TAZs.

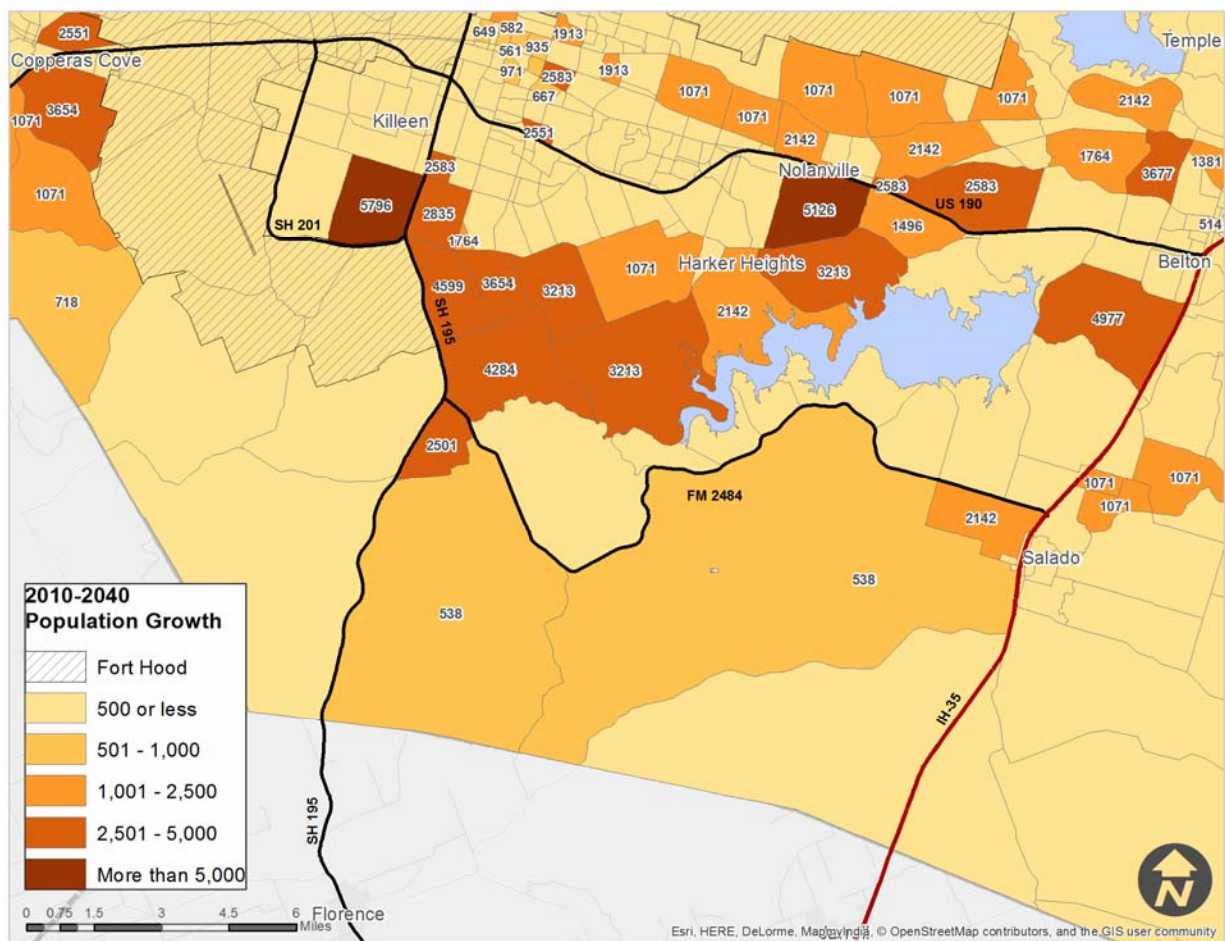
³ US Census Bureau, <http://www.census.gov/population/www/cen2010/cph-t/cph-t-5.html>, accessed August 18, 2014.

Exhibit 2: Projected Population Growth from 2010 to 2040 within the KTMO Planning Area



Source: KTMO socioeconomic data.

Exhibit 3: Projected Population Growth from 2010 to 2040 within the South-Central Portion of the KTMO Planning Area

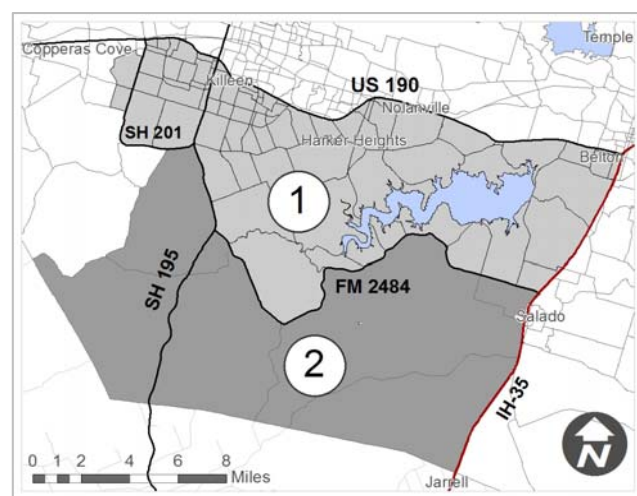


Source: KTMO socioeconomic data.

Note: Only zones with population growth of 500 or more are labelled.

An analysis was performed to clarify the socioeconomic patterns projected for the south-central portion of the KTMO planning area. Exhibit 4 divides this area into two zones. Zone 1 combines the TAZs within the light grey area shown south of US 190. Zone 2 combines the TAZs within the dark grey area shown south of FM 2484 and west of SH 195. Exhibit 5 presents the compiled 2040 projected population and employment data corresponding to Zones 1 and 2 shown on the Exhibit 4.

Exhibit 4: South-Central KTMO Detail



Source: KTMO socioeconomic data.

Exhibit 5: Projections corresponding to Zones 1 and 2 from Exhibit 4

Population 2010	Population Projection 2040	Zone	Population Growth	% of Absolute Population Growth
99,586	148,213	1	48,627	89%
4,691	10,410	2	5,719	11%
104,277	158,263	TOTAL	54,346	100%
Employment 2010	Employment Projection 2040	Zone	Employment Growth	% of Absolute Employment Growth
16,921	30,077	1	13,156	74%
520	5,114	2*	4,594	26%
17,441	35,191	TOTAL	17,750	100%

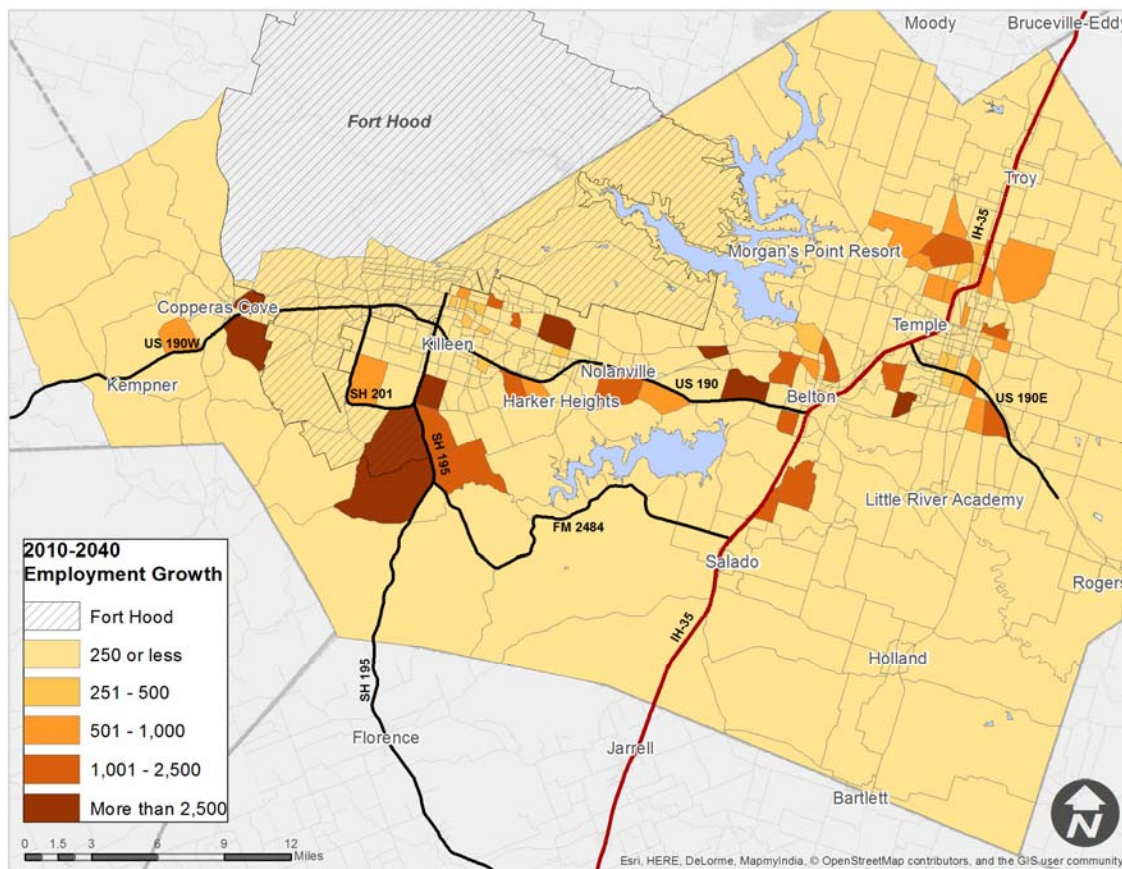
* Over 4,000 of these jobs were added in Fort Hood.

Source: KTMPD socioeconomic data.

Zone 1 is near Fort Hood, which is by far the greatest economic driver in the region. Covering large portions of the cities of Killeen, Harker Heights, Nolanville, and Belton, Zone 1 represents a mature, yet growing urban corridor with well-established residential and commercial development associated with Fort Hood. In contrast, Zone 2 is more rural/suburban in nature and contains large areas of undeveloped land.

One of the primary reasons for the project relates to the expected growth in southern Bell County, which is anticipated to create the need for additional connectivity to I-35 and the area around Salado. Yet, Exhibit 5 demonstrates that Zone 1 will represent a considerably larger absolute growth, both in terms of population and employment between 2010 and 2040. Exhibit 6 shows that most of the jobs generated through 2040 will be clustered around Fort Hood and the City of Temple.

Exhibit 6: Projected Employment Growth from 2010 to 2040 within the KTMO Planning Area



Source: KTMO socioeconomic data.

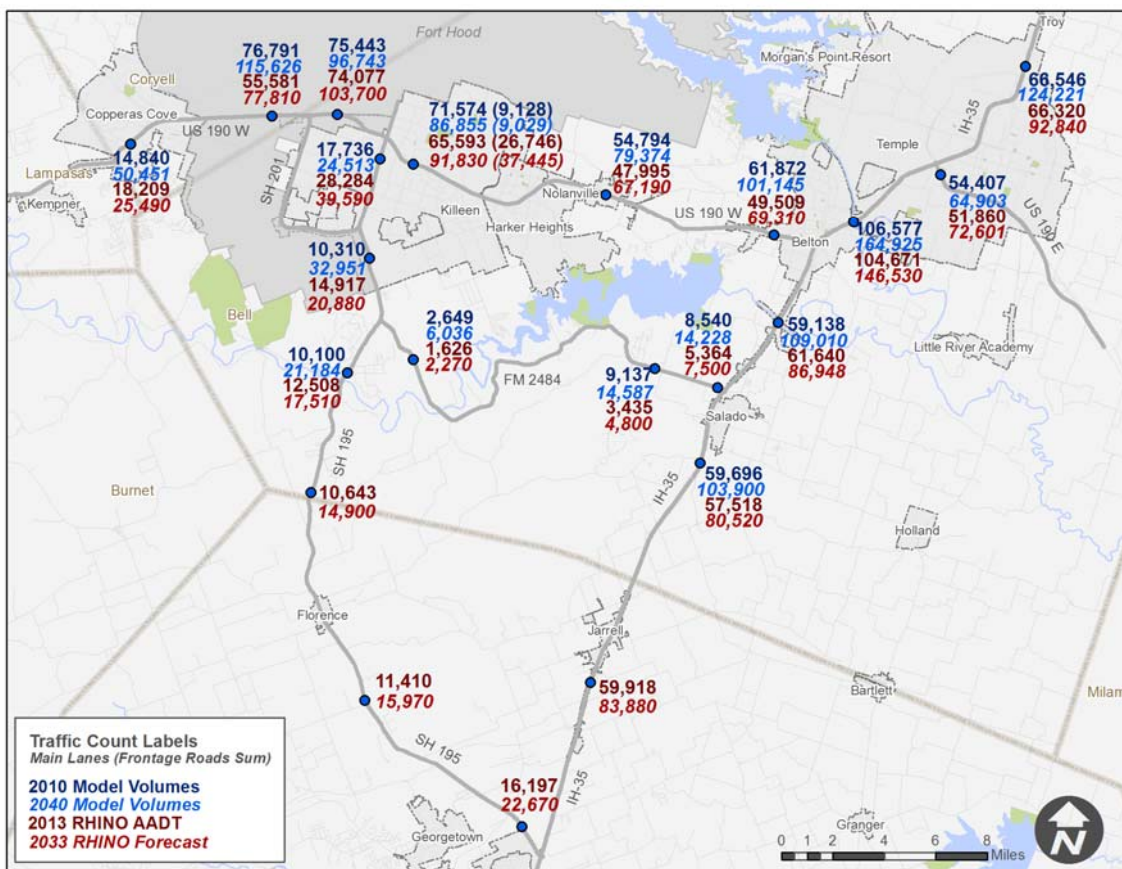
This finding suggests that Fort Hood and the commercial corridor in Zone 1 will continue to be the economic drivers in the study area. Furthermore, with a dependence on (or relationship to) what occurs in Zone 1, the expected growth in Zone 2 would create a greater need for north-south connectivity towards Killeen and Fort Hood, rather than east-west connectivity towards Salado.

Existing and Projected Traffic Demand

Exhibit 7 provides a regional perspective of the traffic patterns within the study area. The graphic shows traffic counts and projections from two sources: the numbers in blue correspond to KTMO's 2040 Model and its corresponding 2010 as well as 2040 projections, while the numbers in red correspond to RHINO 2013 data and its corresponding 2033 projections.

Similar to the demographic patterns discussed above, traffic data from these sources confirm the strong relationship between Fort Hood and the study area. Movement along the US 190 corridor greatly intensifies around and within Fort Hood. Traffic on SH 195 also increases as it approaches the military base. However, southward movement along SH 195 tends to decrease as the highway gets further away from Fort Hood and Killeen.

Exhibit 7: Traffic Counts and Projections for 2010 to 2040 (KTMPPO data) and 2013 to 2033 (RHINO data)



Source: 2010 KTMPPO Model; 2013 RHINO data.

Notes: Blue numbers correspond to KTMPPO volumes; red numbers correspond to RHINO volumes, the numbers in parentheses are frontage road volumes, where applicable.

As the existing alternate east-west route to US 190, FM 2484 experiences less traffic demand compared to SH 195, indicating that southward movement coming from the more developed areas around Fort Hood and Killeen is more likely to head in the direction of Georgetown and Austin, rather than east towards Salado.

It should be noted that the 2013 volumes are actual traffic counts for area roadways. On an overall basis, the KTMPPO model appears to accurately replicate traffic demand based on the 2010 output. However, comparing the actual 2013 volumes with the results of Traffic Model forecasts for 2010 suggests that the model overestimates traffic demand on east-west facilities that SH 201 might serve. This is particularly true on FM 2484, which is an east-west facility in the middle of the southern Bell County traffic shed. As depicted in Exhibit 8, the model is overestimating demands uniformly by almost 100 percent throughout the corridor.

Exhibit 8: 2013 Traffic Counts and Model Base Year Comparison

Location	2013 Counts	2010 Model	Difference	% Change
FM 2484 east of SH 195	1,600	2,600	1,000	63%
FM 2484 south of Lake	3,400	9,200	5,800	171%
FM 2484 west of I-35	5,400	8,500	3,100	57%
Total for FM 2484	10,400	20,300	9,900	95%

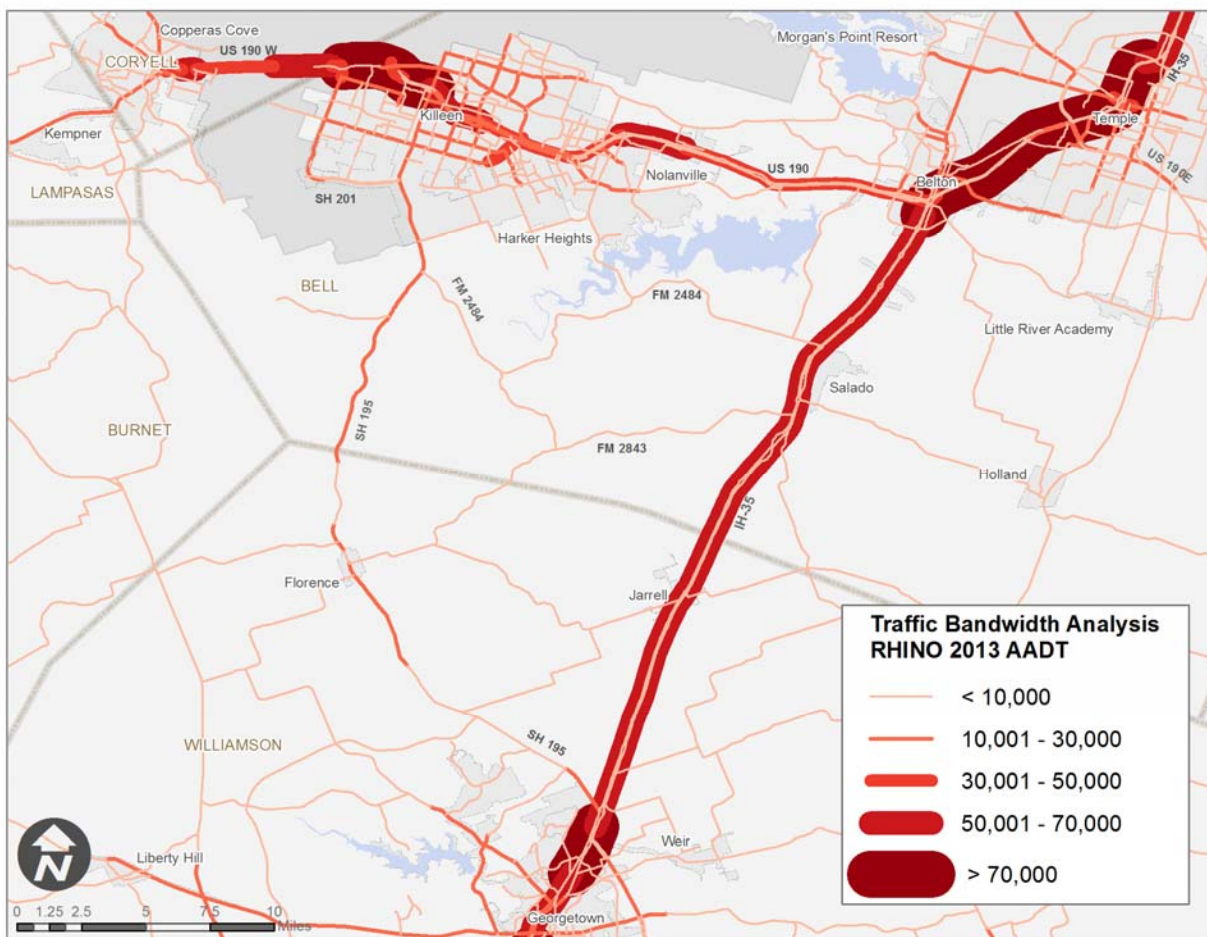
Source: 2010 KTMP0 Model; 2013 RHINO data

Understanding these relationships is critical when interpreting the results of the model. As previously mentioned, the model does a fairly good overall job, but the demand in the FM 2484 corridor is overstated. Since any demand in this corridor is most likely to be capable of diversion to the SH 201 Extension because of proximity, this is a critical matter in establishing accurate forecasts. 2040 forecasts along the eastern side of the FM 2484 corridor would suggest demand in excess of a two-lane capacity (14,200 to 14,600 vehicles per day). However, recognizing the consistent overstatement of the model in this area suggests that traffic forecasts would actually fall below the available capacity for existing facilities. Thus, 2040 demand in the area does not suggest the need for investment in additional facilities, such as SH 201.

Bandwidth Analysis and Traffic Movements

Traffic patterns in the study area were analysed by examining the traffic volumes along the existing facilities in the area. Exhibit 9 reveals high concentrations of traffic along I-35 and US 190, primarily near Temple and at the entrances to Fort Hood. Some portions of SH 195 have average annual daily traffic below 10,000 vehicles per day. Nevertheless I-35, US 190, and SH 195 generally have volumes above 10,000 vehicles per day. East-west facilities (in particular those south of US 190, like FM 2484 and FM 2843) have volumes much lower than 10,000 vehicles per day.

Exhibit 9: Traffic Bandwidth Analysis based on 2013 RHINO data



Source: 2013 RHINO data.

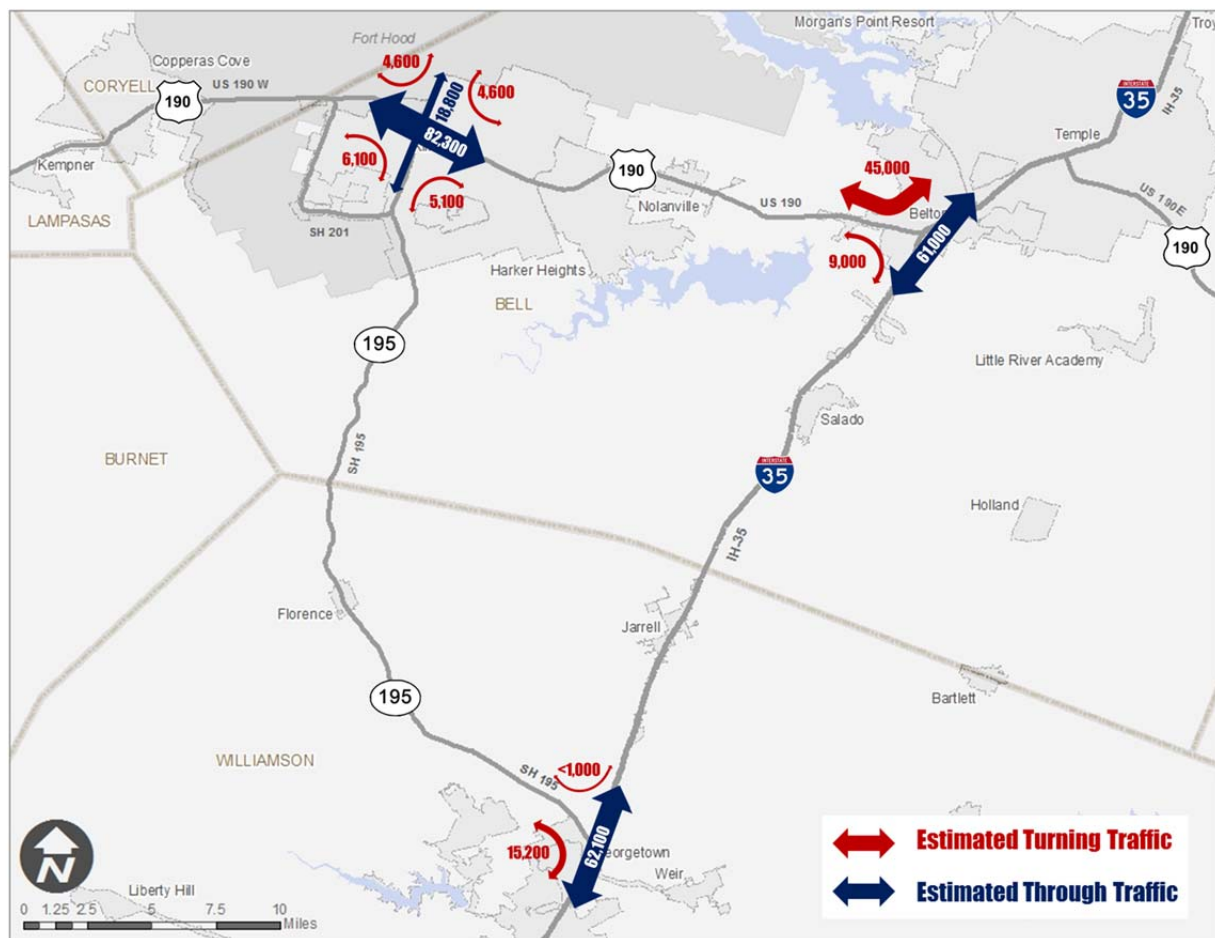
Additionally, traffic movements were estimated based on 2012 AADT on all legs of the existing facilities for connections between facilities, including US 190, SH 195, and I-35, in an effort to understand traffic flow and patterns. Traffic movements described in this section are shown graphically on Exhibit 10.

At the intersection of US 190 and SH 195, US 190 accommodates a large amount of through traffic (about 82,300 vehicles per day). SH 195, on the other hand, has approximately 18,800 vehicles per day passing through the intersection. The likely turning traffic between the two facilities varies from approximately 4,600 to 6,100 vehicles per day. At the interchange of US 190 and I-35, most of the traffic is traveling through on I-35 (roughly 61,000 vehicles per day). Traffic between US 190 and north I-35 (towards Temple) is also high (about 45,000 vehicles per day), but traffic between US 190 and I-35 south (towards Salado) is only a fraction (roughly 9,000 vehicles per day) of the other movements.

The noted traffic volumes demonstrate that the majority of travel on US 190 is oriented to or from the Temple area. At the interchange of SH 195 and I-35, through traffic on I-35 exceeds 62,000 vehicles per day. There is significant difference in the turning traffic at this

interchange, with as many as 15,000 vehicles per day moving between SH 195 and I-35 south (towards Georgetown and Austin), as compared to less than 1,000 vehicles per day moving between SH 195 and I-35 north (towards the City of Jarrell). Considering that Salado and Jarrell have populations of less than 2,500 people each, demand for a direct connection to these communities from western Bell County appears low, and most of the traffic is either oriented towards Temple (where US 190 provides a more direct route) or towards Georgetown and Austin (where SH 195 provides a more direct route).

Exhibit 10: Traffic Movements



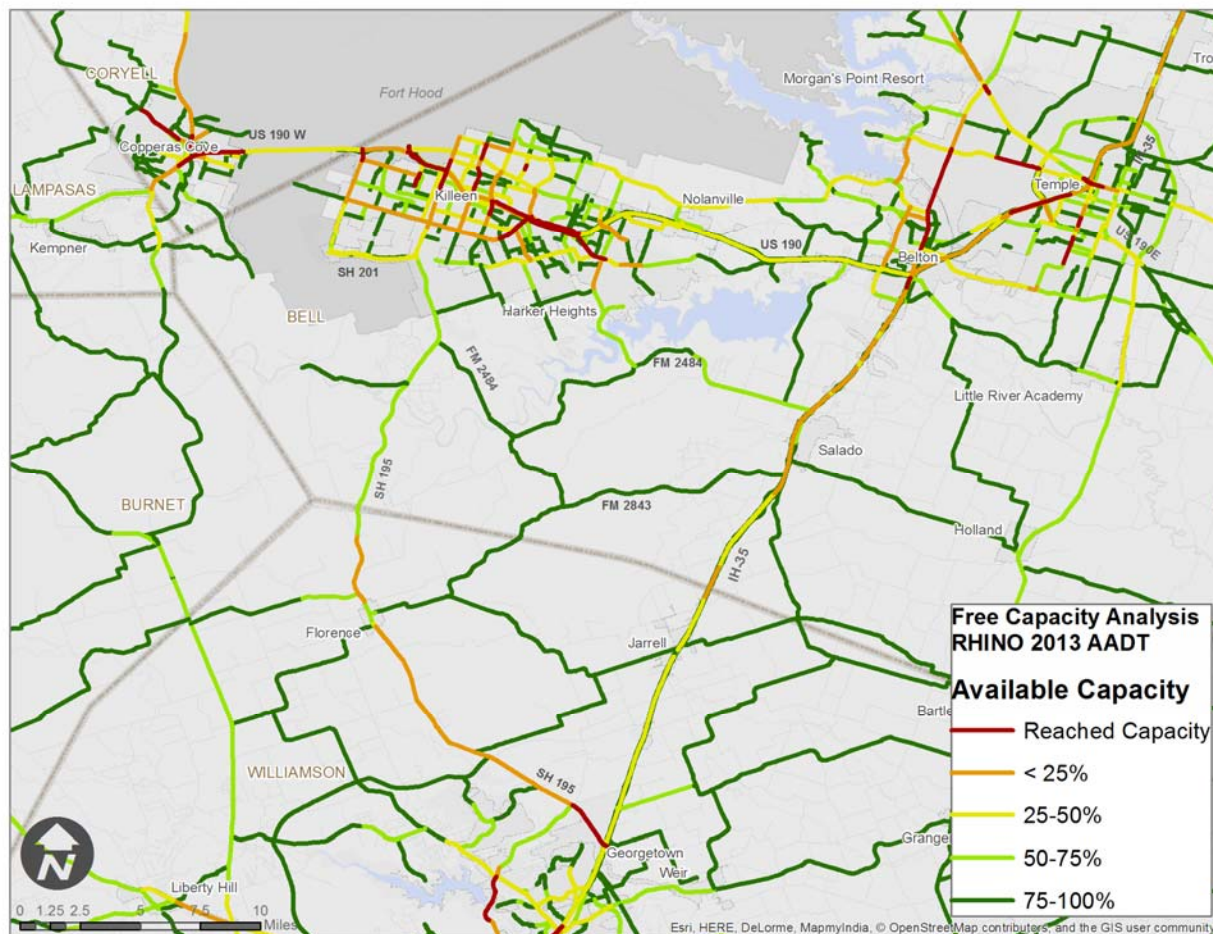
Source: 2013 RHINO data with SH 201 Analyses.

Capacity Analysis

An analysis of free capacity on existing facilities was conducted to comprehend if the lower volumes on some of the east-west facilities were due to capacity constraints. As detailed on Exhibit 11, FM routes connecting SH 195 and US 190 (including FM 2484 and FM 2843) use less than 50 percent of their capacity. Therefore, low traffic volumes in southern Bell County are not from capacity constraints, but primarily exist because there is not much demand for those specific traffic movements. In addition, both FM facilities do not provide

direct connection between area populations and high-activity areas like Killeen, Temple, and Fort Hood.

Exhibit 11: Available Capacity

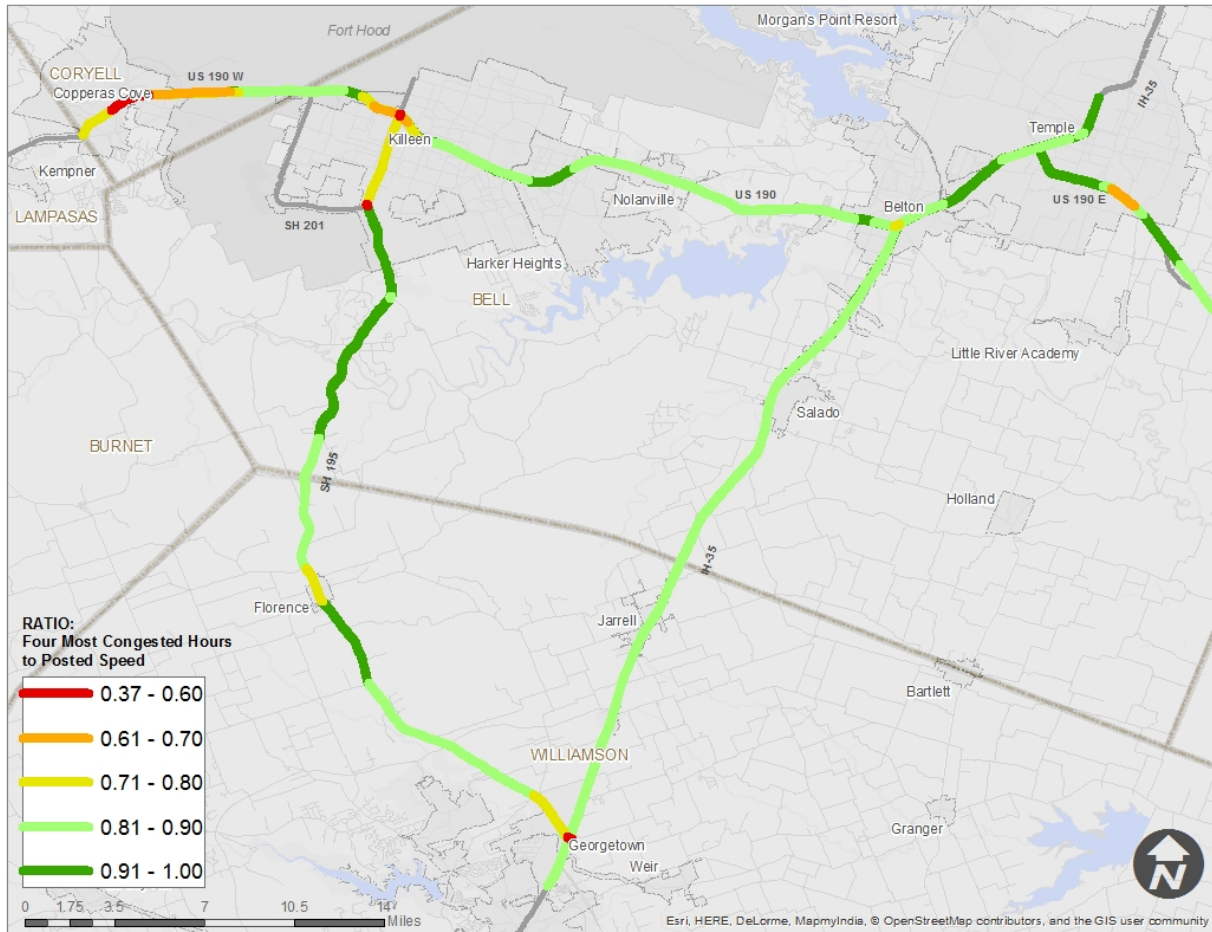


Source: 2013 RHINO data.

INRIX Speed Analysis

A number of companies are now mining databases of cell phone companies to provide composite information that describes motorists' behaviour in specific communities around the country. INRIX is one of these companies. INRIX speed data was analysed for I-35, US 190, and SH 195 to identify potential bottlenecks in the study area. The ratio of speeds during the four most congested hours of the day to the posted speed limits was computed to measure the ability to travel at "free-flow" speeds. As illustrated on Exhibit 12, the bottlenecks are present at the intersection of US 190 and SH 195, at entrances to Fort Hood along US 190, and further west on US 190. Most portions of US 190 and SH 195 have a ratio of over 0.8, suggesting that no severe congestion occurs in these sections during the most congested hours of the day.

Exhibit 12: INRIX Speed Analysis



Source: INRIX Speed Data 2013

Alternate Routes and Travel Time Analysis

Another check on the reasonableness of area traffic forecasts is to compare the potential to make more efficient trips between common points using different routes. For this study, the analysis consisted of comparing trips between the US 190/SH 195 intersection and three different locations along I-35 using Google maps. For each trip, three alternate routes were compared. In Analysis 1 (the US 190/SH 195 interchange to the I-35/FM 2484 interchange) and Analysis 2 (the US 190/SH 195 interchange to the I-35/FM 2843 interchange), travel times are comparable between the three routes (24 to 25 minutes in total), although the distances vary notably between the shortest and the longest routes. The route recommended by Google maps, however, is FM 2484 or FM 2843. In Analysis 3 (the US 190/SH 195 interchange to the I-35/SH 195 interchange), travel times and distances vary significantly with the shortest distance and time provided by SH 195, the most direct route. In all cases, the average speed is approximately 50 miles per hour (mph) or higher. Coupled with the previous assessment using INRIX data, it is apparent that the existing system provides reasonable options for travel between Killeen and various points along I-35.

Exhibit 13a: Analysis 1: From the US 190/SH 195 Intersection to the I-35/FM 2484 Interchange

Route	Distance (miles)	Time (min.)	Speed (mph)
1	19.6	24	49
2	23.5	24	59
3	24.7	25	59

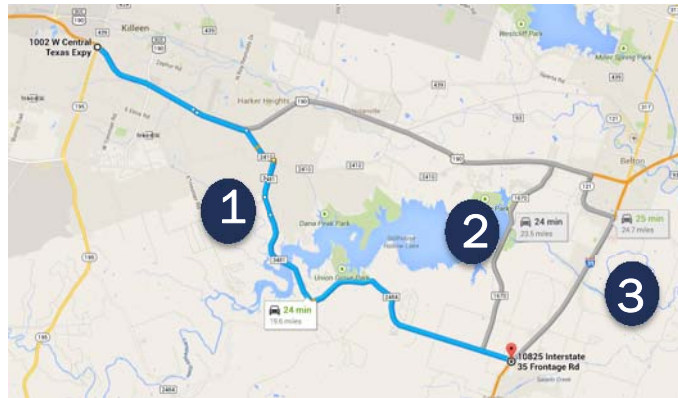


Exhibit 13b: Analysis 2: From the US 190/SH 195 Intersection to the I-35/FM 2843 Interchange

Route	Distance (miles)	Time (min.)	Speed (mph)
1	24.9	29	51
2	22.4	28	48
3	27.5	27	61



Exhibit 13c: Analysis 3: From the US 190/SH 195 Intersection to the I-35/SH 195 Intersection

Route	Distance (miles)	Time (min.)	Speed (mph)
1	33.2	36	55
2	38.4	45	51
3	47.0	44	64

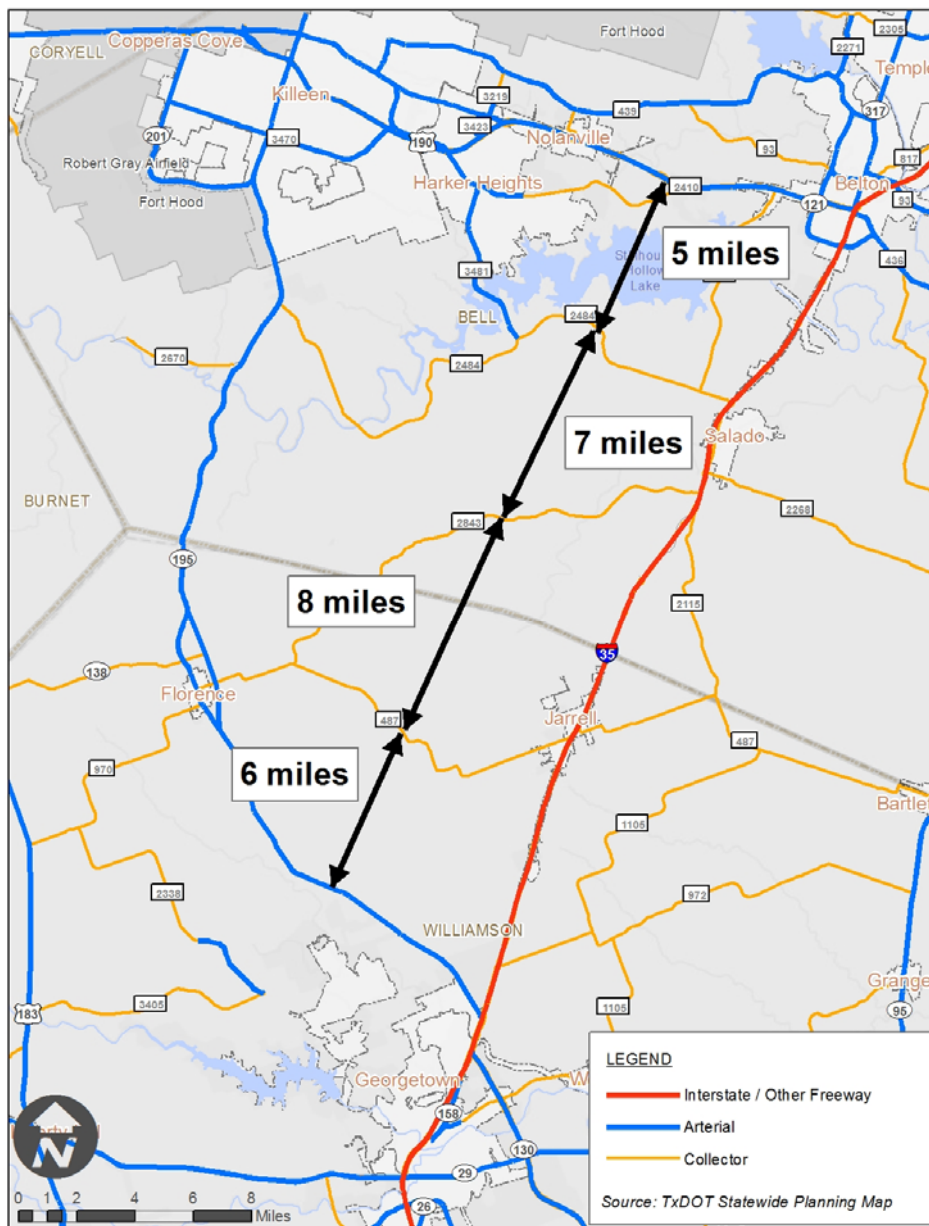


Source: Google Maps

System Architecture Analysis

An analysis of the existing thoroughfare system was conducted to assess the need for an alternative route from a system architecture standpoint. Exhibit 14 shows arterials and collectors relevant to this analysis based on KTMPO's *Mobility 2040*. (Exhibits 4.8 to 4.12 in KTMPO's *Mobility 2040* provide further details.) In general, the distances between the noted east-west connections vary from 5 to 8 miles, providing reasonable transportation opportunities for the rural portion of Bell County.

Exhibit 14: Distances between East-West Arterials and Collectors in the Study Area



Source: TxDOT Statewide Planning Map

Community and Environmental Constraints

A desktop-level environmental constraint mapping exercise was performed in reference to the study area. Key constraints include Stillhouse Hollow Lake, Peaceable Kingdoms Children Retreat, Texas Veterans Cemetery, the existing educational campus near Salado, and a Texas A&M campus near the intersection of SH 201 and SH 195. In addition, there are several state and local parks adjacent to Stillhouse Hollow Lake that should be considered when locating a new east-west facility within the study area. Detailed environmental research and field investigation would be necessary if the development of a facility in the future becomes more desirable and necessary.

Alternatives Considered

No alternatives were considered for this study.

Conclusions and Recommendation

Based on the analyses, the following can be concluded.

- Although there is significant population growth projected to occur in the southern portion of Bell County, potential growth is substantially lower than that along US 190.
- There are several existing arterial facilities with at least 50 percent free capacity available to support additional growth in east-west movements throughout southern Bell County.
- The projected population for 2040 in Fort Hood is expected to remain at 2012 levels per projections from KTMPO's *Mobility 2040*.
- The traffic movements between the Killeen/Fort Hood area and I-35 primarily use US 190 (to and from Temple) or SH 195 (to and from Austin/Georgetown).
- At the intersection of US 190 and I-35, a majority of the demand appears to be to and from Temple (north). Similarly, at the intersection of SH 195 and I-35, a majority of the demand appears to be to and from Austin/Georgetown (south).
- The major attractors in the study area are Killeen, Fort Hood, and Temple. There does not appear to be a substantial traffic demand between the Killeen-Fort Hood area and the section of I-35 between US 190 and SH 195 in southern Bell County.
- Even during the most congested hours of the day, the existing east-west facilities are not congested to the point of creating major delays based on an assessment of existing vehicle speeds. The existing facilities provide adequate mobility for current travel needs and will continue to do so for those anticipated over the next decade.
- A system architecture analysis revealed that the spacing between east-west arterials varies between 5 and 8 miles, providing sufficient alternative routes for the rural area of Bell County.

The study has developed a series of recommendations.

- Based on the traffic analyses and system architecture analysis, there is no need for another east-west facility at this time or within the next 10 years.
- Factors that could trigger a need for an additional east-west facility include:
 - Major increases in Fort Hood population that fuel rapid growth and development in southern Bell County;
 - Severe congestion along US 190 and SH 195, leading to increased travel times for motorists traveling to and from Temple/Dallas/Fort Worth and Austin/Georgetown; and/or
 - Increased demand for travel to or from the section of I-35 between US 190 and SH 195 because of population growth or emergence of a major activity generator.
- Local governments should monitor development trends and traffic conditions within the study area to provide advanced warning if anticipated trends begin to change towards those more favorable to the development of this sort of transportation improvement.
- Targeting resources and funding improvements along the existing facilities (e.g., US 190, SH 195, and FM 2484) would provide more benefits to area motorists at present.