MOBILITY 2045

Killeen-Temple Metropolitan Planning Organization

metropolitan transportation plan

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Approved by the KTMPO Transportation Planning Policy Board: May 15, 2019
Effective Date: May 15, 2019

The 2045 Metropolitan Transportation Plan development and adoption was consistent with requirements identified in the KTMPO 2018 Public Participation Plan. Public input was solicited via public workshops held in April 2018. Public comments received during these workshops were considered in the development of a draft plan. The draft plan was available for public comment for a 30-day period from March 23, 2019 to April 21, 2019. Public hearings on the draft plan were held at ADA accessible locations, with one in the Eastern portion of the KTMPO boundary and one in the Western portion of the KTMPO boundary. Documentation of the 2045 MTP public participation is included in **Appendix C**. Dates and locations of the public hearings are as follows:

Tuesday, March 26, 2019
12:00pm Harker Heights Activities Center, 400 Indian Trail, Harker Heights, TX 76548
5:00pm Central Texas Council of Governments, 2180 N. Main Street, Belton, TX 76513

Federal Certification Review

Every four years, the Secretary of the U.S. Department of Transportation (DOT) must certify that each metropolitan planning organization (MPO) serving a transportation management area (TMA) – a designation by DOT of an urbanized area with a population over 200,000 as defined by the Bureau of the Census or smaller urbanized areas on request by the Governor and MPO – is carrying out the metropolitan planning process in adherence with federal statutes and regulations. FTA and FHWA conduct a review of the metropolitan planning process within each TMA and jointly issue this certification on behalf of the DOT Secretary, in accordance with 49 U.S.C. 5303(k).

In May 2018, KTMPO underwent the four-year Federal Certification Review. A public involvement session held by FTA/FHWA was held on Wednesday, May 9, 2018 at the Central Texas Council of Governments to assess the public's perspective on KTMPO transportation planning processes.

A letter from FTA and FHWA dated May 1, 2019, determined "that the metropolitan transportation planning process is substantially consistent with the federal requirements" with no corrective actions needed.

The Letter from FTA/FHWA and full Summary Report is included in **Appendix J**.

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

RESOLUTION NO. 2019-04

A RESOLUTION OF THE KILLEEN-TEMPLE METROPOLITAN PLANNING ORGANIZATION REGARDING THE 2045 METROPOLITAN TRANSPORTATION PLAN

WHEREAS; 23 CFR Part 450 requires Metropolitan Planning Organizations (MPOs) to develop a long-range, multimodal, financially constrained transportation plan for each metropolitan area every four years; and

WHEREAS; the Transportation Planning Policy Board (TPPB) of the Killeen-Temple Metropolitan Planning Organization (KTMPO) is the MPO for the Killeen-Temple planning area; and

WHEREAS; through the conduct of a continuing, comprehensive and coordinated transportation planning process in conformance with applicable federal and state requirements, KTMPO developed the latest Metropolitan Transportation Plan (MTP) with a 2045 horizon year; and

WHEREAS; the 2045 MTP contains and integrated set of strategies and investments to maintain, manage and improve the transportation system in the planning region through the year 2045 and calls for development of an integrated intermodal transportation system that facilitates the efficient, economic movement of people and goods; and

WHEREAS; the 2045 MTP considers, analyses and reflects, as appropriate, the metropolitan transportation planning process as identified in federal law, including MAP-21 and the FAST Act, and is based reasonable available funding provisions; and

WHEREAS; the 2045 MTP integrates a Congestion Management Process identifying the most serious congestion problems and evaluating and incorporating, as appropriate, all reasonably available actions to reduce congestion, such as travel demand management and operational management strategies for all corridors with any proposed capacity increase; and

WHEREAS; the KTMPO meets federal air quality standards and is in attainment status for these standards; and

WHEREAS; the 2045 MTP was developed through a strategic, proactive, comprehensive public outreach and involvement program, which included: an adopted public participation plan; advertising in local and regional newspapers; distribution of public information materials; a dedicated website; an interactive web-based visualization tool; five workshops to facilitate public comments on the draft 2045 MTP; two public hearings to receive comments on the draft 2045 MTP; and interagency coordination and involvement.

NOW, THEREFORE, BE IT RESOLVED that the Killeen-Temple Metropolitan Planning Organization hereby approves the 2045 Metropolitan Transportation Plan.

PASSED AND ADOPTED on this 15th day of May 2019 at a regular meeting of the Killeen-Temple Metropolitan Planning Organization Transportation Planning Policy Board, which meeting was held in compliance with the Open Meetings Act, Texas Government Code, 511.001, *et seq.*, at which meeting a quorum was present and voting.

ATTEST:

Mayor Tim Davis, Chair

Jim Reed, KTMPO Director

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INTRODUCTION

Over the last decade, Bell County and its neighboring counties in Central Texas between Dallas and Austin have experienced unprecedented growth. By 2045, the area is expected to add more than 206,000 people and 105,000 jobs. This is equivalent to adding another city the size of Killeen in just 25 years, and there are already more people on the road than the system has the capacity to handle. Planning for anticipated growth is critical now to ensure that people and goods can continue to move throughout the region reliably and to ensure the quality of life residents enjoy today will remain in the future. The metropolitan transportation planning process requires the development of long and short-range strategies that help develop an integrated, intermodal transportation system that facilitates these goals, a task made more challenging by dwindling revenues from state and federal motor fuels taxes. The Killeen-Temple MPO's Mobility 2045 Plan was developed through a continuing, cooperative, and comprehensive regional planning process and identifies needs, financial resources, and priorities for the KTMPO area.

The KTMPO region is located in Central Texas and includes the urbanized areas surrounding Killeen and Temple. The planning area includes all of Bell County with portions of Coryell and Lampasas counties.

SYSTEM EXPANSION

As the KTMPO region grows in population, demand on the transportation system will grow as well. The 2045 MTP identifies 65 roadway projects, and 24 bike/pedestrian projects for our region for the 25-year planning horizon. Through KTMPO's Congestion Management Process, congested areas will be identified, and priority given to resulting remedial projects, but only $455 million is available from state and federal funding to address these needs. Other priorities include expanding bike/pedestrian facilities and growing successful bus services.

MTP GOALS AT A GLANCE

- Improve mobility, reduce congestion
- Improve access to jobs, homes, goods, and services
- Improve safety, reliability, and efficiency in transportation system

- Promote a healthier environment
- Encourage regional coordination in decision making

ROADWAY

Located centrally between the Texas Triangle mega-region, Central Texas maintains major roadway facilities that are vital to commerce, manufacturing and the military. Within our region are nationally known manufacturers of goods, distributers of various products, nationally recognized medical facilities and the largest active duty armored post in the United States Armed Services.

Growth factors and expected pass-through traffic growth on our roadways will continue to warrant major investments for safe and reliable roadway facilities.

KTMPO ACCOMPLISHMENTS IN PAST 5 YEARS

- US 190 Bypass in Copperas Cove
- SH 9 relief route in Copperas Cove
- IH 35 widening: US 190 to FM 2843
- US 190 widening: Spur 172 (Main Gate) to Roy Reynolds
- MLK/9th Street Roadway Expansion in Belton
- Phase 1 of LP 363 and Spur 290 Interchange
- SH 317 widening: FM 439 to FM 2305
- Main St. Sidewalk: Avenue C to Avenue J in Belton
- Phase I, II, and III of Ave. D Streetscape Project in Copperas Cove
- Designation of Interstate 14

TRANSIT

The use of public transit is an important tool for improving mobility throughout our region. Hill Country Transit District recommends $11 million in vehicle capital investments across the region through the year 2045. In addition, the following special capital projects are under consideration:

<u>Intelligent Transportations Systems (ITS):</u>

· Vehicle Monitoring Systems (surveillance cameras)
· Transfer Center Kiosks
· Upgraded Vehicle-to-Dispatch Communications System
· Transfer Center Security Systems
· Electronic Fare Payment Smart Cards

<u>Regional Multi-Modal Transportation Facility:</u>

· Transfer Terminal for transit system which could also accommodate intercity bus carriers and taxi cabs. Potential for development as a transit plaza with day care center, ATM machines, restaurants, shops, etc.

BICYCLE AND PEDESTRIAN

Public input supports funding for bicycle and pedestrian improvements throughout the KTMPO region. The Transportation Alternatives Program (TAP) will provide a dedicated source of funding for these types of projects.

To accommodate and support multi-modal travel, Hill Country Transit District now provides bicycle racks on all fixed route buses.

KTMPO recently updated the 2011 Pedestrian/Bicycle Plan as the newly named 2018 Regional Multimodal Plan and continues to monitor the plan goals and objectives to ensure identified needs are met for the region.

MULTIMODAL ALTERNATIVES

Multimodal alternatives in the KTMPO region include rail and trucking for freight while passengers are served through rail, air, motor coach and local bus transit facilities. Located on a Congressional High Priority Corridor, the KTMPO area is one of the highest density freight zones in the United States. This corridor includes the Canada to Mexico, Dallas to San Antonio and Dallas to Houston markets. In addition to KTMPO's strategic economic location for freight, the effective movement of Fort Hood troops/equipment/supplies by all modes of transportation are a key factor in the security and safety of our nation.

SAFETY

Safety issues are discovered in the region by analyzing the prevalence of crashes. The plan highlights the high crash locations and includes deeper analysis on:

· crash type
· crash location
· system user
· contributing cause

SECURITY

The transportation system's ability to respond and recover from an event is important to the well-being of its users. Central Texas Council of Government's Emergency Operation Plan lays out region-wide response management should a disaster occur in the region. The Killeen-Temple MPO monitors this plan to assess the ability of the system to respond to an event.

QUALITY OF LIFE

Protecting the environment, whether natural or man-made, is a key factor in ensuring a high quality of life for the region's occupants. Sensitive environmental features and areas have been identified and the MPO coordinates with appropriate groups and agencies to develop applicable mitigation strategies. Sustainable practices, and context sensitive design and solutions, are also promoted by the MPO to preserve and enhance the region's quality of life.

KTMPO monitors ozone levels via two air quality monitoring stations in the region. The MPO is promoting awareness of air quality issues, climate change and the impact greenhouse gas emissions have on air quality and is also exploring participation in the Ozone Advance Program. A Congestion Management Process is in place to reduce roadway congestion which will also result in cleaner air. Overall, the KTMPO region is currently in compliance with ozone standards.

FINANCING THE 2045 MTP

The 2045 MTP includes a total of 89 projects at an estimated cost of $932 million. However, with anticipated state and federal funding significantly reduced, forecasted revenue over the 25-year planning horizon is estimated at only $455 million. The remaining roadway projects are listed as unfunded. Fiscal constraint will be applied to the bike/pedestrian projects as well.

Reduced state and federal funding at a time when regional growth necessitates expansion of the transportation system will create a challenging environment and may require local entities to consider other financing options and partnerships.

chapter 1

Organization History & Operations

Killeen-Temple Urban Transportation Study was formed in 1975 to conduct transportation planning for the urbanized areas of Killeen and Temple. The planning boundary was expanded in 2009 to include all of Bell County, larger portions of Coryell and Lampasas Counties, and portions of Fort Hood. At that time, the name was also changed to **Killeen-Temple Metropolitan Planning Organization (KTMPO).** KTMPO was designated a Transportation Management Area (TMA) in 2012 due to the population of the Killeen urbanized area exceeding 200,000. By year 2045, the KTMPO population is expected to increase by approximately 206,000, which is equivalent to adding another urbanized area the size of Killeen. **Planning for this growth now is crucial to ensure the efficient and effective movement of people and goods** throughout the region.

HISTORY

With the passing of the Federal Highway Transportation Act of 1962, the U.S. Congress placed particular emphasis on the needs for transportation planning in urbanized areas and made long-range transportation planning a condition for receipt of federal highway funds in urban areas. All cities with a population of 50,000 or more that desired to use federal funds for transportation were required to have a comprehensive, cooperative, and continuing regional transportation planning process. This Act specifically states:

"The Secretary [of Transportation] shall not approve…any projects in any urban area of more than 50,000 population unless he finds that such projects are based on a CONTINUING, COMPREHENSIVE transportation planning process carried on COOPERATIVELY by the States and Local Communities."

In compliance with this Act, the cities of Temple, Belton, Nolanville, Harker Heights, Killeen, and Copperas Cove along with the counties of Bell, Coryell, and Lampasas, and the Texas Department of Transportation (TxDOT) formed the Killeen-Temple Urban Transportation Study (K-TUTS) in 1975 (see "K-TUTS Planning Area" map). Predating 1994, K-TUTS (later KTMPO) was primarily located in TxDOT's Waco District, with a small portion in the Brownwood District.

Two urban zones exist within this area defined by the US Census Bureau as an "urbanized area" or "UZA"—the largest encompasses the cities of Killeen, Harker Heights, Copperas Cove, and Nolanville, and the other contains Temple, Belton, and Morgan's Point Resort. The two UZAs are separated by a narrow, mostly undeveloped gap. However, by the next decennial census, sustained rapid growth is expected to result in urban development within the gap, joining the UZAs.

Following the release of 2010 Census data which estimated the population of the Killeen UZA to be 217,630, and the population of the Temple-Belton UZA to be 90,390, the KTMPO was designated a Transportation Management Area (TMA). An MPO is given TMA designation when a contained UZA reaches the 200,000-population threshold. A TMA enjoys benefits and incurs additional requirements beyond those of smaller MPOs. Although the TMA qualifies for additional types of funding, its planning process must include a Congestion Management Process (CMP) and be certified by the Federal Highway Administration and the Federal Transit

Administration no less than once every three years, and a change in composition of its Transportation Planning Policy Board may be required.

The region contains I-35, dubbed the NAFTA (North American Free Trade Agreement) Superhighway/Main Street Texas, which holds a perpendicular connection westward to the largest active duty armored post in the United States Armed Services, Fort Hood. In 2017, twenty-five miles of US 190 between Copperas Cove and Belton was upgraded to interstate standards and named I-14. Additionally, the region is observed as the end of the road for fleeing gulf hurricanes and boasts a significant regional rail hub active since the late 1800's.

METROPOLITAN PLANNING AREA PROGRESSION

In August of 2008, the K-TUTS Transportation Planning Policy Board (TPPB) directed K-TUTS staff to study a possible MPO boundary expansion due to population growth in the rural areas of Bell, Coryell, and Lampasas Counties. Members of the TPPB believed that the rate of growth in some rural portions of these counties was indicative of urban growth and that it was within reason that these areas would urbanize within the next 25 years. The study supported this assumption and the K-TUTS TPPB approved the adjusted Metropolitan Planning Area (MPA) boundary on January 21, 2009 and petitioned TxDOT for approval. The Governor of Texas delegated authority to approve MPA boundary changes to the Texas Transportation Commission (TTC) in October 2005. The TTC approved the MPA boundary changes on June 25, 2009.

Effective June 25, 2009, the K-TUTS Metropolitan Area Boundary (MAB) was expanded to encompass all of Bell County, larger portions of Lampasas and Coryell Counties, and portions of Fort Hood. The current physical extent of the MPO planning area resulting from that action is depicted on Exhibit 1.1 "KTMPO Metropolitan Planning Area" map. The boundary encompasses the urbanized area and the contiguous geographical area likely to become urbanized within the 25-year forecast period covered by the Metropolitan Transportation Plan.

Subsequent to this action, a task force made up of a subset of the K-TUTS Transportation Planning Policy Board was charged with reviewing the K-TUTS By-Laws with a specific focus on membership. On November 18, 2009, the K-TUTS TPPB voted to accept two recommended actions resulting from this effort:

Membership Change - modify membership to more accurately represent population distribution within the K-TUTS MAB following MAB expansion (detailed in the By-Laws section of this chapter).

Organization Name Change - change the name of the organization from Killeen-Temple Urban Transportation Study (K-TUTS) to Killeen-Temple Metropolitan Planning Organization, or KTMPO.

URBANIZED AREAS

The KTMPO region contains two Census-designated urbanized areas. The eastern urbanized area includes the cities of Temple, Belton, and Morgan's Point Resort, and the western urbanized area includes the cities of Killeen, Copperas Cove, Harker Heights, and Nolanville. In conjunction with the decennial Census of 2010, KTMPO underwent a process of "smoothing" the urbanized boundary to incorporate areas that contain roadways that function with urban characteristics. Exhibit 1.2 depicts the expansion of the urbanized areas in the KTMPO region.

The jagged urbanized boundaries were smoothed to include Census tracts that fall within areas of roadways that carry urban traffic. The gap between the two Killeen and Temple urbanized areas along the US 190 corridor primarily carries urban traffic and should be characterized as urban for planning purposes; therefore, the smoothing resulted in creating one contiguous urbanized area, though the unique characteristics of each remain.

The smoothed urbanized boundary currently touches the planning boundary at the Lampasas-Burnet county line. Future coordination with Capital Area Metropolitan Planning Organization (CAMPO) will be necessary in regional planning efforts involving this area because Burnet County falls within CAMPO's planning boundary.

Exhibit 1.1: Metropolitan Planning Area

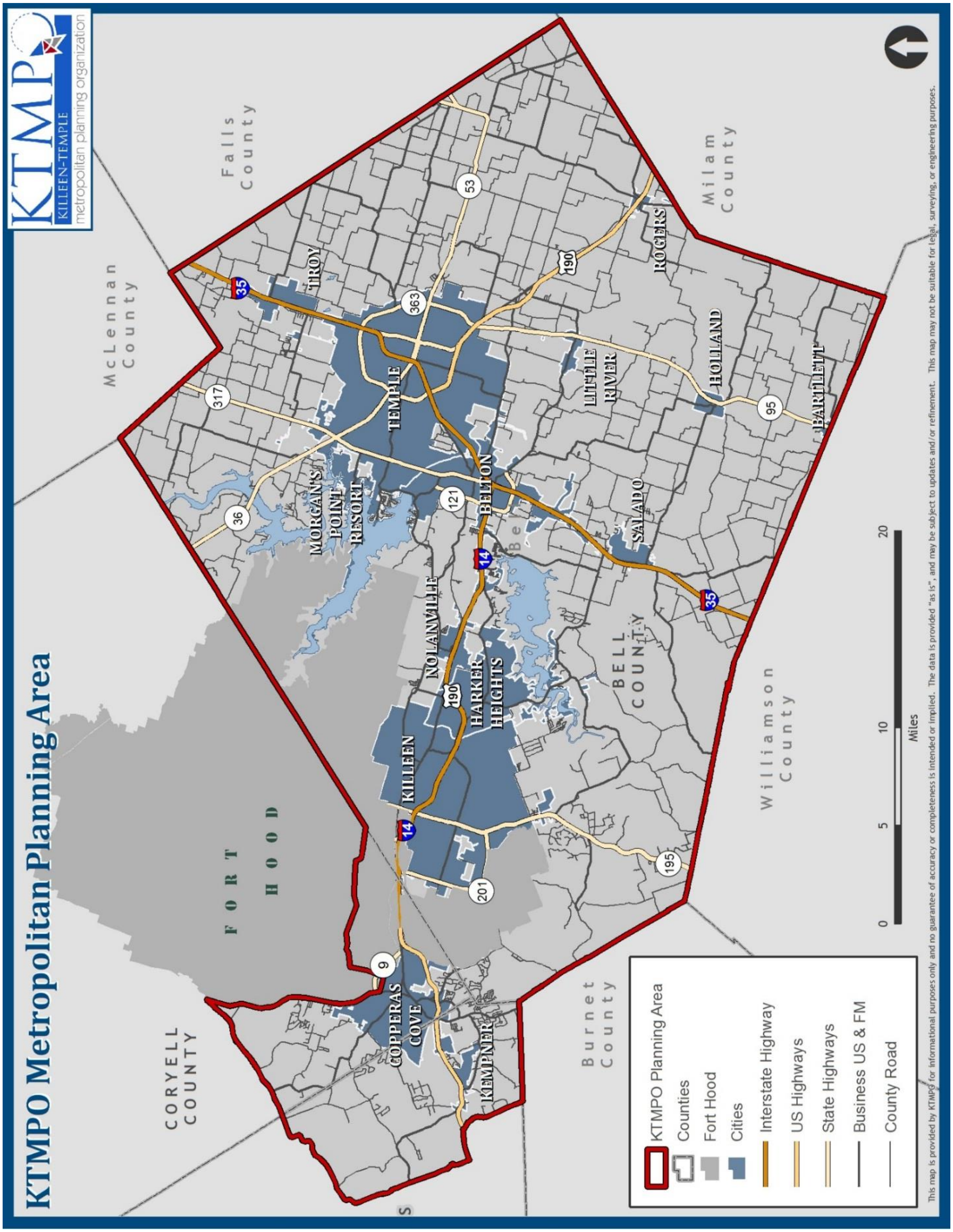
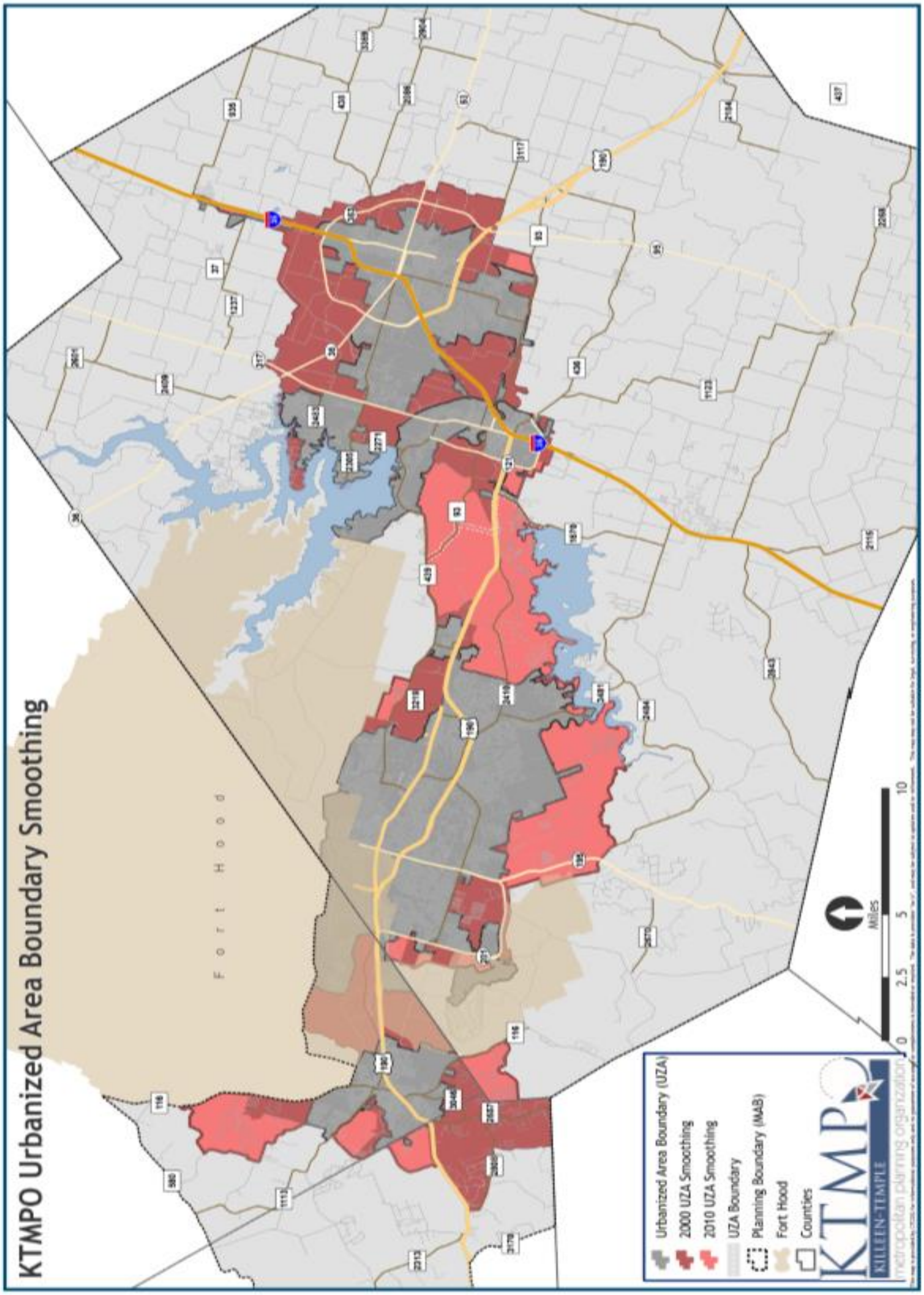


Exhibit 1.2: Urbanized Area Boundary Smoothing



TRANSPORTATION MANAGEMENT AREA (TMA) DESIGNATION

KTMPO was designated a TMA in July 2012. TMAs must have a congestion management process (CMP) that identifies actions and strategies to reduce congestion and increase mobility. In addition, changes to funding and the selection process occur as a result of TMA designation. As a TMA, KTMPO has access to funding from Category 2 (Metropolitan Corridors), Category 7 (Surface Transportation Program-Metropolitan Mobility—STPMM) and Category 9 (Transportation Alternatives Program). TMAs have the ability to select funded projects in consultation with the state; whereas in other MPOs and rural areas the projects are selected by the state in cooperation with the MPO or local government.

OPERATING PROCEDURES

The KTMPO Transportation Planning Policy Board provides regional transportation policy guidance for those participating government entities and agencies which comprise the KTMPO and operates according to the Official By-Laws of the Transportation Planning Policy Board. A Technical Advisory Committee (TAC), made up of appointed representatives from participating entities and agencies, reviews technical issues and develops preferred technical alternatives for TPPB action. Since initial adoption in 1982, amendments have been made to the KTMPO By-Laws in 1997, 1999, 2003, 2004, 2009 (as a result of the boundary expansion), and most recently, September 18, 2013, to incorporate provisions of MAP-21. MAP-21, the Moving Ahead for Progress in the 21st Century Act, was passed by the U.S. Congress and signed into law in July 2012 and was the guiding legislation for development of the country's vital transportation infrastructure until the Fixing America's Surface Transportation Act (FAST Act) was passed in 2015. The FAST Act covers a 5-year period and was the first Federal law in over ten years to provide long-term funding certainty for surface transportation (for fiscal years 2016 through 2020), continues the Metropolitan Planning Program and authorizes $305 billion for the Department's highway, highway and motor vehicle safety, public transportation, motor carrier safety, hazardous materials safety, rail, and research, technology and statistics programs.

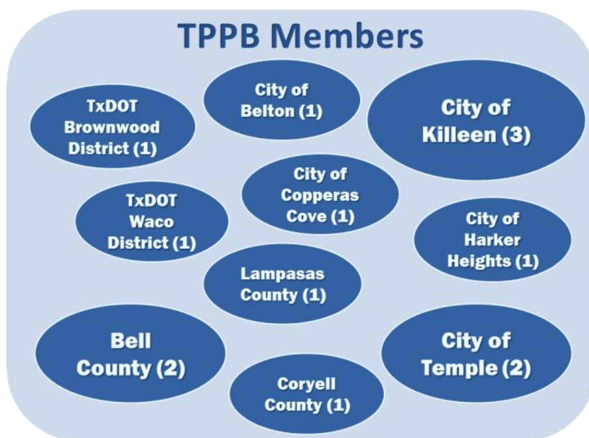
Currently, KTMPO meetings are held on a schedule determined by a majority vote of the members. The TPPB and the TAC make it a practice to meet monthly but are obligated to hold at least four public meetings a year. The chairperson may call a meeting, or any member may request that a meeting be called by written request to said chairperson. Annual meetings are normally held in September.

The MPO director is responsible for all meeting notices and publicity. Specifics of the meeting will be provided to each TPPB member in writing and to the general public in accordance with the Texas Open Meetings Act. With the exception of emergency meetings, all members are notified at least three days prior to meeting. As part of the Open Meetings Act, a record of the proceedings is generated from recording and documentation. Fifty-one percent of the membership with a minimum of four agencies in attendance satisfies the established quorum.

MEMBERSHIP

TPPB Voting membership

The voting membership of the Transportation Planning Policy Board consists of one representative for each city with a population between 10,000 and 40,000, two representatives for cities between 40,000 and 75,000 and three representatives for populations over 75,000 as determined by the most recent Census. All cities within the MPO Boundary with a population under 10,000 shall be represented by their county official or appointee. Additionally, all counties have one designated representative, with the exception of Bell County which contains a majority of the MPO and population. The TPPB voting membership is depicted in the above graphic.



If any voting TPPB member will be unable to attend a meeting, that member may appoint a voting proxy, by writing the MPO in advance, which in turn shall be counted for quorum purposes.

The smaller cities within the study area shall be represented by their County TPPB member. However, they will be encouraged to attend all meetings and to participate in deliberations. Currently, these cities are: Nolanville, Troy, Little River-Academy, Kempner, Salado, Bartlett, Holland, Rogers, and Morgan's Point Resort.

Each of the following agencies or offices shall be represented by one non-voting member:

- Fort Hood Military base
- State Senators, State Representatives and US Representatives serving in the KTMPO area

- Federal Highway Administration
- Federal Transit Administration
- Texas Air Control Board
- Federal Aviation Administration
- Airport managers – Killeen and Temple
- Central Texas Council of Governments
- Others, as may be appropriate

Individuals serving on this Transportation Planning Policy Board shall be elected officials and shall be designated in writing by the following:

City members – Mayor, City Council, or Manager as designated by the governing body
County members – County Commissioners Court
TxDOT districts – Waco and Brownwood District Engineers
Transit member – Hill Country Transit District Board of Directors
Fort Hood member – III Corps Commander, or their designee

TAC Voting membership

The Technical Advisory Committee is tasked with reviewing technical issues and developing preferred technical alternatives for TPPB action. The voting membership of this committee consists of one representative from each of the following:

- City of Killeen
- City of Temple
- City of Copperas Cove
- City of Belton
- City of Harker Heights
- Bell County
- Coryell County
- Lampasas County
- TxDOT Waco District
- TxDOT Brownwood District

Additionally, one non-voting seat is provided for the following entities:

- Cities: Nolanville, Troy, Little River-Academy, Morgan's Point Resort, Salado, Kempner, Bartlett, Holland, Rogers
- Fort Hood Military base
- Federal Highway Administration
- Federal Transit Administration
- TxDOT

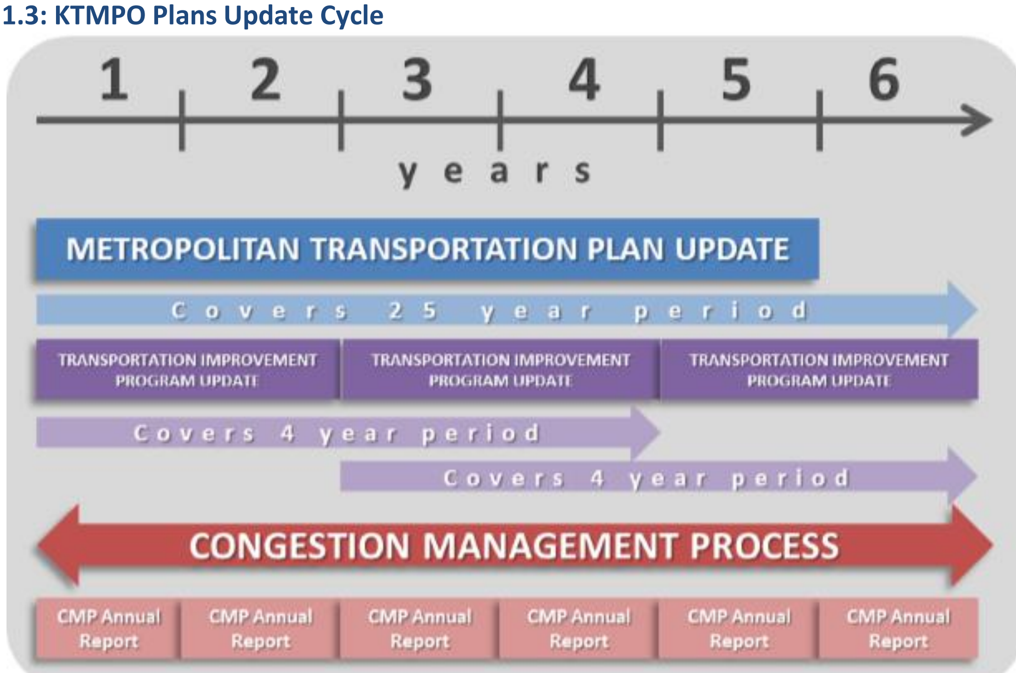
Individuals serving on this Technical Advisory Committee shall be designated in writing by the following:

City members – Mayor, City Council, or Manager as designated by the governing body
County members – County Commissioners Court
TxDOT districts – Waco and Brownwood District Engineers
Transit member – Hill Country Transit District Board of Directors
Fort Hood member – III Corps Commander, or their designee

REQUIRED DOCUMENTS/PLANS AND UPDATE CYCLES

The MPO is responsible for the development of several plans in addition to this Metropolitan Transportation Plan. Though separate documents with different ranges and update cycles, they are meant to inform one another so each will progress.

Exhibit 1.3: KTMPO Plans Update Cycle



Metropolitan Transportation Plan (MTP). Title 23, U.S.C. Section 134 (i) (1) states that MPOs shall prepare and update their MTP every four or five years, depending upon whether the MPO is in attainment with the Clean Air Act (42 U.S.C. 7407 (d)). If in attainment, the MPO is required to update the MTP every five years; if designated as nonattainment, the MTP must be updated every four years. In either case, the MPO may update the plan more frequently if desired. KTMPO is currently in attainment with air quality standards; however, designation as a nonattainment area with regard to ozone is possible in the next few years. KTMPO will update the MTP as required in 2023 or 2024. In addition, MAP-21 and the continued regulation of the FAST Act requires MPOs to establish regional performance measures in coordination with state and public transportation providers, based on statewide goals. Therefore, the MTP will be updated as the performance measures are developed to include the statewide goals and monitored for system performance.

Transportation Improvement Program (TIP). Title 23, U.S.C. Section 450.324 states that the TIP shall cover a period of no less than four years, be updated at least every four years, and be approved by the MPO and the Governor. The TIP may be updated more frequently, but the cycle for updating the TIP must be compatible with the STIP (State Transportation Improvement Program) development and approval process. The TIP expires when the FHWA/FTA approval of the STIP expires. Copies of any updated or revised TIPs must be provided to the FHWA and the FTA. The KTMPO TIP is a four-year transportation planning document that includes a detailed listing of projects reasonably expected to begin within a four-year period. Projects included in the TIP must also be included in the MTP and are chosen based on regional priority and available funding. Although the KTMPO TIP covers a four-year period, it is updated every two years; therefore, an overlap between successive TIPs will occur.

Congestion Management Process (CMP). Title 23, U.S.C. Section 450.320 states the transportation planning process in a TMA shall address congestion management through a process that provides for safe and effective integrated management and operation of the multimodal transportation system. The development of a congestion management process should result in multimodal system performance measures and strategies that can be reflected in the metropolitan transportation plan and the TIP. MAP-21 requires MPOs that have been designated a TMA to develop a CMP within 18 months of the TMA designation. KTMPO fulfilled this requirement. The CMP is a "living" document, continually evolving to address the results of performance measures, concerns of the community, new objectives and goals of the MPO, and up-to-date information on congestion issues. The KTMPO CMP includes an Action Plan that will be assessed on an annual basis. As such, the CMP will be monitored annually and updated as needed.

In addition to these local plans, the following MPO documents were used to inform the KTMPO long-range transportation planning process:

Public Participation Plan. This document serves as the plan for involving all citizens and transportation stakeholders in the public involvement process for metropolitan transportation planning.

Regionally Coordinated Transportation Plan. The purpose of this plan is to coordinate efforts to provide public transportation services to the region. The plan includes an assessment of transportation needs; identification of transportation inefficiencies and service gaps; determination of goals and objectives; and development of a workplan for implementation.

LOCAL GOVERNMENT COORDINATION

In the fall of 2012, KTMPO began hosting quarterly, and later bi-monthly, "Planner Roundtable" meetings to encourage coordination and information exchange among the KTMPO member jurisdictions. The meetings provide an opportunity for the planners to discuss and compare practices and views on a variety of topics to include bike/pedestrian issues, GIS information, new development projects, roadway needs, transit needs, freight issues, air quality, environmentally sensitive areas, operating procedures/ordinances, etc. Regional coordination efforts are enhanced when all parties are engaged in discussions and aware of other's activities and concerns. The roundtable meetings have been well attended and will continue to be an integral part of KTMPO's regional coordination efforts.

chapter 2

MTP Development

Federal and state legislation requires **each urbanized area with a population of at least 50,000 to have a long-range transportation plan to identify and plan for the future regional transportation system.** This MTP update is prepared for the horizon year 2045 and has been developed by KTMPO staff, in coordination with TxDOT and Hill Country Transit District, reviewed by the KTMPO Technical Advisory Committee and Transportation Planning Policy Board, and ultimately approved and adopted by the Transportation Planning Policy Board as the official guide to the development of the regional transportation system for the KTMPO region.

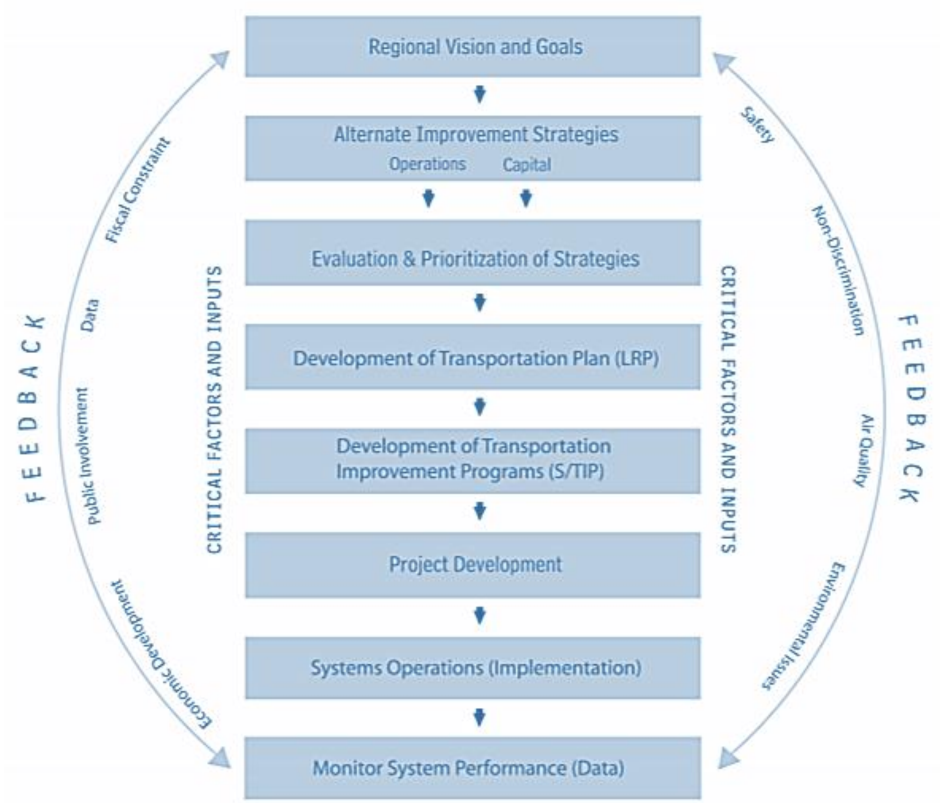
TRANSPORTATION PLANNING AT A REGIONAL LEVEL

The Killeen-Temple Metropolitan Planning Organization planning boundary encompasses an area of 1,222 miles, which includes all of Bell County, and portions of Coryell and Lampasas Counties. Because the planning area includes 14 cities, as well as a large rural area of 1,022 miles, it is the task of KTMPO to develop a cooperative and comprehensive process to promote regional transportation planning.

As a region with two prominent urbanized areas each containing unique traffic generators, the transportation users in the KTMPO planning area truly travel on a regional level. The proximity of businesses, schools, Fort Hood, and other traffic generators to the major arterial roads and other modes of transportation are what defines the transportation characteristics and future needs in the region.

The Mobility 2045 Metropolitan Transportation Plan is the twenty-five-year document that outlines the state of current transportation, projects future needs, and offers projects and other methods for keeping the people and freight in the KTMPO region moving efficiently.

Exhibit 2.1: Transportation Planning Process



LONG-RANGE TRANSPORTATION PLANNING

Long-range transportation planning requirements began with the passage of the Federal Highway Transportation Act of 1962. This act required that all urban areas with populations of 50,000 or greater develop and maintain a comprehensive, cooperative, and continuing regional transportation planning process that includes the development and maintenance of a long-range transportation plan which defines a vision for the region's transportation system. In July of 2012, the KTMPO was designated a Transportation Management Area (TMA) triggered by the release of 2010 census information officially declaring that the population of the Killeen urbanized area (Killeen, Copperas Cove, Harker Heights, Fort Hood, Nolanville) exceeded 200,000. TMA designation has additional impacts such as:

- KTMPO received notice of FY13-20 Category 7 and 9 funding availability and completed the competitive process for project selection in both categories. These projects have completed the necessary MTP/TIP amendments.
- KTMPO allocated approximately $60 million in Category 2 funds for FY18-20. All projects selected for these funds completed a competitive process for project selection and have completed the necessary MTP/TIP amendments.
- The cornerstone of MAP-21's highway program transformation is the transition to a performance and outcome-based program. States and MPO's must invest resources in projects to achieve individual targets that collectively will make progress toward national goals. KTMPO has embraced upcoming performance measures by adding expected standards to various category project selection processes. Current FHWA information states that performance targets may be in place during 4th year of MAP-21's enactment. Performance targets will be measured during year 5. Progress toward meeting targets will be measured during year 6. The national performance goals for the Federal highway programs as established in MAP-21 are:
    - Safety - To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
    - Infrastructure Condition - To maintain the highway infrastructure asset system in a state of good repair.
    - Congestion Reduction - To achieve a significant reduction in congestion on the National Highway System.
    - System Reliability - To improve the efficiency of the surface transportation system.
    - Freight Movement and Economic Vitality - To improve the national freight

network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
    - Environmental Sustainability - To enhance the performance of the transportation system while protecting and enhancing the natural environment.
    - Reduced Project Delivery Delays - To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.
- The FAST Act (23 CFR 450.306) requires MPOs to develop long-range transportation plans and Transportation Improvement Programs (TIPs) through a performance-driven, outcome-based approach to planning for metropolitan areas of the State. The metropolitan transportation planning process shall be continuous, cooperative, and comprehensive, and provide for consideration and implementation of projects, strategies, and services that will address the following factors:
    - Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency;
    - Increase the safety of the transportation system for motorized and non-motorized users;
    - Increase the security of the transportation system for motorized and non-motorized users;
    - Increase accessibility and mobility of people and freight;
    - Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns;
    - Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight;
    - Promote efficient system management and operation;
    - Emphasize the preservation of the existing transportation system;
    - Improve the resiliency and reliability of the transportation system and reduce or mitigate storm water impacts of surface transportation; and
    - Enhance travel and tourism.

In addition, the MPO supports national transportation goals, increasing the accountability and transparency of the Federal-aid highway program, and improving project decision-making through performance-based planning and programming. Our focus sustains the national goals listed in 23 USC 150:

- **Safety:** achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
- **Infrastructure condition:** maintain the highway infrastructure asset system in a state of good repair.
- **Congestion reduction:** achieve a significant reduction in congestion on the National Highway System.
- **System reliability:** improve the efficiency of the surface transportation system.
- **Freight movement and economic vitality:** improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
- **Environmental sustainability:** enhance the performance of the transportation system while protecting and enhancing the natural environment.
- **Reduced project delivery delays:** reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

- Federal requirements state that in all TMAs, a Congestion Management Process (CMP) shall be developed and implemented as an integrated part of the metropolitan transportation planning process. Congestion management is the application of strategies to monitor and improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. A CMP is a systematic approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs. The CMP is intended to move these congestion management strategies into the funding and implementation stages. KTMPO has approved a CMP in 2016. The CMP is discussed in more detail in Section 9.

FEDERAL AND STATE REQUIREMENTS:

On December 4, 2015, the Fixing America's Surface Transportation Act, or "FAST ACT," was signed into law. The FAST Act continues the Metropolitan Planning program and continues to require metropolitan transportation plans and transportation improvement programs (TIPs) to provide for facilities that enable an intermodal transportation system, including pedestrian and bicycle facilities. It adds to this list other facilities that support intercity transportation (including intercity buses, intercity bus facilities, and commuter vanpool providers). The FAST Act also requires that the metropolitan long-range plan include identification of public transportation facilities and intercity bus facilities. [23 U.S.C. 134(c)(2) & (i)(2)].

The previous federal legislation, MAP-21 or “Moving Ahead for Progress in the 21st Century Act,” set forth eight planning factors that all transportation projects and programs must address:

1) Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency;
2) Increase the safety of the transportation system for motorized and non-motorized users;
3) Increase the security of the transportation system for motorized and non-motorized users;
4) Increase the accessibility and mobility of people and for freight;
5) Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns;
6) Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight;
7) Promote efficient system management and operation; and
8) Emphasize the preservation of the existing transportation system.

The FAST Act maintains those factors but adds the following new factors:

1) Improving transportation system resiliency and reliability;
2) Reducing (or mitigating) the storm water impacts of surface transportation; and
3) Enhancing travel and tourism.

A key feature of MAP-21 was the establishment of performance targets and measures at the national, state, and local level. The FAST Act made no changes to those performance measures. Therefore, all established performance targets and measures should align with the national goals which were outlined in MAP-21 and carried forward in the FAST Act. Those measures are as follows:

1) Safety - To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
2) Infrastructure condition - To maintain the highway infrastructure asset system in a state of good repair.

3) Congestion reduction - To achieve a significant reduction in congestion on the National Highway System.
4) System reliability - To improve the efficiency of the surface transportation system.
5) Freight movement and economic vitality - To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
6) Environmental sustainability - To enhance the performance of the transportation system while protecting and enhancing the natural environment.
7) Reduced project delivery delays - To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

Specific quantitative criteria will be published by the Secretary of Transportation in order to measure whether or not these goals have been achieved. When state guidelines are provided, KTMPO's goals, objectives, and performance measures will be modified to support the state performance targets and the MPO will initiate the public involvement process to solicit input and revise the MTP/TIP accordingly. The KTMPO public involvement process provides citizens, public agencies, transportation agencies, private transportation providers, and other interested parties with a reasonable opportunity to comment in the transportation planning process as required by FAST Act.

REGIONAL PERFORMANCE TARGETS:

The Fixing America's Surface Transportation (FAST) Act requires KTMPO to adopt regional performance targets to better utilize transportation investments in the KTMPO region. In this approach, goals, measures, and data are used to inform policy makers about how to invest in a better performing regional transportation system. Transportation funds are intended to target projects aimed at achieving set performance targets for State of Good Repair (transit), safety, pavement/bridge, and system performance. To comply with federal requirements, KTMPO initiated the process for selecting performance measure targets in 2016.

TRANSIT ASSET MANAGEMENT/STATE OF GOOD REPAIR PERFORMANCE MEASURES:

The Transit Asset Condition Performance Rule, found in 49 CFR 625.43(a,b,c,d), establishes performance measures to assess the condition of regional transit networks as defined as State of

Good Repair (SGR) and documented in a transit agency's Transit Asset Management Plan (TAMP). SGR targets measure system performance and evaluate how well a transit system is performing.

Hill Country Transit District (HCTD) serves as the transit operator and designated recipient for federal transit funding within the urban service area. As required by January 1, 2017, HCTD established State of Good Repair performance targets and objectives for both their urban and rural systems in their TAMP. The TAMP covers all fleet vehicles, as well as other capital assets to include equipment, rolling stock, infrastructure, and facilities. The performance target is to have less than 5% of the assets within each group exceed their useful life. In June 2017, KTMPO Policy Board adopted the urban and rural performance targets identified in the HCTD TAMP as the MPO performance targets for the region. KTMPO Policy Board also agreed that future revisions may be necessary to ensure consistency with the performance targets that HCTD establishes and, therefore, any future revisions to the TAMP be administratively approved by KTMPO staff and brought to the attention of both TAC and TPPB. On January 16, 2019, the TPPB approved to continue supporting the previously set transit targets. On February 19, 2020, the TPPB approved to continue supporting the previously set transit targets.

The inclusion of transit projects located in both the TIP and MTP are intended to support HCTD in achieving the SGR performance measures for the regional transportation system.

SAFETY PERFORMANCE MEASURES:

The Safety Performance Rule (PM1), found in 23 CFR 490.207(a1-5), establishes safety performance measures to address fatalities and serious injuries on roadways and is evaluated using Fatality Analysis Reporting System (FARS) and Vehicular Miles Traveled (VMT) estimates. This Rule is to better invest transportation funding for safety improvement projects in order to support safe roadway networks.

TxDOT sets safety performance targets for five federally required safety performance measures. These targets include number of fatalities, fatalities per million miles traveled, number of serious injuries, serious injuries per million vehicle miles traveled, and number of non-motorized fatalities and non-motorized serious injuries. These targets include a reduction of both fatalities and fatality rate by 2% over current baseline forecast, a reduction in incapacitating injuries by 2% over current baseline forecast, maintain the current downward trend in the incapacitating injury rate, and a reduction of non-motorized fatalities and non-motorized incapacitating injuries by 2% over current baseline forecast. On January 17, 2018, KTMPO Policy Board approved to support the State's safety performance measures. On January 16, 2019, the TPPB approved to continue supporting the previously set safety targets.

By supporting the State's safety targets, KTMPO plans on doing the following:

- Work with the state and safety stakeholders to address areas of concern for fatalities or serious injuries within the MPO planning area; Coordinate with the state and include in the Metropolitan Transportation Plan (MTP) the safety performance measures and targets for all public roads in the metropolitan area;
- Integrate into the planning process the safety goals, objectives, performance measures and targets described in other state safety transportation plans and processes such as applicable portions of the Highway Safety Implementation Plan (HSIP);
- Include a description in the Transportation Improvement Program (TIP) of the anticipated effect of the TIP toward achieving HSIP targets in the MTP, linking investment priorities in the TIP to those safety targets.
- Use data to identify areas that have shown a concentration of accidents and continue to use crash rates as one of our scoring criteria to select projects that support the statewide goals.
- Use this information as part of our public outreach efforts to educate drivers about ways they can drive more safely and reduce accidents.

Some recommendations may be made to reduce the recurrence of crashes at particular locations, such as:

- Upgrades to existing transportation infrastructure
- Modification or implementation of safety infrastructure
- Creation of alternative routes to alleviate congestion
- Public campaigns promoting a particular safety issue
- Requirement of the use of motorcycle and bicycle safety gear
- An assessment of the transportation network to determine driver decisions

Projects located in both the TIP and the MTP were evaluated for both fatality and serious injury rate. Projects were measured using the project location's number of fatalities and serious injury rate per 100 million vehicle miles traveled against the statewide 5-year rolling average. A higher difference indicated that a location has more safety issues than the statewide average. A higher difference receives a higher score for a safety project, therefore, a project that addresses hazardous roadways may receive a higher ranking. For future projects, KTMPO plans to continue to review and possibly reweight project scoring criteria and use crash rates to evaluate transportation projects to further support the State's targets for a safe transportation system. In time, as projects are completed and reliable performance measure related data becomes available, we will be able to determine the attainment of these performance measure and if adjustments are needed.

INFRASTRUCTURE OR PAVEMENT/BRIDGE CONDITION MEASURES:

The Infrastructure or Pavement/Bridge Condition Rule (PM2), found in 23 CFR 490.307(a1-4)(c1-2), establishes performance measures to assess MPA Interstate and Non-Interstate NHS pavement and NHS bridges as in good or poor condition and is evaluated using the State DOT Highway Performance Monitoring System (HPMS).

On November 14, 2018, the TPPB approved the adoption of the State's performance measure targets regarding Infrastructure or Pavement/Bridge Condition. Targets set for 2022 regarding pavement on Interstate Highways are 66.4% in "good" condition and 0.3% in "poor" condition. As for non-Interstate National Highway System pavement, 52.3% must be in "good" condition and 14.3% in "poor" condition by 2022. Bridge requirements state that the National Highway System Bridge Deck Condition must be 50.42% in "good" condition and 0.8% in "poor" condition by 2022.

These performance measures are being addressed through the review and possible reweighting of project scoring criteria in preparation for the next MTP reprioritization to further support the State's targets. In time, as projects are completed and reliable performance measure related data becomes available, we will be able to determine the attainment of these performance measure and if adjustments are needed.

SYSTEM PERFORMANCE/FREIGHT/CMAQ MEASURES:

The System Performance/Freight/CMAQ Rule (PM3), found in 23 CFR 490.507(a1-2)(b), 23 CFR 490.607, 23 CFR 490.707(a,b), and 23 CFR 490.807, establishes measures based on Level of Travel Time Reliability (LOTTR), Total Peak Hour Excessive Delay person-hours, Truck Travel Time Reliability Index , percent of trips that are Non-SOV, Total Emission Reductions and Annual Total Tailpipe CO_2 Emissions on NHS and is evaluated using NPMRDS, speed limits, auto occupancy, HPMS, and fuel sales statistics, the American Community Survey and CMAQ Public Access System for air quality measures.

On November 14, 2018, the TPPB approved the adoption of the State's performance measure targets regarding System Performance/Freight/CMAQ. The State's goal is to "work with MPO's to keep system delay and reliability within the target set as proportion to population growth." Targets set for 2022 are listed below with the specific measure that must be met:

- IH Level of Travel Time Reliability – 56.6%
- Non-IH Level of Travel Time Reliability – 55.4%
- Truck Travel Time Reliability – 1.79

These performance measures are being addressed through the review and possible reweighting of project scoring criteria in preparation for the next MTP reprioritization to further support the State's targets. In time, as projects are completed and reliable performance measure related data becomes available, we will be able to determine the attainment of these performance measure and if adjustments are needed.

KTMPO's TIP and MTP will be continuously updated to reflect demonstrated performance-based decisions that relate to the support and attainment of performance measure targets for the region.

LOCAL AGENCIES AND PLANS

The many jurisdictions within the KTMPO planning area develop their own local initiatives and plans to guide future growth and development, including comprehensive plans, zoning plans, capital improvement plans, building codes, subdivision and platting standards, thoroughfare plans, downtown master plans, and park and open space plans. In developing current estimates and future year projections of various socioeconomic data to help plan for transportation projects and programs included in this MTP, local plans and staff were consulted to gain the most accurate and informed insight into future development patterns.

GUIDING PRINCIPLES

The Mobility 2045 MTP provides a blueprint for addressing mobility challenges in our region as a result of growth in our area. This long-range plan contains an integrated set of policies, strategies, and investments to maintain, manage, and improve the transportation system in the Central Texas region through the year 2045. The Guiding Principles, Vision, and Goals outlined in the 2040 MTP were considered as the 2045 MTP was developed. The Guiding Principles remain relevant for the 2045 Plan and are as follows:

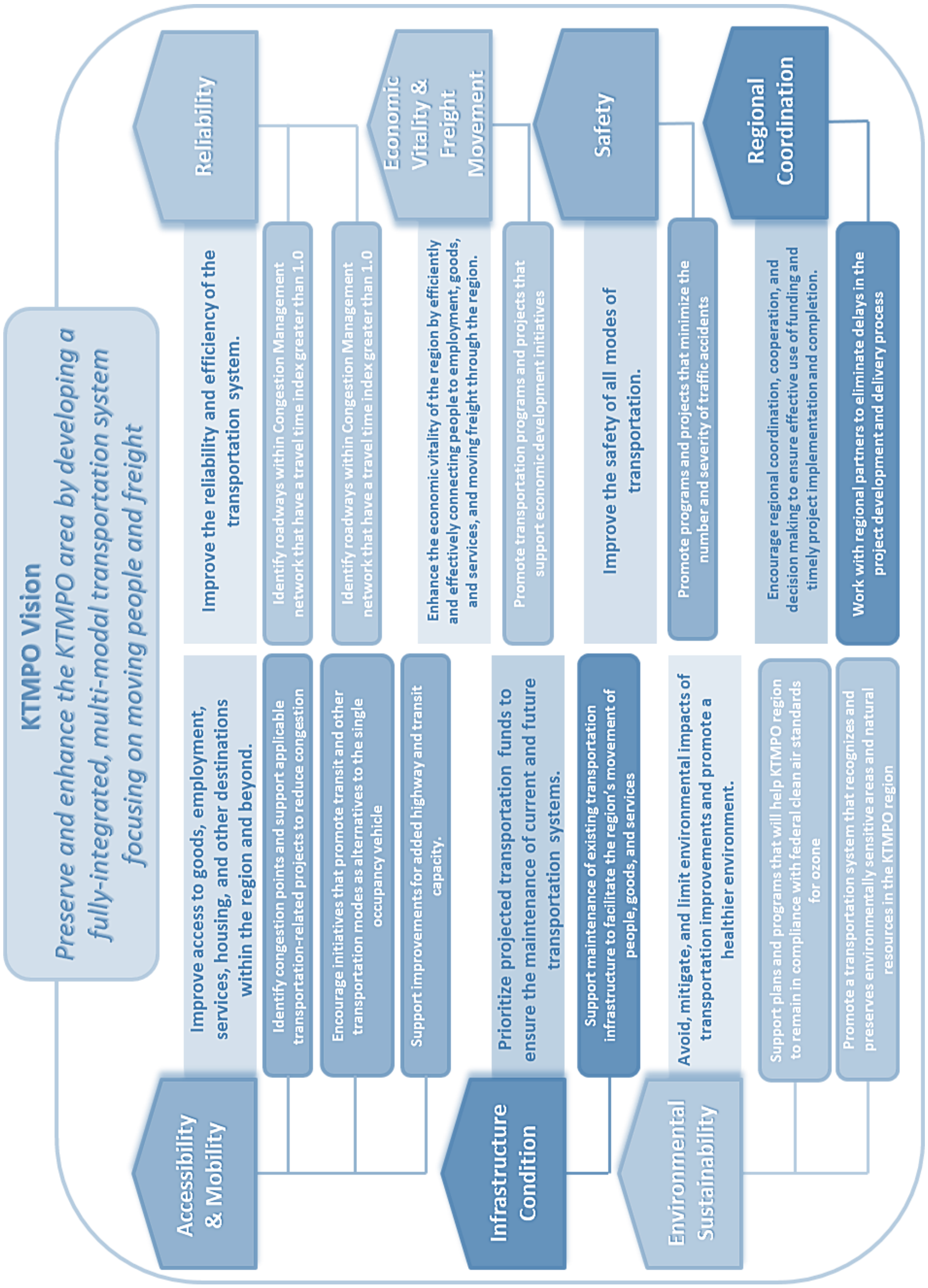
The MPO should create a plan:

- Based on the best available data and analysis on all transportation modes;
- Built on the cooperation of all stakeholders in the region;
- Developed with opportunities for public involvement and participation;
- Respects the unique character of the communities within the region; and,
- Recognizes the need to make difficult choices to implement desired long-term improvements.

VISION AND GOALS

With the KTMPO Guiding Principles as the foundation, KTMPO staff began the process to update the MTP. As part of this process, five public workshops were held in April 2018 to solicit public feedback and input with regard to the region's transportation system, including a regional vision and goals. The vast majority of respondents felt the current goals were still applicable. Comments regarding KTMPO's vision focused on improving safety, reducing congestion, providing a multi-modal transportation system, and improving the area's quality of life. The goals were slightly modified and continue to reflect the 8 Planning Factors identified in MAP-21. Objectives were also developed under the goals. The 2045 MTP Vision, Goals and Objectives are as follows:

Exhibit 2.2: KTMPO Vision, Goals, and Objectives



PERFORMANCE-BASED PLANNING AND PROGRAMMING

In MAP-21, the metropolitan and statewide transportation planning processes are continued under the FAST Act and enhanced to incorporate performance goals, measures, and targets into the process of identifying needed transportation improvements and project selection. Public involvement remains a hallmark of the planning process.

Performance-based planning and programming refers to the application of performance management to achieve desired performance outcomes for the multimodal transportation system. The objective is to ensure transportation investment decisions are made based on their ability to meet established goals. MAP-21 establishes national performance goals for Federal highway programs. These performance goals will be integrated into transportation planning at the state and MPO levels and are as follows:

- **Safety**
- **Infrastructure condition**
- **Congestion reduction**
- **System reliability**
- **Freight movement and economic vitality**
- **Environmental sustainability**
- **Reduced project delivery delays**

Specific quantitative criteria will be published by the Secretary of Transportation in order to measure whether these goals have been achieved. When state guidelines are provided, KTMPO's Goals, Objectives, and Performance Measures will be modified to support the state performance targets and the MPO will initiate the public involvement process to solicit input and revise the MTP accordingly.

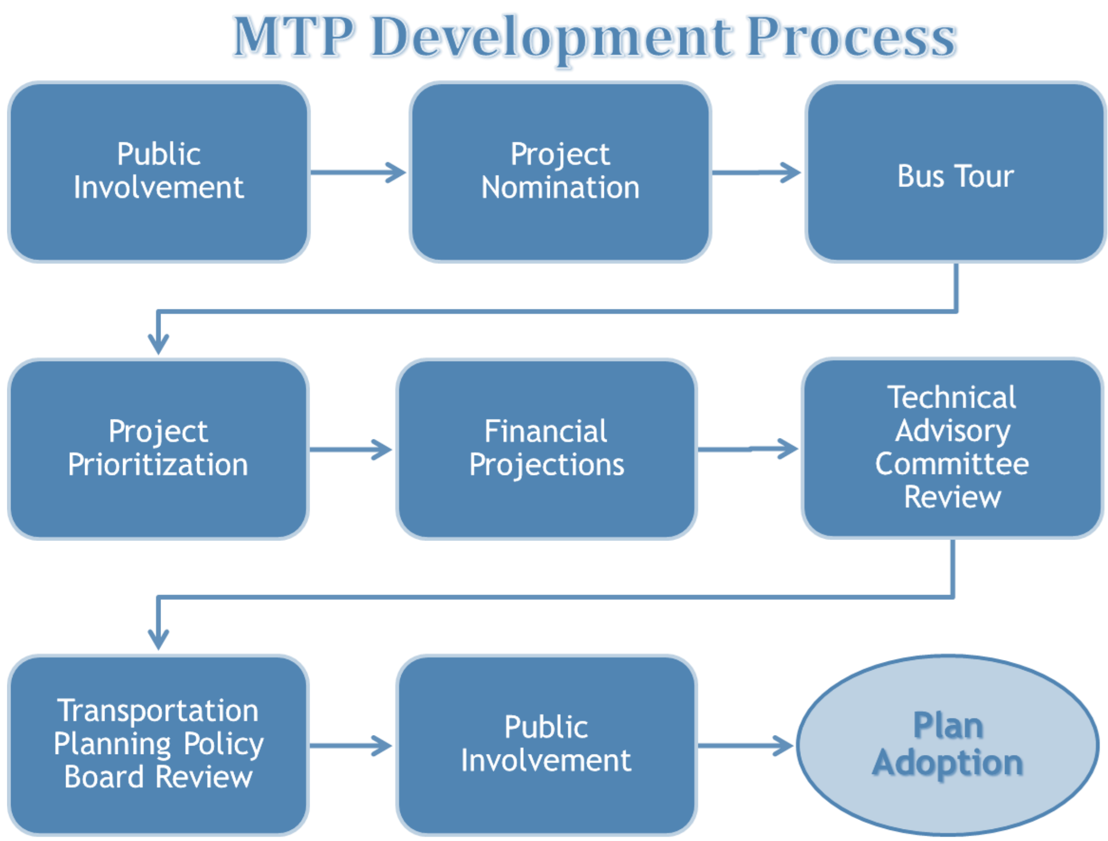
Upon adoption of the revised Goals, Objectives, and Performance Measures, KTMPO planning efforts will include consideration of the performance targets in project prioritization and selection to ensure projects support desired outcomes. KTMPO staff will then evaluate and report the condition and performance of the transportation system to determine if desired performance outcomes have been achieved. Monitoring, evaluating and performance reporting will be an ongoing process to better understand successful approaches and inform future decisions regarding the transportation system.

THE 2045 METROPOLITAN TRANSPORTATION PLAN

Over the last decade, Bell County and its neighboring counties in Central Texas between Dallas and Austin have experienced unprecedented growth. By 2045, the area is expected to add more than 206,000 people and 105,000 jobs. This growth estimate exceeds our current largest city population by over 70,000. Planning for anticipated growth is critical now to ensure that people and goods can continue to move throughout the region reliably and to ensure the quality of life residents enjoy today will remain in the future. The metropolitan transportation planning process requires the development of long- and short-range strategies that help develop an integrated, intermodal transportation system that facilitates these goals, a task made more challenging by dwindling revenues from state and federal motor fuels taxes. The Killeen-Temple MPO's Mobility 2045 Plan, adopted in May 2019, was developed through a continuing, cooperative, and comprehensive regional planning process and identifies needs, financial resources, and priorities for the KTMPO area. The Mobility 2045 Plan, currently in development, will also incorporate the same processes to best plan for the future of Central Texas.

The local entities, TxDOT districts, and public within the KTMPO planning area play a major role in the development of the Metropolitan Transportation Plan by assessing the current infrastructure in their jurisdiction and by suggesting or nominating suggested transportation projects that would enhance mobility for inclusion in the MTP Project Listing. The MTP Development and Project Selection Process details are as follows:

Exhibit 2.3: MTP Development Process



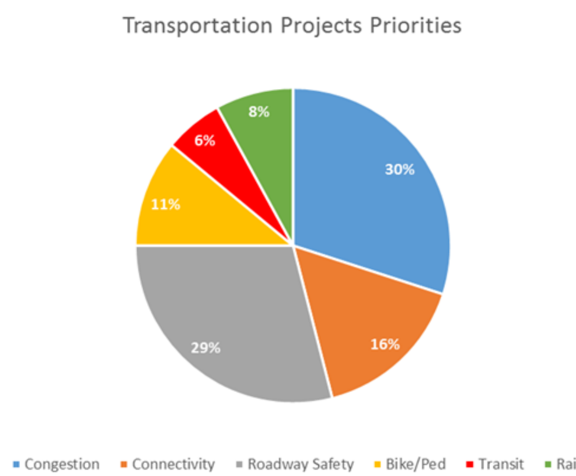
PUBLIC INVOLVEMENT

The KTMPO Mobility 2045 Metropolitan Transportation Plan has been developed from a process that is marked with early involvement from the voice of the people of the Killeen-Temple region. KTMPO hosted a series of public workshops as a medium for collecting the interests of the public on the regional transportation system. The workshops solicited general and geographic feedback in the form of surveys and interactive mapping about congestion, safety, transit, bicycle and pedestrian facilities, rail, aviation, and project selection. Two primary objectives, supporting KTMPO's public involvement process, guided the development of the workshops:

1. Distribute information to the public about the role of KTMPO in the region; and
2. Receive input from the public on the current and future regional transportation system.

Remaining aligned with KTMPO's Public Participation Plan, these workshops sought to involve all individuals that use the transportation infrastructure by using communication methods that could be accessed by all. Efforts include:

- Holding in-person workshops in each of the 5 most populous cities in the region;
- Holding 2 of the 5 in-person workshops in targeted Environmental Justice locations;
- Promoting the workshops in a variety of mediums, including the newspaper, public buildings, on the KTMPO website and social media, and by flyers and word of mouth;
- Allowing the public to complete the workshop survey online; and
- Inviting local elected officials and city planners to help staff the booths to speak one-on-one with the public.



After providing feedback and receiving information at the various workshop stations, participants were asked to vote how they would like to see funding allocated for transportation in the region. They were able to be the decision-maker in the region's transportation priorities.

Outcome: **Public gained knowledge of the transportation planning process and provided feedback to guide future planning decisions.**

PROJECT NOMINATION

Member entities such as TxDOT, municipalities and counties, are encouraged to submit proposed improvements and/or new transportation projects due to development and noticeable changes in usage. In order for KTMPO Staff to have sufficient time to analyze, research, and compile all of the project information, a deadline is set and made known to the member entities. Outcome: **MPO member entities determined the transportation need of the region by the development of projects.**

BUS TOUR

The Transportation Planning Policy Board, Technical Advisory Committee, KTMPO staff, and other local officials and staff participate in fieldwork to educate themselves on the need and location of proposed projects in the form of a one-day bus tour, where they view a sample of the nominated projects. This tour allows each nominating entity to showcase certain projects and future development in their areas to the members before the project prioritization process.
Outcome: **Because of the separated UZAs, board members acknowledge that this event helps give them perspective on the transportation state in other parts of the region.**

PROJECT PRIORITZATION

KTMPO prioritizes roadway projects in the MTP in accordance with the approved Project Selection Process (found in **Appendix B**). This process combines technical and subjective scores and results in a final score and ranking to determine regional priorities. MPO staff compiles technical data from its member entities, TxDOT, and the transportation model, and the Technical Advisory Committee complete the subjective scoring element from their perspective.

During the scoring process, Staff noted several anomalies in the technical data which caused board members to reexamine whether the previously adopted process is still currently the best method to evaluate project priorities in the region. They suggested KTMPO staff schedule meetings with directors from other TMAs in Texas to gain perspective on advancing the prioritization process for future project selections.

To complete the prioritization process for the MTP, Staff engaged TAC members in the review of projects proposed for inclusion in the financially constrained component of the MTP to ensure the criteria stated in the approved project selection process are met. These criteria are as follows:

1) consistency with KTMPO goals;
2) identified local funding for match requirements; and
3) project readiness.

The TPPB considered project readiness to be a priority and they chose to reserve a percentage of funding for preliminary engineering (PE) costs. This prioritization process was completed for this MTP update and the resulting project listing found in **Appendix A**.

Outcome: **KTMPO's member entities come together to develop a list of regional transportation priorities to guide TxDOT in their selection of future projects for the region.**

FINANCIAL PROJECTIONS

The TRENDS (Transportation Revenue Estimation and Needs Determination System) Model, a tool to forecast state transportation revenues by year through the year 2045, is used to develop funding scenarios based on various assumptions with regard to tax rates and revenues. The Transportation Planning Policy Board reviews the funding scenarios and selects the scenario that most reasonably reflects projected growth and revenue for the region. This tool allows staff to forecast what types of funding will be available in the short and long-range plans. More details on the financial projection process is discussed in Chapter 11.

Outcome: **A list of regionally prioritized and affordable projects is in place to guide TxDOT.**

TECHNICAL ADVISORY COMMITTEE REVIEW

KTMPO staff drafts the Metropolitan Transportation Plan during a process of updating statistical and technical data to support its planning efforts. The updates reflect forecasted growth and travel, public input, and entity-sponsored projects for the 25-year planning period. The draft plan is provided to the Technical Advisory Committee for input, review, and approval, before forwarding to the Transportation Planning Policy Board.

Outcome: **TAC members gain a regional transportation perspective, while providing a beneficial local perspective into the planning process.**

TRANSPORTATION PLANNING POLICY BOARD REVIEW

The Transportation Planning Policy Board reviews the plan drafted by staff and TAC members. They authorize staff to begin the public involvement process and will consider final approval after the public comment period has closed.

Outcome: **A consensus is reached between the elected officials, local planners, and public on the future state of transportation in the region.**

PUBLIC INVOLVEMENT

As the planning process begins with the public, it also concludes with the public. As required by the Public Participation Plan (PPP), two public hearings are held to allow for public involvement and to initiate the public comment period. This allows the transportation users to have input on the final draft before the plan is officially adopted.

Outcome: **The public is again consulted for final input and confirms that the developed plan meets future transportation needs of the region.**

PLAN ADOPTION

Technical Advisory Committee and Policy Board members review final public input and officially adopt the updated Metropolitan Transportation Plan for the Killeen-Temple MPO.

Outcome: **The Killeen-Temple region has an updated forecast of the transportation needs and desires and will continue to monitor and analyze the transportation state.**

chapter 3

Demographics

Our planning boundary is characterized by a diverse group of communities who will expect the **transportation infrastructure to grow and meet their current and future needs.** The wide variations in population density, age, and socioeconomic status will challenge planners to consider the impacts and benefits of various projects in each community.

Key strengths of this area are its central position in the Texas Triangle, with access to Interstate 35, known as "Main Street, Texas" as well as the Killeen-Fort Hood Regional Airport and the Amtrak station in Temple. The area is home to two universities, two junior colleges, a variety of light industries, and several medical facilities. These elements will drive development and commerce far into the future.

REGIONAL OVERVIEW

The Killeen-Temple MPO serves a varied region characterized by multiple cities and urbanized areas in close proximity to rural ranchland. The KTMPO planning boundary takes in all of Bell County, as well as portions of southern Coryell County and eastern Lampasas County. Fort Hood, the largest armored military installation in the nation, is located partially within the planning boundary. The geography is generally flat with occasional steep, rocky hills and valleys. These valleys lent themselves to the construction of two dams which created two large reservoirs, Belton Lake and Stillhouse Hollow Lake. The positioning of the two lakes and the military reservation boundary have impacted much of the development and population patterns across the region.

The KTMPO planning area has experienced tremendous growth in terms of people, housing, commerce, and traffic. Due to the influence of For Hood, and the combination of two Census-designated Urbanized Areas (UZA), this area is vibrant, active, and diverse.

Exhibit 3.1: Population Growth (2000-2015)

Entity	2000 Census	2010 Census	Percent Increase Between 2000 and 2010	2015 Population[1]	Percent Increase Between 2010 and 2015	Percent Increase Between 2000 and 2015
KTMPO	293,209	365,368	24.6%	382,855	4.79%	30.6%
Belton	14,623	18,216	24.57%	19,766	8.51%	35.2%
Copperas Cove	29,592	32,032	8.25%	33,005	3.04%	11.5%
Harker Heights	17,308	26,700	54.26%	28,199	5.61%	62.9%
Killeen	86,911	127,921	47.19%	136,378	6.61%	56.9%
Temple	54,514	66,102	21.26%	69,938	5.80%	28.9%
Bell County	237,974	310,235	30.37%	326,034	5.09%	37.0%
Coryell County[2]	N/A	49,235	N/A	49,811	2.38%	N/A
Lampasas County[2]	N/A	5,898	N/A	7,003	18.74%	N/A

[1]2015 populations are based on the 2015 American Community Survey 5-year estimates for Census Block Groups.

[2]Populations for Coryell and Lampasas Counties represent Census Block Groups that are within the KTMPO boundary area.

As shown in Exhibit 3.1, between 2000 and 2010, the population of KTMPO increased by 72,159 people. The City of Harker Heights, with its proximity to Fort Hood, experienced the greatest percentage of population increase at 54.26%. From 2010 to 2015, the population of KTMPO increased to 382,855 resulting in a 4.79% percent increase. During this time, Lampasas County saw the greatest percent increase of 18.74%. Overall, from 2000 to 2015 the population of the KTMPO region increased by 30.6% with the City of Harker Heights had the highest percent increase during this time at 62.9%.

DIVERSITY

KTMPO has a diverse population with no single racial/ethnic group having a majority of the population. In the KTMPO region, approximately 47% of residents are considered Non-Hispanic White/Caucasian, followed by 22% Hispanic or Latino, 21% Black or African American, 5% Two or More Races, 3% Asian, 1% Native American or Alaskan Native, and 0.9% Hawaiian Native or

Exhibit 3.2: Racial/Ethnic and Median Income[1]

Entity	Non-Hispanic White/Caucasian	Non-Hispanic Black or African American	Hispanic or Latino[2]	Native American or Alaskan Native	Asian	Hawaiian Native or Pacific Islander	Two or More Races	Median Household Income
Killeen-Temple MPO	181,586	79,178	85,425	3,292	10,788	3,276	19,303	$54,315[3]
Belton	10,526	1,965	6,428	124	266	4	453	$51,033
Copperas Cove	18,000	5,410	5,757	315	824	551	2,148	$51,972
Harker Heights	13,202	5,039	6,421	121	1,141	53	2,222	$64,494
Killeen	42,464	49,263	32,600	574	5,210	2,164	8,534	$47,763
Temple	37,113	11,345	17,098	154	1,875	154	2,199	$44,716
Bell County	149,670	70,205	75,761	2,814	9,314	2,558	15,712	$50,550
Coryell County	26,571	8,660	8,834	422	1,425	718	3,181	$49,823[4]

[1]2015 populations are based on the 2015 American Community Survey 5-year estimates.

[2]Hispanic or Latino population are people who identify as Hispanic or Latino, regardless of race.

[3]Median Household Income for the KTMPO region was determined by taking an average of the Median Household Income for Bell, Coryell, and Lampasas Counties

[4]Coryell County's Median Household Income was determined by taking an average of the MHI of each Census Block Groups.

Pacific Islander.

The entity with the highest Median Household Income is Harker Heights at $64,494 and the lowest is Temple at $44,716. While the US Median Household Income at $55,775, there are areas within the KTMPO region that are below the Median Household Income of the US. These areas as well as areas that have high minority populations need to be identified so that these marginalized groups receive fair treatment and meaningful involvement in the planning and implementation of transportation projects.

Mapping these populations clearly shows where Minority, Hispanic, and Low-Income areas are concentrated within the KTMPO planning boundary. By analyzing this demographic data, KTMPO determined which areas of the KTMPO region are designated as Environmental Justice areas as shown in Exhibit 3.3. KTMPO will continue to focus our public outreach efforts to specific EJ areas as described in our Title VI Plan. An assessment of these EJ areas and proposed roadway projects will be discussed in Chapter 10, Environment and Quality of Life.

Exhibit 3.3: Environmental Justice (EJ) Areas

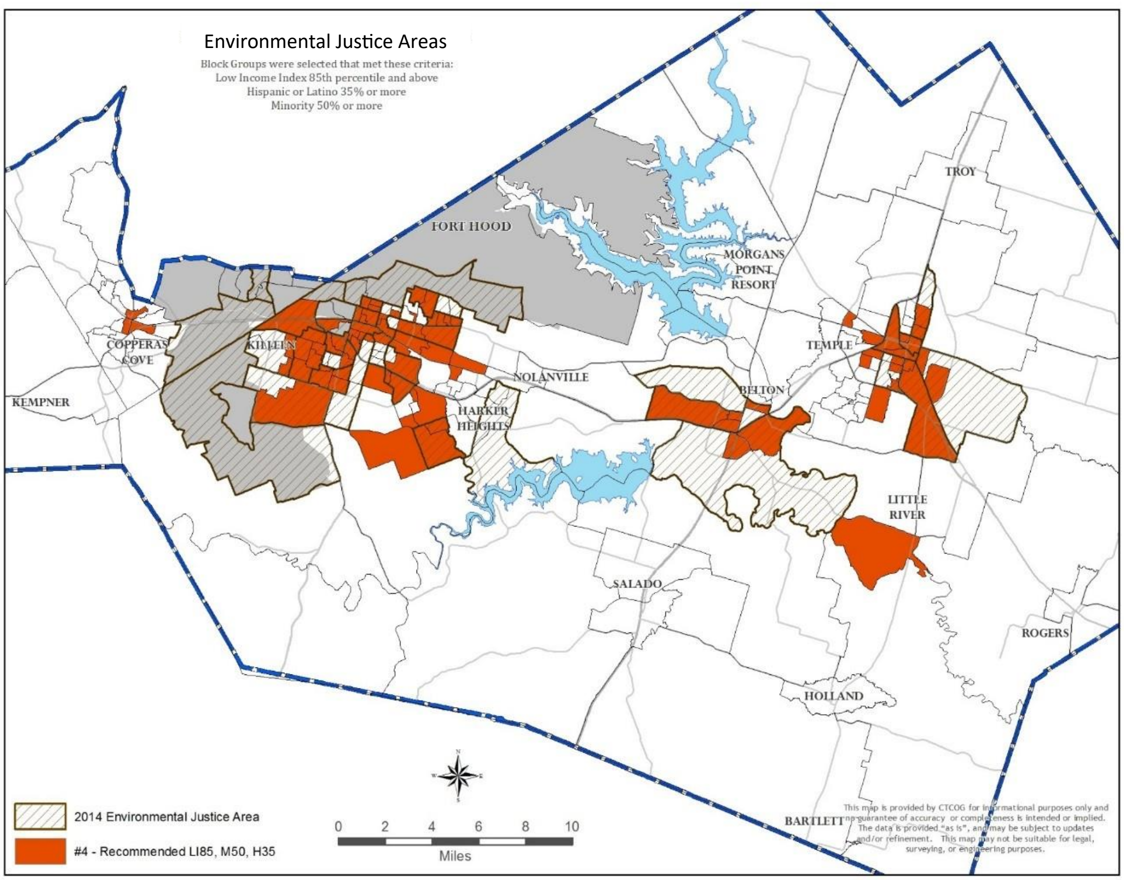


Exhibit 3.4: Hispanic/Latino EJ Areas

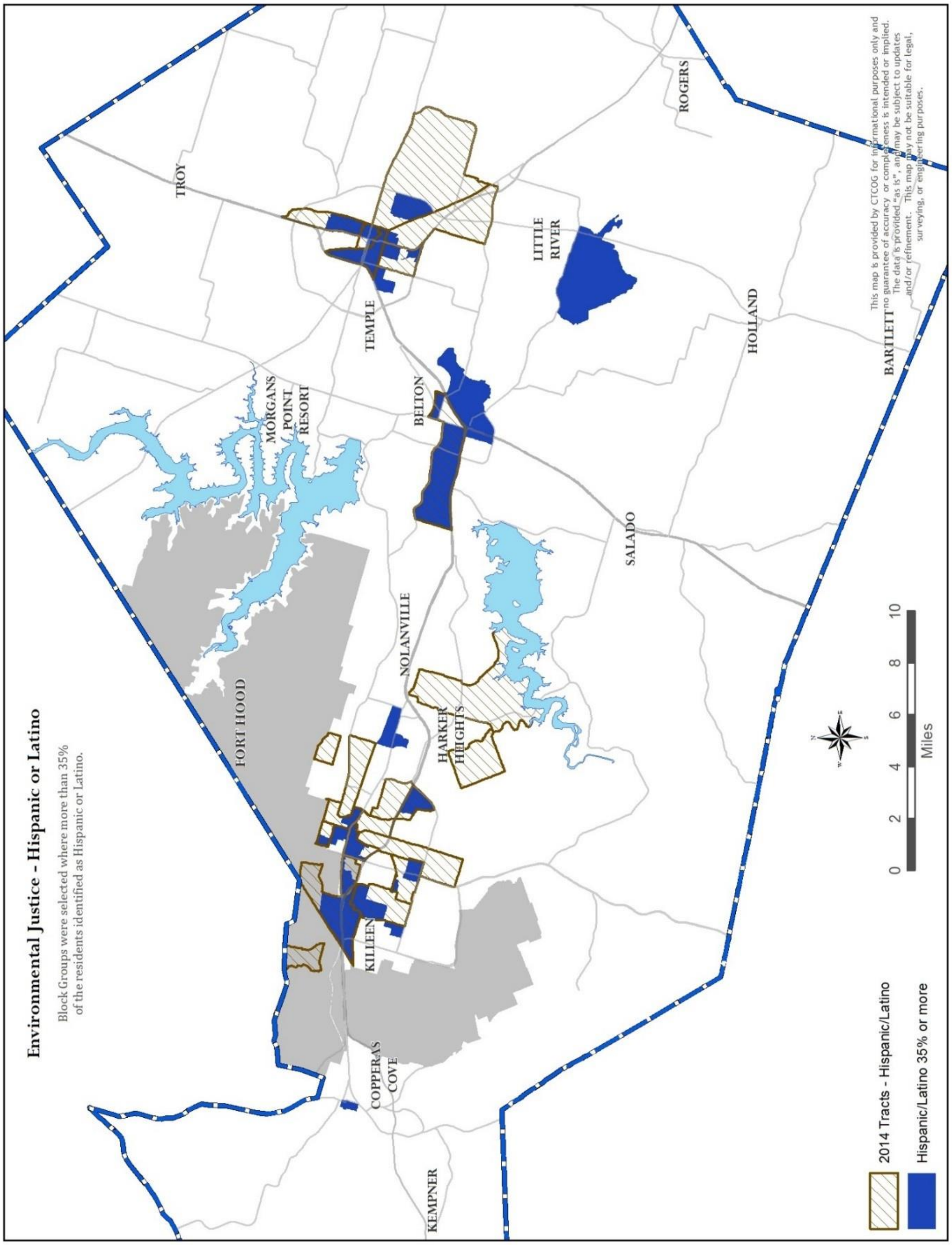


Exhibit 3.5: Low Income EJ Area

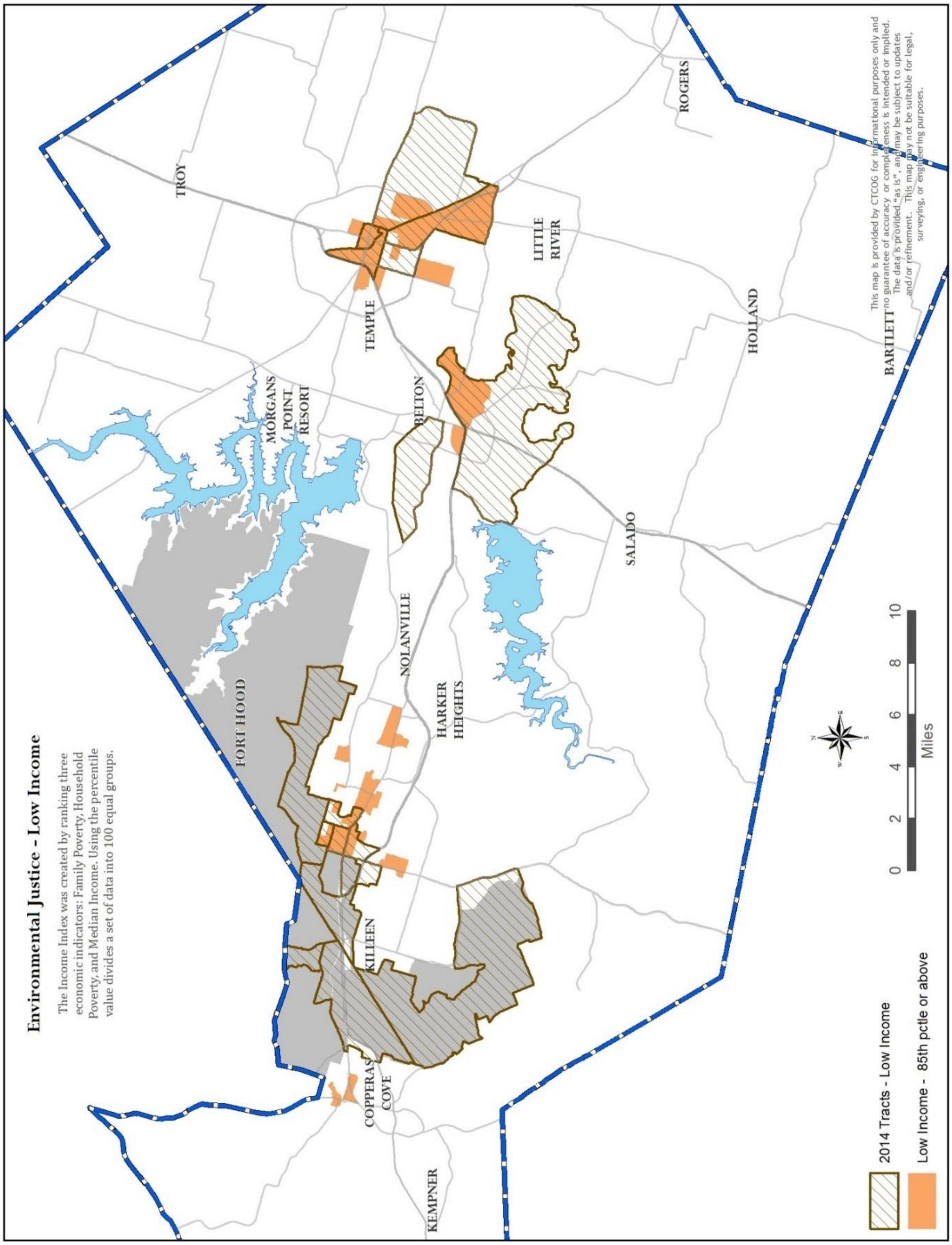
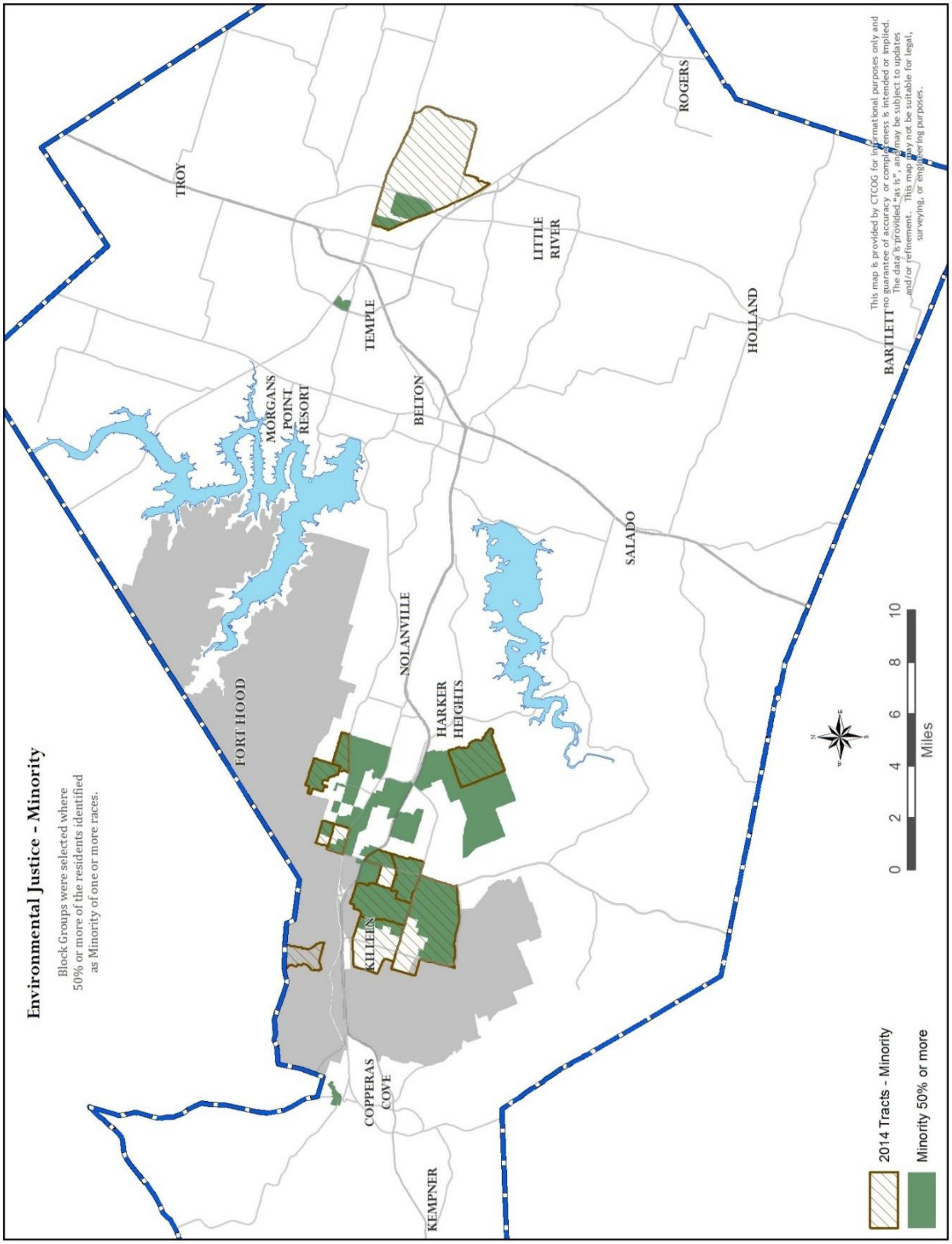


Exhibit 3.6: Minority EJ Areas



AGE

Median age is significantly younger in the urbanized areas, compared to the rest of the planning boundary. This shows the effect of Fort Hood on the surrounding area. Belton has the lowest median age of the KTMPO planning boundary, followed by Killeen.

Exhibit 3.7: Median Age

Entity Name	Median Age	Total Median Age for Males	Median Age for Females
KTMPO	31.6	30.3	32.9
Belton	27.2	25.1	29.2
Copperas Cove	31.0	30.0	32.4
Harker Heights	31.7	29.8	33.3
Temple	34.9	34.6	35.3
Killeen	28.2	27.2	29.0
Bell County	30.2	29.0	31.2
Coryell County	28.8	31.0	26.6
Lampasas County	40.9	40.9	40.8

POPULATION PROJECTIONS

In 2017, KTMPO hired a consultant (Kimley-Horn) to assist in developing demographic and network data for inclusion in the updated Travel Demand Model. This work included updating the Traffic Analysis Zones (TAZ), TAZ-level demographics, and the modeled roadway network for the years 2015 and 2045. The initial step in developing demographic data for the study area was to establish future demographic "control totals." The consultant team reviewed the following plans:

- City of Belton: Belton 2017-2021 Strategic Plan
- City of Copperas Cove: Future Land Use Plan
- City of Harker Heights: Comprehensive Plan, January 2007
- City of Killeen: Comprehensive Plan, November 2010
- City of Temple: Comprehensive Plan 2008-2030, May 2008

Based upon documented growth rates in the above data sources, the consultant team developed the 2045 population projections shown in Exhibit 3.8, thereby establishing the 2045 population control total for the KTMPO planning area at 572,306.

Employment was split into basic, retail, service, and education sectors. Based on the 2015 base data, total employment to individual employment sector ratio was calculated for each county and the future years were projected to carry forward the same ratio. Exhibit 3.10 summarizes the 2045 employment control totals by entity. Chapter 4 includes a more detailed discussion of the work done to update KTMPO's regional travel demand. The complete Travel Demand Model Update/Model Documentation is included in **Appendix I.**

Exhibit 3.8: Population Projections (KTMPO Planning Area)

Entity	2015 Estimated Population[1]	2045 Population Projections[2]	Percent Increase
KTMPO Region	365,882	572,306	56.4%
Bell County	310,235	491,055	58.2%
Coryell County	49,029	58,702	19.7%
Lampasas County	6,618	22,549	240.7%
Belton	18,216	35,203	93.3%
Copperas Cove	32,032	40,610	26.8%
Harker Heights	26,700	47,003	76.0%
Killeen	127,921	188,860	47.6%
Temple	66,102	102,067	81.6%

[1]2015 populations are based on population of Traffic Analysis Zones (TAZ).

[2]2045 projections are based on the projected TAZ population for the 2045 Travel Demand Model Refresh.

Exhibit 3.9: Household Projections (KTMPO Planning Area)

Entity	2015 Households[1]	2045 Household Projections[2]	Percent Increase
KTMPO Region	145,051	275,611	90.0%
Bell County	126,618	237,812	87.8%
Coryell County	16,146	27,413	69.8%
Lampasas County	2,287	10,386	354.1%
Belton	7,779	15,163	94.9%
Copperas Cove	14,819	33,352	125.1%
Harker Heights	9,259	13,777	48.8%
Killeen	56,305	71,286	26.6%
Temple	30,142	42,754	41.8%

[1]2015 populations are based on population of Traffic Analysis Zones (TAZ).
[2]2045 projections are based on the projected TAZ population for the 2045 Travel Demand Model Refresh.

Exhibit 3.10: Employment Projections (KTMPO Planning Area)

Entity	2015 Employment[1]	2045 Employment Projections[2]	Percent Increase
KTMPO Region	174,546	278,592	59.6%
Bell County	144,768	242,026	67.2%
Coryell County	29,135	33,953	16.5%
Lampasas County	643	2,613	306.4%
Belton	8,605	17,906	108.1%
Copperas Cove	6,934	22,133	219.2%
Harker Heights	7,313	10,095	38.0%
Killeen	27,231	50,585	85.8%
Temple	41,280	102,820	149.1%

[1]2015 populations are based on population of Traffic Analysis Zones (TAZ).
[2]2045 projections are based on the projected TAZ population for the 2045 Travel Demand Model Refresh.

chapter 4

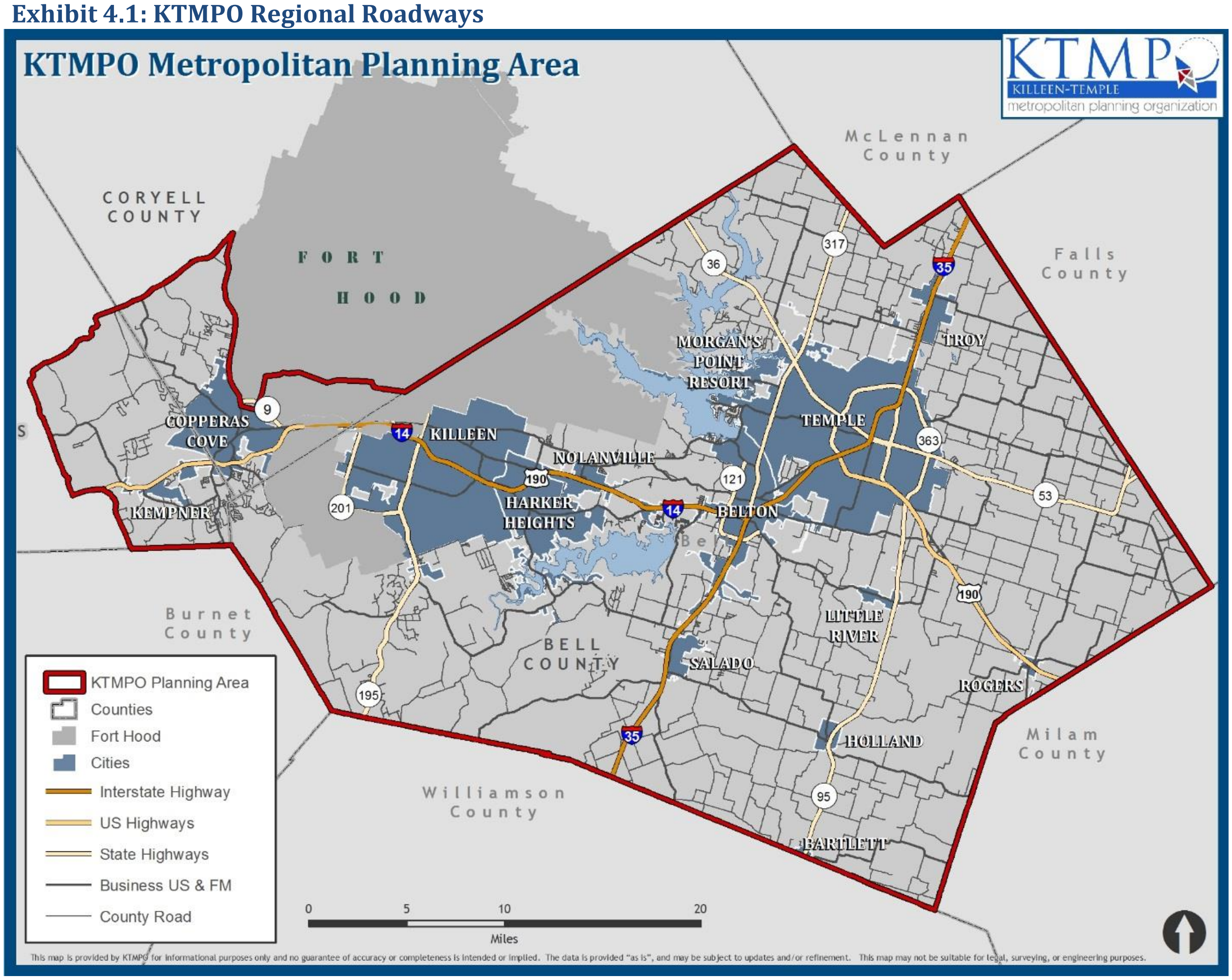
Regional Roadway System

The KTMPO regional roadway system features **3,700 miles of roadway with 71 miles interstate, 107 miles of US highway and 135 miles of state highway.** On average there are approximately 4,500,000 daily vehicle miles traveled. These roadways are vital to business, rural farmers to market, military deployment, manufacturers, health care, recreation, and throughput.

REGIONAL FUNCTION OF MAJOR TRANSPORTATION FACILITIES

The Killeen-Temple Metropolitan Planning Organization (KTMPO) is situated in Central Texas and benefits greatly from growth economically. Central Texas maintains major roadway facilities that are vital to commerce, manufacturing and the military. As stated in the previous chapter, the KTMPO region expects to add another 206,000 in population by 2045. Growth factors and expected pass-through traffic growth on our roadways will continue to warrant major investments for safe and reliable roadway facilities. These investments are essential to the economy and security for Texas and the United States.

Exhibit 4.1: KTMPO Regional Roadways



The KTMPO region is home to nationally known manufacturers of goods, distributers of various products, nationally recognized medical facilities and the largest active duty armored post in the United States Armed Services. Our location allows for the movement of goods, services and the military in an economically viable manner. Major highways such as I-35 and US 190/I-14 provide a safe and efficient way to move products through the State and the nation.

As of 2015, the Killeen-Temple-Fort Hood metro area is #9 in Texas based on population. From 2010 through 2015, the KTMPO region grew an estimated 5% and projections show that growth in the KTMPO region is expected to increase by an estimated 56% by 2045. As previously stated, these growth factors have a significant impact on the future KTMPO transportation facility needs. With growth comes the growth pains of congestion. Congestion in the KTMPO region has a significant impact on the region's ability to maintain air quality, effectively move goods, people and services, and to decrease transportation cost. KTMPO's goal is to maintain a safe, reliable, functional and efficient transportation system for the growing population, growing commerce needs and meet future air quality standards.

Quality of life events have been a local mantra for the KTMPO area for many years and is a large reason for business and the labor force to locate in Central Texas. KTMPO reaps the benefit of having two large US Army Corps of Engineers managed reservoirs. Belton Lake covers 12,300 surface acres and Stillhouse Hollow Lake covers 6,430 acres. These lakes are critical for water resources and flood control, but also provide recreational users with 15 parks to visit for hiking, biking, boating, and swimming.

Temple is home to the Wildflower festival and Belton has been named as one of the nation's "Top Ten Places to Fly Your Flag on the 4th of July." Belton is also home to the Bell County Expo center that brings visitors to the area weekly with events that draw crowds in the thousands. Fort Hood holds major events annually that draws visitors by the thousands to include a 5-mile animated Christmas light display and one of Texas' premiere 4th of July festival and fireworks displays. The City of Killeen is home to Killeen Civic and Conference Center. Killeen hosts many events to include fun runs, the arts and theatre productions to name a few. Copperas Cove holds an annual "Rabbit Festival" with over 20,000 visitors over a 3-day period. Harker Heights hosts the annual "Central Texas Food, Wine and Brew Festival".

With thousands of tourists visiting Central Texas, communities are dependent on safe, reliable, functional and efficient transportation systems to maintain a high quality of life, and to that end, this is a KTMPO goal.

The larger cities of the KTMPO region are home to higher education facilities such as Central Texas College and Texas A&M University - Central Texas in Killeen; University of Mary Hardin Baylor in Belton; and Temple College in Temple. Each of these facilities are experiencing phenomenal growth to meet the demand. Quality of life, central location, and opportunity have played important roles in the sustained growth the KTMPO region experiences. Along each of the KTMPO major transportation facilities, users of these facilities consist of businesses, commuters, school students, recreational users, freight haulers, military and medical personnel.

THOROUGHFARE PLAN DEVELOPMENT

KTMPO developed a Regional Thoroughfare and Pedestrian/Bicycle Plan in 2008 to create a forward-thinking blueprint for the region's transportation system. The plan consists of two distinct, but related components: a thoroughfare element and a pedestrian/bicycle element. This plan was updated in 2010 to accommodate an expansion in the KTMPO boundary, and again in 2011 to incorporate significant changes in the pedestrian/bicycle element.

In 2018, KTMPO developed a Regional Multimodal Plan which includes the Regional Thoroughfare and Pedestrian/Bicycle Plan. However, this plan expands its focus to include how other multiple transportation modes such as transit, freight and air interaction with the roadway and bike/pedestrian network and provides an outline on how to plan for developing an integrated and comprehensive regional transportation network. The plan can be found in **Appendix E, Regional Multimodal Plan.**

TYPICAL CROSS-SECTIONS BY FUNCTIONAL CLASSIFICATION

The cross-section designs that follow are taken from the Regional Multimodal Plan and are tailored for each classification in the KTMPO planning area. More details on the development of the typical sections can be found in **Appendix E, Regional Multimodal Plan**. Future regional thoroughfare plans are depicted in Exhibits 4.8 through 4.12.

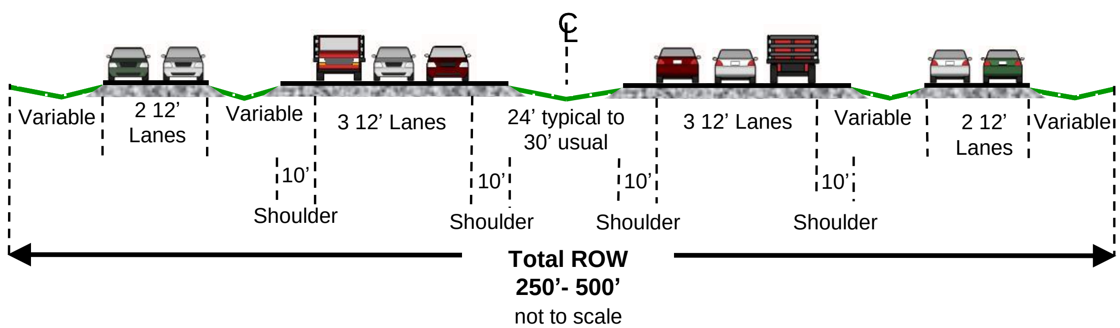
Controlled-Access Functional Classification

General design standards for Controlled-Access Function Class call for a minimum right-of-way width of 250’ for four lanes, with the desirable standard being six lanes and 500’. Design details are determined by TxDOT. Bicycles and pedestrians are prohibited due to the high speeds of these classes of road, so the design of supporting bicycle and pedestrian infrastructure (including shared use of wide shoulders) is not applicable.

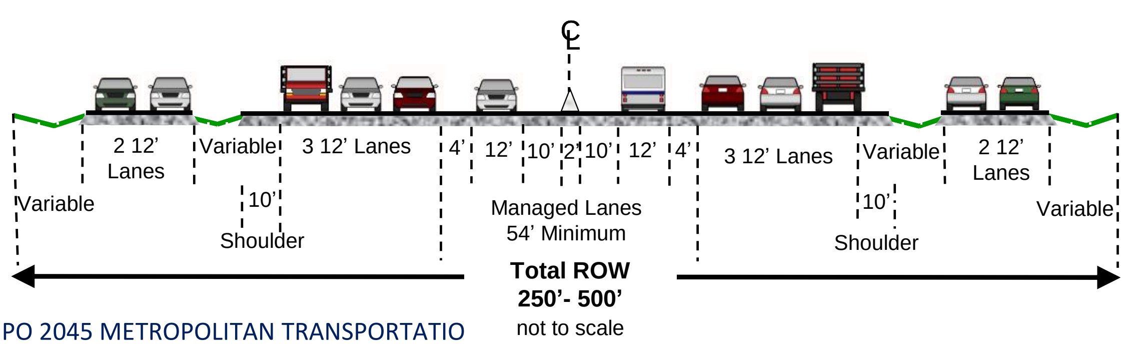
Where a wide grassy median is not desired, a raised concrete median such as a “Jersey barrier” can be installed. The use of Jersey barriers can serve as the base for light standards, sign posts, bases for the retaining walls between the main lanes and the frontage roads.

Exhibit 4.2: Typical Cross-Sections—Controlled-Access Arterials

Controlled Access Facility (4-6 Lanes) with Frontage Roads



Controlled Access Facility (4-6 Lanes) with Managed Lanes and Frontage Roads



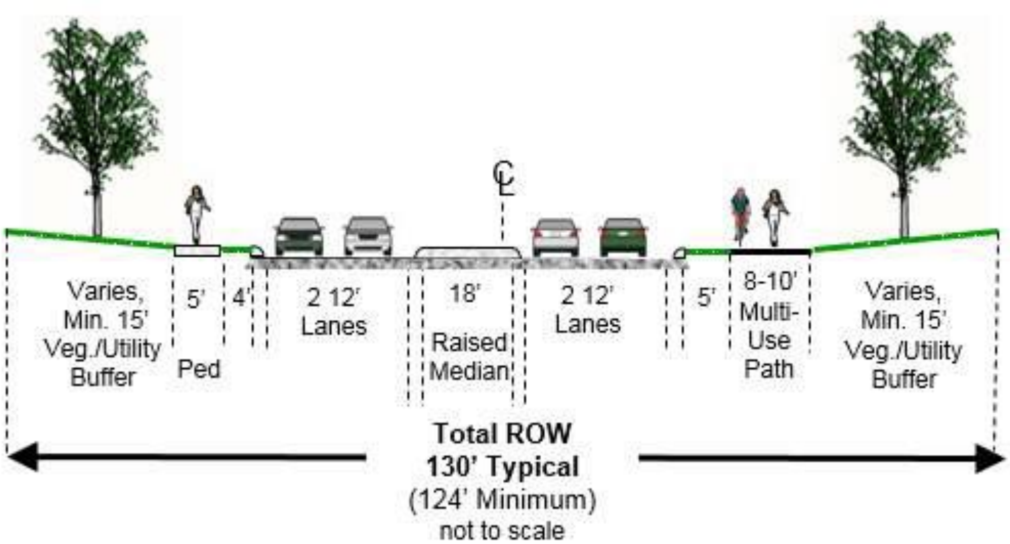
Major Arterial Functional Class

Major Arterial Functional Class general design standards call for a 130' minimum right-of-way for a four-lane facility, with 160' desirable for six lanes. A travel lane width of 12' as specified is common for existing Major Arterials in the KTMPO region, but Complete Streets and Vision Zero guidance calls for narrowing travel lanes to 11' to slow traffic to speeds that are safer for all road users.

For divided Major Arterials, a minimum median width of 18" is desirable. The median divider can be a permanent feature such as a curb or a raised concrete barrier or can be landscaped. For landscaped medians, a minimum width of 15" is recommended. Typical practice in the KTMPO region has been to install wider grassy medians, with widths of 15' typical for older urban streets such as Ave H in Temple, and 20' to 40' typical for new construction streets in suburban areas such as SH 201 in Killeen and S. 5th Street in Temple.

Bicycle and pedestrian facilities are permitted on Major Arterials and lower Functional Classes. Therefore, the cross sections for typical Major Arterials include sample variations in the different classes of bicycle and pedestrian infrastructure as well as differences in the number of lanes, lane widths, medians, and other road attributes. Typical cross-sections are shown in Exhibit 4.3.

Exhibit 4.3: Typical Cross-Sections—Major Arterials



Minor Arterial Functional Class

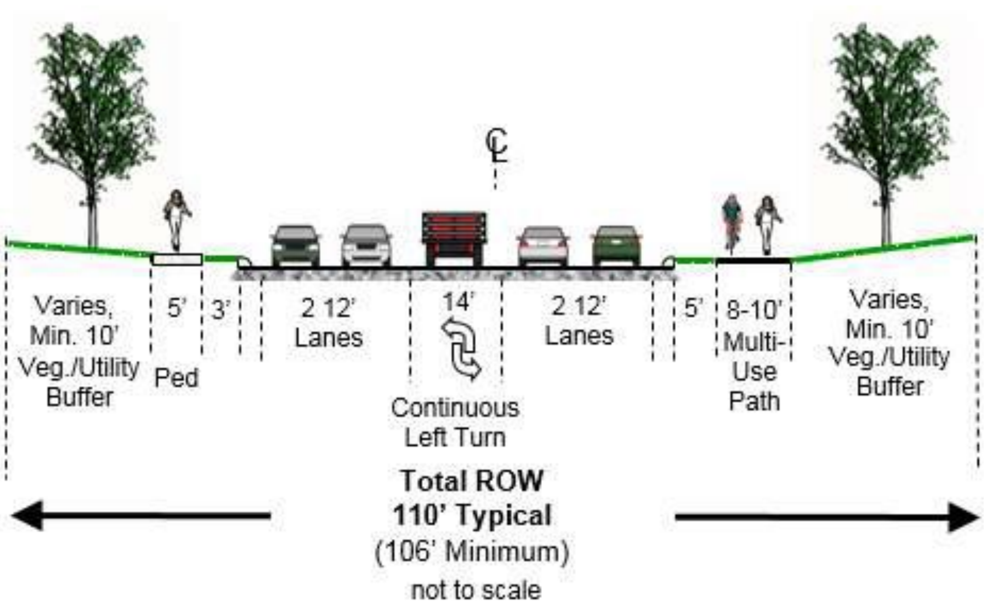
Minor Arterials general design standards call for a minimum right-of-way of 80’ for three lanes, increasing to 110’ for four lanes. The desirable right-of-way is 120’, which will accommodate five lanes.

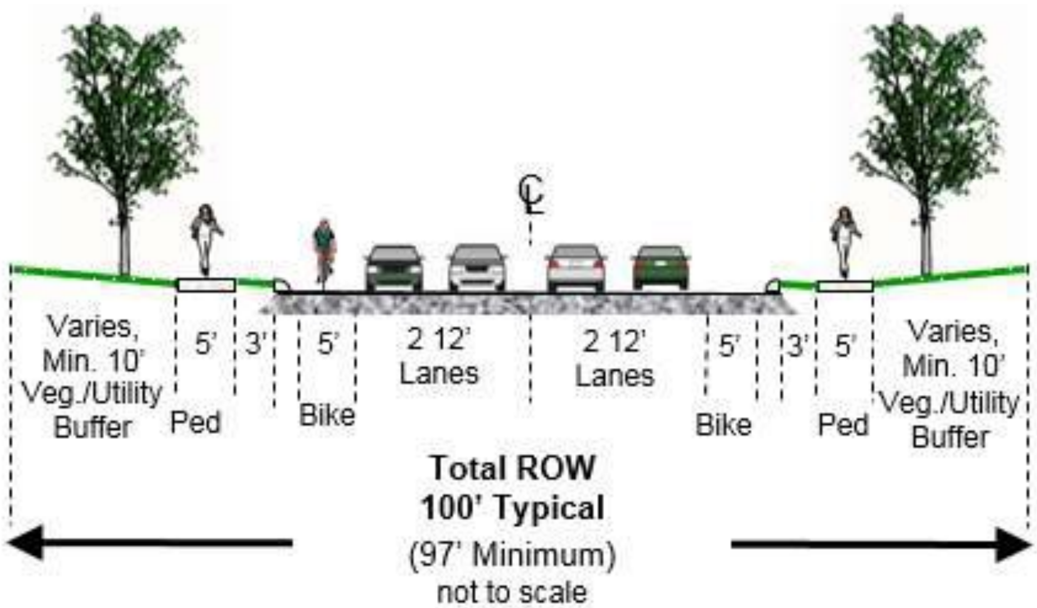
As with Major Arterials, a travel lane width of 12’ is common in the KTMPO region. The Complete Streets and Vision Zero guidance calling for travel lanes of 11’ to slow traffic to speeds that are safer for all road users is even more pertinent for Minor Arterials, given their position in the access/mobility continuum that has greater emphasis on access and on multimodal uses.

A continuous center turn lane has been recommended as an appropriate median treatment for Minor Arterials, with a desirable width of 16’. Landscaped buffer areas on the edges of Minor Arterials are recommended with a 10’ width.

Minor Arterials may have greater accommodations for bicycles and pedestrians than Major Arterials, as they typically have lower speeds, lower traffic volumes, and a smaller percentage of trucks in the traffic stream. Separated off-street paths or sidewalks and a separated off-street multi-use may be included along Minor Arterials.

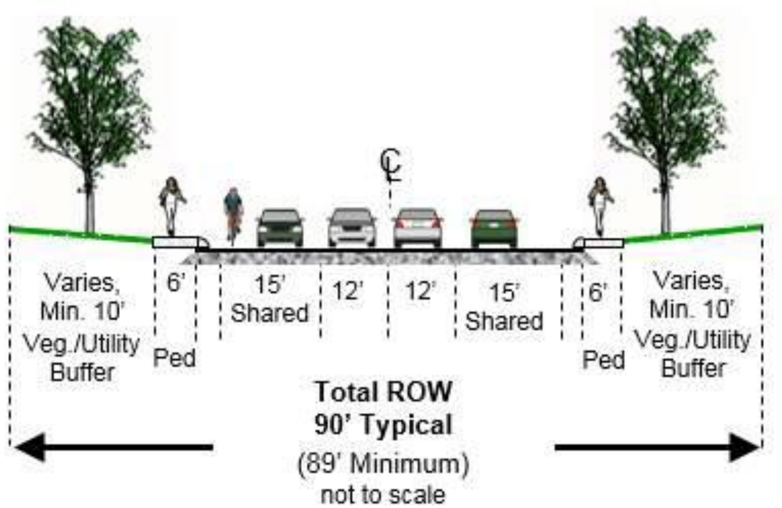
Exhibit 4.4: Typical Cross-Sections—Minor Arterials





More extensive bicycle and pedestrian accommodations are shown in the cross section in below. Separated off-street paths or sidewalks and on-street conventional unbuffered bike lanes are shown.

The next cross-section shows a typical four-lane Minor Arterial with wide outside lanes, intended to permit autos and bicycles to safely share a lane. The recommended width of the shared lane is 15'. The wider outside lanes should be carefully marked with visual clues to discourage excessive vehicle speeds and preserve street safety for all users. The width of the street can compromise the safety of the pedestrian crossing, but this can be mitigated by the use of median pedestrian refuges and well-marked crosswalks.



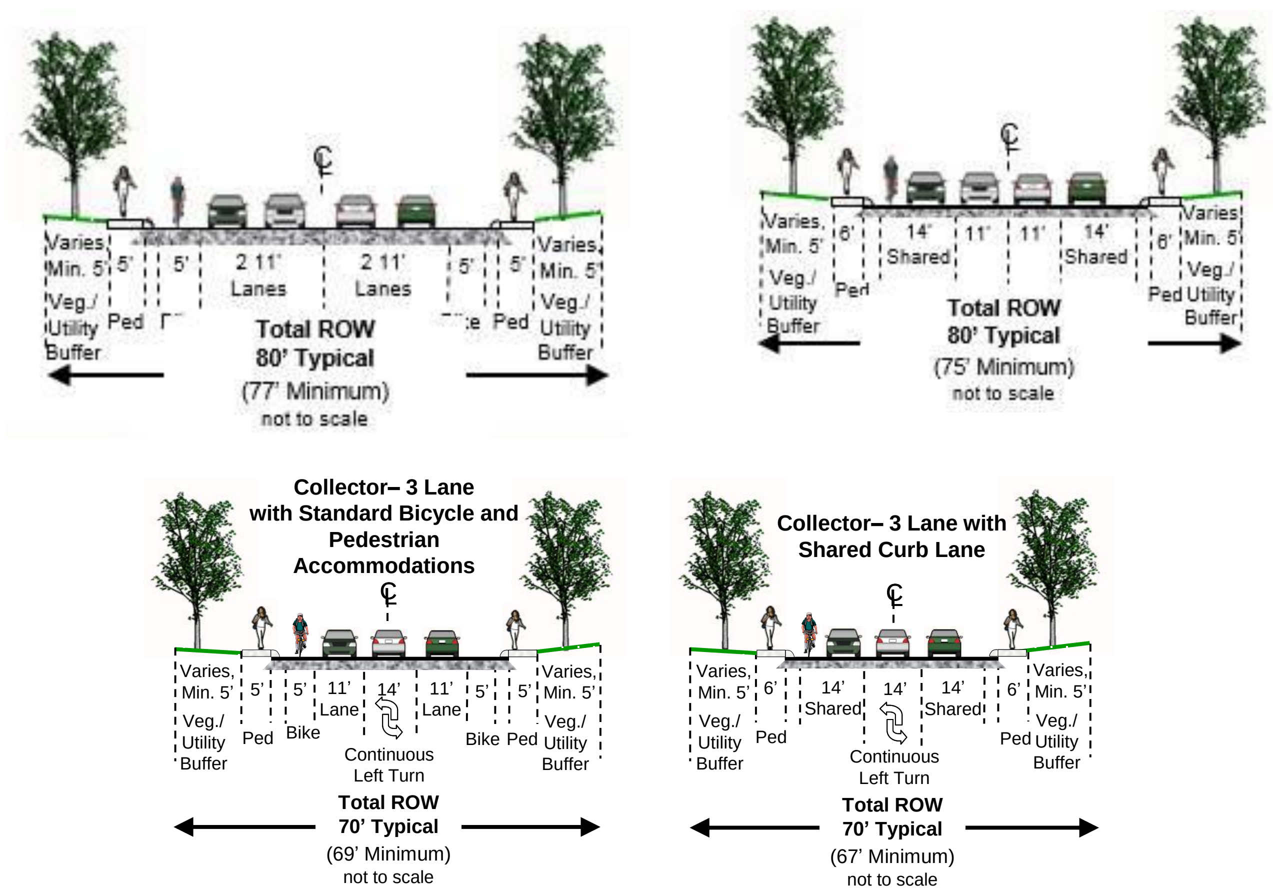
Collector Functional Class

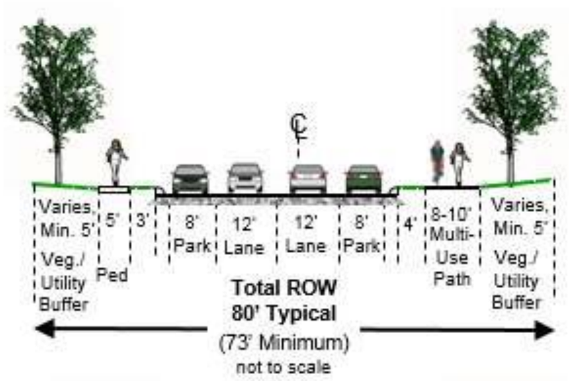
Collector Functional Class is the Functional Class which is most geared to providing access. With mobility as a less critical attribute, narrower lane widths of 11’ are recommended, although widths as narrow as 10’ are cited in Complete Streets and Vision Zero guidelines. Shared auto and bicycle outside lanes may be as narrow as 14’. Minimum right-of-way of 60’ for two lanes and 70’ for three lanes are listed in the guidance. For four lanes, a desirable right-of-way is 80’.

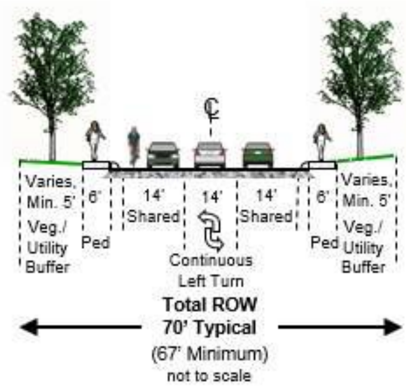
Due to the lower speeds and lower volumes of traffic, continuous center turn lanes on Collector Streets may be as narrow as 14’. Medians and buffers should have a minimum width of 5’.

More extensive bicycle and pedestrian treatments should be expected on Collector Streets.

Exhibit 4.5: Typical Cross-Sections—Collectors





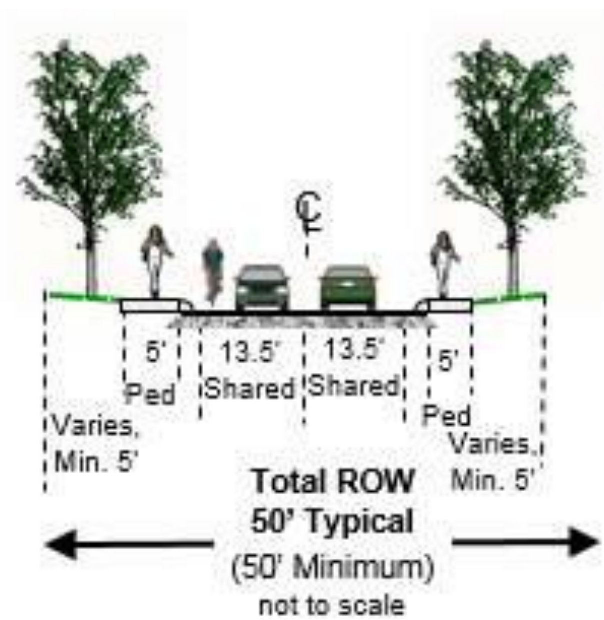


Local Street Functional Class

Local Functional Class Streets have the lowest speeds and volumes of all the Functional Classes. With these attributes, travel lane widths can consistently be narrower, with 10.5’ recommended as a minimum. Widths as narrow as 10’ are cited in Complete Streets and Vision Zero guidelines.

A right-of-way width of 50’ is recommended for Local streets. The Exhibit 4.6 shows a typical cross section for a two-lane local street. In this illustration, shared lanes of 13.5’ are provided. Narrower travel lane widths may be implemented to reduce traffic speeds to levels that are safe for users of all ages and abilities.

Exhibit 4.6: Typical Cross-Sections—Local Street Functional Class



The table below summarizes the recommendations for right-of-way (ROW) considerations by street Functional Class. Minimum ROW is based on 4 lanes for Principal Arterials, 3 lanes (two travel lanes and a center turn lane) for Minor Arterials, and 2 lanes for Collectors and Local streets.

Exhibit 4.7: Summary of ROW Requirements Recommendations by Functional Class

Design Element	Controlled-Access	Major Arterial	Minor Arterial	Collector	Local
Preferred ROW Width	Varies up to 500'	160'	120'	80'	50'
Minimum ROW Width	250'	130'	80'	60'	44'
Typical Pavement Width (BOC to BOC)	Varies	82' to 106'	47' to 75'	31' to 57'	23' to 29'
Auto Lane Width	Minimum 12'	Preferred 12'	Preferred 12'	Minimum 11'	Minimum 10.5'
Median Treatment	Rural: Minimum 36' Urban: Minimum 10'	Preferred18'	Continuous Center Left Turn Lane Preferred 14' Minimum	Continuous Center Left Turn Lane Preferred 14' Minimum	None
Outside Vegetation/Utility Buffer (minimum)	Varies	15'	10'	5'	5'
Notes	Inside Shoulder: Minimum 4' Outside Shoulder: Minimum 10' Vertical Clearance: Minimum 14'	ROW may be greater with parking, bicycle and pedestrian facilities, bus stops, and intersection treatments.			

Exhibit 4.8: KTMPO Regional Thoroughfare

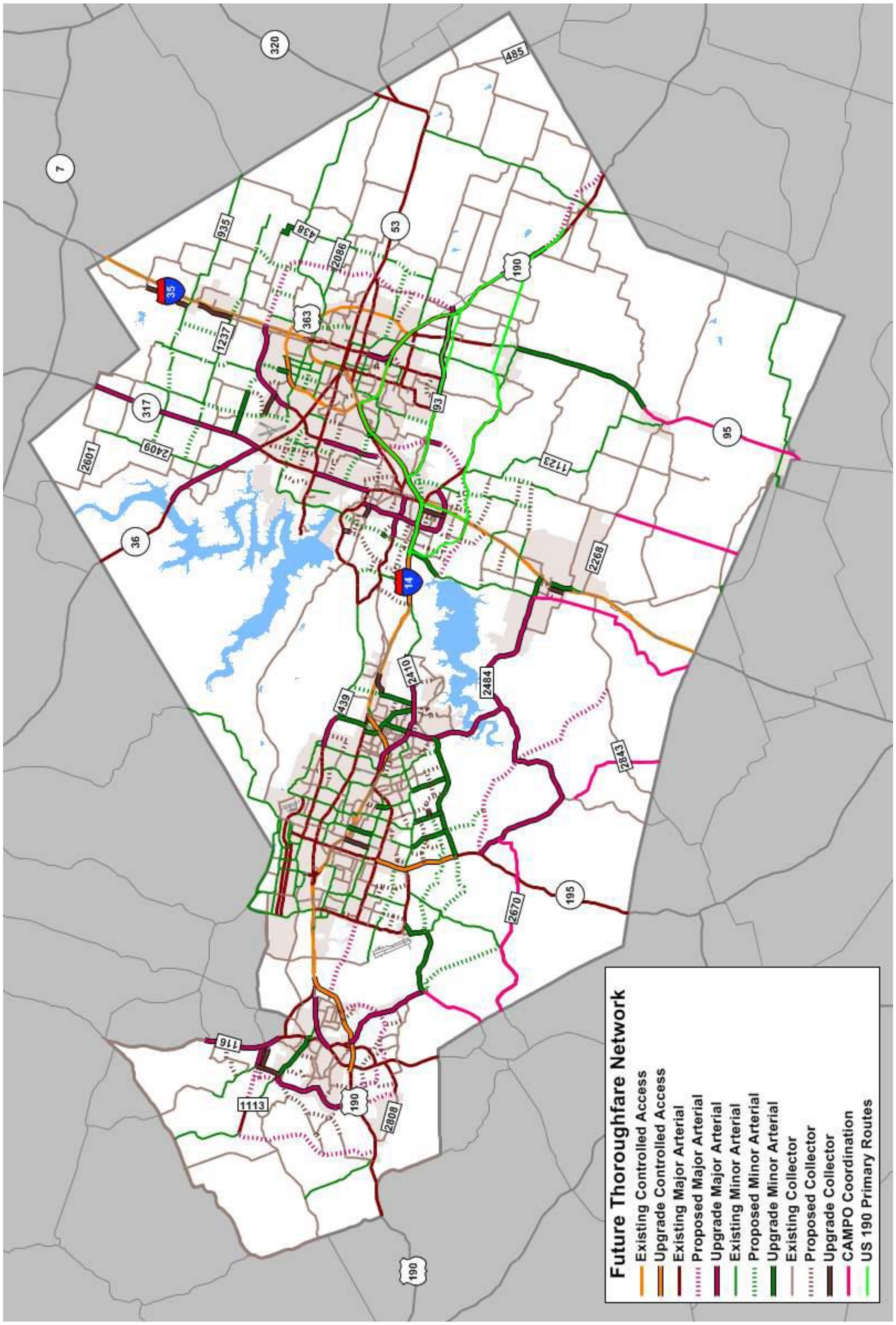


Exhibit 4.9: KTMPO Regional Thoroughfare (Copperas Cove)

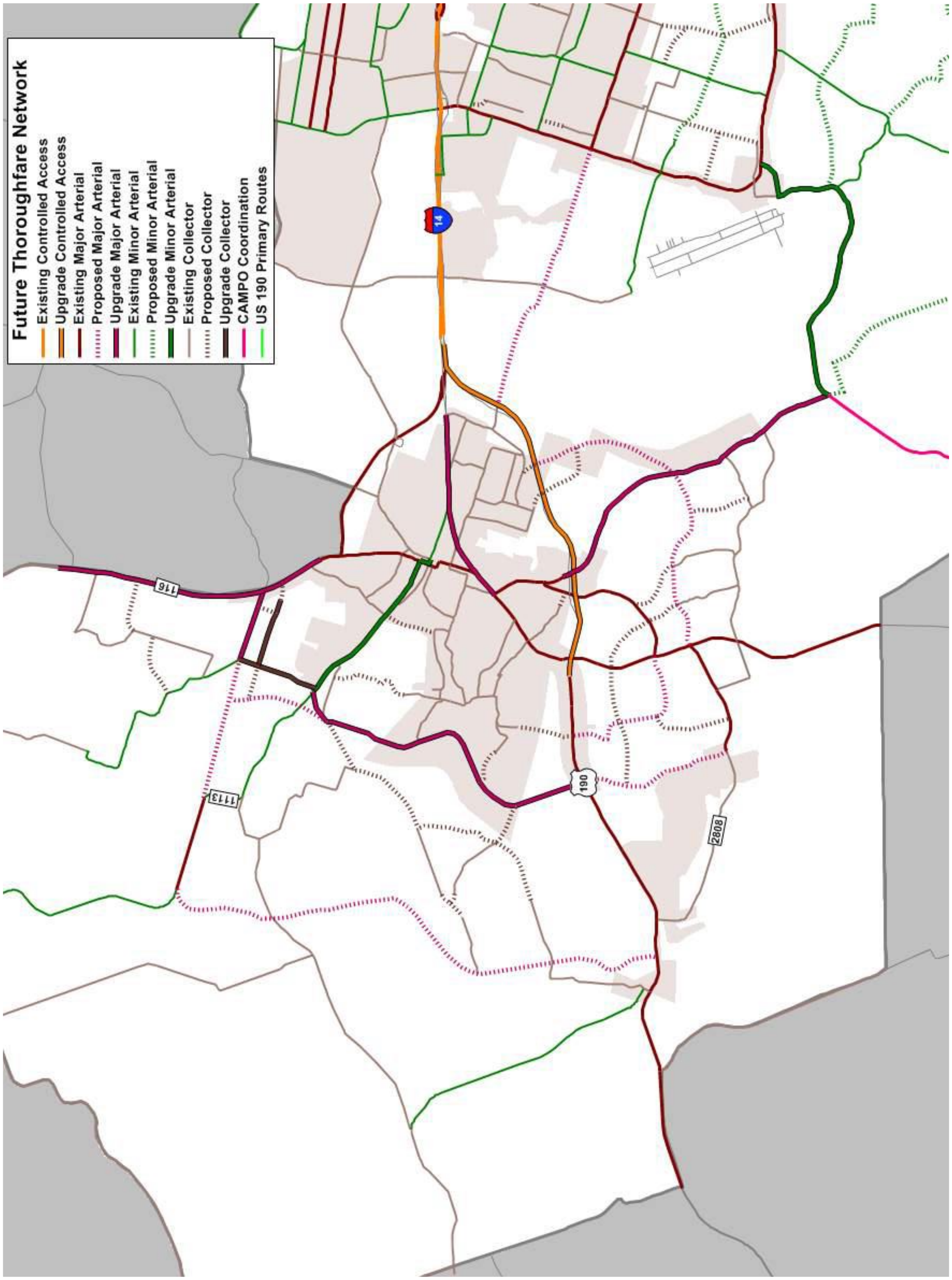


Exhibit 4.10: KTMPO Regional Thoroughfare (Killeen, Harker Heights, Nolanville)

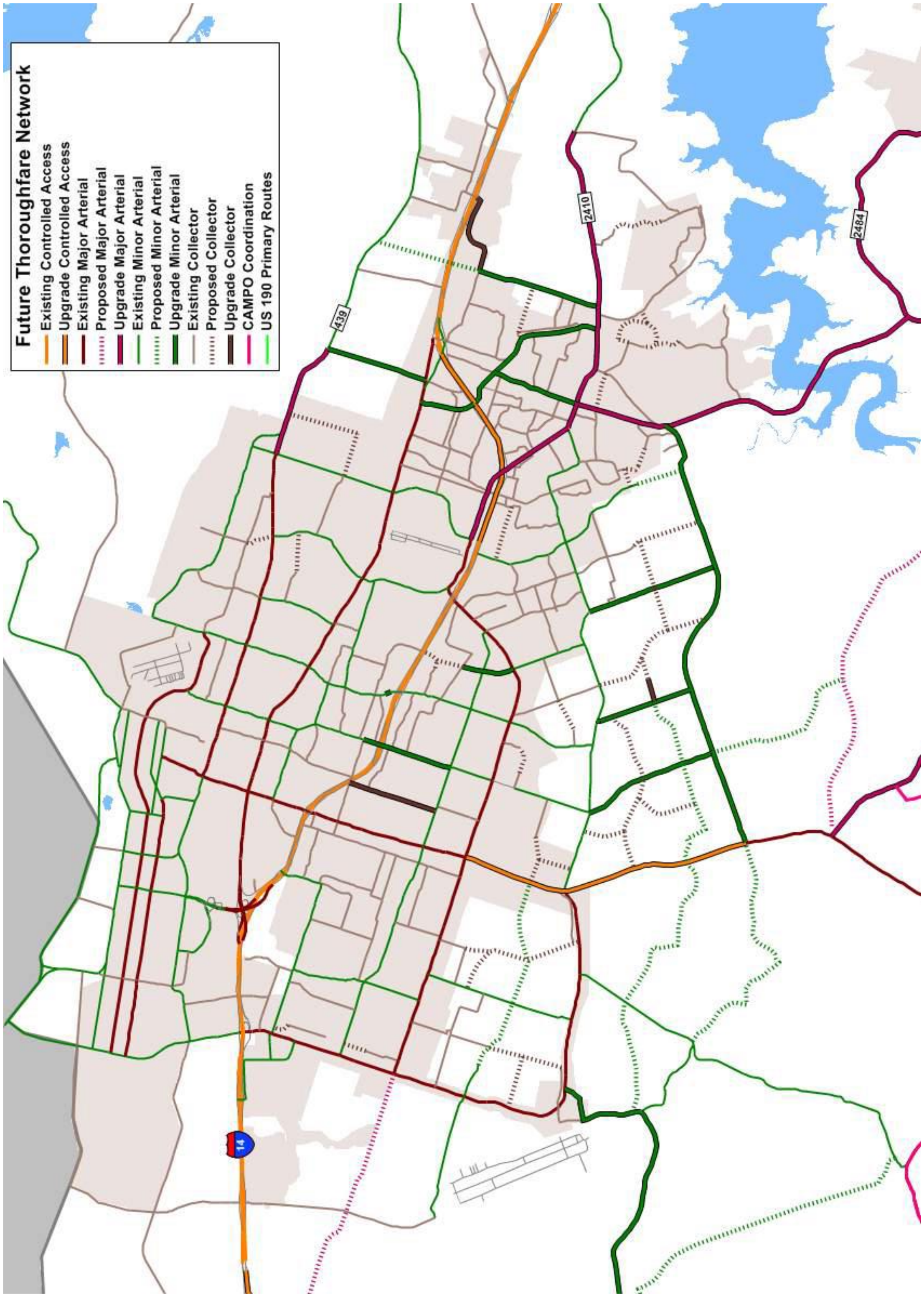


Exhibit 4.11: KTMPO Regional Thoroughfare (Belton, Salado)

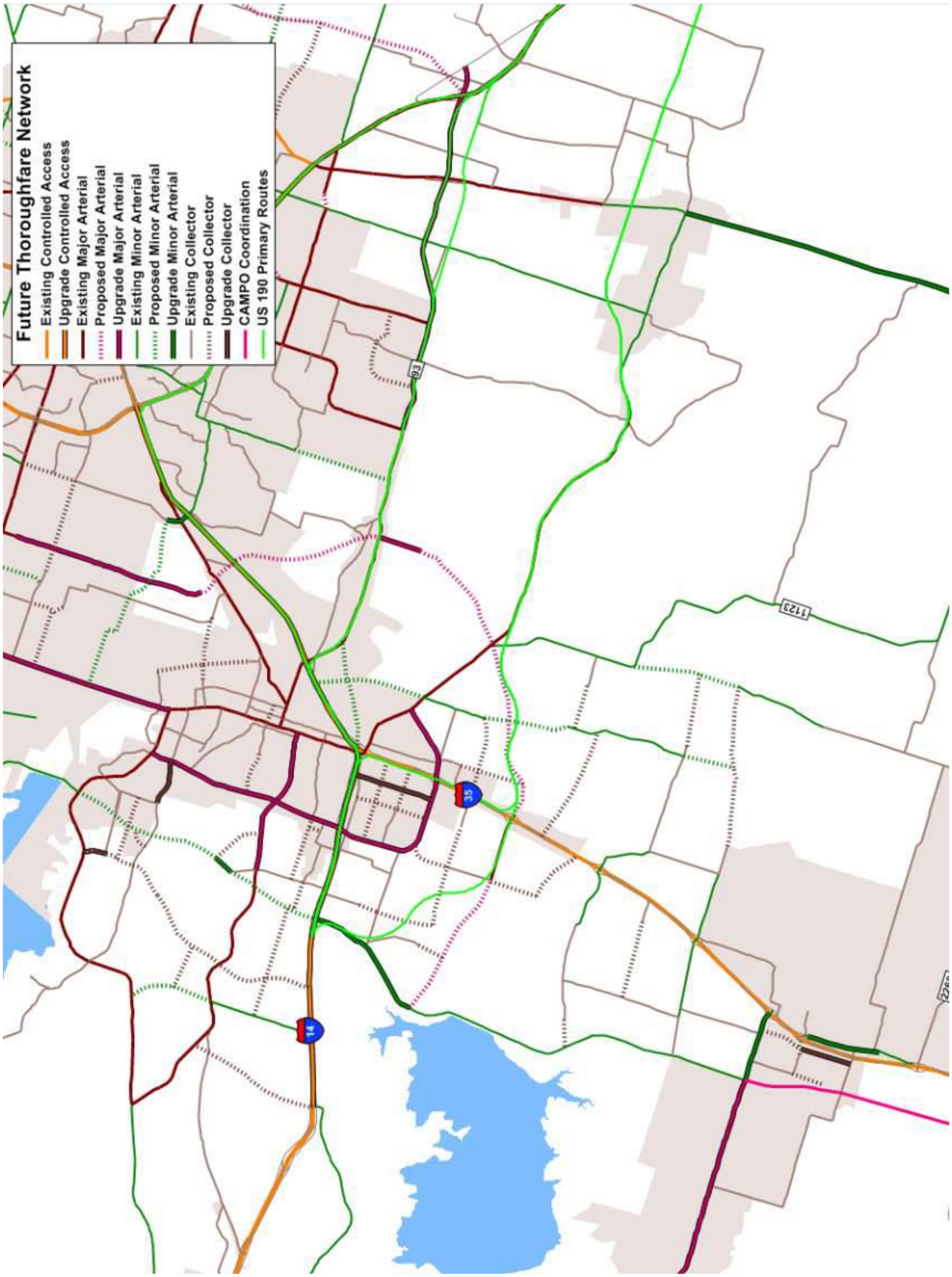
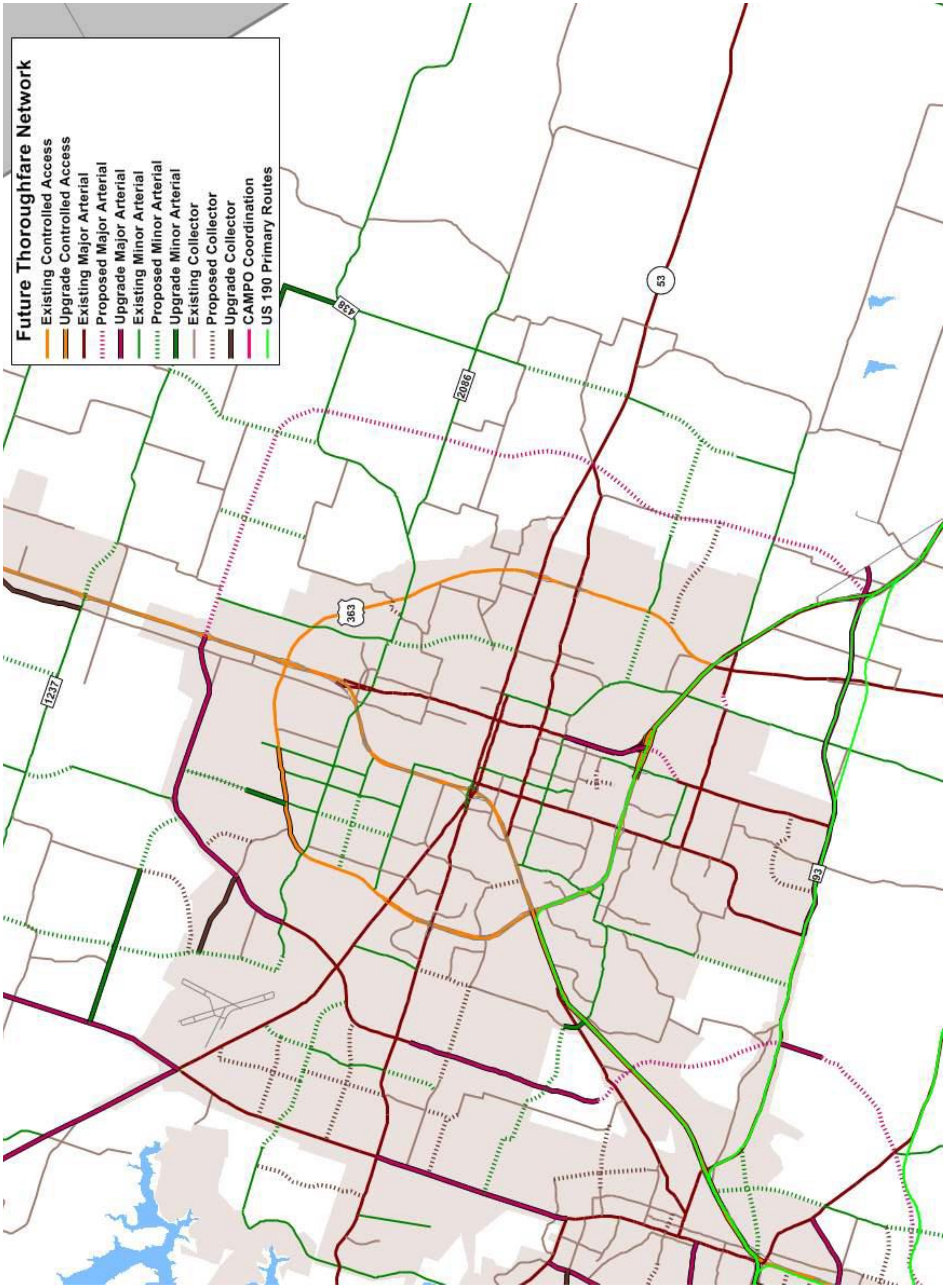


Exhibit 4.12: KTMPO Regional Thoroughfare (Temple)



THOROUGHFARE PLAN IMPLEMENTATION, FINANCING, AND MAINTENANCE

Projects required for the implementation of the Thoroughfare Plan are to be constructed by a variety of implementing agencies, including municipalities, counties, Fort Hood, the Texas Department of Transportation, private developers, and in some cases, public-private partnerships. Municipalities are encouraged, while coordinating more closely with KTMPO, to continue their own sound planning practices as they relate to zoning, subdivision regulations, building setbacks, access control, and visibility standards so that land and roadway development occurs in such a fashion to be consistent with the Thoroughfare Plan. In addition, they are urged to view the network within their jurisdiction as part of a larger regional system.

Traditionally, funding for the various types of roadway projects related to the development of the regional thoroughfare plan is provided via the local general obligation bond programs, the KTMPO's Transportation Improvement Program, developer participation, and in some cases, toll revenue financing. The prioritization processes that are in-place for the development of these funding programs should continue to be followed to ensure that the most needed projects are the ones that are implemented first.

As with any long-range planning document, this plan is considered a "living" document that responds to changing visions, goals, priorities, and trends of each individual jurisdiction. Alterations to the plan are derived from sound planning practices and are supportive of maintaining an effective transportation system in the KTMPO region. As member jurisdictions make changes to their thoroughfare plan through either an incremental update process or through a complete restructuring as part of an updated Comprehensive Plan, notification should be provided to the MPO planning staff so that this regional plan can remain up-to-date. Any modifications to this plan should be such that they are harmonious with local plans and sensitive to the needs and constraints found within a local area. In turn, the local area plan must seriously consider the impact their changes have on the mobility needs of the entire region.

It is vital that a plan maintenance process is formalized and incorporates suggested processes when changes are made to this plan. The following is the recommended process for these amending this plan:

- The local entity presents the suggested revision to the MPO staff for initial review
- MPO staff reviews the suggested revision in terms of regional connectivity, impacts to future traffic patterns, and compatibility with the existing plan

- Once common understanding between MPO staff and the requesting entity is reached, MPO staff and the requesting entity present the suggested revision to the MPO Technical Advisory Committee
- The MPO Technical Advisory Committee formally considers the proposed change(s) and staff recommendations
- Should the change be considered “significant” (e.g., in response to a complete overall of a city Comprehensive Plan), the proposed amendments are presented at a public hearing
- The MPO Technical Advisory Committee recommends approval by the MPO Transportation Planning Policy Board
- The revised Thoroughfare Plan network is adopted by the MPO Transportation Planning Policy Board

This process should be considered one element of the continuing, cooperative, and comprehensive transportation planning processes for the KTMPO planning area.

MAJOR FACILITIES IN THE KTMPO REGION

Below are the major facilities within the KTMPO region and their current state of usage:

Interstate Highway 35 (I-35)

As one of the highly recognized Congressional High Priority Corridors, I-35 is essential to the movement of goods and services within the state of Texas as well as from Canada to Mexico. Within KTMPO, I-35 stretches 36 miles from the Bell County lines north to south. I-35 is currently considered a lifeline for economic vitality. Future needs are far outgrowing the capacity of this facility. As a result, the State of Texas has organized an I-35 Advisory Committee that has developed a plan dated August 2011. Through this committee, it initiated the reconstruction of I-35 throughout the State of Texas. I-35 is currently undergoing facility upgrades from the Bell County line to the south to the northern extent of Bell County. Facility upgrades will include: expansion from 4 lanes to 6/8 lanes of traffic, one-way service roads, bridge turnarounds, direct-connect bridges, safer entrance and exit ramps, and others. While projects in Belton and Salado are now completed, expected completion of I-35 projects in Troy and Temple are expected to be completed in 2019. The only remaining section of I-35 is KTMPO project T15-06k, widen I-35 from 6 to 8 lanes between US 190/I-14 in Belton to State Loop 363 in Temple. The current average daily traffic count along this segment is

101,196. The projected 2045 average daily traffic count is 193,971.

Left: I-35 at Thomas Arnold Looking North. The section of I-35 between FM 2843 in Salado to US 190 in Belton was completed in December 2016. This section of I-35 was upgraded to six lanes, improved ramps, one-way frontage roads, and new bridges.

Interstate 14 (I-14)/US Highway 190 (US 190)

Stretching approximately 50 miles, with 25 miles designated as I-14, US 190 is another major corridor in the KTMPO region. This facility is the main east to west corridor in the KTMPO region. With approximately 45,000 to 55,000 troops present in Fort Hood, there are approximately 278,000 members of military families and support personnel in the region, I-14/US 190   As a result of the large growing population, work continues to upgrade I-14/US 190 from four to six lanes. With I-14/US 190 in Killeen completed, the section of I-14/US 190 through Harker Heights has recently begun to be upgraded. Future funding has been allocated to continue upgrading I-14/US 190 from the Nolanville area to the I-35. Funding has also been allocated through Category 4 funds to construct the US 190 Rogers Relief Route in Rogers. This facility will enhance safety and reduce congestion in eastern Bell County. As a strategic regional corridor, US 190/I-14 continues to be a top regional priority for the KTMPO region.

Possible future consideration could be placed on relieving the congestion, increase freight movement, and providing a more direct connection of US 190. In 2018, KTMPO, in partnership with TxDOT, completed the US 190 Feasibility Study to upgrade and/or relocate US 190 between FM 1670 in Belton to the Rogers Relief Route. The purpose of this study is to identify primary route options for a four-lane controlled access facility, with two to three lane frontage roads (if needed), 70 mph main lane design speed, overpass vertical clearance not less than 18’6”, direct connectors to/from I-35. A 400-ft right-of-way (typical) width was determined for this study.

As a community-driven effort, KTMPO established a working group to guide the study and provide input. The working group, made up of city/county representatives, elected officials and other stakeholders, developed goals and objectives, route options and evaluation criteria to determine the five route options for further study as shown below. Exhibit 4.13 shows the five primary route options.

Exhibit 4.13: Primary Route Options

Pink Route: Utilizes existing I-14 and I-35; upgrades existing Loop 363 and US 190 between I-35 and Rogers

Blue Route: Follows existing 1-14 to I-35 north to FM 93. Follows FM 93 and continues straight on an undeveloped land route to existing US 190.

Brown Route: Follows existing I-14 to north on I-35 to FM 93. Follows FM 93 from I-35 to existing US 190

Black Route: Follows existing I-14 to south on I-35. Briefly continues on an undeveloped land route to FM 436, and continues on an undeveloped land route north of Little River-Academy to existing US 190

Aqua Route: Takes an undeveloped land route from I-14 at FM 1670 to existing Shanklin Road, crosses I-35 to connect to FM 436. Continues on an undeveloped land route north of Little River-Academy to existing US 190

As part of the study, an open house was held to solicit public input on the proposed project and the five primary route options. A total 207 people registered their attendance at the open house by signing in. An online survey and public comment sheets were also available to those who did and did not attend the open house. In total, 428 online surveys were completed, and 75 written comments were submitted. Overall, the Pink Route was the most supported and least opposed route, while the Black Route was the least supported and most opposed route.

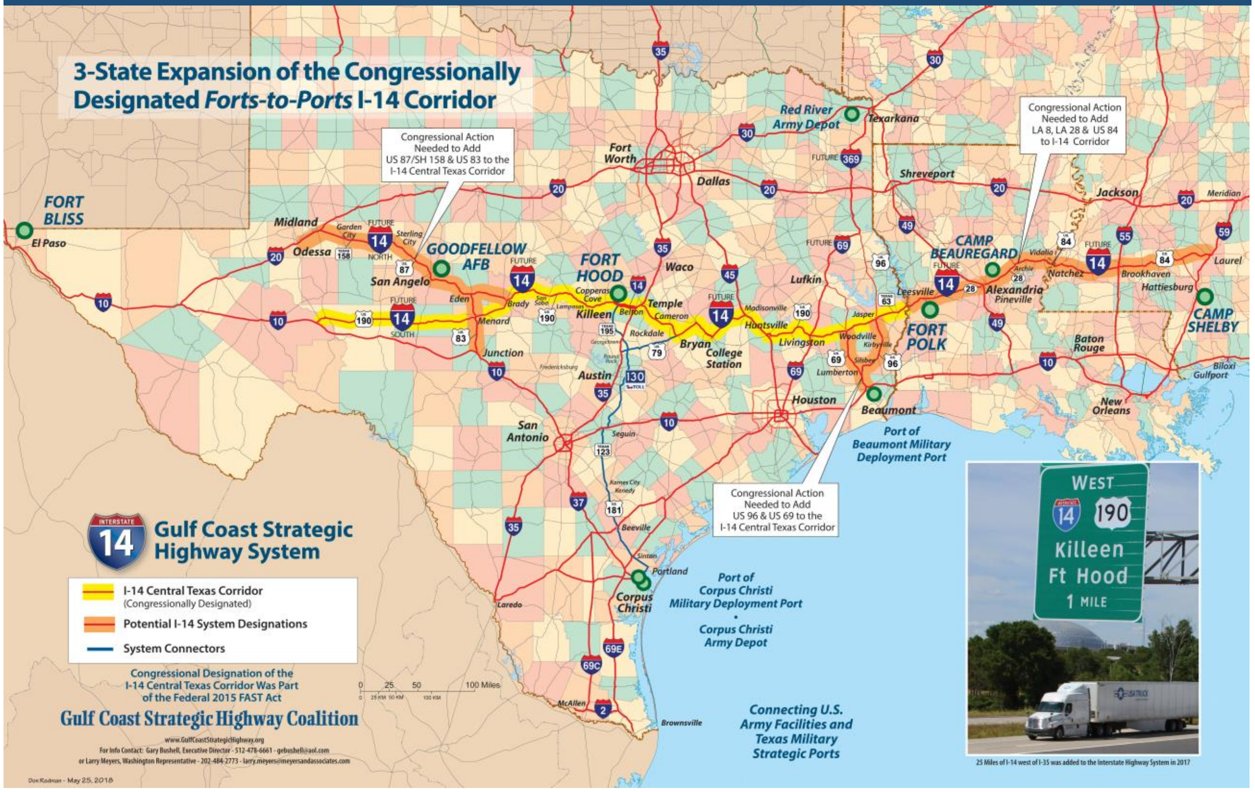
The study found that the Pink Route is most supported/least opposed by the public, the general public does not see the need to relocate US 190, the Pink +2 Route option confirms regional planning efforts calling for the additional of a travel lane in each direction on I-35, and future US 190 improvements are compatible with and complement the Rogers Relief Route. If, in the future, it becomes necessary to relocate US 190, a fresh look at the primary route options identified in this report is recommended to assess land use and environmental conditions at that time.

The working group considered the results of the open house, the goals and objectives, and other factors, the working group recommended that only the Pink +2 Route be carried forward into future studies/phases of project development and modify the MTP by adding other improvements as necessary to upgrade US 190 to interstate standards between I-35 and the Rogers Relief Route.

The US 190 Feasibility Study was conducted at the request of KTMPO and local officials to gauge the level of public support for the concept and identify potential route options. The working group was created to guide the study and provide input. This report serves to document the findings of the study as well as the recommendation of the US 190 Working Group. The information contained in this report will be considered by KTMPO and its Transportation Planning Policy Board as transportation funding decisions are made and the Metropolitan Transportation Plan is updated in the future. More about the US 190 Feasibility Study can be found on the KTMPO website.

Gulf Coast Strategic Highway Coalition

A multi-state coalition for transportation improvements (Gulf Coast Strategic Highway Coalition) that includes Texas, Louisiana and Mississippi was formed to pursue the transportation needs of the United States Armed Forces. The results of the "Forts to Ports" study show a corridor from El Paso Texas to Hattiesburg, Mississippi. US Highway 190 was selected as the corridor of choice for point to point delivery of troops and military goods. Local communities along US 190 showed significant need and desire to obtain interstate designation (I-14). There was significant regional, state and local support to upgrade and identify this facility as an East/West interstate connector to ports. On January 26, 2017 the Texas Transportation Commission officially designated US 190 between Copperas Cove and I-35 in Belton as I-14.



State Highway 195 (SH 195)

SH 195 connects travelers from I-14/US190 to I-35 north of Georgetown, Texas. Historically, this facility has been used for commuters to the Austin area. Whereas the facility continues to be utilized for commuters, in recent years it has become an important artery in the KTMPO roadway system. SH 195 is primarily utilized by commuters, students, military and regional airport travelers. SH 195 has recently undergone extensive upgrades to accommodate the needs of the public as well as the military as an alternative deployment artery. South of the KTMPO region, SH 195 was completed to finish upgrading SH 195 to a divided four lane highway all the way to I-35 in Georgetown.

The 2045 MTP incorporates four projects that along SH 195. Project K25-04 grade elevation over the BNSF railroad tracks and Business 190 with widening of the roadway from Rancier Drive to US 190 (six to 10 lanes). The current AADT is 43,442 and the projected 2045 AADT is 45,319. Project W35-02 reconstructs the interchange of SH195 at FM 3470. The current AADT is 38,739 and the projected 2045 AADT is 52,478. Project W35-03 widens SH195 from four to six lanes with frontage roads from Stan Schlueter Loop to Chaparral Road. The current average daily traffic count along this segment is 10,895. The projected 2045 average daily traffic count is 15,340. Project W35-05 reconstructs the intersection of SH 195 at US190/I-14, The current AADT is 32,444 and the projected AADT is 32,652.

State Highway 36 (SH 36)

This two-lane roadway has been used by trucking companies and travelers for many decades as an alternate route from Abilene to Houston. The route alternative is to pass through Fort Worth to Dallas and then to Houston. Just beyond the borders of the KTMPO region, SH36 passes through North Fort Hood. The North Fort Hood facility is home to the Military Equipment and Training Site which provides equipment for the US Army Reserve and Army National Guard. Fort Hood trains on average 22,000 guardsmen annually. As a result, SH36 is often a congested corridor with the movement of these troops. Oilfield activity in West Texas has also increased the usage of this facility.

The 2045 MTP incorporates consideration of projects that would widen this facility (two to four lane divided highway) from SH317 to the Coryell County line. The current average daily traffic count along this segment is 7,958. The projected 2045 average daily traffic count is 13,159.

State Highway 201 (SH 201)

SH201 begins at I-14/US190 and ends at SH 195. Recently, SH201 has undergone extensive upgrade to accommodate the traffic needs of higher education, the regional airport and the military. Texas A&M University – Central Texas (TAMUCT) has relocated along SH201. The TAMUCT is continuing to be develop and expand which can affect the amount of traffic along SH 201. The Killeen/Fort Hood Regional Airport is also located on SH201. Future considerations may include extension of SH201 for a direct connection to IH35. A SH201 connection was studied in 2014 that would allow for an alternative route to IH35, thereby relieving congestion and accommodating the future southern growth trends of Copperas Cove, Killeen and Harker Heights. On the northern end of SH201 there are three major businesses that contribute to congestion. Central Texas College, Robert M. Shoemaker High School and Metroplex Hospital are all located close in proximity to US 190.

State Highway 317 (SH 317)

SH317 begins in Belton, Texas and ends at Valley Mills, Texas. This two-lane facility is utilized by a vast array of motorists to include commuters, recreational users, and freight haulers. Located parallel to I35, motorists utilize this two-lane facility at times as an alternative route. SH317 is also located near Lake Belton and many residential neighborhoods.

SH 317 provides major connections to I-35, Lake Belton and SH 36. SH 317 also acts as an alternate north to south route when I-35 becomes congested. There are many events that take place during the year on Lake Belton and in the Belton/Temple area. Each of the major holidays brings hundreds and sometime thousands to these communities and Lake Belton. Within the vicinity of SH 317 in west Temple, there are six Belton ISD facilities that compete with commuters, rock quarry truck traffic and recreational users. With the addition of the future Lake Belton High School at SH 317 and FM 2483 and a new future BISD elementary along Poison Oak Road, traffic along SH 317 is expected to increase.

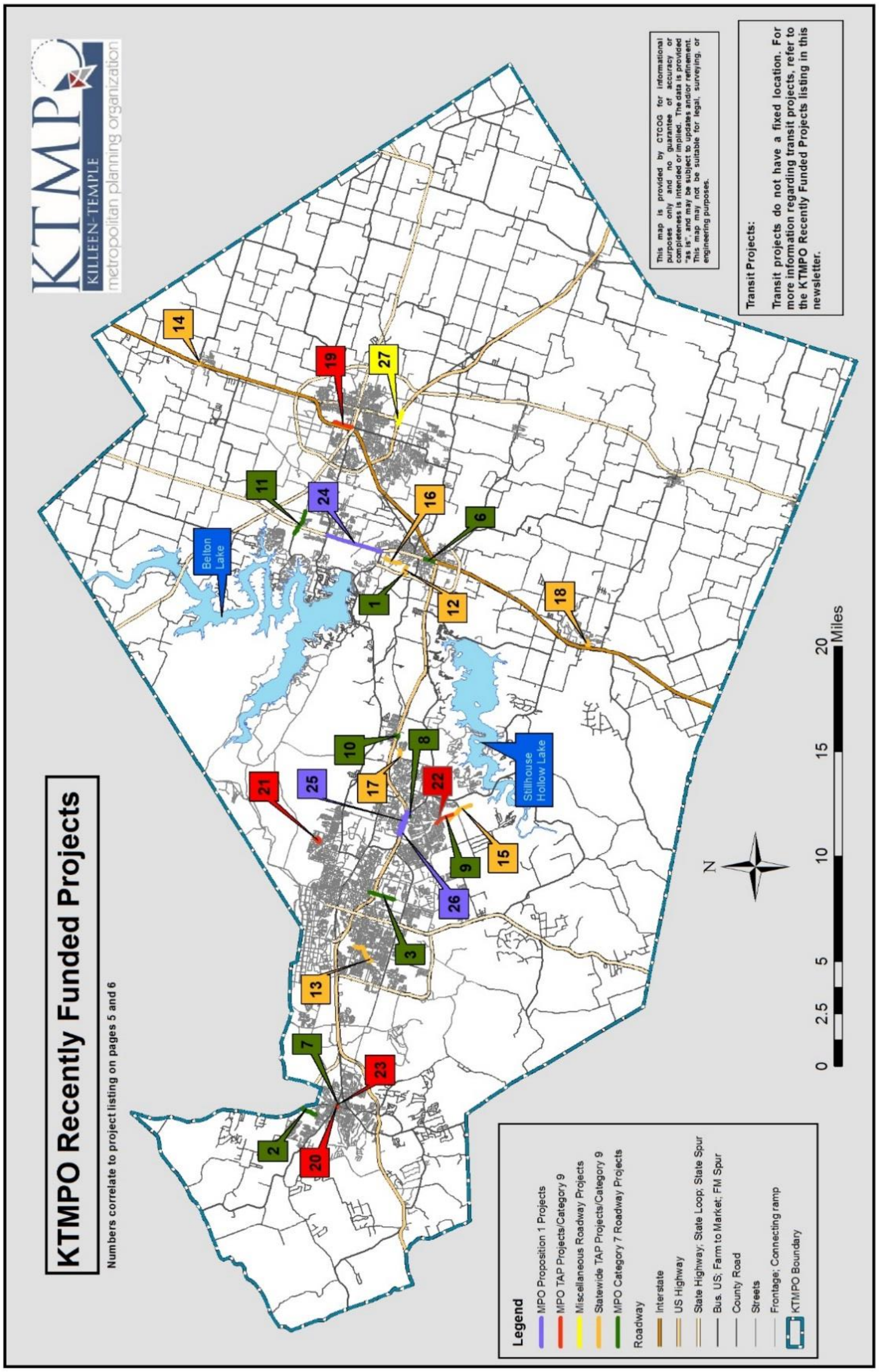
KTMPO has addressed current and future projections along SH 317 by allocating Proposition One funds to widen SH 317 from FM 439 to FM 2305 (Adams Ave) from two to four lanes with a median, and a shared-use path. This project was completed in fall 2018. Another project that will relieve congestion along this vicinity is the Prairie View Realignment Project. This project realigns Prairie View Rd and FM 2483 to a single intersection along SH 317 reducing the number of access points and increasing better traffic flow along each roadway. This project will be completed in early 2019.

Loop 363 Expansion

Loop 363 in Temple continues to experience heavy traffic. Expansion of this corridor over the past years appears to have accommodated traffic volume very well. By building out Loop 363 to a limit access facility with one-way frontage roads on the southern portion of the loop has allowed better flow of traffic and easier east/west movement through Temple. Notable projects include reconstruction of Loop 363 in Temple from South 57th Street to South 5th Street, construction from South 57th to SH 36, construction of the IH 35 overpass, construction of SH 36 underpass and others.

The 2045 MTP incorporates three projects that will help improve safety and congestion along LP 363. Project W30-21 reconstructs the intersection of LP 363 at FM 2305 (Adams Ave). The current average daily traffic count along this segment is 36,191. The projected 2045 average daily traffic count is 53,067. Project W30-23 widens LP 363 from Spur 290 to SH 95. The current AADT is 7,943 and the projected AADT is 18,530. Project W35-07 widens the LP between Lucius McCelvey to Industrial Blvd. The current average daily traffic count along this segment is 6,866. The projected 2045 average daily traffic count is 20,820.

Exhibit 4.14: KTMPO Funded Projects (FY2013-FY2017)



MPO CATEGORY 7 PROJECTS

Reference Number	KTMPO ID	Project Name	Full Extents	Description	Total Cost	
1	B15-01	W 9th Ave	Loop 121 to University Dr on UMHB campus	Constuct new roadway and bridge	$ 3,990,610	Metro Mobility (Category 7 FY13 & FY14)
2	C35-04	Courtney Lane Sidewalks	FM 116 to Fairbanks St	Construct roadway/pedestrian improvements, including right turn lane and replacement of curb	$ 273,133	
3	K35-03	W Trimmier Rd	Jasper Dr to Elms Rd	Reconstruct and widen to six lanes, access drive improvements, install signals and turn lanes	$ 8,214,573	
4	A35-02	Bus Replacement	HCTD service in Temple UZA	Two replacement 25-passenger (Type 11) fixed route buses	$ 803,303	
5	A40-03	Bus Replacement	Killeen/Temple UZA	Purchase of Fixed Route Service (FRS) buses and/or Special Transit Service buses	$ 1,214,606	FY15 , FY16 & FY17
6	B40-03	Main St Sidewalks	Avenue C to Avenue J	Phase 1 of the proposed sidewalk expansion will include the repair and installation of sidewalks	$ 406,908	
7	C40-02a	Ave D Sidewalk	South Main St. to South 2nd St.	Construct multi-terraced pedestrian walkway to include ramps, railings, crosswalk	$ 330,492	
8	H40-02	Traffic Circle at Commercial Dr	Intersection of Commercial Dr. and Heights Dr.	Construct traffic circle at intersection of Commercial Dr. and Heights Dr.	$ 571,349	
9	*K30-02	Rosewood Dr Extension	Riverstone Dr to Chaparral Rd.	Construction of a 4 lane roadway with center median with and off-system bridge	$ 8,642,149	
10	N40-01	Main Street Connectivity	Avenue I to US190 Frontage	Construct ADA bicycle/pedestrian pathways along Main Street and under US190	$ 627,186	
11	T35-24	Prairie View Road Enhancements	West of SH 317 to N. Pea Ridge	Construction of a 4 lane roadway, aligning FM 2483 to Prairie View Road with signalized intersection	$ 6,858,000	
	*Project partially funded--Cat 7 dollars: $3,596,430				$ 31,932,309	Total

STATEWIDE TAP (Transportation Alternatives Program) PROJECTS (Category 9)

Reference Number	KTMPO ID	Project Name	Full Extents	Description	Total Cost	
12	B35-01	City Street	Loop 121 to University Dr on UMHB campus	Construct Chisholm Trail Corridor facility	$ 1,569,750	Statewide TAP (previously Transporation Enhancements)
13	K35-02	City Street	Rimes to Watercrest Rd	Construct Killeen-Fort Hood Regional Trail, Segment 3	$ 1,940,664	
14	D35-01	FM 935	Main Street to US Post Office Troy, TX	Construct downtown Troy Streetscape-Historic Commercial District	$ 499,388	
15	K40-21	Heritage Oaks Hike & Bike Trail Segment 4	Proposed Roseword Elementary to USACE property at approx 1 mile N of Cedar	Shared Use Pedestrian/Bicycle Path	$ 3,899,071	
16	B40-04	Chisholm Trail corridor Hike and Bike Phase II	0.25 MI S of Crusader Way to Sparta Rd at Commerce St.	Construct alternate transportation route consisting of shared-use path for pedestrian and bicyclists.	$ 3,109,795	TAP FY13, FY14, FY15 & FY16
17	N40-02	Old Nolanville Road Elementary Bicycle and Pedestrian Safety Improvements	Old Nolanville Rd at Warriors Path Rd to Shaw Branch Creek	Construct alternate transportation route consisting of shared-use path for pedestrians and bicyclist.	$ 673,782	
18	S40-01	Enhancements along Salado Creek	Main St. at College Hill Dr to 0.09 MI N of Royal St. on Center Circle	Construct alternate transportation route consisting of shared-use path for pedestrians and bicyclist.	$ 411,682	
					$ 12,104,132	Total

MPO TAP (Transportation Alternatives Program) PROJECTS (Category 9)

Reference Number	KTMPO ID	Project Name	Full Extents	Description	Total Cost	
19	T40-11	N. 31st St. Side-walks & Enhance.	N. 31st Street from SH53 to Nugent Drive	PHASE 1 of T40-11 to Construct alternative transportation route of Pedestrian/Bike Trail	$ 307,740	TAP FY13 & FY14
20	C40-03	Avenue D Streetscape	FM113 from FM116 to Main Street	Construct streetscape improvements to downtown Copperas Cove	$ 221,220	
21	K40-20	Brookhaven Bike/Ped Trail	Traverse Drive to Brookhaven Elementary School	Construct alternative transportation route of Pedestrian/Bike Trail	$ 348,837	
22	K40-23	Heritage Oaks Hike & Bike Trail, Segment 3	Rosewood Drive from Flagstone to Pyrite	Construction of a hike and bike trail with lighting	$ 849,000	
23	C40-02b	Avenue D Streetscape	Avenue D from South 1st Street to South 3rd Street	Construction of multi-terraced concrete walkways, ramps, railings, striping and necessary signage	$ 367,142	
	TAP FY15, FY16 & FY17 Call For Projects due on February 22. TAC scoring and recommendation will be March 2nd with TPPB project selection on March 16th. Category 9 FY15-FY17 funds is estimated to be $800,000.					
					$ 2,093,939	Total

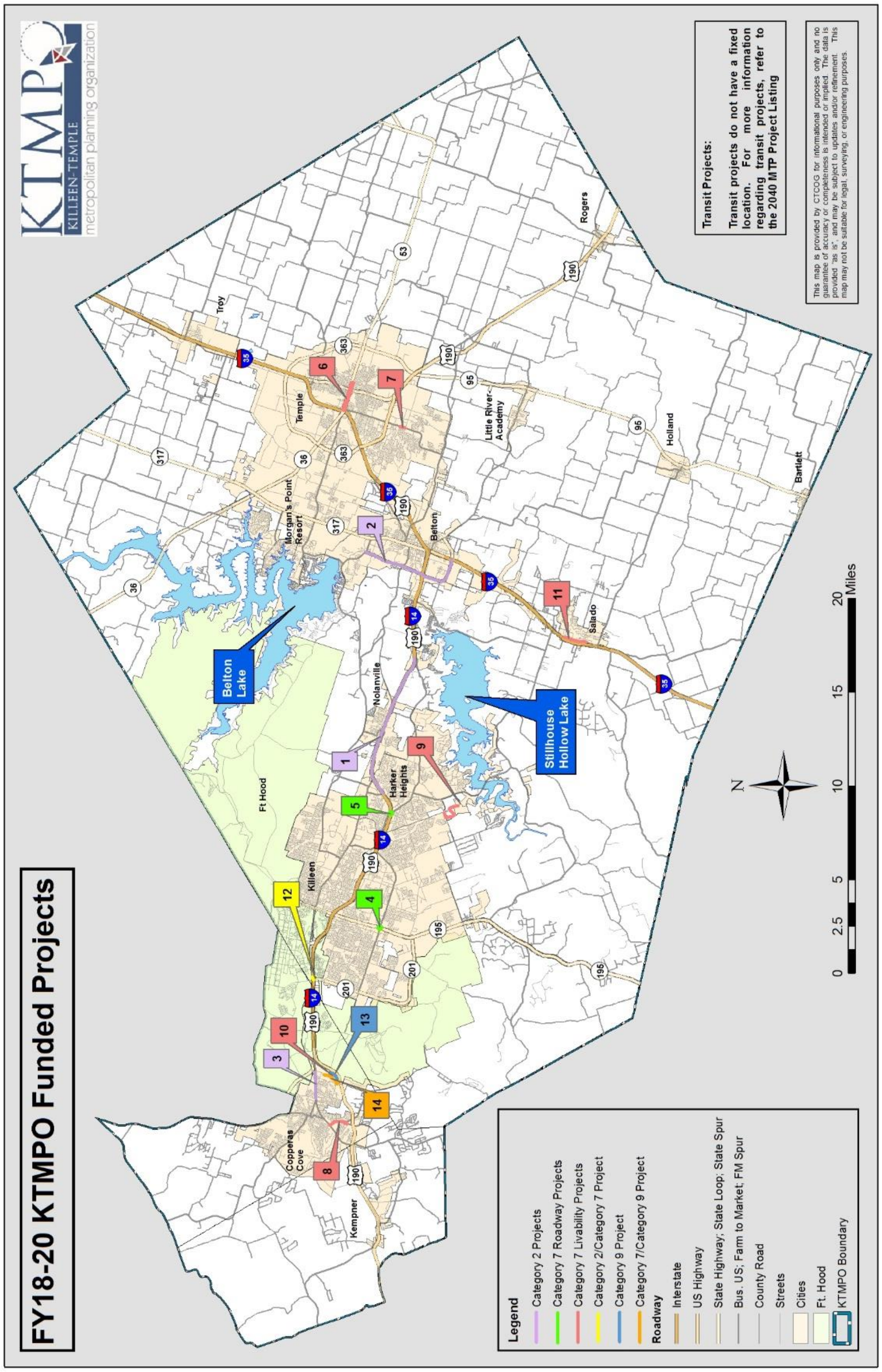
MPO PROPOSITION 1 PROJECTS

Reference Number	KTMPO ID	Project Name	Full Extents	Description	Total Cost	
24	W40-01	SH 317	FM 2305 to FM 439	Widen from 2 to 4 lane with raised median	$18,998,000	FY 15
25	H15-02b	FM 2410	Roy Reynolds Dr to Commercial	Widen from 2 to 4 lane roadway, with sidewalks, median and turn lanes in a context sensitive design	$9,200,419	FY 16
26	W40-02	US 190	1.0 mi West of FM2410 to Knights Way	Widen from 4 to 6 lane roadway.	$9,510,000	FY 17
					$37,708,419	Total

MISCELLANEOUS PROJECTS

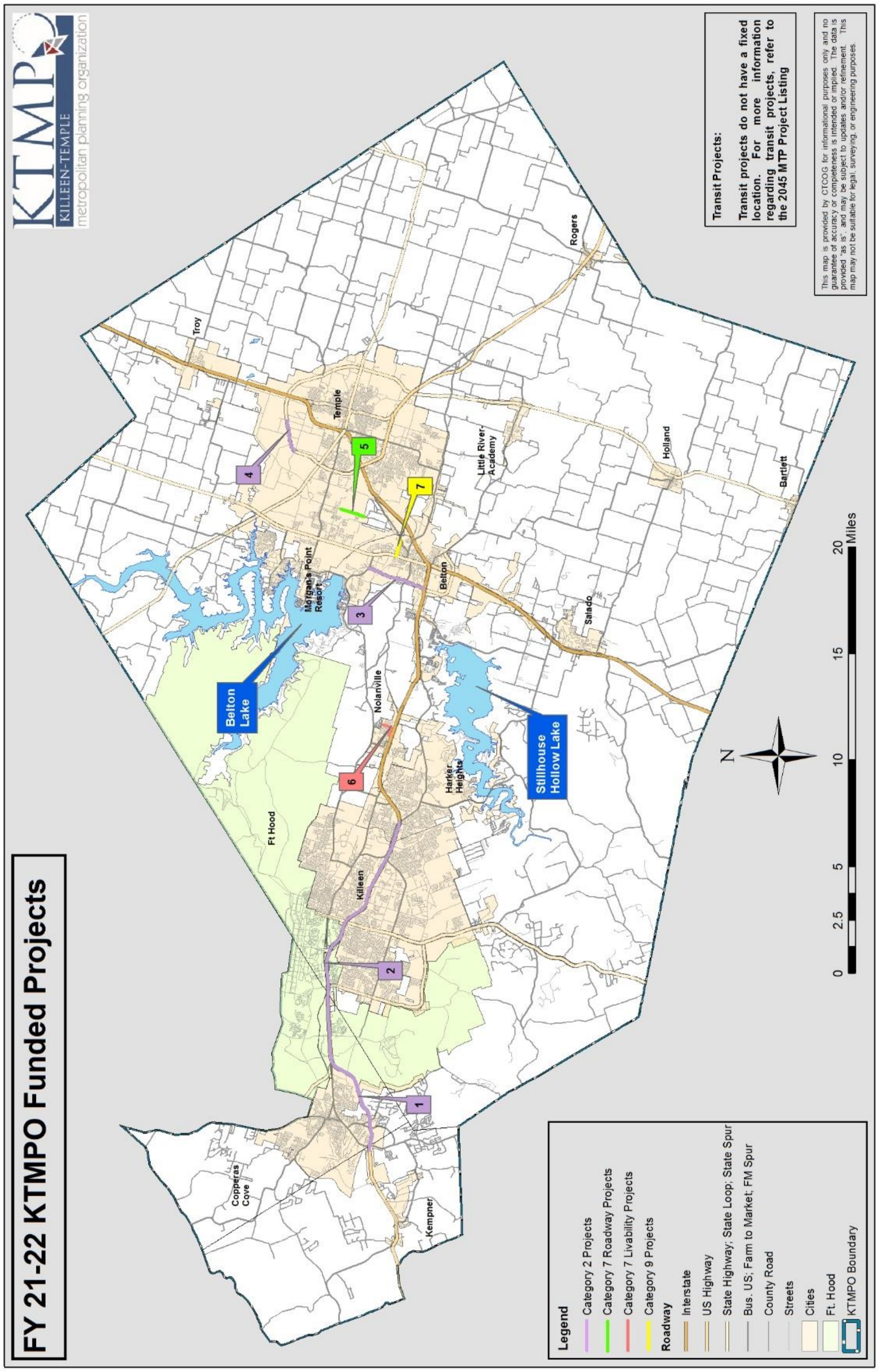
Reference Number	KTMPO ID	Project Name	Full Extents	Description	Total Cost	
27	T25-06	Loop 363	At Spur 290	PHASE 1 of interchange construction	$10,415,448	Category 1 & Local
28	A35-01	Bus Replacement	HCTD service in Killeen UZA	Replacement of ADA-accessible paratransit buses	$ 77,293	FTA 5339

Exhibit 4.15: KTMPO Funded Projects (FY2018-2020)



MPO CATEGORY 2 PROJECTS					
Reference Number	KTMPO ID	Project Name	Full Extents	Description	Estimated Cost
1	W40-06[1]	US 190	FM 3423 (Indian Trail) to FM 2410 in W Belton	Widen main lanes from 4 to 6 lane divided freeway and ramp alignments	$39,000,000
2	W40-04a[1]	Loop 121 Phase 1	FM 439 to IH 35	Widen from 2 to 4 lane divided roadway with bike/ped improvements	$27,000,000
3	C30-03b	Business US 190 Phase I	Ave D to Constitution Dr	Change the center turn to a raised center turn and convert one travel lane in each direction to 6' sidewalk, 5' bicycle lane and 1.5' curb and gutter	$10,000,000
MPO CATEGORY 7 ROADWAY PROJECTS					
4	K40-27[1]	SH 195	At FM 3470	Construct turn-arounds	$800,000
5	H35-01	US 190 at FM 2410	East Central TX Expy W to East Central TX Expy East	Phase 2, West to East Connector- Turnaround	$5,000,000
MPO CATEGORY 7 LIVABILITY PROJECTS					
6	T40-12	31st St Sidewalks (FM1741)	Marlandwood Rd to Canyon Creek Rd	Construct 6 ft wide sidewalks on both sides	$500,000
7	T40-15	Adams Ave/Central Ave. Bicycle/Pedestrian Improvements	IH 35 to MLK Jr Blvd	Construct sidewalk and bike path along Central and Adams Ave	$1,913,044
8	C40-05	FM 116 & 3046 Sidewalks	Business 190 to South Park on FM 3046	Construct ADA compliant sidewalks, curb ramps, crosswalks, and bike lanes	$975,000
9	K40-21b	Heritage Oaks Hike and Bike Trail, Segment 5	Chaparral Rd to USACE Property	Construct shared use path for pedestrian and bicyclists	$1,300,000
10	C40-04c	The Narrows (Charles Tillman Way)	Constitution Dr to RGIII Dr	Construct sidewalk	$170,000
11	S40-04a[1]	Main St Sidewalks Phase 1	Salado Plaza Dr to College Hill Dr	Main St. improvements to include lighting, sidewalks, & striping for bicycles	$1,616,956
MPO CATEGORY 7 TRANSIT PROJECTS					
N/A	A40-15	Fleet Replacement Project	Killeen UZA	Purchase of three fixed route buses to replace Killeen fixed route buses	$1,285,000
MPO COMBINED CATEGORY 2 AND CATEGORY 7 PROJECTS					
12	W40-03[1]	US 190 Turnaround	At SH 201 (Clear Creek Rd)	Roadway reconfiguration to improve turning movements	$4,000,000
MPO CATEGORY 9 PROJECTS					
13	C40-04b	The Narrows (RG III at Old Copperas Cove Rd)	Loop on Old Copperas Cove Rd to RGIII ending at Constitution Dr	Construct sidewalk	$680,000
MPO COMBINED CATEGORY 7 AND CATEGORY 9 PROJECTS					
14	C40-04a	The Narrows (Constitution Drive)	Bowen Ave to S of MLK	Construct sidewalk	$850,000

Exhibit 4.16: KTMPO Funded Projects (FY2021-2022)



FY21-FY22 KTMPO Funded Projects

Reference Number	KTMPO ID	Project Name	Full Extents	Description	Estimated Cost
MPO CATEGORY 2 PROJECTS					
1	W35-01	US 190 Bypass	US 190 W of FM 2657 to Coryell County Line	Widen from two lanes to four lanes divided and construct interchange	$48,150,000
2	W45-01	I-14 ATMS	Coryell County Line to FM 2410	Construction of fiber optics, traffic cameras, and dynamic message boards	$6,200,000
3	W40-04a(1)	Loop 121 Phase 1a	Lake Rd (FM 439) to US 190	Widen from 2 to 4 lane divided roadway with raised median	$28,000,000
4	W35-07	NW Loop 363	Lucius McClevey to Industrial Blvd	Construct interchange and expand 2 to 4 lanes with frontage roads	$45,000,000
MPO CATEGORY 7 ROADWAY PROJECTS					
5	T40-07a	Temple Outer Loop West, Phase 1	522 ft S. of Jupiter to 454 ft S. of Dove Meadown	Widen from 2 to 4 lanes divided roadway and curb and gutter, Phase 1	$10,298,198
MPO CATEGORY 7 LIVABILITY PROJECTS					
6	N40-04	Nolanville City Park Connectivity	Park (North Mesquite) along Ave H to 10th St.	Construct 10' sidewalk, ADA ramps, and corsswalks; widen pavement by 32" with curb and gutter	$1,558,802
MPO CATEGORY 7 TRANSIT PROJECTS					
N/A	A45-01	HCTD Fleet Replacement Project	Killeen UZA-Two, Temple UZA-One	Purchase Buses to Provide Transportation	$1,145,000
MPO CATEGORY 9 PROJECTS					
7	B45-03	13th Ave. Sidewalk & SUP	Main St (SH 317) to Waco Rd. (FM 817)	Construct 5' sidewalks on the north side of 13th Ave from Main St to Woodall; transition to 10' SUP from Woodall to Waco Rd	$423,611

TRAFFIC VOLUMES

KTMPO ID	Project Name	AADT - 2015	AADT - 2045
B30-01	George Wilson Extension	6,866	6,086
B30-02	Shanklin Road West - Outer Loop	6,866	12,072
B30-03	Belton Outer Loop East	6,866	2,684
B40-01	Huey Drive	6,866	4,214
B40-02	Southwest Parkway	6,866	4,026
B40-07	Connell Street	1,189	5,605
B40-08	Sparta Road	4,871	14,516
B40-09	West Avenue D	6,866	8,895
B40-10	FM 1670	3,389	14,918
B40-11	FM 2271 - Lake to Lake Road	6,866	18,064
B45-08	Mesquite Road Improvements	6,866	11,635
C30-03a	Business US 190 - Phase II	18,014	41,612
C35-02ab	FM 116 Railroad Underpass	21,152	32,874
D40-01	North Waco Rd. (Old 81)	32	1,763
D40-03	Old TX 81 - Phase I	789	6,353
H15-01	FM 3423/Indian Trail	7,543	10,790
H30-01	Business US 190/Veterans Memorial Blvd	13,262	23,537
H30-03	FM3219	1,574	2,519
H30-05	Warriors Path Upgrade	698	5,872
H45-01	E. FM 2410 (E. Knights Way) Phase 1	4,011	13,297
H45-02	E. FM 2410 (E. Knights Way) Phase 2	2,709	4,161
H45-03	FM 3481 (Stillhouse Lake Road) Phase 1	7,793	15,702
H45-04	FM 3481 (Stillhouse Lake Road) Phase 2	4,966	10,663
K25-04	SH 195 Overpass	43,442	45,319
K25-05	Florence Rd	6,533	6,931

K30-13	Chaparral Road	4,207	14,482
K30-23	Jasper Bridge Expansion	13,256	14,460
K40-03	FM 3470 Extension	6,866	21,119
K40-06	FM 2484	2,563	11,667
K40-11	WS Young Drive	27,400	27,959
K40-16	East Trimmier Rd Improvements	4,051	12,578
K40-17	Trimmier Road Improvements	1,797	14,034
K40-24	Featherline Drive	8,175	18,312
K40-25	Bunny Trail/SH 201 Traffic Signal	11,467	24,439
K40-26	Cunningham Rd	4,254	14,509
N40-03	Old Nolanville Road Bridge (Expansion & Bike/Ped Integration)	2,808	8,684
N40-06	Nolanville Railroad Crossing Safety	15,990	20,055
N40-07	Warrior's Path Extension Phase I (Formerly Warrior's Path)	6,866	8,679
N45-01	FM 439 Roundabout	3,703	4,957
N45-02	FM 439 Shoulder Improvements & Bike Lanes	8,243	12,069
N45-03	Nola Ruth Reconfiguration	6,325	11,661
S40-03	Salado West Village Road Capacity and Enhancement Project	162	179
T15-02	Kegley Road (Phase 2)	6,859	15,322
T15-06k	I 35 - US 190 to LP 363	101,196	193,971
T35-36a	S. 1st Street/Spur 290 Improvements	13,489	19,059
T40-07	Temple Outer Loop - West	6,866	16,012
T45-10	East Avenue C	6,866	1,420
T45-11	East Young Avenue	2,674	11,071
T45-12	Lake Pointe Drive	6,866	3,756
T45-13	Little River Road	2,826	12,186
T45-14	Lower Troy Road	25	4,090

T45-15	Temple Outer Loop - East	6,866	6,204
T45-16	South 1st Street Extension	6,866	13,106
T45-17	Azalea Drive	6,866	9,797
W25-02	SH 36 - SH 317 to Lake Belton Bridge	7,958	13,159
W30-13	FM 2484 - FM 1670 to IH 35	6,602	12,319
W30-17	FM 93 - Phases I and 2	1,530	14,901
W30-21	Loop 363 at FM 2305 Reconfiguration	36,191	53,067
W30-23	US 190 - Spur 290 to SH 95	7,963	18,530
W35-01	US 190 Bypass	18,704	43,037
W35-02	SH 195 at FM 3470 (SS Loop) Reconstruction	38,739	52,478
W35-03	SH 195 - FM 3470 to Chaparral Rd	10,895	15,340
W35-04	FM 439 - Roy Reynolds Drive to FM 3219	7,568	13,083
W35-05	SH 195 at US 190/IH 14	32,444	32,652
W35-07	Loop 363 - Lucius McCelvey to Industrial Blvd	6,866	20,820
W35-08	FM 93 - FM 1741 to SH 95	3,901	13,536
W35-09	FM 93 - SH 95 to SH 36	2,187	3,933
W45-01	IH 14 Advanced Traffic Management System	59,337	86,870

TRAVEL DEMAND MODEL

A Travel Demand Model (TDM) is a helpful tool in projecting future traffic demand, and current and forecasted roadway capacity. An updated KTMPO model was completed in spring 2018. In 2017, KTMPO hired a consultant to assist in developing demographic and network data for inclusion in the updated TDM. This work involved developing and updating the Traffic Analysis Zone (TAZ) structure, TAZ-level demographics, and the modeled roadway network for the years 2015 and 2045.

During the model development process, KTMPO sought to include the existing land use patterns as well as future trends across the region to provide better, more defined input. KTMPO requested future land use plans, existing zoning, local transportation plans, plat logs, established land use and locations of substantial traffic generators from member cities. Data was also collected from a variety of sources, to include school districts and local colleges, to develop growth projections and determine new generators. This data was then refined by KTMPO staff, and forwarded to consultant, Kimley-Horn.

TDM Supporting Documents will be included as an **Appendix**.

TRAFFIC ANALYSIS ZONE GEOGRAPHY

A Traffic Analysis Zone (TAZ) is a unit of geography most commonly used in transportation planning models. The zones are constructed by census block information. Typically, these blocks are used in transportation models by providing socio-economic data. Most often, the critical information is the number of automobiles per household, household income, and employment within these zones. This information helps to further the understanding of trips that are produced and attracted within the zone.

2015 population and household data were derived directly from the 2010 US Census at the block level. Since some TAZs span county boundaries, there are some TAZs that extend slightly outside of the official MPO planning area. Therefore, a query of the TAZ database will show slightly higher population and household values than the official MPO planning area. Education, household, and employment data were identified for each zone using data from the Texas Demographic Center.

ROADWAY NETWORK

The consultant updated the 2015 roadway network to include all roadways within the expanded metropolitan planning area boundary and assigned attributes for all defined links. Other fields in the network such as area type, capacity, speed, and time are assigned by TxDOT during the model validation process. The 2015 network is detail coded for higher functional classed facilities as defined by TxDOT. Generally, only links with frontage roads and ramps are shown as separate road links for each direction. Special Generators are locations that generate a large volume of traffic such as a shopping mall, hospital, college, airport, etc. 2015 special generators were identified and included in the model.

Exhibit 4.16: Special Generators

List of Special Generators	
Name	**Physical Address**
Copperas Cove Nursing & Rehab	607 W Ave. B, Copperas Cove, TX 76522
Skylark Field	1523 Stonetree Dr., Killeen, TX 76543
Killeen Mall	2100 South WS Young Drive, Killeen, TX 76543
Central Texas College	6200 W Central Texas Expy., Killeen, TX 76549
Metroplex Hospital	2201 S Clear Creek Rd., Killeen, TX 76549
University of Mary Hardin-Baylor	900 College St., Belton, TX 76513
Temple Airport	7720-F Airport Rd., Temple, TX 76501
Baylor Scott & White	2401 S 31st St., Temple, TX 76508
Temple College West of S. 1st St	2600 S 1st St. Temple, TX 76504
Temple College East of S. 1st St.	1903 S 1st St., Temple, TX 76504
Temple VA Clinic	1901 S 1st St., Temple, TX 76504
Scott & White Temple Santa Fe Hospital	600 S 25th St., Temple, TX 76504
Temple Living Center Western Hills	512 Draper Dr., Temple, TX 76504
Cornerstone Gardens Nursing Home	763 Marlandwood Rd., Temple, TX 76502
Temple Mall	3111 S. 31st St., Temple, TX 76502
Mclane's Children Hospital	1901 SW H K Dodgen Loop., Temple, TX 76502
Weston Inn Health Center	2505 S 37th St., Temple, TX 76504
Will-O-Bell Nursing Home	412 Dalton, Bartlett, TX 76511
Killeen-Ft. Hood Regional Airport	8101 S Clear Creek Rd., Killeen, TX 76549
Ft. Hood	N/A

INTELLIGENT TRANSPORTATION SYSTEMS

Having management and operational strategies in place is crucial if transportation facilities are to function at their peak level of performance. Proper maintenance of facilities and use of Intelligent Transportation Systems (ITS) are key elements in system management and operations. ITS involve the application of advanced information and communication technologies on various transportation elements which ultimately enable users to be better informed and make safer, more coordinated and smarter use of transportation networks.

Transportation facilities generally cross various jurisdictional lines; therefore, it is important for the entities to work cooperatively to ensure a safe and efficient transportation network for the movement of people and goods. Management and operational policies and strategies at various jurisdictional levels are discussed in the following sections.

State Level

State designated highways in Texas are generally maintained by the Texas Department of Transportation (TxDOT). When these state highways fall within a city's corporate limits, the city and state enter into a Municipal Maintenance Agreement which lays out the responsibilities of both parties to include maintenance of facilities that lie within the right-of-way. TxDOT generally will install, operate, and maintain traffic signals in cities with a population less than 50,000, whereas the city takes on this responsibility if their population is equal to or greater than 50,000. According to TxDOT Waco District officials, most of the Killeen, Temple and Belton area TxDOT maintained roadway traffic signals have been equipped with Video Image Vehicle Detection System (VIVDS) devices. These devices have a large number of detection zones that can be used limitless ways to control intersections and their flow. The benefit of these devices improves delays at intersections for vehicles. Fewer delays at intersections have a positive impact on quality of life and air quality.

TxDOT generally maintains roadways on a seven-year schedule. Signs and striping are reviewed annually, and preventive maintenance is performed on traffic signals and school flashers on an annual basis. Bridges are inspected on a two-year cycle.

Thanks to increased public awareness, the use of DOT-supplied ITS resources are on the rise in KTMPO. There are currently ten Dynamic Message Signs (DMS) locations along I-35, which is currently undergoing construction, and two along US 190 which are providing drivers with estimated travel times, Amber alerts and other critical emergency statements. There are also There are currently 11 cameras along the I-35, one on LP 363, two on SH 36. In 2016, TxDOT also installed and that are of public use to citizens and planners to observe traffic flow.

TxDOT's My35 ITS project aims at keeping drivers informed of the congestion situations along the region's primary north-south corridor DMS technology has been placed along the interstate to give drivers real-time alerts of current conditions as they enter the work zone. This data is also used on the My35 website, which offers dynamic traffic maps showing real-time lane closures, incidents, and travel times. Traffic cameras in our region can be viewed online for live feed of current conditions.

KTMPO Regional Level

Increased activity in the area of ITS is motivated in part by an increased focus on homeland security. ITS can play a role in the rapid mass evacuation of people in urban centers after large casualty events such as a natural disaster or threat. Much of the infrastructure planning involved with ITS parallels the need for homeland security systems. As such, KTMPO has coordinated with CTCOG's Homeland Security and other emergency service grants. Contacts at the municipal and county level for these efforts have been made. CTCOG is also coordinating with Department of Public Safety, the Texas Statewide Interoperability Channel Plan, a narrowband and cross-band plan utilized for emergency services in the region.

In the future, KTMPO anticipates additional inputs, such as real-time GPS tracking utilizing existing resources and staff mobile phones with GIS applications installed. This will better track lane movements and speed progression through given segments. KTMPO also plans to coordinate with contracted transportation consultants in implementing guidelines in this regard.

The use of global positioning system (GPS) source data collected by private companies may soon be available to MPOs via TxDOT and FHWA. The data is collected from GPS fixtures on large trucks and on other vehicles by cell phones that have activated mapping and GPS services and depicts travel delays on major roadways. The MPOs may use this data to compare with other collected data; however, in some areas this may be the only data that is available.

Exploring regional and local ITS resources through interoperability, increasing ITS awareness and implementing new traffic surveillance technologies should prove to be a good return on investment. More specifically, signal timing/coordination in the region's cities could benefit the congestion management aspect of regional mobility. KTMPO will continue to seek ITS methods to implement in order to improve the efficiency of the regional transportation system. Innovative services which promote alternate means of transportation and encourage drivers to make more informed transportation decisions feed a congestion management strategy. KTMPO continues to collect and analyze travel time data on selected roadways identified in the Congestion Management Process

chapter 5

Public Transportation

Public transportation creates opportunities for employment, education, recreation, shopping, social activities, community involvement, and cultural activities for a region's population. For many, public transit is an amenity used on occasion; however, for those with limited transportation means, public transportation may be a necessity. **Public transit contributes to the economic health of a region and is a fundamental element of an enhanced quality of life.** It is also a means to reduce traffic congestion and improve a region's air quality.

In April 2018, KTMPO held a series of workshops to solicit public input regarding transportation planning in the KTMPO region. Public transit was one of the topics. Approximately 50 people participated and were asked to divide funding among various types of transportation projects. The resulting feedback indicated support for transit projects at a level of approximately 6% of available funding. Congestion was the top contender at 30%. Transit projects are considered a strategy for relieving congestion and therefore, public support for transit projects may actually be higher once the correlation between congestion and transit becomes more evident.

REGIONAL TRANSIT POLICIES

The objectives below outline the transit policies desired within the KTMPO planning region through the year 2045. These objectives support MTP goals to provide increased accessibility, mobility, and travel options; enhance economic vitality; and improve the safety and reliability of the region's transportation system. These objectives also support the goals identified in the Regionally Coordinated Transportation Plan from 2013 and updated in 2017.

Objectives

- Designate and develop priority transit corridors to include facilities such as transit terminals, park & ride lots, and a regional multi-modal facility.
- Create innovative multimodal transportation strategies supportive of mass transit and other alternative modes of transportation such as carpooling, bicycling, and walking.
- Develop a comprehensive program of transit improvements designed to encourage additional ridership for existing facilities.
- Implement increased use of Intelligent Transportation System (ITS) technology within the existing system which increase the ease of using the transit system, provide additional safety and security measures for drivers and riders, and provide more reliable information for analyzing the current system.

The following sections generally describe the operations and facility plans for transit services within the KTMPO planning region. This includes a summary of current services and identifies regional needs for future development.

PUBLIC TRANSPORTATION PROVIDERS

Public Transportation resources in the KTMPO region include rail service, bus service (private and public), taxi service, vanpool and ride-share. In updating the Regionally Coordinated Transportation Plan (RCTP) these resources were considered, and an inventory of vehicles was compiled. Inventory information presented in this section is taken from the RCTP. Rail service is discussed Chapter 7. Private bus and taxi service, along with vanpool/rideshare options, are briefly discussed in this chapter with the bulk of the chapter focusing on the region's public transit system—The HOP. KTMPO recognizes the diversity of the region and the need to provide a variety of transportation options for the public, and as such, will seek to inform the public of these options through various media, including the KTMPO website.

Private Intercity Transit Service

There are two providers of private intercity service in the region available to limited areas in Bell County and Mason County. Greyhound Lines, Inc. provides charter bus service, scheduled service across the continental United States, and has a station in Temple (Bell County), as well as Mason (Mason County).

Arrow Trailways of Texas provides charter bus and tour service to the continental United States. Scheduled service is provided as a connector to the Greyhound bus line to the Temple/Killeen area as well as Waco, Austin, and Houston. Arrow Trailways operates two stations in Bell County—one in Temple and one in Killeen. Connector service to the Greyhound bus line is provided at the Temple station. Arrow Trailways operates a fleet of 17 buses, 1 sprinter, and three vans with access to one Amtrak train.

Since 2013, there has been one vehicle added to Private Intercity Transit Service (2017 inventory).

Taxi Service

Taxi service is available in Bell County and portions of Coryell County. The three providers identified in this region serve both Bell County and Coryell County. At this time, the number of vehicles has been estimated at approximately 34.

Since 2013, Luxury Cab in Killeen has acquired Express Cab, Kelly Cab, Yellow Cab, Copperas Cove Cab Inc., and Killeen Cab, with a consolidated fleet of ten vehicles. Overall, the number of vehicles has decreased from 60 vehicles to 34 vehicles. Additionally, the number of providers has decreased from twelve companies to three companies (2017 inventory).

Vanpool/Rideshare

Vanpool and ridesharing programs are other options for travel within the KTMPO region. These programs are generally implemented by private companies or groups of individuals seeking to coordinate their travel needs with others having the same need. An example of such a program is the RideShare Program offered through Enterprise Rent-A-Car. They provide vehicles as well as a vanpool coordinator to assist in determining start date, pick-up time, and number of pick-up points along the way. They also offer a ride-matching program to assist individuals in locating existing vanpools or creating new ones.

HCTD

Hill Country Transit District (HCTD) operates The HOP which is the only regional public transit system in the KTMPO region. They provide service to a nine-county area as follows: Bell, Coryell, Hamilton, Lampasas, Llano, Mason, Milam, Mills, and San Saba. The HOP provides urban, paratransit and rural service. Rural service is provided to all nine counties and includes door to door demand response public transportation. In addition to the rural division, HCTD operates two Urban Divisions—the Temple Urban Division which includes Belton, and the Killeen Urban Division which includes Copperas Cove and Harker Heights. Urban service includes fixed route and complementary paratransit services.

Five fixed routes are provided within the Killeen urbanized area. Three fixed routes are provided within the Temple urbanized area. Additionally, an express connector route runs between the two areas. HCTD operates a fleet of 139 buses including 24 fixed route buses, 41 urban para-transit vehicles, and 74 service vehicles in the rural division. The Concho Valley Transit District (CVTD) through the Concho Valley Council of Governments (CVCOG) operates the Concho Valley public transportation system. Although Mason County is part of CVCOG, transit service is provided by HCTD and not CVTD.

Since 2013, Regional Public Transit Service added one express connector between Killeen and Temple, decreased the para-transit by nine buses, and increased fixed transit by one. Overall, public transportation saw a decrease of eight buses from their fleet (2017 Inventory).

HCTD SERVICE

Urban

HCTD operates two Urban Divisions—the Temple Urban Division which includes the cities of Temple and Belton, and the Killeen Urban Division which includes the cities of Killeen, Copperas Cove and Harker Heights. Nine fixed routes are provided within the Killeen and Temple urbanized areas.

Special Transit Service (STS)

Section 223 of the Americans with Disabilities Act of 1990 (ADA) requires public entities operating non-commuter fixed route transportation services to also provide complementary paratransit service for individuals unable to use the fixed route system. The HOP Special Transit Service (also referred to as Complementary Paratransit Service or Paratransit Service) is provided to those individuals with disabilities that are unable to use the regular HOP services for their trip needs.

Rural Transit

Hill Country Transit District provides transit services to a broad range of individuals within rural portions of the KTMPO region on a demand-responsive basis. HCTD provides transportation services across nine counties and provides approximately 110,000 one-way trips annually within the KTMPO region. Destinations for passengers using these services include Health and Human services agencies, day care centers, public schools, medical facilities and pharmacies, dialysis centers, senior nutrition sites, employment sites, and shopping and retail establishments.

HCTD SERVICE ROUTES AND RIDERSHIP

System Wide

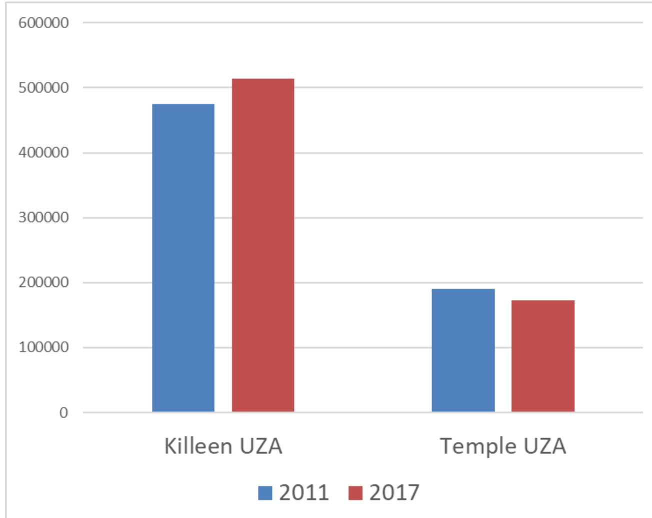
HCTD provides fixed route and complementary paratransit service in both the Killeen and Temple urbanized areas. HCTD fixed routes include two routes in Killeen, one route in Copperas Cove, one route connecting Killeen and Copperas Cove, one route in Harker Heights, one route in Belton, two routes In Temple, and one route connecting Harker Heights, Nolanville, Belton, and Temple. See **Appendix F** for route maps and schedules.

HCTD has seen significant increases in ridership over the last few years. From calendar year 2017 to 2018, total ridership in the Killeen area decreased from 514,328 to 391,245, a decrease of approximately 24%. During the same period of time, total ridership in the Temple area increased from 172,911 to 196,589, an increase of approximately 14%.

Exhibit 5.1: HCTD Fixed Routes

HCTD Route Location	Number of Fixed Routes
Killeen UZA	
Killeen	4
Copperas Cove	1
Harker Heights	1
Temple UZA	
Temple	2
Belton	1
Connectors	
Harker Heights – Nolanville – Belton – Temple	1

Exhibit 5.2: Ridership per UZA



Numerous factors have contributed to this change in ridership. HCTD has taken proactive measures to make the HOP successful. HCTD has aggressively worked to:

- improve the service by adjusting and increasing service locations and times;
- purchase new fixed route buses; and
- install more passenger shelters.

HCTD has made efforts to ensure access to transportation for people residing in areas identified as Environmental Justice Communities of Concern (EJ). EJ Communities of Concern are areas containing a higher percentage of low income or minority groups. These areas are selected based on higher percentages of minorities or low-income households. Based on a sample of 2013 ridership data collected across the MPO region and at different times of the year, we have identified some key facts about how people use public transit in these areas (see graphic at right). The City of Killeen shows the most access in terms of EJ communities, with 48% of the EJ areas being within 1/4 mile of a bus stop. Other cities show lower percentages based on their geographic distribution and number of routes.

In addition, the increased cost of fuels has affected the number of people looking for alternate means of transportation. Accordingly, ridership may not increase at the same rate when comparing future calendar years. Nonetheless, with the continued population growth, it is reasonable to expect ridership to continue to increase.

22 average daily boardings
25 average daily boardings in EJ Areas
43.9% stops in EJ Areas
36.5% land area within EJ areas located within .25 mile of a fixed route
Of the 15 stops with largest boardings, 8 located within EJ areas

Killeen UZA

HCTD has seen ridership patterns change in specific areas of the community. For example, in 2017, three routes, Route 7 (serving A&M and the Killeen Airport), 21 (serving WS Young and the Killeen Police Department office), and 30 (serving along Stan Schlueter) were low-performing routes and were discontinued in order to maximize efficiency. Average monthly ridership for the Killeen UZA decreased from 39,600 passengers a month in 2017 to 35,539 in 2018, a decrease of 10%. In 2018, Route 5 (serving residential areas in the southwest area of Killeen) was discontinued. The remaining Killeen routes are described below:

Killeen Route 2: Operates along Lake Road and Rancier Avenue, serving the East Lake Plaza as well as work sites along Twin Creek.

Killeen Route 4: Operates along Lowe's Boulevard, Illinois Avenue, Trimmier Road, and Highway 190 access roads including the Killeen Mall, Walmart, Scott and White Clinic, and numerous retail establishments.

Killeen Route 100: Operates along Highway 190 servicing Central Texas College, Metroplex Hospital, and connecting Killeen to Copperas Cove.

Harker Heights Route 35: Operates throughout Harker Heights providing access to residential areas, shopping, and employment sites as well as providing access to Killeen and Temple via connecting routes.

Copperas Cove Route 65: Operates throughout Copperas Cove providing access to residential areas, shopping, and employment sites as well as providing access to Killeen via connecting routes.

Temple UZA

HCTD has been operating fixed route and ADA complementary paratransit services in the Temple UZA for more than a decade. In 2016, Route 520 was discontinued in order to maximize efficiency. The Temple UZA fixed routes are described below.

Temple Route 510: Operates from downtown Temple, providing service to the Veterans Administration (VA) and Scott & White medical facilities, Temple College, as well as to shopping areas along the S 31st Street corridor.

Temple Route 530: Operates from downtown Temple, serving the northwest side of Temple and returning to the east side of Temple via the W Adams and Avenue H corridors.

Belton Route 610: Operates as a loop route, providing service to Sparta Road on the north to the Bell County Expo Center and the Justice Center on the south, serving University of Mary Hardin Baylor in between, as well as providing service to multi-family housing areas in southeast Belton.

Connector Route 200: An express connector service that connects the fixed routes operating on the west side of The HOP's service area in Harker Heights, Killeen, and Copperas Cove with service routes in Belton and Temple.

HCTD ACCOMPLISHMENTS

HCTD has had zero deficiencies in the last three Federal Transit Administration (FTA) Triennial Reviews (2008, 2011, and 2014). The FY2017 FTA Triennial Review had one deficiency found in 17 areas of review. This 2017 deficiency was closed out during the site visit. HCTD's accomplishments identified in the review include the following:

Projects Completed Since the 2014 Triennial Review

- Purchase of seven (7) fixed route buses (4 in the Temple UZA and 3 in the Killeen UZA).
- Installation of video and audio equipment on all buses except Killeen STS buses which will be done in the near future.
- Replacement of all annunciators in the entire Urban System.
- Developed and implemented an improved information system utilizing signage at all stops and shelters throughout the system.

Projects Underway

- Purchase of 3 additional fixed route buses (2 more in the Killeen UZA and 1 more in the Temple UZA). These will all be purchased with Category 7 funding.

Future Projects

- Purchase of additional replacement fixed route buses; and
- Purchase of additional paratransit buses; and
- Purchase of video and audio equipment on all Killeen STS buses.

OPERATIONS AND OUTREACH

HCTD strives to stay "technologically in tune" through the use and development of a variety of software programs for planning and scheduling routes and trips for fixed route and paratransit; to plan for and ensure adherence to scheduled preventive maintenance programs for the transit fleet; and to purchase and track parts for the fleet. HCTD has planned for quality control measures and relies on Ultra Low Sulfur Diesel (ULSD) fuel to meet alternate fuel requirements for the transit fleet. These and related programs enable HCTD to operate the regional transit system with greater efficiency and effectiveness, making use of the transit system more attractive to the region's residents and visitors. HCTD constantly monitors and promotes ridership growth as a means of controlling traffic, congestion, and emissions on the region's major roadways.

HCTD monitors marketing and advertising opportunities and uses newcomer guides, participation in local job fairs and community programs, participation in senior expositions, publication of route maps, and an up-to-date website in efforts to properly promote the transit system. Such efforts to promote the system will enhance ridership growth in the region, thereby helping to reduce traffic congestion and exhaust emissions.

HCTD REGIONAL COORDINATION

Agencies and Municipalities

HCTD coordinates with various Health and Human Services agencies to provide transit services through State service contracts. They have worked diligently to monitor the needs of the region and adjust routes, schedules, and facilities to meet those needs. They have coordinated their planning efforts with counties and cities in the region to enable improved financial planning and preparation for areas undergoing or projected for development.

To stay "connected", performance data are routinely provided to cities, the HCTD Board of Directors, the Central Texas Regional Transit Advisory Committee, the Killeen-Temple Metropolitan Planning Organization (KTMPO), and other agencies. This data includes the following performance measures which HCTD consistently meets or exceeds:

- Fixed route ridership per service hour
- STS ridership per service hour
- ADA trip duration
- Telephone service data
- Fixed route missed trips
- Customer complaints
- Number of traffic accidents
- Number of maintenance road calls
- Travel training events for public education
- Media advertising campaigns

HCTD participates regularly with network meetings in which information about ridership, routes, service options, and other information/data is provided. When planning routes and service adjustments, HCTD works closely with planning staff in area cities regarding demographics, projected growth, and new housing, retail, and employment areas. Through this cooperative effort, everyone is aware of the number of people using the transit system and can see which areas of service are most productive in terms of ridership, and a stronger sense of team efforts is realized.

In past years, HCTD has coordinated with the transit advisory committees of the cities of Temple and Killeen. The Temple Transit Advisory Committee (TTAC) held meetings four to six times annually. The TTAC received performance information and in turn made suggestions regarding service enhancement possibilities. The Killeen Transportation Committee consisted of elected city officials, city staff, and economic development people. Route changes and other factors that affected the transit system were often brought to this committee. Neither advisory committee exists today; however, HCTD continues to coordinate with each city through the cities' planning staff.

KTMPO

KTMPO staff is available to assist HCTD in their planning efforts and were instrumental in the development of their current GIS system. From 2008 to 2010, all mapping and route planning was performed at the KTMPO offices in coordination with transit planners. KTMPO staff used GIS technology to assist HCTD in updating their routes. Staff analyzed mileage, travel times, turning movements and destinations to enhance connectivity across the region with both express and local routes. The result of this planning process was a complete geodatabase of stops, shelters, and routes. After training HCTD staff to use GIS software, KTMPO delivered the geodatabase and related documentation. The mapping data was then used to produce foldable maps of all routes served by The HOP. The same data was used by HCTD staff to post route maps on their website. HCTD has purchased ESRI software licenses and is now completely self-sufficient at mapping and geographic analysis.

KTMPO and HCTD continue to share the vision of improving the mobility of our region's population and work cooperatively to achieve this goal. In 2011, KTMPO and HCTD entered into an Interlocal Agreement for coordinated transportation planning efforts. An updated agreement was signed in 2016. In 2012, KTMPO signed a resolution designating HCTD as the Designated Recipient of FTA 5307 funds for the Killeen UZA, which previously came to HCTD through the KTMPO. In 2013, KTMPO signed a resolution designating HCTD as the Designated Recipient of FTA 5310 funds, also for the Killeen UZA.

Other cooperative efforts between KTMPO and HCTD is evidenced by voting representation of HCTD on the KTMPO Technical Advisory Committee and the Transportation Planning Policy Board. KTMPO staff works closely with HCTD to obtain input on the region's transportation needs as the MTP is updated and the congestion management process is developed. KTMPO facilitates Planner Roundtables on a monthly basis. Planning and administrative staff from the region's cities, along with HCTD and Fort Hood, routinely attend these meetings. Discussions frequently include transit issues and the importance of including transit elements in development plans, along with infrastructure to accommodate pedestrians and bicyclists.

To help promote use of the HOP, a link to The HOP website is provided on both the CTCOG and the KTMPO websites. In addition, the KTMPO website promotes the use of public transportation by providing a link to the American Public Transportation Association website which includes a detailed article regarding "Public Transportation Benefits."

HCTD utilizes a Transit Management Plan that incorporates the State of Good Repair (SGR) reports. These reports are developed and maintained by HCTD. The SGR program develops a framework for HCTD and KTMPO to monitor and manage public transportation assets, improve safety, increase reliability and performance, and establish performance measures.

Regionally Coordinated Transportation Plan

The Regionally Coordinated Transportation Plan (RCTP) is a planning document intended to promote the most efficient use of regional transportation resources. Transit agencies receiving federal dollars are required to develop this plan and update it every 5 years. HCTD operates The HOP which is the only regional public transit system in the nine-county area covered by this RCTP.

Central Texas Council of Governments (CTCOG) entered into an Interlocal Agreement with HCTD for coordinated transportation planning efforts, which included updating the 2006 RCTP for State Planning Region 23. The counties covered by this plan include the seven counties in the CTCOG region—Bell, Coryell, Hamilton, Lampasas, Milam, Mills, and San Saba—plus Llano and Mason Counties. Staffing for this project was provided by KTMPO through the lead agency, CTCOG.

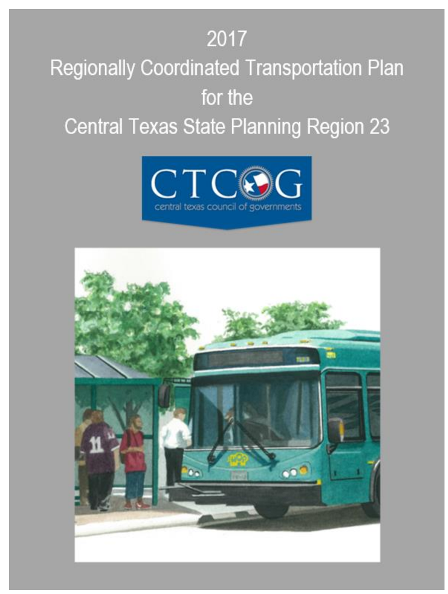
Guidelines for updating this plan were provided by Texas Department of Transportation (TxDOT) to ensure the Plan complies with state legislation relating to Statewide Coordination of Public Transportation. KTMPO staff worked closely with the Central Texas Regional Transportation Advisory Group (CTRTAG), which functioned as the Steering Committee, to update this plan. The Steering Committee approves actions and documents and provided KTMPO staff with guidance and information during the update process.

The RCTP identifies goals and objectives to provide a more efficient system, increase levels of service, increase coverage of service area, meet needs of social service agencies, and reduce air pollution. These goals coincide with the MTP goals.

As part of the Plan update, a needs assessment survey was required to evaluate public transportation inefficiencies and service gaps. A survey was conducted during 2016 among transit stakeholders by Texas A&M University—Central Texas (TAMUCT).

CTCOG entered into an interlocal agreement with TAMUCT to utilize University staff and students to develop and administer the survey, compile and analyze the survey results, and present recommendations to address the needs that were identified in the survey responses. The final survey report was presented to the CTRTAG members in December 2016, and the RCTP was revised based upon the survey results. Findings from the survey with recommendations to address the survey findings can be found in the 2017 Regional Coordination Transportation plan in the Supporting Documents.

Another task associated with past RCTP updates has been the adoption of a Limited English Proficiency (LEP) Plan. CTRTAG has adopted HCTD's LEP Plan since their plan covers the same areas as the RCTP and HCTD is the service provider for this area. The LEP Plan was last updated and adopted in March 2018.



Following adoption of the 2017 RCTP, quarterly meetings have been held to report back on progress in achieving the Work Plan goals. KTMPO staff will continue to work with the CTRTAG members in this endeavor. KTMPO receives FTA funds to continue staffing and facilitating the implementation of the RCTP. A Project Grant Agreement is in place and metrics are reported for implementing or achieving RCTP strategies and goals.

2017 RCTP TRANSPORTATION INEFFICIENCIES AND SERVICE GAPS ASSESSMENT SURVEY

The planning area for this report includes the following nine counties: Bell, Coryell, Hamilton, Lampasas, Llano, Mason, Milam, Mills, San Saba, and Fort Hood. Hill Country Transit District provides regional Public Transit Service in this planning area.

Demographic Data

Total county population figures for 2016 were available for all counties and are shown below in ranked order starting with the highest population.

Table 1: Population Total by County

County	Population
Bell	321,591
Coryell	76,276
Milam	24,388
Lampasas	20,020
Llano	19,272
Hamilton	8,330
San Saba	5,901
Mills	4,881
Mason	4,061
Fort Hood	32,177

Source: 2014 American Community Survey 5-year estimate (B01003)

Geographic Data

Basic geographic data for the nine counties and Fort Hood are shown in the following table. Bell County is the most populous county with the most persons per square mile, which supports the survey findings that Bell County is the primary geographic area that utilizes and needs public transportation.

Table 2: Geographic Data by County

County	*Land Area in Square Miles	Persons per Square Miles	Metropolitan Statistical Area
Bell	1,051.02	295.2	Killeen-Temple Metro Area
Coryell	1,052.07	71.78	Killeen-Temple-Fort Hood Metro Area
Hamilton	835.91	10.2	none
Lampasas	712.84	27.6	none
Llano	934.03	20.7	none

Mason	928.80	4.3	none
Milam	1,016.93	24.3	none
Mills	748.26	6.6	none
San Saba	1,135.30	5.4	none
Fort Hood	1,908.1	15.51	Killeen-Temple-Fort Hood Metro Area

Source: US Census Bureau, QuickFacts 2015 *Excludes bodies of water

Other factors that may influence the need for public transportation include elderly populations, employment status, the percentage of population commuting to work, and the factors related to income level. The following data obtained from 2010-2014 American Community Survey five-year estimates, may not accurately reflect current population characteristics.

Table 3: Demographic Data by County

County	% Population 60 or over	% Renter Occupied Housing Units	% of Total Population 16 Years or Older	% of Total Population Commuting to Work	Per Capita Income $	% Poverty Status (Families)
Bell	*13.73	42.33	76.70	92.9	23,335	11.6
Coryell	*11.38	46.66	76.00	85.1	19,410	9.4
Hamilton	25.8	26.46	84.78	93.5	23,734	10.1
Lampasas	16.9	26.70	79.68	91.7	24,134	9.5
Llano	*22.78	23.02	86.19	84.5	34,348	10.4
Mason	28.5	15.81	84.51	87.8	27,512	7.4
Milam	18.2	31.64	79.04	89.9	21,465	16.3
Mills	22.5	15.66	79.73	92.8	22,615	8.5
San Saba	20.8	27.63	90.44	90.2	19,595	10.1
Fort Hood	0.03	99.75	97.36	67.6	15,779	11.3

Source: US Census Bureau American Community Survey 5-year estimates (2010-2014), Commuting Characteristics by Sex (ID S0801), Total Population in Occupied Housing Units by Tenure (ID B25008), Selected Economic Characteristics (ID DP03), *Population 60 Years and Over in the United States (ID S0102), and Employment Status (ID S2301)

**based on estimates and may not reflect accurate population charateristics*

Resident and Agency Needs Assessment Instrument

The needs assessment survey had three phases: (1) Survey Development, (2) Data Collection, and (3) Data Compilation and Analysis. The general methods used to accomplish the three phases of the project are outlined below.

Phase I: Survey Development

Developed a methodological design in conjunction with CTCOG/CTRTAG that included the creation of two surveys (resident and agency) that were designed to gather information from the stakeholders regarding perceived and real gaps in public transportation service within the service area.

Phase II: Data Collection

The needs assessment survey was conducted using a phased, multi-modal approach outlined below. After survey development, a variety of data collection techniques were employed to gather information as described below.

Residents

The needs assessment survey was distributed to residents in all nine counties plus Fort Hood electronically. Participants were solicited via social media (i.e. Facebook), county and city official websites, local newspapers, and local news channels. Face-to-face surveys were collected in high traffic areas such as senior citizen centers, hospitals, VA offices, bus depots, bus lines, medical clinics, food banks, churches, and shelters.

Agency

The needs assessment survey was distributed to a group of local agency stakeholders. The Steering Committee provided input regarding possible stakeholders. Participants in the stakeholder group were solicited from agencies representing various health and human service organizations to address needs of older adults, children, persons with disabilities, low incomes, limited English proficiency, those served by government funded health and human service agencies and workforce agencies. Organizations associated with job creation and economic growths were also targeted along with county government.

Phase III: Data Compilation and Analyses

Needs assessment surveys for agencies and participants were treated in the following manner:

Surveys were collected from participants in a variety of locations in the service area. Overall, the data collection plan was very successful resulting in 1,359 surveys collected from participants and 38 surveys being collected from agencies. Per the data collection and analysis plan, data collected via the paper-pencil survey method were entered into SPSS (v.23) for appropriate analysis.

Open-ended or fill-in-the-blank items were analyzed to determine travel patterns and behaviors of rural and urban travelers. Additionally, open-ended response items were coded into themes and then analyzed.

The data used in the report provides findings and recommendations related to the overall needs assessment project. The following findings related to needs assessment were provided as a formative report to CTCOG/CTRTAG.

Findings

The results of the 2016 Resident Needs Assessment are highlighted below with detailed results found in the **Appendix**. The demographic data results show that 46.86% of the residents who participated were Caucasian, followed by 25.17% African Americans. There was a low percentage of Spanish-as-Primary language (5.31%) participants. Seventy-six percent of the residents self-identified themselves as urban residents with a significant percentage (60.06%) stating their annual income was $0-$25,000 with 17.44% of households claiming there was no full-time worker in the home. In regards to housing, 46.86% were renters, while 71.00% of the elderly lived in retirement or nursing homes. Over half of the participants stated they had at least one or more adult over the age of 60 living in their home while 60.27% stated they had one or more children under the age of 18 living with them.

1. **Residents Findings**

- Bell County (69.7%) was identified as the most common geographic area that the stakeholders served, followed by Coryell (14.71%) and Lampasas (4.31%) counties.
- Seventeen and a half percent stated they had used the HOP before.
- Fifty-seven percent of residents believe that there is a need for public transportation on Fort Hood. If it was available, 33% said they would use it daily and 13.5% said they would use it weekly.
- Compared to 2013, the awareness and importance of the services provided by the HOP have increased.
- Residents state that they would like to see the HOP run: every 30 minutes (40.0%), run all weekend (81.8%), and until 10:00 pm (21.3%).
- Distance to nearest bus stop (36.36%) is still the number one problem when accessing public transportation.
- Forty-three percent of those surveyed stated that they had navigated the HOP website.
- Of those surveyed, 30% stated the bus schedule was hard to read while 39% proposed changing the layout of the current schedule to better reflect the days (52.54%) and hours of operation (54.17%).
- Seventy-four percent of the participants felt there were unmet transportation needs. The highest group with unmet needs was identified as Low-Income Individuals at 18% followed closely by Students at (16%), Senior Citizens (13%), General Public (13%), and Persons with Disabilities (8%).
- Inconveniences listed were:
  - Bus does not run late enough (17.18%).
  - Bus does not run on weekends (15.34 %).
  - Bus not on time (11.66%).
  - Trips take too long (11.66%).
- Access problems listed were:
  - Distance to bus stops (7.36%).
  - No shelter/bench at bus stops (18.52%).

2. **Agency Findings**

The results of the 2016 Agency Needs Assessment are highlighted below with detailed results found in the **Appendix**. Of the 90 agencies contacted, 38 completed the survey. Not all 38 completed the survey in its entirety. Eighty-four percent of the agencies provide services to clients whose first language is not English and 85.71% provided services to those with disabilities.

- The stakeholders that responded represented agencies that provide a variety of services to their clients. The most frequent services provided included Health & Human Services, and Community Development, each coming in at 6% of the total. The next services were Senior Services, Government Services, and Economic Development at 4% each.
- Bell County was identified as the most common geographic area that the stakeholders served, followed by Coryell County and Fort Hood.
- Forty-one percent of the agencies were not aware of the HOP's hours of operations, and 66.67% were not aware of the areas the HOP covered.
- Three percent purchase or subsidize fares for their clients from the Hill Country Transit District (HCTD or HOP) and, in some cases, from taxi service providers; 8% have staff that provides client transportation.
- Killeen (29.03%) and Belton (22.58) were two of the most common destinations.
- The most frequent type of trip needed by the stakeholder clients were Medical at 24% followed closely by Employment and religion both at 18%. This was followed by Social Services at 16%, and Low-Income Mobility, Education, and Senior Nutrition, each at 13%.
- With regard to when client transportation was needed, the most frequent response was Weekdays 7:00 am to 6:00 pm at 26%, followed by Weekdays 6:00 pm to 10:00 pm and Saturday 7:00 am to 6:00 pm both at 13%. Sunday 7:00 am to 6:00 pm and Holidays both came in next at 11%. Then, Saturday 4:00 am to 7:00 am, Saturday 6:00 pm to 10:00 pm, and Sunday 6:00 pm to 10:00 pm all came in at 8%.
- In identifying the type of public transportation needed by their clients, the stakeholder responses were very close with 11% for Fixed Route Scheduled Bus Service and followed by Fixed Route Deviated Service at 8%. Special Transit followed this at 5% and Curb-to-Curb at 3%.

3. **Recommendations**

The needs assessment survey findings in this report are in alignment with the project's objectives. The primary focus of the project was to assess the needs of regional ground public transportation throughout the Central Texas region placing emphasis on participants who are individuals with disabilities, elderly, or low-income. The overwhelming majority of participants were unemployed or retired, with the largest portion having an annual household income of less than $25,000. By directing survey efforts toward individuals who are elderly, individuals with disabilities, have limited English proficiency, or low-income, an overrepresentation of those individuals utilizing public transportation was achieved. The majority of individuals are aware of public transportation in the service area; however, the majority of respondents are not aware of all the services provided by public transportation. The need for more services regarding hours, days and locations were reported by those utilizing public transportation. Data support the finding that participants know more about their needs than agencies. Although past reports have recommended the elimination of agency surveys, the current recommendation would be to revise the survey to be shorter and more applicable to the actual funds used to provide transportation alternatives to the clients.

Overall, the needs assessment survey of local ground public transportation provided a wealth of information for stakeholders as they work to improve services for their clients. Additionally, the survey raised awareness of the services that the HOP provides to all customers and potential customers in the nine-county service areas plus Fort Hood.

Recommendations to assist with the improvement of service and closing the gaps of services are provided below.

- Conduct a needs assessment in partnership with Fort Hood to establish if Fort Hood only bus routes are feasible.
- Expand routes to rotate every 30 minutes during high peak times on high usage routes.
- Keep Steering Committee and Stakeholders actively involved in regional transportation planning.
- Consider stakeholder input via the surveys as follows
    - Expanded hours needed and service extended. Service needed Monday through Sunday 6 am to 10 pm.
    - Medical facilities and Social Service Agencies are top destinations.
    - Maintain the low fees.

4. **Summary-Transportation Inefficiencies and Service Gaps**

Hill Country Transit District (HCTD or HOP) is the only regional public transit service provider for the nine-county planning areas that includes Bell, Coryell, Hamilton, Lampasas, Llano, Mason, Milam, Mills, and San Saba. There is currently no service available on Fort Hood, although this assessment has determined that a need may exist.

Current resources to evaluate transportation inefficiencies and service gaps in the planning region are limited. The comprehensive regional need assessment determined the following transportation inefficiencies and service gaps in the area. These resources, along with geographic/demographic data are discussed below.

Based upon resources discussed in this report, within the nine-county planning region, Bell County has the largest population and the highest number of health and human service agencies, medical facilities, employment centers and other desirable destinations. Bell County has the most developed transportation network but also appears to have the most need for improved transportation. Students, low-income residents, and the elderly seem to have the highest need for public transportation.

When considering transportation needs, there are two basic population segments to consider—the general population (fixed routes) and those with disabilities (Special Transit). The general population functions well with fixed route service. Many of the health and human service organizations have clients that need Para-transit service more so than fixed route. In Bell County, it appears that most individuals rely on their vehicles for transportation (75%) but are willing to use public transportation if the price of gasoline increased to more than $4.00 per gallon. HCTD provides good service with current schedules and routes; however, expanded hours in the early morning and late evening may be needed to provide coverage from 6 am to 10 pm, Monday through Sunday. Additional bus routes outside the major cities may also be needed.

The Agency Survey targeted agencies associated with health and human services. Participation was very limited. While all responses provide valuable input for consideration, it is difficult to draw meaningful conclusions with the limited study base and low participation rate.

HCTD SYSTEM MANAGEMENT AND OPERATIONS

As the operator of the regional public transit system (The HOP), Hill Country Transit District takes its role in the ownership, operation, and management of facilities and equipment very seriously. Most of the equipment used, ranging from shop tools and equipment to passenger shelters and buses, is expensive to purchase, and proper maintenance can increase the safe, dependable, and useable life of each piece of equipment. Only through proper maintenance can the equipment be dependable enough to ensure the safe transportation of The HOP passengers.

HCTD carefully plans the replacement of all equipment. Even the service life of passenger shelters has been identified and an on-going amenity program has been established whereby each bus stop and shelter is cleaned and inspected regularly. Each bus has a specific service life that is used to determine when and if major components, such as engines and transmissions, are deemed worthwhile for replacement. Service life may therefore be extended, provided the equipment can continue to be used safely, comfortably, and efficiently.

HCTD utilizes a professionally designed software program known as Fleet Pro to track each piece of equipment used by The HOP. This software includes detailed preventive maintenance schedules for each piece of equipment, transit amenity, shop tool, and vehicle to ensure all equipment is safe, well maintained, attractive, and dependable. Through such attention to detail in HCTD's management programs, the performance of the existing transportation facilities is always at its peak, thereby ensuring reliability so people can depend on the transit system as an alternate transportation mode, thereby helping to relieve traffic congestion. Each bus is periodically serviced in accordance with the specifications of the original equipment manufacturer. The fluid levels of each bus are checked daily with fluids added as needed, and noted loss of fluids leading to a mechanical inspection to correct any problems.

As each vehicle ages, it becomes subject to review for potential replacement in accordance with a fleet replacement schedule. HCTD includes all equipment in such a review, including its operations facility. HCTD and the communities it serves were fortunate enough to realize the completion of a new central operations facility in Belton in early 2013. In planning the facility, HCTD considered anticipated growth of the transit system and developed a construction plan that supports the service operations for a full 25 years. This ensures the facility can continue to support the safe mobility of people via an alternate transportation mode that helps relieve traffic congestion and reduce harmful emissions.

HCTD FUNDING

Prior to 2010 Census data, the Killeen and Temple UZAs were separate, each with a population of 50,000 to 199,999 based on 2000 Census data. The release of 2010 Census data confirmed that the Killeen and Temple UZAs still do not touch and will remain separate; however, the Killeen UZA went over the 199,999 population threshold at 217,630, moving up to the next category which is 200,000 to 999,999, thereby becoming a Transportation Management Area (TMA). The Temple UZA has grown to 90,390 and as such has not changed categories with regard to population. With the 2012 designation to TMA status, changes to transit funding also occur.

Federal funds may only be awarded if the receiving entity is complying with the "Buy America" program. Federal funds may not be obligated unless steel, iron, and manufactured products used in FTA funded projects are produced in the US. To comply with this requirement, HCTD conducts a pre-award and a post-award delivery audit of purchases of rolling stock to verify that Buy America provisions are met. Funding sources are discussed below.

Funding Programs

a) Job Access and Reverse Commute (FTA): The JARC Program (5316) was established to help provide welfare recipients and low-income persons access to and from jobs and activities related to employment. Operators of public transportation services are eligible sub-recipients. Funds may be used to finance capital, planning, and operating expenses. Local matching funds are required.

Hill Country Transit District (HCTD) does not currently participate in the JARC Program. These funds may be helpful in expanding the current transit system when conventional transit services are reduced or non-existent, i.e. during late night or weekend times if related to employment (shift work). Recently, JARC funds have been folded into the 5307 (Urbanized Area Formula) Program.

b) New Freedom (FTA): The New Freedom Program (5317) is intended to assist individuals with disabilities seeking integration into the work force and full participation in society, beyond the requirements of the Americans with Disabilities Act (ADA). Operators of public transportation services are eligible sub-recipients. Funds may be used to finance capital and operating expenses. Local matching funds are required.

HCTD received 5317 funds for FY2010. New Freedom funds were used for the installation of 149 passenger shelters in the urban area. These shelters are useful in helping persons with disabilities more easily access HCTD transit services. The New Freedom Program has recently been incorporated into the 5310 Program.

c) Elderly Individuals and Individuals with Disabilities (FTA): The 5310 Program is intended to improve mobility for elderly individuals and individuals with disabilities. Funds are authorized for public transportation capital projects planned, designed and carried out to meet the special transportation needs of this group. The program requires coordination with other federally assisted programs and services.

HCTD currently receives 5310 funds. The 5310 funds are used to purchase capital equipment (ADA accessible buses and related items such as communication and surveillance equipment) to expand services to elderly and disabled individuals to help them access medical services, including dialysis centers, senior nutrition sites, and other destinations that will help keep them independent and aid in quality of life. These funds are also used for preventive maintenance of vehicles purchased with 5310 funds.

d) Urbanized Area Formula Program (FTA): The 5307 Program makes Federal resources available to urbanized areas and to Governors for transit capital and operating assistance in urbanized areas and for transportation related planning. Funding is made available to designated recipients that must be public bodies with the legal authority to receive and dispense Federal funds. The Governor or Governor's designee is the designated recipient for urbanized areas between 50,000 and 200,000. For urbanized areas with 200,000 in population and over, funds are apportioned and flow directly to a designated recipient selected locally to apply for and receive Federal funds. Matching funds are required.

HCTD currently receives 5307 funds for the urbanized areas of Killeen and Temple. The 5307 funds are used in the Killeen and Temple urbanized areas to provide fixed route and complementary ADA paratransit transportation services.

The 5307 funds for a UZA with a population of 50,000 to 199,999 may be used for both capital projects (at an 80/20 federal/local match) and operating projects (at a 50/50 federal/local match). Section 5307 apportionments are based on population and population density.

The 5307 funds for a UZA with a population of 200,000 to 999,999 may only be used for capital projects including preventive maintenance, at an 80/20 federal/local share. Use of funds for operating assistance is not allowed in this category, unless there is specific statutory language allowing this. Section 5307 apportionments are based on vehicle revenue miles, passenger miles traveled, operating costs, population, and population density.

With the Killeen UZA becoming a TMA, HCTD will no longer be able to use all of its 5307 funds for operating expenses within this UZA. MAP-21 permits a portion of 5307 funds to be used for operating expenses if fewer than 100 buses are used in fixed route service during peak hours—

HCTD falls under this criterion. HCTD is only eligible for Section 5307 Operating Assistance Special Rule Operator Cap funds beginning with the Federal Fiscal Year (FFY) 2013 apportionment.

e) Surface Transportation Program—Metropolitan Mobility (STPMM)(FHWA): KTMPO became eligible to receive STPMM or Category 7 funds starting in FY2013 due to its designation as a TMA. Such funds require a minimum 20% match. The funds do not have to be obligated during the fiscal year for which they are allocated but may rollover to the next year and be combined with the following fiscal year funding. Up to three years of funding may be combined. The KTMPO Policy Board approved the dissemination of funds with 90% for roadway projects and 10% for transit projects. For combined FY2013 and 2014, HCTD received approximately $640,000 which was used to purchase two replacement buses for the fixed route service in the Temple UZA. For combined FY2015 and FY2016, HCTD received approximately $972,000 which was used to purchase three replacement buses for the fixed route service in the Killeen UZA. Future plans are to combine two or three years of funding to be used again, as the funds become available, for the purchase of fixed route buses for the urbanized areas.

FUTURE GROWTH

Within the KTMPO boundary, HCTD predicts for the year 2030 that Fixed Route Service (FRS) fleet size will increase to 58 buses, and that the number of annual FRS passengers will increase to more than 1.5 million. Also, by 2030, it is predicted that Special Transit Service (STS) will continue to carry both STS-eligible passengers and other passengers who fall under one or more other programs whereby an annual total of about 200,000 STS passengers will be carried using an STS fleet of 90 vehicles.

For the year 2045, HCTD predicts that Fixed Route Service (FRS) fleet size will increase to 70 buses, and that the number of annual FRS passengers will increase to almost 2.5 million. Also, by 2045, it is predicted that Special Transit Service (STS) will continue to carry both STS-eligible passengers and other passengers who fall under one or more other programs whereby an annual total of about 300,000 STS passengers will be carried using an STS fleet of about 115 vehicles.

Geographic Direction of Growth

The geographic direction of growth for the fixed route service plan is anticipated to follow the growth pattern of the region as projected by KTMPO. This growth will likely be as follows:

- Service in and to Troy, Little River/Academy, and Salado will be provided via route “connectors” and limited circulator service within each of these areas.

- Service in the Temple area will be expanded further south, following the growth toward and along the north of Highway 93. Service in Temple will also be expanded to provide service in a northern corridor (along North 3rd Street) and a western corridor (along West Adams) as the population density in these areas increase.
- Service will be expanded into the Morgan's Point Resort area using both "connectors" and circulator service approaches.
- "Connector" service into Belton will continue, and service in Belton will be expanded to include a circulator service.
- Service in the Killeen UZA, which includes the cities of Killeen, Nolanville, Harker Heights, and Copperas Cove will be expanded in areas of increasingly geographic growth, especially to the south, north, and west of Copperas Cove and to the south of Killeen.
- Service along the US 190 corridor will take on more of a linear transit corridor from which circulators and feeder routes can operate.

Future Projects

Hill Country Transit District projects that it will perform ongoing purchases of replacement and expansion rolling stock, and passenger shelters and benches. Future projects could include Park and Ride facilities (Killeen and Temple) with parking lots and waiting shelters, curb cuts and sidewalks at major bus stops and transfer points, public education, and marketing. Special Capital Projects may include the following:

- Vehicle Monitoring Systems (surveillance systems)
- Transfer Center Kiosks
- Upgraded Vehicle-to-Dispatch Communications System
- Transfer Center Security Systems
- Electronic Fare Payment Smart Cards
- Regional Multi-Modal Transportation Facility

chapter 6

Bicycle and Pedestrian

The walking and biking trails in the Killeen-Temple Metropolitan area encompass Bell, Coryell, and Lampasas counties. **Central Texas has a multitude of trails that already exist and are being used on a regular basis.** Future planned development of the trails will connect the cities of Killeen, Harker Heights, Copperas Cove, Temple, Belton, Nolanville, and Salado into a 123 mile network of multi-use trails in which users include commuters, walkers, joggers, bikers, horseback riders, rollerbladers, bird watchers, and other outdoor activity seekers.

REGIONAL THOROUGHFARE AND PEDESTRIAN/BICYCLE PLAN

Development Process

The MPO developed a Regional Multimodal Plan as one of the key elements of its transportation planning process in order to create a forward-thinking blueprint for the transportation system in the region. This "advance planning" tool provides a vision for the future regional transportation system that is required for the continued mobility and prosperity of the region well into the future. More specifically, it defines the roadway, bicycle, pedestrian facilities needed to serve both existing and long-term future development. **T**he complete Regional Multimodal Plan is found in Appendix E.

For the purpose of this chapter, the plan is comprised of a bike-pedestrian element. These two elements are similar in that they both establish a long-term vision for the mobility needs of the region. However, they differ in terms of the level of detail regarding the specific transportation recommendations required to realize the full transportation network. The MPO embarked on an effort in FY2018 to update the original Regional Thoroughfare and Pedestrian/Bicycle Plan to incorporate how the bicycle/pedestrian network into other transportation modes.

In FY2018, KTMPO, with assistance from CDM Smith, developed a Regional Multimodal Plan (RMP). The RMP defined a vision and goals for integrated multimodal transportation systems in the KTMPO area and developed specific needs-based potential projects for the thoroughfare, bicycle, pedestrian, transit, and freight systems. The Plan will not impose controls on projects for local jurisdictions. Rather, it can serve to define common goals, definitions, descriptions of needs, and design criteria, and can illustrate best practices to guide local jurisdictions in defining and selecting their own projects.

For the development of the RMP, a survey was conducted as part of the plan. Outcomes of completed surveys include the following:

- Trails & Sidewalks along arterial roadways are needed;
- High-volume and higher-speed routes still need access by multiple modes.
- "Multimodal" should provide smooth transition from one use to another;
- Continuous linear hike/bike system through communities are needed;
- It's important to not forget about street trees and the value they provide to make our pedestrian network inviting and attractive;

A common theme with the surveys was that roads are only meant for motorized vehicles and not bicycles and pedestrians. As a result, the RMP also outlines the legal rights of bicyclists and pedestrians, and ways KTMPO can further educate its citizens. The RMP was approved in October of 2018. The RMP will feed into the 2045 Metropolitan Transportation Plan (MTP) but will not be constrained by MTP requirements for fiscal constraint and funding categories. The Plan will instead present a full range of needs and potential projects and will include elements not required in the MTP or relevant for project selection.

Regional Coordination

The RMP reflects a continuing collaborative effort among MPO-member jurisdictions, Bicycle/Pedestrian Advisory Committee, Technical Advisory Committee, and Transportation Planning Policy Board. The project utilized a substantial amount of existing information from the MPO's GIS database; project schematics and other planning documents from both Fort Hood and TxDOT; and the formal Comprehensive Plans, Thoroughfare Plans, and Master Trail Plans adopted by the cities of Belton, Copperas Cove, Harker Heights, Killeen, Temple, and the Village of Salado. Significant efforts were made during the development, review, and refinement of the plan to include the technical expertise, public input, and political leadership within the KTMPO planning area. All local government agencies were contacted to gather their insight as to the long-term needs for their communities and to refresh the planning assumptions that were made during the development of their latest plans.

Relationship to Other Planning Documents

The regional thoroughfare element of the plan is primarily a map that provides a vision for the ultimate roadway build-out for major roadway facilities. Similarly, the recommended bicycle accommodations presented in the plan represent an ideal network of non-motorized transportation routes. As such, the recommendations pertaining to future thoroughfares and bicycle accommodations contained herein should not be construed as a commitment by any MPO-member jurisdiction to fund or construct any facility, in any particular location, at any particular time. Other planning and programming documents, such as this Metropolitan Transportation Plan, the Transportation Improvement Program, and various county and city capital improvement programs, will specify individual projects that, over time, will accumulate to define the ultimate build-out of the transportation network presented in this plan. In other words, the thoroughfare plan simply creates a master guide for the development of the regional transportation system and helps guide the MPO in the identification of projects for its next MTP.

Elements of the RMP explicitly support many of the **MPO's goals** stated in the Mobility 2045 Metropolitan Transportation Plan which was in place when the Regional Thoroughfare and Pedestrian/Bicycle Plan was developed, namely:

· **Accessibility and Mobility** – The plan improves access to goods, jobs, services, housing and other destinations within the region and beyond by defining a cohesive, interconnected, regional transportation system.

· **Travel Options** – By developing a long-range planning document that considers both motorized and non-motorized transportation, the plan defines a transportation system characterized by an interconnected, hierarchical network of roadways and bicycle and pedestrian facilities, thereby promoting transportation alternatives.

· **Economic Vitality** – The plan enhances the economic vitality of the region by efficiently and effectively connecting people to jobs, goods, and services. In addition, a robust regional bicycle network can bring significant economic benefits to the region.

· **Equity** – The plan addresses the future needs in all parts of the region in a balanced fashion, thereby assuring that impacts of transportation projects needed to support the development of the plan do not adversely affect particular communities disproportionately.

· **Transportation and Land Use** – The plan seeks to encourage the development of sustainable land use patterns by providing a grid-like framework around which development can occur, while simultaneously improving access to jobs, services, and housing to everyone in the region.

· **Health** – The plan explicitly encourages transportation investments in bicycle and pedestrian facilities to help promote healthy and active lifestyles.

Specific Pedestrian/Bicycle objectives are identified in the 2018 RMP**.** KTMPO is following the RMP goals and objectives to ensure identified needs are met for the region.

BICYCLE AND PEDESTRIAN NETWORK

The short distances Americans travel for many of their daily trips make bicycling and walking a highly viable transportation mode. Nearly 40% of all trips are under two miles, a distance easily accomplished by bicycle or on foot by a reasonably physically fit adult or child. In addition, 80% of all trips people take are not for commuting to work, but are for other purposes, many of which do not necessarily demand a car to accomplish. However, while there is potential for many more people to bicycle and walk for transportation, the lack of a safe, direct and usable bicycle and pedestrian network often makes it difficult. Not unlike many regions across the state, and indeed the country, the Killeen-Temple region faces the challenge of a less than complete bicycle/pedestrian network. However, as will be discussed, many of the cities within the region are making significant strides toward improvement.

Existing Network

A bicycle is legally recognized by the State of Texas (and many other states) as a vehicle, with all the rights and responsibilities for roadway use that are also provided to motor vehicles. As such, cyclists can legally ride on any roadway in the region (except controlled access highways such as the Interstate 35 main lanes). However, certain roadways are more “bikeable” than others. Local and collector streets are suitable for use by most adult bicycle riders, as long as traffic volumes are not high, and speeds are less than 35 miles per hour. Arterial streets typically carry higher traffic volumes with speeds of 35 to 45 miles per hour and are used by only the more skilled and assertive bicyclists. With proper education in bicycle operation and safety, many people could safely bicycle on existing roadways, even those without bicycle accommodations. Rural arterials with shoulders and/or very low traffic volumes attract sports cyclists interested in longer-distance travel with fewer interruptions.

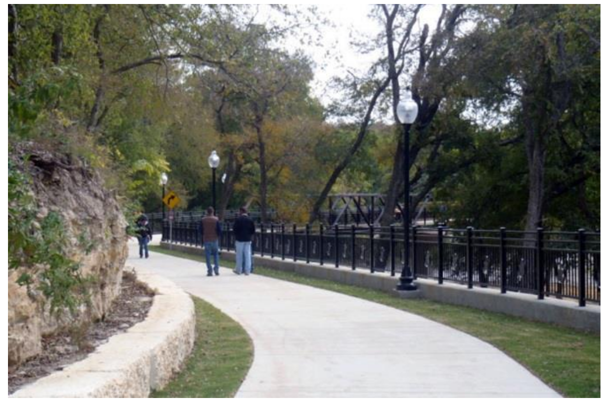
The existing pedestrian system is comprised primarily of the roadside sidewalks that are present throughout the region. While many of the older, core urban areas in the region have extensive sidewalk systems, recent patchwork development and a lack of a consistent regional sidewalk development policy has led to many gaps in the sidewalk network. In recent suburban developments, sidewalks are constructed only along the frontage of the development, with the subsequent gaps left to be filled in when the adjacent parcels are developed. While this sidewalk development policy is perhaps cost-effective, it has the unfortunate result of leaving the full potential of walking as a viable transportation option unrealized.

KTMPO has inventoried the existing bicycle and pedestrian data including sidewalks, bicycle routes and lanes, roadways with shoulders, and trails to provide a more complete picture of the state of non-motorized mobility in the region, as shown in Exhibits 6.6 through 6.10. Some significant bicycle and pedestrian facilities as identified in the Regional Thoroughfare and Bicycle/Pedestrian Plan are featured below in Exhibit 6.4.

Exhibit 6.1: Significant Bicycle and Pedestrian Facilities

Temple Pepper Creek Trail—3.5 Miles

Belton's Nolan Creek Trail—1.4 Miles



Nolanville Main St. Sidewalks;

Not Pictured:

Harker Heights Comanche Gap

Killeen Brookhaven Trail

Copperas Cove South Park Trail

Exhibit 6.2: Bicycle and Pedestrian Network (for the KTMPO Region)

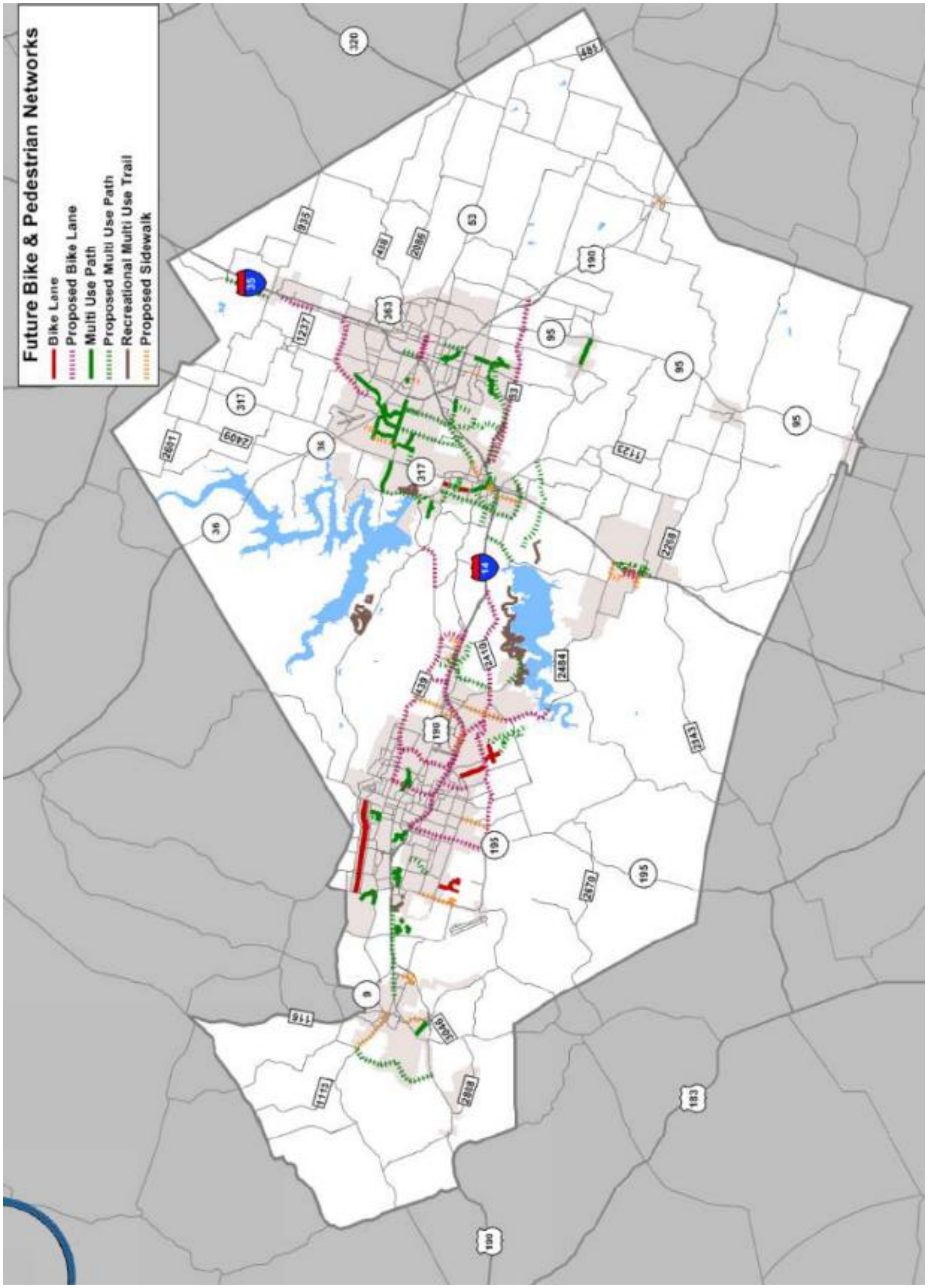


Exhibit 6.3: Bicycle and Pedestrian Network (Western KTMPO Region)

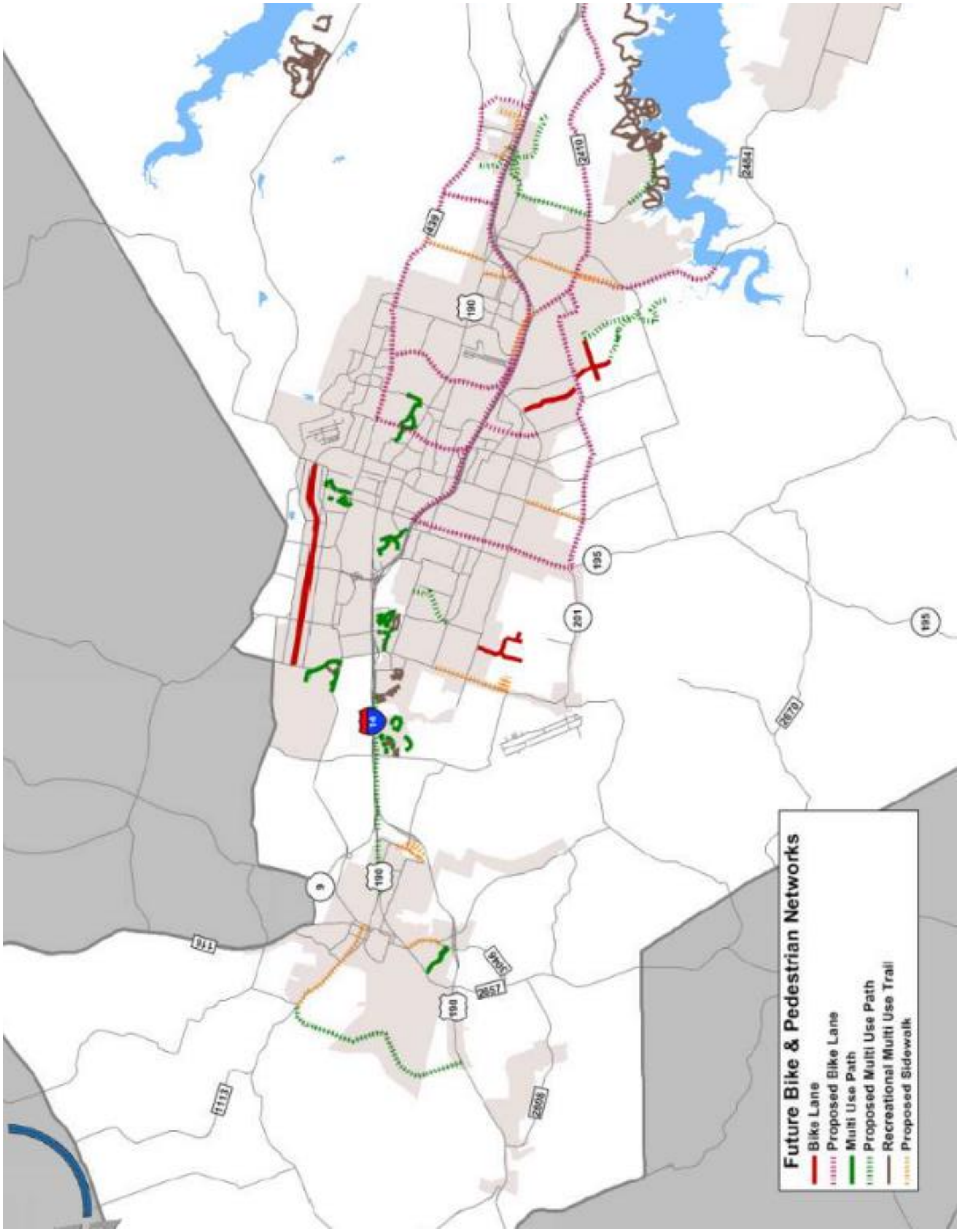
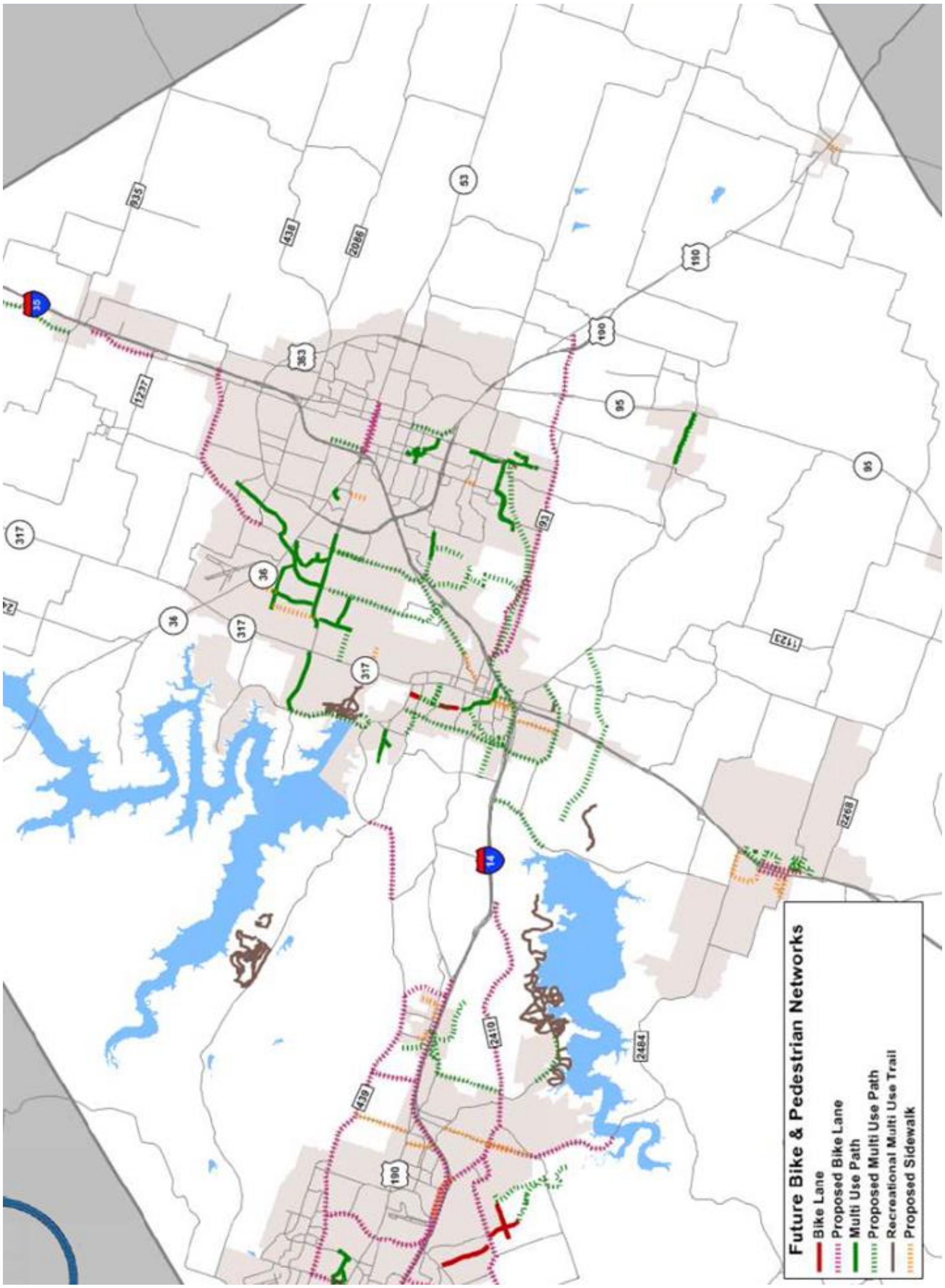


Exhibit 6.4: Bicycle and Pedestrian Network (Eastern KTMPO Region)



SAFETY

It can be hazardous for bicyclists and pedestrians to use the car-dominant transportation system when roadway designs do not adequately consider these modes. Even in locations where a sidewalk or space on the roadway for a bicyclist exists, certain conditions can make public infrastructure basically unusable. Lack of pedestrian crossing indicators or lack of traffic control at free right turns can expose a pedestrian to danger, particularly if that person has no safer alternative to crossing at that location. Extremely long block faces or distances between traffic signals can force pedestrians to make unprotected mid-block crossings.

An analysis using TxDOT's Crash Records Information System (CRIS) for the years 2015-2017 was performed for bicycle and pedestrian-related crashes to identify the safety conditions of current facilities. Exhibit 6.5 shows the number of bicyclists and pedestrian crashes for 2015-2017

Exhibit 6.5: 2015-2017 Bicyclists and Pedestrian Crashes

Type of User	Number of Crashes	Number of Non-Incapacitating Injury Crashes	Percentage of Non-Incapacitating Injury Crashes	Numner of Incapacitating Injury Crashes	Percentage of Incapacitating Injury Crashes	Number of Fatality Crashes	Percentage of Fatality Crashes
Cyclists	65	50	77%	11	17%	4	6%
Pedestrians	187	108	58%	53	28%	26	14%

Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) created design guidelines to ensure that transportation facilities are constructed to a set of standards that ensures accessibility for the disabled. Sidewalks are one of the most common pieces of transportation infrastructure, yet if not accessible, they can pose great challenges and danger to anyone with limited mobility.

Public entities such as city governments and transit agencies are required to construct facilities in accordance with ADA standards. These standards apply to all new construction; however, the ADA also requires that public entities retrofit any public facility to these standards to ensure equal access. These requirements include sidewalks and curb ramps which must be retrofitted to meet all current standards. Any non-compliant sidewalks or curb ramps must be upgraded to meet current standards whenever any alterations, such as road surfacing, are carried out. ADA requirements are summarized in **Appendix E**. KTMPO will continue to coordinate with the municipalities to keep this inventory updated and promote improvements and expansion of the sidewalk network through the planner roundtable meetings. Gaps in the network system will be evaluated and considered when opportunities for expansion occur.

Safe Routes to School

Safe walking and bicycling routes should be established for each elementary and middle school student living within reasonable distance of the school. Students should have a sidewalk to walk on, rather than be forced to walk in the road. They should have designated street crossing locations, preferably enhanced with crosswalks and crossing aids (e.g., signals, crossing guards, pedestrian refuge islands) to make their crossing safer. School speed zones on roadways around the school that must be crossed are typically established for school entry and exit time periods. Having safe walking and bicycling routes to elementary and middle schools is particularly important for low-income families that may not have a vehicle available to take students to and from school.

Administered by the Texas Department of Transportation, the Safe Routes to School program is a federally funded effort to encourage elementary and middle school students to walk and bicycle to school, for their own physical fitness and health, to ease auto traffic congestion and increase student safety at and near schools, to improve neighborhood conditions and to provide transportation options for families without multiple car ownership. The Safe Routes to School program is now funded under Category 9-Transportation Alternatives Program.

Safe Routes to Transit

It is critical to provide a network of ADA compliant sidewalks to feed bus stops and transit transfer points so that people can safely access the transit system. Representatives of Hill Country Transit District (the HOP) have stated that "more sidewalks are needed everywhere" in the region. When planning where to add sidewalks, special priority should be given to developing the network feeding key transit routes and bus stops. In addition to the general lack of sidewalks along many routes, hazardous roadway crossings present a significant access barrier and safety issue for citizens. Many multi-lane, high-volume arterials are too wide for some citizens, particularly the elderly, disabled, and children, to cross during a signal timing phase, or traffic control at these intersections favors auto traffic flow rather than pedestrian access and safety.

Transit Linkages

The ability to link bicycle trips with bus trips provides benefits for both systems—the service area for bus routes may be expanded and the use of bicycles as a travel mode may also grow. Hill Country Transit District has recently installed bicycle racks on each of their fixed route buses; each rack may hold up to two bicycles. Bicycle racks and/or lockers at the bus stops would also be beneficial and would require coordination with municipalities. This is a topic of discussion that will be covered with the planner roundtable meetings.

FUNDING SOURCES

Transportation Alternatives Program

As a TMA, KTMPO receives funding through the Transportation Alternatives Program (TAP), or Category 9. TAP funding was authorized under Section 1122 of Moving Ahead for Progress in the 21st Century Act (MAP-21). FAST Act continues to provide funding through TAP. Programs under TAP include the following:

- Transportation Enhancement Activities;
- Recreational Trails Program; and
- Safe Routes to School Program (SRTS).

As such, the TAP provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities; infrastructure projects for improving non-driver access to public transportation and enhanced mobility; community improvement activities and environmental mitigation; recreational trail program projects; safe routes to school projects; and projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former Interstate System routes or other divided highways.

TAP funds are administered by the State Department of Transportation (State DOT) and must be used for eligible projects that are submitted by eligible entities and chosen through a competitive process. TAP does not establish minimum standards or procedures for competitive processes but requires the state or MPO to do so. For urbanized areas with populations over 200,000, the MPO, through a competitive process, is required to select the TAP projects in consultation with the State.

A call for conceptual TAP projects was issued in conjunction with roadway projects for inclusion in the MTP 2040. A total of 30 projects were submitted and are included in the project listing section of the MTP.

In January 2016, a call for projects was issued for FY15-17 TAP funding totaling $1,151,642. KTMPO staff received proposals from the cities of Copperas Cove, Harker Heights, Killeen, Nolanville, Salado and Temple. These entities were provided with an opportunity to present their respective projects to the Technical Advisory Committee. The Technical Advisory Committee (TAC) members, or their proxies, scored each of these proposals at the March 2, 2016 TAC meeting and prepared a recommendation to the Transportation Planning Policy Board. TAC recommended funding the City of Killeen's Heritage Oaks Hike and Bike Trail Segment 3A project and Copperas Cove Ave D Streetscape Phase III project. The amendments to revise the TIP and MTP went through the required public involvement process and funding was officially approved by TPPB at their April 20, 2016 meeting.

During the 2016 Reprioritization, KTMPO received 19 livability projects. These projects went through competitive process and were scored and ranked. During the spring of 2017, KTMPO presented possible scenarios that would allocate FY18-20 TAP funds which totaled $1,170,000. TAC reviewed and provided input on each scenario and made a recommendation to fully fund

Copperas Cove The Narrows (RGIII at Old Copperas Cove Rd) project and partially fund Copperas Cove The Narrows (Constitution Dr) with the remaining Category 9 and supplement the remaining with Category 7 funds to TPPB. The proposed amendments went through the required public involvement process and funding was officially approved by TPPB at their June 21, 2017 meeting. KTMPO also funded Belton's 13th Avenue Sidewalk and Shared Use Path using FY21-22 Category 9 funds.

During the development of the 2045 MTP, KTMPO received 27 livability projects. At this time, KTMPO was able to fund one project using FY21-22 TAP funds. This project constructs 5' sidewalks on the north side of 13th Ave from Main St to Woodall; transition to 10' SUP from Woodall to Waco Rd.

Statewide Transportation Alternatives Set Aside/Transportation Alternative Program:

The Texas Department of Transportation initiated a statewide competitive "call for projects" for funding under the Statewide TAP Program in 2015. The Texas Transportation Commission reviewed each statewide project and authorized projects for funding for three of these projects in the KTMPO region. The three projects include Belton's Chisholm Trail Corridor Hike and Bike Facility Phase II, Killeen's Heritage Oaks Hike and Bike Trail Segment 4, and Old Nolanville Rd Elementary Bicycle and Pedestrian Safety Improvements.

Another "call for projects" for funding under the Statewide Transportation Alternatives Set Aside Program in 2017 which replaced the Statewide TAP funds. Through this project call, one KTMPO project was funded. This project was Belton's Hike and Bike Trail Extension South (South Belton Shared Use Path).

Surface Transportation Program—Metropolitan Mobility: As a TMA, KTMPO also receives funding through the Surface Transportation Program Metropolitan Mobility also known as Category 7. These funds can be used for roadway, bike/pedestrian and transit projects. In late 2015, KTMPO held a "call for projects" for FY15-17 Category 7 funds. KTMPO staff received 7 proposed projects with 3 projects being solely bike/pedestrian projects. Again, each submitting entity was able to present their respective proposal to the Technical Advisory Committee. TAC then scored each proposal at their December 2, 2015 meeting and provide a recommendation to TPPB to fund all 7 projects which included the 3 bike/pedestrian projects. The 3 bike/pedestrian projects that were selected were Belton's Main St. Sidewalk Expansion, Copperas Cove's Ave D Sidewalk, and Nolanville's Main St. Connectivity projects. The proposed amendments went through the required public involvement process and funding was officially approved by TPPB at their January 20, 2016 meeting.

During the 2016 Reprioritization, KTMPO received 19 projects to compete for STPMM funds. These projects went through competitive process and were scored and ranked. During the spring of 2017, KTMPO presented possible scenarios that would allocate FY18-20 TAP funds which totaled $13,890,000. TAC reviewed and provided input on each scenario and made a recommendation to fund Temple's 31st St Sidewalk, Temple's Adams Ave/Central Ave Bicycle/Pedestrian Improvements, Copperas Cove FM 116 & FM 3046 Sidewalks, Killeen's Heritage Oaks Hike Bike Trail Segment 5, Copperas Cove The Narrows (Charles Tillman Way) and Salado's Main St. Sidewalk Phase 1 projects, and the remaining Copperas Cove The Narrows (Constitution Dr) project as described above. These projects total an amount of $6,835,000. The proposed amendments went through the required public involvement process and funding was officially approved by TPPB at their June 2017 meeting.

KTMPO was also able to allocate a portion of Category 7 funds to Nolanville's Park Connectivity Project. This project constructs a 10' wide sidewalk, ADA ramps, and crosswalks and also widens the pavement by 32' with curb and gutter from Mesquite Park, along Ave H to 10th St.

NEXT STEPS—MOVING FORWARD

The 2011 KTMPO Pedestrian/Bicycle Plan identified recommended actions to promote pedestrian and bicycle improvements throughout the KTMPO region. The Regional Multimodal Plan will continue to outline actions to promote regional pedestrian and bicycle improvements. These actions are described in detail in **Appendix E.** KTMPO staff will continue working to implement various portions of this action plan during the next five years. Some elements are already in progress and are identified as such below. In order to facilitate the actions of the bicycle/pedestrian portion of KTMPO's Regional Multimodal Plan, the Bicycle/Pedestrian Advisory Committee was established in January 2016. This committee consists of representatives of KTMPO cities and counties, TxDOT, and citizen stakeholders. BPAC provides input and helps KTMPO to implement the action plan as well as general bicycle and pedestrian issues. Actions that the BPAC has under taking in the Fitness Friendly Business Program, provide feedback on bike/pedestrian infrastructure, vulnerable road user ordinance, and others. KTMPO plans to continue to utilize BPAC as a way to implement the regional bicycle and pedestrian policies, programs and implementation strategies.

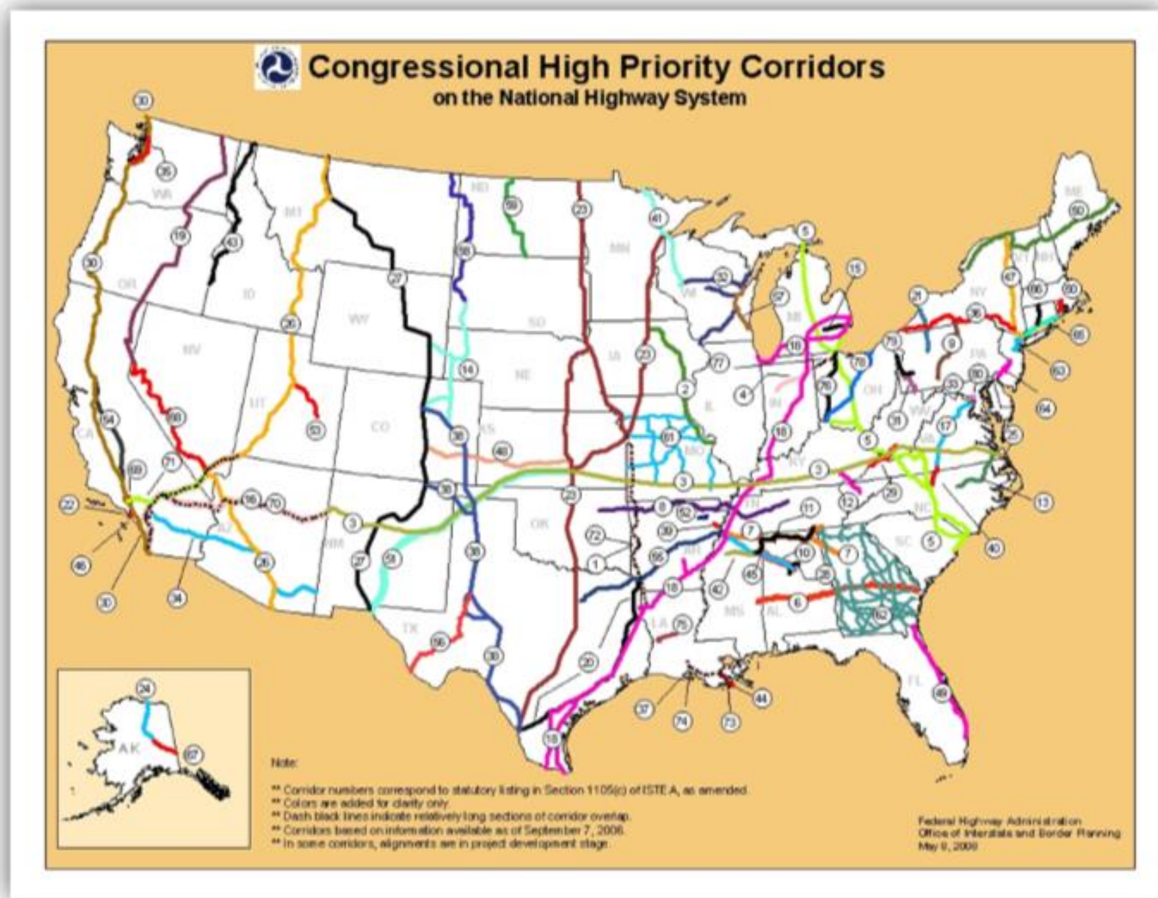
chapter 7

Multimodal

The Killeen-Temple metropolitan area has facilities and infrastructure in place to accommodate for **the movement of goods and people through various modes of transportation**. Multi-modal alternatives include rail and trucking for freight and rail, air, motor coach, and local bus transit for the movement of people. The Killeen-Temple Metropolitan Area has been and will continue to be an integral part of freight movement in the state of Texas. Located in Central Texas and on the western leg of the Texas freight triangle (Dallas-San Antonio-Houston), the KTMPO area is one of the highest density freight zones in the United States.

MULTIMODAL

Freight along the IH 35 corridor has increased dramatically due to the North American Free Trade Agreement (NAFTA) from points south of the region originating in Mexico via Laredo and Brownsville. NAFTA has also caused increased port activity resulting in the movement of goods from Corpus Christi, Galveston, Houston, and Beaumont. Central Texas will continue to experience increased cargo movement via truck, rail and air in the foreseeable future. As a major connector for national transportation systems, infrastructure in Central Texas is critical to the effective movement of goods and services. As a truck and rail hub along freight corridors, KTMPO services the markets that connect Canada, United States & Mexico. This corridor includes the Dallas to Mexico, Dallas to San Antonio, and Dallas to Houston markets.



Although the KTMPO region may be located on a major corridor for international trade, it is also home to the largest active duty armored post in the United States Armed Services—Fort Hood.

Fort Hood is home to over 50,000 troops and a large variety of equipment. Troop and equipment movements by all multimodal methods of transportation are a key factor in the security and safety of our nation. Based on a City of Temple logistics study, the KTMPO region is extremely diversified with manufacturing and distribution of many types of goods. The outgoing freight within a fifty-mile radius distributed approximately 131 million tons of goods in 2007. It is expected that the same area will distribute approximately 185 million tons of goods by 2040. Pass thru freight from Mexico to Dallas is projected to grow from 5.5 million to 16.3 million tons.

Recent developments in West Texas (Permian Basin and Concho Valley) have revealed significant activity in the oil industry. The Eagle Ford and Cline Shale sites have been classified as scenes from the old "gold rush days". With the increased needs of the oil industry and local manufacturing, rail service is expected to play a major role.

Passenger service continues to expand with the movement of Central Texans for military, business and personal purposes. Focus on national security abroad and area growth are expected to increase the need for passenger service.

RAIL

The Central Texas area has a vital purpose in the state's railroad operation. This central proximity allows for north/south and east/west rail corridors. The KTMPO boundaries are served by two "class 1" railroad companies located in Temple. Burlington Northern and Santa Fe (BNSF) and Union Pacific (UP) are the predominant railroad freight carriers for the area. The City of Temple was founded in 1881 by the Gulf, Colorado and Santa Fe Railway Company. Santa Fe needed a town at a major junction point to provide services for railroad equipment and passengers. Because of this need, a city was developed. Temple hails its name from Mr. Bernard Moore Temple, a chief engineer who built the tracks for the Gulf Colorado and Santa Fe Railway in the Temple area. From its humble beginnings, Temple has played an important role in supporting the railroads operational needs and continues to operate as a major junction point.

The Temple rail yard performs rail car switching, locomotive fueling and is a strategic point for crew changes. Currently, there is a short-line railroad operation that is providing switching services to specific industries. There are approximately 10 miles of specific industry rail service in the Temple Central Pointe business park.

There is no intermodal facility in the KTMPO region, and the nearest intermodal ramps are in Dallas-Fort Worth. Containerized cargo must be offloaded or loaded in Dallas. Interactions with the railroads suggest that the Class 1 companies envision Central Texas as an untapped resource for shipping/receiving cargo. With the continued growth of Central Texas manufacturing industries and oilfield needs, Central Texas is prime for expansion to bulkhead/intermodal services. Bulkhead services are critical in the future to ease the congestion within the KTMPO boundaries.

As with the city of Temple, most of the towns and cities within the KTMPO region have a rich rail history. The present-day largest city, Killeen, was developed by the Santa Fe Railway in 1881. The initial 70 block town was named after the assistant general manager of the Santa Fe, Frank P. Killeen. From its beginnings as a regional source of shipping farm goods, Killeen has grown exponentially due to the military locating at Camp Hood (currently recommissioned as Fort Hood). Fort Hood utilizes the rail for deployments of equipment and supplies out of two ports – Corpus Christi and Beaumont.

Farming continues to be served regionally by the use of one grain elevator within the region. The City of Rogers grain elevator has a track capacity of 54 cars and 815,000 bushels. Local farmers utilize this facility for rail shipments of their grain crops.

AMTRAK

AMTRAK provides passenger train service from the historic Temple train depot. Daily AMTRAK Texas Eagle service is provided from San Antonio to Fort Worth. From Fort Worth passengers can choose to travel to Oklahoma City or Chicago. The Temple AMTRAK station has increased ridership by 5.6% from 2016 to 2017. Total ridership in 2017 was 16,461.

High-Speed Passenger Rail Studies

The need for passenger rail service is growing. As a result of the increased demand, special studies are underway for high speed rail service by the Texas Department of Transportation—one of which is from Oklahoma City to the border of Texas.

TxDOT began public comment in 2013 on the Texas-Oklahoma Rail Study that stretches over 850 miles from Oklahoma City to Brownsville. Public input meetings were held across the state in January and February 2014. The study concluded in November 2017 after the completion of a service-level environmental impact statement (EIS) and a service development plan. Both of these reports document how passenger rail could serve Texas communities and the benefits and impacts of different passenger rail choices.

KTMPO is providing support for a high-speed rail feasibility study that would utilize high-speed trains connecting Dallas, Arlington and Fort Worth — and eventually Waco, Austin, Laredo.

High speed rail could play a significant and immediate role in providing an alternative mode of travel for the Central Texas region. Local transit service is in place throughout the Killeen-Temple region and offers a connection to this future transportation service.

Freight Shuttle System (FSS)

The Texas Transportation Institute has developed a freight transportation system referred to as the Freight Shuttle System (FSS). The FSS transporter system would utilize current I35 right of way, specifically the median. It is a raised transport system that would operate from Dallas to San Antonio. This freight shuttle system would have the capacity to handle 17,000 semi-truck type containers a day thereby relieving I35 of approximately 9,000 semi-trucks traveling on the I35 corridor a day. As reported in the San Antonio Express News, "this proposal bears watching even though it may be years away from construction." The project would be privately financed, operated and maintained. Currently, there is a signed renewable 3-year agreement for "reservation of right-of-way" between TxDOT and Freight Shuttle International. The agreement allows Freight Shuttle International lease rights along I35 from Dallas to San Antonio for a Freight Shuttle System.

MOTOR COACH

Passenger service is readily available with two companies—Arrow Trailways and Greyhound Lines Inc. There are two bus depots in the KTMPO area, with one located in Killeen and one in Temple. AMTRAK has partnered with the local motor coach services coordinating daily service from Killeen to the Temple AMTRAK depot. Motor coach services are very flexible with schedules that accommodate most larger cities within the United States. There is also international service available to Canada and Mexico. Local transit service is in place and offering connecting transportation service throughout the Killeen-Temple region.

TRUCKING

Trucking is the predominant freight mover for the Central Texas area. Freight passes through daily on the Interstate 35 corridor for points south to Mexico and north to Canada. Further, Central Texas is a connector to the West Texas oilfields via US Highway 190 and State Highway 36. Transportation systems are continuing to be upgraded throughout Central Texas to better accommodate the needs of the trucking community. These upgrades include a 4 to 8 lane expansion on IH 35 from Salado to Troy.

In addition to the "through traffic", Central Texas moves freight by truck for nationally known distributors such as McLane Food Services, Wilson Art International plastic laminate products, ACER computer products, Wal-Mart Distribution Services and H-E-B Distribution products. There are many other companies that provide goods to market throughout the country that are manufactured and trucked from Central Texas. The list of products shipped from Central Texas is extensive.

Based on the City of Temple logistics study there is an expectation of strong growth in shipping plastics, machinery, chemicals, food and alcoholic beverages by 2040 in the Central Texas region. These forecasts also suggest a trend that Mexico will be sending heavy quantities of higher value industrial input products for U.S. manufacturing and finished consumer goods. As stated in the introduction, exports within a 50-mile radius are expected to grow by 42% to 185 million tons.

The Interstate 35 corridor future growth challenges are being addressed through significant expansion and commitment. The Central Texas region expects significant increase with both east to west corridors (US 190, SH 36). Continued support of West Texas oil field operations could have significant impact on these roadways in the near future. Basic infrastructure challenges such as the lack of housing in West Texas is causing oil field support companies to locate manufacturing operations in Central Texas. These factors may increase the truck traffic on the East/West connectors and it is expected to continue rapid growth.

AIR

Killeen-Fort Hood Regional Airport

The Killeen-Fort Hood Regional Airport (K-FHRA), located along SH 201, opened in August of 2004. Prior to September 11, 2001, Killeen had outgrown facilities at their municipal airport, Skylark Field. Local support for a new airport was received from 17 different communities within the KTMPO region. More than 60 parcels of land, as well as Fort Hood property, were needed for five miles of roadway (SH 201) that would service the new facility. City officials worked with the US Army and formed a Joint Management Board (JMB). Through the efforts of the Joint Management Board, Federal Highway Administration and the Texas Department of Transportation, all right of way requirements for the State Highway 201 roadway were obtained in less than a year. State Highway 201 construction is complete and servicing Texas A&M – Central Texas as well as the K-FHRA.

K-FHRA is an enterprise fund commercial-service airport, owned by the City of Killeen. Aviation Pros.com touts the Killeen-Fort Hood Regional Airport as a successful "Joint-Use" project. The Joint Management Board created a series of Joint Operating Plans. As a result, in exchange for land use, the city is responsible for runway maintenance and landscape maintenance. The US Army provides rescue and firefighting services for civilian aircraft in exchange for firefighting services by the city for selected military housing.

During the planning phase of the airport project, the tragedy of terrorism/September 11, 2001 attacks occurred. Due to the apparent necessity for airline security, a number of the site plans were abandoned. The JMB worked with Transportation Security Administration/Federal Aviation Administration and planned the very first US airport terminal to be built after 9/11. The new K-FHRA incorporated security features that are present in today's airports.

The airport leases space to approximately 15 business tenants including airline operators, rental car companies, parking lot, restaurant, bar, gift shop, arcade and other miscellaneous vendors. The Perryman Group (PG) was hired by the City of Killeen to do an Economic Impact Study prior to the start of the project. The PG study forecasted the creation of over 800 new jobs and $2.8 billion added to the local economy. In 2011 the Perryman Group reported the economic impact was much greater due to higher population growth than anticipated. The PG report stated the economic impact in 5 years was in fact 4.4 billion. The airport's direct economic output is approximately $50 million annually.

The K-FHRA facility has accommodated Air Force One and an extensively modified Boeing 747 carrying the Space Shuttle over the years on many occasions. These facilities are equipped to land any aircraft in the world. There are two 6,000-foot taxiways and a runway that measures 10,000 by 200 feet. The airport terminal has expanded from the initial 10,000 feet of interior space due to growth of airline enplanements. Overall, the K-FHRA is located on an 85-acre tract. Other facilities on this tract include Rental Car parking lot, customer parking, an airport maintenance building, and a 45,000 square foot aircraft parking apron. Airport staff operates an aviation/rental car fuel business for additional revenues. Aviation fuel is available for airlines and corporate accounts.

K-FHRA has commercial airline operations through 2 carriers: American and United Airlines. Multiple daily flights are available via regional jets and turbo prop service to Dallas-Fort Worth, and Houston. Local transit service is in place and offering connecting service transportation throughout the Killeen-Temple region.

The Regional Airport completed a comprehensive and complex security upgrade project in 2014 and will undertook significant taxiway and terminal ramp rehabilitation improvements in 2015. Future plans include parking lot improvements, rental car facility improvements, and corporate aviation facility improvements. Skylark Field, Killeen's general aviation airport, embarked on an Aviation Master Plan that was completed in 2015.

Skylark Field (Airport)

The existing 180-acre Killeen Municipal Airport remains open after airline service was moved to the Killeen-Fort Hood Regional Airport facility. As a result of the transition, Killeen Municipal Airport was renamed Skylark Field. Skylark Field serves Genesis Aero Flight Academy, Phil Air Medical Air Ambulance Service and the Central Texas College Flight School. Additional operations consist of general aviation and corporate aircraft. The City of Killeen owns and operates Skylark Field.

The terminal is open during normal business hours (8-5) and offers full-service jet fuel services. Skylark personnel accommodate some after-hours services and a 24 hour per day self-serve jet refueling station. The Skylark Field runway measures 5,495 x 100 feet. Future plans include commercial land use development, addition of hangars, expansion of the general aviation line-of-business, fixed-base operator improvements, and the addition of pilot/aircraft common-use facilities.

Draughon-Miller Central Texas Regional Airport

Draughon-Miller Central Texas Regional Airport is a modern, award winning aviation facility operated by the City of Temple. Draughon-Miller is a general aviation airport that is certified for air carrier operations. Draughon-Miller also offers a number of services provided by experienced staff as well as contractual agreements to include Airframe Maintenance, Service/Repair, Piston Engine Overhauls, Line Service, Avionics, Flight Training, Pilot Training, and Rental.

Draughon-Miller received the 2008 General Aviation Airport of the Year award at the 2008 Annual Texas Aviation Conference. This award was received due to the airport's efforts to better serve the military. The airport funded an effort to complete a 50,000-square foot hangar facility to enhance the operations of the U.S. Army Aviation and Missile Command operation providing over 200 highly skilled jobs to the City of Temple. In addition to this award, Draughon-Miller has been named one of the best general aviation facilities in the nation in Exxon/Mobil's network of fixed base operators (FBO). The Exxon/Mobile "Premier Spirit Gold Winner" classification reassures the aviation community that they are receiving the highest level of fuel quality and customer service. Winners of this award represent the top 15 percent of Exxon/Mobil's Aviation-branded FBOs in the United States who participated in Premier Spirit.

The airport has completed multiple expansions and improvements to benefit the Central Texas region including: T-hangar taxiway improvements, taxiway/runway improvements, terminal expansion, and renovation. The Draughon-Miller Central Texas Regional Airport continues to play a vital role in the Central Texas area economy and culture.

In November 2012 the airport received a lease agreement for transient parking services. There are several aircraft from single engine to large multi-million-dollar jets landing at the airport conducting business in the Central Texas area every day. For those staying overnight, Draughon-Miller offers a 7,590-square foot hangar to protect their investment.

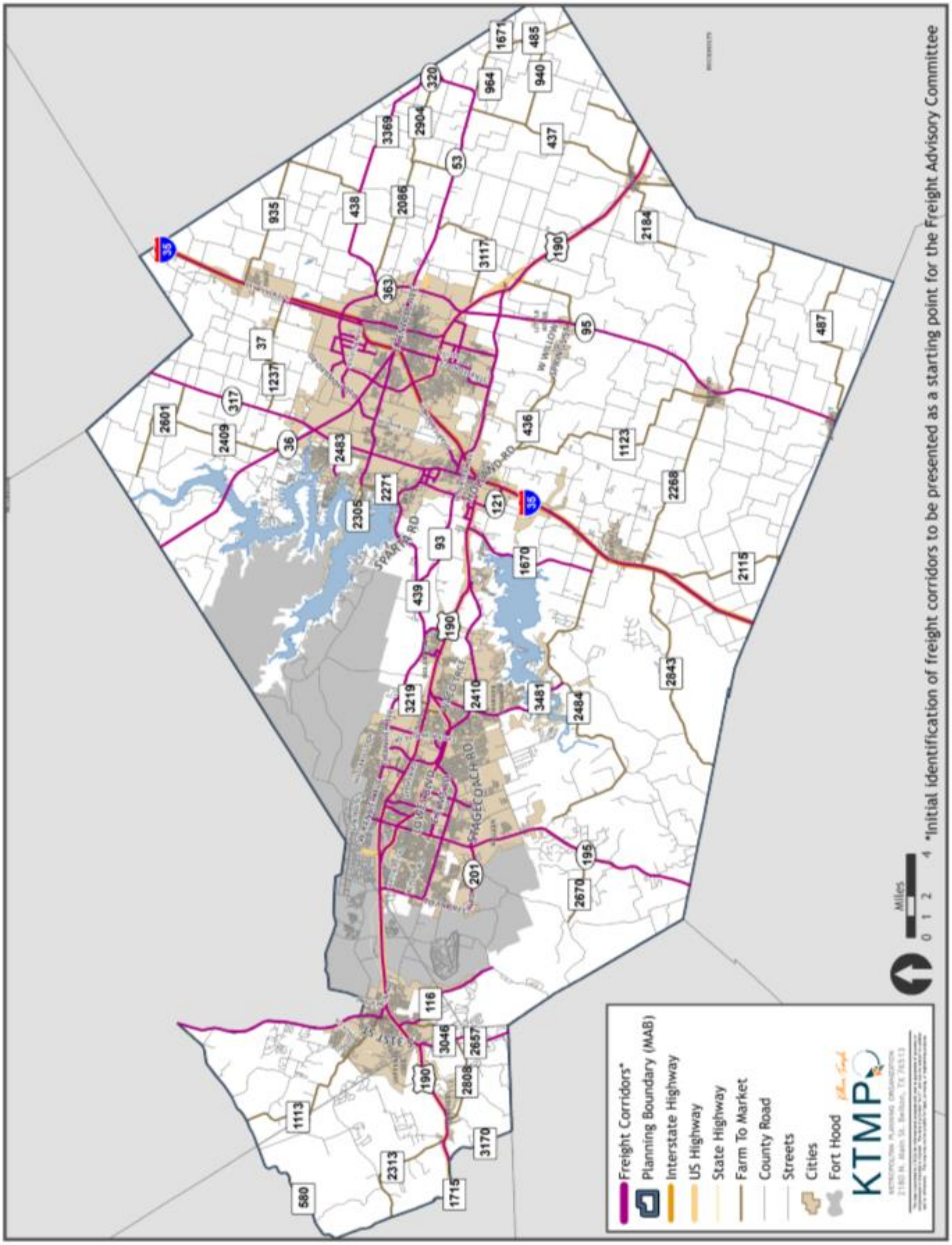
Draughon Miller began as an Army airfield in 1942 and has grown to a total of 1022 acres with runway 15/33 measuring 7,000 feet by 150 feet and runway 2/20 measuring 4,740 feet by 100 feet. For the 12-month period ending February 29, 2016, the airport had 48,276 to 53,798 aircraft operations, an average of 132 per day to 147 per day: 85% general aviation and 15% military. Draughon Miller has been owned by the City of Temple since the closure of World War II. There is no future expectation of freight operations for this facility.

NEXT STEPS

In the last two years, KTMPO staff have been in contact with TxDOT, FHWA, economic developers, construction material haulers, manufacturing managers, military representatives, airport and motor coach facilities and other freight industries in an effort to establish a Freight Advisory Committee. The first KTMPO Freight Advisory Committee (FAC) Meeting was held on May 17, 2017 and has continued quarterly since. The FAC has initiated two tasks of identifying and adopting a regional freight corridor map and conducting a freight parking study. Meeting discussions include identifying freight needs and improvements, freight focused presentations, and other freight discussion items. The needs of the freight community are communicated through the FAC to the KTMPO Technical Advisory Committee and the Transportation Planning Policy Board.

The identification of future expansions and descriptions of the trucking, rail and air industry facilities have been discussed in this chapter. KTMPO staff will continue coordination efforts with company leadership/economic development directors regarding plans to expand facilities to accommodate projected growth in the KTMPO region.

Exhibit 7.1: Freight Corridors



chapter 8

Safety & Security

The Killeen-Temple Metropolitan Planning Organization has a goal to improve the safety of all modes of transportation in the region, which confirms that **maintaining the well-being of the KTMPO public as they travel throughout the region is a priority**. Safety and security programs provide data and insight on areas of concern and offer proactive and reactive ways to ensure the safety of the transportation users.

According to the Federal Highway Administration's Code of Federal Regulations regarding the development and content of the metropolitan transportation plan:

The metropolitan transportation plan should include a safety element that incorporates or summarizes the priorities, goals, countermeasures, or projects for the MPA contained in the Strategic Highway Safety Plan required under 23 U.S.C. 148, as well as (as appropriate) emergency relief and disaster preparedness plans and strategies and policies that support homeland security (as appropriate) and safeguard the personal security of all motorized and non-motorized users.

Code of Federal Regulations, Highways, Title 23, sec. 450.322.

The information obtained by safety and security programs should be implemented into every project planning effort and considered during every phase of the process. The awareness of safety issues and security plans that are unique to the Killeen-Temple region will better inform both the decision makers and public in future efforts to maintain the well-being of its citizens.

SAFETY

The Highway Safety Improvement Program (HSIP), established by SAFETEA-LU in 2005, focuses on reducing traffic fatalities and serious injuries on all public roads. As a major piece of the HSIP, SAFETEA-LU requires all state DOTs to develop a Strategic Highway Safety Plan (SHSP) to identify state safety issues and needs and to guide planning decisions. TxDOT's initial Strategic Highway Safety Plan, approved in 2006, details the crash data analysis, stakeholder surveys, and workshops of safety professionals that were used to assist TxDOT in the identification of special highway safety emphasis areas. The passage of the Moving Ahead for Progress in the 21st Century Act (MAP-21) in 2012 reaffirmed commitment to the national safety program. MAP -21 strengthens the SHSP while the FAST Act continues to build upon safety requirements. Since then, the 2017-2022 Texas Strategic Highway Safety Plan serves as the current publication. The Texas Strategic Highway Safety Plan is structured around seven emphasis areas to include distracted driving, impaired driving, intersection safety, older road users, pedestrian safety, roadway and lane departures, and speeding. The plan focuses on each of these areas and provide

KTMPO utilizes the Texas SHSP as a guidebook in the safety analysis of its regional infrastructure. The roadway safety emphasis areas help staff focus analysis on particular crash types and locations, system users, user behaviors, and system administration.

Current Safety Conditions

KTMPO uses crash data from the Crash Records Information System (CRIS) database, which is maintained by TxDOT. These data come directly from the CR-3 crash reports that are completed at the time of the incident by local law enforcement for all reported motor vehicle crashes. For the Killeen-Temple MSA, there were 6,256 serious accidents (Fatality, Incapacitating Injury, Non-incapacitating Injury), 1186 incapacitating injury accidents, and 249 fatal accidents from 2012-2016. Exhibit 8.1 and Exhibit 8.2 details the total number of fatalities and serious injuries resulting in crashes.

Exhibit 8.1: Number of Fatal Crashes from 2012-2016

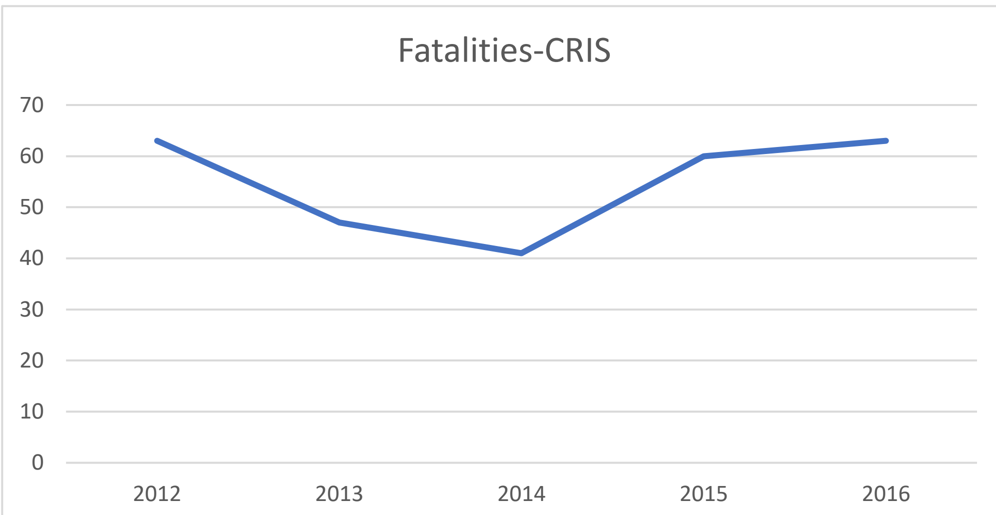
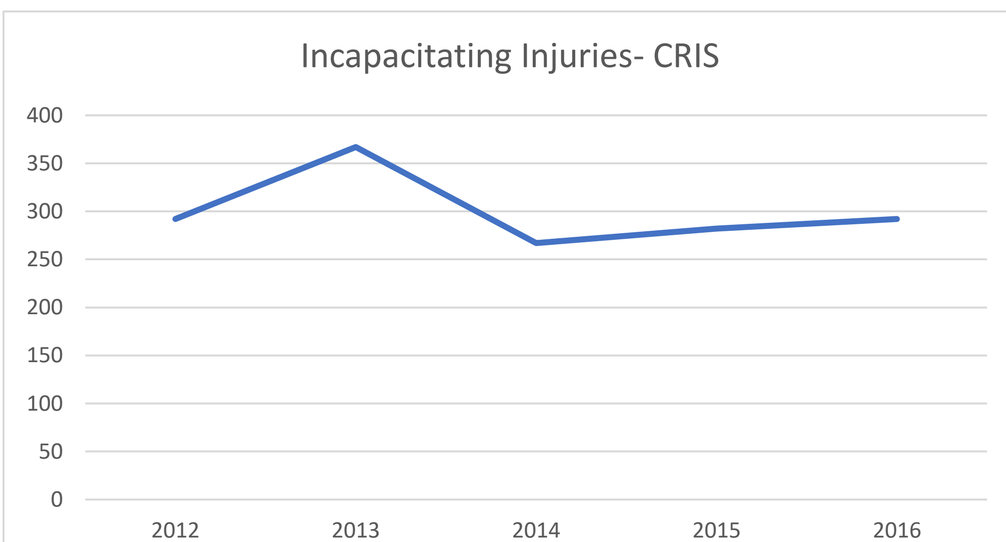


Exhibit 8.2: Number of Incapacitating Injury Crashes from 2012-2016



The knowledge of the geographic location of a crash is the first step in determining the safety issue at hand. Staff has used the CRIS data to create heat maps showing the concentration of crashes in the region at intersections and along road segments as shown in Exhibits 8.3-8.7. Further crash rate analysis was completed for intersections and segments with high crash numbers.

Some recommendations may be made to reduce the recurrence of crashes at particular locations, such as:

- Upgrades to existing transportation infrastructure
- Modification or implementation of safety infrastructure
- Creation of alternative routes to alleviate congestion
- Public campaigns promoting a particular safety issue
- Requirement of the use of motorcycle and bicycle safety gear
- An assessment of the transportation network to determine driver decisions

Another key element to improve safety is identifying and understanding the root causes of crashes. Knowing what caused crashes to occur can help planners and engineers determine if roadway and/or human factors need to be addressed.

The improvement of transportation safety is an ongoing process that requires collaboration with all transportation decision makers in the KTMPO region. Continuing efforts will assist this process as new issues are discovered or updated data can be obtained to inform new decisions. A large part of safety on the roads involves the attention and attitude of the transportation users. Successful safety programs also incorporate a public education element to help the KTMPO public make informed decisions in its driving behavior. KTMPO will continue to push information from national and state safety organizations and keep the public aware of safety issues in our region via online social media methods and in line with the public involvement process.

Exhibit 8.3: Fatality Crash Hotspot Map

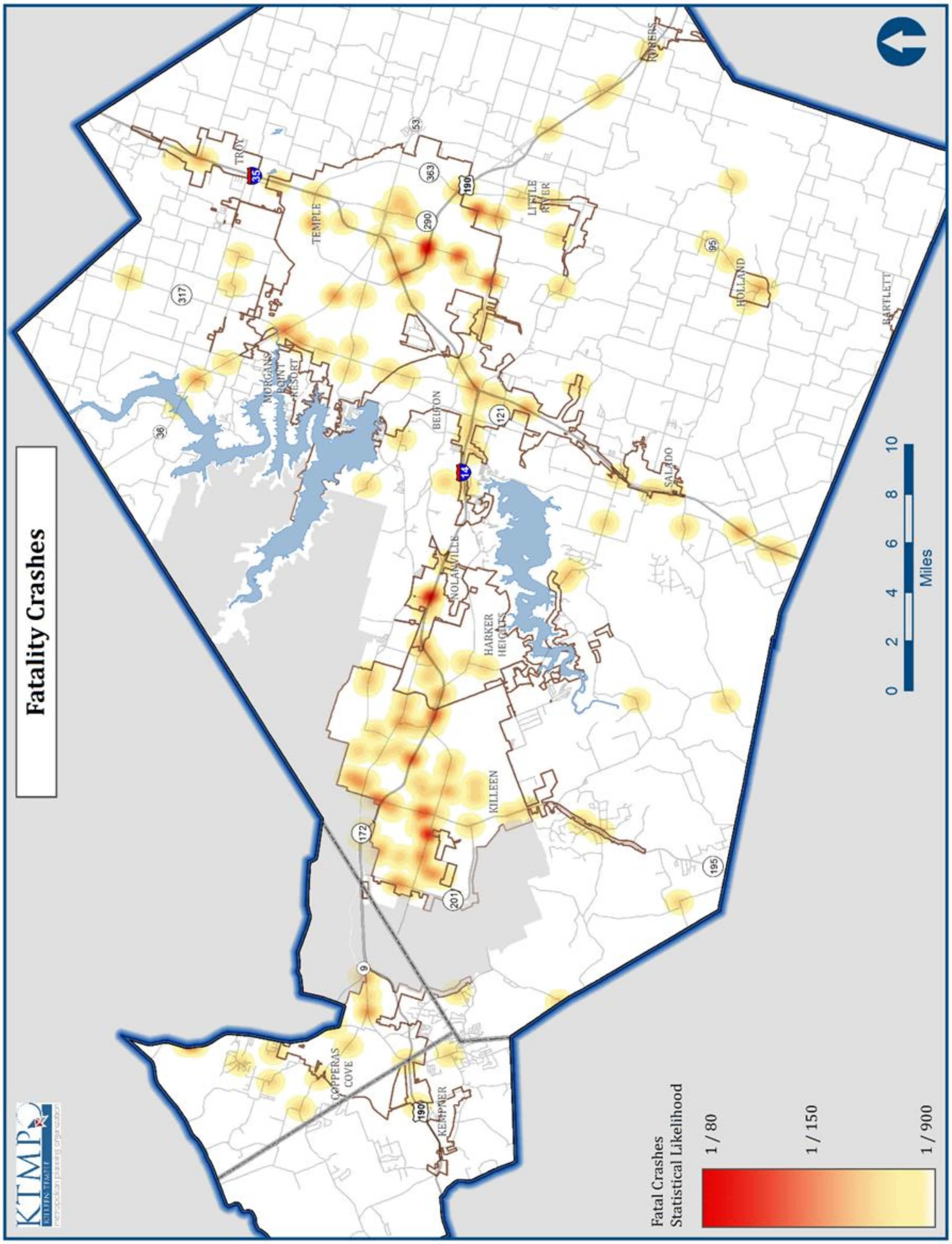


Exhibit 8.4: Fatal and Injury Crashes Hotspot Map

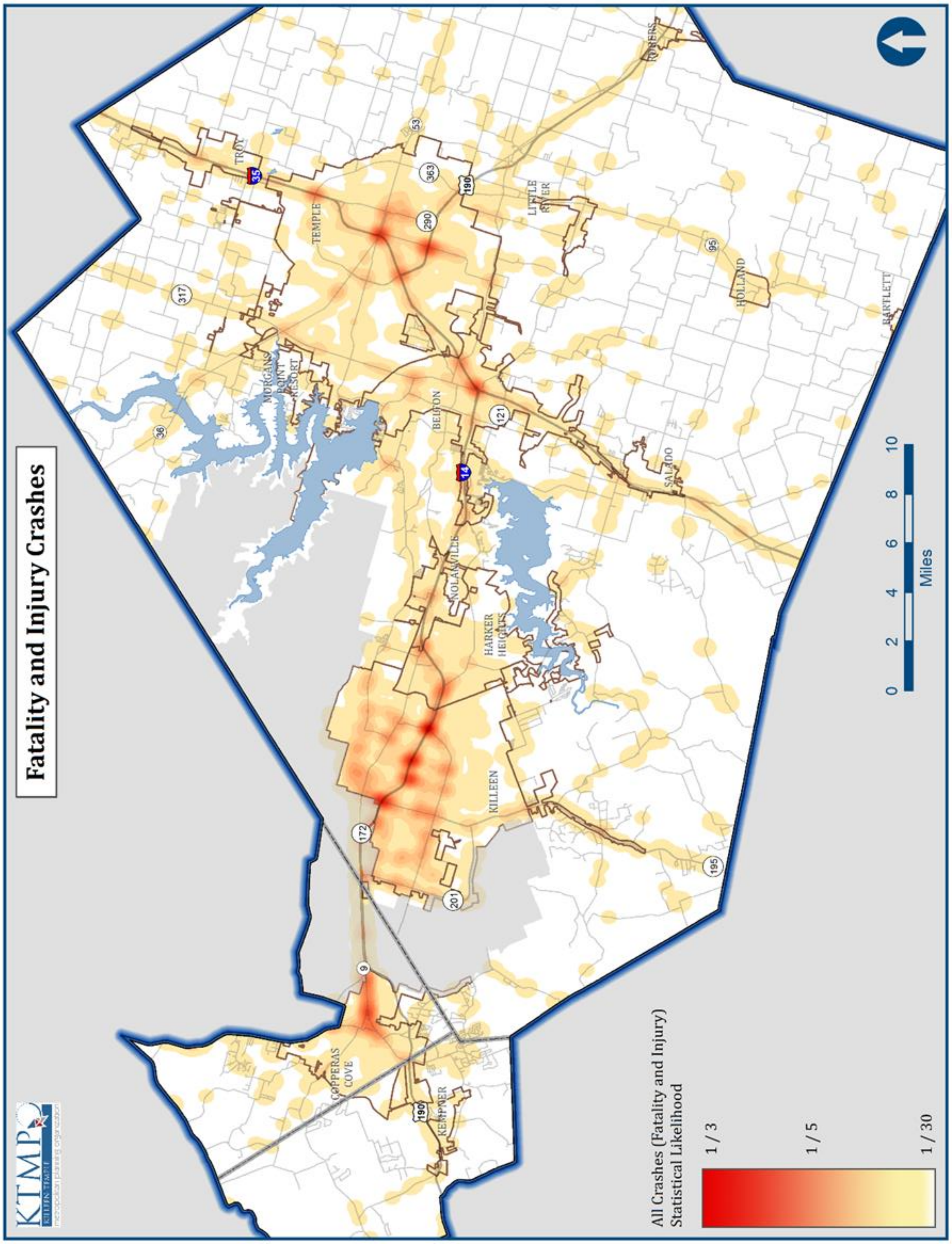


Exhibit 8.5: Distracted Driving Crashes Hotpot Map

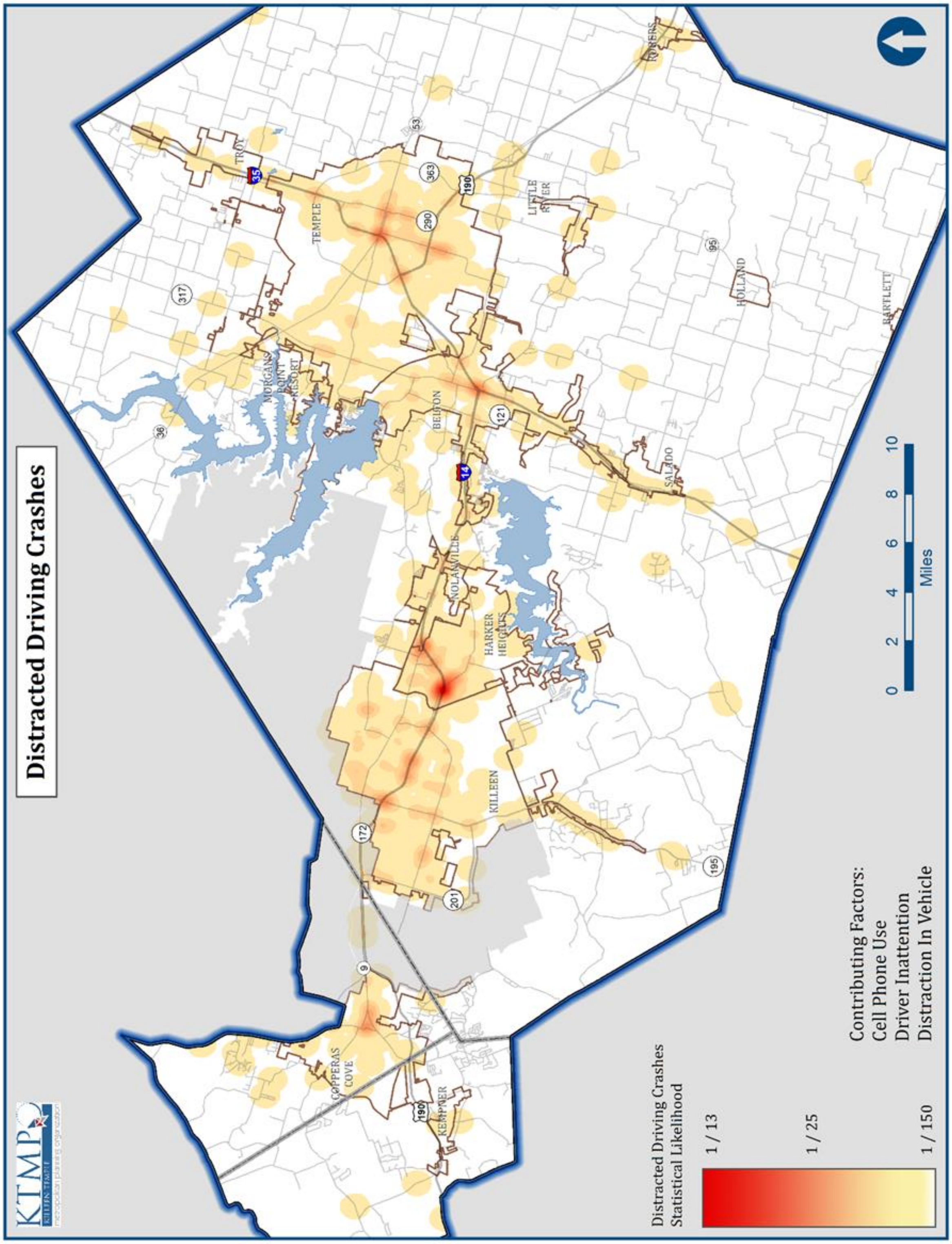


Exhibit 8.6: Impaired Driver Crashes Hotpot Map

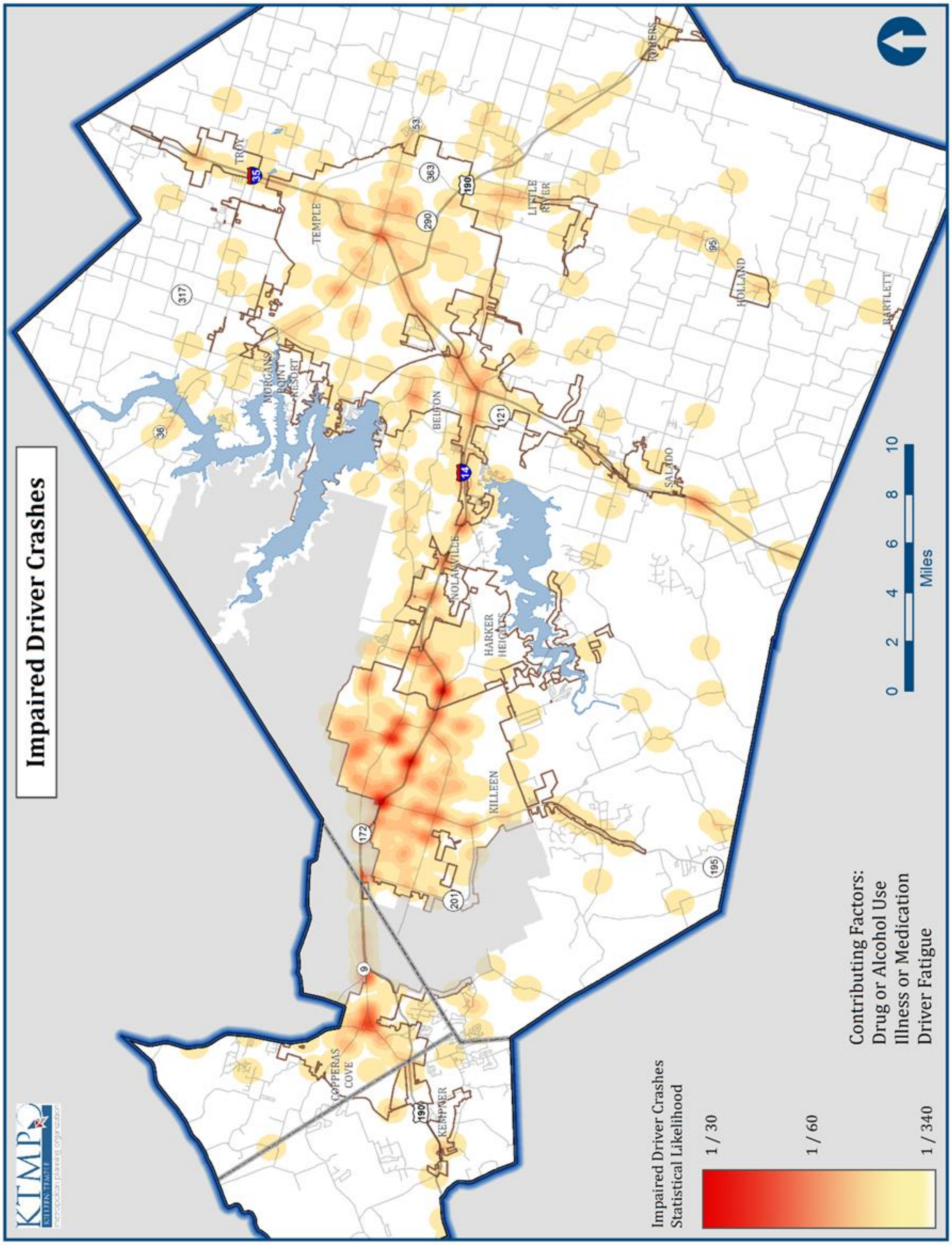
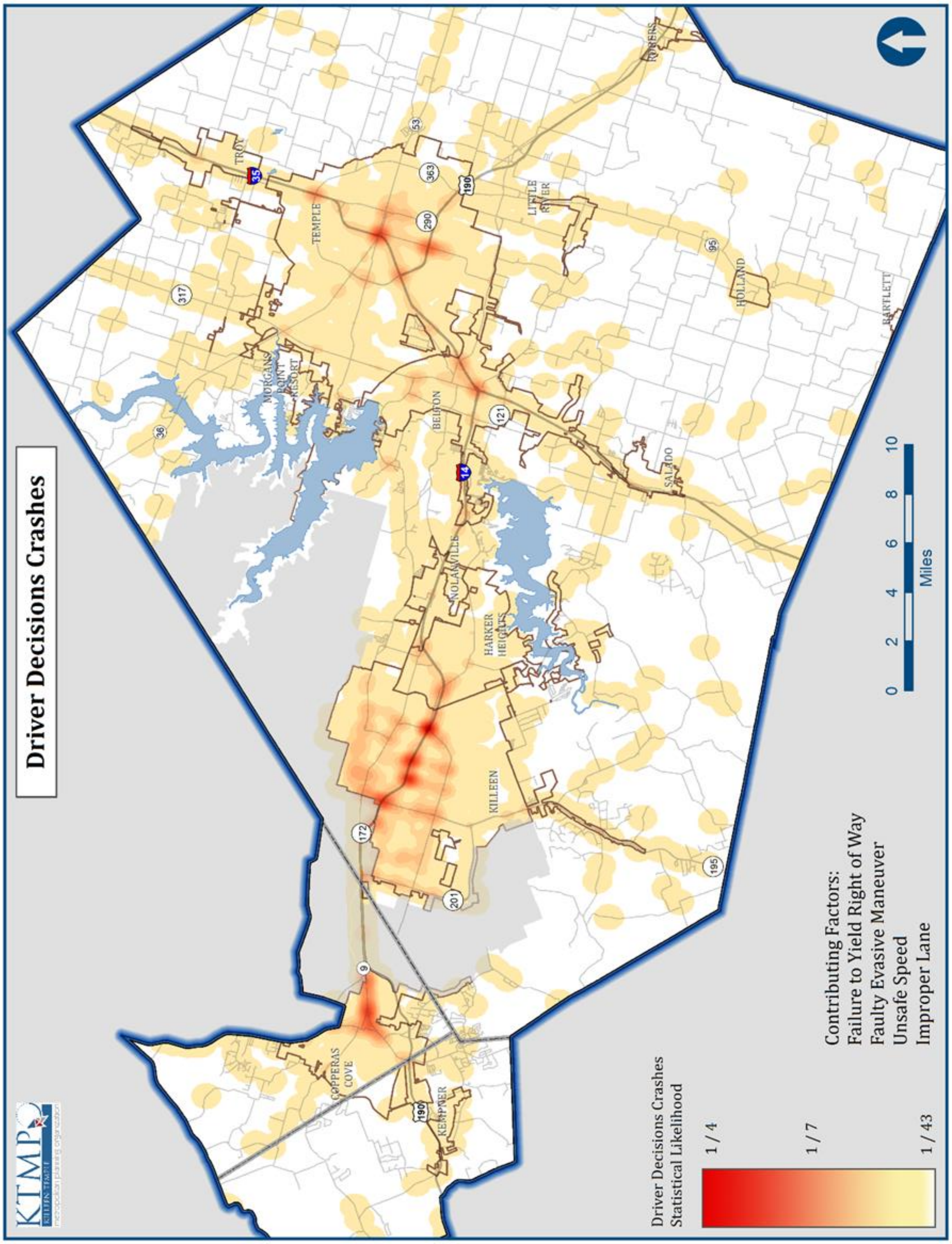


Exhibit 8.7: Driver Decisions Crashes Hotpot Map



SAFETY PERFORMANCE MEASURES:

The FAST Act builds upon the MPOs requirement to establish safety performance measures. This requirement required MPOs to establish their own safety performance measures or support performance measures established by the State. The target is to achieve a 2% reduction from the original trend line projection in 2022 for total number of traffic fatalities, total number of incapacitating injuries, death rate, injury rate, and total number of non-motorized fatalities and serious injuries. KTMPO staff used CRIS data to produce heat maps to further evaluate whether KTMPO sets their own performance measures or support the performance measures established by the State.

Looking at the crash data, KTMPO decided to support the safety performance measures established by the Texas Department of Transportation. By supporting the State's safety targets, KTMPO plans on doing the following:

- Work with the state and safety stakeholders to address areas of concern for fatalities or serious injuries within the MPO planning area; Coordinate with the state and include in the Metropolitan Transportation Plan (MTP) the safety performance measures and targets for all public roads in the metropolitan area;
- Integrate into the planning process the safety goals, objectives, performance measures and targets described in other state safety transportation plans and processes such as applicable portions of the Highway Safety Implementation Plan (HSIP);
- Include a description in the Transportation Improvement Program (TIP) of the anticipated effect of the TIP toward achieving HSIP targets in the MTP, linking investment priorities in the TIP to those safety targets.
- Use data to identify areas that have shown a concentration of accidents and continue to use crash rates as one of our scoring criteria to select projects that support the statewide goals.
- Use this information as part of our public outreach efforts to educate drivers about ways they can drive more safely and reduce accidents.

Some recommendations may be made to reduce the recurrence of crashes at particular locations, such as:

- Upgrades to existing transportation infrastructure
- Modification or implementation of safety infrastructure
- Creation of alternative routes to alleviate congestion

- Public campaigns promoting a particular safety issue
- Requirement of the use of motorcycle and bicycle safety gear
- An assessment of the transportation network to determine driver decisions

The improvement of transportation safety is an ongoing process that requires collaboration with all transportation decision makers in the KTMPO region. Continuing efforts will assist this process as new issues are discovered or updated data can be obtained to inform new decisions.

A large part of safety on the roads involves the attention and attitude of the transportation users. Successful safety programs also incorporate a public education element to help the KTMPO public make informed decisions in its driving behavior. KTMPO will continue to push information from national and state safety organizations and keep the public aware of safety issues in our region via online social media methods and in line with the public involvement process.

SECURITY

The transportation system is vital however disasters or attacks can affect the vitality of the system due to its large spread and accessibility. Effective management is important for the system's preparedness and ability to respond and recover from an event in order to maintain the well-being of the transportation system users.

Coordination Efforts

Security planning starts at the local, municipality level, and progresses up to the state, and eventually, federal level. Coordination amongst the cities, neighboring counties, and the state must occur because the geographic extent of a disaster cannot be predicted. KTMPO works closely with the Homeland Security division of the Central Texas Council of Governments (CTCOG) to increase awareness of the transportation system's role in the security of the region's citizens. CTCOG's Homeland Security division works with the Emergency Management Coordinators of all counties of the CTCOG region and serves as a central clearinghouse for the emergency and evacuation plans of each county. At the MPO level, the information from these plans allows transportation planners to assess the ability of the system to respond to an event as the plan details. The following routes are considered the major evacuation routes of the KTMPO region: **IH 35, US 190, US 190/SH 36, SH 95, FM 93, and FM 2268**. Bell County's plan, specifically Annex E, details potential evacuation areas with hazardous material locations and evacuation routes as shown below in Exhibit 8.8.

Flood Monitoring

The KTMPO region is susceptible to flooding. When heavy rainstorms occur, flooded roadways can cause which creates an ineffective way to transport goods, services, and people. Due to the flooding, monitoring was recently enhanced in flood prone areas to gauge water levels, providing advanced notice for thoroughfare closure and evacuation. In the MPO area, USGS has established 11 monitors, which are described below:

- Belton Lake Near Belton Dam;
- Leon River North of FM 817 (Charter Oak Drive);
- Nolan Creek at South Penelope St;
- Lampasas River at SH 195;
- Stillhouse Hollow Lake Near Dam;
- Chalk Ridge Falls Park;
- Lampasas River at IH-35;
- Salado Creek East of FM 2268 (Main St.);
- Little River at SH 95;
- North Elm Creek at FM 485;
- Lampasas River at US 190.

Additional locations in the rural areas are currently utilized by emergency responders and planners involved in flood mitigation.

Scenario Planning

CTCOG's Homeland Security division have outlined a Threat and Hazard Identification and Risk Assessment to estimate the impact to people and infrastructure in the event of natural and/or man-made disasters. An analysis was performed to predict the people involved, infrastructure damage, and roadways affected. The assessments outline the description, impacts, and desired outcome. The various scenarios that were looked at include the following:

- Severe flooding of Nolan Creek;
- A strong tornado hitting the Killeen urbanized area;
- A train derailment that causes HAZMAT materials to leak in Lampasas County;
- An active shooter situation on Ft. Hood and at Metroplex Hospital;
- Wildfires across Coryell County and Ft. Hood.

For the Critical Transportation Core Capability, the description is to prove transportation (including infrastructure access and accessible transportation services) for response priority objectives, including the evacuation of people and animals, and the delivery of vital response personnel, equipment, and services into the affected areas. The desired outcome is to have an active response within 6 hours of the incident. By having a response to potential disasters can minimize impacts on the transportation system.

Fort Hood

Fort Hood makes a concerted effort to ensure the safety and security of the military community, both on-post and in the surrounding area. They employ various levels of Force Protection conditions, and in the most threatening emergencies they will elect to seal the facility from all traffic, in or out. This notification is pushed out to local law enforcement and other emergency communications outlets. KTMPO is willing to assist in public messaging to inform local motorists when such a lockdown takes place, in order to prevent excessive congestion that may form at the Access Control Points from backing up onto local streets and highways.

Exhibit 8.8: Potential Evacuation Areas (Hazardous Materials)

ID	Name	Description	Hazard	Estimated Population	Evacuation Routes	Estimated Evacuation Time
E-1	Holland	Best Butane Company, 100 Fannin St.	Butane	500 Homes, 1100 People	Hwy 95, FM 2268 (other routes to be selected based on wind conditions)	3 hours
E-2	Heidenheimer	Blue Bonnet Grain and Storage	Numerous fertilizer chemicals	100 Homes, 950 people	Hwy 36, FM 93 (other routes to be selected based on wind conditions)	3 hours
E-3	Temple, Troy, Belton, Nolanville, Harker Heights, Killeen	BNSF Railroad, cross county railroad system	Transportation of multi-hazard chemicals	will vary by location	To be selected based on wind conditions	5 hours
E-4	Brazos Cooperative	Fertilizer	Farm chemicals	will vary due to wind direction	FM 817 & River Road	4 hours
E-5	Belton	Brazos River Authority, 2406 E 6th, Waste Treatment Plant	Chlorine	7000 homes 14,600 people	E. 6th, IH 35 South, IH 35 North	6 hours
E-6	Holland	Chemical Supply Co., 901 Lexington	Chlorine, Calcium Hypochlorite	100 homes, 950 people	Hwy 95 (other routes to be determined at time of evacuation)	5 hours
E-7	Pendleton	Lone Star Gas Co., Bell County Pipeline Distributor	Natural and other gases	Number will be determined by location and wind direction	Refer to company pipeline maps	TBD
E-8	Pendleton	Pendleton Agri. Supply	Agri chemicals	150 Homes, 350 People	IH 35 South and North	4 hours
E-9	Pendleton Water Supply	Pendleton water supply, water distributor	Chlorine	150 Homes, 350 People	IH 35 North and South	TBD

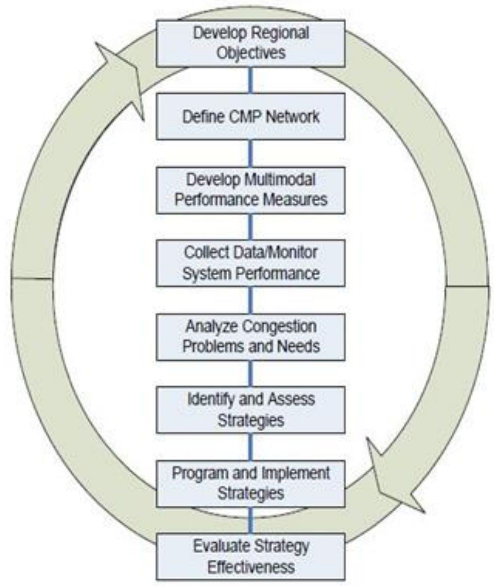
chapter 9

Congestion Management

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. The Congestion Management Process (CMP), as defined in federal regulation, is intended to serve as a systematic process that provides for safe and effective integrated management and operation of the multimodal transportation system.

CONGESTION MANAGEMENT PROCESS

The Congestion Management Process (CMP) enables MPOs and their operating agency partners to measure performance, manage data, and analyze alternative strategies in a systematic manner. The CMP also enables MPOs to base congestion management strategies on defined objectives; this process allows regions to focus on the most congested areas and achieve maximum benefit by targeting their investments.



KTMPO became a TMA in July 2012. As a TMA, KTMPO developed a CMP within 18 months of the TMA designation with assistance from CDM Smith, Inc. in September 2012. In 2016, KTMPO, with assistance from Alliance Transportation Group, updated the CMP. The content of the CMP was based on federal regulation and is modeled after Federal Highway Administration's *Congestion Management Process: A Guidebook* which includes the steps and components listed below.

1. **Develop Regional Objectives** – This step in the process answers the questions: "What is the desired outcome?" and "What do we want to achieve?" It may not be feasible or desirable to try to eliminate all congestion, and so in this step it is important to define the regional objectives for congestion management that are designed to achieve the desired outcome. Some MPOs also define congestion management principles, which shape how congestion is addressed from a policy perspective.

2. **Define Network** - This step in the process involves answering the question, "What components of the transportation system are the focus?" and involves defining both the geographic scope and system elements (e.g., freeways, major arterials, transit routes) that will be analyzed in the CMP.

3. **Develop Performance Measures** – In this step in the process, the CMP addresses the question, "How do we define and measure congestion?" This step involves developing

performance measures to be used to measure congestion on both a regional and local scale. These performance measures should support the regional objectives.

4. **Collect Data/Monitor System Performance** - After performance measures are defined, the next step in the process is to collect and analyze data to determine, "How does the transportation system perform?" Data collection may be on-going and involve a wide range of data sources from various planning partners.

5. **Analyze Congestion Problems and Needs** - Using available data and analysis techniques, in the next step in the process the CMP should address the questions, "What congestion problems are present in the region, or are anticipated?" and "What are the sources of unacceptable congestion?"

6. **Identify and Assess Strategies** - Working together with the MPO's planning partners, in the next step in the process the CMP should address the question, "What strategies are appropriate to mitigate congestion?" This step involves both identifying and assessing potential strategies and may include efforts conducted as part of the development of the Metropolitan Transportation Plan (MTP), corridor studies, or project studies.

7. **Program and Implement Strategies** – This step involves answering the question, "How and when will solutions be implemented?" The step typically involves: including strategies in the MTP; determining funding sources; prioritizing strategies; allocating funding in the TIP; and, ultimately, implementing the strategies.

8. **Monitor Strategy Effectiveness** – This step should assess, "What have we learned about implemented strategies?" This step will be tied closely to monitoring system performance and is designed to inform future decision making about the effectiveness of transportation strategies. From the lessons learned in this step, the process begins again in a continuous process of monitoring and improving congestion management processes within the region.

GOALS AND OBJECTIVES

The objectives define what the MPO wants to achieve regarding the congestion management process and are an essential part of an objectives-driven, performance-based approach to planning for congestion management. These objectives will also serve as one of the primary points of connection and coordination between the CMP and the MTP. The MPO developed goals and objectives for the 2013 CMP based on existing KTMPO planning documents and national best practices. The 2016 CMP Update maintains the same goals and objectives, which guide the actions necessary to maintain a safe efficient and convenient transportation system throughout the KTMPO region. The MPO will continue working to promote projects and policies that support the stated vision, goals, and objectives of this 2016 CMP Update. Goals and objectives can be found in Appendix ___ of the 2045 MTP.

Congestion Data Sources

The KTMPO CMP employs three main quantitative data sets (NPMRDS, INRIX, and KTMPO TDM) and one qualitative data set (Google Traffic) for analysis. Supplementary data sources include crash data (CRIS) and a public survey for further analysis.

Exhibit 9.1: 2016 Survey Response-Worst Congestion Locations

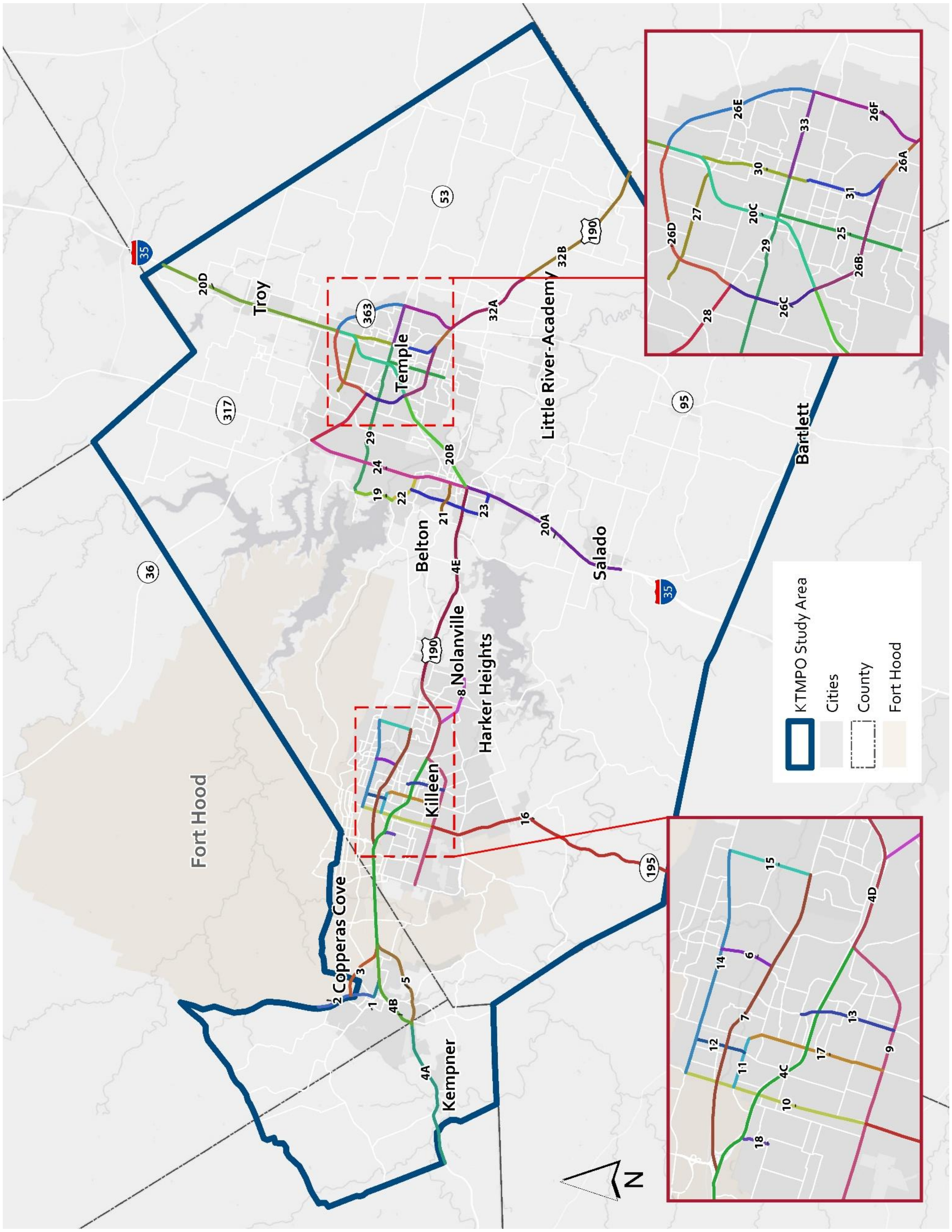
Intersection	Segment
WS Young @ US 190	W. Adams Ave. (Temple)
FM 2410 @ US 190	WS Young Dr. (Killeen)
Trimmier Rd @ US 190	Trimmier Rd. (Killeen)

The public survey was essential in determining the location and other characteristics of region congestion. KTMPO received 222 unique survey responses. The survey revealed that many of the respondents perceived daily congestion to be a significant problem in the region, and mostly caused by roadway construction, inadequate road capacity, or ineffective traffic signals. Respondents also identified locations where congestion was the worst (Exhibit 9.1) and provided information about each respondent's commuting patterns and strategies to avoid congestion.

CONGESTION DATA SOURCES

Defining a CMP Network involves specifying the geographic boundaries and transportation system components that are the basis of analysis and foundation of the congestion management process. Efforts to improve traffic conditions in the region begin on the CMP Network, and the level of congestion on this network serves as a gauge for overall congestion in the region. The updated CMP Network (Exhibit 9.2) reflects the overlapping data coverage from the four congestion datasets mentioned previously, as well as information gathered from the congestion survey.

Exhibit 9.2: 2016 CMP Network



IDENTIFYING PERFORMANCE MEASURES

The Federal CMP requirements do not mandate specific performance measures that must be used during the process. Identifying appropriate congestion performance measures is up to each MPO. Although there are a wide range of performance measures available, it was determined by KTMPO that those selected for this 2016 CMP Update must be understandable, outcome-oriented, and supported by readily available data sources.

The 2013 CMP recommended several performance measures. The 2016 CMP Update evaluated the 213 performance measures to determine whether the old performance measures meet current standards and need for quantifiable measurement. Performance measures used for the 2016 CMP include the following:

Congestion Measures

- Travel Time Index
  - Average Daily
  - Maximum
- Delay
  - Average Daily
  - Peak Period
  - Annual Hours of Delay
- V/C Ratio (Current and Future)
  - Average Daily
  - Peak Period

Supplemental Measures

- Transit Availability
- Crash Rate
- Rear-end Crash Rate

EVALUATION CRITERIA

Through data conflation, evaluation criteria was developed to prioritize congestion hotspots. Each segment of the CMP network was given a congestion score that represents a weighted measure of congestion as determined through the quantitative and qualitative congestion data collected for the network. Other evaluation criteria include traffic volume, safety (crashes and rear-ended crashes), school locations, transit routes, and public need identification. Each of these criteria had different weights as show in Exhibit 9.3.

Exhibit 9.3: 2016 Evaluation Criteria Weighting

Criteria		Weight
Congestion Rank		30%
Volume		20%
Safety	Crashes	15%
	Rear-End Crashes	10%
Transit		15%
School		5%
Public Input		5%
Total		***100%***

These weights were then used to prioritize the congestion hotspots for both highways and arterials. The ranked list of highways and arterials are listed in Exhibit 9.4 and 9.5 respectively.

Exhibit 9.4: 2016 Final Prioritized List of Congestion Hotspots—Highway

Segment ID	Description	Priority Rank
4C	US 190 - SH 9 TO FM 3470/STAN SCHLUETER LOOP	1
4D	US 190 - FM 3470/STAN SCHLUETER LOOP TO BUSINESS 190	2
4E	US 190 - BUSINESS 190 TO IH 35	3
20A	IH 35 - SALADO (FM 2268) TO US 190	4
20C	IH 35 - S LOOP 363 TO N LOOP 363	5
26B	LOOP 363 - SPUR 290 TO IH 35 S	6
20B	IH 35 - US 190 TO S LOOP 363	7
20D	IH 35 - N LOOP 363 TO FALLS COUNTY LINE	8
26C	LOOP 363 - IH 35 S TO SH 36	9
26A	LOOP 363 - US 190 TO SPUR 290	10
16	SH 195 - WILLIAMSON COUNTY LINE TO FM 3470/STAN SCHLUETER LOOP	11
32B	US 190 SE - PRITCHARD RD TO MILAM COUNTY LINE	12
4A	US 190 - FM 1715 TO BUSINESS 190	13
28	SH 36/AIRPORT RD - LOOP 363 TO SH 317	14
32A	US 190 SE - LOOP 363 TO PRITCHARD RD	15
26E	LOOP 363 - IH 35 N TO SH 53	16
26D	LOOP 363 - SH 36 TO IH 35 N	17
26F	LOOP 363 - SH 53 TO US 190	18

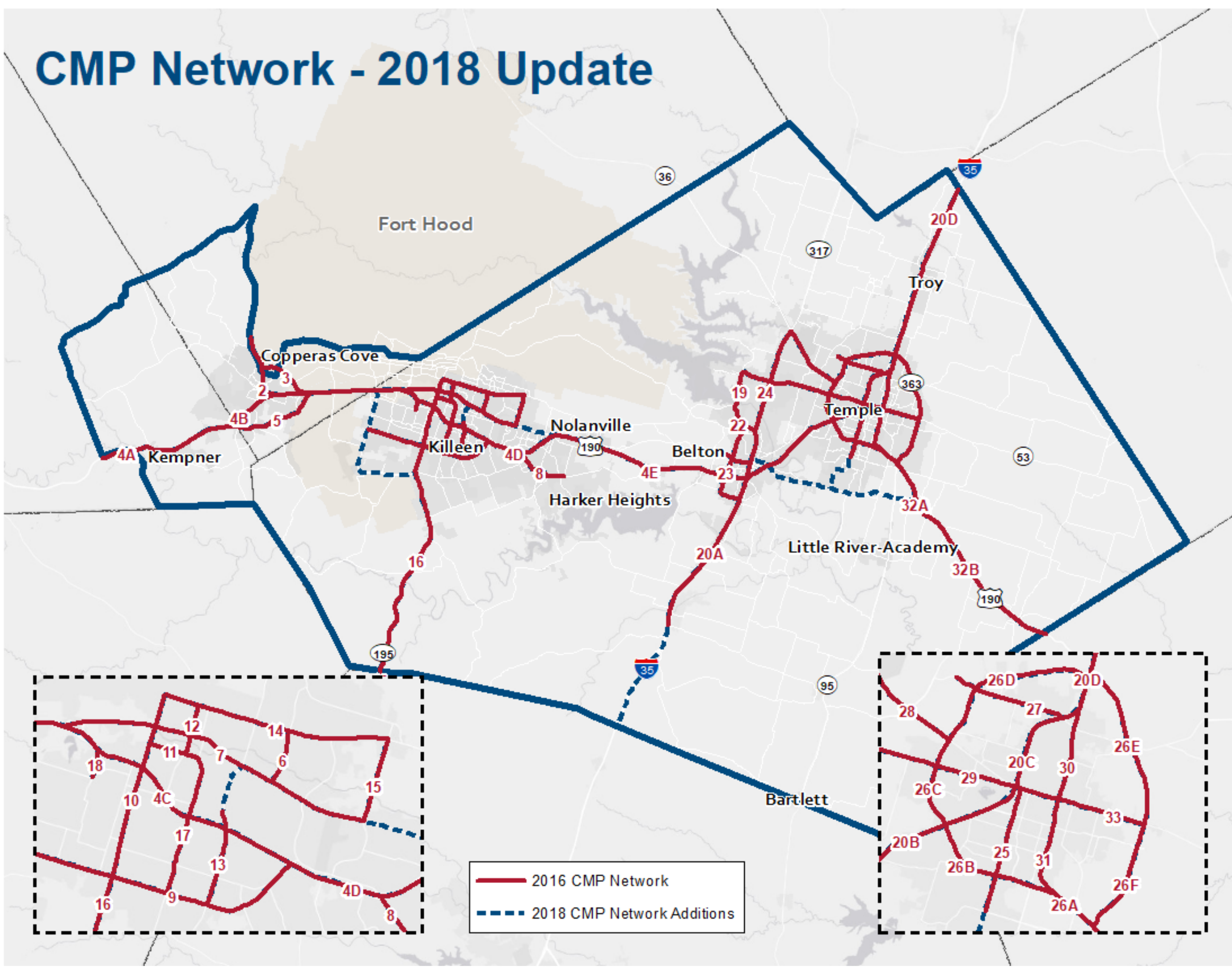
Exhibit 9.5: 2016 Final Prioritized List of Congestion Hotspots—Arterials

Segment ID	Description	Priority Rank
17	TRIMMIER RD - FM 3470/STAN SCHLUETER LOOP TO HALLMARK AVE	1
9	FM 3470/STAN SCHLUETER LOOP - SH 201/CLEAR CREEK RD TO US 190	2
4B	US 190 - US 190 BYPASS W TO US 190 BYPASS E	3
14	RANCIER AVE - FORT HOOD ST TO ROY REYNOLDS DR	4
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	5
24	SH 317 - US 190 TO SH 36	6
7	BUSINESS 190 - US 190 TO ROY REYNOLDS DR	7
23	LOOP 121 - IH 35 TO LAKE RD	8
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	5
13	WS YOUNG DR - ILLINOIS AVE TO FM 3470/STAN SCHLUETER LOOP	9
1	AVE D - N 1ST ST TO BUSINESS 190	10
29	FM 2305/ADAMS AVE - FM 2271 TO 3RD ST	11
8	FM 2410 - US 190 TO WARRIORS PATH	12
25	FM 1741/S 31ST ST - CANYON CREEK DR TO SH 53/ADAMS AVE	13
18	WILLOW SPRINGS RD - US 190 TO WATERCREST RD	14
2	FM 116 - AVE D TO ELIJAH RD	15
22	LAKE RD - FM 2271 TO SH 317	16
31	SPUR 290/S 1ST ST - S LOOP 363 TO AVE E	17
21	FM 93/NOLAN VALLEY RD - WHEAT RD TO SH 317	18
30	SPUR 290/3RD ST - AVE E TO IH 35	19
11	HALLMARK AVE - FORT HOOD ST TO TRIMMIER RD	20
6	38TH ST - BUSINESS 190 TO RANCIER AVE	21
12	N 2ND ST - HALLMARK AVE TO RANCIER AVE	22
27	INDUSTRIAL BLVD - OLD HOWARD RD TO IH 35	23
15	ROY REYNOLDS DR - BUSINESS 190 TO RANCIER AVE	24
33	SH 53/ADAMS AVE - 3RD ST TO E LOOP 363	25
19	FM 2271 - LAKE RD TO FM 2305/W ADAMS AVE	26

PLAN MONITORING AND PERFORMANCE

Since the CMP is considered a "living" document, when updated data is available a reprioritization of the CMP network routes will be needed. In 2018, KTMPO reprioritized the CMP network segments. This CMP update used three quantitative datasets with updated data sources to include the National Performance Management Research Data Set (NPMRDS), INRIX, and KTMPO's Travel Demand Model. Part of this update was to include additional roadways for which data was previously unavailable. Major additions to the network include FM 93 and Clear Creek Rd (SH 201). Other updates include extensions to IH 35, S. 31st St. (FM 1741), Business 190 near Nolanville, and W.S. Young Dr. Additionally, data was available for Segment 3 (SH 8) and Segment 5 (US 190 Bypass), which were previously included in the CMP but did not have available data to include in the congestion scoring. Figure 9.6 is the updated 2018 CMP network.

Exhibit 9.6: 2018 CMP Network



The prioritization process for the 2018 CMP remained the same with the exception of an added evaluation criteria: Congestion Rank Change. This evaluation criteria compared the 2016 and 2018 congestion ranking. Segments where the ranking became significantly worse (i.e. higher congestion ranking) were assigned a higher prioritization score, segments where the ranking dropped significantly were given a lower prioritization score. The updated evaluation criteria weighting used to calculate prioritization score is outlined in Figure 9.7.

Exhibit 9.7: 2018 CMP Network

Criteria		Weight
Congestion Rank		25%
Congestion Rank Change		5%
Volume		20%
Safety	Crashes	15%
	Rear-End Crashes	10%
Transit		15%
School		5%
Public Input		5%
Total		***100%***

Due to differences in data, additions to the CMP network, and real-life changes to the region's roadway network, there were several significant changes to the prioritized list of CMP segments. Figures 9.8 and 9.9 below show a comparison between the 2016 and 2018 priority rank for each CMP segment.

Exhibit 9.8: 2018 Final Prioritized List of Congestion Hotspots—Highway Segments

Segment ID	Description	Priority Rank	2016 Rank	Ranking Change
4E	US 190 - BUSINESS 190 TO IH 35	1	2	-1
20B	IH 35 - US 190 TO S LOOP 363	2	14	-12
4C	US 190 - SH 9 TO FM 3470/STAN SCHLUETER LOOP	3	1	2
4D	US 190 - FM 3470/STAN SCHLUETER LOOP TO BUSINESS 190	4	5	-1
26B	LOOP 363 - SPUR 290 TO IH 35 S	5	7	-2
20D	IH 35 - N LOOP 363 TO FALLS COUNTY LINE	6	11	-5
20C	IH 35 - S LOOP 363 TO N LOOP 363	7	12	-5
20A	IH 35 - US 190 TO WILLIAMSON COUNTY LINE	8	4	4
16	SH 195 - WILLIAMSON COUNTY LINE TO FM 3470/STAN SCHLUETER LOOP	9	8	1
26D	LOOP 363 - SH 36 TO IH 35 N	10	13	-3
26C	LOOP 363 - IH 35 S TO SH 36	11	9	2
28	SH 36 - LOOP 363 TO SH 317	12	6	6
26A	LOOP 363 - US 190 TO SPUR 290	13	3	10
26E	LOOP 363 - IH 35 N TO SH 53	14	16	-2
5	US 190 - BUSINESS 190 W TO BUSINESS 190 E	15	-	-
32B	US 190 SE - PRITCHARD RD TO MILAM COUNTY LINE	16	10	6
26F	LOOP 363 - SH 53 TO US 190	17	18	-1
4A	US 190 - FM 1715 TO US 190	18	15	3
3	SH 9 - US 190 to FM 116	19	-	-
32A	US 190 SE - LOOP 363 TO PRITCHARD RD	20	17	3

Exhibit 9.9: 2018 Final Prioritized List of Congestion Hotspots—Arterial Segments

Segment ID	Description	Priority Rank	2016 Rank	Ranking Change
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	1	3	-2
24	SH 317 - US 190 TO SH 36	2	17	-15
13	WS YOUNG DR - BUSINESS 190 TO FM 3470/STAN SCHLUETER LOOP	3	14	-11
17	TRIMMIER RD - FM 3470/STAN SCHLUETER LOOP TO HALLMARK AVE	4	5	-1
9	FM 3470/STAN SCHLUETER LOOP - SH 201/CLEAR CREEK RD TO US 190	5	1	4
4B	BUSINESS 190 - US 190 BYPASS W TO US 190 BYPASS E	6	2	4
25	FM 1741/S 31ST ST - FM 93 TO SH 53/ADAMS AVE	7	16	-9
29	SH 53/ADAMS AVE - FM 2271 TO 3RD ST	8	24	-16
7	BUSINESS 190 - US 190 TO NOLA RUTH BLVD	9	4	5
14	RANCIER AVE - FORT HOOD ST TO ROY REYNOLDS DR	10	10	0
8	FM 2410 - US 190 TO WARRIORS PATH	11	23	-12
1	AVE D - N 1ST ST TO BUSINESS 190	12	7	5
34	CLEAR CREEK RD - US 190 TO SH 195	13	-	-
23	LOOP 121 - IH 35 TO LAKE RD	14	13	1
30	SPUR 290/3RD ST - AVE E TO IH 35	15	15	0
31	SPUR 290/S 1ST ST - S LOOP 363 TO AVE E	16	18	-2
18	WILLOW SPRINGS RD - US 190 TO WATERCREST RD	17	12	5
2	FM 116 - AVE D TO ELIJAH RD	18	6	12
6	38TH ST - BUSINESS 190 TO RANCIER AVE	19	20	-1
22	LAKE RD - FM 2271 TO SH 317	20	26	-6
21A	FM 93/NOLAN VALLEY RD - WHEAT RD TO IH 35	21	8	13
12	N 2ND ST - HALLMARK AVE TO RANCIER AVE	22	21	1
11	HALLMARK AVE - FORT HOOD ST TO TRIMMIER RD	23	11	12
19	FM 2271 - LAKE RD TO FM 2305/W ADAMS AVE	24	25	-1
33	SH 53/ADAMS AVE - 3RD ST TO E LOOP 363	25	19	6
27	INDUSTRIAL BLVD - OLD HOWARD RD TO IH 35	26	22	4
21B	FM 93 - IH 35 TO US 190	27	-	-
15	ROY REYNOLDS DR - BUSINESS 190 TO RANCIER AVE	28	9	19

The largest increases in priority ranking for arterials occurred along Segments 24 (SH 317), 13 (WS Young Dr), 29 (SH 53/Adams Ave.), and 8 (FM 2410). The large increase in priority ranking for Segment 24 is due to a large increase in congestion, which may be attributed to major construction occurring along SH 317 during the congestion data collection period. The increased rankings for Segments 13 and 29 are also mostly associated with increases in congestion score.

While the congestion ranking does increase for Segment 8 as well, the increase in priority ranking can also be attributed to an increase in the percentage of crashes along the roadway that are rear-end and an increase in the number of schools located along the segment2. In general, the priority ranking for arterials appear to be much more variable compared to highways from year-to-year.

For highways, the largest increases in priority ranking occurred along Segments 20B, 20D, and 20C. The change in priority rank for Segments 20D and 20C is mostly due to congestion rank changes, which are an expected result of ongoing construction during the data collection period. Conversely, for segments where roadway projects were completed prior to the congestion data collection period (2017), the priority and congestion ranking decreased (i.e. congestion improved). Examples of projects improving congestion appear along Segments 4C and 20A.

CONCLUSION

An ongoing monitoring program is one of the key steps in implementing the FAST Act performance management strategy. It not only allows KTMPO to identify emerging problems on the transportation system, but it also allows the MPO to measure the outcomes of transportation investment decisions to determine if the planning process is being effective in addressing local transportation challenges. Learning what works and doesn't work provides a basis for continuous improvement in the outcomes of the metropolitan planning process.

chapter 10

Environment & Quality of Life

The environment in which we live includes a variety of features that may be natural or man-made, physical or perceived. **Protecting natural and cultural features and minimizing impacts of transportation projects on the environment are important considerations in transportation planning**. It is important to achieve a balance between economic development and mobility with the desire for a high quality of life that includes clean air and water, environmental preservation, and recreational opportunities.

The definition of the word "environment" varies depending upon the context, but in general, it is the aggregate of surrounding things, conditions, or influences, i.e. the surroundings. These surroundings may be natural or man-made, physical or perceived. The environment in which we live affects our quality of life. This Chapter discusses a variety of environmental factors including air quality, climate change, planning and environmental linkages, sustainability, and context sensitive solutions.

AIR QUALITY

KTMPO is bisected by IH 35, one of the nation's busiest interstate corridors. An average of 65,000 vehicles pass through this corridor daily. The Killeen and Temple urbanized areas have experienced considerable growth during the past 10 years and growth is projected to continue. KTMPO is also located between two major urbanized areas (UZA)—Austin UZA to the south and Waco UZA to the north. These factors may have an impact on the air quality of the KTMPO region. As a result, KTMPO has been actively researching and monitoring air quality information to incorporate into regional planning efforts.

Air Quality Standards

Exhibit 10.1: Ozone Monitoring Station – Temple Georgia C1405

The Clean Air Act, which was last amended in 1990, requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for pollutants considered harmful to public health and the environment. The Clean Air Act identifies two types of national ambient air quality standards. ***Primary standards*** provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. ***Secondary standards*** provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. These standards are implemented by the EPA to assign limits to the amount of pollution that can be present in the atmosphere. Based on monitoring data, the EPA will determine whether a region complies the NAAQS. An area may be considered in nonattainment if the thresholds are exceeded. EPA has set National Ambient Air Quality Standards for six principal pollutants, which are called "criteria" pollutants, as listed below:

- Carbon Monoxide
- Lead
- Nitrogen Dioxide
- Ground-Level Ozone
- Particulate Matter
- Sulfur Dioxide

Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air (µg/m^3).

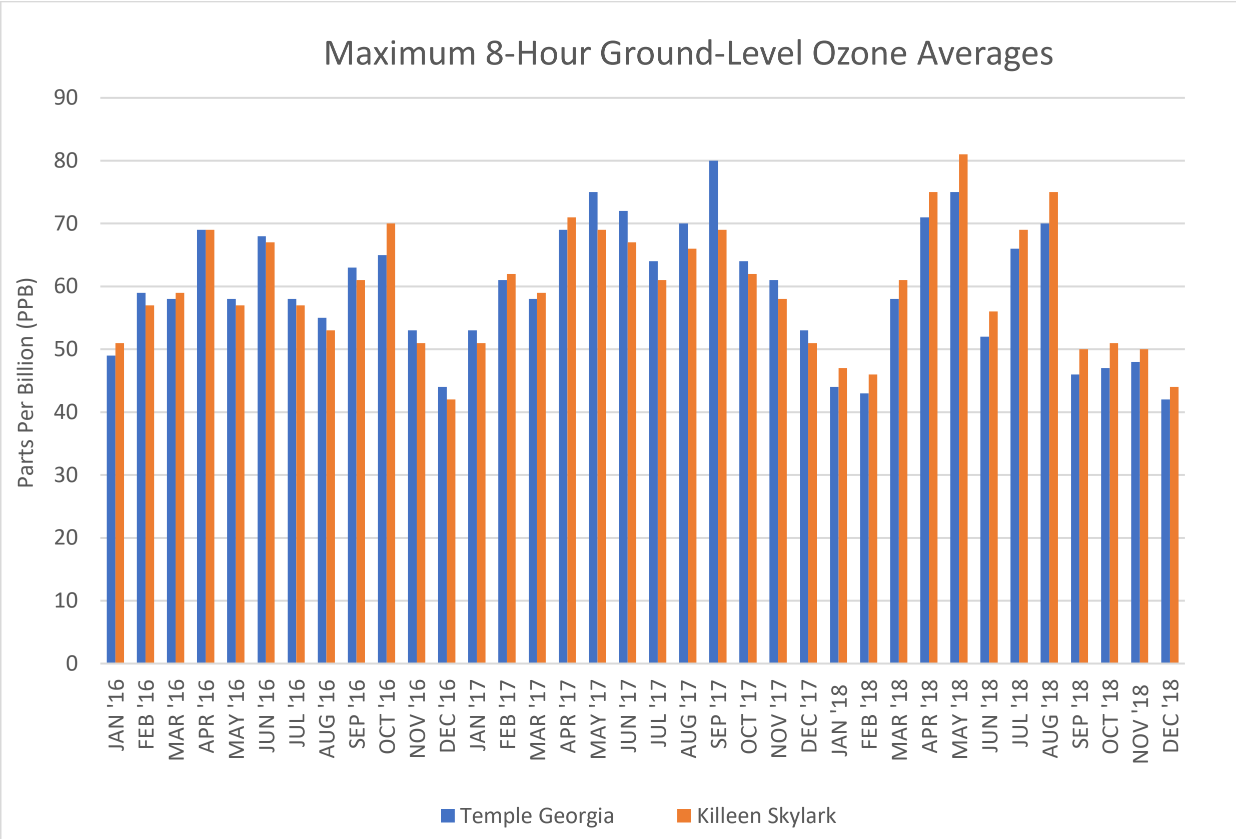
The EPA reviewed the NAAQS for ground-level ozone that were set in 2008. A reduction in the standards from 0.075 ppm to 0.060 - 0.070 ppm was under consideration. The proposed revised standards were available December 1, 2014, and the EPA finalized the revised standard of 0.070 ppm on October 1, 2015.

KTMPO Air Quality

KTMPO is currently in attainment for all air pollutants. In June 2009, an air quality monitoring station was established at Skylark Field in Killeen. A second monitoring station was established in October 2013, at West Temple Park near Georgia Avenue in Temple. These are the only monitoring stations in the KTMPO boundary and ground-level ozone is the only pollutant that is measured. Ground-level ozone forms when two types of pollutants, volatile organic compounds (VOC) and oxides of nitrogen, combine with sunlight and high temperatures. These pollutants are found in emissions from vehicles, construction equipment, lawn and garden equipment, sources that combust fuel such as industries and utilities, small industries such as gas stations and print shops, and consumer products including some paints and cleaners.

Data collected from the monitoring stations is posted on the Texas Commission on Environmental Quality (TCEQ) website and is available for viewing by the public. These values are collected hourly and averaged over 8-hour blocks. At the end of the calendar year, the highest values are recorded and the 4th highest daily maximum 8-hour concentration is used for compliance calculations. Once three full years of data are available, the 4th highest values are averaged to determine compliance. Based on current standards, this average cannot exceed 0.070 ppm (70 ppb). If exceeded, the area is considered to be nonattainment for the ozone standard.

Exhibit 10.2: Regional Ozone Monitor Data



Implications of Nonattainment

Three full years of certified data is needed to decide whether an area is in attainment with the NAAQS. A nonattainment designation may include an entire county or part of a county. Nonattainment areas must develop a plan to return to compliance within a specified time period. This time varies from 3 to 20 years, depending upon the severity of the classification. Failure to comply may trigger sanctions, such as a loss of federal transportation dollars.

The Texas State Implementation Plan (SIP) is the state's comprehensive plan to clean the air and meet federal air quality standards. The SIP must be revised to include areas (counties) classified as nonattainment. Components of a SIP Revision Include:

- Monitoring Data
- Emissions Inventory
- Photochemical Modeling
- Control Measures

The SIP revision process typically takes 3 – 4 years and is initiated upon nonattainment designation. This is an intense period of data collection and modeling; control measures and strategies are proposed and tested, and the revision is drafted. TCEQ goes through a rule making process which involves public meetings, hearings, review of public comments, etc. TCEQ then adopts final rules and the SIP revisions. The State's SIP revision package is then submitted to the EPA for review and approval.

Metropolitan Planning Organizations (MPO's) in nonattainment areas must demonstrate that their Metropolitan Transportation Plan (MTP) and Transportation Improvement Program (TIP) conform to the purpose of the SIP, i.e. "transportation conformity". Transportation Conformity only addresses air pollution from on-road sources which includes emissions created by cars, trucks, buses, commuter rail, and motorcycles. Federal Projects receiving FHWA/FTA funding and/or approval are also subject to Transportation Conformity. Conformity to a SIP means:

- Activities will not cause or contribute to any new violations of the NAAQS
- Activities will not increase the frequency or severity of NAAQS violations
- Activities will not delay timely attainment of the NAAQS or any required interim milestone

A conformity determination demonstrates that implementation of the MTP, TIP or project will not cause any new violations of the air quality standard, increase the frequency or severity of violations of the standard, or delay timely attainment of the standard or any interim milestone. Total projected emissions for the MTP or TIP must be within the "emissions budgets" established by the SIP. Transportation Control Measures (TCM) must be implemented in a timely fashion and State and local agencies consulted on data, modeling, and other issues. Development and implementation of TCMs are the responsibility of the MPO's participating local governments and includes both regulatory and non-regulatory measures.

Examples of TCMs include the following:

- Programs for improving public transit
- Developing high occupancy vehicle (HOV) lanes
- Employing ordinances to promote non-motor vehicle travel

MTP/TIP transportation conformity determination occurs within 12 months of a nonattainment designation. This determination is based upon the SIP; however, if SIP revisions have not been developed, conformity is determined by "Build/No Build" evaluation and comparison to determine impact of the proposed projects on air quality.

Future Steps

It is in the best interest of the KTMPO region to remain in compliance with the NAAQS and avoid a nonattainment designation. Steps/measures that will be undertaken by KTMPO are discussed below.

CMP Development and Implementation: KTMPO will continue developing and implementing the Congestion Management Process (CMP) which involves collecting data to identify congested corridors and developing strategies to alleviate congestion. Reducing vehicle emissions will help provide cleaner air for our region. Objectives may include the following:

- Promote policies and projects to reduce travel delay
- Promote awareness of alternative transportation modes
- Promote policies and projects to reduce number of crashes and crash severity
- Promote policies and programs to increase transit ridership on existing services
- Promote awareness of multi-modal facilities
- Promote carpool/shared-ride opportunities
- Consider participation in air quality improvement programs
- Encourage community land development plans that balance access to all modes of transportation

Ozone Advance Participation:
One tool that may be available to KTMPO is the Ozone Advance program. This voluntary program has the following goals:

1. Help attainment areas take action to keep ozone levels below the level of the standard to ensure continued health protection
2. Better position areas to remain in attainment
3. Efficiently direct available resources toward actions to address ozone problems quickly

The Ozone Advance program offers participating entities the opportunity to work in partnership with EPA and each other within a framework that focuses on efforts to keep their air clean. Participation in the program is not a guarantee that an area will avoid a future nonattainment designation or other Clean Air Act requirements; however, it can better position the area to comply with the requirements associated with such a designation.

Staff is working to obtain more information to educate and inform the public about air quality issues such as ozone and will work with the Policy Board to consider participation in this program. Program participation will include collaboration and support of the KTMPO member entities to identify measures for consideration to lower ozone concentrations. These measures may include transportation demand management programs such as ridesharing, carpooling, telecommuting, transit, and bike/pedestrian travel.

Steps involved in enrolling and participating in the Ozone Advance program include the following:

1. Signup letter to EPA
2. Identify available information regarding area's ozone issue
3. Secure stakeholder participation
4. Coordinate control strategy development
5. Submit path forward letter to EPA
6. Implement control strategy per schedule and provide annual status updates
7. Apply for federal grants if desired/available

Before the KTMPO region signs up for the Ozone Advance program, preliminary steps are needed. KTMPO plans to proceed as follows:

1) collect existing information and data to help determine pollution sources;
2) identify stakeholders and form an air quality coalition/advisory group;
3) focus on public education and awareness programs highlighting information about ozone and associated pollutants.

These preliminary measures will prepare the KTMPO region for participation in the program and will lead to the Signup Letter and subsequent steps. KTMPO may enroll in the Ozone Advance Program until the effective date of nonattainment designation.

TWG Participation: The Technical Working Group for Mobile Source Emissions (TWG) was formed by the Texas Department of Transportation (TxDOT) in the early 1990's. It was originally designed for a small group of technical staff to work out problems or strategies for modeling on-road mobile source emission inventories. Since then, topics have grown to include policy discussions and membership has grown considerably.

TxDOT Transportation Planning and Programming (TPP) Division has overall management responsibility for the TWG. The Texas Transportation Institute (TTI) facilitates the meetings and provides other staff support for the TWG as part of a contract with TxDOT. KTMPO has been participating in TWG meetings and will continue to do so. TWG meetings are currently held twice a year or as often as needed. Topics have included Ozone Advance Program, State Implementation Plan (SIP), NAAQS, MOVES (Motor Vehicle Emissions Simulator) Model, CMAQ (Congestion Mitigation and Air Quality Improvement) Program, Transportation Conformity reviews, etc.

Other Data Sources: KTMPO is coordinating with TCEQ and EPA to identify sources of air quality data relevant to the KTMPO region. TCEQ's Point Source Emissions webpage provides a list of entities throughout the state who are reporting their emissions to TCEQ. Nine have been identified in Bell County and 16 from the adjacent counties to the north, east, and south. Nitrogen Oxides and Volatile Organic Compounds are among the pollutants that are reported. KTMPO is reviewing this information and will encourage these entities to participate as stakeholders as air quality issues for the region are examined. Other sources of information that will be reviewed include TCEQ's Air Modeling webpage and Air Quality Research webpage, along with data from

Public Education: Educating the public regarding air quality issues and obtaining public support is a key factor for any program to be successful. KTMPO will continue to review data from the ozone monitors at Skylark field in Killeen and West Temple Park (Georgia Avenue) in Temple. Information will be provided on the KTMPO website to educate the public regarding ozone and other pollutants and inform the public of ways to reduce pollutant levels and improve air quality.

CLIMATE CHANGE

Extreme weather events can damage transportation networks and affect air quality. Extreme heat contributes to high Ozone levels which can be harmful to our health and affect our ability to breathe. Heat waves and flooding can be particularly taxing on the road infrastructure. Higher temperatures can cause road pavement to soften and expand resulting in potholes, buckling of roads, and stress on bridge joints. Heavy rains and flooding can disrupt traffic, delay construction activities, and weaken or wash out the soil and culverts that support roads and bridges. These extremes in weather can shorten the life expectancy of the roadway, resulting in a need for more frequent maintenance and repairs.

High temperatures can also affect railways causing rail tracks to expand and buckle. Heavy rains can cause delays and disrupt service, and flooding can damage the rail lines resulting in repairs and/or replacement of the line and possible relocation to avoid future flooding events.

Weather extremes can also impact air travel. Extreme heat may result in cargo restrictions, flight delays, and cancellations. Heavy rains and flooding can cause disruptions by delaying service and forcing airports to close. Air related infrastructure, including runways, may also be damaged by flooding and higher temperatures.

According to FHWA, "Many state DOTs and MPOs are recognizing the role that transportation policies and investments play in contributing to the emissions of GHGs and conversely, the potential impact of climate change on transportation systems." Promoting the reduction of CO2 gases and other pollutants that make up "greenhouse gases" (GHG) is in the best interest of our region to extend the life of the infrastructure and ensure a healthy air supply for our population.

KTMPO is researching this issue to collect information that will promote awareness of the damaging effects of GHG and encourage practices to reduce these gases. These efforts will include publishing educational material on the KTMPO website and discussions with the Transportation Planning Policy Board to enlist support of future programs to promote a healthy environment and lengthen the lifespan of the transportation infrastructure.

In addition, through CTCOG, KTMPO is coordinating with the Homeland Security Advisory Council to assimilate information from Emergency Management Plans for counties within and adjacent to the MPO boundary. This information includes evacuation routes which may be needed during extreme weather events such as flooding, hurricanes, etc. These routes should be given top priority with regard to maintenance.

Information Resources

Federal Highways Administration (FHWA) is a resource KTMPO may use in assimilating information on climate change. FHWA supports transportation and climate change research and dissemination of information, technical assistance to stakeholders, and coordination within US DOT and other Federal agencies. FHWA is also involved in climate change initiatives with the US DOT Center for Climate Change and Environmental Forecasting and other partners. The FHWA website provides information on FHWA research, publications, and resources related to climate change science, policies, and actions along with current state and local practices in adapting to climate change and reducing GHG emissions. The following areas of focus have been identified by FHWA and are discussed in detail on the following page:

Mitigation: Identifying strategies that reduce GHG emissions from transportation sources;
Adaptation: Preparing for the impacts of global climate change on the nation's transportation infrastructure and systems;
Sustainability: Ensuring that balanced choices are made among environmental, economic, and social values that will benefit current and future road users;
Energy: Promoting the use of alternative and renewable fuels, and vehicle technologies to reduce oil dependence, vehicle pollution and energy use.

Mitigation Strategies

- Improve system and operational efficiencies by optimizing the design, construction, operation, and use of transportation networks. The strategies range from anti-idling ordinances to traffic management to congestion pricing. The objective of this group of strategies is to reduce the energy use and GHG emissions associated with a given unit of passenger or freight travel (e.g., person-miles, vehicle-miles, or ton-miles of travel).
- Reduce travel activity by reducing growth in vehicle-miles traveled. The objective of this group of strategies is to influence travelers' activity patterns, thereby reducing total travel, shifting travel to more efficient modes, increasing vehicle occupancy, or otherwise taking actions that reduce energy use and GHG emissions associated with personal travel.
- Introduce low-carbon fuels. The objective of this group of strategies is to develop and introduce alternative fuels that have lower carbon content and generate fewer transportation GHG emissions. These alternative fuels include ethanol, biodiesel, natural gas, liquefied petroleum gas, synthetic fuels, hydrogen, and electricity.

- Increase fuel efficiency by advancing and bringing to market advanced engine and transmission designs, lighter-weight materials, improved aerodynamics, and reduced rolling resistance. The objective of this group of strategies is to use less fuel and generate fewer GHG emissions.

Adaptation

Planning, designing, constructing, operating, or maintaining transportation infrastructure while incorporating consideration of climate changes. The impacts of climate change should be taken into account as transportation systems are planned and as transportation projects are developed. Highways are an integral part of the broader context of sustainable development.

Sustainability

A sustainable highway should satisfy the functional requirements of societal development and economic growth while striving to enhance the natural environment and reduce consumption of natural resources. Significant advances are being made to improve the overall efficiency of the energy sector, particularly with regards to fuel economy. However, further fuel savings is needed. The traveling public is increasingly investing in alternative fuels, plug-in hybrid and other electric vehicle (EV) technologies. States and localities in the U.S. are beginning to build the necessary infrastructure to support the use of these fuels and vehicle technologies.

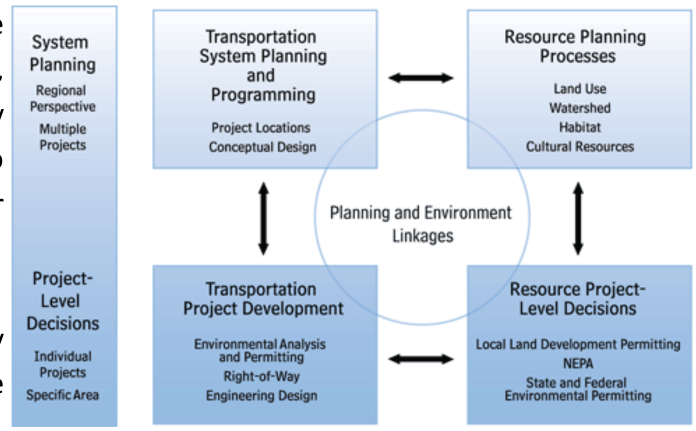
Energy

KTMPO will use these resources and others to promote awareness of climate change and the impact it may have on the transportation network, as well as methods and strategies to mitigate these impacts.

PLANNING AND ENVIRONMENTAL LINKAGES (PEL)

When planning transportation projects, it is important to consider the effect a project may have on the environment. Environmental issues should be considered early in the transportation planning process and should focus on the following principles: 1) avoid; 2) minimize; and 3) mitigate. When possible, projects should avoid environmentally sensitive areas and natural resources. If avoidance is not possible then efforts should be made to minimize adverse effects on the environment. When environmental impacts are known, mitigation efforts may be necessary and involve implementing projects or programs to offset the known impacts.

By including environmental analysis early in the project planning stage, environmental, regulatory, and resource agencies are actively involved from the beginning which will help to streamline environmental reviews that occur later in the process.



Potential problems may be identified in the early stages which may result in cost savings and more efficient project delivery times.
When considering environmental impacts of transportation planning, it is important to include the following:

Define and Identify Environmentally Sensitive Areas and Natural Resources

It is important to define "environmentally sensitive areas" and "natural resources" within a region. Once defined, these areas can then be identified and mapped. Defining and identifying these areas will involve coordination with various agencies and groups and review of local conservation plans and programs.

Evaluate Impact

When projects are proposed it is important to determine what impact, if any, the project may have on the environment. By obtaining geospatial data of the sensitive areas and overlaying potential infrastructure projects over them in GIS, potential impacts can be easily assessed from a geographic perspective.

Coordinate with Agencies

As previously stated, it is important to communicate with environmental agencies and groups, as well as TxDOT Environmental Coordinators, early in the planning process to identify potential conflicts and evaluate possible action

Environmentally Sensitive Areas

KTMPO actively researches the geographic location of environmentally sensitive areas and natural resources in the region, as depicted in Exhibit 10.5. The identification of these areas began with the established statewide datasets from state agencies and has been augmented with local data from member entities. The southwestern portion of the KTMPO region has the most concentration of sensitive areas, largely due to the watersheds and recharge zones for two major aquifers. Detailed information on the identified sensitive areas is discussed below.

Natural or Recreational Areas: A database is maintained of natural or recreational areas in the region, consisting of data from a variety of sources, including Texas Parks and Wildlife, TxDOT, and local entities.

Archaeological Sites: The Gault archaeological site is in the KTMPO region, west of Salado and south of Stillhouse Hollow Lake. Considered one of the major excavation sites in Texas, it is receiving international attention because of the wealth of new information on Clovis culture that is being discovered.

The MPO coordinates with TxDOT on issues related to identifying Native American tribal lands and potential artifact locations. Maps are available depicting historic tribal territories in Texas and KTMPO has access to a tribal representative database to obtain more information on tribal lands within the KTMPO region. The available maps indicate the KTMPO region is within historic tribal territories for two tribes—the Comanche Nation of Oklahoma and the Tonkawa Tribe of Oklahoma. KTMPO will continue coordination efforts to determine whether the MPO region lies within historic tribal territories of other Indian tribal groups with interests in Central Texas and will contact these groups as needed.

Historical Structures or Areas: Data for the National Register of Historic Places was obtained from National Park Service for structures and districts, and additional local historic data has been received. These historic places are listed below in Exhibit 10.4.

Environmental Justice Communities of Concern (EJCOC): EJCOC areas were discussed in Chapter

2, Demographics, and are areas containing a higher percentage of low income or minority groups. The purpose of an environmental justice review is to ensure that federally funded transportation projects do not adversely impact minority populations and low-income populations.

Landfills: The identification of closed landfills and waste disposal sites is important for new transportation projects, as soil testing may indicate poor load-bearing qualities, unsupportive of the weight of the roadway and heavy vehicle traffic. In this case, a costly and time-consuming process of removing the buried waste may be necessary. Hazards of excavating a previously closed landfill include contaminated water and the release of disease-causing pathogens to the surrounding area.

Watersheds: Of the Brazos River Basin, the watersheds present in the planning area include the Lampasas, Leon, Little, Lower Brazos-Little Brazos, Cowhouse, and San Gabriel watersheds. Though not depicted on the map, KTMPO has geospatial data detailing the location of the watersheds for use in analysis. Particularly sensitive, the Nolan Creek watershed, a part of the Leon River watershed, covers a large portion of the Killeen urbanized area and Little Nolan Creek from confluence with Nolan Creek/South Nolan Creek upstream has been determined by TCEQ to have elevated bacteria concentrations. These segments are classified as 5b, indicating that a review of the water quality standards for this water body will be conducted before a total maximum daily load (TMDL) will be scheduled.

Aquifers: The Trinity Aquifer underlies all of the planning area, while the Edwards Aquifer underlies the south-central portion. In an aquifer recharge zone, or outcrop, water from precipitation and/or storm water runoff may easily enter the aquifer system. If the runoff carries pollutants, these pollutants will also enter the aquifer system. Structural damage to the aquifer is also a concern as this could affect the ability of an aquifer to recharge.

The Edwards Aquifer is a karst limestone aquifer consisting of porous, honeycombed, rock in which water easily moves through. In the recharge zone where the aquifer is exposed at the surface, the Edwards is highly faulted and fractured allowing large quantities of water to flow into the aquifer with little if any filtration. As a result, the Edwards aquifer recharge zone is considered particularly sensitive. In the downdip area of an aquifer, the water-bearing layers underlie other layers and are under artesian pressure. Construction projects in these areas should be carefully planned and monitored to ensure there is no loss of artesian pressure which can result in declining spring flows.

It should be noted that both the Trinity and Edwards BFZ aquifers are considered major aquifers by the Texas Water Development Board. Within the KTMPO planning boundary, there are several other groundwater resources that are smaller in extent and capacity and are not classified as major or minor aquifers. These other groundwater resources supply the majority of water wells in the eastern half of the KTMPO area and are relatively close to the surface, i.e. generally less than 100 feet below the surface.

Endangered species: While the KTMPO region is the home to several endangered species, the U.S. Fish and Wildlife Service has not identified any critical habitats in the region; therefore, there are currently no specific areas designated as essential for the conservation of an endangered species. Both U.S. Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife maintain a county level inventory of species of special concern in Texas.

Exhibit 10.3 depicts the rare, threatened, or endangered species that are present in Bell County, the largest portion of the KTMPO planning area. The most well-known endangered species present include the black-capped vireo, the golden-cheeked warbler, and the whooping crane. Recently, there has been much discussion regarding the Salado Springs salamander. On February 24, 2014, the USFWS officially listed the Salado Springs salamander as threatened; critical habitat has not been designated at this time.

Exhibit 10.3: Rare, Threatened, or Endangered Species in KTMPO region

Rare, Threatened or Endangered Species in KTMPO Region				
Taxon	**Common Name**	**Scientific Name**	**Federal Status**	**State Status**
Amphibians	Salado Salamander	*Eurycea chisholmensis*	T	
Birds	Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	
Birds	American Peregrine Falcon	*Falco peregrinus anatum*	DL	T
Birds	Bald Eagle	*Haliaeetus leucocephalus*	DL	T
Birds	Black-Capped Vireo	*Vireo atricapilla*	LE	E
Birds	Golden Cheeked Warbler	*Setophoga chrysoparia*	LE	E
Birds	Henslow's Sparrow	*Ammodramus henslowii*		
Birds	Interior Least Tern	*Sterna antillarum athalassos*	LE	E
Birds	Mountain Plover	*Charadrius montanus*		
Birds	Peregrine Falcon	*Falco peregrinus*	DL	T
Birds	Red Knot	*Calidris canutus*	T	
Birds	Sprague's Pipit	*Anthus spragueii*		
Birds	Western Burrowing Owl	*Athene cunicularia hypugaea*		
Birds	Whooping Crane	*Grus americana*	LE	E
Fish	Guadalupe Bass	*Micropterus treculii*		
Fish	Smalleye Shiner	*Notropis buccula*	LE	
Insects	Leon River Winter Stonefly	*Taeniopteryx starki*		
Mammals	Cave Myotis Bat	*Myotis velifer*		
Mammals	Gray Wolf	*Canis lupus*	LE	E
Mammals	Llano Pocket Gopher	*Geomys texensis*		
Mammals	Red Wolf	*Canis rufus*	LE	E
Mammals	Plains Spotted Skunk	*Spilogale putorius interrupta*		
Mollusk	Smooth Pimpleback	*Quadruia houstonensis*	C	T
Mollusk	Texas Fawnsfoot	*Truncilla macrodon*	C	T
Mollusk	Texas Pimpleback	*Quadrula petrina*	C	T
Plants	Hall's Prairie Clover	*Dalea hallii*		
Plants	Hill County Wild-Mercury	*Argythamnia aphoroides*		
Plants	Glass Mountains Coral Root	*Hexalectris nitida*		
Plants	Reverchon's Curfpea	*Pediomelum reverchonii*		
Plants	Osage Plains False Foxglove	*Agalinis densiflora*		
Plants	Plateau Loosestrife	*Lythrum ovalifolium*		
Plants	Plateau Milkvine	*Matelea edwardsensis*		
Plants	Scarlet Leatherflower	*Clematis texensis*		
Plants	Sycamore Leaf Snowbell	*Styrax platanifolius*		
Plants	Tree Dodder	*Cuscuta exaltata*		
Plants	Texabama Croton	*Croton alabamensis var. texensis*		
Plants	Texas Almond	*Prunus minutiflora*		
Plants	Texas Fescue	*Festuca versuta*		
Plants	Texas Milk Vetch	*Astragalus reflexus*		
Reptile	Concho Water Snake	*Nerodia paucimaculata*	DL	
Reptile	Texas Garter Snake	*Thamnophis sirtalis annectens*		
Reptile	Texas Horned Lizard	*Phrynosoma cornutum*		T
Reptile	Timber Rattlesnake	*Crotalus horridus*		T

Federal Status Legend
LE: Listed Endangered
T: Threatened
C: Candidate
DL: Delisted

State Status Legend
E: Endangered
T: Threatened

Source: Texas Parks & Wildlife

Exhibit 10.4: National Register of Historical Places in the KTMPO Region

National Register of Historical Places				
County	City	Name	Facility	Address
Bell	Salado	Anderson House and Store	Historic House	35 S. Main St.
Bell	Salado	Armstong-Adams House	Historic House	Main St. and Thomas Arnold Rd
Bell	Belton	Austin, F.K. and Mary, House	Historic House	702 N. Penelope St.
Bell	Belton	Baggett, Ele, House	Historic House	1019 N. Main St.
Bell	Belton	Baggett, Silar and Ellen House	Historic House	1018 N. Main St.
Bell	Salado	Baines, George Washington, House	Historic House	316 Royal St.
Bell	Salado	Barbee-Berry Mercantile Building		Main and Royal St.
Bell	Temple	Barclay-Bryan House	Historic House	S. 25 St and W Ave. H
Bell	Bartlett	Bartlett Commercial Historic District	Historic District	Clark St bounded by SH 95 (East), E. Bell St. (North), E Pietzsch St. (South), Railroad Tracks (West)
Bell	Salado	Barton House	Historic House	101 N. Main St.
Bell	Belton	Baylor Female College Historic District	Historic District	Bounded by King, College and W. Ninth St.
Bell	Belton	Beamer, William, House	Historic House	1202 S. Beal St.
Bell	Belton	Bell County Courthouse	Courthouse	101 W. Central Ave.
Bell	Belton	Belton Academy	School	404 E. Ninth St.
Bell	Belton	Belton Commercial Historic District	Historic District	FM 93, Penolope St. and Nolan Creek
Bell	Belton	Belton Farmers' Gin Coop	Cultural Monument	219 S. East Ave., Building 4
Bell	Belton	Belton Standpipe	Cultural Monument	W Aveune J and Hughes St
Bell	Belton	Belton Yarn Mill	Cultural Monument	805 E. 4th Ave.
Bell	Belton	Birdwell, T. Hamp and Beulah, House	Historic House	503 N. Wall
Bell	Belton	Burford, R. F. and Lena House	Historic House	920 N. Penelope St.
Bell	Belton	Carnegie Public Library	Historic Library	201 N. Main St.
Bell	Belton	Cornelison House	Historic House	1102 N. Pearl St.
Bell	Salado	Davis House	Historic House	Main St.
Bell	Belton	Elliott, Joel, House	Historic House	716 N. College St.
Bell	Belton	Ferguson House	Historic House	518 N. 7th St.
Bell	Belton	Ferguson, James A., House	Historic House	1123 N. Beal St.
Bell	Belton	Ferguson, James E. and Miriam House	Historic House	604 N. Penelope St.
Bell	Belton	First Christian Church Parsonage	Historic Church	608 N. Penelope St.
Bell	Salado	Fowler House	Historic House	N. Main St.
Bell	Belton	Frazier, Dr. Jacob Moore House	Historic House	618 N. Wall St.
Bell	Belton	Gray Rental Houses	Historic House	702-708 N. Pearl St.
Bell	Salado	Halley, Capt. Robert, House	Historic House	Main St.
Bell	Belton	Hammersmith, John P. House	Historic House	520 S. Main St.
Bell	Belton	Harris, Capt. Andrew Jackson House	Historic House	1001 W. 10 St.
Bell	Salado	Hendrickson-Caskey House	Historic House	Center Circle
Bell	Belton	House at 402 N. East St.	Historic House	402 N. East St.
Bell	Belton	House at 730 N. Beal St.	Historic House	730 N. Beal St.
Bell	Belton	Hudson, Dr. Taylor, House	Historic House	324 N. Main St.
Bell	Belton	James House	Historic House	805 N. Beal St.
Bell	Killeen	Killeen Downtown Historic District	Historic District	Roughly Bounded by Ave. A (North), Santa Fe Plaza (South), N. 4th St (West), and N. 8th St. (East)
Bell	Belton	Kinchion, L.B., House	Historic House	702 S. Pearl St.
Bell	Temple	Kyle Hotel	Historic Inn	111 N. Main St.
Bell	Belton	Lee, Walter J., House	Historic House	804 N. College St
Bell	Belton	McWhirter, George and Martha, House	Historic House	400 N. Pearl St.
Bell	Belton	Means, V.R., House	Historic House	E. 14th St
Bell	Belton	Miller, J.Z., House	Historic House	804 N. Penelope St.
Bell	Belton	Miller-Curtis House	Historic House	1004 N. Main St.
Bell	Belton/Temple	Missouri, Kansas & Texas Railroad Bridge at the Leon River	Historic Bridge	Across the Leon River at Taylor's Valley Rd.
Bell	Belton	Morey House	Historic House	328 N. Main St.
Bell	Belton	Mount Zion United Methodist Church	Historic Church	218 Alexander St.
Bell	Belton	Naismith, Robert, House	Historic House	440 N. Penelope St.
Bell	Belton	Norton-Orgain House	Historic House	Main St.
Bell	Belton	Old St. Luke's Episcopal Church	Historic Church	401 N. Wall St.
Bell	Belton	Potts, Arthur, House	Historic House	445 N. Wall St.
Bell	Salado	Robertson, Col. Elijah Sterling Clack, Plantation	Historic Plantation	I-35 approximetely 0.25 miles southwest of Main St.
Bell	Salado	Rose, Maj. A.J., House	Historic House	Rose Way and Royal St.
Bell	Salado	Salado College Archeological Site	Archeological Site	Main St. & College Hill
Bell	Salado	Salado United Methodist Church	Historic Church	650 Royal St.
Bell	Salado	Stagecoach Inn	Historic Inn	416 S. Main St.
Bell	Belton/Temple	State Highway 53 Bridge at the Leon River (Waco Rd, Belton)	Historic Bridge	Waco Rd (FM 817) at Leon River
Bell	Temple	Temple Commercial Historic District	Historic District	Roughly bounded by French Av., 3rd St., Av. D & 6th St.
Bell	Salado	Tenney, Levi, House	Historic House	Pace Park Dr
Bell	Salado	Twelve Oaks	Historic House	Center Circle
Bell	Salado	Tyler House	Historic House	Main St.
Bell	Belton	Venable, W.J., House	Historic House	426 N. Wall St.
Bell	Salado	Vickery House	Historic House	Main St.
Bell	Belton	Ware, H. A. and Helena, House	Historic House	401 Pearl St.
Bell	Salado	White-Aiken House	Historic House	I-35
Bell	Temple	Wilson, Ralph, Sr., and Sunny House	Historic House	1714 S. 61st St.
Coryell	Copperas Cove	Copperas Cove Stagestop and Post Office	Historical Post Office	Ogletree Gap Park, Post Office Road

Evaluate Impacts

The evaluation of potential impacts of new transportation projects on sensitive areas helps prevent damage to the natural or historical environment of the region. Proposed transportation projects that intersect with any of the identified environmentally sensitive areas are shown on Exhibit 10.6. The appearance of projects in Exhibit 10.7 indicates that some part of the project lies in the same geographic location as one of the identified sensitive areas and should be addressed in the initial stages of planning. The awareness of the potential effects on these sensitive areas early in the planning process ensures that efforts and resources are not spent towards a project only to fail during the National Environmental Policy Act (NEPA) process, costing more resources as the project is changed or refined. It should be noted that the entire KTMPO region lies within one watershed or another, so this factor in itself was not considered in listing a project.

Exhibit 10.5: Environmental Sensitive Areas

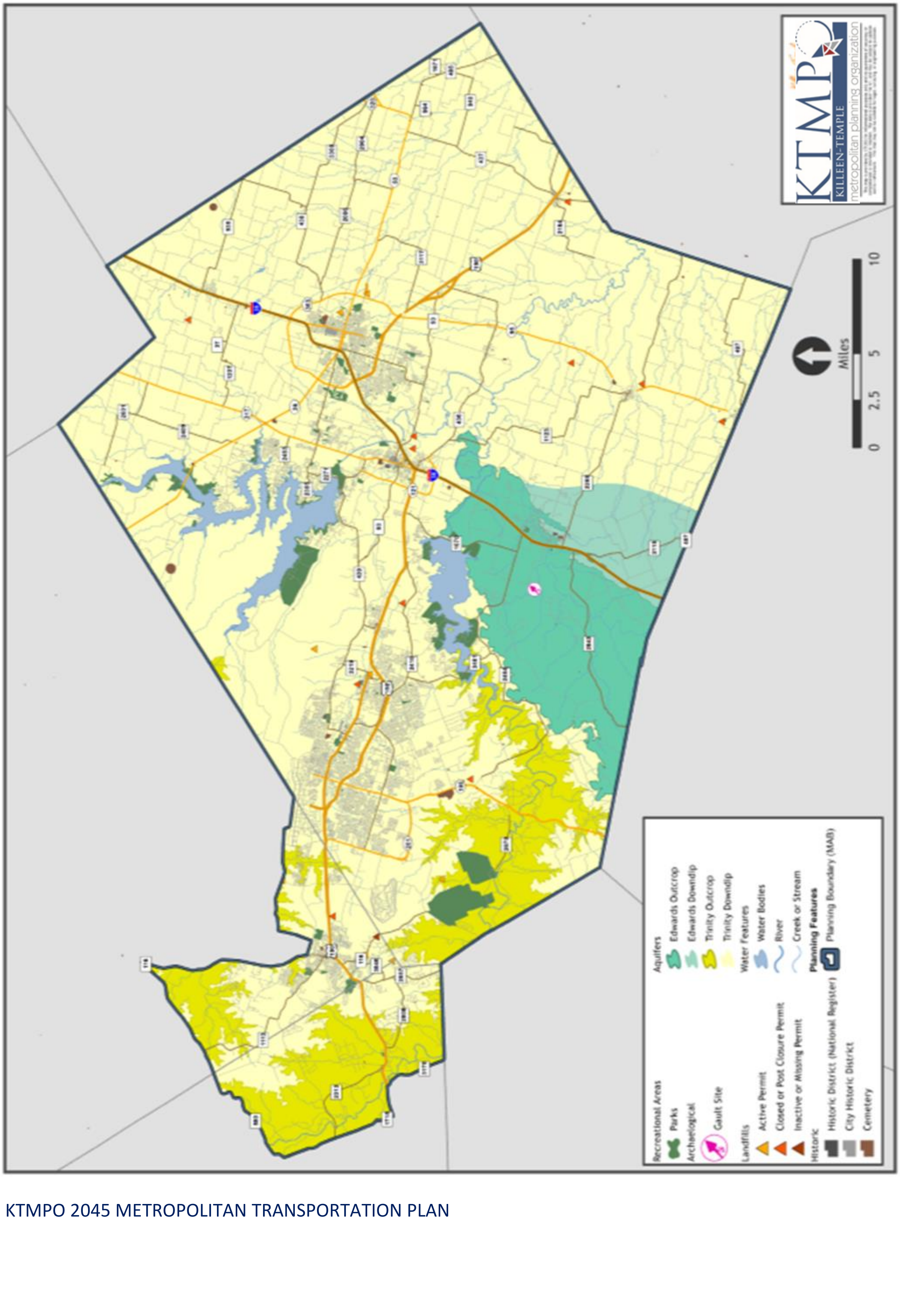


Exhibit 10.7: Proposed Roadway Project Listing with ENV Sensitive Areas

ROADWAY PROJECTS				
KTMPO ID	**Project Name**	**Project Limits**	**Project Description**	**Environmental Considerations**
W30-17	FM 93 Phase 1 and 2	SH 317 to Wheat Rd	Widen from 2 to 4 lane roadway with a bike lane and 6 foot sidewalks	EJ, H, P
T40-07b	Temple Outer Loop West Phase II	454 ft South of Dove Meadow to IH-35 S	Widen from 2 to 4 lanes with divided roadway and curb and gutter; includes hike & bike trail and bike dedicated lanes to incorporate multimodal transportation	P, H
K30-13	Chaparral Rd	SH 195 to FM 3481 (Stillhouse Hollow Lake Rd)	Reconstruct and widen roadway from 2 to 4 lane divided roadway with bicycle and pedestrian facilities.	EJ, H
H30-05	Warriors Path Upgrade	FM 2410 (Knights Way) to Old Nolanville Rd	Create a two lane road section with a left turn lane at future school, curb and gutter, 6 ft sidewalk on west side and a 10ft wide hike/bike path on east side	H
T15-06k	IH 35	US 190/ IH 14 to Loop 363	Reconstruct and widen to 8 lanes	EJ, H
C35-02ab[5]	FM 116 Railroad Underpass	S Main (through existing parking facility) to Ave B	Create an underpass at the existing BNSF railroad with sidewalks	EJ
W25-02	SH 36	SH 317 to Lake Belton Bridge	Widen from 2 to 4 lane divided roadway	P
W35-04	FM 439	Roy Reynolds Drive to FM 3219	Widen from 4 to 6 lanes	EJ
H45-03	FM 3481 (Stillhouse Lake Road) Phase 1	Prospector Trail to Proposed Chaprarral Road Intersection	Widen roadway from 2 to 4 lanes with a continous center turn lane with sidewalks	H, ARZ, P
W30-23	US 190/Loop 363	Spur 290 to SH 95	Upgrade to 4 lane freeway with continous frontage roads and grade separation at MLK Blvd	EJ
C30-08a	Business US 190 - Phase II	FM 1113 (Ave D) to FM 116 South	Convert the center turn lane to a controlled left turn lane with raised median, maintain the two existing travel lanes, add curb and gutter on north and south sides of the roadway, 6' sidewalk on the south side right-of-way, pedestrian crossings with curb ramps at street intersections, bicycle lanes on the outside travel lanes.	EJ
W35-08	FM 93	FM 1741 to SH 95	Widen from 2 to 4 lanes, provide for a raised median and construct grade separation at UP RR	H
W30-13	FM 2484	FM 1670 to IH 35	Widen from 2 to 4 lane divided roadway	P
W30-21	Loop 363 at FM 2305 (Adams Ave) Reconfiguration	Intersection of Loop 363 and FM 2305 (Adams Ave)	Reconstrct interchange at FM 2305 (Adams Ave) and LP 363	EJ
K40-24	Featherline Drive	Stagecoach Rd to Chaparral Rd	Widen from two to four lanes with a center turn lane and roundabouts at Featherline Rd and Stagecoach Rd and Stagecoach Rd at W.S. Young Drive	EJ
T35-36a	S. 1st Street/Spur 290 Improvements	SE Loop 363 to Ave M	Widen from 4 lane undivided to 4 lane divided roadway with curb and gutter, hike and bike traills and will incorporate multimodal design	EJ
K40-11	WS Young Drive	Mall Dr to AJ Hall Blvd	Add turn lane and relocate traffic signal at Mall Dr to AJ Hall Blvd	EJ
D40-03	Old TX 81 - Phase I	FM 1237 to Loves Overpass	Widen from 2 to 4 lanes with bicycle lanes and curb and gutter	H
H45-04	FM 3481 (Stillhouse Lake Road) Phase 2	Proposed Chaparral Road Intersection to South City Limits	Widen roadway from 2 to 4 lanes with a continous center turn lane with sidewalks	H, ARZ, P
K40-16	East Trimmier Rd Improvements	Stagecoach Rd to Chaparral Rd	Widen roadway from 2 to 4 lanes with a continous center turn lane with sidewalks and bike lanes	EJ
H30-01	Business US 190 (Veterans Memorial Blvd)	N Roy Reynolds to US 190/IH 14	Reduce roadway profile, install curb & gutter, access management/driveway control, drainage improvements, sidewalks, medians and other context sensitive solutions	EJ, L, H
B40-10	FM 1670	US 190 to Three Creeks Boulevard	Widen from 2 to 4 lane roadway with a 10' hike and bike trail	EJ, H
W35-02	SH 195 at FM 3470 (SS Loop) Reconstruction	Intersection of SH 195 at FM 3470 (SS Loop)	Upgrade Interchange	EJ
K25-04	SH 195 Overpass	At Business 190	Construct grade separation over Business 190 and BNSF RR	EJ
B40-11	FM 2271 (Lake to Lake Road)	FM 1670 to FM 2271	Construct 4 lane roadway with 10' wide trail	EJ, H, P
T45-15	Temple Outer Loop - East	IH 35 N to FM 93 at Business 190	Construction of a 4 lane divided roadway and curb and gutter; includes hike & bike trail and bike dedicated lanes to incorporate multimodal transportation	EJ

B40-07	Connell Street	US 190/IH 14 to Loop 121	Widen from 2 to 4 lanes with center turn lane and 5' wide sidewalks	EJ
W35-09	FM 93	SH 95 to SH 36	Widen from 2 to 4 lanes, provide for a raised median	EJ
K40-26	Cunningham Rd	US 190/IH 14 to Little Nolan Rd	Construct and widen from 2 to 4 lane road with shoulder, median turn lane, with bike/ped facilities	EJ
K40-03	FM 3470 Extension	SH 201 (Clear Creek Rd) to US 190 Bypass	Construct 4 lane FM Road with continous turn lane and shoulders	H
H45-02	E. FM 2410 (E. Knights Way) Phase 2	Warriors Path to Rummel Rd	Widen from 2 to 4 lanes with a continous turn lane with curb and gutter and sidewalks	L
K40-17	Trimmier Road Improvements	Stagecoach Rd to Chaparral Rd	Widen from 2 to 4 lanes with a median	EJ, P
K30-23	Jasper Bridge Expansion	S Florence Rd to Jasper Dr	Construct 8 lane overpass with pedestrian improvements with turnarounds	EJ
K25-05	Florence Rd	Elms Rd to Jasper Dr	Widen from 2 to 5 lane section with curb and gutter	EJ
B40-08	Sparta Road	Loop 121 to Dunn's Canyon Rd	Construct protected turn lane with 10' wide hike and bike trail	H, P
W35-05	SH 195 at US 190/IH 14	At SH 195	Upgrade interchange	EJ
T15-02	Kegley Road (Phase 2)	856 ft S of FM 2305 to 450 ft S of Wildflower Lane	Widen and add middle turn lane, curb and gutter, includes 12' shared use path and will incorporate multimodal design	H
T45-13	Little River Road	SE HK Dodgen Loop to FM 93	Reconstruct two lane arterial roadway with center-turn lane, bike lanes and 6' sidewalks	EJ
K40-25	Bunny Trail/SH 201 (Clear Creek Rd) Traffic Signal	Intersection of Bunny Trail and SH 201 (Clear Creek Rd)	Install traffic signal	EJ
W35-03	SH 195	FM 3470 (SS Loop) to Chaparral Rd	Reconstruct to 4 lane freeway with frontage roads	EJ, H
T45-11	East Young Avenue	Lower Troy Rd to Loop 363	Reconstruct and realign roadway from 2 to 4 lanes with a 6 ft. wide sidewalk and a center turn lane.	EJ
K40-06	FM 2484	SH 195 to IH 35	Widen from 2 to 4 lane divided roadway	H, ARZ, P
B40-09	West Avenue D	Loop 121 to Wheat Rd	Construct 2 lane roadway with sidewalks and bike lanes	EJ
B40-01	Huey Drive	Washington Dr to IH 35 Frontage Rd	Construct 2 lane roadway with center turn lane	EJ
T45-17	Azalea Drive	Lowes Dr to S. 1st St. Future Extension	Construct new two-lane roadway with a continous center turn lane, 5' bike lanes, and 6' sidewalks	EJ
B30-01	George Wilson Extension	FM 93 at George Wilson Rd to FM 439	Construct 2 lane roadway with shoulder	EJ
H30-03	FM3219	Veterans Memorial Blvd/Business 190 to FM 439	Widen from 2 to 4 lane divided roadway	L,H
B45-08	Mesquite Road Improvements	I-35 Frontage Rd to Shanklin Rd	Widen to 2 lanes with curb and gutter, shoulders/bike lanes, and 6ft wide sidewalk on both sides.	H
N45-02	FM 439 Shoulder Improvements & Bike Lanes	N. 38th St to Sparta Rd	Construct a continous shoulder/bike lane.	EJ, P
N40-07	Warrior's Path Extension Phase I	Old Nolanville Rd to US 190/IH 14	Extend Warriors Path to US 190/IH -14	H
T45-10	East Avenue C	14th St to 24th St	Reconstruct roadway to 2 lanes and add bike lanes, sidewalks, lighting, and landscaping.	EJ
T45-14	Lower Troy Road	East Young Ave to Loop 363	Reconstruct roadway to 2 lanes with a continuous center-turn lane and 6 ft sidewalks	EJ

Exhibit 10.8: Proposed Livability Project Listing with ENV Sensitive Areas

TRANSPORTATION CHOICES/LIVABILITY PROJECTS				
KTMPO ID	Project Name	Project Limits	Project Description	Environmental Considerations
T40-13	Temple's Georgetown Rails to Trails	S. 5th St to FM 93	Construct 10 ft wide hike/bike trail	EJ, H, P
K45-01	Heritage Oaks Hike & Bike Trail Segment 2	Stiltstone to Fawn Dr	Construct shared use path for pedestrian and bicyclists	EJ
S40-02	Salado Creek Off-Road Trail: Pace Park	Pace Park along Pace Park Rd	Construct 10 ft wide trail	ARZ, ES, P
B45-01	Belton's Georgetown Rails to Trails	E Ave. B to Leon River Bridge	Construct 10 ft. wide shared use path to connect KTMPO projects B40-05 and T40-13	EJ, H
T45-02	Downtown Sidewalks - 1st and 3rd Street	Mayborn Civic Center to Avenue F	Construct and repair sidewalks with ADA-compliance ramps, crosswalks and landscaping	EJ, P, H
B45-02	6th Avenue Sidewalk & Shared Use Path	Main St (SH 317) to I-35 Frontage Rd	Construct 6 ft. wide sidewalk on north side of 6th Ave, 10 ft. wide SUP on the south side and relocate utilities underground.	EJ, L
B45-05	Commerce/Industrial Shared Use Path	Sparta Rd to Main St (SH 317)	Construct 10 ft. wide shared use path on east side of Commerce St and north side of Industrial Park Rd; provide curb and gutter along Commerce St	H
B40-12	Belton Hike and Bike Trail Extension Southwest	Confederate Park to Nolan Creek Pedestrian Bridge	Construct 10 ft. wide hike/bike trail	EJ, H, P
T45-03	East Central Sidewalks	MLK Drive to N. 22nd St.	Construct 6 ft wide sidewalks, repair existing sidewalks with crosswalks and landscaping.	EJ, P
B45-04	Beal Street Sidewalk	E 24th Ave to E. 6th St.	Construct 5' sidewalk on east side from E. 24th Ave to Downing St, construct 5' sidewalk on both sides from E 13th Ave to Railroad Track, and construct 5' sidewalk on west side from railroad track to E. 6th Ave with bicycle signage along entire project	EJ, P
T45-08	West Adams Sidewalks	Olaf Drive to IH 35	Construct 6 ft wide sidewalk	EJ
T45-06	South Pea Ridge Greenbelt Trail	West Adams Ave (FM 2305) to Poison Oak Rd	Construct 8 ft wide trail along linear park east of S. Pea Ridge Rd and through Von Rosenberg Park	P
T40-25	Bird Creek Interceptor Trail	N side of Lions Community Park to Midway Dr (near Bonham Middle School)	Construct 8 ft wide trail	P
B45-07	Avenue H Sidewalk/Road Improvements	Main St (SH 317) to Saunders St.	Construct 5' wide sidewalk on north side of Ave H with Bicycle Signage and reconstruct roadway and widen to 2 lanes from Connell St. to Saunders St.	EJ
T45-09	Apache Drive Sidewalks	West Adams Ave (FM 2305) to Gila Trail	Construct 6 ft. wide sidewalks and crosswalks	EJ
T45-07	Temple Lake Park Connection	FM 2271 to Temple Lake Park	Construct 8 ft wide hike and bike trail	P
T25-05	FM 2271 Trail	FM 2305 to Miller Spring Park	Construct 8 ft wide trail	H, P
T45-01	Canyon Creek Trail	Canyon Creek Dr to Lions Park	Construct 8' hike & bike trail	P
S40-01	Salado Creek Shared Use Path - Royal Street	Main St at College Hill Dr to 0.09 mi N of Royal St on Center Circle	Construct alternate transportation route consisting of shared-use path for pedestrians and bicyclists	ARZ, H, ES
T45-05	Hickory Road Sidewalk	Midway Dr to Aspen Trail	Construct 6' sidewalk with crosswalks	P

Coordination with Agencies

KTMPO initially coordinated with statewide agencies in the identification of areas of environmental sensitivity, followed by outreach to local entities. These agencies and entities are shown below. An inventory of groups and agencies with interests in the KTMPO region will be maintained and augmented for use in coordination efforts as more groups are discovered and participate.

- **Environmental Protection Agency**
- **Texas Commission on Environmental Quality**
- **Texas Historical Commission**
- **U.S. Fish & Wildlife Service**
- **Texas Parks & Wildlife**
- **Texas Water Development Board**
- **Clearwater Underground Water Conservation District**
- **City of Belton**
- **City of Temple**
- **City of Killeen**
- **City of Harker Heights**
- **City of Copperas Cove**

Environmental Mitigation Activities

KTMPO will continue coordination with appropriate entities to identify environmentally sensitive areas and develop mitigation activities. To the extent possible, transportation projects should minimize off-site disturbance in sensitive areas and develop strategies to preserve air and water quality, limit tree removal, minimize grading and other earth disturbance, provide erosion and sediment control, and limit noise and vibration. Where feasible, alternative designs or alignments may be developed that would lessen the project's impact on environmentally sensitive areas. Federal Regulation 40 CFR 1508.20 suggests that typical steps for mitigation include the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected

environment.

- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

Effective mitigation starts at the beginning of the environmental process and should be included as an integral part of the alternatives development and analysis process. There are a variety of possible mitigation activities and measures that can be considered when dealing with environmental impacts, most of which should be considered during the project development process. The environmental mitigation strategies and activities shown on the following page are intended to be regional in scope and may not necessarily address potential project-level impacts. As the location and magnitude of the proposed projects are determined, appropriate project level mitigation measures will be developed in consultation with appropriate entities.

Potential Environmental Mitigation Activities

Resource	Mitigation Measures
Natural/Recreational Areas	Avoidance; minimization; replacement property for open space easements to be of equal fair market value and of equivalent usefulness; design exceptions and variances; environmental compliance monitoring.
Archaeological Sites/Historic Structures and Areas	Avoidance; minimization; landscaping for historic properties; preservation in place of excavation for archeological sites; Memoranda of Agreement with the Department of Historic Resources; design exceptions and variances; environmental compliance monitoring.
EJCOC	Impact avoidance or minimization; context sensitive solutions for communities (appropriate functional and/or aesthetic design features).
Landfills	Avoidance; minimization; design exceptions and variances; environmental compliance monitoring.
Watersheds/Aquifers	Avoidance; minimization; design exceptions and variances; environmental compliance monitoring.
Endangered Species	Avoidance; minimization; time of year restrictions; construction sequencing; design exceptions and variances; species research; species fact sheets; Memoranda of Agreements for species management; environmental compliance monitoring.

SUSTAINABILITY

Sustainability is defined as the capacity to maintain, support, or endure. Since the 1980's, *sustainability* has been used more in the sense of human sustainability on planet Earth and this has resulted in a definition related to the concept of sustainable development as follows: sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations, 1987).

Incorporating Sustainability into the Planning Process

Sustainable transportation is the process of designing transportation systems in order to improve livability and mobility by simultaneously meeting social, environmental, and economic goals. It is not an end state, but it is an interlocking series of processes, guided by a collection of principles to meet the needs of present and future members of the community by conserving natural resources. KTMPO may choose any combination of accepted best practices to implement sustainability principles:

Triple Bottom Line – considering the Social, Environmental and Economic impacts equally.

Life Cycle Assessment – considering environmental impacts over the life of a project.

Project Scoring and Selection – placing higher value on projects or methods that combine a positive effect on quality of life with minimal impact on the natural environment.

Performance Measures – Collecting data from multiple sources related to the Triple Bottom Line. Public Surveys, Air Quality Monitoring, Cost Analysis, and other metrics may be used.

INVEST - Employing the web-based tools developed by FHWA: www.sustainablehighways.org.

Congestion Management – implementing a broad policy in order to improve mobility and reduce emissions, resulting in higher quality of life for our region.

Materials Selection – Seeking ways to use recycled materials during construction and maintenance, and eliminate use of non-renewable resources.

Energy Efficiency – Developing projects to maximize efficient travel in terms of time and fuel.

KTMPO will strive to inform and educate the public on sustainability through various media to include the KTMPO website, and incorporate the practices and principles discussed above into the transportation planning process.

KTMPO seeks to include as many of the principles of sustainable transportation as described by FHWA, American Association of State Highway and Transportation Officials (AASHTO), American Society of Civil Engineers (ASCE), TXDOT, and other organizations. These principles are in line with KTMPO goals and include but are not limited to:

Strategies for Implementing Sustainable Principles

Access	providing the same level of service to all members of the community
Movement	balancing the need to move people and goods, free from congestion
Choice	providing a range of options, including public transit, bicycles and walking, and alternate routes to alleviate bottlenecks
Environmental Justice	ensuring that low-income or minority communities do not suffer adverse effects of construction or design of transportation systems
Economic Impact	considering the local and regional financial effects
Environmental Impact	examining the impact during construction as well as the impact of obtaining, processing and transporting various road-building materials, and the long-term impact of the different components of the transportation system

KTMPO acknowledges that sustainable transportation planning is a complex and challenging undertaking. Sustainable principles may be applied to any of our planning focus areas, listed below:

- Long and Short-Range Planning
- Project Scoring and Prioritization
- Project Selection and Funding
- Traffic Modeling and Forecasting
- Congestion Management
- Intelligent Transportation Systems (ITS)
- Environmental Justice
- Air Quality
- Safety
- Public Involvement, Outreach, and Education

CONTEXT SENSITIVE SOLUTIONS

Overall, context sensitive solutions techniques provide a more enjoyable experience of the transportation system. Community participation is encouraged in developing the project design concept and considering community needs and concerns in project implementation. As a result:

- Local leader commitments to the project are enhanced
- Dialogue between local entities and the MPO is further supported
- Purpose of a given project is clearly defined
- Land use decisions in the area are coordinated
- Lines of communication regarding multi-modal transport are opened
- Environmental, aesthetic and scenic harmony is promoted
- Overall system user safety and security is improved
- Project expectations yield more positive results
- More stakeholders are integrated and efficiency of resources is increased
- Local issues are addressed while increasing long-term value for community

Context sensitive solutions (CSS) Is a collaborative, interdisciplinary approach that involves all stakeholders in providing a transportation facility that fits its setting. It is an approach that leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources, while improving or maintaining safety, mobility, and infrastructure conditions.

Source: Results of Joint AASHTO/FHWA Context Sensitive Solutions
Strategic Planning Process, Summary Report, March 2007

I-35 Northbound Main Lanes Mural at Salado Plaza Dr

Currently, TxDOT Waco and Brownwood Districts have taken the lead on Context Sensitive Solutions for a variety of projects in the KTMPO area, most notably the I-35 expansion. With this aspect being shifted towards the MPO, KTMPO is researching methodologies to integrate CSS into the public participation process through TxDOT's experience. Of note, the City of Harker Heights recently adopted “Designing Walkable Urban Thoroughfares: A Context Sensitive Approach” as the design manual for use in the Development Overlay District 1—The Knights Way Corridor (FM 2410 Overlay). TxDOT has also adopted this publication as an appropriate design manual and city officials have encouraged TxDOT to implement the recommendations for projects in Harker Heights.

chapter 11

Financial Plan

Member entities of the Killeen-Temple MPO strive to keep the region's transportation system functioning by planning projects that will ensure it can handle the current and projected travel in the region. These proposed investments involve maintaining, operating, and expanding transportation facilities for a variety of modes. The financial plan is an analysis of the Killeen-Temple region's ability to fund these projects in the 25-year forecast period based on the estimations of future transportation dollars and by the assumptions of future growth and legislative changes.

FINANCIAL PLANNING

Federal regulations require the financial component of the Metropolitan Transportation Plan to demonstrate that the requested projects' cost does not exceed that amount which can be reasonably expected to be made available to the MPO in the next 25 years. When these costs do not exceed forecasted revenues, the financial plan is considered to be fiscally constrained. KTMPO demonstrates this compliance in the complete project listing, which can be found in **Appendix A**.

KTMPO prioritizes roadway projects in the MTP in accordance with the approved Project Selection Process (found in **Appendix B**). From the rank created from this process, KTMPO staff worked with the TAC and TPPB to finalize the project listing based on the following criteria identified in the adopted Project Selection Process. The Project Selection Process followed KTMPO goals to improve mobility; reduce congestion; improve access to jobs, homes, goods, and services; improve safety, reliability, and efficiency in the transportation system; promote a healthier environment; and encourage a regional coordination in decision making. In the past, project readiness was a priority and resulted in a decision by the TPPB to allocate Development Authority funds for projects. The TPPB also chose to reserve 10% of funding for transit projects. Projects which can be funded with the estimated available dollars are placed on a short and long-range plan list. Those projects which fall outside of the available funding limits are placed on the regionally significant-unfunded list.

Because of KTMPO's designation as a Transportation Management Area (TMA), it receives two additional dedicated sources of funding that are available for alternative transportation modes: Category 7—Surface Transportation Program—Metropolitan Mobility (STPMM), and Category 9—Transportation Alternatives Program (TAP). Scoring criteria was developed to specifically score alternative transportation modes and a separated ranked MTP list of livability projects was developed as well. For the transit element, the provider's federal, state, and local funding projection is provided.

REVENUE FORECAST METHODOLOGY

KTMPO is eligible for and expects to receive funding in categories 2M, 7, 9, and 11. KTMPO does not receive Category 5 Funds—Congestion Mitigation Air Quality since KTMPO is considered "in-attainment" in regards to ground-level ozone. With the status designation of TMA, KTMPO receives direct distributions for Metropolitan Mobility and Transportation Alternatives (Categories 7 and 9) which are included in the forecasted scenarios as well. Since the development of the 2040 MTP, Category 2 funds have been made available and as a result, projects were funded through FY 2020.

In regards to maintenance, non-traditionally funded transportation projects, statewide urban connectivity, bridge replacement, safety, supplemental transportation, and strategic priority (Categories 1, 3, 4, 6, 8, 10, and 12 respectively), placeholders for TxDOT grouped CSJ projects are provided in the MTP 2045 project listing. KTMPO participates in the use of grouped projects in cooperation with FHWA and TxDOT. TxDOT developed Grouped Project CSJ (Control-Section-Job) numbers for projects that are "not determined to be regionally significant" and typically includes non-mobility projects such as preliminary engineering, right of way, maintenance, rehab, bridges, safety, etc. This allows those projects to be grouped in one line item as permitted in Title 23 USC Section 135 Statewide Planning. For these categories, the MPO assumed that given a 25-year planning period, future allocations would reflect similarly on past allocations, allowing no additional funding for inflationary purposes.

FUNDING SCENARIO DEVELOPMENT AND SELECTION

The KTMPO region relies primarily on state and federal funding to implement regional transportation improvements. Considerable statewide needs coupled with rising fuel efficiency and an unstable transportation funding trend leave many future transportation funding questions unanswered. As a result, the Texas Transportation Institute (TTI) developed a model to estimate future state & federal highway revenues based upon user-specified assumptions and inputs. This model, called TRENDS (Transportation Revenue Estimation and Needs Determination System) forecasts state transportation revenues by year through the year 2045. In addition to requiring users to estimate the degree and timing of various tax and revenue changes, the model also requires users to estimate possible population growth and fuel economy scenarios. To estimate revenues available to the MPO for the MTP planning period of 2019-2045, the MPO utilized this model and developed possible funding scenarios by making certain assumptions on how funds would be distributed using previous practices and TxDOT's UTP. The scenarios that were developed include a **Baseline**, **Low**, **Medium**, and **High (With Local Option)**, which represent varying extremes of federal and state legislative changes that would generate increased revenue for transportation funding. For each scenario, the TRENDS model outputs a statewide revenue figure.

To determine the fiscal constraint for the 2045 MTP, staff prepared two options that were presented to TAC and TPPB for their input. Option #1 (Exhibit 11.1) used the same scenarios for the 2040 MTP and Option #2 (Exhibit 11.2) used the same scenarios as the 2040 MTP plus additional inputs that were developed by TTI since the last MTP update. These scenarios can be found on the following page. The 2045 MTP only includes Mobility scenarios since the funds for Maintenance projects are distributed by TxDOT.

Exhibit 11.1: Funding Scenario Option #1

Option #1: Same Outputs as 2040 MTP Update				
KTMPO KILLEEN-TEMPLE metropolitan planning organization	**Baseline**	**Low**	**Medium**	**High (Local Option)**
SCENARIO				
State Population Growth Rate	Low	Low	Low	High
Fuel Efficiency	Average	High	Average	Low
TxDOT Maintenance Standards by 2035	Current TxDOT Scenario	Current TxDOT Scenario	80% good or better condition	90% good or better condition
FEDERAL AND STATE OPTIONS				
State Gas Tax	No Increase	$0.02 increase in 2025 and $0.05 in 2035	$0.06 increase in 2025 and 2035	$0.10 increase in 2025 and 2035.
State Diesel Tax	No Increase	$0.02 increase in 2025 and $0.05 in 2035	$0.06 increase in 2025 and 2035	$0.10 increase in 2025 and 2035.
Federal Gas Tax	No Increase	$0.02 increase in 2025 and $0.05 in 2035	$0.06 increase in 2025 and 2035	$0.10 increase in 2025 and 2035.
Federal Diesel Tax	No Increase	$0.02 increase in 2025 and $0.05 in 2035	$0.06 increase in 2025 and 2035	$0.10 increase in 2025 and 2035.
TX Rate of Return on Federal Funds	Default (85%)	90%	95%	100%
Indexing the Gas Tax to CPI	No	No	Yes in 2035	Yes in 2025
% of State Gas Tax Increase to Transportation	Default (75%)	80%	85%	90%
Vehicle Registration Fees Increase	No Increase	$5 in 2025	$15 in 2025	$25 in 2025
State Vehicle Mile Traveled Tax	No	No	No	$0.001 per mile in 2025 and 2035 ($1 per 1,000 mi)
Add New Capacity Dollars	No	No	No	$5 Billion in 2035
LOCAL OPTIONS				
Local Option Gas Tax	None	None	None	$0.10 increase in 2030
Local Option Diesel Tax	None	None	None	$0.10 increase in 2030
Local Option Vehicle Registration Fee	None	None	None	$10 increase in 2030
Local Option Vehicle Mile Traveled Tax	None	None	None	$0.001 per mile in 2035 ($1 per 1,000 mi)

Exhibit 11.2: Funding Scenario Option 2

Option #2: 2040 Scenarios With New Inputs				
	Baseline	Low	Medium	High (Local Option)
SCENARIO				
State Population Growth Rate	Low	Low	Low	High
Fuel Efficicency	Average	High	Average	Low
TxDOT Maintenance Standards by 2035	Current TxDOT Scenario	Current TxDOT Scenario	80% good or better condition	90% good or better condition
Annual Percent Increase in Planning Expenses	Default (1%)	5%	10%	15%
Annual Percent Increase in Build Expenses	Default (1%)	5%	10%	15%
Annual Percent Increase in Maintenance Expenses	Default (1%)	5%	10%	15%
Annual Percent Increase in Use Expenses	Default (1%)	5%	10%	15%
Annual Percent Increase in Manage Expenses	Default (1%)	5%	10%	15%
Annual Percent Increase in cost of other agencies funded by TxDOT	Default (1%)	5%	10%	15%
Annual percent increase in contributions from TxDOT to Comptroller and Retirement	Default (1%)	5%	10%	15%
Annual percent increase in Category 1 Preventative and Routine Maintenance Expenses	Default (1%)	5%	10%	15%
Annual percent increase in Category 6 Bridge Maintenance	Default (1%)	5%	10%	15%
Annual percent increase in Category 7 STP Metro Mobility and Maintenance	Default (1%)	5%	10%	15%
Annual percent increase in Category 8 Federal Safety expenses	Default (1%)	5%	10%	15%
Annual percent increase in Category 9 Federal Enhancement expenses	Default (1%)	5%	10%	15%
Annual percent increase in Category 10 Supplemental Transportation Project expenses	Default (1%)	5%	10%	15%
Annual percent increase in Category 11 District Discretionary funding	Default (1%)	5%	10%	15%

FEDERAL AND STATE OPTIONS				
State Gas Tax	No Increase	$0.02 increase in 2025 and $0.05 in 2035	$0.06 increase in 2025 and 2035	$0.10 increase in 2025 and 2035.
State Diesel Tax	No Increase	$0.02 increase in 2025 and $0.05 in 2035	$0.06 increase in 2025 and 2035	$0.10 increase in 2025 and 2035.
Federal Gas Tax	No Increase	$0.02 increase in 2025 and $0.05 in 2035	$0.06 increase in 2025 and 2035	$0.10 increase in 2025 and 2035.
Federal Diesel Tax	No Increase	$0.02 increase in 2025 and $0.05 in 2035	$0.06 increase in 2025 and 2035	$0.10 increase in 2025 and 2035.
TX Rate of Return on Federal Funds	Default (85%)	90%	95%	100%
Indexing the Gas Tax to CPI	No	No	Yes in 2035	Yes in 2025
% of State Gas Tax Increase to Transportation	Default (75%)	80%	85%	90%
Vehicle Registration Fees Increase	No Increase	$5 in 2025	$15 in 2025	$25 in 2025
State Vehicle Mile Traveled Tax	No	No	No	$0.001 per mile in 2025 and 2035 ($1 per 1,000 mi)
Add New Capacity Dollars	No	No	No	$5 Billion in 2035
Percent of Revenue Enhancements Spent Maintenance	Default (25%)	30%	35%	40%
LOCAL OPTIONS				
Local Option Gas Tax	None	None	None	$0.10 increase in 2030
Local Option Diesel Tax	None	None	None	$0.10 increase in 2030
Local Option Vehicle Registration Fee	None	None	None	$10 increase in 2030
Local Option Vehicle Mile Traveled Tax	None	None	None	$0.001 per mile in 2035 ($1 per 1,000 mi)
Fuel Efficiency Assumption for Local Vehicles	None	None	None	Low
Bonding Options				
General Obligation Bond Amounts[1]				
Revenue Bonds[2]				

After the scenarios were developed, KTMPO ran the TRENDS model to decide projected funding for Categories 2, 7, 9 and 11 for years 2019-2045. Projected funding outputs were presented to both TAC and TPPB for Option #1 (Exhibit 11.3) and Option #2 (Exhibit 11.4).

Exhibit 11.3: Option #1 Funding Outputs

Revenue (In Millions)				
Baseline Scenario				
	Short Range[1]	**Long Range[2]**	**Total**	
Category 2	$0.00	$0.00	$0.00	
Category 7	$39.20	$71.90	$111.10	
Category 9	$5.00	$9.30	$14.30	
Category 11	$5.30	$10.20	$15.50	
Total	$49.50	$91.40	$140.90	
Low Scenario				
	Short Range	**Long Range**	**Total**	
Category 2	$5.20	$41.80	$47.00	
Category 7	$45.60	$133.80	$179.40	
Category 9	$6.60	$23.00	$29.60	
Category 11	$6.50	$19.10	$25.60	
Total	$63.90	$217.70	$281.60	
Medium Scenario				
	Short Range	**Long Range**	**Total**	
Category 2	$16.40	$115.80	$132.20	
Category 7	$59.70	$216.90	$276.60	
Category 9	$9.50	$41.60	$51.10	
Category 11	$8.50	$31.40	$39.90	
Total	$94.10	$405.70	$499.80	
High (Local Option) Scenario				
	Short Range	**Long Range**	**Total**	
Category 2	$36.20	$115.00	$151.20	
Category 7	$84.80	$440.90	$525.70	
Category 9	$15.20	$91.50	$106.70	
Category 11	$11.60	$64.40	$76.00	
Total	$147.80	$711.80	$859.60	

[1]Short Range: 2019-2028

[2]Long Range: 2029-2045

Exhibit 11.4: Option #2 Funding Outputs

Revenue (In Millions)				
Baseline				
	Short Range[3]	**Long Range[4]**	**Total**	
Category 2	$0.00	$0.00	$0.00	
Category 7	$39.20	$71.90	$111.10	
Category 9	$5.00	$8.70	$13.70	
Category 11	$5.30	$10.20	$15.50	
Total	$49.50	$90.80	$140.30	
Low Scenario				
	Short Range	**Long Range**	**Total**	
Category 2	$6.00	$45.70	$51.70	
Category 7	$46.90	$166.80	$213.70	
Category 9	$7.00	$27.00	$34.00	
Category 11	$7.40	$23.80	$31.20	
Total	$67.30	$263.30	$330.60	
Medium Scenario				
	Short Range	**Long Range**	**Total**	
Category 2	$17.00	$72.50	$89.50	
Category 7	$61.90	$313.30	$375.20	
Category 9	$10.20	$52.30	$62.50	
Category 11	$8.80	$44.90	$53.70	
Total	$97.90	$483.00	$580.90	
High (Local Option) Scenario				
	Short Range	**Long Range**	**Total**	
Category 2	$36.20	$294.00	$330.20	
Category 7	$84.80	$440.90	$525.70	
Category 9	$15.20	$91.50	$106.70	
Category 11	$12.10	$64.40	$76.50	
Total	$148.30	$890.80	$1,039.10	

[3]Short Range: 2019-2028
[4]Long Range: 2029-2045

After reviewing each estimated funding output for Categories 2, 7, 9, and 11, TPPB approved using the baseline scenario under Option #1 for the short-range funding and the medium scenario under Option #1 for the long-range funding for the 2045 MTP fiscal constraints as shown in Exhibit 11.5.

Exhibit 11.5: 2045 MTP Fiscal Constraints-Mobility Funding

2045 MTP Update-Mobility		
Short Range:	Baseline	$49,500,000
Long Range:	Medium	$405,700,000
Total:		$455,200,000

MAINTENANCE FUNDING PROJECTIONS

Both short and long-range maintenance forecasts were determined by the projected Categories 1, 6, and 8 as stated in the 2040 MTP. These amounts will be used as a placeholder for the 2045 MTP and are shown in Exhibit 11.6.

Exhibit 11.6: 2045 MTP Fiscal Constraints-Maintenance Funding

2045 MTP Update-Maintenance		
Short Range:	Medium	$165,803,999
Long Range:	Medium	$295,989,993
Total:		$461,793,992

TRANSIT FUND PROJECTIONS

Due to the progressing mileage and age of fixed route buses and complementary paratransit vehicles being used in service in the Killeen and Temple urbanized areas, HCTD projected the need and costs for replacement buses based on average annual miles, service life of existing vehicles, and increasing costs. KTMPO plans to continue allocating 10% of Category 7 funds for vehicle capital replacement projects for transit through 2045. **Appendix F** provides detailed information on estimated operating costs through 2045.

CONCLUSIONS

The fiscal constraint figures formulated in this section were determined by future funding projections generated by the TRENDS model. The fiscal constraint represents the most feasible funding scenario for the KTMPO region given the 25-year planning period. However, the future of transportation funding relies heavily on the actions of state and federal legislators and is subject to change and uncertainty.

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

Appendix A:

2045 MTP

Project Listing

2045 Metropolitan Transportation Plan Project Listing

Short Range Funded (2014-2023) Projects with Allocated Funding as of December 2018 and Listed in the Transportation Improvement Program (TIP)

MPO PROPOSITION 1/CATEGORY 2 PROJECTS (METROPOLITAN CORRIDORS)

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding Amounts
H15-02b	2304-02-036 2304-02-040	FM 2410	Roy Reynolds Dr to Commercial Drive	Widen from 2 to 4 lane roadway with sidewalks, median and turn lanes incorporating context sensitive design	N/A	N/A	N/A	$8,800,000	2017	Yes	N/A	FY15-FY17 MPO Proposition 1: $17,800,000
W40-02	0231-03-143	US 190	1.0 Mi W of FM 2410 to Knights Way	Widen main lanes from 4 to 6 lane divided freeway and ramp alignments	N/A	1	N/A	$9,000,000	2018	Yes	N/A	
W40-06	0231-03-145 0231-04-061	US 190	FM 3423 (Indian Trail) to FM 2410 in W Belton	Widen main lanes from 4 to 6 lane divided freeway and ramp alignments	87.45	1	1	$39,000,000	2019	Yes	H	FY18-20 Category 2: $84,000,000
C30-03b	0231-02-062	Business US 190 Phase I	FM 1113 (Avenue D) to Constitution Dr.	Construction of a raised median, bike lane and sidewalk on south side of project, and convert the north outside lane to a shared vehicle and bicycle lane to retain three travel lanes in each direction	81.00	4	4	$10,000,000	2020	Yes	EJ	
W40-05	0231-04-060	US 190	FM 2410 in W Belton to IH 35	Widen main lanes from 4 to 6 lanes and resurface	83.79	3	3	$35,000,000	2020	Yes	EJ	
W40-04a (1)	2502-01-021	Loop 121 Phase 1a	Lake Rd (FM 439) to US 190	Widen from 2 to 4 lane divided roadway with raised median	56.45	14	5	$28,000,000	2021	Yes	EJ, H, P	FY21-22 Category 2: $127,350,000
W35-07	0320-06-902	NW Loop 363	Lucius McClevey to Industrial Blvd	Construct interchange and expand 2 to 4 lanes with frontage roads	72.00	3	1	$45,000,000	2021	Yes	H	
W35-01	0231-19-003	US 190 Bypass	E of Copperas Cove to 0.5 mi W of Lampasas County Line	Widen from two lanes to four lanes divided and construct interchange	68.27	9	2	$48,150,000	2021	Yes	L, H,	
W45-01	0231-03-152	IH 14 Advanced Traffic Management System	Coryell County Line to FM 3423 (Indian Trail)	Construction of fiber optics, traffic cameras and Dynamic Message Boards	73.33	2	11	$6,200,000	2022	Yes	EJ, L, H	

COMBINED CATEGORY 2 AND CATEGORY 7 FUNDS

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding
W40-03	0231-03-146	US 190 Turnaround	At Clear Creek Rd	Roadway reconfiguration to improve turning movements (Turnaround)	42.11	42	6	$4,000,000	2018	No	EJ	FY18-20 Category 2 Funds ($2,100,000) and Category 7 Funds ($1,900,000): $4,000,000

CATERGORY 4 PROJECTS (STATEWIDE CONNECTIVITY)

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding
W35-12	0185-01-030	US 190 (Rogers Relief Route)	2.0 MI S of FM 436 in Heidenheimer to Milam County Line	Widen from 2 to 4 lane divided rural highway	45.56	36	38	$62,800,000	2019	Yes	H	FY19 Category 4 Funds: $62,800,000

CATEGORY 7 PROJECTS (SURFACE TRANSPORTATION PROGRAM-METROPOLITAN MOBILITY)

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding
H40-02	0909-36-153	Traffic Circle at Commercial Dr	Intersection of Commercial Dr and Heights Dr	Construct traffic circle at intersection of Commercial Dr and Heights Dr	40	6	5	$489,249	2018	No	EJ	FY15-17 Category 7 Funds: $15,530,684
K30-02	0909-36-156	Rosewood Dr Extension	Riverstone Dr to Chaparral Dr	Construction of a 4 lane roadway with center median with an off-system bridge	38	4	6	$7,965,049	2018	No	EJ, ARZ	
N40-01	2057-01-009	Main St Connectivity	Ave I to US 190 Frontage Rd	Construct ADA bicycle/pedestrian pathways along Main St and under US 190	31	3	3	$596,386	2018	No	N/A	
T35-24	0909-36-155	Prairie View Road Enhancements	W of SH 317 to N Pea Ridge	Construction of a 4 lane roadway, aligning FM 2483 to Prairie View Rd with a signalized intersection	39	5	4	$6,480,000	2017	Yes	N/A	

K40-27[1]	0836-02-073	SH 195	0.1 MI N of FM 3470 to 0.1 MI S of FM 3470	Turnaround underpass for northbound and southbound traffic on SH 195 frontage rads and FM 3470 (Stan Schlueter)	42.68	41	7	$800,000	2019	Yes	EJ	FY18-20 Category 7 Funds: $11,976,956
H35-01	0231-03-147	US 190 at FM 2410	East Central Tx Expy W to East Central Tx Expy East	Construction of a west to east turnaround at FM 2410	67.11	6	8	$5,000,000	2020	Yes	N/A	
T40-12	1835-02-058	31st St Sidewalks (FM1741)	Marlandwood Rd to Canyon Creek Rd	Installation of 6' sidewalks on both sides of FM1741	94.35	1	1	$500,000	2019	Yes	N/A	
T40-15	0184-03-039 0232-01-053	Adams Ave/Central Ave. Bicycle/Pedestrian Improvements	IH 35 to MLK Jr Blvd (Spur 290)	Construct shared use path for pedestrian and bicyclists	92.00	2	2	$1,300,000	2019	Yes	EJ, H	
C40-05	3128-01-013 3131-01-007	FM 116 & 3046 Sidewalks	Business 190 to Dennis St	Construct ADA compliant sidewalks and bike lanes	77.88	5	4	$975,000	2019	Yes	H, P	
C40-04c	0909-39-133	The Narrows (Charles Tillman Way)	Charles Tillman Way from Constitution Dr to Charles Tillman Way @ RG III Blvd	Construct shared use path for pedestrian and bicyclists	70.32	11	6	$170,000	2020	No	EJ, H	
S40-04a	2136-01-020	Main St Sidewalks Phase 1	Salado Plaza Dr to College Hill Dr (North End)	Main St. improvements to include lighting, sidewalks, & striping for bicycles	81.01	3	7	$1,616,956	2018	No	H, ARZ, ES	
A40-15	0909-36-162	Fleet Replacement Project	Killeen UZA	Purchase Buses	N/A	N/A	N/A	$1,615,000	2018	N/A	N/A	
T40-07a	0909-36-903	Temple Outer Loop West-Phase I	522 ft South of Jupiter to 454 ft South of Dove Meadow Blvd	Widen from 2 to 4 lanes divided roadway and curb and gutter, Phase 1	64.67	17	4	$10,298,198	2021	No	P, H	FY21-22 Category 7 Funds: 13,002,000
N40-04	0909-36-901	Nolanville City Park Connectivity	Park (North Mesquite) along Ave H to 10th Street	Construct 10' sidewalk, ADA ramps, and crosswalks; widen pavement by 32" with curb and gutter	72.34	6	3	$1,558,802	2021	No	P	
A45-01	0909-36-905	HCTD Fleet Replacement Project	Hill Country Transit, Killeen UZA-Two, Temple UZA-One	Purchase Buses to Provide Transportation	N/A	N/A	N/A	$1,145,000	2021	N/A	N/A	

COMBINED CATEGORY 7 AND MPO CATEGORY 9 PROJECTS

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding
C40-04a	0909-39-131	The Narrows (Constitution Drive)	Constitution Dr from Bowen Ave to 0.2 MI S Martin Luther King Jr. Blvd5	Construction of sidewalks for pedestrian/bicycle use5	72.78	8	9	$850,000	2020	No	EJ,H	FY 18-20 Category 7 ($360,000) and Category 9 ($490,000): $850,000

MPO CATEGORY 9 PROJECTS (TRANSPORTATION ALTERNATIVE PROGRAM)

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding
K40-23	0909-36-160	Heritage Oaks Hike and Bike Trail, Segment 3A	Rosewood Dr from Nickelback Dr to Pyrite Dr	Construction of a hike and bike trail with lighting	23	1	1	$800,000	2018	No	EJ, ARZ	FY15-17 Category 9 Funds: $800,000
C40-04b	0909-39-132	The Narrows (RG III at Old Copperas Cove Rd)	RG III Blvd. from Constitution Dr to Old Copperas Cove Rd at Constitution Dr.	Construct sidewalks for pedestrian/bicycle use	70.87	9	10	$680,000	2020	No	EJ, H	FY18-20 Category 9 Funds: $680,000
B45-03	0909-36-169	13th Avenue Sidewalk & Shared Use Path	Main St (SH 317) to Waco Road (FM 817)	Construct 5' sidewalks on the north side of 13th Ave from Main St to Woodall; Transition to 10' SUP from Woodall to Waco Rd	72.16	7	4	$423,611	2021	No	P	FY21-22 Category 9 Funds: $423,611

STATEWIDE CATEGORY 9 PROJECTS (TRANSPORTATION ALTERNATIVE SET-ASIDE PROGRAM)

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding
B40-04	0909-36-157	Chisholm Trail Corridor Hike and Bike Facility Phase II	University Blvd. 0.25 mile south of Crusader Way to Tiger Drive 0.10 mi north of Sparta Rd.	Construct sidewalks and shared use path--widths vary from 8 ft to 10 ft; includes landscaping and lighting.	N/A	N/A	N/A	$2,670,615	2018	No	N/A	FY15 Statewide TAP Funds: $6,118,899
K40-21a	0909-36-152	Killeen Heritage Oaks Hike and Bike Trail, Segment 4	Platinum Dr to Chaparral Rd	Construct shared use path for pedestrians and bicyclist	N/A	N/A	N/A	$3,448,284	2017	No	EJ, ARZ	
B40-05	0909-36-163	Belton Hike and Bike Trail Extension South (South Belton Shared Use Path)	IH 35 from FM 436 to Confederate Park Drive	Construct 12 ft wide hike and bike trail. Project will extend along FM 436, IH 35 northbound frontage road and Confederate Park Drive.	N/A	N/A	N/A	$1,790,570	2020	No	EJ, P	FY17 TASA Funds: $1,790,570

GROUPED PROJECTS

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	FY2017-2020 TIP	FY2019-2022 TIP
G01-PE	Various CSJs	Preventative Projects	Various Locations	Various Descriptions	$12,579,008	$0
G03-MT	Various CSJs	Maintenance Projects	Various Locations	Various Descriptions	$37,602,002	$20,009,216
G04-BR	Various CSJs	Bridge Projects	Various Locations	Various Descriptions	$3,125,284	$1,400,000
G06-SA	Various CSJs	Safety Projects	Various Locations	Various Descriptions	$497,599	$2,690,079

Proposed Roadway, Transportation Choices/Livability,Transit, and Preventative Maintenance Projects

ROADWAY PROJECTS[7]

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding[4]
W30-17	1835-01-026	FM 93 Phase 1 and 2	SH 317 to Wheat Rd	Widen from 2 to 4 lane roadway with a bike lane and 6 foot sidewalks	64.81	16	3	$8,794,843	2023	Yes	EJ, H, P	Short Range Funding: $46,096,645
T40-07b	0909-36-174	Temple Outer Loop West Phase II	454 ft South of Dove Meadow to IH-35 S	Widen from 2 to 4 lanes with divided roadway and curb and gutter; includes hike & bike trail and bike dedicated lanes to incorporate multimodal transportation	64.67	17	4	$9,701,802	2027	No	P, H	
K30-13	0909-36-175 0909-36-172	Chaparral Rd	SH 195 to FM 3481 (Stillhouse Hollow Lake Rd)	Reconstruct and widen roadway from 2 to 4 lane divided roadway with bicycle and pedestrian facilities.	59.99	27	5	$23,000,000	2023	No	EJ, H	
D40-01	N/A	North Waco Rd (Old 81)	West Main St to West Big Elm	Widen from 2 to 4 lanes, with curb and gutter, bridge improvements	52.64	44	6	$4,600,000	TBD	No	___	
H30-05	0909-36-171	Warriors Path Upgrade	FM 2410 (Knights Way) to Old Nolanville Rd	Create a two lane road section with a left turn lane at future school, curb and gutter, 6 ft sidewalk on west side and a 10ft wide hike/bike path on east side	48.17	50	7	$8,968,950	2025	No	H	Long Range Funding: $378,524,579
N40-03	N/A	Old Nolanville Road Bridge Expansion and Bike/Pedestrian Project	Bridge on Old Nolanville Rd to US 190/IH 14	Reconstruct bridge on Old Nolanville Road and add multi-use trail system to connect to existing trail system.	49.84	46	8	$1,602,700	TBD	No	___	
S40-03	N/A	Salado West Village Road Capacity and Enhancement Project	Thomas Arnold Rd to IH 35	Widening roadway, add turn lanes and bike/ped facilities	36.45	66	9	$300,500	TBD	No	___	
T15-06k	N/A	IH 35	US 190/IH 14 to Loop 363	Reconstruct and widen to 8 lanes	78.27	1	10	$129,700,000	TBD	Yes	EJ, H	
C35-02ab[5]	N/A	FM 116 Railroad Underpass	S Main (through existing parking facility) to Ave B	Create an underpass at the existing BNSF railroad with sidewalks	71.73	4	12	$13,470,000	2023	Yes	EJ	
W25-02	N/A	SH 36	SH 317 to Lake Belton Bridge	Widen from 2 to 4 lane divided roadway	71.63	5	13	$36,715,000	TBD	No	P	
W35-04	N/A	FM 439	Roy Reynolds Drive to FM 3219	Widen from 4 to 6 lanes	70.27	6	14	$11,539,000	TBD	No	EJ	
H45-03	N/A	FM 3481 (Stillhouse Lake Road) Phase 1	Prospector Trail to Proposed Chaprarral Road Intersection	Widen roadway from 2 to 4 lanes with a continous center turn lane with sidewalks	69.33	7	15	$6,566,500	2024	No	H, ARZ, P	
W30-23	N/A	US 190/Loop 363	Spur 290 to SH 95	Upgrade to 4 lane freeway with continous frontage roads and grade separation at MLK Blvd	68.36	8	16	$16,784,000	TBD	Yes	EJ	
C30-03a	N/A	Business US 190 - Phase II	FM 1113 (Ave D) to FM 116 South	Convert the center turn lane to a controlled left turn lane with raised median, maintain the two existing travel lanes, add curb and gutter on north and south sides of the roadway, 6' sidewalk on the south side right-of-way, pedestrian crossings with curb ramps at street intersections, bicycle lanes on the outside travel lanes.	68.16	10	17	$7,400,000	2022	Yes	EJ	
W35-08	N/A	FM 93	FM 1741 to SH 95	Widen from 2 to 4 lanes, provide for a raised median and construct grade separation at UP RR	66.44	11	18	$12,588,000	TBD	Yes	H	
H45-01	N/A	E. FM 2410 (E. Knights Way) Phase 1	Cedar Knob Rd to Warriors Path	Widen from 2 to 4 lanes with a continous turn lane with curb and gutter and sidewalks	66.35	12	19	$5,561,600	TBD		___	
W30-13	N/A	FM 2484	FM 1670 to IH 35	Widen from 2 to 4 lane divided roadway	65.99	13	20	$3,147,000	TBD	No	P	
W30-21	N/A	Loop 363 at FM 2305 (Adams Ave) Reconfiguration	Intersection of Loop 363 and FM 2305 (Adams Ave)	Reconstrct interchange at FM 2305 (Adams Ave) and LP 363	65.45	14	21	$18,000,000	TBD	Yes	EJ	
K40-24	N/A	Featherline Drive	Stagecoach Rd to Chaparral Rd	Widen from two to four lanes with a center turn lane and roundabouts at Featherline Rd and Stagecoach Rd and Stagecoach Rd at W.S. Young Drive	65.00	15	22	$9,000,000	2025	No	EJ	
H15-01	N/A	FM 3423 (Indian Trail)	Business 190 (VMB) to US 190/IH 14	Construct an urban cross-section roadway with sidewalks, median and pedestrian enhancements within the appropriate context senisitive cross section	64.55	18	23	$3,391,800	TBD	No	___	
T35-36a	N/A	S. 1st Street/Spur 290 Improvements	SE Loop 363 to Ave M	Widen from 4 lane undivided to 4 lane divided roadway with curb and gutter, hike and bike traills and will incorporate multimodal design	64.45	19	24	$8,500,000	TBD	Yes	EJ	
K40-11	N/A	WS Young Drive	Mall Dr to AJ Hall Blvd	Add turn lane and relocate traffic signal at Mall Dr to AJ Hall Blvd	64.09	20	25	$4,889,549	TBD	Yes	EJ	
N40-06	N/A	Nolanville Railroad Crossing Safety	Pleasant Hill Cemetary Rd to Jack Rabbit Road (4 RR Crossings)	Upgrade crossings for better connections and safety	63.18	21	26	$500,000	TBD	No	___	
D40-03	N/A	Old TX 81 - Phase I	FM 1237 to Loves Overpass	Widen from 2 to 4 lanes with bicycle lanes and curb and gutter	61.55	22	27	$3,500,000	TBD	No	H	
H45-04	N/A	FM 3481 (Stillhouse Lake Road) Phase 2	Proposed Chaparral Road Intersection to South City Limits	Widen roadway from 2 to 4 lanes with a continous center turn lane with sidewalks	60.84	24	28	$6,306,620	TBD	No	H, ARZ, P	
K40-16	N/A	East Trimmier Rd Improvements	Stagecoach Rd to Chaparral Rd	Widen roadway from 2 to 4 lanes with a continous center turn lane with sidewalks and bike lanes	60.84	23	29	$7,000,000	TBD	No	EJ	
H30-01	N/A	Business US 190 (Veterans Memorial Blvd)	N Roy Reynolds to US 190/IH 14	Reduce roadway profile, install curb & gutter, access management/driveway control, drainage improvements, sidewalks, medians and other context sensitive solutions	60.19	26	30	$5,000,000	TBD	No	EJ, L, H	
B40-10	N/A	FM 1670	US 190 to Three Creeks Boulevard	Widen from 2 to 4 lane roadway with a 10' hike and bike trail	59.45	28	31	$5,643,360	TBD	No	EJ, H	
W35-02	N/A	SH 195 at FM 3470 (SS Loop) Reconstruction	Intersection of SH 195 at FM 3470 (SS Loop)	Upgrade Interchange	59.17	29	32	$52,450,000	TBD	Yes	EJ	

T45-16	N/A	South 1st Street Extension	Loop 363/US 190 to Blackland Rd	Constuct arterial thoroughfare with street trees, sidewalks and bicycle lanes.	58.49	30	33	$10,830,000	2020	No	___	Regionally Significant Unfunded List
K25-04	N/A	SH 195 Overpass	At Business 190	Construct grade separation over Business 190 and BNSF RR	58.35	31	34	$20,000,000	TBD	Yes	EJ	
B40-11	N/A	FM 2271 (Lake to Lake Road)	FM 1670 to FM 2271	Construct 4 lane roadway with 10' wide trail	57.74	32	35	$49,700,000	TBD	No	EJ, H, P	
T45-15	N/A	Temple Outer Loop - East	IH 35 N to FM 93 at Business 190	Construction of a 4 lane divided roadway and curb and gutter; includes hike & bike trail and bike dedicated lanes to incorporate multimodal transportation	57.34	33	36	$74,000,000	2023	No	EJ	
B40-07	N/A	Connell Street	US 190/IH 14 to Loop 121	Widen from 2 to 4 lanes with center turn lane and 5' wide sidewalks	56.64	34	37	$5,244,000	TBD	No	EJ	
W35-09	N/A	FM 93	SH 95 to SH 36	Widen from 2 to 4 lanes, provide for a raised median	56.37	35	38	$5,245,000	TBD	Yes	EJ	
K40-26	N/A	Cunningham Rd	US 190/IH 14 to Little Nolan Rd	Construct and widen from 2 to 4 lane road with shoulder, median turn lane, with bike/ped facilities	56.27	36	39	$7,817,350	TBD	No	EJ	
K40-03	N/A	FM 3470 Extension	SH 201 (Clear Creek Rd) to US 190 Bypass	Construct 4 lane FM Road with continous turn lane and shoulders	56.17	37	40	$15,000,000	TBD	No	H	
H45-02	N/A	E. FM 2410 (E. Knights Way) Phase 2	Warriors Path to Rummel Rd	Widen from 2 to 4 lanes with a continous turn lane with curb and gutter and sidewalks	55.84	38	41	$5,149,800	TBD	No	L	
K40-17	N/A	Trimmier Road Improvements	Stagecoach Rd to Chaparral Rd	Widen from 2 to 4 lanes with a median	55.34	39	42	$7,900,000	TBD	No	EJ, P	
K30-23	N/A	Jasper Bridge Expansion	S Florence Rd to Jasper Dr	Construct 8 lane overpass with pedestrian improvements with turnarounds	54.99	40	43	$24,628,150	TBD	No	EJ	
K25-05	N/A	Florence Rd	Elms Rd to Jasper Dr	Widen from 2 to 5 lane section with curb and gutter	54.72	41	44	$6,292,450	TBD	No	EJ	
B40-08	N/A	Sparta Road	Loop 121 to Dunn's Canyon Rd	Construct protected turn lane with 10' wide hike and bike trail	54.46	42	45	$2,080,000	TBD	No	H, P	
W35-05	N/A	SH 195 at US 190/IH 14	At SH 195	Upgrade interchange	54.36	43	46	$52,450,000	TBD	Yes	EJ	
T15-02	N/A	Kegley Road (Phase 2)	856 ft S of FM 2305 to 450 ft S of Wildflower Lane	Widen and add middle turn lane, curb and gutter, includes 12' shared use path and will incorporate multimodal design	51.63	45	47	$3,800,000	TBD	No	H	
T45-13	N/A	Little River Road	SE HK Dodgen Loop to FM 93	Reconstruct two lane arterial roadway with center-turn lane, bike lanes and 6' sidewalks	49.84	46	48	$12,888,000	TBD	No	EJ	
K40-25	N/A	Bunny Trail/SH 201 (Clear Creek Rd) Traffic Signal	Intersection of Bunny Trail and SH 201 (Clear Creek Rd)	Install traffic signal	49.36	48	49	$190,000	TBD	Yes	EJ	
W35-03	N/A	SH 195	FM 3470 (SS Loop) to Chaparral Rd	Reconstruct to 4 lane freeway with frontage roads	48.45	49	50	$39,862,000	TBD	Yes	EJ, H	
B40-02	N/A	Southwest Parkway	Loop 121 to W Ave O	Construct 2 lane roadway with center turn lane	48.10	51	51	$4,200,500	TBD	No	___	
N45-01	N/A	FM 439 Roundabout	Intersection of Main St (FM 439 Spur) and Avenue I	Construction of a roundabout	47.83	52	52	$10,000,000	2022	No	___	
T45-11	N/A	East Young Avenue	Lower Troy Rd to Loop 363	Reconstruct and realign roadway from 2 to 4 lanes with a 6 ft. wide sidewalk and a center turn lane.	47.50	53	53	$3,940,000	2023	No	EJ	
K40-06	N/A	FM 2484	SH 195 to IH 35	Widen from 2 to 4 lane divided roadway	45.08	54	54	$35,000,000	TBD	No	H, ARZ, P	
B30-02	N/A	Shanklin Road West - Outer Loop	IH 35 to east end of Three Creeks subdivision	Construct 4 lane roadway	44.82	55	55	$10,820,000	TBD	No	___	
B40-09	N/A	West Avenue D	Loop 121 to Wheat Rd	Construct 2 lane roadway with sidewalks and bike lanes	44.09	56	56	$4,918,500	TBD	No	EJ	
N45-03	N/A	Nola Ruth Reconfiguration	Intersection of Nola Ruth Blvd at US 190/IH14	Improve intersection to enhance safety	43.84	57	57	$10,000,000	2025	No	___	
B30-03	N/A	Belton Outer Loop East	IH 35 at Shanklin Rd to FM 436	Construct 2 lane roadway with shoulder	43.46	58	58	$12,060,000	TBD	No	___	
B40-01	N/A	Huey Drive	Washington Dr to IH 35 Frontage Rd	Construct 2 lane roadway with center turn lane	42.92	59	59	$2,615,000	TBD	No	EJ	
T45-17	N/A	Azalea Drive	Lowes Dr to S. 1st St. Future Extension	Construct new two-lane roadway with a continous center turn lane, 5' bike lanes, and 6' sidewalks	42.50	60	60	$4,975,000	2020	No	EJ	
B30-01	N/A	George Wilson Extension	FM 93 at George Wilson Rd to FM 439	Construct 2 lane roadway with shoulder	42.19	61	61	$1,386,984	TBD	No	EJ	
H30-03	N/A	FM3219	Veterans Memorial Blvd/Business 190 to FM 439	Widen from 2 to 4 lane divided roadway	42.10	62	62	$8,000,000	TBD	No	L,H	
B45-08	N/A	Mesquite Road Improvements	I-35 Frontage Rd to Shanklin Rd	Widen to 2 lanes with curb and gutter, shoulders/bike lanes, and 6 ft wide sidewalk on both sides.	41.50	63	63	$3,591,000	2020	No	H	
N45-02	N/A	FM 439 Shoulder Improvements & Bike Lanes	N. 38th St to Sparta Rd	Construct a continous shoulder/bike lane.	38.17	64	64	$1,600,000	2020	Yes	EJ, P	
N40-07	N/A	Warrior's Path Extension Phase I	Old Nolanville Rd to US 190/IH 14	Extend Warriors Path to US 190/IH -14	38.08	65	65	$5,703,255	TBD	No	H	
T45-10	N/A	East Avenue C	14th St to 24th St	Reconstruct roadway to 2 lanes and add bike lanes, sidewalks, lighting, and landscaping.	35.17	67	66	$2,630,000	2023	No	EJ	
T45-12	N/A	Lake Pointe Drive	SH 317 to Clinite Grove (Future Collector)	Construct 2 lane roadway with bike lanes and sidewalks	33.49	68	67	$4,000,000	2023	No	___	
T45-14	N/A	Lower Troy Road	East Young Ave to Loop 363	Reconstruct roadway to 2 lanes with a continuous center-turn lane and 6 ft sidewalks	29.33	69	68	$6,920,000	2023	No	EJ	

H40-03[6]	N/A	Chaparral Road	FM 3481 to Killeen City Limits on Chaparral Rd	Widen and straighten roadway and construct hike/bike trail	N/A	N/A	N/A	N/A	N/A	No	H	Unscored/Unfunded List
C25-02	N/A	FM 1113	Signal Light at FM 116/Ave B to Summers Rd	Widens from 2 to 4 lanes with ADA-Compliant sidewalks	N/A	N/A	N/A	N/A	N/A	No	H	
C25-04	N/A	North Side Loop	FM 1113 to FM 116	Widen from 2 to 4 lanes with raised median curb and gutter with enclosed storm drainage	N/A	N/A	N/A	N/A	N/A	No	—	
C40-01	N/A	FM 116 South	Copperas Cove City limits to SH 201	Upgrade Ivy Gap Rd and Ivy Mountain Rd to FM status, widen roadway from 2 to 5 lanes with curb and gutter	N/A	N/A	N/A	N/A	N/A	No	EJ, L, H, ARZ	
H40-04	N/A	E FM 2410	East side from FM 2410 Community Park to Simmons Rd	Expand roadway to include curb & gutter, access management control, turning lanes, drainage improvements, and context sensitive solutions	N/A	N/A	N/A	N/A	N/A	No	EJ, L, H	
N40-08	N/A	Warrior's Path Extension Phase II	US 190 to FM 439	Construct 2 lane roadway	N/A	N/A	N/A	N/A	N/A	No	—	
N40-10	N/A	FM 439 Safety Improvements	FM 439 at Lonesome Oak Dr	Add turning lane, shoulder expansion and possible traffic signals/signs	N/A	N/A	N/A	N/A	N/A	No	—	
W30-06	N/A	SH 201 @ Killeen Airport	Killeen Airport Entrance	Construct interchange	N/A	N/A	N/A	N/A	N/A	Yes	EJ, H	
W40-04a2	N/A	Loop 121 Phase 1b	US 190 to IH 35	Widen from 2 to 4 lane divided roadway with raised median	N/A	N/A	N/A	N/A	N/A	Yes	EJ, H, P	
W40-04b	N/A	Loop 121 Phase 2	IH 35 to FM 436	Widen from 2 to 4 lane divided roadway with bike/ped improvements	N/A	N/A	N/A	N/A	N/A	No	EJ, H, P	

TRANSPORTATION CHOICES/LIVABILITY PROJECTS[8]

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding[4]
T40-13	0909-36-173	Temple's Georgetown Rails to Trails	S. 5th St to FM 93	Construct 10 ft wide hike/bike trail	84.73	3	2	$2,000,000	2026	No	EJ, H, P	Short Range Funding: $5,099,965
D40-02	N/A	North Waco Rd. (Old 81) - Sidewalk	West Main St to West Big Elm	Construct 10' wide pedestrian/bicycle facility	69.02	11	5	$1,700,000	2027	No	___	
K45-01	N/A	Heritage Oaks Hike & Bike Trail Segment 2	Stiltstone to Fawn Dr	Construct shared use path for pedestrian and bicyclists	58.57	26	6	$1,200,000	2020	No	EJ	
S40-02	N/A	Salado Creek Off-Road Trail: Pace Park	Pace Park along Pace Park Rd	Construct 10 ft wide trail	57.44	27	7	$199,965	TBD	No	ARZ, ES, P	
B45-01	N/A	Belton's Georgetown Rails to Trails	E Ave. B to Leon River Bridge	Construct 10 ft. wide shared use path to connect KTMPO projects B40-05 and T40-13	86.01	2	8	$2,040,000	TBD	No	EJ, H	Long Range Funding: $26,937,064
T45-02	N/A	Downtown Sidewalks - 1st and 3rd Street	Mayborn Civic Center to Avenue F	Construct and repair sidewalks with ADA-compliance ramps, crosswalks and landscaping	75.42	4	9	$2,720,000	TBD	Yes	EJ, P, H	
B45-02	N/A	6th Avenue Sidewalk & Shared Use Path	Main St (SH 317) to I-35 Frontage Rd	Construct 6 ft. wide sidewalk on north side of 6th Ave, 10 ft. wide SUP on the south side and relocate utilities underground.	73.44	5	10	$6,000,000	TBD	Yes	EJ, L	
B45-05	N/A	Commerce/Industrial Shared Use Path	Sparta Rd to Main St (SH 317)	Construct 10 ft. wide shared use path on east side of Commerce St and north side of Industrial Park Rd; provide curb and gutter along Commerce St	72.15	8	11	$1,233,333	TBD	No	H	
B40-12	N/A	Belton Hike and Bike Trail Extension Southwest	Confederate Park to Nolan Creek Pedestrian Bridge	Construct 10 ft. wide hike/bike trail	71.08	9	12	$3,252,480	TBD	No	EJ, H, P	
T45-03	N/A	East Central Sidewalks	MLK Drive to N. 22nd St.	Construct 6 ft wide sidewalks, repair existing sidewalks with crosswalks and landscaping.	69.29	10	13	$600,000	TBD	No	EJ, P	
B45-04	N/A	Beal Street Sidewalk	E 24th Ave to E. 6th St.	Construct 5' sidewalk on east side from E. 24th Ave to Downing St, construct 5' sidewalk on both sides from E 13th Ave to Railroad Track, and construct 5' sidewalk on west side from railroad track to E. 6th Ave with bicycle signage along entire project	69	12	14	$282,500	TBD	No	EJ, P	
T45-08	N/A	West Adams Sidewalks	Olaf Drive to IH 35	Construct 6 ft wide sidewalk	68.71	13	15	$950,000	TBD	Yes	EJ	
T45-06	N/A	South Pea Ridge Greenbelt Trail	West Adams Ave (FM 2305) to Poison Oak Rd	Construct 8 ft wide trail along linear park east of S. Pea Ridge Rd and through Von Rosenberg Park	66.57	14	16	$1,680,000	2023	No	P	
T40-25	N/A	Bird Creek Interceptor Trail	N side of Lions Community Park to Midway Dr (near Bonham Middle School)	Construct 8 ft wide trail	66.43	15	17	$375,000	TBD	No	P	
B45-07	N/A	Avenue H Sidewalk/Road Improvements	Main St (SH 317) to Saunders St.	Construct 5' wide sidewalk on north side of Ave H with Bicycle Signage and reconstruct roadway and widen to 2 lanes from Connell St. to Saunders St.	66	16	18	$429,167	TBD	No	EJ	
T45-09	N/A	Apache Drive Sidewalks	West Adams Ave (FM 2305) to Gila Trail	Construct 6 ft. wide sidewalks and crosswalks	65.84	17	19	$325,000	2023	No	EJ	
T45-07	N/A	Temple Lake Park Connection	FM 2271 to Temple Lake Park	Construct 8 ft wide hike and bike trail	64.56	18	20	$2,640,000	2023	No	P	
T25-05	N/A	FM 2271 Trail	FM 2305 to Miller Spring Park	Construct 8 ft wide trail	63.88	19	21	$950,000	TBD	Yes	H, P	
T45-04	N/A	Friars Creek Trail	Friars Creek Trail Terminus to S. 1st St. Future Extension	Construct 10 ft wide hike/bike trail to extend and connect to extisting trail sections.	63.85	20	22	$500,000	2023	No	___	
N40-05	N/A	FM 439 Spur Connectivity	Main St to North Dr	Construct 10' wide sidewalk, ADA ramps and crosswalks, improve shoulders at Main St	63.71	21	23	$967,500	TBD	No	___	
T45-01	N/A	Canyon Creek Trail	Canyon Creek Dr to Lions Park	Construct 8' hike & bike trail	62.58	22	24	$720,000	2023	No	P	
S40-01	N/A	Salado Creek Shared Use Path - Royal Street	Main St at College Hill Dr to 0.09 mi N of Royal St on Center Circle	Construct alternate transportation route consisting of shared-use path for pedestrians and bicyclists	62.42	23	25	$368,959	TBD	No	ARZ, H, ES	
T45-05	N/A	Hickory Road Sidewalk	Midway Dr to Aspen Trail	Construct 6' sidewalk with crosswalks	61.43	24	26	$500,000	TBD	No	P	
B45-06	N/A	Central Avenue Sidewalk & Traffic Signals	Main St (SH 317) to Pearl St	Upgrade to a 5 ft. wide sidewalk on north side of Central Ave and install pedestrian crossing infrastructure at intersection of Main St (SH 317) to Pearl St.	59.29	25	27	$403,125	TBD	No	___	
N40-09	N/A	Pleasant Hill Rd	Lonesome Oak Drive to Ave I	Construct Class 2, buffered on-street bike lane	N/A	N/A	N/A	$500,000	N/A	No	H	Unscored/Unfunded List
N40-11	N/A	Nolan Creek Off System Trail	Bridge on Old Nolanville Rd to Levy Crossing	Construct 10 ft. multi-use trail boarding Nolan Creek	N/A	N/A	N/A	N/A	N/A	No	H	
N40-12	N/A	Jack Rabbit Road Bike Thoroughfare	US 190 to FM 439 and through Park to School	Add Class 2 Bike Lanes on system	N/A	N/A	N/A	N/A	N/A	No	___	
N40-13	N/A	Wild Wood Trail	Lonesome Oak Drive to Ave I	Construct an 8 ft. wide multi use trail	N/A	N/A	N/A	$400,000	N/A	No	___	
S40-04b[1]	N/A	Main St Sidewalks Phase 2	College Hill Dr to Salado Plaza Dr	Main St improvements to include pavement widening, bike paths, drainage improvements.	N/A	N/A	N/A	$2,223,044	N/A	No	H, ARZ, ES	
K40-21b	N/A	Heritage Oaks Hike & Bike Trail Segment 5	Chaparral Rd	Construct shared use path for pedestrian and bicyclists	N/A	N/A	N/A	$1,300,000	N/A	No	EJ, ARZ	

TRANSIT PROJECTS

KTMPO ID	CSJ Number	Project Name	Project Limits	Project Description	Project Score[1]	Project Ranking[1]	Prioritized List[1]	Estimated Cost	Estimated Let Date	CMP Network[2]	Environmental Considerations[3]	Funding[4]
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

GROUPED PROJECTS

Short Range Funded (2019-2028)

KTMPO ID	Project Name	Description		Funding
G01-PE	Preventative Projects	Various Locations	Grouped CSJ Placeholder	Short Range Funding: $165,803,999
G03-MT	Maintenance Projects	Various Locations		
G04-BR	Bridge Projects	Various Locations		
G06-SA	Safety Projects	Various Locations		

Long Range Funded (2029-2045)

KTMPO ID	Project Name	Description		Funding
G01-PE	Preventative Projects	Various Locations	Grouped CSJ Placeholder	Long Range Funding: $295,989,993
G03-MT	Maintenance Projects	Various Locations		
G04-BR	Bridge Projects	Various Locations		
G06-SA	Safety Projects	Various Locations		

Notes:

[1]Project score, project ranking and prioritized list is based on the scoring criteria at the time those projects

[2]CMP network is based on the network when that project was selected for funding and/or when project was submitted to KTMPO.

[3]Environmental considerations is based on the environmental conditions when that project was selected for funding and/or when project was submitted to KTMPO. Use key below for identification purposes.

Environemntal Considerations	
Symbol	
EJ	Environmental Justice Community of Concern
L	Landfill
H	Cemeteries, Archaeological Sites, Historical Markers
ARZ	Aquifer Recharge Zone
ES	Endangered Species
P	Park

[4]Fiscal Constraints are determined by inputs into the TRENDS model as approved on March . Short range funding is estimated funding for FY2019-2028 and Long Range Funding is estimated funding for FY2029-2045

[5]Project is a combination between C35-02a and C35-02b. Projecct C35-02b was the top prioritized livability project.

[6]Project H40-03 Chaparral Rd original score, project ranking, and prioritized list order was 60.51, 25 and 30 respectively.

[7]KTMPO received a total of 69 roadway projects with an estimated total cost of $1,008,785,911. Roadway prioritized list was recommended by TAC on November 28, 2018. During this process, five bonus points were added to projects that lie on a freight corridor as notated in the Regional Multimodal Plan as approved by TPPB on October 24, 2018. After assigning bonus points, each submitting entities' top roadway project was moved to the top of the list. The order was based on the total number of points for those top roadway projects. All remaining projects were ranked based on total project score. Other changes to the ranked list included swapping projects N40-03 and H30-05 and moving project H40-03 to the unfunded list since K30-13 overlaps with this project. Each change was discussed and agreed to during the 11/28/2018 TAC meeting. Prioritize list is not the order of funding and allocation of funds is based on various factors such as but not limited to project ranking, project readiness, funding availability and project need. During discussion, it was decided that project T15-06k will retain its rank, however, this project will be skipped if this project is a candidate for funds.

[8]Note: KTMPO recieved a total of 27 livability projects with an estimated total cost of $34,939,442. Livability ranked list was recommended by TAC on November 28, 2018. During this process, five bonus points were given to projects that were deemed a priority by BPAC (C35-02b, T40-13, N40-04, B45-01, and B45-05). Bonus points were proposed to projects B45-03 and B45-05 from the City of Belton based on fatalities that occurred in 2018 along these routes. Crash rates were calculated based on data from 2013-2017. Project B45-03 recieved four bonus points as discussed by TAC at the November 28, 2018 meeting. Project B45-05 would've recieved bonus points to accomodate the fatality along this route, however, this project was given the maximum number of bonus points since this project was a BPAC priority route. After bonus points were assigned each submitting entities top livability project was moved to the top of the list. Each submitting entites top priority livability project was ranked based on total score. Prioritize list is not the order of funding and allocation of funds is based on various factors such as but not limited to project ranking, project readiness, funding availablity, and project need.

MTP Amendment Dates

January 21, 2015	November 16, 2016	December 21, 2017*
November 18, 2015	June 21, 2017	March 14, 2018
January 20, 2016	July 5, 2017*	October 24, 2018
April 20, 2016	August 28, 2017*	January 16, 2019
August 17, 2016	November 16, 2017*	17-Apr-19

* Administrative Amendments

Appendix B:

MTP Scoring Process

Mobility 2045 Metropolitan Transportation Plan Call for Projects

General Information

The Killeen – Temple Metropolitan Planning Organization, hereinafter referred to as KTMPO, serves as the planning organization for the federally designated Transportation Management Area located in the Central Texas area. The KTMPO boundary covers all of Bell County and parts of Lampasas and Coryell Counties along with portions of Fort Hood. The Central Texas Council of Governments (CTCOG) serves as the lead staffing agency for the KTMPO Transportation Planning Policy Board (TPPB).

KTMPO is issuing a Call for Projects (CFP) as part of the update of the Mobility 2045 Metropolitan Transportation Plan (MTP). Projects representing all modes of transportation are requested to include roadway, bike and pedestrian, transit, and other eligible activities. Projects included in the MTP will be funded through various sources at the local, state, and federal levels based on established priority and funding availability. These funding sources include Surface Transportation Metropolitan Mobility and Transportation Alternatives funding, other FAST ACT programs, etc. These projects are anticipated to be needed within the 25 year planning horizon of the MTP.

This CFP describes a detailed process for submission of a project. The projects will be evaluated and scored by the KTMPO Staff or designee (objective criteria) and Technical Advisory Committee (TAC) (subjective criteria). Projects will be ranked based upon the scores and the TAC will provide a recommendation to the TPPB. Final approval of the prioritized project list will be made by the KTMPO TPPB. Projects will be evaluated based on the scoring criteria provided in this project call packet.

The CFP is available on the KTMPO website at www.ktmpo.org. Any revisions or updates to the CFP will be posted on the KTMPO website. Questions about the CFP may be sent via email to John Weber at john.weber@ctcog.org. Questions will be addressed upon receipt and will be posted on the KTMPO website. Questions about the CFP must be submitted to KTMPO by Friday, August 17, 2018.

All submittals must be received by the KTMPO **by 12 noon CST on August 31, 2018,** via physical electronic media or email. For large files, contact us for options using FTP or file-sharing services. Electronic responses must be formatted for 8 ½” x 11”, 8 ½” x 14” or 11” x 17” output only. Hard copies will not be accepted.

Submission of Project Proposals – Electronic Media

By Mail
Central Texas Council of Governments
Attention: John Weber
P.O. Box 729
Belton, Texas 76513

Hand Delivery
Central Texas Council of Governments
Attention: John Weber
2180 North Main
Belton, Texas 76513

By Email: john.weber@ctcog.org

KTMPO Project Scoring Process

The Project Selection Process fulfills several needs in the metropolitan planning process. In order to spend federal dollars on local transportation projects and programs, a metropolitan area must have a long-range Metropolitan Transportation Plan (MTP) and short-range Transportation Improvement Program (TIP). Federal and State regulations require both of these documents to be performance-based and financially constrained. Fiscal constraint has been a key component of transportation planning and program development since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991.

The MTP is a long-range plan, normally 20 to 25 years, which outlines the long-term goals for the region's transportation system.

The long-term goals of the MTP include:

- Improve mobility;
- Reduce congestion;
- Improve access to jobs, homes, goods, and services;
- Improve safety, reliability, and efficiency in transportation system;
- Promote a healthier environment;
- Encourage a regional coordination in decision making.

The MTP includes a list of projects that, over the long term, will meet the objectives of the plan. The projects listed in the MTP are grouped into three component project lists: a short range plan, a long range plan, and a regionally significant-unfunded plan.

Fiscal constraint means that the cost of those projects selected for inclusion in the MTP's planning horizon must reasonably match the expected funding levels for that time period. The cost of those projects included in the 10 year short range plan cannot exceed projected funding available during that 10 year period. Projects that are advanced to the four-year TIP have received dedicated funding. Because of the limited resources available, a process is needed to evaluate and score projects.

Once projects have been scored according to the procedures set forth in the remainder of this document, they will be placed in the financially constrained component project lists of the MTP based on projected funding levels for the MTP planning horizon, the project's score, and the project's implementation timeline (readiness). When fiscal constraint for the MTP planning horizon is reached, the remaining projects will be placed in the regionally significant-unfunded section of the MTP.

Project Selection Process

The KTMPO Project Selection Process consists of 4 steps:

1. Call for Projects and project submission to KTMPO.
2. Project Review and Evaluation.
3. KTMPO Technical Advisory Committee Recommendation.
4. KTMPO Transportation Planning Policy Board Review and Approval.

The following is a detailed discussion of these steps and their processes.

Step 1: Call for Projects and Project Submission to KTMPO

As part of the updated 2045 MTP process, KTMPO, with coordination and cooperation from TxDOT, will open a call for projects for all participants in the KTMPO area. KTMPO member organizations wishing to submit projects to KTMPO can do so by completing a KTMPO 2045 MTP Project Submission Packet. Projects must be submitted to KTMPO by 12 p.m. on Friday, August 31, 2018.

All projects submitted to KTMPO will be reviewed by staff to ensure that they are responsive to all required scoring criteria. Projects which are non-responsive will be returned to the submitting member with notes to enable them to update and re-submit their project. Resubmittals must be submitted by 12:00 pm on Wednesday, September 5, 2018. All projects which are evaluated as responsive and containing all the required information will proceed to the scoring process.

Projects that are currently in the 2040 MTP project list will use the same submission packet as used during the 2016 Reprioritization and need not be resubmitted. Any changes to a project will need a new submission packet.

The criteria for evaluating a project submission as responsive or non-responsive are:

- **Exhibit A:** The project submittal must include project name, MPO ID (unless project is new), project track, project readiness status and describe any issues with timing, staging, funding, or coordination with other projects that impact whether this project is best implemented in the immediate timeframe or at some other short-term or long-term time, local priority ranking, project limits, work description, length (miles), estimated total cost, planned let year, how the project addresses the goals set out in the MTP and other local plans.

  The purpose and needs statement must address the following:

  - Describe the primary issue which requires correction or enhancement and describe how the project will address the issue.

  - Describe reasonable alternative approaches to the issue, if any, and why the proposed project is the best alternative.

- Each member may submit an unlimited number of projects for evaluation. All projects submitted by the member must be given a preferred order of selection. Members' project preference order is given points under the Local Priority evaluation criteria.

- **Exhibit B:** The project submittal must include a brief narrative stating how it addresses the overall vision of developing a fully-integrated, multimodal transportation system for people and freight, and how it addresses KTMPO long-range goals adopted in the MTP. Topics to be included in this section may include the following:

  - Connectivity;
  - Local Support;
  - Scope of Benefit;
  - Planning & Environmental Linkages;
  - Multi-Modal Support;
  - Security & Resilience;
  - Transportation Enhancements and Livability;
  - Sustainability;
  - Economic Development & Freight Movement.

- **Exhibit C:** Map of project clearly showing the project location and limits.

- **Exhibit D:** The project submittal must include a signed assurance that any and all TxDOT/FHWA deadlines will be met and required contracts will be signed.

- **Exhibit E:** Local support for the project, both "official" support from the submitting member and "unofficial" support from other agencies and the general public, is an important evaluation criteria. The submitting member should provide brief documentation on the local support for each project.

Step 2: Project Review and Evaluation

The overall vision of KTMPO as outlined in the draft 2045 MTP is to develop a fully-integrated, multimodal transportation system for people and freight. KTMPO actively seeks to promote projects to develop and support transportation choices in the region, including transit and active transportation modes.

In evaluating eligible transportation projects, the different scopes, characters, and operating characteristics of the various modes and project types are apparent. These are so distinctly different that it would be impossible to develop a single process which would support a fair and comprehensive evaluation of all the different projects. Project evaluation and scoring therefore follows two distinct tracks:

- **Road Track**—Evaluation of projects primarily addressing roads and bridges.

- **Transportation Choices and Livability Track**—To provide a fair evaluation of bicycle and pedestrian projects and of projects dealing with environmental and quality of life issues.

Each evaluation track contains objective and subjective criteria. Each track is customized to contain the criteria and weights most appropriate to their transportation modes, but each also contains common criteria and evaluation points for the categories of:

- Linkage to the MTP or Other Relevant Regional Plans, with a maximum of 6 points given for a project's linkage to current planning documents.
- Local Priority and Support, with a maximum of 10 points given for a project's listing in the submitting member's list of preferences and documented local support.
- Project Scope, with a maximum of 35 points given for a project's contributions to local benefits and livability.

Step 3: KTMPO Technical Advisory Committee Recommendation

The KTMPO Technical Advisory Committee will review all projects which are evaluated as responsive and complete and which are forwarded to them by KTMPO staff. Their evaluation will follow the defined project review and evaluation process, which will include the following steps:

Step 1: Projects will receive scores for all objective criteria through a third-party consultant. KTMPO staff will deliver objective scores to each entity on October 1, 2018. TAC members may question any project's objective score for any criteria. KTMPO staff will provide documentation of all scores as requested. The TAC will have the final decision on any objective project score, if, after consulting with KTMPO Staff, a dispute still exists.

Step 2: Subjective criteria for all new projects and legacy projects that submit a new submission packet will be scored by the TAC. TAC subjective scores will need to be submitted to KTMPO by Friday, October 26, 2018. Subjective scores from the 2016 Reprioritization will be used for legacy projects that did not resubmit a submission packet.

Step 3: As projects are scored, the TAC may discuss individual projects' scoring together and highlight any projects for consideration of bonus points. The assignment of bonus points is intended to provide flexibility for special situations and to provide better documentation and transparency for the normal give-and-take inherent to any process involving subjective scoring. The assignment of bonus points is subject to specific criteria:

- The project must have some prominent characteristic which is not adequately covered by the selection criteria. A project to correct for unintended consequences or to fine-tune the performance of a previously constructed project would also qualify for this criteria.
- The characteristic must have a regional benefit.
- The reasoning for the assignment of bonus points must be discussed openly, and must be documented.

A bonus score of 1 to 5 points may be added to any project by the TAC with a simple majority vote.

Step 4: Each project's total score will be calculated within its particular evaluation track of Road Track or Transportation Choices and Livability Track.

Step 5: All projects will then be placed in order from the highest to the lowest score within their respective evaluation tracks. To break ties, the highest subjective score of the tied projects will be used as the first tiebreaker. If projects remained tied, the lower estimated project cost will be used as the second tiebreaker. If ties remain after two tiebreakers, the rank of the project will be determined by the TAC with a simple majority vote.

From this rank ordering, projects will be placed in one of the MTP's three project listing components. The first ten years' worth of projects, balanced to the available funding determined by the fiscal constraint component of the MTP, will comprise the short-range listing of projects to be placed in the TIP during the next ten years. The remaining fifteen years of projects, balanced to the available funding determined by the fiscal constraint component of the MTP, will be placed in the long-range listing. All other projects will be placed on the regionally significant-unfunded listing. TAC will be given the opportunity to develop a funding order based off of the project ranking and the need to fund a specific project. The funding order will be developed and recommended by the TAC with a simple majority vote.

Once the Project Review and Evaluation Process is complete, the TAC will forward a recommendation for the three project listing components of the MTP to the KTMPO Transportation Planning Policy Board for their review and approval.

Step 4: KTMPO Transportation Planning Policy Board Review and Approval

The KTMPO Transportation Planning Policy Board (TPPB) will review and may accept, or by consensus, revise candidate projects for inclusion in the three project listing components of the MTP. If the TPPB chooses to reject the recommendation of the TAC, the project listing may be returned to them for further review and evaluation. If the TPPB adopts the TAC recommendation and funding is available, those components will then be incorporated into the MTP.

Road Evaluation Track

1 Congestion — 0 to 10 points each; 30 points maximum—Objective

Scoring is based on current and forecasted LOS and the change in LOS from the forecasted build to the forecasted no-build condition. Forecasted conditions for the year 2045 are estimated by the travel demand model, and current conditions are estimated by the 2015 model. New construction road projects are also to be input into the 2015 model to estimate their current conditions within the context of the full network and to provide a consistent basis for comparison. A forecast improvement in LOS means that the project reduces congestion, so a project which shows a greater improvement in LOS will score better. This is an objective model-based criteria.

Present LOS		No Build LOS		Build vs No Build	
A	0 points	A	0 points	No change	0 points
B	1 point	B	1 point	LOS increase by 1 letter	5 points
C	4 point	C	4 point		
D & E	7 points	D & E	7 points	LOS increase by more than 1 letter	10 points
F	10 points	F	10 points		

2 Traffic — 2 to 30 points

This criteria considers the current and forecasted traffic volume in three parts: Average Annual Daily Traffic (AADT), peak hour traffic flow, and network connectivity.

Part A: Average Annual Daily Traffic (AADT) — **2 to 20 points—Objective**

The scoring criteria for AADT considers both the existing and the forecasted traffic volumes, with points adding to a cumulative total. Forecasted conditions for the year 2045 are estimated by the travel demand model, and current conditions are estimated by the 2015 model. New construction road projects are also to be input into the 2015 model to estimate their current conditions within the context of the full network and to provide a consistent basis for comparison. The score for this criteria is the cumulative value of the current and forecasted AADT points. Roads with higher traffic tend to have greater regional significance, so projects with higher traffic will score better. This is an objective criteria based on model-based estimates of AADT.

AADT	Current AADT	Forecast AADT
70000 +	10 points	10 points
60,000 - 69,999	8 points	8 points
40,000-59,999	6 points	6 points
20,000-39,999	4 points	4 points
10,000-19,999	2 points	2 points
<10,000	1 point	1 point

Part B: Peak Period Traffic Flow **0 to 5 points—Objective**

This criteria considers the project's ability to reduce peak period traffic congestion and its ability to provide connectivity to defined special traffic generators. The defined special generators are sites, typically with high concentrations of employment, which generate high levels of traffic in the peak period. Projects that are close to and connect multiple special generators would have a greater ability to reduce peak period traffic, and so would score higher.

A list of special traffic generators for the Road Track is in the Appendix.

This is an objective criteria.

(1) Number of Special Generators That Are Located Along the Proposed Project:

	Points
Connects to 3 or more special generators	3 points
Connects to 2 special generators	2 points
Connects to 1 special generator	1 point
Does not connect to a special generator	0 points

(2) Distance from any point of project to closest special generator:

	Points
Project is less than 0.5 mile from closest special generator	2 points
Project is between 0.5 mile and 1 mile from the closest special generator	1 points
Project is more than 1 mile from the closest special generator	0 point

Part C: Network Connectivity **0 to 5 points—Subjective**

The connectivity of the network determines the ease of movement from origin to destination and the alternative routes available to bypass congestion. This criteria measures how well the project improves that connectivity. Scores are subjective and cumulative. A project is scored for either closing a physical gap (in two categories for collector or arterial or higher streets), or for closing a gap in the number of lanes (in two categories for collector or arterial or higher streets). In addition, a project also receives points for closing a gap in multimodal connectivity or providing support for other modes' operations. A project closing a physical gap and closing a gap in multimodal connectivity therefore has a maximum of 5 points, and a project closing a gap in the number of lanes and closing a gap in multimodal connectivity has a maximum of 4 points. This is a subjective criteria.

	Points
Closes a gap for an arterial or higher	0 to 3 points
Closes a gap for a collector street	0 to 2 points
Closes a gap in the number of arterial lanes	0 to 2 point
Closes a gap in the number of collector lanes	0 to 1 point
Closes a gap in multimodal connectivity	0 to 2 points

3 Safety — 0 to 2 points; 4 points maximum

This criteria is used to identify safety problem areas and to support projects which will impact the number and severity of traffic-related crashes. There are two parts to the criteria: the five-year rolling average fatality rate, and the five-year rolling average serious injury rate.

Part A: Fatality Rate — **0 to 2 points—Objective**

This criteria measures the project location's number of fatalities per 100 million vehicle miles travelled against the statewide 5-year rolling average. A higher difference indicates that a location has more safety issues than the statewide average. A higher difference receives a higher score for a safety project. Proposed roads are assumed to be designed to current safety standards, and therefore will receive the neutral score of 1 point for this criteria for meeting the statewide average rates. This criteria is objective.

	Points
Higher than statewide fatality rate	2 points
Same as statewide fatality rate	1 point
Lower than statewide rate	0 points

Part B: Serious Injury Rate — **0 to 2 points—Objective**

This criteria flags the facility's average serious injury rate during a rolling 5-year period. A higher difference indicates that a location has more safety issues than the statewide average. A higher difference receives a higher score for a safety project. Proposed roads are assumed to be designed to current safety standards, and therefore will receive the neutral score of 1 point for this criteria for meeting the statewide average rates. This criteria is objective.

	Points
Higher than statewide serious injury rate	2 points
Same as statewide serious injury rate	1 point
Lower than statewide serious injury rate	0 points

4 Linkage to MTP or Other Plan — 0 to 6 points—Objective

This criteria references the project's inclusion in the current MTP or other plans. This criteria demonstrates a project's history and planning linkages. Projects with a history in the MTP are rated as having a recognized need in the community and have been vetted by the prior planning and project prioritization process, and so receive a higher score. Scores are cumulative for inclusion in one or more plans or MTP lists, and the criteria is objective.

	Points
In the current Long Range MTP Plan	2 points
In the current Regionally Significant/Unfunded List	1 point
In the 2018 Regional Multimodal Plan	2 points
Lies on a corridor from the Congestion Management Process	1 point

5 Local Priority & Support **0 to 5 points each; 10 points maximum**

The local priority & support category of evaluation criteria is designed to define the extent of local commitment to a project.

Part A: Local Priority **1 to 5 points—Objective**

The stated preference order for implementation is defined by the submitting member, and may consider objective and subjective factors, available funding, coordination with other projects or planning, or other factors. **Submitted projects are listed in order by the member regardless of the evaluation track.** KTMPO staff will use the preference list as an objective criteria to score each project within its appropriate evaluation track.

	Points
Preference #1	5 points
Preference #2	4 points
Preference #3	3 points
Preference #4	2 points
Preference #5 and lower	1 point

Part B: Local Support **0 to 5 points—Subjective**

Local support and lack of controversy for a project are a gauge of the support that a project has from both the official submitting member and from the general public. This measure may consider local overmatch, resolutions, petitions, news articles, blog postings, or other relevant factors. This is a subjective criteria that will be scored based on the submitting member's documentation.

	Points
Significant local support	4 to 5 points
Moderate local support	2 to 3 points
Minimal local support	1 to 2 points
Significant local controversy	0 points

6 Project Scope **0 to 5 points each; 35 points maximum**

Part A: Scope of Benefit **1 to 5 points—Subjective**

A submitting member's narrative, in addition to the project's model-based traffic changes, should be used to evaluate the project's scope of benefits. Factors to be considered include, but are not limited to, the project's geographic scale, functional class of the project roadway and connecting roadways, and the roadway's significance within the region.

This is a subjective criteria.

	Points
Regional Benefit	4 to 5 points
Benefit within KTMPO	2 to 3 points
Local Benefit	1 to 2 points

Part B: Planning and Environment Linkages **0 to 5 points—Subjective**

Planning and Environment Linkages (PEL) represents a collaborative and integrated approach to transportation decision-making that considers environmental, community, and economic goals early in the transportation planning process rather than after a project has progressed to the alternatives analysis and design stages. Considering PEL factors earlier in the process promotes developing more feasible and prudent alternatives and can significantly improve the ultimate project benefits, costs, and implementation.

The purpose of the PEL criteria is to ensure that these factors are considered when developing a project. A project's impact on PEL issues does not mean that projects in those areas are prohibited. Rather, the project should document the extent of its impacts and the search for reasonable and prudent alternatives. Federal legislation calls for projects to "avoid, minimize, or mitigate" their impacts on these areas.

When PEL issues are encountered with a project, documentation should show that the appropriate resource agencies or other public agencies have been consulted to determine impacts, approaches, and alternatives. Relevant resource agencies include agencies such as Texas Parks & Wildlife, Texas Natural Resources Conservation Commission, Texas Historical Commission, TxDOT, and the KTMPO.

Section 4(f) of the Department of Transportation Act of 1966 stipulates that federal funds may not be spent on projects in publicly-owned parks, recreational areas, wildlife and waterfowl refuges, or public or private historical sites unless there are no feasible alternatives and all mitigating steps are taken, or alternatively, that the project has a minimal impact on the use of the land.

Environmentally sensitive areas in the KTMPO region are identified in the draft 2045 MTP to include natural or recreational areas, archaeological sites, historic structures, Environmental Justice Communities of Concern (EJCOC), landfills, watersheds, aquifers, and endangered species.

Historic preservation and archaeology issues include historic bridges and structures and known sites of archaeological interest.

Environmental Justice Communities of Concern (EJCOC) are defined by KTMPO. The criteria for defining an EJCOC are a Census Tract where the Low Income Index was in the 85% percentile and above, a Census Tract with at least 50% of the population self-identified as minority, or a Census Tract with at least 35% of the population self-identified as Hispanic or Latino descent.

Americans with Disability Act (ADA) Standards for Accessible Design for the project and its adjacent facilities should also be considered.

Projects which are expected to improve regional air quality by improving travel speeds, reducing idling, promoting ridesharing or other travel modes, or otherwise reducing the emissions of NO_2 or VOC should be considered under this criteria.

This is a subjective criteria that will be scored based on the submitting member's documentation. A project scores positively if it has an impact on environmentally sensitive lands but contains some provision for adequate mitigation. It scores higher if the impact is minimal, and highest if the project has a positive impact on the sensitive land use.

	Points
Positive impact	3 to 5 points
Minimal negative impact	2 to 3 points
Negative impact with mitigation	1 to 2 points
Negative impact with no mitigation	0 points

Part C: Economic Development & Freight Movement **0 to 5 points—Subjective**

Road projects can have direct impacts on economic activity, including supporting access and development for new economic activity areas, redevelopment of economically depressed regions, and access that supports activities creating new jobs. Projects can also support freight movements through providing access to industrial areas and to freight handling facilities. Scoring is cumulative to a maximum of 5 points. This is a subjective score based in part on the submitting member's narrative.

	Points
Supports creation of new permanent jobs	0 to 2 points
Supports freight movements	0 to 2 points
Supports economic activity	0 to 1 point

Part D: Multimodal Support **0 to 5 points—Subjective**

To support an integrated multimodal transportation system and to promote intermodal linkages, a project is evaluated on whether or not it accommodates additional modes. Example linkages include connections from road projects to transit, pedestrian, or bicycle facilities or networks. Projects may also receive points for features which promote or accommodate other modes' operations or facilities, or improve the safety of other modes' interaction with the road network. This is a subjective criteria that will be scored based on the submitting member's documentation.

	Points
Supports 3 or more additional modes	5 points
Supports 2 additional modes	3 points
Supports 1 additional mode	1 point
Supports only the highway mode	0 points

Part E: Security & Resilience **0 to 5 points—Subjective**

This criteria supports the ability of the transportation network to recover from emergency situations and to mitigate their effects.

The designated evacuation corridors for the region are IH 35, US 190, US 190/SH 36, SH 95, FM 93, and FM 2268.

Emergency services sites include fire stations, hospitals, police stations, designated shelters, and locations where emergency response vehicles or equipment are stored.

Scoring is cumulative to a maximum of 5 points. This is a subjective criteria to be scored based on the submitting member's documentation.

	Points
Lies on a designated evacuation corridor	0 to 3 points
Enhances access for emergency services	0 to 2 points

Part F: Transportation Enhancements & Livability **0 to 5 points—Subjective**

Contributions of transportation projects to the overall livability of the environment has been an important consideration since the Transportation Enhancement program was established in ISTEA, continuing forward under the Transportation Alternatives Program (TAP) in MAP-21. This evaluation criteria continues that emphasis by scoring projects' contributions to the overall environment, aesthetics, and livability of the region. Projects which primarily address enhancements and livability include, but are not limited to, the construction of turnouts for scenic views, preservation of historic transportation facilities, pedestrian-scaled lighting and amenities, landscaping and other scenic beautification, vegetation management, storm water management, and environmental improvements. Projects which document their steps to reduce life-cycle costs, such as landscaping with native species, xeriscaping, or integrated low-impact design (LID) storm water systems, should score higher for this criteria.

Scoring is cumulative to a maximum of 5 points. This is a subjective criteria to be scored based on the submitting member's documentation.

	Points
Enhances environment, aesthetics, or livability	0 to 3 points
Documents steps to reduce life-cycle costs	0 to 2 points

Part G: Sustainability **0 to 5 points—Subjective**

This criteria measures how a project contributes to social, environmental, and economic impacts in a way that meets current needs without compromising the ability to meet future needs. It credits a project for using any of the range of innovative approaches which promote sustainability or multi-modalism in transportation, such as FHWA's Context Sensitive Solutions, Complete Streets, the FHWA's INVEST sustainability evaluation program, the Institute for Sustainable Infrastructure's

Envision evaluation program, or the Green Roads evaluation program.

Programs and principles such as Context Sensitive Solutions (CSS) support the consideration of transportation, land use, and infrastructure needs in an integrated way. Enhanced public involvement and strengthened consideration of the natural and cultural environments are key factors of CSS. Sustainability rating systems provide a framework for conceiving and planning sustainable infrastructure projects which can reduce the negative environmental impacts of a project, reduce life cycle costs, and help ensure that all aspects of a project are fully considered.

Scoring is cumulative to a maximum of 5 points. This is a subjective criteria to be scored based on the submitting member's documentation.

	Points
Uses a sustainability-oriented approach	0 to 3 points
Uses a sustainability rating system	0 to 2 points

Transportation Choices and Livability Evaluation Track

1 Connectivity & Service Gaps **0 to 5 or 0 to 10 points each; 40 points maximum**

Part A: Peak Period Traffic Flow **0 to 5 points—Objective**

This criteria considers the project's ability to reduce peak period traffic congestion and its ability to provide connectivity to defined special traffic generators. The defined special generators are sites, typically with high concentrations of employment, which generate high levels of traffic in the peak period. Projects that are close to and connect multiple special generators would have a greater ability to reduce peak period traffic, and so would score higher.

A list of special traffic generators for the Road Track is in the Appendix.

This is an objective criteria.

(1) Number of special generators that are located along the proposed project:

	Points
Connects to 3 or more special generators	3 points
Connects to 2 special generators	2 points
Connects to 1 special generator	1 point
Does not connect to a special generator	0 points

(2) Distance from any point of project to closest special generator:

	Points
Project is less than 0.5 mile from closest special generator	2 points
Project is between 0.5 mile and 1 mile from the closest special generator	1 points
Project is more than 1 mile from the closest special generator	0 point

Part B: Eliminates Barriers **0 to 15 points—Subjective**

This criteria evaluates how a project addresses the barriers to active transportation which were identified in the KTMPO Regional Thoroughfare and Pedestrian/Bicycle Plan. Barriers are defined in terms of movements crossing a facility, not travel on it. The categories of barriers include, but are not limited to:

- Crossings of grade-separated arterials
- Crossings of multilane arterials with at-grade intersections
- Bridge crossings at overpasses and water features
- Railroad track crossings

Examples of barriers reference the Regional Thoroughfare and Pedestrian/Bicycle Plan. The Appendix also lists the special traffic generators for the Transportation Choices and Livability Track. This is a subjective criteria.

	Points
Eliminates barrier in the bike/ped network	0 to 5 points
Eliminates barrier in the EJCOC	0 to 5 points
Eliminates barrier within 1 mile of a special generator	0 to 5 points

Part C: Active Transportation Network Connectivity **0 to 10 points—Subjective**

The connectivity within the active transportation network and its connectivity to other modes is measured in terms of how a project can close a gap in the network or in the network's connections to other modes. Network gaps are to be defined with reference to the KTMPO Regional Thoroughfare and Pedestrian/Bicycle Plan's defined active transportation network. Note that new connections to other modes are a separate issue evaluated under the project scope; this criteria is to evaluate projects which address gaps in the existing network. This is a subjective criteria.

	Points
Closes a gap in the active transportation network	0 to 5 points
Closes a gap in intermodal connectivity	0 to 5 points

Part D: Addresses a Documented Need **0-10 points—Subjective**

As part of the narrative submitted for a project, the member should document how active transportation needs have defined the project. The narrative should describe how the submitted project will address the referenced needs. This is a subjective criteria.

	Points
Documented need in EJCOC	0 to 5 points
Documented need in region	0 to 5 points

2 Access to Jobs **0 to 10 points each; 15 points maximum—Subjective**

This criteria evaluates a project based on how well it supports active transportation facilities which enhance the connection to employment opportunities. Projects focused on Environmental Justice Communities of Concern can score higher. This is a subjective criteria.

	Points
Provides access to jobs in EJCOC	0 to 10 points
Provides access to jobs in region	0 to 5 points

3 Safety 0 to 5 points each; 20 points maximum—Objective and Subjective

This criteria rates a project on how it enhances the safety of pedestrians or bicyclists on the active transportation network. This criteria is scored cumulatively with four different criteria of up to 5 points each. The first three criteria are subjective, and the fatality and serious injury rates scoring is objective.

	Points
Provides an exclusive path on an arterial	0 to 5 points
Provides a connection to a school	0 to 5 points
Enhances areas with identified hazards	0 to 5 points
Fatality & serious injury rate	0 to 4 points

Part A: Exclusive Path **0 to 5 points—Subjective**

An exclusive path is defined as being separated from vehicular traffic with a physical barrier such as bollards, curbs, landscaped areas, or on-street parking. Projects on roads with a functional class of minor arterial or higher in the KTMPO Regional Thoroughfare Plan are eligible for these points.

Part B: Connection to a School **0 to 5 points—Subjective**

Projects which enhance safety on facilities which directly connect to a school should score higher.

Part C: Enhances Areas with Identified Hazards **0 to 5 points—Subjective**

Identified hazards include, but are not limited to, locations with five or more documented crashes between pedestrians or bicycles and other transportation modes within the past five-year period. Other hazards include physical and operational conditions which would contribute to safety issues, such as storm water grate designs which do not trap bicycle tires, new pedestrian signals, mid-block crossings, or pedestrian refuge islands.

Part D: Fatality and Serious Injury Rates **0 to 4 points—Objective**

This criteria flags an adjacent road facility's average fatality and serious injury rates for active transportation users during a rolling five-year period. The higher of the fatality rate or the serious injury rate should be used for comparison to the statewide rate. A higher difference indicates that a location has more safety issues than the statewide average. A higher difference receives a higher score for a safety project. Proposed roads are assumed to be designed to current safety standards, and therefore will receive the neutral score of 1 point for this criteria for meeting the statewide average rates.

	Points
Higher than statewide fatality rate	2 points
Same as statewide fatality rate	1 point
Lower than statewide rate	0 points
Higher than statewide serious injury rate	2 points
Same as statewide serious injury rate	1 point
Lower than statewide serious injury rate	0 points

4 Linkage to MTP or Other Plan 0 to 2 points each; 6 points maximum—Objective

This criteria references the project's coordination with the current 2040 MTP, the Regional Thoroughfare Plan or other regional plans. This criteria demonstrates a project's history and planning linkages. Projects with a history in the MTP are rated as having a recognized need in the community and have been vetted by the prior planning and project prioritization process, and so receive a higher score. Scores are cumulative for inclusion in one or more plans or MTP lists, and the criteria is objective.

	Points
In the current Long Range MTP Plan	2 points
In the current Regionally Significant/Unfunded List	1 point
In the Regional Thoroughfare Plan	2 points
Lies on a corridor from the Congestion Management Process	1 point

5 Local Priority & Support 0 to 5 points each; 10 points maximum

The local priority & support category of evaluation criteria is designed to define the extent of local commitment to a project.

Part A: Local Priority **1 to 5 points—Objective**

The stated preference order for implementation is defined by the submitting member, and may consider objective and subjective factors, available funding, coordination with other projects or planning, or other factors. **Submitted projects are listed in order by the member regardless of the evaluation track.** KTMPO staff will use the preference list as an objective criteria to score each project within its appropriate evaluation track.

	Points
Preference #1	5 points
Preference #2	4 points
Preference #3	3 points
Preference #4	2 points
Preference #5 and lower	1 point

Part B: Local Support **0 to 5 points—Subjective**

Local support and lack of controversy for a project are a gauge of the support that a project has from both the official submitting member and from the general public. This measure may consider local overmatch, resolutions, petitions, news articles, blog postings, or other relevant factors. This is a subjective criteria that will be scored based on the submitting member's documentation.

	Points
Significant local support	4 to 5 points
Moderate local support	2 to 3 points
Minimal local support	1 to 2 points
Significant local controversy	0 points

6 Project Scope **0 to 5 points each; 35 points maximum**

Part A: Scope of Benefit **1 to 5 points—Subjective**

A submitting member's narrative should be used to evaluate the project's scope of benefits. Factors to be considered include, but are not limited to, the project's geographic scale, functional class of the project roadway (if the active transportation project is adjacent to a roadway) and connecting roadways, and the roadway's significance within the region.

This is a subjective criteria.

	Points
Regional Benefit	4 to 5 points
Benefit within KTMPO	2 to 3 points
Local Benefit	1 to 2 points

Part B: Planning and Environment Linkages **0 to 5 points—Subjective**

Planning and Environment Linkages (PEL) represents a collaborative and integrated approach to transportation decision-making that considers environmental, community, and economic goals early in the transportation planning process rather than after a project has progressed to the alternatives analysis and design stages. Considering PEL factors earlier in the process promotes developing more feasible and prudent alternatives and can significantly improve the ultimate project benefits, costs, and implementation.

The purpose of the PEL criteria is to ensure that these factors are considered when developing a project. A project's impact on PEL issues does not mean that projects in those areas are prohibited. Rather, the project should document the extent of its impacts and the search for reasonable and prudent alternatives. Federal legislation calls for projects to "avoid, minimize, or mitigate" their impacts on these areas.

When PEL issues are encountered with a project, documentation should show that the appropriate resource agencies or other public agencies have been consulted to determine impacts, approaches, and alternatives. Relevant resource agencies include agencies such as Texas Parks & Wildlife, Texas Natural Resources Conservation Commission, Texas Historical Commission, TxDOT, and the KTMPO.

Section 4(f) of the Department of Transportation Act of 1966 stipulates that federal funds may not be spent on projects in publicly-owned parks, recreational areas, wildlife and waterfowl refuges, or public or private historical sites unless there are no feasible alternatives and all mitigating steps are taken, or alternatively, that the project has a minimal impact on the use of the land.

Environmentally sensitive areas in the KTMPO region are identified in the draft 2045 MTP to include natural or recreational areas, archaeological sites, historic structures, Environmental Justice Communities of Concern (EJCOC), landfills, watersheds, aquifers, and endangered species.

Historic preservation and archaeology issues includes known sites of archaeological interest.

Environmental Justice Communities of Concern (EJCOC) are defined by KTMPO. The criteria for defining an EJCOC are a Census Tract where the Low Income Index was in the 85% percentile and above, or a Census Tract with at least 50% of the population self-identified as minority, or a Census Tract with at least 35% of the population self-identified as Hispanic or Latino descent.

Americans with Disability Act (ADA) Standards for Accessible Design for the project and its adjacent facilities should also be considered.

Projects which are expected to improve regional air quality by improving travel speeds, reducing idling, promoting ridesharing or other travel modes, or otherwise reducing the emissions of NO_2 or VOC should be considered under this criteria.

This is a subjective criteria that will be scored based on the submitting member's documentation. A project scores positively if it has an impact on environmentally sensitive lands but contains some provision for adequate mitigation. It scores higher if the impact is minimal, and highest if the project has a positive impact on the sensitive land use.

	Points
Positive impact	3 to 5 points
Minimal negative impact	2 to 3 points
Negative impact with mitigation	1 to 2 points
Negative impact with no mitigation	0 points

Part C: Economic Development **0 to 5 points—Subjective**

Active transportation projects can have direct impacts on economic activity, including supporting access and development for new economic activity areas, redevelopment of economically depressed regions, and access that supports activities creating new jobs. Scoring is cumulative to a maximum of 5 points. This is a subjective score based in part on the submitting member's narrative.

	Points
Supports creation of new permanent jobs	0 to 3 points
Supports economic activity	0 to 2 point

Part D: Multimodal Support **0 to 5 points—Subjective**

To support an integrated multimodal transportation system and to promote intermodal linkages, a project is evaluated on how it accommodates or connects to additional modes. Example linkages include connections from active transportation projects to road and transit facilities or networks. Connections may include paths connecting to transit and bike racks on buses. Projects may also receive points for features which promote or accommodate active transportation operations or facilities as they interact with other modes, or improve the safety of their interaction with other modes. This is a subjective criteria that will be scored based on the submitting member's documentation.

	Points
Supports 2 or more additional modes	5 points
Supports 1 additional mode	3 points
Supports 2 active transportation modes	2 points
Supports only one active transportation mode	1 point

Part E: Security & Resilience **0 to 5 points—Subjective**

This criteria supports the ability of the transportation network to recover from emergency situations and to mitigate their effects. A project's score under this criteria may consider facilities lying on an evacuation corridor or facilities which provide access to an evacuation corridor or emergency services site.

The designated evacuation corridors for the region are IH 35, US 190, US 190/SH 36, SH 95, FM 93, and FM 2268.

Emergency services sites relevant to active transportation modes include access to hospitals and designated shelters.

Scoring is cumulative to a maximum of 5 points. This is a subjective criteria to be scored based on the submitting member's documentation.

	Points
Lies on a designated evacuation corridor	0 to 3 points
Enhances access for emergency services	0 to 2 points

Part F: Transportation Enhancements & Livability **0 to 5 points—Subjective**

Contributions of transportation projects to the overall livability of the environment has been an important consideration since the Transportation Enhancement program was established in ISTEA, continuing forward under the Transportation Alternatives Program (TAP) in MAP-21. This evaluation criteria continues that emphasis by scoring projects' contributions to the overall environment, aesthetics, and livability of the region. Projects which primarily address enhancements and livability include, but are not limited to, the construction of turnouts for scenic views, preservation of historic transportation facilities, pedestrian-scaled lighting and amenities, landscaping and other scenic beautification, vegetation management, storm water management, and environmental improvements. Projects which document their steps to reduce life-cycle costs, such as landscaping with native species, xeriscaping, or integrated low-impact design (LID) storm water systems, should score higher for this criteria.

Scoring is cumulative to a maximum of 5 points. This is a subjective criteria to be scored based on the submitting member's documentation.

	Points
Enhances environment, aesthetics, or livability	0 to 3 points
Documents steps to reduce life-cycle costs	0 to 2 points

Part G: Sustainability **0 to 5 points--Subjective**

This criteria measures how a project contributes to social, environmental, and economic impacts in a way that meets current needs without compromising the ability to meet future needs. It credits a project for using any of the range of innovative approaches which promote sustainability or multi-modalism in transportation, such as FHWA's Context Sensitive Solutions, Complete Streets, the FHWA's INVEST sustainability evaluation program, the Institute for Sustainable Infrastructure's Envision evaluation program, or the Green Roads evaluation program.

Programs and principles such as Context Sensitive Solutions (CSS) support the consideration of transportation, land use, and infrastructure needs in an integrated way. Enhanced public involvement and strengthened consideration of the natural and cultural environments are key factors of CSS. Sustainability rating systems provide a framework for conceiving and planning sustainable infrastructure projects which can reduce the negative environmental impacts of a project, reduce life cycle costs, and help ensure that all aspects of a project are fully considered.

Scoring is cumulative to a maximum of 5 points. This is a subjective criteria to be scored based on the submitting member's documentation.

	Points
Uses a sustainability-oriented approach	0 to 3 points
Uses a sustainability rating system	0 to 2 points

Appendix C:

MTP Public Involvement

KTMPO ● P.O. Box 729 ● Belton, TX 76513

Killeen-Temple Metropolitan Planning Organization

Public Comment Opportunity

Regarding:

2045 Metropolitan Transportation Plan Update

Tuesday, April 10, 2018

Copperas Cove Police Station
302 E. Avenue E.
Copperas Cove, TX 76522
12:00pm

Central Texas Council of Governments
2180 N. Main Street
Belton, TX 76513
5:00pm

Tuesday April 17, 2018

Killeen Community Center
2201 E. Veterans Memorial Blvd
Killeen, TX 76543
12:00pm

Harker Heights Activity Center
400 Indian Trail
Harker Heights, TX 76548
5:00pm

Monday, April 16, 2018

Temple Public Library
100 W. Adams Ave.
Temple, TX 76501
12:00pm

For other KTMPO information, visit:
http://www.ktmpo.org

Note of Basic Requirement:
Please note that public notice of public involvement activities and time established for public review and comment on the Transportation Improvement Program (TIP) and TIP development (and/or other planning documents) will satisfy the Program of Projects requirements of the Urbanized Area Formula Program (FTA Section 5307) operated by Hill Country Transit District.

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

Please Sign In

2045 Metropolitan Transportation Plan (MTP)

Public Workshop – 5:00 pm
April 10, 2018
CTCOG Offices
2180 N. Main St
Belton, TX 76513

Attendees Name	Organization (Please initial)	E-mail or Telephone (Please initial)
John Weber	KTMPO	—
Kendra Coufal	KTMPO	
Bobby Whitson	DDoCT	
Jason Deckman	City of Temple	

PUBLIC COMMENT FORM

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

Instructions: Your personal information is not required, but may allow planning officials to contact you in the future. Your comments will be recorded and presented to our Transportation Policy Board before voting on project selection or funding decisions. *Knowing your location will help KTMPO with planning the needs in your community.

Name: Wayne H. McCoy
Title: real estate agent / Keller Williams Realty
Company:
*Address: 3105 Pecan Dr Temple, TX 76502
(Or Closest Intersection)
Phone: (254) 721-3123
Email: WayneMcCoy @ kw. com

Comments:
(MORE ROOM ON BACK)

What do you want to say?

Some completed project are dangerous and dysfunctional

PUBLIC COMMENT FORM

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

Instructions: Your personal information is not required, but may allow planning officials to contact you in the future. Your comments will be recorded and presented to our Transportation Policy Board before voting on project selection or funding decisions. *Knowing your location will help KTMPO with planning the needs in your community.

Name: Lynette Sowell
Title: Managing Editor
Company: Copperas Cove Leader Press Newspaper
*Address: 2210 E. Bus 190
(Or Closest Intersection)
Phone: 254 394- 1317
Email: lsowell@coveleaderpress.com

Comments:

(MORE ROOM ON BACK)

What do you want to say?

Looking forward to the projects in our community! Thanks for your hard work -

All comments and personal information will become part of public records and are subject to requests made under the Freedom of Information Act .

PUBLIC COMMENT FORM

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

Instructions: Your personal information is not required, but may allow planning officials to contact you in the future. Your comments will be recorded and presented to our Transportation Policy Board before voting on project selection or funding decisions. *Knowing your location will help KTMPO with planning the needs in your community.

Name: Dennis Furey

Title:

Company:

*Address: (Or Closest Intersection) 707 N 19th St Copperas Cove

Phone: 254-238-8472

Email:

Comments:

(MORE ROOM ON BACK)

What do you want to say?

Plenty of information.
Meetings & Public forums
need to be scheduled at times convenient
to All. not noon.

KTMPO ● P.O. Box 729 ● Belton, TX 76513

Killeen-Temple Metropolitan Planning Organization
Public Hearing and Comment Period

Regarding:

2045 Metropolitan Transportation Plan (MTP)

Tuesday, March 26, 2018

12:00 pm **Harker Heights Activities Center** **400 Indian Trail** **Harker Heights, TX 76548**	**5:00 pm** **CTCOG Offices** **2180 N. Main Street** **Belton, TX 76513**

Public Comment Period March 23 – April 21, 2019

For other KTMPO information, visit:
http://www.ktmpo.org

Note of Basic Requirement: Public involvement activities for TIP will satisfy the Program of Projects requirements of the Urbanized Area Formula Program (FTA Section 5307) operated by Hill Country Transit District.

KTMP
KILLEEN-TEMPLE
metropolitan planning organization

Please Sign In

2040 Metropolitan Transportation Plan (MTP)
FY19-22 Transportation Improvement Program (TIP)
2045 Metropolitan Transportation Plan (MTP)

Public Hearing – 12:00 pm
March 26, 2019
Harker Heights Activities Center
400 Indian Trail, Harker Heights, TX 76548

Attendees Name	Organization (Please initial)	E-mail or Telephone (Please initial)
Julian Sciortino	Arcade News	JJS Julians4317@gmail.com

KTMP
KILLEEN-TEMPLE
metropolitan planning organization

Please Sign In

2040 Metropolitan Transportation Plan (MTP)
FY19-22 Transportation Improvement Program (TIP)
2045 Metropolitan Transportation Plan (MTP)

Public Hearing – 5:00 pm
March 26, 2019
Central Texas Council of Governments
2180 North Main Street, Belton, TX

Attendees Name	Organization (Please initial)	E-mail or Telephone (Please initial)
NO Attendees		

Appendix D:

Future Growth

MOBILITY 2040

Killeen-Temple Metropolitan Planning Organization

Appendix D: Visioning/Scenario Planning

Killeen-Temple KTMPO METROPOLITAN PLANNING ORGANIZATION

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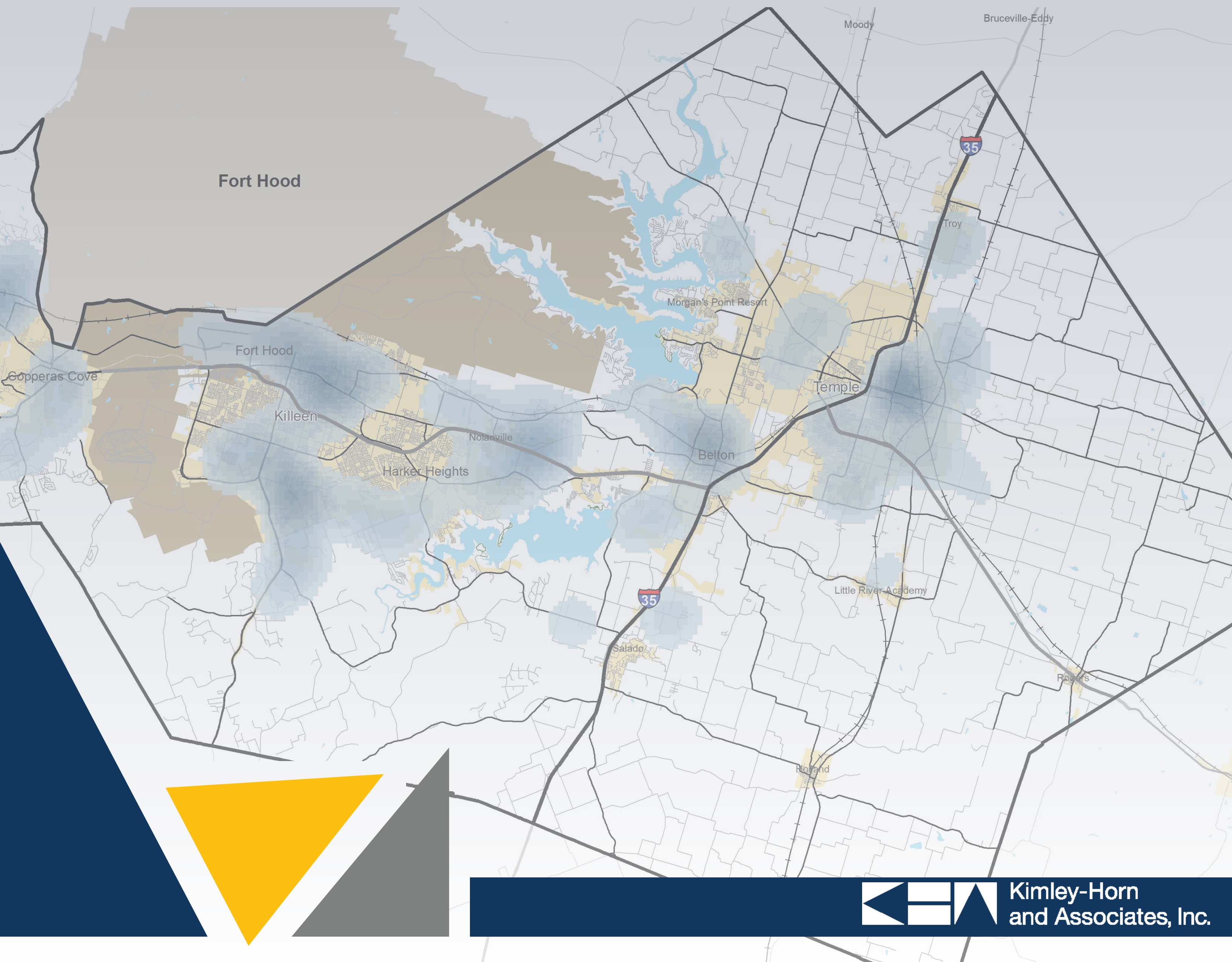
Killeen-Temple Metropolitan Planning Organization

Scenario Planning Technical Memorandum

February 2013



Kimley-Horn and Associates, Inc.

Scenario Planning Basics

Scenario planning provides a forum, process, set of tools, and measurable outcomes for the region to contemplate future growth possibilities. Development scenarios prepared for the region are plausible stories about future growth—they are not forecasts or predictions. They are possible future outcomes that might come to pass based on existing conditions and trends, or on regional goals and community values. The essential requirement of any development scenario is that it be plausible, within the realm of what exists or what could be. Scenario planning also allows the community to measure results and evaluate the trade-offs associated with competing development scenarios. This ability provides stakeholders with an opportunity to identify and discuss strengths and weaknesses associated with the various development scenarios, and enables more informed decision-making for formulating the region's preferred development scenario. Scenario indicators reflect the impacts of new growth. They do not include existing population and land uses.

A scenario approach to planning enables an assessment of the relationship between land use choices and transportation and other outcomes, and provides residents, business leaders, and elected officials the opportunity to explore and debate the regional growth visions, their tradeoffs, and alternative futures.

CommunityViz®, a Geographic Information System (GIS)-based software program, was used to analyze the scenarios against a set of performance measurement indicators, enabling a comparison and contrast of each of the development scenarios.

From the FHWA Scenario Planning Guidebook, February 2011

Scenario planning is a process that can help transportation professionals to prepare for what lies ahead. It provides a framework for developing a shared vision for the future by analyzing various forces (e.g., health, transportation, livability, economic, environmental, land use), that affect communities. The hallmark of scenario planning is identifying land-use patterns as variables (rather than as static inputs) that could affect transportation networks, investments, and operations. Other variables might include demographic, economic, political, and environmental trends. Considering and analyzing alternative possibilities for each variable helps stakeholders to understand how a state, community, region, or study area might look and function in the future.

Public Involvement

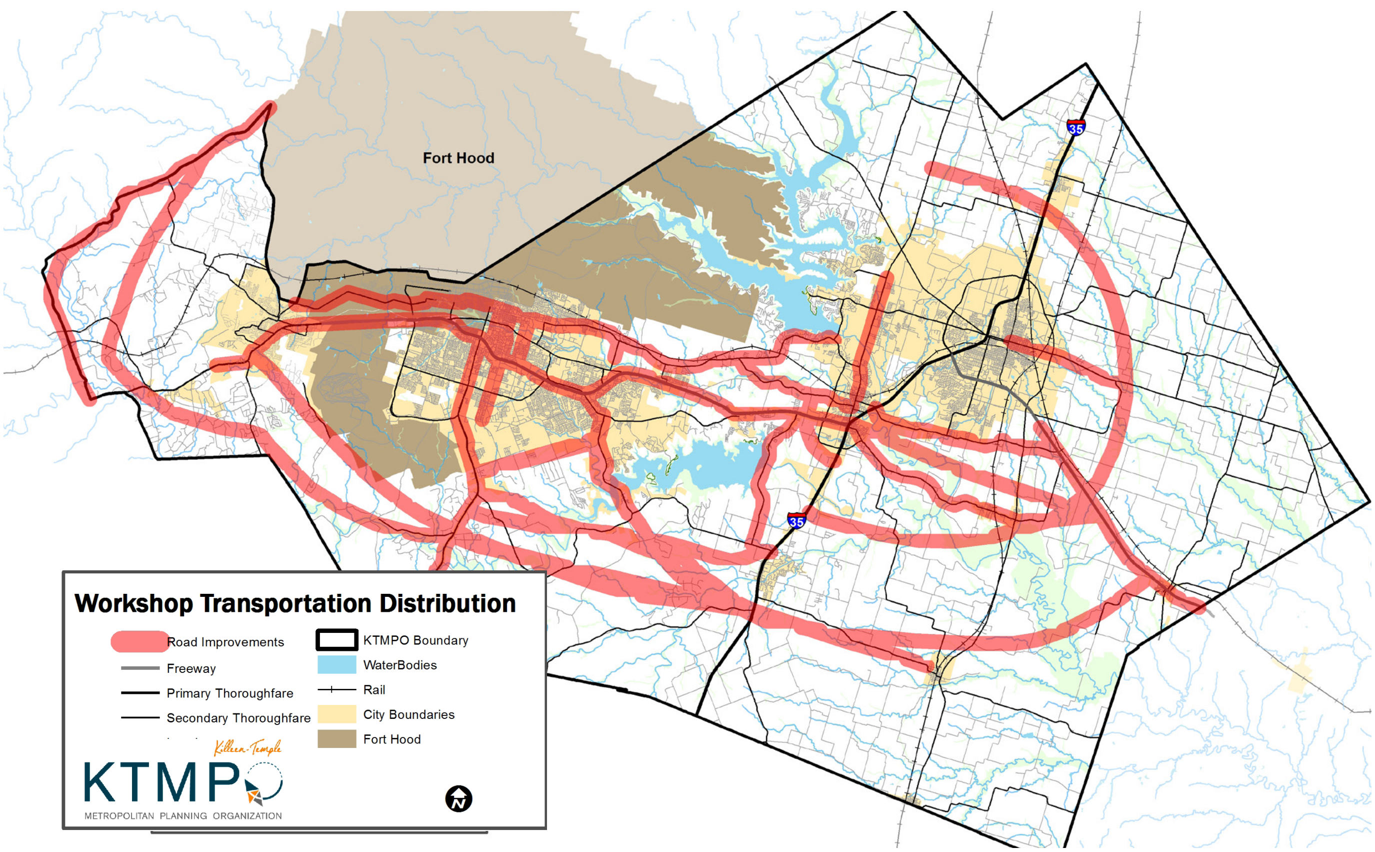
Killeen-Temple MPO

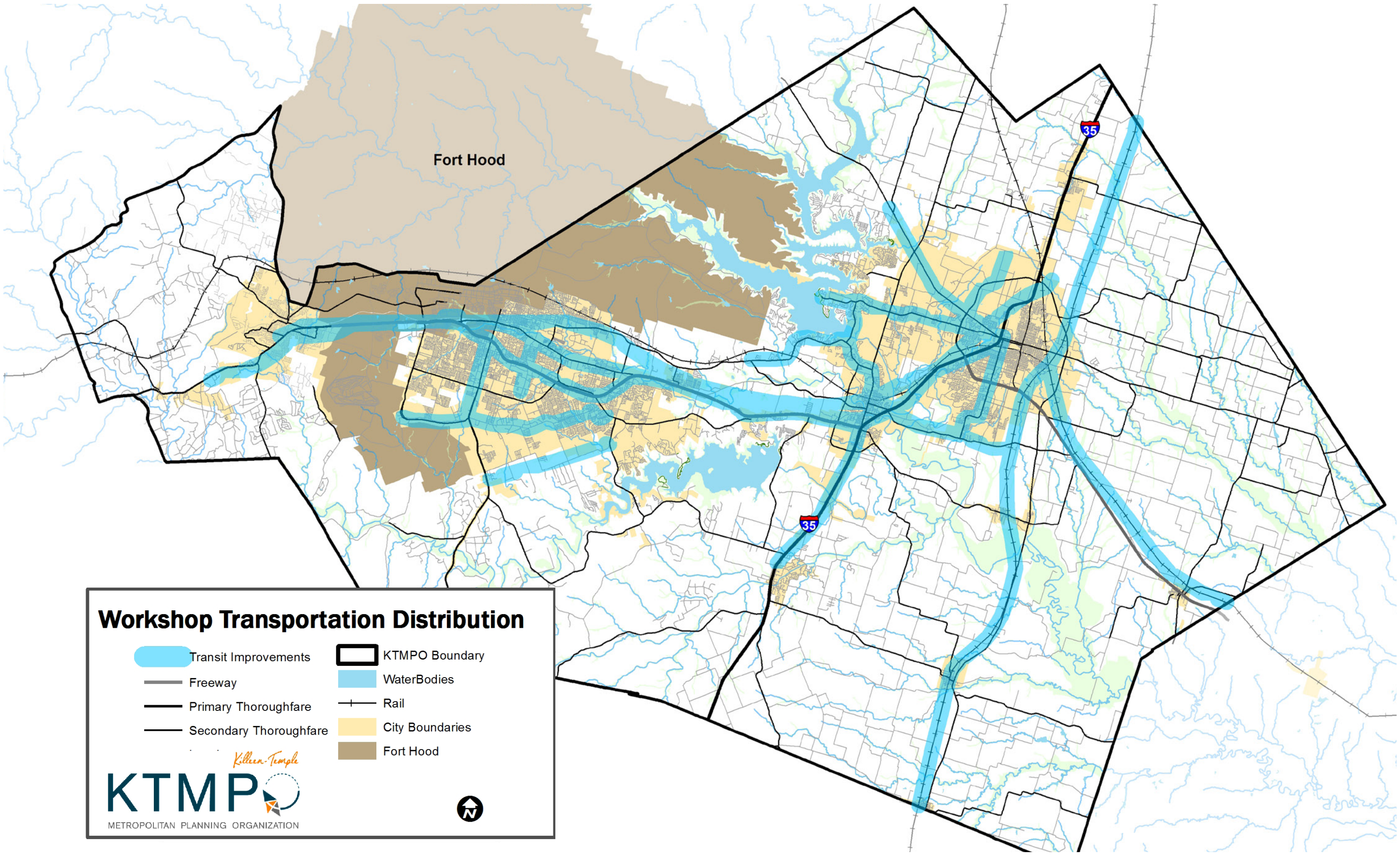
On October 16th, 2012 the Killeen-Temple Metropolitan Planning Organization (KTMPO) hosted a regional visioning workshop to help determine future growth patterns for new development. The growth that is projected in the region is ~209,000 people and ~89,000 jobs. From this workshop, residents of the area and policy makers help to determine where this growth would occur. A scenario planning allocation was used in the public workshop to solicit public opinion on growth trends. The workshop process was intended to challenge residents and stakeholders to decide where land use and transportation improvements should and should not occur within the region.

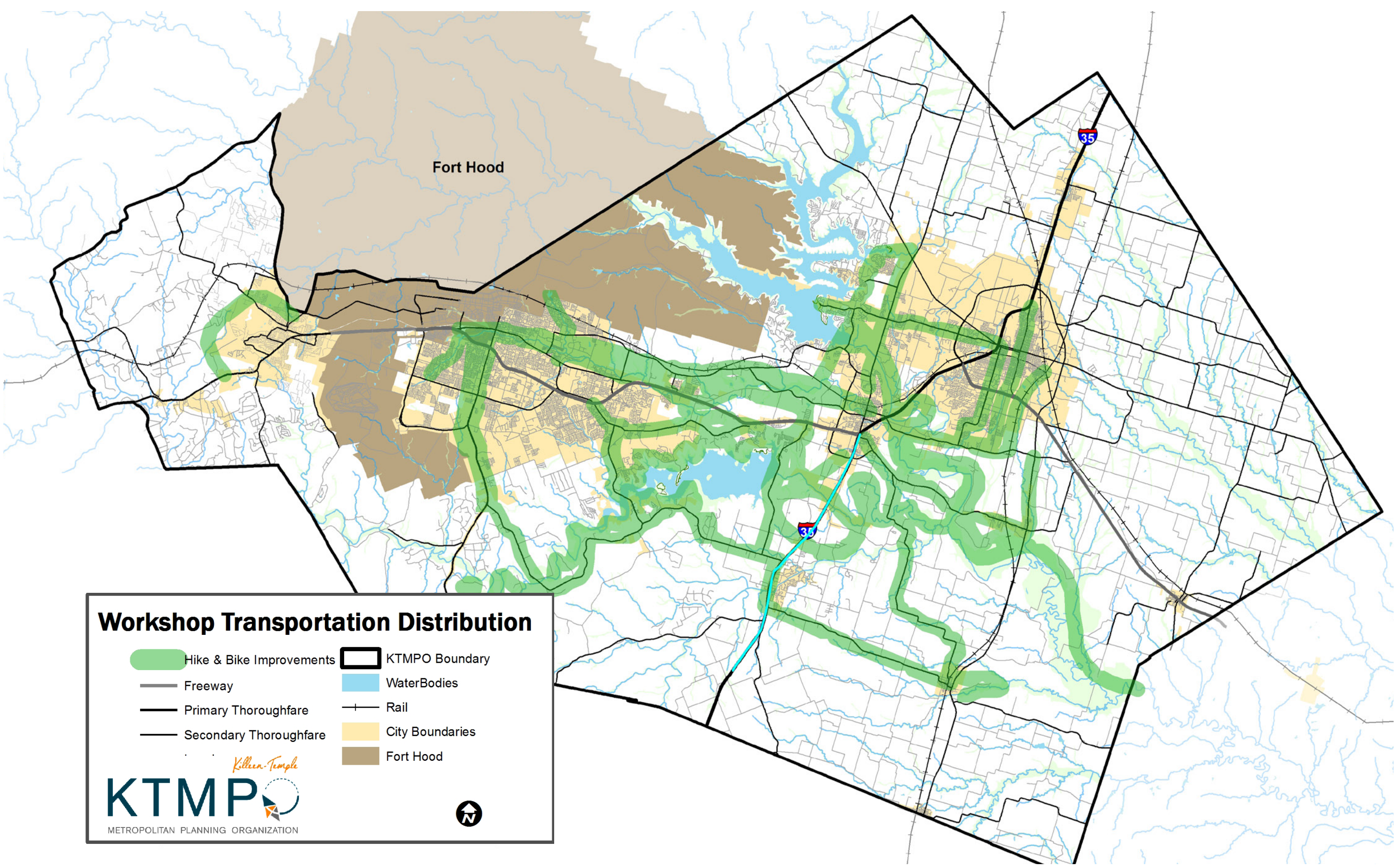
The scenario approach used a control total growth allocation technique. Each of the chips that were provided to the workshop participants represented a unique allocation of population and employment within the KTMPO study area. The results were three growth scenarios that capture the "Trend" scenario and 2 additional scenarios that were guided by the workshop participants.

Participants were also tasked with identifying transportation corridors that need to be improved or constructed. This included road infrastructure, transit connections and bicycle trails. The maps below indicate the locations where the workshop participants would like to see either improved or new connections.

In a follow-up open house on November 13th, 2012 the three scenarios discussed above were presented in an open house. The participants of the open house were able to provide feedback in an interactive polling exercise to gauge the direction for a regional preferred growth scenario. The results of the open house survey are found in Appendix A. Also included in the tables are the results of the online survey that was conducted with the Policy Board and Technical Committee members following the November 13th open house in order to collect additional feedback.




Fort Hood
35
Workshop Transportation Distribution
Transit Improvements
Freeway
Primary Thoroughfare
Secondary Thoroughfare
KTMPO Boundary
WaterBodies
Rail
City Boundaries
Fort Hood
Killeen-Temple
KTMPO
METROPOLITAN PLANNING ORGANIZATION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Secondary Thoroughfare
KTMPO Boundary
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Rail
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Killeen-Temple
KTMPO
METROPOLITAN PLANNING ORGANIZATION

Housing Choices

The trend for residential development are typically single-family detached units and suburban multi-family. While the majority of the public involvement participants expressed the desire to continue to provide a supply of single-family housing, there was a desire to improve the housing choices to allow for more urban options such as mixed-use neighborhoods and townhomes.

Multimodal Transportation Options

A majority of the transportation funding in the region is allocated for vehicle capacity improvements however there is a growing desire to see additional multi-modal transportation choices. People of all ages and physical capabilities should have a variety of mobility choices for getting to work, school, shopping, and recreation.

Downtown Redevelopment

The KTMPO region comprises a number of medium sized municipalities. These include Belton, Copperas Cove, Harker Heights, Killeen, and Temple. As the region grows, new development is going to occur; it is important for a portion of this new development to be located in the city centers to maintain and/or create a vibrant location for the people in the region.

Maintain & Improve Existing Infrastructure

With the expected growth in the region in the next 25 years, maintaining and improving existing infrastructure in the region is important to the community. Providing for a network with improved congestion affects both travel times and also can improve air quality in the region.

Housing & Employment Proximity

The current trend for land use development in the region includes a large gap between new housing and jobs. This pattern has a large impact on transportation performance. Providing an improved proximity to jobs will result in reduced vehicle miles traveled and the average miles per trip. This can have dramatic implications on congestion, safety and air quality in the region.

Kimley-Horn and Associates

www.pedbikeimages.org/Laura Sandt

Killeen-Temple MPO

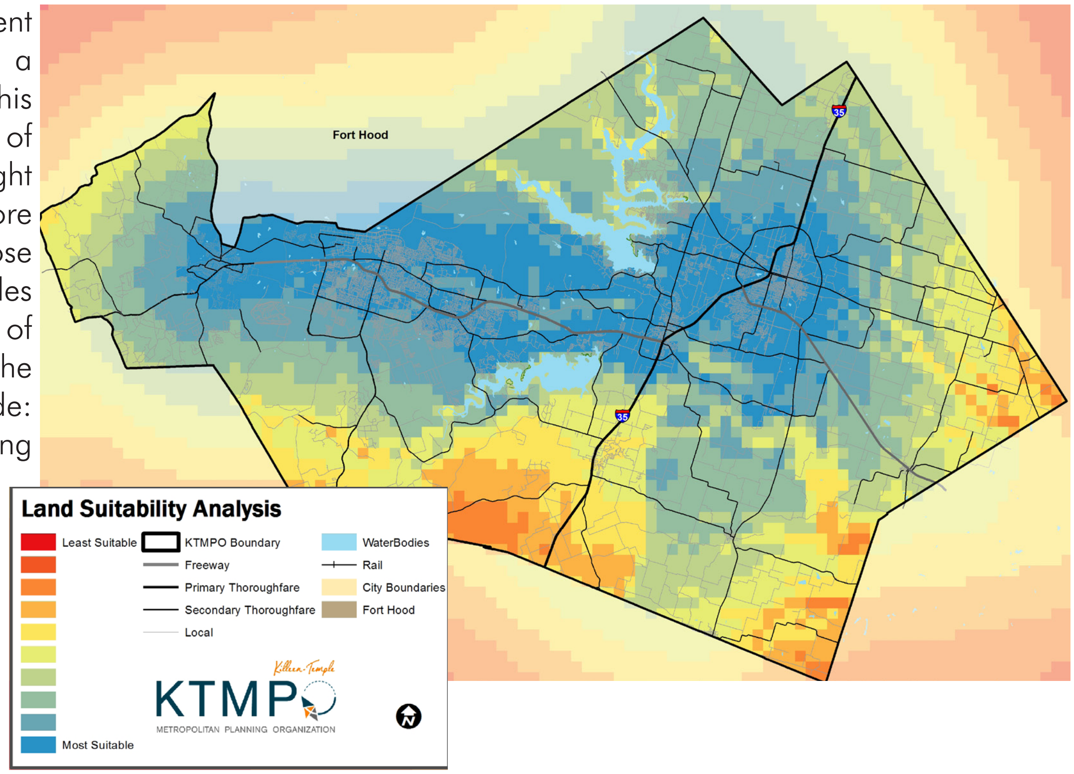
memelodia.blogspot.com

Scenario Development

Based on current trends, future demographic forecasts, and public participation direction, two land use scenarios were developed along with the already developed "trend" scenario. A preferred scenario was developed using these initial three scenarios along with the public feedback provide in the open house. The preferred scenario was developed to project the goals of the public and to encompass the guiding principles.

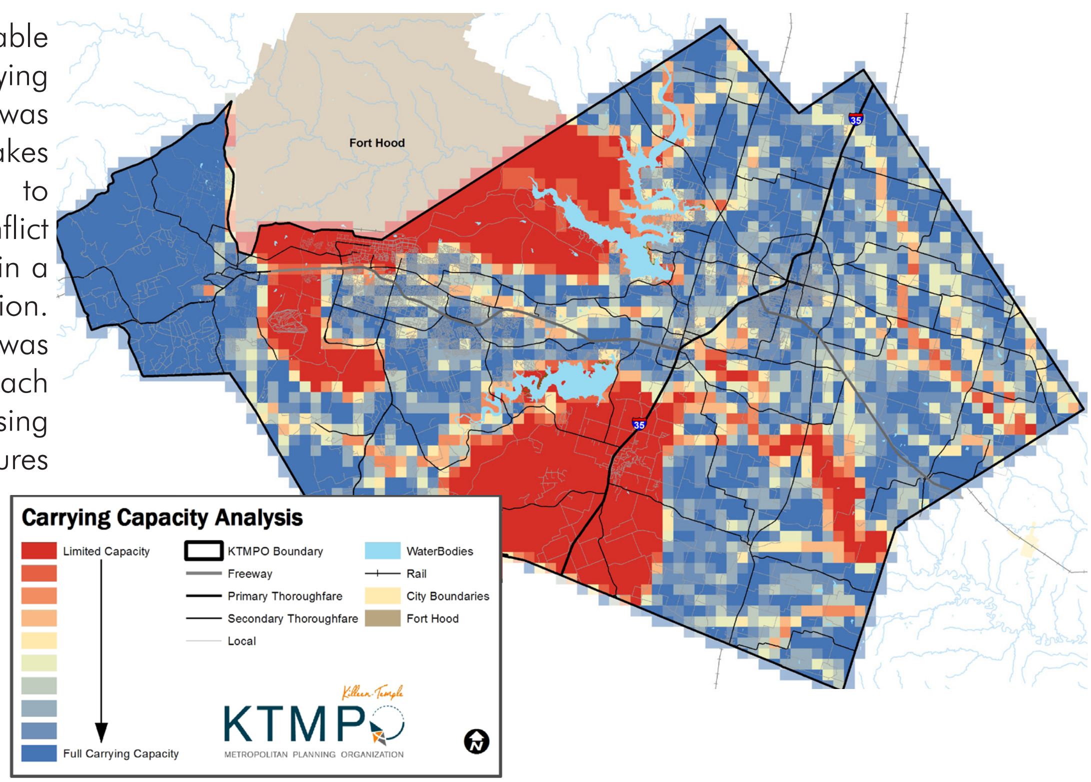
Land Suitability Analysis

Decisions on development allocations were assisted using a land suitability analysis score. This score was based on a number of factors. The image to the right identifies the areas that are more suitable for development and those that are not. This suitability provides a market force for the allocation of population and employment. The factors used in this analysis include: environmental features, existing transportation networks, sensitive areas and land uses.

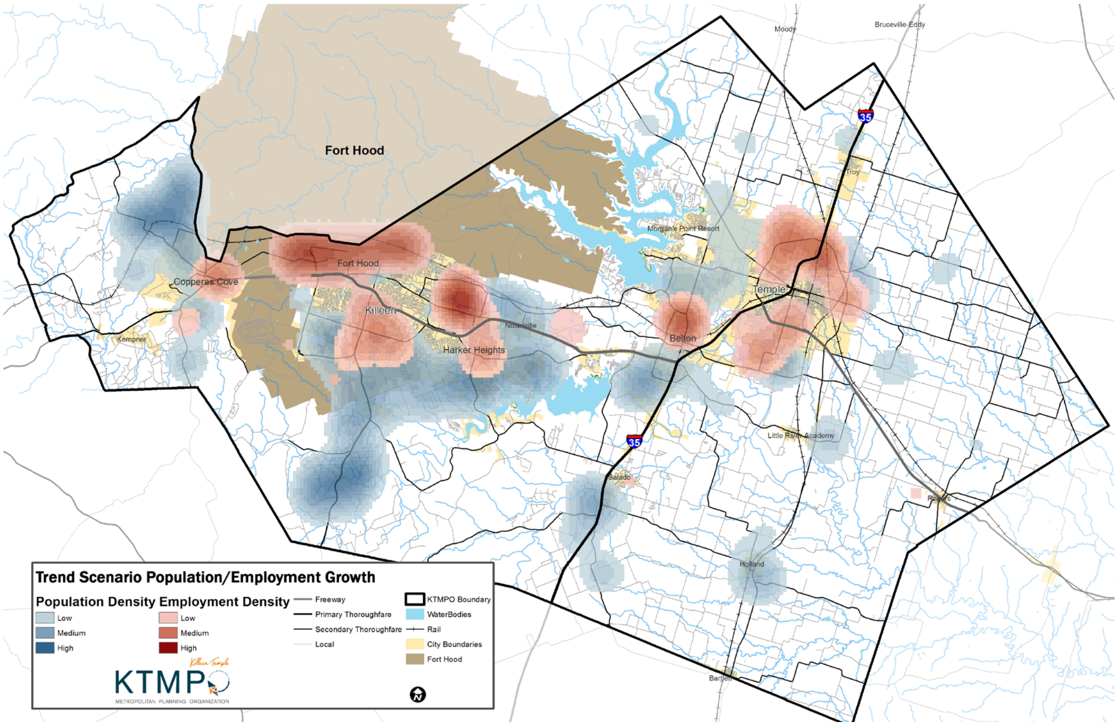


Carrying Capacity Analysis

To estimate supply of land available for development, a carrying capacity analysis of the land was completed. This analysis takes into consideration constraints to development and areas of conflict for development. This resulted in a build-out potential for the region. Once the build-out potential was complete the desirability of each parcel was analyzed by assessing elements such as physical features and proximity to roads, transit, and parks.

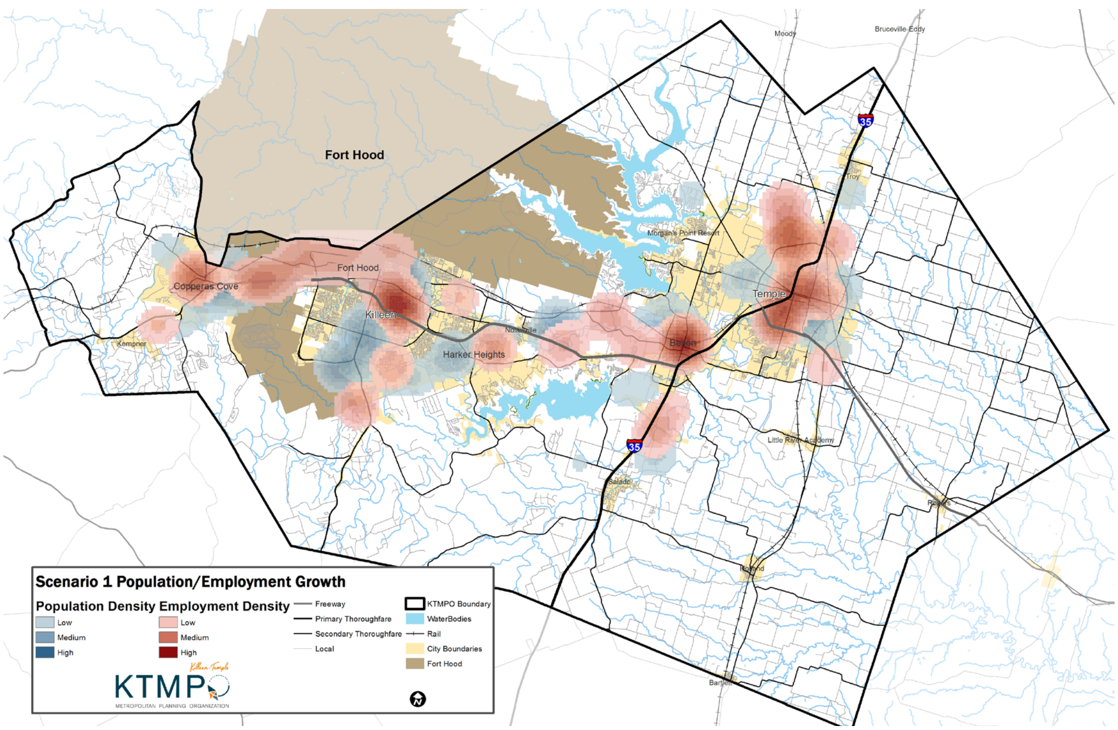


trend SCENARIO



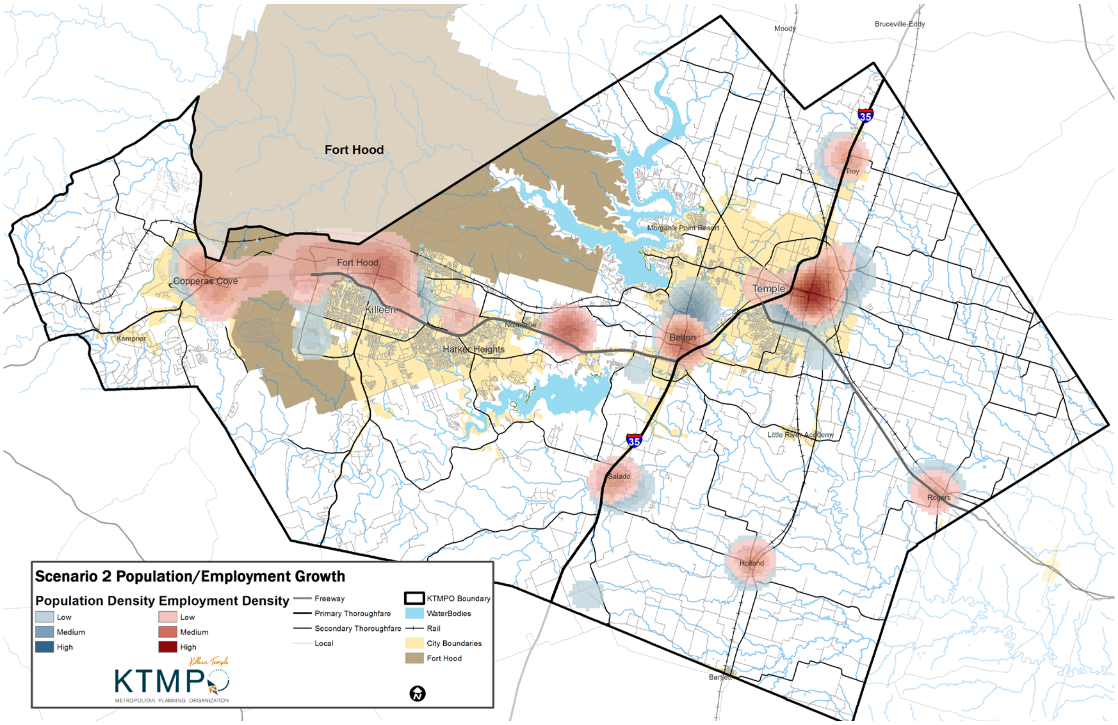
The trend scenario represents continuation of an emerging suburban development pattern prevalent in the Killeen-Temple Region. New construction is characterized by single-use developments surrounded by low density rural residential home sites. The regional activity centers located at major intersections continue to be the social and economic center of the study area. This land use scenario is the one that is used by TxDOT to project future traffic demand in the region for the year 2040.

SCENARIO one



Scenario 1 consists of an increased mix of housing types. This scenario includes townhomes, multifamily, single-family subdivisions, and rural residential. These developments are clustered near jobs and infrastructure. Developments largely occur near existing infrastructure with moderate growth that will require additional water and sewer lines. The primary transportation mode will continue to be the automobile; however, due to more centrally located housing and employment, residents will have additional options (i.e., public transit, biking, or walking). Clustered mixed-use developments will serve as centers for small business and entrepreneurs. Some large retail centers will continue to occur.

SCENARIO two



Scenario 2 represents an increase of density and a mix of housing. This scenario represents the most dramatic change, in terms of altering land use policies, of the three scenarios. Many new renter and owner-occupied multi-unit buildings and townhomes will be built in the city centers for those who prefer compact low-maintenance residences that are walkable to jobs and commercial areas. While the primary transportation mode will continue to be the automobile, many people will also use an expanded transit system within and between cities. Investment will be made into new walking and biking options. These options will be designed for year-round use. There will also be limited investment in new and widened roadways. Jobs will be centrally located.

Preferred Scenario

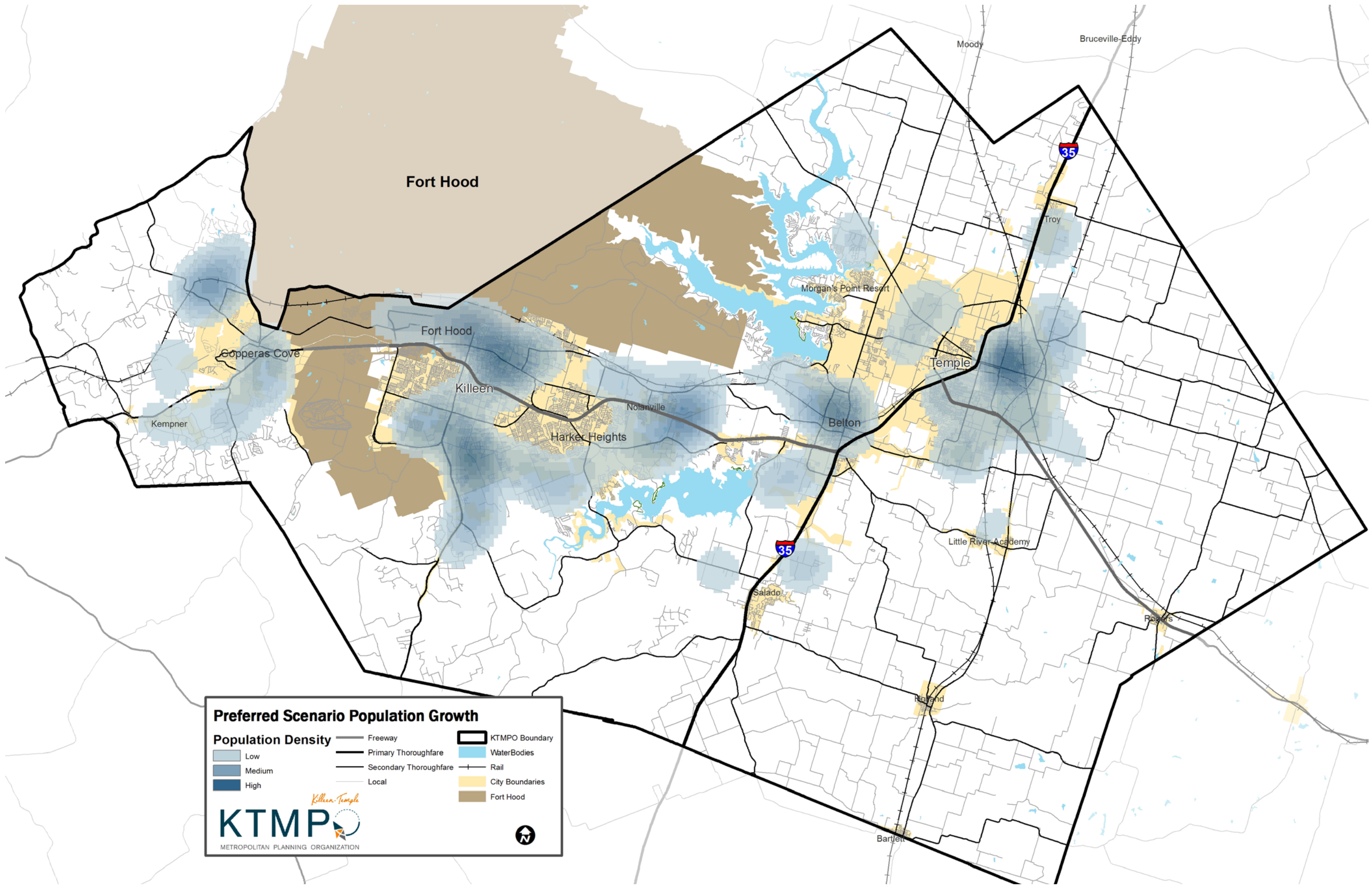
Based on feedback from the public workshop, the open house and the survey results, it can be concluded that change in the future growth patterns of the region are desired. Although this change is not a dramatic change from the trend, it attempts to embrace certain opportunities of growth that may have been missed. Focusing growth in key centers across the region is important to the community; this is done by investing in the downtowns and the main streets of the Killeen-Temple region. At the same time allowing for economic growth to occur in new suburban areas is also important.

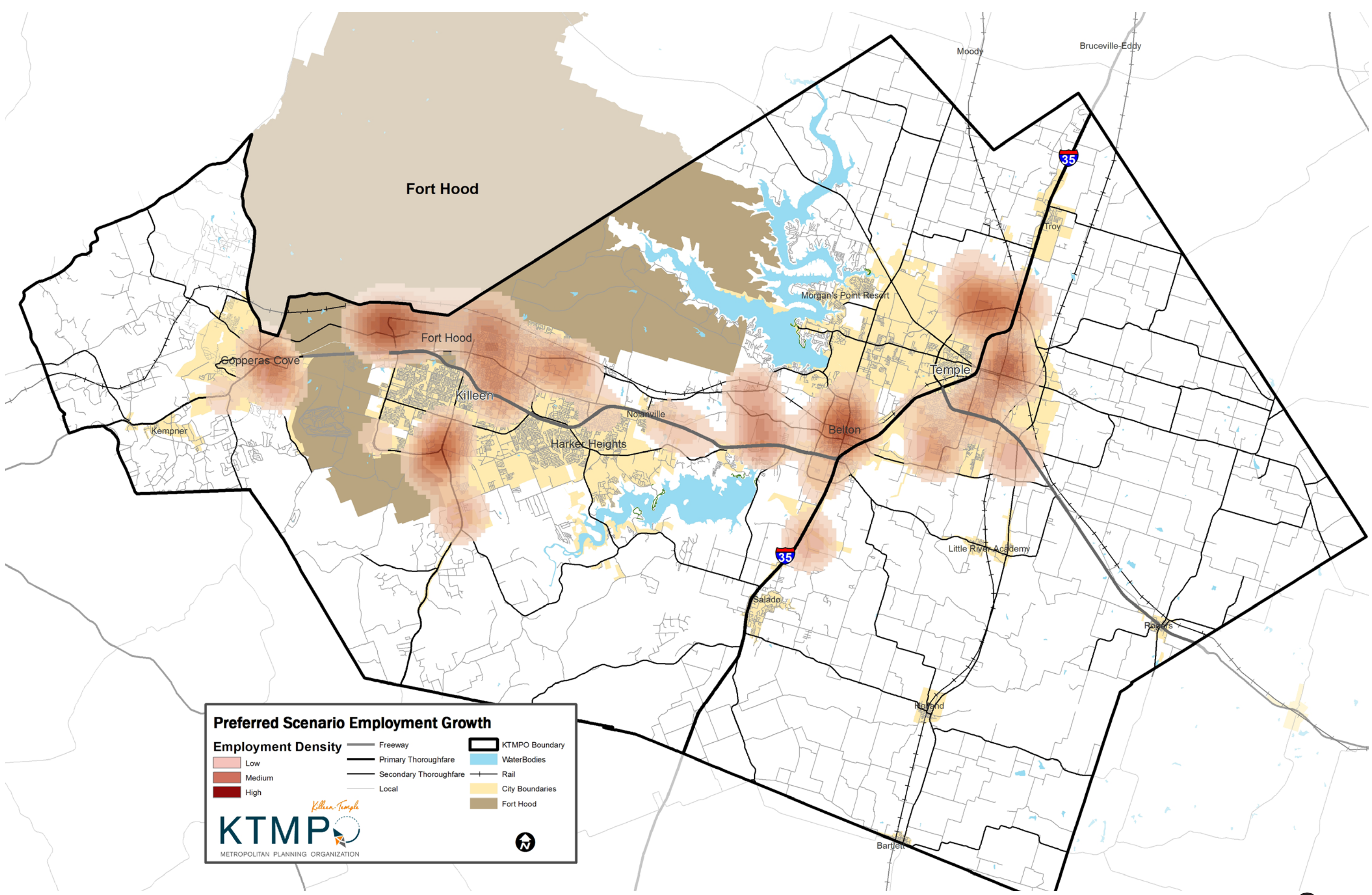
The preferred scenario will combine aspects of the trend and scenario 1 that were most important to the members of the community. It will balance the potential reality of the future while providing opportunities to adjust to changing development patterns and transportation technologies.

Priority Elements of Preferred Scenario

- Important balance of housing by providing new suburban growth while also increasing the capacity of urban infill opportunities
- Population and employment growth focused around key transportation linkages that includes the road, transit and bicycle networks
- New jobs centers are focused in nodes with existing supportive infrastructure
- Population growth is in closer proximity to job centers

preferred SCENARIO





Scenario Summary

Scenario planning represents the next generation of analytical processes created to evaluate the influence of development intensities and land use patterns on the efficiency of a proposed transportation system. Visualization of the interaction between land use and transportation decisions, as well as causational factors that explain the push-pull relationship between them, provide citizens and community leaders with the information they need to evaluate the consequences of potential growth. Building on this momentum, the Federal Highway Administration and other federal agencies are actively promoting the use of scenario planning models by state departments of transportation, metropolitan planning organizations, and local governments to better integrate transportation and land use decisions.

This study utilized public involvement techniques to engage the public and help them understand the consequences of growth. Starting with the Trend for future growth adapted from the 2040 regional travel demand model, two additional land use scenarios were developed by the participants. These two scenarios along with the trend scenario were evaluated using CommunityVIZ software. Transportation, air quality, development yields and modal share indicators assisted in the decision making process.

Using the three initial scenarios and comparing the indicators developed for each of them, the public and stakeholders were able to help direct the pattern of growth for the preferred scenario.

The results from the indicators summary show a number of unique characteristics when comparing each scenario. For the preferred, the acres developed is lower than the trend indicating that some of the new housing and employment growth is being focused within the cities. Trips generated is reduced from the trend as a result of the mix of housing being implemented and the increase ability to have mobility choices. This is also seen in the increase of the transit mode share. The results of fewer auto trips will also result in lower air quality emissions relative to the trend scenario. These indicators provide a measure to assist in gauging our policy decisions as we move forward in the region.

The preferred scenario will be used as the new demographic allocation method for the Killeen-Temple MPO regional travel demand model for anticipating future traffic patterns for the year 2040.

INDICATORS

For New Growth Only

	Trend Scenario	Scenario 1	Scenario 2	Preferred
Development Yields				
Households	82,370	82,990	82,910	82,470
Population	207,580	209,140	208,920	207,820
Employment	89,210	89,170	89,360	89,490
Acres Developed	86,300	36,200	25,900	57,300
Transportation				
Total Trips Generated (Daily)	988,000	980,000	995,000	982,000
Auto Trips (Daily)	902,000	767,000	729,000	821,000
Vehicle Miles Traveled (Daily)	8,807,000	7,484,000	7,119,000	8,014,000
Annual Fuel Consumption (gallons)	140,378,000	119,286,000	113,462,000	127,740,000
Air Quality				
CO_2 Emissions (tons)	1,286,000	1,093,000	1,039,000	1,170,000
NOx Emissions (tons)	5,320	4,520	4,300	4,840
VOC Emissions (tons)	6,380	5,420	5,160	5,800
Mode Share				
Auto Mode Share	91%	78%	73%	84%
Transit Mode Share	1%	8%	11%	5%
Walk & Bike Mode Share	8%	14%	16%	11%

Appendix E:

KTMPO Regional Multimodal Plan

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

REGIONAL MULTIMODAL PLAN

2018

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Chapter 1: Introduction

CHAPTER HIGHLIGHTS

- The Regional Multimodal Plan
- The Region
- The MPO
- The Transportation Modes
- Outline of MTP Chapters

The Regional Multimodal Plan

Historically, the dominant mode of travel in the region of the Killeen-Temple Metropolitan Planning Organization (KTMPO) has been the personal automobile, and a transportation planning process that focused on automobile mobility was appropriate and adequate. However, people and industries are rethinking their transportation needs, preferences, and habits. It is now critical to consider multiple options for mobility and access, and the way we plan for transportation must progress to include all transportation modes for people and freight. Transportation planning must shift from its historic focus on the automobile mode and expand to consider all modes within an **integrated transportation system**.

The vehicle for accomplishing the transportation planning task for an integrated transportation system is this **Regional Multimodal Plan**. The change in names from the previous Regional Thoroughfare Plan to this Regional Multimodal Plan reflects the greater emphasis that this update places on planning for all transportation modes. There are two significant characteristics of an integrated transportation system to be considered in this Plan. First, the integrated transportation system is **regional**, covering the geographic area of the Killeen-Temple Metropolitan Planning Organization (KTMPO) with its member jurisdictions and rural areas. Second, the integrated transportation system is **multimodal**, considering the needs and potential of existing transportation modes for people and freight, and planning for appropriate new modes.

The purpose of a plan is not to predict the future; it is to enable it.

In general terms, the Plan is a tool for defining the orderly development of the integrated transportation system so that all planning and projects are efficient, effective, and mutually supportive. The Plan has a **short-term** component to address existing transportation needs, and a **long-term** component that considers future needs defined by anticipated socioeconomic growth and the performance of the transportation system. Both components support the ultimate Plan goals of enhancing mobility, increasing the connectivity and convenience of the transportation system, supporting opportunities for economic development, and enhancing the quality of life in the region.

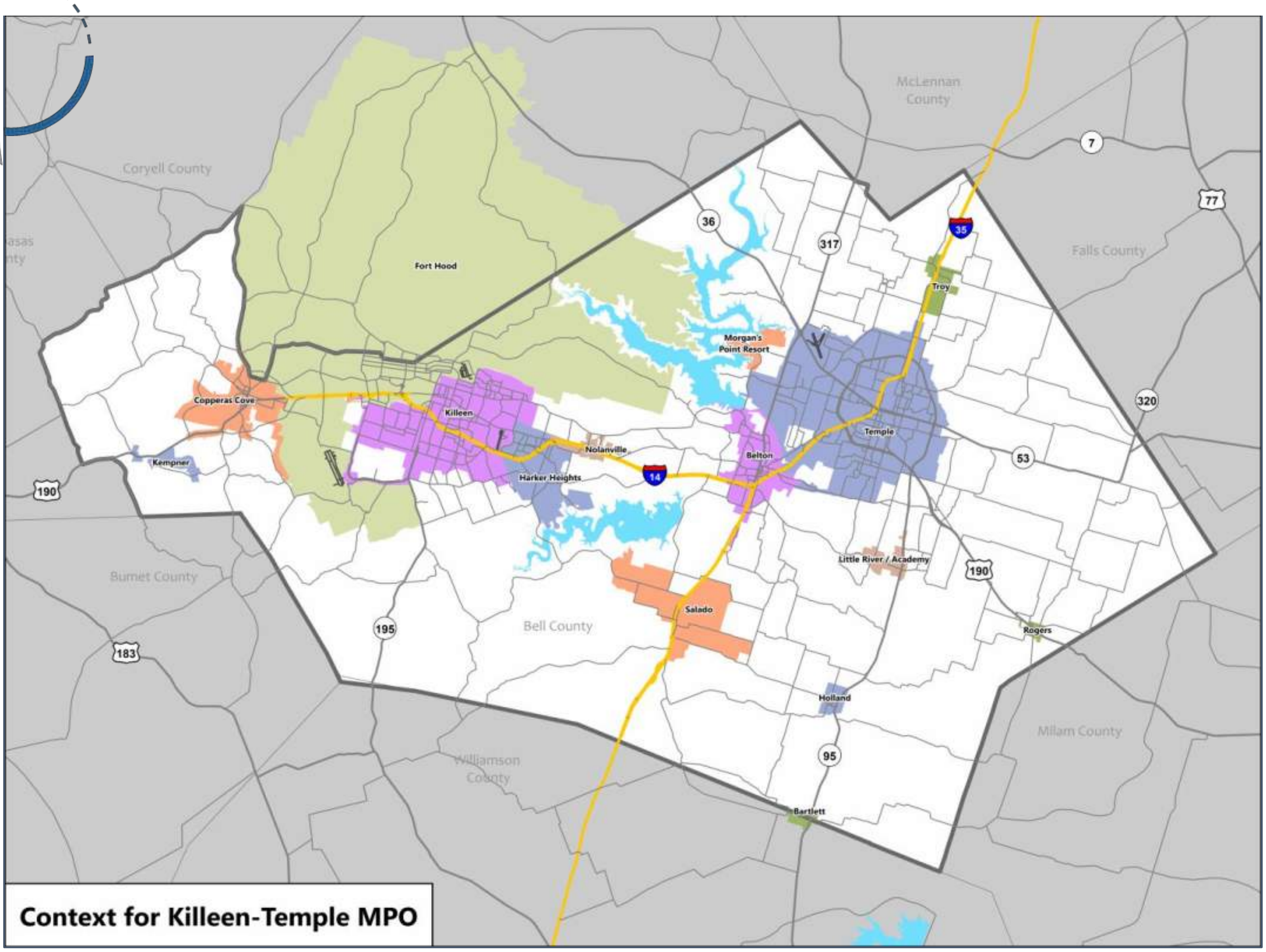
As a practical tool, the Plan includes a Regional Thoroughfare Plan that defines roadway functional classes and typical cross sections. The Regional Thoroughfare Plan considers the individual Thoroughfare Plans from KTMPO member jurisdictions in developing its consistent and comprehensive definitions and cross sections for the full region. The Thoroughfare Plan component of the Regional Multimodal Plan is in no way intended to supersede the plans of the KTMPO member jurisdictions; it is a tool to define consistent roadway standards for the entire region. This enables an orderly system of roadway types and consistent performance, and supports coordination among KTMPO member jurisdictions.

The more proactive you can be, the less reactive you have to be.

The Region

One important feature of the integrated transportation system is that it is **regional**. Regional transportation planning recognizes that the needs of the integrated transportation system are not limited to a single city or corridor, and takes a broader view to consider the needs of the whole region, including smaller communities and rural areas. To fill this need, federal regulations have established the concept of the Metropolitan Planning Organization (MPO) as a planning agency for a region, defining a planning area based on the extent of current and anticipated socioeconomic activity. This provides a vehicle for regional planning that is not constrained by city boundaries. The boundaries and context of the KTMPO planning region are shown in **Figure 1-1**. The planning area includes the full extent of Bell County and portions of Coryell and Lampasas Counties. The Figure shows the boundaries for the travel demand model, which include a small sliver of McLennan County to accommodate the alignment of Stampede Rd., and a small slice of Williamson County, so that the full extent of the City of Bartlett would fall within the study area. The main cantonment, the Robert Gray Army Airfield, and other portions of Fort Hood lie within the study area, but the north cantonment and training area lie outside.

Figure 1-1: KTMPO Planning Region

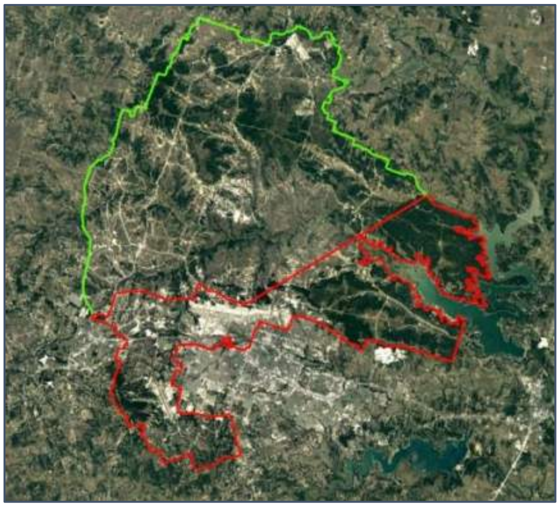


The KTMPO region includes seven larger jurisdictions which are treated in more detail based on their significance in the region and for coordination with their individual planning efforts. Each of these jurisdictions have produced their own Comprehensive Plan or Thoroughfare Plan that must be considered in building this Regional Multimodal Plan.

Belton is located southwest of Temple at the junction of IH-35 and IH-14/US 190. Belton serves as the Bell County seat. Commercial activity in Belton is focused downtown and along N. Main Street and E. 6^{th} Street. Industrial uses lie along IH-35, IH-14/US 190 and E. 6^{th} Street. Major employers are the University of Mary Hardin-Baylor and Bell County government. The US Census estimates a 2017 population of 20,900. Total employment is about 7,900.

Copperas Cove is located to the west of Fort Hood, straddling Coryell and Lampasas Counties. It is best classified as a bedroom community oriented to Fort Hood, with commercial activity along Business Route 190. Retail-oriented employers at the Town Square Shopping Center are collectively the largest employer in Copperas Cove. The US Census estimate of the 2017 population is 32,800 with total employment of about 6,300.

Harker Heights sits between Killeen and Stillhouse Hollow Lake. It is primarily a bedroom community with most of its commercial uses located along US 190, Business Route 190, and Knight's Way/FM 2410. The top employer sectors include Seton Hospital and the Market Heights retail area. The US Census estimates a 2017 population of 29,800. Total employment is about 7,500.



Fort Hood covers around 215,000 acres in Bell and Coryell Counties, bordering directly along Killeen and Copperas Cove. Significant units stationed at Fort Hood include III Corps, 1st Army Division West, and 1st Cavalry Division. The main cantonment with the majority of the residential area lies within the KTMPO area, but much of the training area and the north cantonment are outside the region. Population and employment on the base vary with unit deployments, but typically are around 65,000 active duty service members and dependents and 9,000 civilian employees.

Killeen is located on US 190, bordered by Fort Hood on the north and west sides and Harker Heights on the east side. Killeen is mostly residential, with commercial activity along US 190, Business 190, and SH 195. Killeen also has an industrial park in the eastern portion of the city adjacent to US 190. The top employers are Central Texas College, Metroplex Hospital, Killeen Mall, AEGIS Communications Group, Killeen-Ft. Hood Regional Airport, and Skylark Field. The 2017 population estimate from the US Census is 143,400 and total employment is about 33,000.

The Village of Salado is located south of Belton, with development centered along IH-35 and Salado Creek. The top employers in Salado focus on the arts and tourism, with nineteen sites listed in the National Register of Historic Places. The 2017 estimate of population is 2,000 and total employment is about 1,300.

Temple is located along IH-35 and US 190 in the eastern portion of the KTMPO region. Commercial activity is located on the southern edge of the city, IH-35, and US 190. Industrial parks are located along Loop 363 and southeast of Temple. The top employers include Scott & White Hospital, Temple College, the Veteran's Clinic, Tenneco Packaging, McLane Southwest, Walmart Distribution Center, Wilsonart, Temple Mall, King's Daughters Hospital, and Draughon-Miller Central Texas Regional Airport. The US Census estimate of the 2017 population is 73,600. Total employment in Temple is about 47,100; so while Killeen has the most population of any city in the region, Temple has the most employment.

The remainder of the KTMPO region includes rural areas and eight other communities. Several of these communities have population or employment larger than the other listed jurisdictions, but the communities listed in this group have not produced their own Comprehensive Plans or Thoroughfare Plans.

Total population for the eight other communities is about 18,100 and total employment is about 3,400. In the rural area, total population is about 39,400 and total employment is about 9,000. This calculates to 89% of the regional population lying within the 15 incorporated communities and 11% in the rural area; while 94% of employment falls within the incorporated communities and 6% lies in the rural area.

The eight other communities include:

- Bartlett, straddling Bell County and Williamson County, with a 2017 population estimate of 2,800 and about 600 total employment.
- Holland in Bell County, with an estimated 2017 population of 1,100 and total employment just over 200.
- Kempner in Lampasas County, with a population of 1,100 and about 60 total employment.
- Little River-Academy in Bell County, with an estimated 2017 population of 2,000 and employment just under 350.

- Morgan's Point Resort in Bell County, with an estimated 2017 population of 4,200 and total employment of about 240.
- Nolanville in Bell County, with an estimated population of 5,000 and 560 in total employment.
- Rogers in Bell County, with an estimated population of 1,300 and total employment of 340.
- Troy in Bell County, with an estimated 2017 population of 1,900 and an estimated total employment of 700.

The MPO

Federal law requires that a Metropolitan Planning Organization (MPO) is designated for each urban area with a population of 50,000 or more. The MPO is to provide a continuing, cooperative, and comprehensive transportation planning process that results in plans and programs that consider all transportation modes and supports metropolitan community development and social goals. The ultimate goal of the planning process is the development and operation of an integrated intermodal transportation system that supports the efficient movement of people and goods.

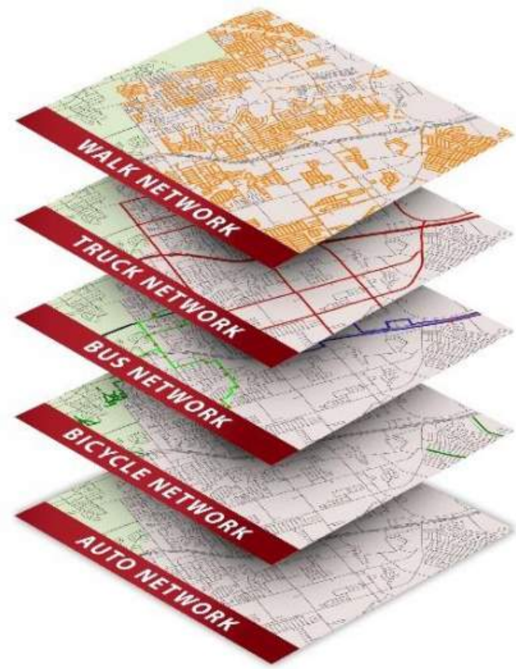
Federal and state legislation requires that each MPO have a long-range transportation plan covering a 25-year period. This plan is called the Metropolitan Transportation Plan (MTP). Its purpose is to develop the overall vision for multimodal planning in the region, develop a systematic and inclusive planning process, determine future needs, and develop a prioritized list of projects that will effectively address future needs in an efficient and equitable manner. The **Regional Multimodal Plan** with its Thoroughfare Plan and Bicycle/Pedestrian Plan are not directly components of the MTP, but they are complementary and feed into the MTP to support the definition and selection of transportation projects.

Preparing the MTP and the Regional Multimodal Plan are only two of the planning purposes of the Killeen-Temple MPO. KTMPO also produces a Transportation Improvement Plan (TIP) for short-term investments and a Unified Planning Work Program (UPWP) to define the annual schedule of planning work performed. Mapped traffic counts in the region, GIS layers, other plans and reports, and studies for specific transportation projects are also produced and available on the MPO website at http://www.KTMPO.org. Public participation is welcomed throughout the process for each of these MPO products, and is guided by the Public Participation Plan, which is also available on the KTMPO website, but direct public participation is not a component of Regional Multimodal Plan development.

Transportation Modes

One important feature of the integrated transportation system is that it is **multimodal**. Multimodal transportation planning recognizes that the needs of the integrated transportation system in the region are not limited to the historic emphasis on personal automobiles, and takes a broader view to consider the needs of all transportation modes for personal travel and for freight. To fill these needs, the Regional Multimodal Plan embraces multimodal transportation planning as the vehicle to develop the historically auto-oriented transportation system into a truly integrated multimodal transportation system.

The integrated multimodal system can be considered as a series of layered networks with some links shared among transportation modes, some links exclusive to one or more modes, and some modes interfacing with the system as points rather than as links. Multimodal transportation planning must consider the features of each mode individually, and must also plan for how each mode interacts with the others. While each mode in theory can operate independently, in practice the interface between modes can be vital in establishing how well each mode performs. In particular, the issue of safety in the interface between active transportation modes and motorized modes is critical. Where facilities such as protected bicycle lanes are provided, users feel much more comfortable and ridership has been seen to increase significantly.



Seven unique networks are components of the integrated multimodal transportation system in the KTMPO region:

The **auto network** is currently the most robust component of the integrated system. This network places the least restrictions on its users in terms of access, barriers, and connectivity. Transportation planning and funding programs have historically had an automobile orientation. The auto network also carries by far the majority of all travel in the KTMPO region, and so the traditional focus of the planning process on the automobile is entirely appropriate. The challenge in developing the integrated multimodal network is to broaden the focus of transportation planning while at the same time preserving the regional mobility provided by the auto network.

The **bicycle network** typically shares the roads with the auto network, and bicycles are in fact classified as vehicles by state law. Bicycle riders are, however, much more vulnerable than the auto users with whom they share the road. The interface between bicycles and motor vehicles is therefore an important issue, both along the street and at intersections. Various types of bicycle facilities have been developed to address this interface, including shared lanes, bike lanes, protected bike lanes, bike boulevards, and protected intersections.

The **bus network** for the KTMPO region is defined by the service provided to the HOP's ten fixed routes that provide service in Temple, Belton, Nolanville, Harker Heights, Killeen, and Copperas Cove. The fixed route system is served by 313 stops with a variety of amenities ranging from simple bus stop signs to intermodal stations providing indoor waiting areas and linkage to taxi, intercity bus, and AMTRAK service for the stations in Killeen and in Temple.

The HOP's paratransit service is also a component of the bus network. It operates within ¾ mile of the fixed routes in Killeen and in Temple, providing bus service and connections to qualified persons with disabilities.

The **truck network** is essentially the same as the auto network, but includes restrictions based on height and loaded weight. Some at-grade railroad crossings and bridges also place restrictions on the routes that trucks may reasonably use, and some jurisdictions have specified routes for hazardous materials. Specific routes defined in the regional network that consider the needs of freight traffic include the National Highway Network, the Freight Analysis Framework network, the Texas Highway Trunk System, and local truck-restricted roads.

While the **walk network** has historically received the least direct attention in transportation planning, it is vital to the transportation system. Every trip begins and ends as a walk trip, even if it is only to walk to access another mode of transportation. As with bicycles, walking is an active transportation mode with users who are particularly vulnerable to motorized vehicles. The safety of the interaction between the walk mode and motorized modes is therefore a critical consideration in multimodal transportation planning.

The **airport system** is not a network co-linear with the other network layers. Rather, it is an independent network that interacts with the other layers at specific points – the discrete and controlled land-side access to public airports. While this narrows the range of issues for multimodal transportation planning, the issues themselves remain the same: access, barriers, and connectivity between the airports and the rest of the networks must still be considered.

Like the airport system, the **rail system** is an independent network that interacts with the other network layers at specific points. The points of interaction are not limited to access points at rail stations; consideration must also be given to locations where the rail network crosses the road network with at-grade crossings. At-grade crossings define concerns with safety and pavement condition. Railroad grade-separated crossings may have height, width, weight, and load restrictions as well.

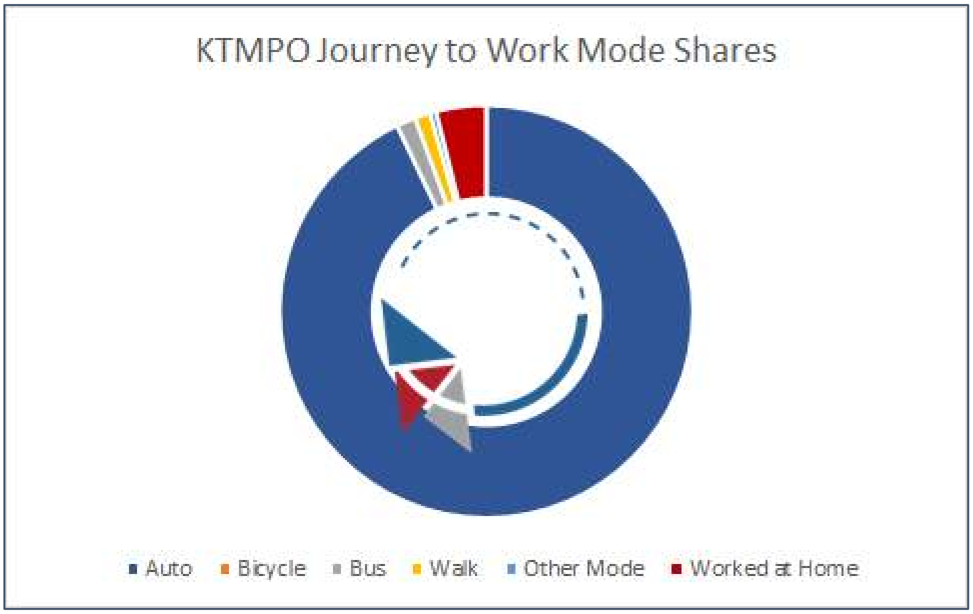
The rail system includes freight service run by Burlington Northern Santa Fe (BNSF) and Union Pacific, and an independent but connected freight network within Fort Hood. Passenger rail service in provided by AMTRAK using Burlington Northern and Union Pacific tracks. There is also about 6 ½ miles of abandoned rail track that lies between Belton and southern Temple which provides opportunities for re-use and can be considered in planning the integrated multimodal network.

Share and Balance of Transportation Modes

The goal of a regional multimodal system is to develop complementary modal networks that interact to provide safe, convenient, and practical transportation options for all users. Within this balanced system, all transportation modes are not equal, nor are all modes equally used. The private automobile is the predominant mode of transportation in the KTMPO area. Transportation planning must recognize this fact, and take care to balance the needs and traditional accommodation of this mode while increasing the integration of all modes into the regional multimodal system.

Figure 1-2 shows the Census data for each transportation mode's share of the total for the Journey to Work (JtW) trip. The auto mode was used by 92.9% of all trips. Transit mode share was 1.5%; walking was the travel mode for 1.2% of trips, and other modes such as taxis were used for 0.5%. The mode share for bicycle was so low that it was reported as 0.0%. The total for all non-automobile modes was 3.2%, compared to a 3.9% share for people working at home.

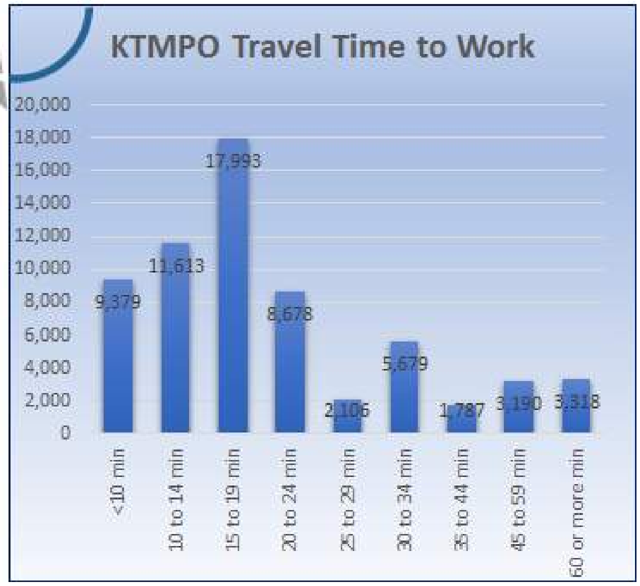
Figure 1-2: KTMPO Journey to Work Mode Shares



The relatively low shares for non-automobile modes can be seen as a testimony of how the region views the safety, convenience, and practicality of those forms of transportation within the existing network. One of the purposes of this Regional Multimodal Plan is to determine the gaps, barriers, and constraints in the network that must be addressed in order to balance all transportation modes. Once the balance is addressed, volumes of use of these modes may be expected to increase.

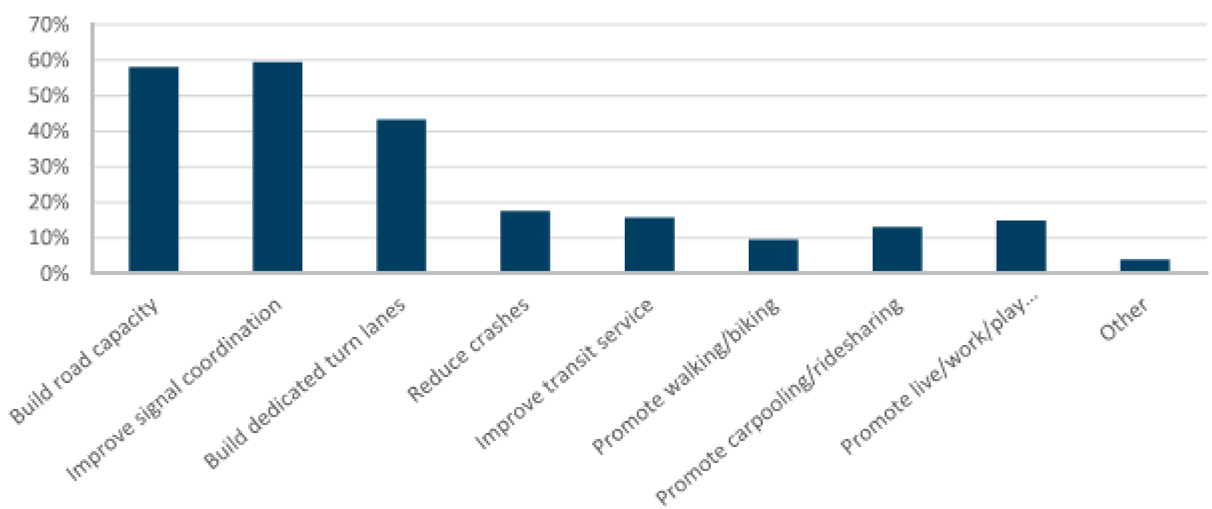
Figure 1-3 shows the distribution of travel time to work for the KTMPO region, based on Census data. A cumulative 32.9% of all work trips are shorter than 15 minutes, and 61% are under 20 minutes. While travel times by bicycle, bus, and walking would undoubtedly be longer, the data show that the majority of work trips can feasibly be made by other transportation modes; the issue is balancing the networks and the operating conditions so that each mode is seen as safe, convenient, and practical.

Figure 1-3: Distribution of Travel Time to Work



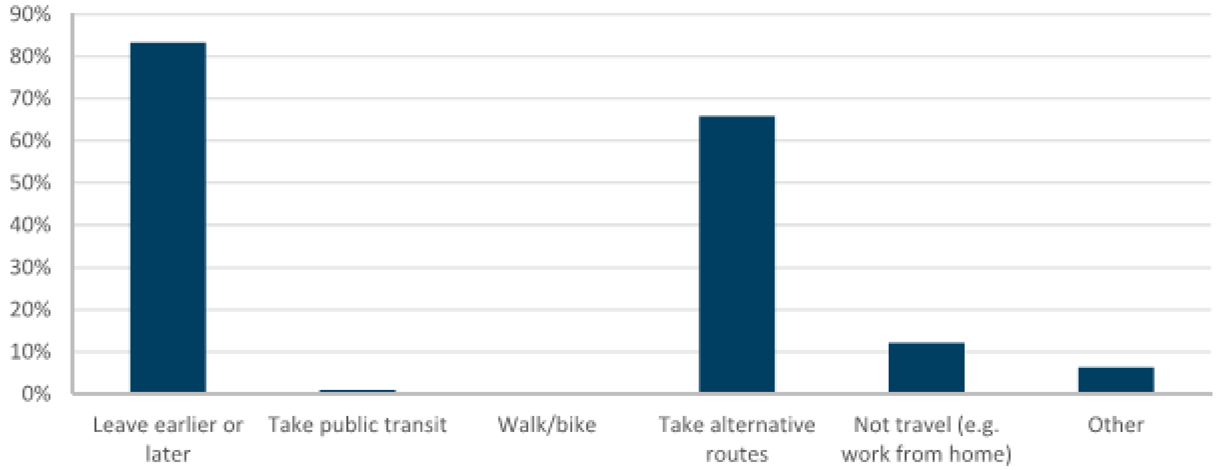
The results of surveys taken for the 2016 Congestion Management Process provide further data on how the auto and other transportation modes are perceived in the KTMPO region. **Figure 1-4** charts the survey results in answer to the question "What do you believe are the most effective strategies for addressing traffic congestion?" The results show that both roadway capacity and operational efficiencies were top strategies. This is consistent with the predominance of the automobile in regional mode shares. Strategies addressing a multimodal system consistently were scored by between 10% and 20% of respondents.

Figure 1-4: Strategies to Address Congestion



Taking this to a personal level, the survey also asked, "What actions do you take to avoid traffic congestion?" The responses, shown in **Figure 1-5**, again show a reliance on strategies based on driving a personal automobile.

Figure 1-5: Actions to Avoid Congestion



Taken together, the Census data and the Congestion Management Process surveys reinforce the perception of the automobile as the predominant mode of transportation. This does not negate the consideration of other transportation modes in the regional multimodal system; but rather outlines the challenge of developing the proper and adequate balance between modes.

Outline of Regional Multimodal Plan Chapters

This first chapter to the Regional Multimodal Plan has introduced:

- The concept and function of the Regional Multimodal Plan.
- An overview of the region and its jurisdictions.
- A definition of the MPO with its establishing Federal regulations and its planning purposes.
- An overview of the transportation modes to be considered in this plan.

Subsequent chapters of the Plan will introduce additional concepts and detail the elements of the Plan:

Chapter 2 will detail the planning context of the Plan. It references the individual Thoroughfare Plans developed by KTMPO member jurisdictions.

Chapter 3 introduces the concept of Complete Streets and associated movements designed to promote the integration of modes into an integrated system serving the needs of all users.

Chapter 4 will define the concept of Functional Classes for planning for modal networks.

Chapter 5 will provide inventories of existing facilities by transportation mode.

Chapter 6 is the regional Thoroughfare Plan for the years 2017 and 2045.

Chapter 7 will define the active transportation networks for bicycles and pedestrians.

Chapter 8 will cover the modes which are defined as group transportation: transit, carpool and rideshare, intercity bus, passenger rail, and passenger air.

Chapter 9 will detail the freight system, focusing on the truck and rail freight networks. Specialized high-value, low-weight air cargo will also be considered in this chapter.

Chapter 10 will define performance measures related to the integrated multimodal system. It will reference and support the project selection criteria used for the latest version of the MTP, but will be independent of them. The performance measures will tie to the required planning factors as defined in the FAST Act.

Chapter 11 will list potential implementation projects for each mode based on identified needs that will be presented to the Technical Advisory Committee, and may be submitted by local jurisdictions for project development. Projects will not be ranked or prioritized in this Plan.

Chapter 12 will provide a summary of the Plan to document its processes and results in a clear but concise manner. Any action items for implementing the Plan will be detailed in this final chapter.

Chapter 2: Planning Context

CHAPTER HIGHLIGHTS

- **Planning Context**
- **Goals and Objectives**
- **Demographics and Growth**
- **Thoroughfare Plans**
- **Travel Demand Model**

The Planning Context

The **Regional Multimodal Plan** defines a consistent integrated transportation system, but it operates within the context of regional goals, regional demographics, regional plans, and the regional travel demand model setup and definitions.

One of the most vital plans to consider is the Thoroughfare Plan. In general terms, a Thoroughfare Plan is a long-range master plan for the orderly development of an efficient roadway transportation system. Most importantly, it defines an interconnected hierarchical system of roads that is required to meet the anticipated long-term growth within an area. The Thoroughfare Plan developed as part of the Regional Multimodal Plan is regional and therefore must not be overly deterministic: it presents typical cross-sections for roadways and general alignments for proposed roads, without dictating specific features of the thoroughfare system to the KTMPO member jurisdictions.

A second vital plan that provides context for the Regional Multimodal Plan is the Bicycle & Pedestrian Plan. Similar to the Thoroughfare Plan, the Bicycle & Pedestrian Plan is a long-range master plan for the orderly development of bicycle and pedestrian facilities. There is a hierarchy of facilities identified within the plan that includes on-street bikeways and off-street trails.

Although the Thoroughfare Plan and the Bicycle & Pedestrian Plan are the more critical elements of the Regional Multimodal Plan, the other transportation modes in the region play an important role in providing mobility for people and freight, and are accommodated in the Plan as well. Facilities supporting group transportation modes must be supported, barriers must be identified and addressed, and connectivity between modes must be enhanced so that all users are served by the integrated transportation system.

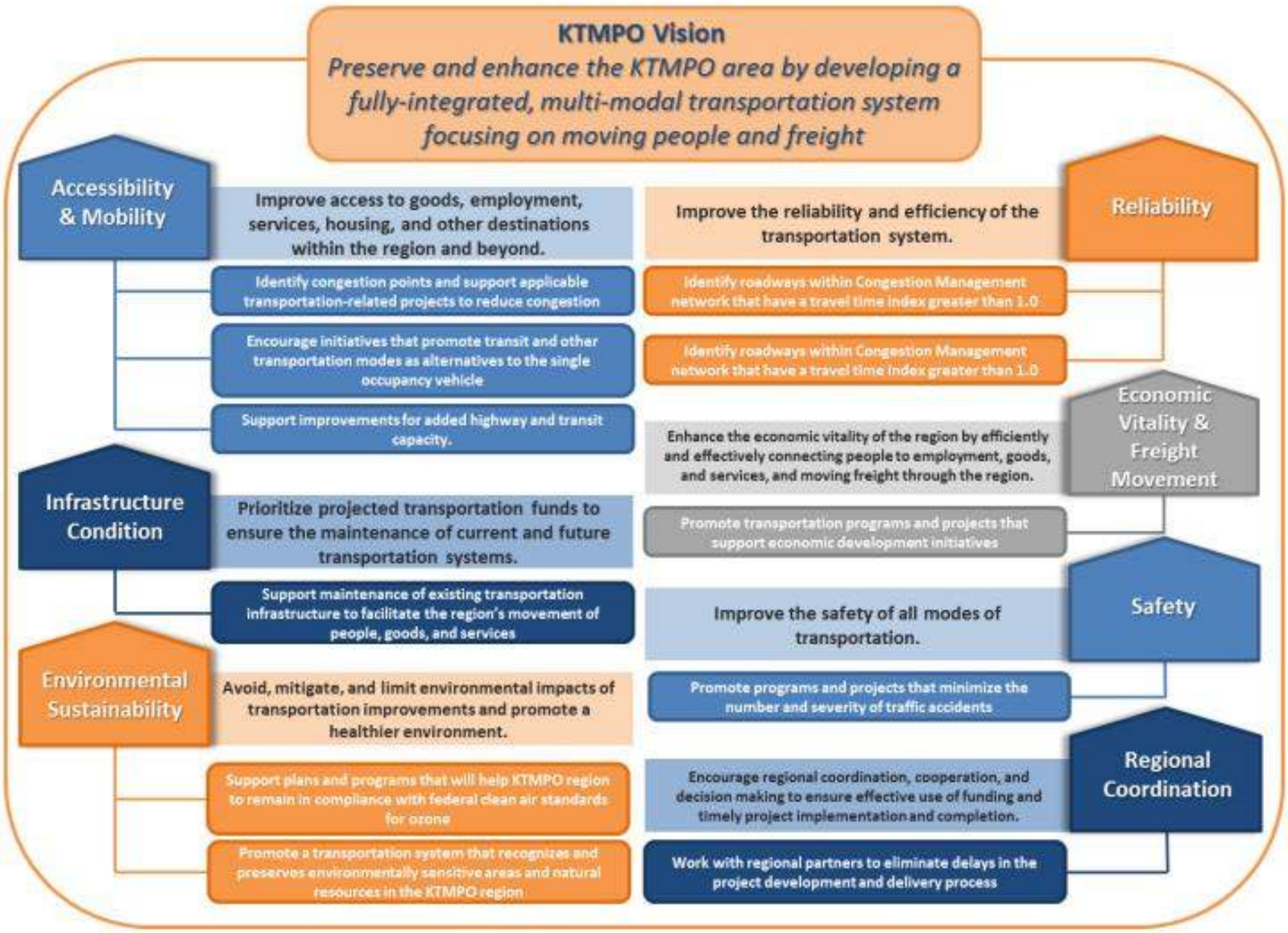
The Context of Regional Goals and Objectives

As one of the purposes of the Regional Multimodal Plan is to feed into the next update of the 2045 Metropolitan Transportation Plan (MTP), the goals and objectives of regional transportation planning as outlined in the current Mobility 2040 MTP are relevant to Plan development. The MTP goals are themselves derived from the eight Planning Factors first specified under the MAP-21 Federal Highway Authorization in 2012, and continued under the latest FAST Act Authorization in 2015. The component goals and objectives of the MTP are likewise supported by the Regional Multimodal Plan, and are shown in **Figure 2-1**.

The overall vision for the MTP is directly applicable to the Regional Multimodal Plan: **to preserve and enhance the KTMPO area by developing a fully-integrated, multi-modal transportation system focusing on moving people and freight**. Five of the MTP's sub-goals are particularly applicable to the Regional Multimodal Plan:

- Identify congestion points and support applicable transportation-related projects to reduce congestion.
- Encourage initiatives that promote transit and other transportation modes as alternatives to the single occupancy vehicle.
- Support improvements for added highway and transit capacity.
- Identify roadways within Congestion Management network that have a travel time index greater than 1.0.
- Enhance the economic vitality of the region by efficiently and effectively connecting people to employment, goods, and services, and moving freight through the region.

Figure 2-1: Goals and Objectives of the Mobility 2040 Metropolitan Transportation Plan



Source: Mobility 2040: KTMPO Metropolitan Transportation Plan

The Context of Regional Demographics and Growth

Current and forecast demographics also form an important context for regional transportation planning. Both the intensity and the distribution of population and employment affect how the transportation system should be designed to provide access and mobility for persons and freight.

Figure 2-2 illustrates the intensity and distribution of regional population for the year 2015. Population concentrations can be seen in cities along I-14, I-35, US 190, SH 36, SH 95, and SH 317. Note that on the periphery of the region, the larger Traffic Analysis Zone (TAZ) sizes causes the graphic to show more cumulative population, even though these are rural areas with low density.

Figure 2-2: 2015 Regional Population

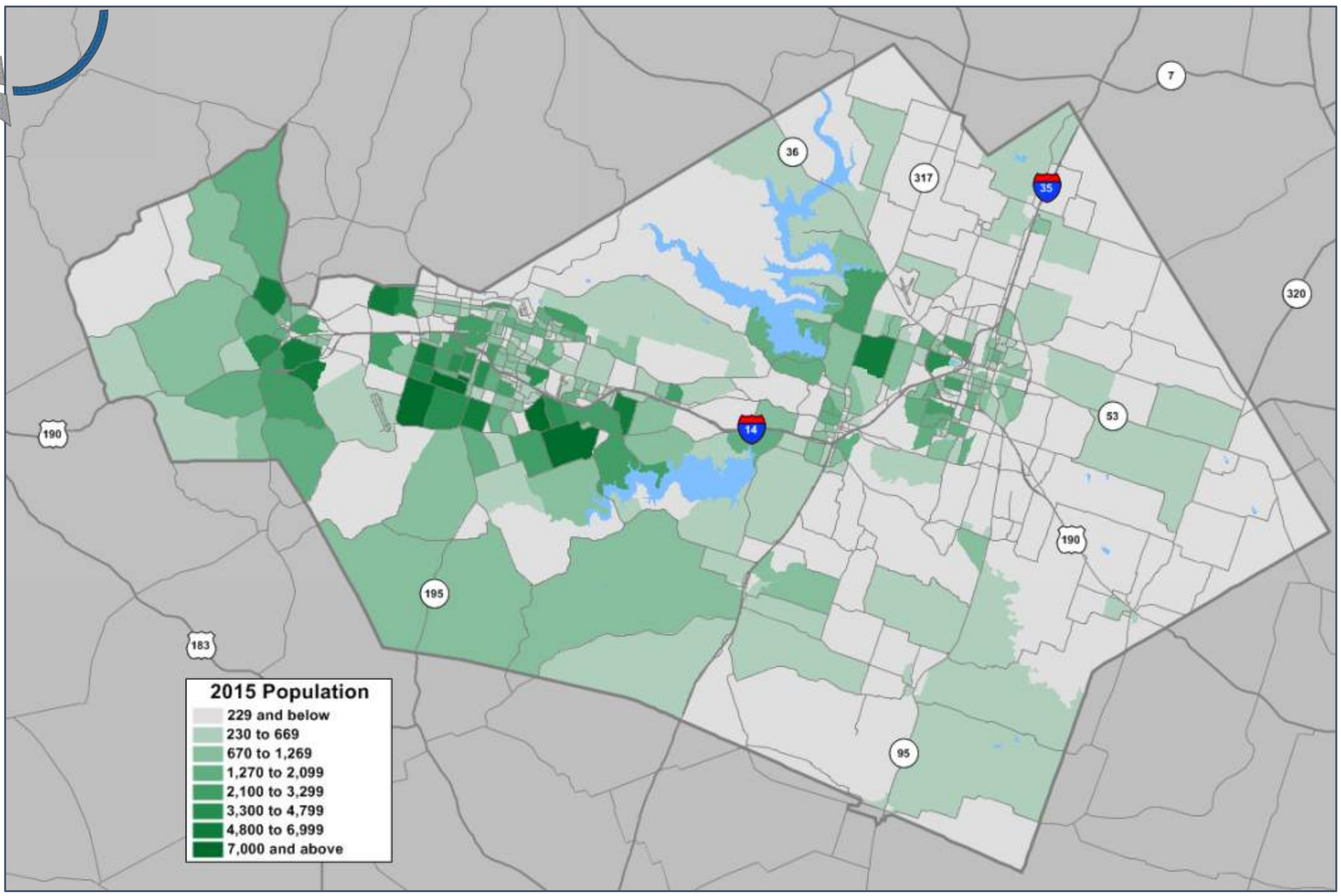
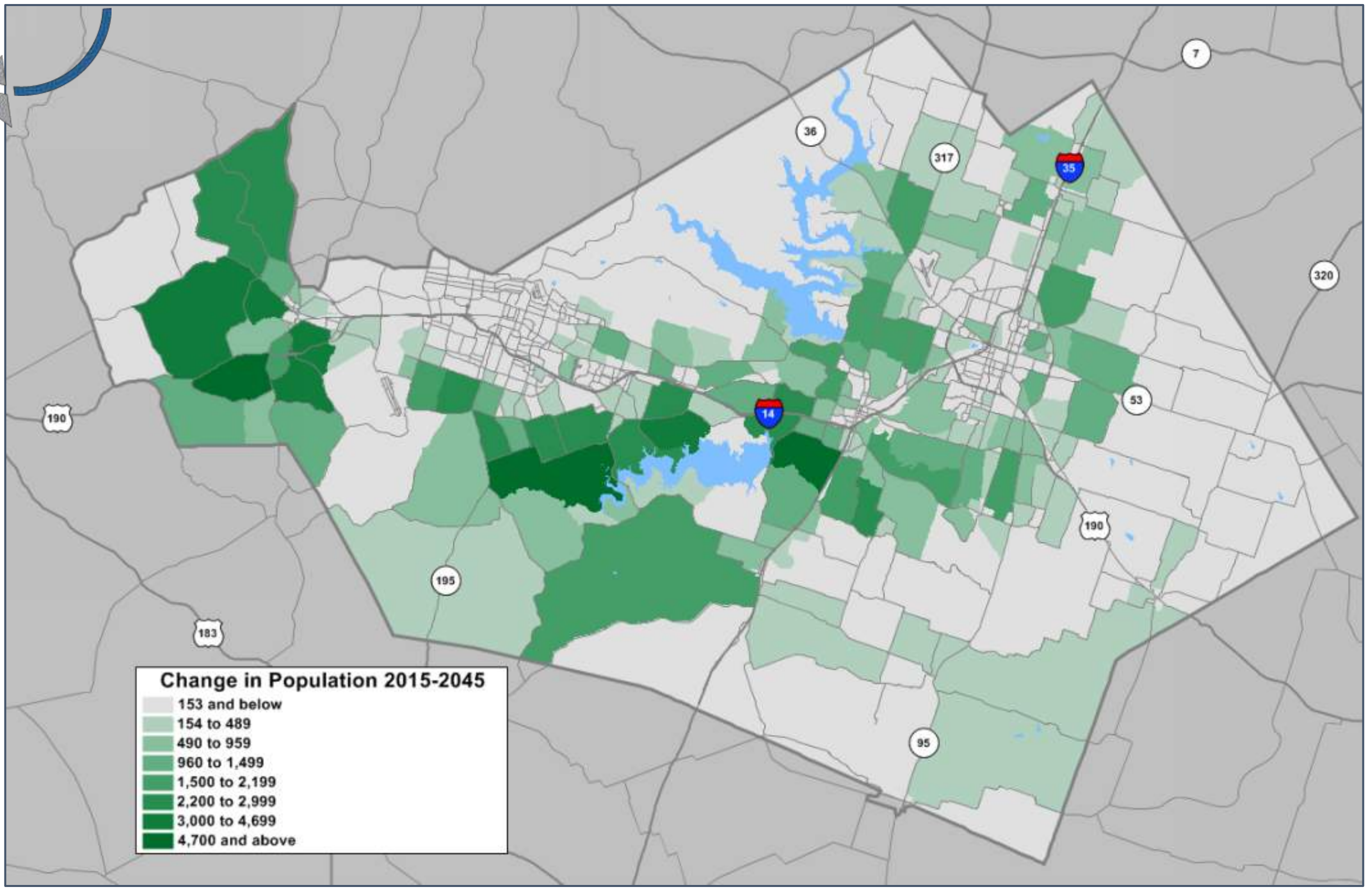


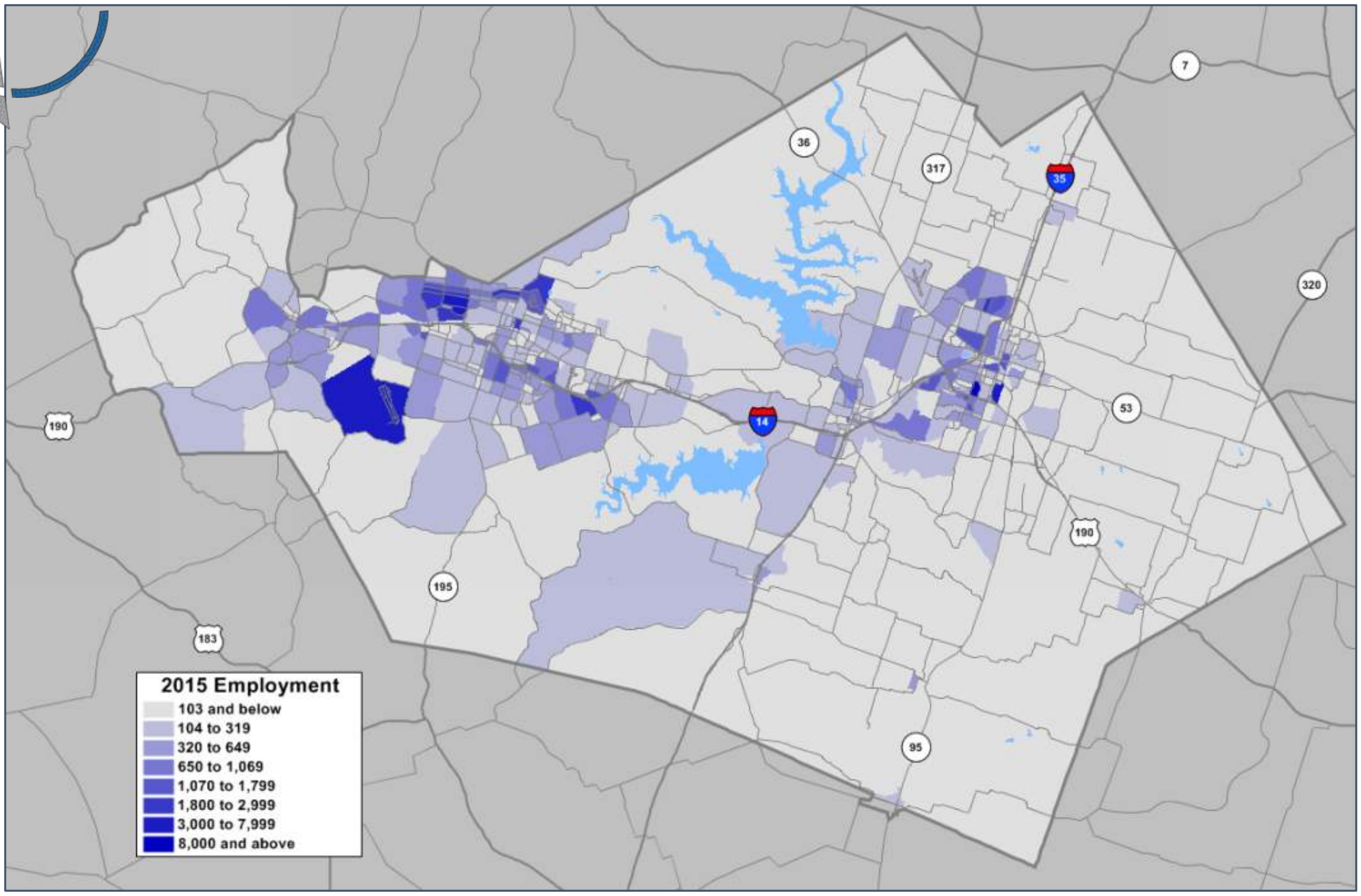
Figure 2-3 shows the projected changes in regional population from 2015 to the forecast year 2045. Population is generally shown growing outward from established areas to areas which are currently more rural and have available buildable land. The population change is greatest in the areas around Copperas Cove, south of Killeen, and along IH-35 and SH 317 west of Temple.

Figure 2-3: Change in Regional Population From 2015 to 2045



Regional employment for the year 2015 is shown in **Figure 2-4**. Concentrations of employment can be seen at Fort Hood and the Killeen-Fort Hood Regional Airport, in the retail areas along US 190 in Killeen, along I-35, and around Loop 363 in Temple.

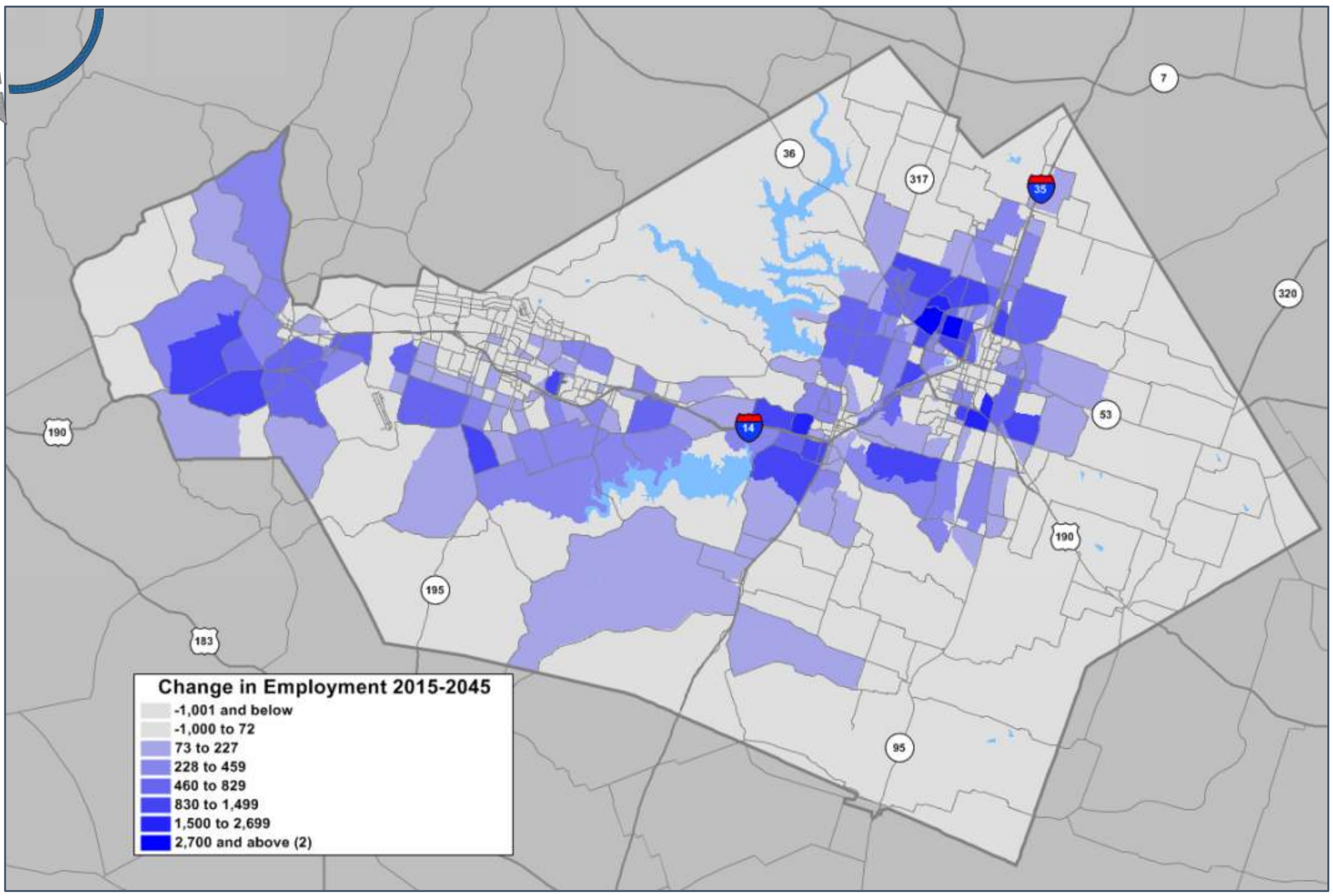
Figure 2-4: 2015 Regional Employment



Forecast employment change for the year 2045 is shown in **Figure 2-5**. Forecast employment is concentrated in existing areas and around industrial parks, but to some extent also follows population growth to new areas. Employment growth is evident surrounding Temple, along I-35, south of Killeen, and surrounding Copperas Cove. The data also shows forecast reductions in employment in several smaller areas in the downtowns of Temple, Belton, Killeen, and Copperas Cove.

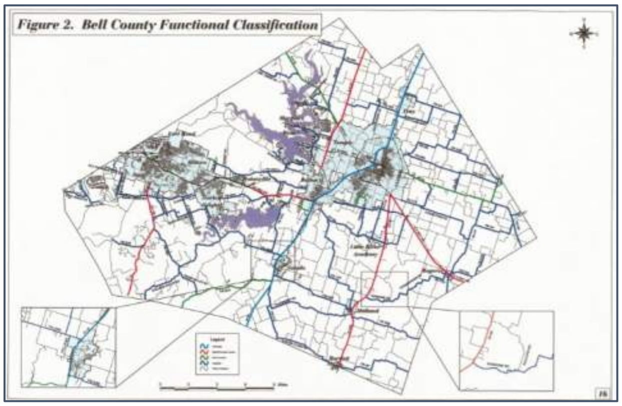
The intensity and distribution of forecast population and employment provide context for the integrated transportation system by defining new areas of need, revealing the need for additional connectivity in one mode and between modes, and defining new barriers to transportation. Each of these needs should be addressed in the new Regional Multimodal Plan.

Figure 2-5: Change in Regional Employment From 2015 to 2045



The Context of Local Thoroughfare Plans

In addition to the KTMPO Mobility 2040 MTP, which includes cross sections for typical roadway functional classes, the other planning documents with the most applicability to the Regional Multimodal Plan are the individual Thoroughfare Plans from the KTMPO member jurisdictions. Each of the Thoroughfare Plans for the member jurisdictions responds to their specific local conditions and needs. Each defines their own customized Functional Classification system for the roads in their local area.



KTMPO and the Central Texas Council of Governments (CTCOG) prepared a Thoroughfare Plan for Bell County in October 2001. That plan considered TxDOT design standards and defined a county-wide system of typical cross-sections for Interstates, Arterials, Minor Arterials, Collectors, and Local Roads. This plan recognized that there was no accepted regional Functional Classification system or policies for roadway spacing by Functional Class, and developed the plan to address these deficiencies.

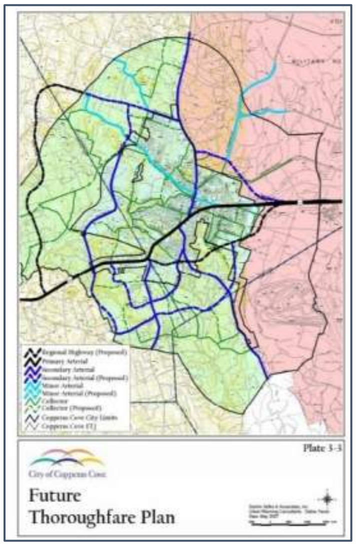
The four Functional Classes defined for roadways in the Bell County Thoroughfare Plan are:

Interstate	Major Arterial	Collector
	Minor Arterial	

The Thoroughfare Plan for Belton is embedded in its Draft 2017 City Comprehensive Plan. The plan defines certain **Land Use Center** types around key intersections, which is a variation on the standard Functional Classification system which has been codified in the recent *NCHRP Report 855: An Expanded Functional Classification System for Highways and Streets*. The NCHRP Report likewise defines several Context Settings which modify the roadway and streetside features defined for each Functional Class.

The Belton Thoroughfare Plan defines five Functional Classes for roadways:

Interstate	Major Arterial	Major Collector
	Minor Arterial	Minor Collector



The Copperas Cove Thoroughfare Plan is part of its 2007 Comprehensive Plan. Their Functional Class system considers the context of the street system, with attention given to each Functional Class' function, spacing, intersection spacing, land access, speed limits, and provisions for parking.

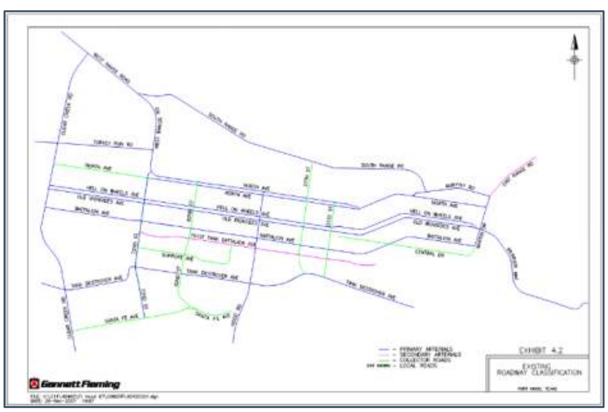
Seven Functional Classes are defined for roadways:

Regional Highway	Primary Arterial	Major Collector
	Secondary Arterial	Collector
	Minor Arterial	Residential

Harker Heights' Thoroughfare Plan is based on function, spacing, and width.

Although the Thoroughfare Plan map shows only Arterials and Collectors, the text of the plan defines four Functional Classes:

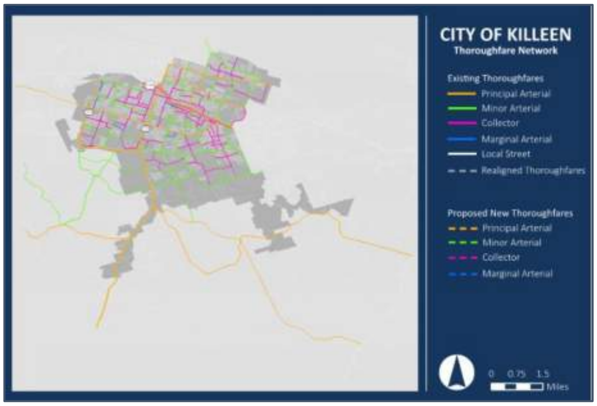
Major Arterial	Collector
Minor Arterial	Local



A Post-Wide Traffic Engineering and Safety Study was developed for Fort Hood in 2008. Primary goals of the study were traffic control, access control, an evaluation of intersections, traffic signals, pedestrian crossings, and a listing of planned projects. The study noted significant pedestrian activity on post, particularly during the morning physical training sessions. It noted that Battalion Ave, classified as a Primary Arterial, is closed to auto traffic each weekday morning to accommodate pedestrians and physical training. Bicycle traffic on post was observed to be minimal.

Four Functional Classes were defined for roads in Fort Hood:

Primary Arterial	Collector
Secondary Arterial	Local



The Thoroughfare Plan for the City of Killeen was developed in 2015. This plan evaluates existing conditions and growth patterns to define development scenarios for the city. The Thoroughfare Plan then defines an appropriate Functional Classification system with typical roadway cross sections.

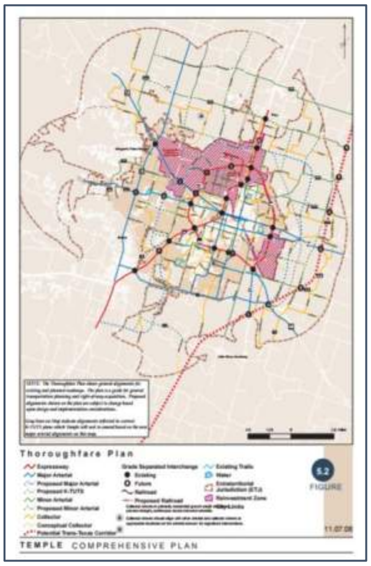
Five Functional Classes are defined for roadways:

Principal Arterial	Collector
Minor Arterial	Local
Marginal Arterial	

The Village of Salado does not appear to have an active Thoroughfare Plan. An artifact graphic labeled as the transportation plan was found referenced in another planning document, but is not posted or referenced on the village website. The map is dated May 2002. The artifact map shows village streets with a Functional Classification system and typical cross sections. Future as well as current roads are shown.

There are five Functional Classes in the map:

Interstate	Minor Arterial	Major Collector
		Minor Collector
		Local



The Thoroughfare Plan for Temple is part of its 2008 Comprehensive Plan. The plan shows a commitment to reviewing regional mobility issues as well as the local network, and considers future growth and changes in land uses. Neighborhood connectivity is a concern, and one of the goals of the plan is to accommodate the needs of bicycles, pedestrians, and transit modes within the system.

The Functional Classification system for Temple considers roadway function, spacing, continuity, posted speeds, and parking. Multimodal issues are considered by defining criteria for through truck routes, bikeways, and sidewalks for each Functional Classification.

The five Functional Classifications defined for Temple are:

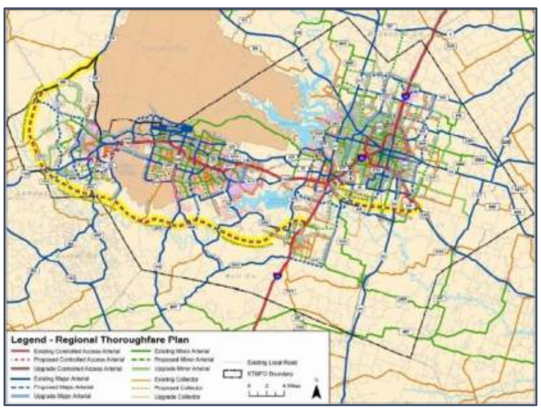
Expressway

Principal Arterial

Minor Arterial

Collector

Local



The previous KTMPO Regional Thoroughfare Plan, adopted in January 2011, is embedded in the Mobility 2040 MTP as Appendix E-2. Key elements of this plan are the synthesis of consistent roadway Functional Classification definitions based on local Thoroughfare Plans, and the inclusion of bicycle and pedestrian networks in the regional plan. The previous plan was termed a Regional Thoroughfare Plan, which emphasized the automobile portion of the plan. With this update, it is being termed a true Regional Multimodal Plan to highlight its role in providing planning for all transportation modes.

The previous Regional Thoroughfare Plan defines four Functional Classes based on the local jurisdictions' plans, the purpose of the road, access and access management, posted speed, and typical daily traffic volumes:

Controlled Access Arterial

Major Arterial

Minor Arterial

Collector

The Context of the KTMPO Travel Demand Model

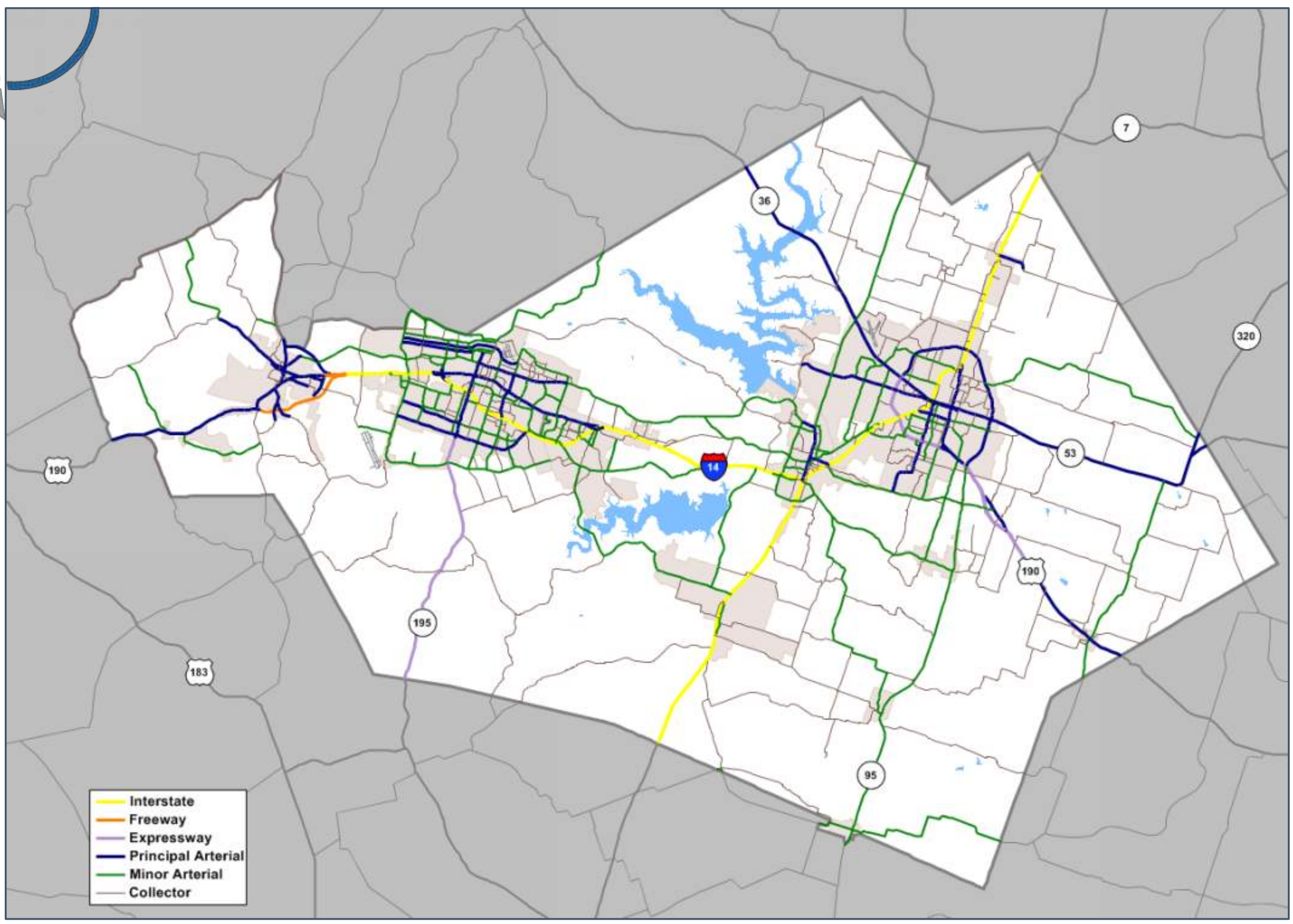
Consistent regional roadway Functional Classes are defined in the KTMPO Mobility 2040 MTP based on a review and compilation of the Functional Classes contained in the member jurisdictions' Thoroughfare Plans, FHWA and TxDOT standards, and the TxDOT standard travel demand model Functional Classification system. The Functional Classes are shown in **Figure 2-6**.

The six Functional Classes in the KTMPO travel demand model are:

Interstate	Principal Arterial	Collector
Freeway	Minor Arterial	
Expressway		

Detailed coding of Interstates, Freeways, and Expressways includes supporting Functional Classes of Frontage Roads and Ramps. The travel demand model further stratifies Arterials and Collectors into three Facility Types: Divided, Continuous Center Turn Lane, and Undivided.

Figure 2-6: KTMPO Travel Demand Model Functional Classes



Each region is different with its own specific mix of Functional Classes, conditions, and geography, so there is no hard and fast guidance on the appropriate mix of classes. However, FHWA has listed general guidelines for the appropriate percentages of each Functional Class within a typical region. The mix of Functional Classes in the KTMPO region is appropriate when compared to these general standards, as detailed in **Table 2.1**. For sake of comparison with FHWA guidance, the Functional Classes for Interstate, Expressway, and Freeway were combined to be considered as Controlled Access. The Principal Arterial Functional Class from the KTMPO travel demand model was re-named to Major Arterial for this Plan. Each Functional Class falls within its expected range except for Local Streets, which falls slightly under the generally recommended percentages.

Table 2-1: Regional Mix of Functional Classes

Regional Mix of Functional Classes			
Functional Class	**Mileage**	**Percent**	**Guidelines**
Controlled Access	143	4%	0 - 9%
Interstate	71	1.9%	
Expressway	51	1.4%	
Freeway	21	0.6%	
Major Arterial	110	3%	2 - 4%
Mnor Arterial	246	7%	4 - 8%
Collector	760	21%	20 - 25%
Local	2,406	66%	65 - 75%

General guidance is also provided for the spacing of Functional Classes in a region, as shown in **Table 2.2**.

Table 2-2: Regional Spacing of Functional Classes

Regional Mix of Functional Classes	
Functional Class	**Spacing Guidelines**
Regional	5 miles or more
Major Arterial	2 miles or more
Mnor Arterial	1/2 to 2 miles
Collector	1/4 to 1/2 mile
Local	less than 1 mile

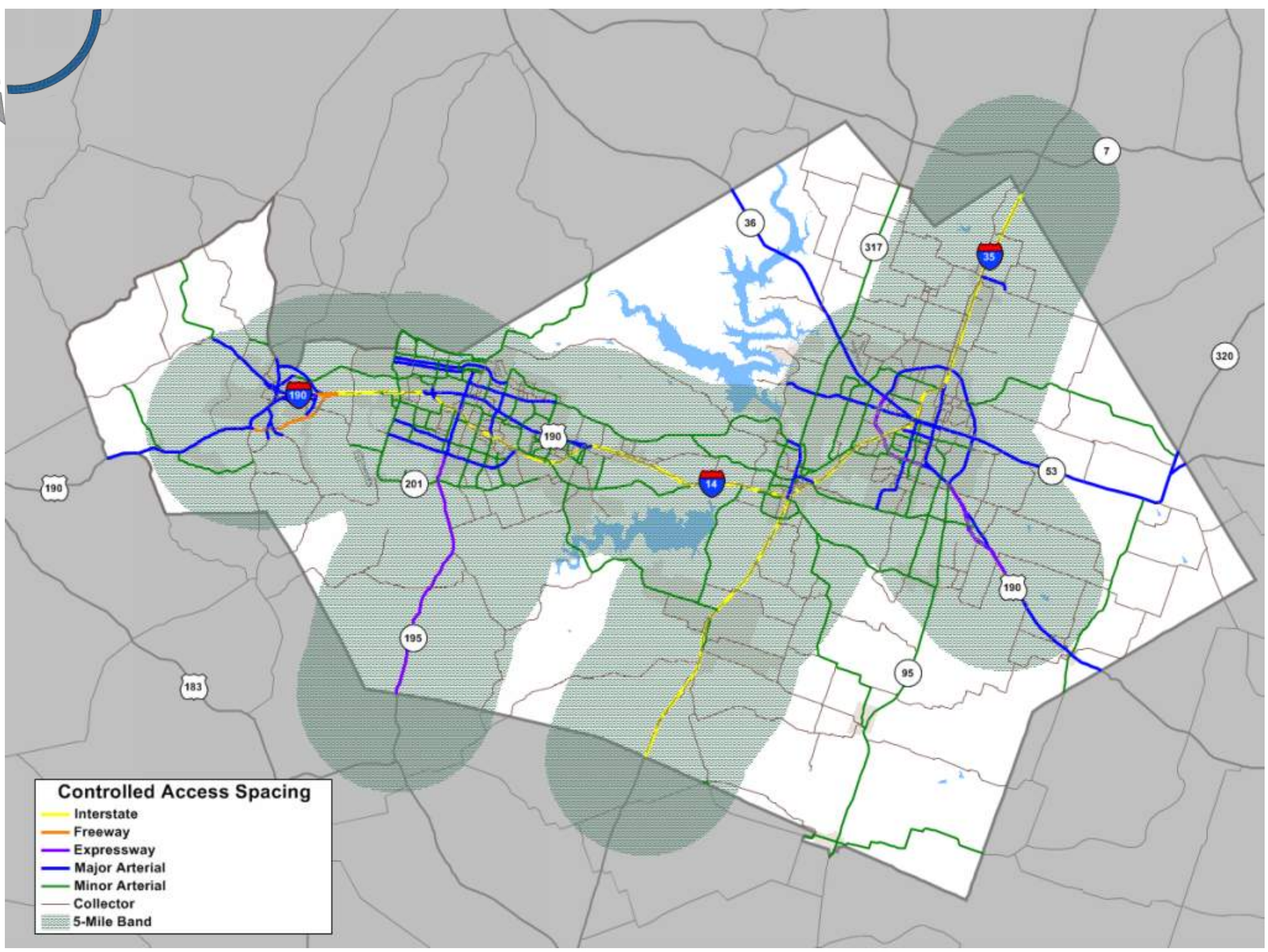
This general guidance recognizes that the appropriate spacing of functionally classified streets depends on the types and lengths of the trips that they serve, access to land uses and access control, posted speeds, and traffic levels. The mix of attributes for each Functional Class determines the context of each in the regional setting. Overall, the spacing of functionally classified roads in the region falls within the recommended guidelines.

Controlled Access roads include the Interstate, Freeway, and Expressway Functional Classes. Interstates have the most access control with frontage roads and grade-separated crossings, while Expressways may have limited numbers of at-grade intersections and traffic signals. These facilities provide regional mobility with longer-distance trips. Posted speeds are in the 55-70 mph range and average daily traffic volumes are greater than 40,000.

Controlled access roads in the KTMPO region include the Interstate, Freeway, and Expressway Functional Classes: the Copperas Cove Bypass on US 190, IH-14, IH-35, the southwest quadrant of Loop 363, and part of US 190 between Temple and Rogers.

Figure 2-7 shows a five-mile buffer around the controlled access roads in the region. All the urbanized areas in the region fall within the buffer area except for Holland, Bartlett, and a portion of Morgan's Point Resort bordering Lake Belton.

Figure 2-7: 5-Mile Buffer Around Controlled Access Roads

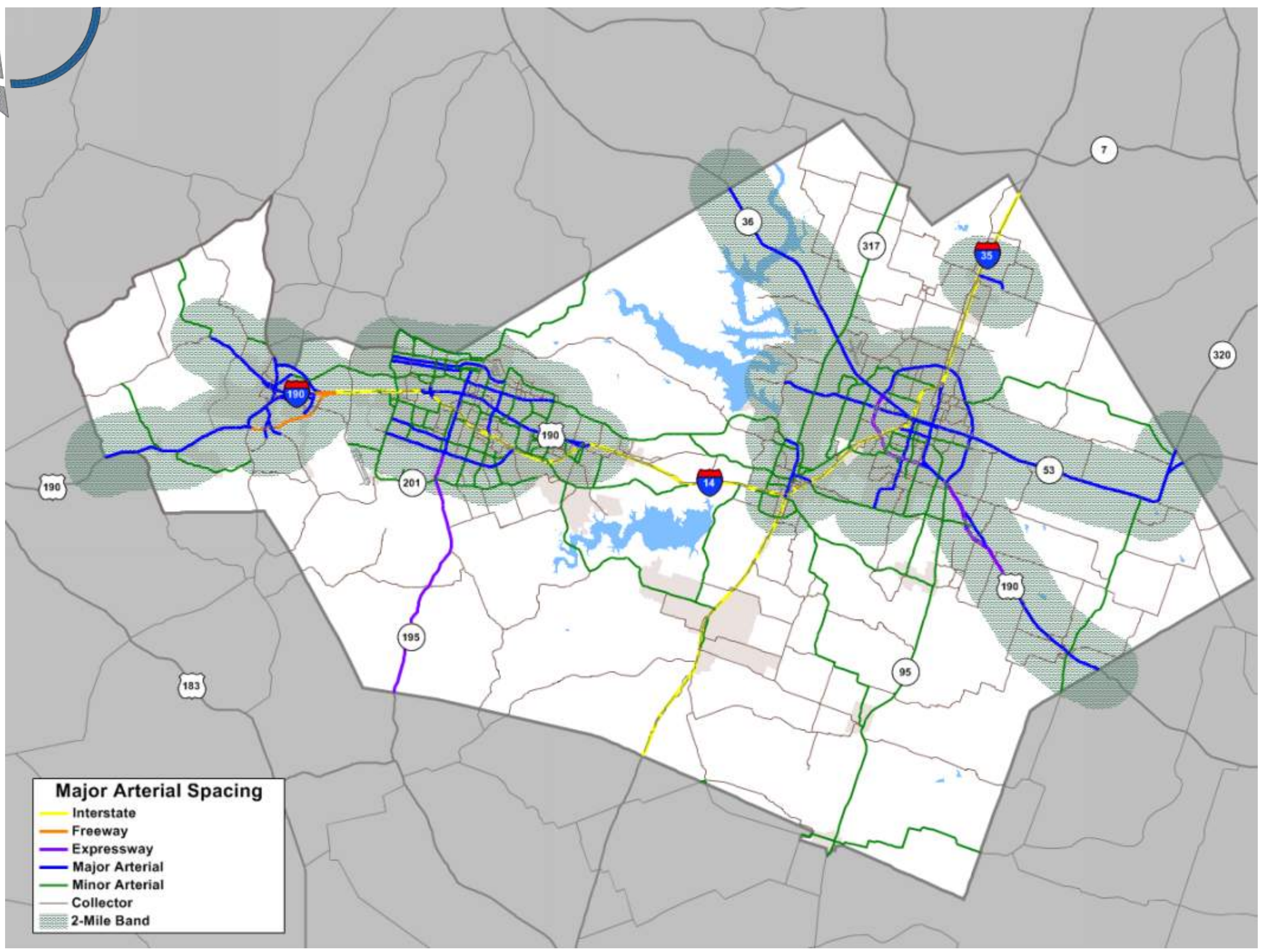


Major Arterials focus on providing regional mobility, but provide a greater amount of access to land uses than controlled access roads do. Posted speeds are in the 35-60 mph range and average daily traffic volumes are 15,000 to 50,000.

Prominent Major Arterials in the KTMPO region include Business 190, Stan Schleuter Loop, Fort Hood St, SH 36, SH 53, and portions of Loop 363.

Figure 2-8 shows a two-mile buffer around the Major Arterials in the region. The majority of urbanized areas fall within the buffer area. Gaps in coverage are associated with Lake Belton and Stillhouse Hollow Lake, along with the southern portion of Bell County.

Figure 2-8: 2-Mile Buffer Around Major Arterials

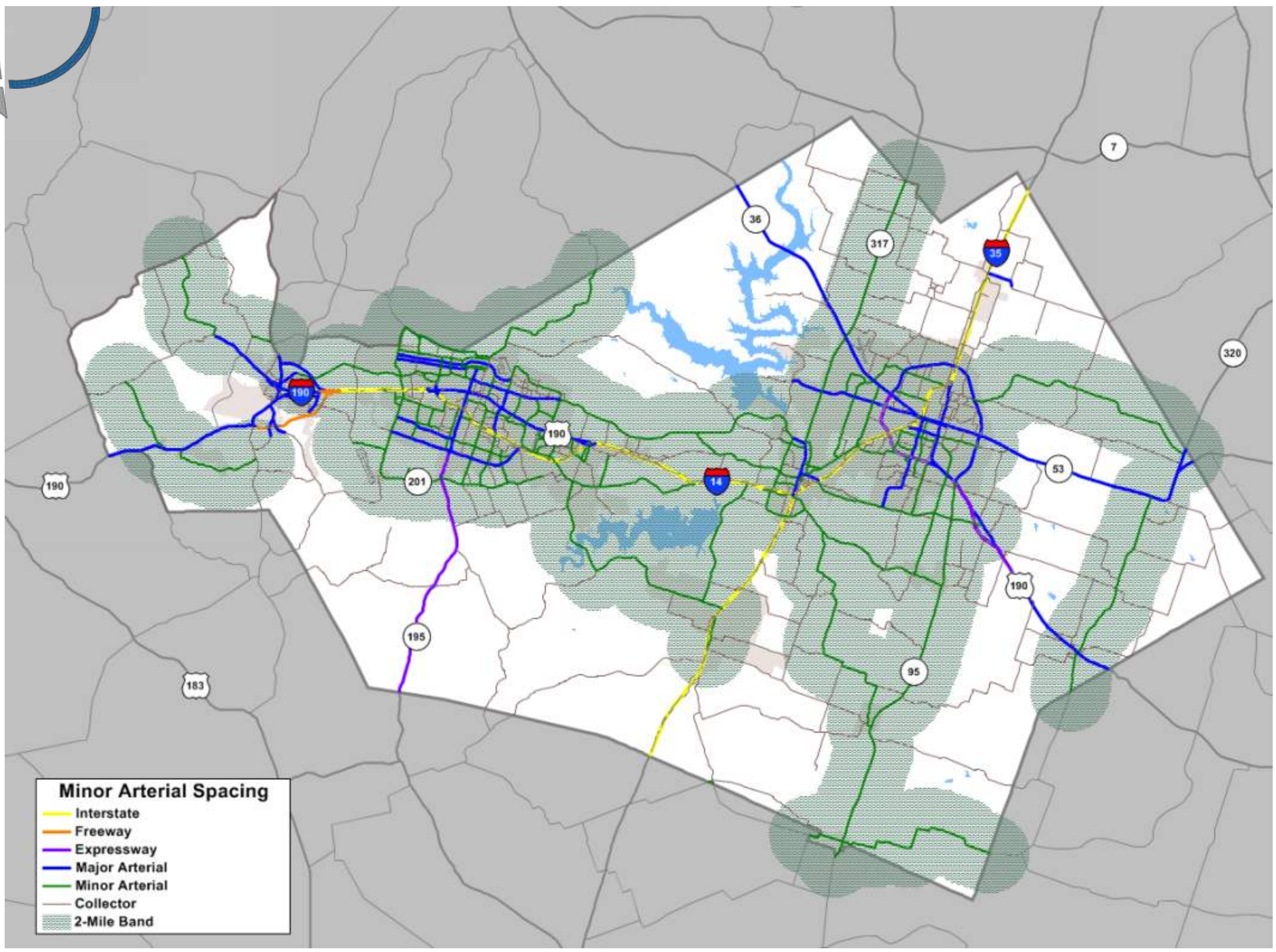


Minor Arterials are critical facilities for providing access to land uses. Regional mobility is a secondary purpose for Minor Arterials. Posted speeds are in the 30-40 mph range, but can be higher in rural areas. Average daily traffic volumes are in the range from 5,000 to 30,000.

Prominent Minor Arterials in the KTMPO region include Elms Rd, FM 439 between Killeen and Belton, SH 95, and SH 317.

Because of their different purposes within the transportation network, the general recommended spacing for Minor Arterials is ½ to 2 miles. **Figure 2-9** shows a 2-mile buffer around Minor Arterials, illustrating how they cover the region. All the region's urbanized areas except for Troy, the western portion of Copperas Cove, and a sliver of Morgan's Point Resort are covered by the buffer area.

Figure 2-9: 2-Mile Buffer Around Minor Arterials



Collector streets often serve residential uses, but can also provide access for commercial areas. They function primarily to collect traffic from smaller streets for access to the road network and to provide access to land uses. Most trips on the Collector system are shorter length trips, with speeds below 35 mph and average daily volumes of 1,000 to 5,000.

Because Collectors primarily serve local trips and provide access to the network, the general recommended spacing is ¼ to ½ mile. **Figure 2-10** shows how this smaller buffer defines areas of coverage which are more dense in urban areas, but which are relatively sparse in rural undeveloped areas.

Figure 2-6: 1/2-Mile Buffer Around Collectors

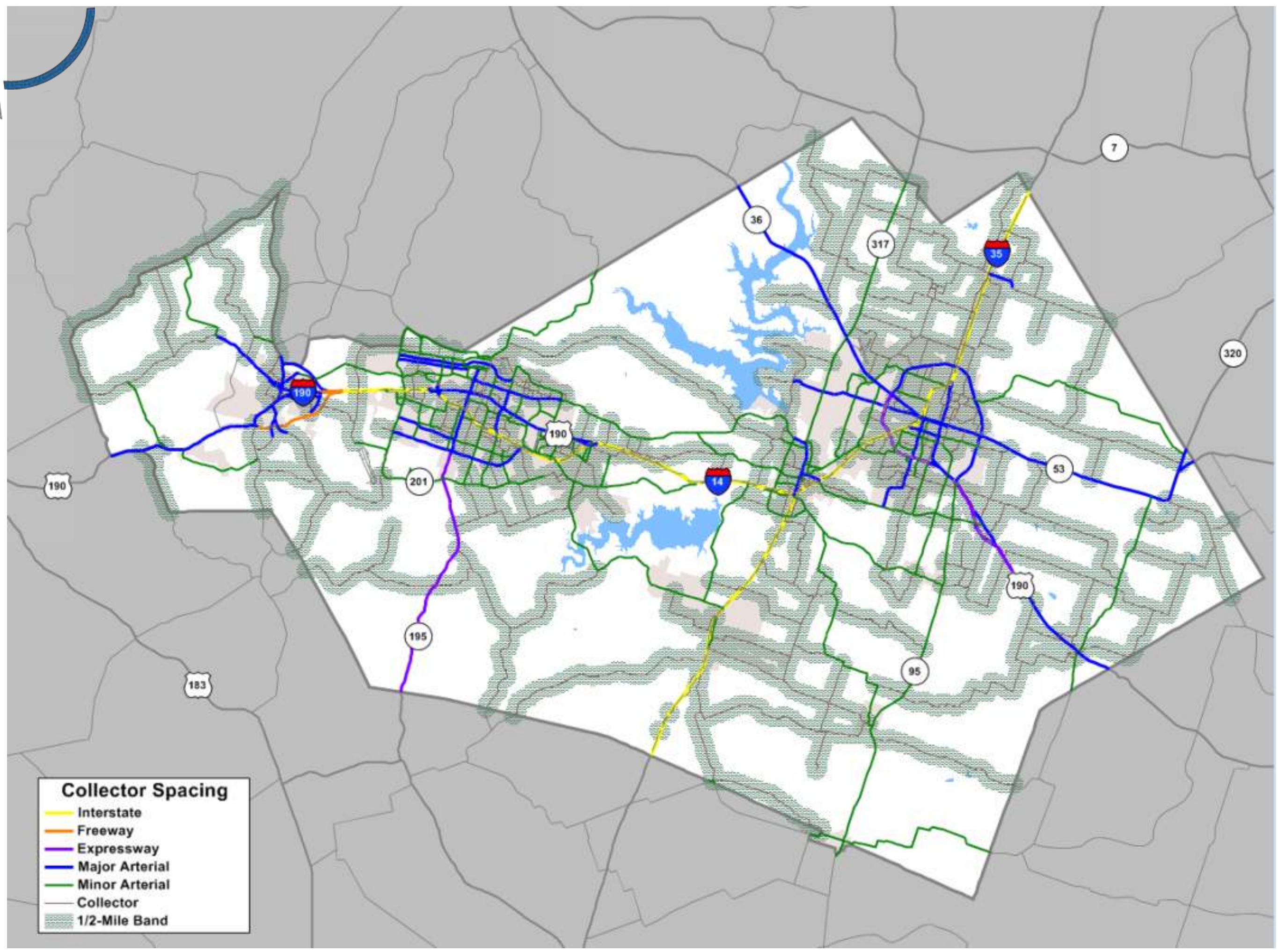
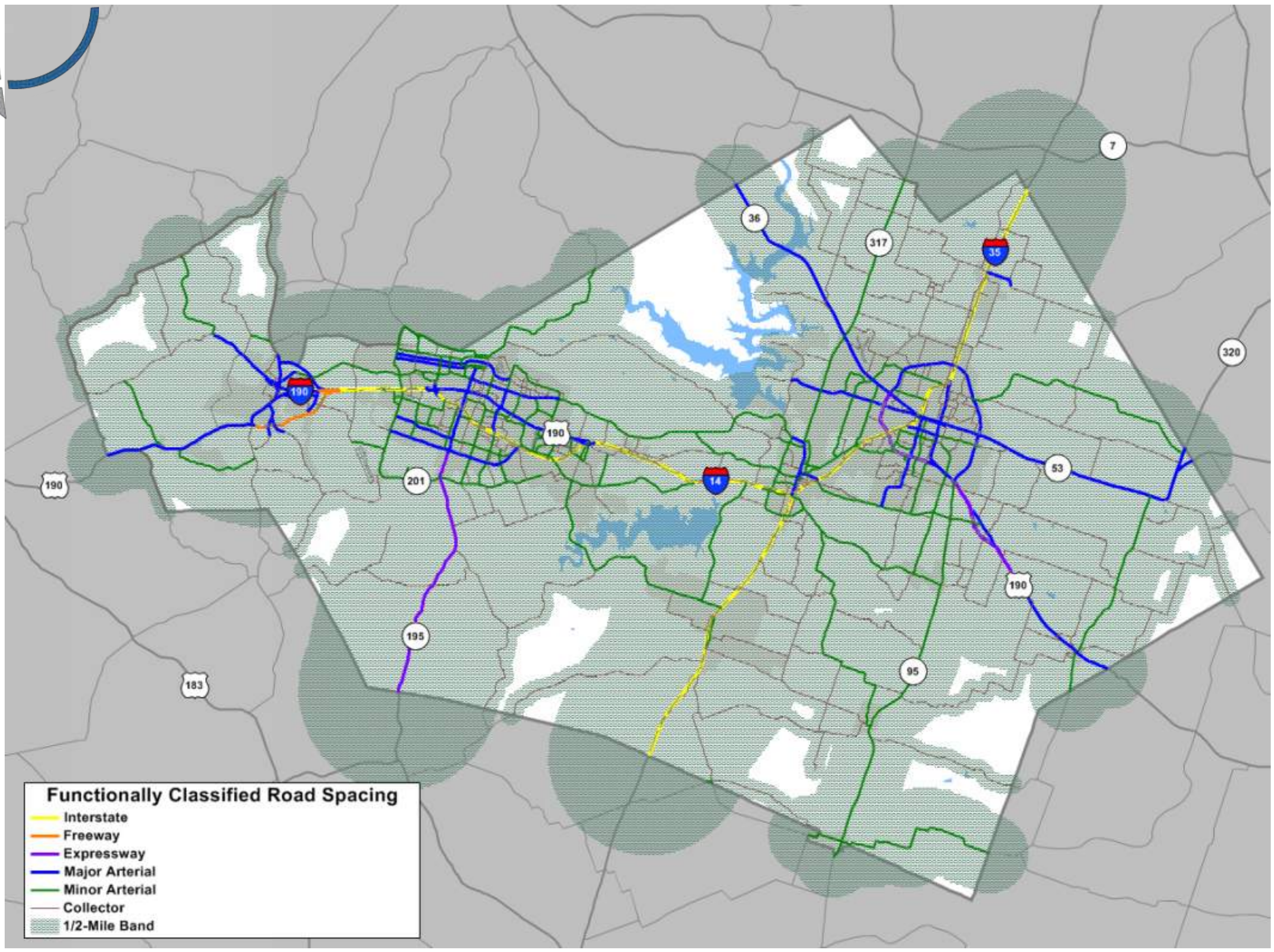


Figure 2.11 shows the overall coverage of the combined functionally classified road network with their respective spacing buffers ranging from ½ mile to 5 miles. All urbanized areas in the KTMPO region fall within the combined buffer area. The rural areas not covered include the lakes and unbuildable park lands, active agricultural areas, and low-density rural areas. Overall, the buffer area from the combined functionally classified road network covers slightly over 92% of the total land area in the KTMPO region.

Figure 2-7: Coverage of Functionally Classified Roads



Summary

The **Regional Multimodal Plan** defines a consistent integrated transportation system, but it operates within the context of regional goals, regional demographics, regional plans, and the travel demand model setup and definitions.

A review of each of these contexts shows that the existing transportation planning process and transportation infrastructure in the region are robust and supportive of the Plan.

The current Mobility 2040 MTP has an intermodal focus, and complies with the Federal and State planning regulations which were active at the time of its development. The embedded Regional Thoroughfare Plan and Bicycle & Pedestrian Plan provide a comprehensive review of regional facilities.

The intensities and patterns of existing demographics and projected growth show that the road infrastructure is generally well patterned to serve transportation demand.

The individual Thoroughfare Plans from the KTMPO member jurisdictions define Functional Class systems that are appropriate to their local needs.

A review of general Federal guidelines for the definition of Functional Classes, their functions, their mix, and their spacings shows that the infrastructure in the region follows the guidelines.

Chapter 3: Complete Streets Concepts

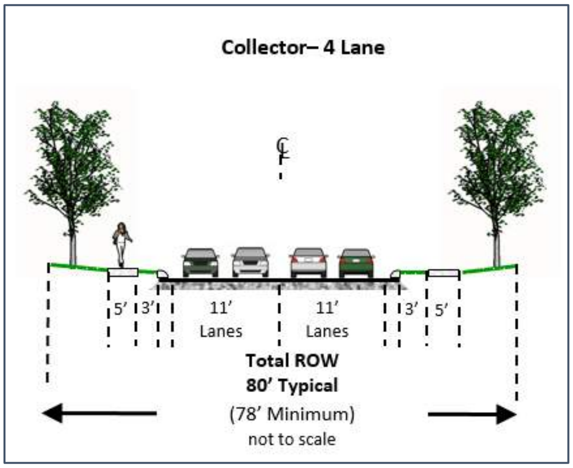
CHAPTER HIGHLIGHTS

- **Complete Streets**
- **Vision Zero**
- **Road Diets & Traffic Calming**
- **Common Street & Sidewalk Treatments**
- **Common Intersection Treatments**

Introduction

It has already been recognized that people and industries are rethinking their transportation needs, preferences, and habits. To accomplish the needed shift in transportation planning to consider all modes within an **integrated transportation system**, a suite of planning concepts should be considered. The consideration of the **Complete Streets** movement in transportation planning has defined a set of tools and priorities that impact how streets are designed. Similar movements for **Vision Zero**, **Road Diets**, and **Traffic Calming** have consistent and compatible goals of providing increased support for other modes of travel and promoting street safety. With similar goals, they also share a set of common treatments for streets, sidewalks, and intersections. Taken together, Complete Streets movement and its associated movements contribute a more multimodal and more livability-oriented approach to street design.

Complete Streets Concepts



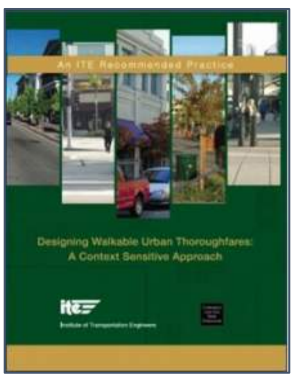
Historically, a city would adopt standard cross sections for each street functional class. While it was recognized that the cross sections were "typical" and each street had unique context and constraints, the general purpose was to define consistent characteristics for streets. In practice, this has led to streets being optimized for the automobile mode over other transportation modes, and automobile throughput has been the controlling priority. Pedestrians, bicyclists, and transit riders are theoretically able to use the streets, but those modes are seen as incidental and are not prioritized or supported. The unintended consequences of these over-optimized streets is that they can limit transportation choices by making walking, bicycling, and using transit inconvenient, unattractive, or dangerous. These types of streets can be called "incomplete streets" in that they do not accommodate all transportation modes. To remedy this, a movement has emerged to encourage a new way of designing roadways called **Complete Streets**.

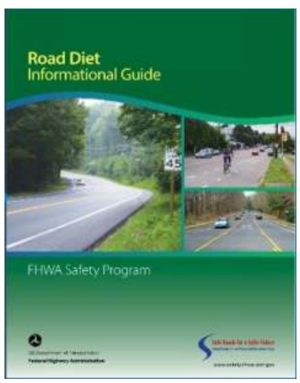
The concept of Complete Streets gives pedestrians, bicyclists, and transit modes the same priorities in street design that automobiles have traditionally had, so that the street can routinely support safe and convenient uses for all modes of transportation within an integrated multimodal system.

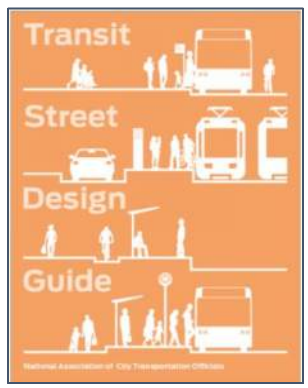
Elements of Complete Streets treatments are designed to make the street more supportive of all modes. Operating within an integrated multimodal system, the specific mix of modes that are appropriate to a street and the treatments used to make it a complete street vary with the function of the street, its Functional Class, and characteristics such as right-of-way, lane width, speed, and topography.

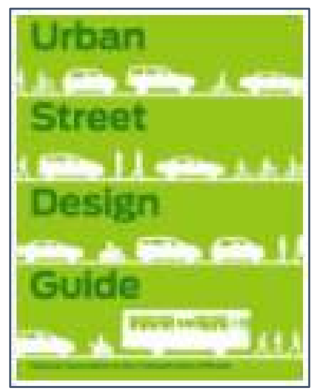
There is no singular design prescription for complete streets; each one is unique and responds to its context.

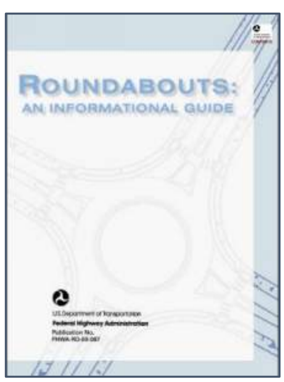
The concept of Complete Streets may be seen as a comprehensive suite of design requirements and priorities to be considered for all streets. The primary source for guidance on street design remains the Institute of Transportation Engineers' (ITE) *Highway Design Manual*, which is the most widely accepted standard for roadway design. The many different additional publications providing guidance for complete streets approaches illustrate just how widely the concept has been accepted. Publications include the ITE *Walkable Urban Thoroughfares: a Context-Sensitive Approach*, which has been endorsed by TxDOT. The ITE *Road Diet Handbook: Setting Trends for Livable Streets* and the FHWA *Road Diet Informational Guide* both provide guidance for "right-sizing" streets to re-purpose right-of-way for Complete Streets treatments. FHWA guidance also includes *Roundabouts: an Informational Guide*, dealing with this particular type of intersection treatment. The National Association of City Transportation Officials (NATCO) has published several manuals to provide "a blueprint for designing 21st century streets", with focus on urban streets, transit streets, bikeways, and bike share.

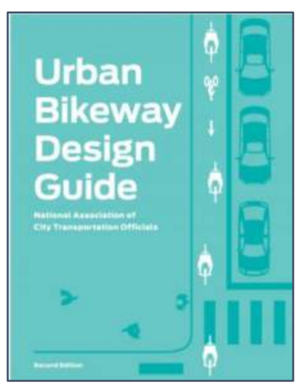










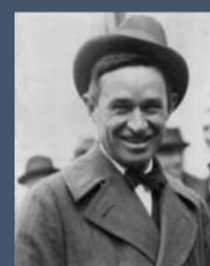


Vision Zero

The **Vision Zero** movement complements Complete Streets concepts with a focus on adapting street design to reduce fatalities. Many of the same street treatments associated with Complete Streets are also supported by the Vision Zero movement. While road safety depends on many factors, the thrust of the Vision Zero movement is that redesigning streets and lowering speed limits are vital elements that can reduce the chance of crashes and also reduce their severity. While people will inevitably make mistakes while driving, the goal of Vison Zero is that those mistakes do not inevitably lead to crashes and loss of life.

Excessive speed is typically a factor in about a third of all traffic fatalities, so controlling vehicle speeds in areas with multimodal uses is a critical strategy. Speed reductions in areas where vehicles mix with vulnerable street users such as bicyclists and pedestrians are therefore an important element of Vision Zero.

The Vision Zero movement often uses the term **dangerous by design** to describe streets that are over-optimized for automobile throughput. This term is inaccurate and often wrongly applied, but the general point is valid: if streets are designed so that people are comfortable driving at excessive speeds, then crashes are more likely, fatalities are more likely, and vulnerable street users are disproportionally at risk.



All I know is just what I read in the papers. And there is something that we all read in the papers every morning of our lives, no matter what paper it is we pick up, and it has generally happened right in the town that particular paper is printed in. It's in there every morning "Four Killed and Three Wounded Yesterday by Automobiles in This Town." Maybe it's more; maybe it's less, but it's there every day. In another part of the paper it tells that 22 thousand met their death last year by auto and that we are well on our way to beat that record.

Suppose around 25 years ago when automobiles were first invented, that a man had gone to our government, and he had put this proposition up to them: "I can in 25 years' time have every person in America riding quickly from here to there. Shall I go ahead with it?"

"Why sure, if you can accomplish that wonderful thing, why we are heartily in accord with you."

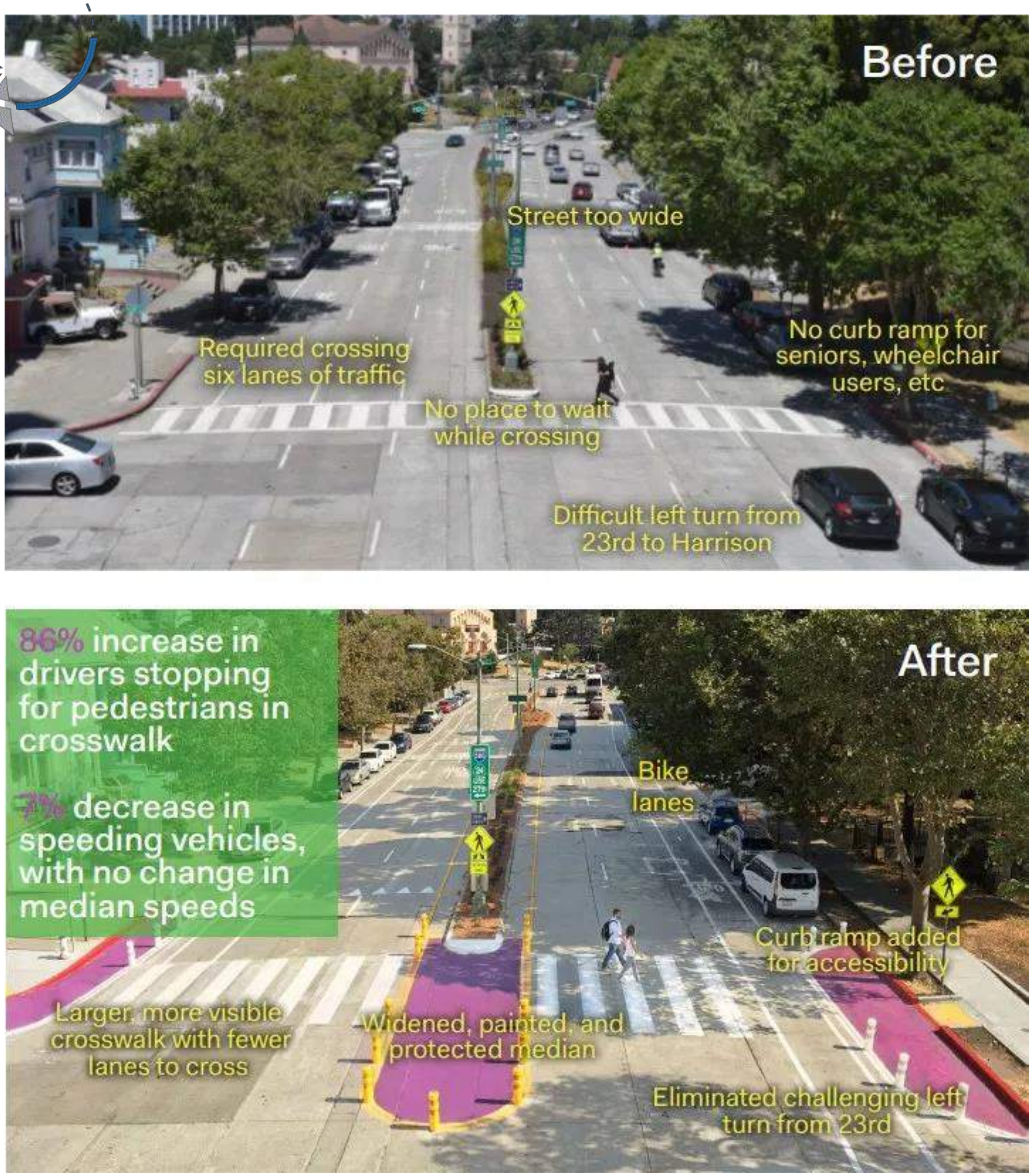
"But," he says, "I want you to understand it fully, in order to accomplish it and when it is in operation it will kill 20 to 25 thousand a year of your women and children and men."

Now they call all these accidents PROGRESS. Well maybe it is Progress. But I tell you it certainly comes high priced.

Will Rogers
Syndicated newspaper column
April 4, 1926

An example from Oakland, California illustrates some elements of Vision Zero and how it complements Complete Streets concepts with some of the same implementation strategies.

Figure 3-1: Before and After Example of Vision Zero Treatments



Following a pedestrian fatality at the intersection of 23rd Street and Harrison Street, the Oakland Department of Transportation (DOT) reviewed how changes in street design might be used to slow traffic and increase the safety of vulnerable users. As shown in **Figure 3.1**, multiple elements were positioned to heighten drivers' awareness of their environment and reduce their comfort with excessive speeds. A feature of this example is that it was implemented in a very short time frame, with low-cost infrastructure such as paint, bollards, and other simple fixes. After the area is made safe and drivers are used to the changes, the DOT plans to implement more permanent fixes.

Data collected by the Oakland DOT before and after implementation of the Vision Zero fixes shows their effectiveness. It is interesting to note that median vehicle speeds are unchanged, but that the outlier speeding vehicles saw a 7% drop. The 86% increase in drivers stopping for pedestrians in the crosswalk is a testimony not only to the design of the crosswalks, but also to the design of the street environment that makes drivers more aware of their surroundings, with a slower-speed regime that gives them more time to stop.

Other safety elements in addition to street design are considered in Vision Zero treatments. One element of concern is that large trucks pose a disproportionate threat to people biking and walking. Large trucks are hindered by their height, larger blind spots, and larger turning radii, making the risk of conflicts with all road users greater. At the same time, bicyclists and pedestrians are particularly vulnerable to the open wheels which are a feature of large trucks. The Volpe Center, a research institute of the US Department of Transportation, has studied the issue of vulnerable road users and heavy trucks. Their study cites a statistic that nearly half of bicyclist fatalities and more than one quarter of pedestrian fatalities from heavy trucks first impacted the side of the truck and were swept under the wheels. By attaching a side guard that runs along the gaps in the side of the truck similar to those shown in **Figure 3-2**, a person who is hit by a truck has a better chance of being pushed out of the way of the following wheels.
A study cited by the Volpe Center notes that implementation of truck side guards in London reduced fatalities

Figure 3-2: Examples of Truck Side Guards

by 61% for people biking and 20% for pedestrians.

Cities of course do not have the legal authority to require side guards for all trucks operating in their area. However, they do have control over their own municipal fleets of large trucks, box trucks, garbage trucks, and trailers. Some cities in the United States were cited in the Volpe Center study as requiring side guards on trucks for contractors who do business with the city.

Vision Zero treatments may also focus on street operations. Leading Pedestrian Intervals (LPIs) are an approach to reduce the conflict between pedestrians and vehicles at crosswalks by configuring traffic signals for a 7- to 10-second head start for pedestrians before the signal turns green for vehicles. This interval gives pedestrians time to enter into the crosswalk, where they are more visible to drivers, before cars get a green signal. The small interval increases pedestrian visibility enough that crash rates decline significantly. A study in *Transportation Research Record 22198* concluded that a 46% reduction in crashes can generally be expected with the installation of LPIs. Installation requires simply re-programming the signal, so no trenching, concrete pouring, or lane closures are required, and implementation costs are low. LPIs have been called "Dollar for dollar…a really smart, life-saving investment that ought to be a part of any city's effort to eliminate traffic deaths."

Road Diets & Traffic Calming

One of the issues with implementing Complete Streets and Vision Zero treatments on existing streets is the limitations of the available street right-of-way. The concept of a **road diet** addresses this issue by "right-sizing" a street where the current and projected traffic volumes permit. Right-sizing involves narrowing or removing travel lanes and re-purposing them for bicycle lanes, sidewalks, sidewalk bulb-outs, and other Complete Streets elements. As shown in **Figure 3-3**, the classic configuration of a road diet converts a 4-lane undivided street into a street with 2 travel lanes and a continuous center turn lane, with bicycle lanes on each side.

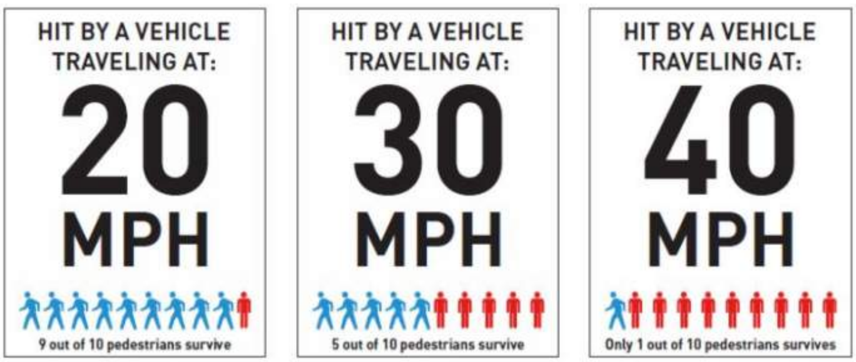
Figure 3-3: Road Diet Implemented on a 4-Lane Street

Other configurations of road diets vary the mix of bike lanes and parking lanes, sometimes placing the bike lanes on the curb side so that the parking lanes buffer them from moving traffic. Another configuration creates a two-way cycle track on one curb side of the street, protected from traffic by a buffer strip and a parking lane.

Traffic Calming is a similar concept, with treatments complementary to Complete Streets concepts that are primarily aimed at reducing vehicle speeds by addressing drivers' perceptions and behavior. Speeds in residential areas and other places with vulnerable road users are a particular focus of traffic calming.

Small differences in speed can make a big difference in safety and survivability. VisionZeroNetwork.org reports the survivability chances of a person hit by an automobile, as shown in **Figure 3.4**. The position of the traffic calming movement is that the proper balance of vehicle speeds and safety can reduce traffic violence and eliminate traffic fatalities.

Figure 3.4: Speed and Vulnerable User Survivability



The basis for traffic calming is that people naturally tend to drive at a speed that they are comfortable with. Traffic calming treatments take advantage of this trend by placing physical or perceptual barriers in the driver's sight to shift their comfort level to a lower speed.

Common Street & Sidewalk Treatments

With the commonality in purpose among the Complete Streets, Vision Zero, Road Diets, and Traffic Calming movements, it is not surprising that they share a common set of street and sidewalk treatments that contribute towards the goals of each movement. Treatments include reduced lane widths, in-lane treatments, median islands, curb extensions, sidewalk and parking lane treatments, parklets, bike lanes, and crosswalk treatments.

Reduced Lane Widths run contrary to the historic practice of lane widths of 12 to 13 feet. The wide traditional lane widths create an in-lane buffer that is more forgiving to drivers, particularly for higher-speed streets. However, these widths also make drivers more comfortable with higher speeds, even when it is not appropriate within the street context of bicycle and pedestrian activity, intersections, and sight lines. Reducing lane widths to 10 or 11 feet has been shown to reduce speeds and improve safety without a reduction in capacity. Lanes wider than 11 feet are not recommended, but may be necessary locally to accommodate trucks and buses.

In-Lane Treatments are also called vertical speed control, in that they place one of several forms of humps in the travel lane to slow traffic speeds. Common types include speed humps, which are 12 – 14 feet long to raise one axle at a time; and speed tables, which are long enough that the entire vehicle is raised at one time. Stormwater drainage and street cleaning are issues with any in-lane treatment.

Median Islands are refuge spots for pedestrians in the center of the street, so that they don’t have to cross the full width of the street without protection. They are most useful for multi-lane streets where traffic volumes and total street width makes the crossing a safety issue. Median islands can be emphasized with landscaping or textured surfaces to highlight their role as part of the pedestrian realm. The purple painted areas in **Figure 3.1** show an example of a median island treatment.

Curb Extensions function to narrow the width of the street in particular locations. They may include pinch points, bulb-outs, and bus bulb-outs. In addition to slowing vehicle speeds, curb extensions increase safety by reducing the length of the pedestrian path crossing the street. The purple painted areas in **Figure 3.1** show an example of curb extensions treatments. A chicane can be built from a set of staggered curb extensions that further reduce speeds by shifting the street path from one side of the street to the other.

Sidewalk and Parking Lane treatments are part of Complete Streets and Traffic Calming for their definitions of space and use as buffers from traffic. Increasing activity in the sidewalk zone heightens drivers' awareness, and helps define a pedestrian realm adjacent to and intersecting with the street. Wider sidewalks, distinct paving, pedestrian-scaled lighting, and buffering with landscaping are all treatments intended to promote pedestrian visibility and activity.

Parklets extend the sidewalk activity area to temporarily or permanently use parking spots for seating areas. Parklets provide additional sidewalk space and increase the visibility of the pedestrian realm. This treatment enhances the use of parking as a buffer for the sidewalk. Potential issues with parklets include stormwater drainage, street cleaning, and possible interruption of bike lanes.

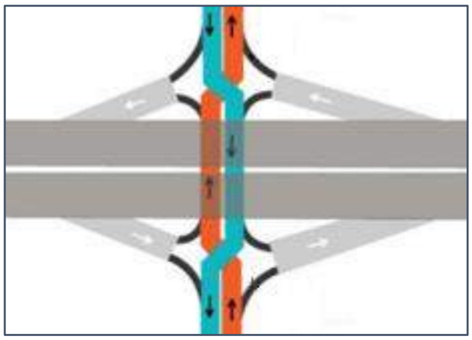
Bike Lanes address safety and smooth traffic flows by placing the flow of bicycles outside the flow of automobiles. Several striped bike lanes have already been developed in the KTMPO region. Numerous configurations of bike lanes are in common use, with notable variations including striped lanes, striped lanes buffered by parking, protected bike lanes, and cycle tracks. Bicycle traffic may also be routed off of high-volume arterials, with equivalent paths provided on a system of lower-volume streets designated as **bicycle boulevards**. Issues with curbside bike lanes include people parking in the lanes, obstruction by garbage bins on pickup days, and street cleaning.

Crosswalk Treatments use color and design to highlight the presence of a crosswalk. The concept of **creative crosswalks** uses distinct and sometimes whimsical designs to capture drivers' attention. Crosswalks are considered a traffic control device, and guidelines for their colors and designs are specified in the FHWA's *Manual on Uniform Traffic Control Devices* (MUTCD), but US cities have not always strictly followed MUTCD guidelines with their creative crosswalks. Maintenance of the painted designs of creative crosswalks has been an issue.

Common Intersection Treatments

Accommodating the safe interaction of the numerous modes and users in the integrated multimodal network is essential. The most interactions within and between the transportation modes occurs at street intersections.

Two general types of intersection treatments are in use: those that seek to increase the efficiency of vehicle throughput, and those that seek to increase the safe accommodation of all transportation modes. Both general types of intersection treatments are consistent with the goals of Complete Streets and its associated movements.



Intersection Efficiency Treatments often include designs that limit the conflict between through movements and turning movements. In a Diverging Diamond Interchange, the left turn movement is physically displaced from the intersection by crossing over the travel lanes before the turn. All turns at the remaining intersection are through movements, eliminating the need to accommodate turns in the traffic signal cycle and therefore increasing the green time. With fewer vehicle conflict points, the remaining intersection is more safe as well. The Displaced Left Turn Intersection is a modified intersection treatment with the same theme, which has the left turn crossing, but keeps the through movements on the right side of the road. Other similar treatments include the Super Street and the Michigan Left intersections, which accomplish traffic signal cycle simplification by completely prohibiting left turns, replacing them with a right turn followed by a U-turn.

Roundabouts are a type of intersection offering dramatic improvements in safety and vehicle throughput under favorable conditions. Where a conventional intersection with its numerous vehicle crossings and turnings has 32 conflict points, a roundabout reduces the number of conflicts to only 8 points. Additionally, the 8 remaining conflict points are merging movements rather than head-on or right-angle conflicts, so crashes in a roundabout tend to be less serious than crashes in a conventional intersection. Roundabouts reduce vehicle speeds while preserving throughput, and can be more efficient than stop signs or traffic signals at lower-volume intersections.

Accommodating All Modes is a general type of intersection treatment that concentrates on safety. A typical intersection with a bike lane forces a vehicle making a right turn to cross over the bike lane at an angle that creates visibility issues for both the driver and the bicyclist.

The protected intersection is designed to address this issue by continuing the bike lane through the intersection for both through movements and turning movements. With this design, the lane-changing conflict before the intersection is eliminated. Splitter islands at the corners protect bicyclists on the curve and slow vehicle speeds. The vehicle and bicycle crossing conflict is placed so that they meet at a right angle within the turn, which increases the visibility to reduce the risk of crashes.

Summary

The Complete Streets, Vision Zero, Road Diets, and Traffic Calming movements contribute to planning for an integrated multimodal system with a compatible focus on supporting and protecting all transportation modes and users. The street, sidewalk, and intersection treatments proposed by each movement are similar and consistent. Consideration of these types of treatments is a valuable addition to the concept of typical street cross sections which have historically been used.

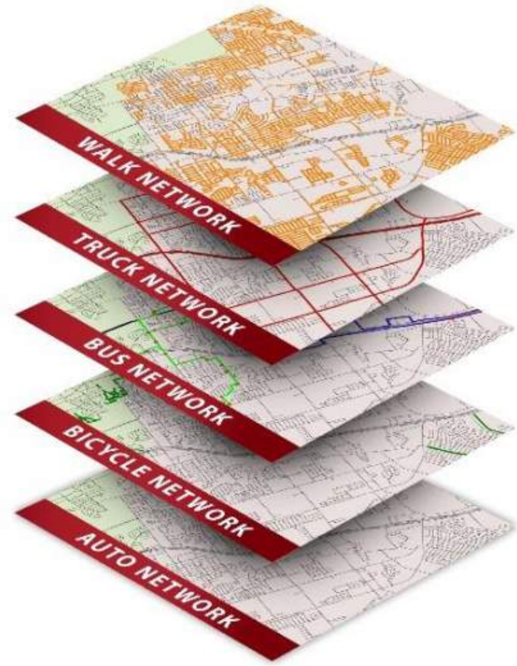
Chapter 4: Functional Classification Systems

CHAPTER HIGHLIGHTS

- The Concept of Multimodal Functional Class and Facility Type
- The Auto Network
- The Bicycle Network
- The Bus Network
- The Truck Network
- The Walk Network

The Concept of Multimodal Functional Classes

The general concept of Functional Class was introduced in Chapter 2 to show the context of the hierarchy of different types of roads in the KTMPO region. That Chapter included a review of Thoroughfare Plans from KTMPO jurisdictions to show the street Functional Classes that were defined in their Plans, and showed that they were defined differently within each Plan. A set of accepted street Functional Classes were introduced that could be used consistently throughout the region, and which could be supported by the regional travel demand model in compliance with TxDOT standards.



With the general concept of Functional Class for streets having been introduced, this Chapter will expand the concept to cover the five discrete networks in the region which are layered together to form the regional multimodal network. Two additional transportation modes, the airport and railroad systems, interact with the networks as points of access rather than as travel links, and so the concept of Functional Class is not applicable to them.

For each discrete network layer, a mode-specific Functional Classification system is introduced. Where applicable, sub-classes of Facility Types are detailed to define additional features that may be applied to each Functional Class. Each Functional Class is described with its purpose, benefits, and applications.

Extending the concept of Functional Class and Facility Type to all transportation networks is proposed in order to bring the same level of precision to the analysis of all modes' needs. At the same time, transportation planners must recognize the relative shares of each mode and their respective contributions to mobility in the region. **Table 4-1** shows the national-level mode shares for commuting and for all trips, illustrating the significantly heavier use of the automobile over the other transportation modes of transit, bicycling, and walking. Recognizing this fact does not mean that the other modes are less important; rather it calls for transportation planning that preserves the mobility granted by the automobile while at the same time developing the mobility, sustainability, and livability that is promised by other transportation modes. It calls for the development and support of a balanced regional multimodal transportation system.

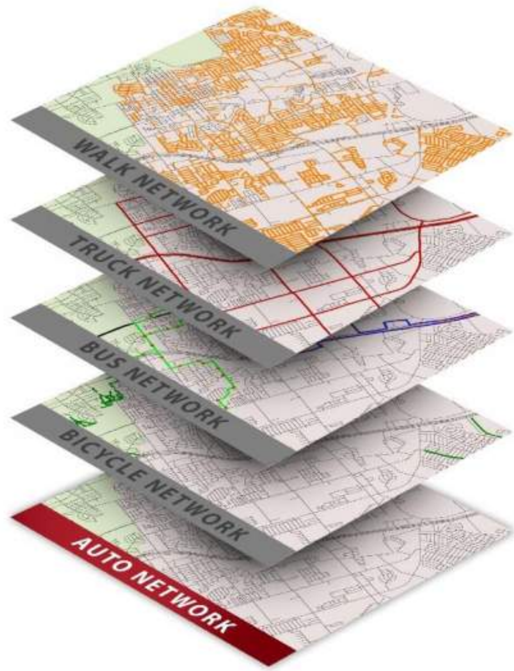
Table 4-1: National-Level Mode Shares

Mode of Travel	% of Commuters		% of All Trips Nationwide [3]
	Nationwide [1]	52 Large U.S. Cities [2]	
	2.8%	5.0%	10.4%
	0.6%	1.0%	1.0%
	5.0%	17.2%	2.2%
[4]	91.6%	76.7%	86.4%
All Modes	100%	100%	100%

Sources: (1) ACS 2011 (2) ACS 2009–2011 (3) NHTS 2009 **Notes**: The term "mode share" is used to describe the percentage of all trips or percentage of trips to work by each mode of transportation. (4) This includes trips by private car and "other" means that are not public transportation, bicycling, or walking—such as taxi, motorcycle, recreational vehicle, school bus, etc.

> **This community [was planned] when the car was king, and now we're recognizing the value of multiple modes and there are certain areas where we need to re-imagine, rethink, so they work for pedestrians.**
>
> **- Eugene Howard**
> **Project Manager**
> **Denver Community Planning & Development Department**

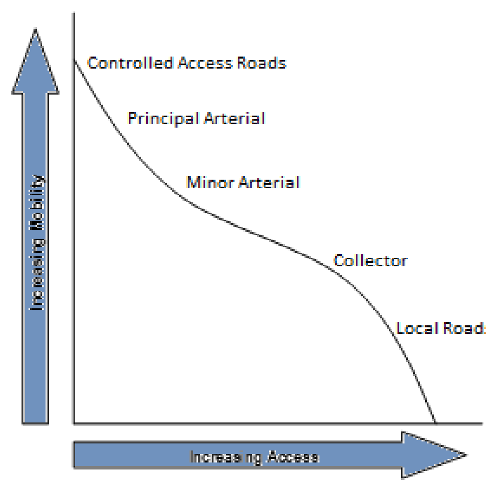
Auto Network Functional Classification



The functional classification of roadways with a comprehensive, systematic hierarchy of street type definitions considers the relationship between the type of trips served, the type of areas served, and characteristics of the streets themselves. The use of functional classification was mandated by the Federal-Aid Highway Act of 1973 to guide the provision of aid for transportation improvement projects, and this legislative requirement is still in effect today through provisions of the current FAST Act highway funding authorization. The Federal Highway Administration Functional Classification system is commonly accepted to define the functional and operational requirements for streets. These classifications are also used as the primary basis for geometric design criteria.

Purpose

The fundamental basis of street functional classification is the need to balance the two conflicting but complementary purposes of access and mobility. The Functional Classification system recognizes the hierarchy of purpose among streets that channel traffic flow from the highest level of access (local streets), to facilities collecting these flows (collector streets), then to facilities able to conveniently transport these larger flows over longer distances (arterials), and then even larger flows over even longer distances (controlled access roads), with the highest levels of mobility but least amount of access to adjacent land uses.



Unavoidably, as the provision for access to adjacent land uses increases with connecting street intersections, curb cuts, and provisions for turning movements, the level of mobility that a facility provides must decrease. The balance that a facility demonstrates between serving access and mobility is a substantial part of defining a facility's Functional Classification.

Recognizing this balance between access and mobility in a street's purpose is important to consider when planning for the balance between the street's accommodation of auto traffic and ensuring the safe and comfortable use of the street for users of all ages and abilities, using all appropriate transportation modes. This second balancing is a critical part of updating the previous Regional Thoroughfare Plan into a Regional Multimodal Plan.

Benefits
From a practical perspective, identification of the functional role of roadways is a useful tool for communities to plan for their transportation system. The Functional Classification system directly supports the Metropolitan Transportation Plan (MTP) project selection process by establishing a consistent relationship among all streets. This in turn is the basis for establishing a consistent system of street speeds and capacities that is linked to street attributes. For the purposes of project evaluation, any project for a change in a street's Functional Class (Minor Arterial to Major Arterial), Facility Type (undivided to divided), number of lanes (2 lanes to 4 lanes), or associated Area Type (rural to suburban) has a consistent and realistic effect on the street's speed and capacity attributes for itself and in relation to all other streets in the network. This allows each street project to be properly evaluated using the travel demand model, supporting a consistent and objective evaluation of projects.

Applications
The derived regional street Functional Classification system that has been developed with reference to the FHWA system and to the systems defined in the individual Thoroughfare Plans from KTMPO member jurisdictions is incorporated into the regional travel demand model network. The regional street Functional Classification system defines facilities as:

Controlled Access Functional Class roads include Interstate Highways, Freeways, and Expressways. Interstate Highways are high speed, divided highways with no direct access to adjacent land uses. All interchanges are grade-separated. Freeways and Expressways have a lesser amount of control over access, and may have a limited number of at-grade intersections controlled by traffic signals. The primary function of Controlled Access roads is to serve mobility, so they tend to serve longer-distance trips.

Major Arterial Functional Class roads are higher speed, higher volume facilities which provide regional mobility, but are balanced with a greater degree of access. They often serve significant regional activity centers, and provide major access points with at-grade intersections. While access is important, the principal function of this Functional Class is to provide mobility.

The ***Minor Arterial Functional Class*** augments and feeds the major arterial system and distributes traffic flows to smaller regions. This Functional Class places more emphasis on providing access.

The ***Collector Streets Functional Class*** is the lowest level Functional Class that is considered to have regional significance and to be routinely included in the travel demand model. They function to gather and concentrate the traffic from local streets, and funnel it onto the higher Functional Class System in the street network. For Collector Streets, providing access is by far the most important concern. Low speed and low capacity reflect the lesser importance given to mobility.

Frontage Roads and ***Ramps*** are secondary street Functional Classes associated with detail coded Controlled Access Arterials. They provide the linkage to connect Controlled Access Arterials to the network.

Local Streets Functional Class is typically not included in a regional travel demand model, as the modeled network is designed to include only streets which have regional significance. However, provisions have been made to include local streets if they provide necessary connectivity for the network.

TxTag

There are currently no ***Toll Roads*** or managed lanes (High-Occupancy/Toll, or ***HOT*** lanes) in the KTMPO region, and no toll roads or managed lane projects are included in the adopted 2040 KTMPO modeled street network. The standard TxDOT Functional Class System has been updated to define this Functional Class, so it can be added to the KTMPO regional network if needed for the analysis of projects.

Several tolled Facility Types have been defined to distinguish between radial and circumferential facilities, and to support the definition of truck-only facilities. Facility types for HOT lanes distinguish between the travel lanes and HOT ramps that provide connections to the non-tolled main lanes.

Facility Types

The standard TxDOT definition street attributes defines three Facility Types for roads. To support the concept of livability in the transportation planning process, two additional street Facility Types have been defined in this Plan. In general, Facility Types are optional attributes within the street cross section which may be applied to a street regardless of its Functional Class.

The **Divided Facility Type** applies to Major Arterials, Minor Arterials, and Collectors that have a median that physically separates the travel lanes by direction. Periodic median crossings are provided to accommodate turning movements.

In most instances of divided streets in the KTMPO region, the median is formed by a grassy or landscaped buffer strip. Divided streets may also be defined by a raised curb with paving, as shown in this illustration.

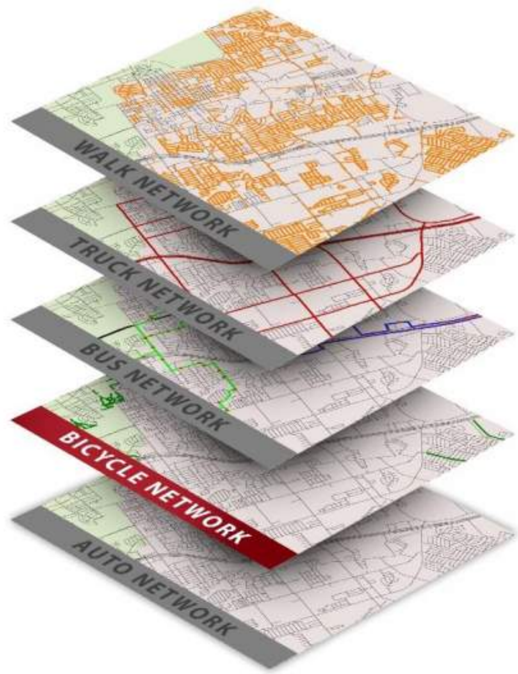
The **Continuous Left Turn Lane Facility Type** also applies to Major Arterials, Minor Arterials, and Collectors. The purpose of the continuous left turn lane is to provide opportunities for vehicles to pull out of the travel lane as they wait for oncoming traffic to clear before making their turn, so they are most commonly applied to higher Functional Class roads with higher speeds and higher volumes of traffic.

The **Undivided Facility Type** is common throughout the system, and has no physical barrier between the travel lanes by direction. While this allows unlimited turning movements, vehicles queueing for a turn can block the travel lanes. Undivided streets are more common on lower Functional Class roads with lower speeds and lower volumes of traffic.

Complete Streets are an additional **Facility Type** defined for this Regional Multimodal Plan. The concepts of Complete Streets and Context Sensitive Solutions have been endorsed by FHWA and TxDOT, which promote their development and provide guidance and design standards. The goal of Complete Streets is to design street attributes so that they consider the needs of all appropriate users and transportation modes. This does not imply that all modes must be present on all streets, but that accommodations are made as appropriate. Complete Streets design features were introduced in Chapter 3, and include treatments such as narrower travel lanes, median islands, curb extensions, parklets, bike lanes, and crosswalk treatments. Streetscape treatments such as landscaping and shade trees may also be considered as Complete Streets features.

The **Green Street Facility Type** is also newly defined in this Plan. A Green Street integrates stormwater management into the street design, often using natural water diffusion and infiltration techniques rather than simply channeling water to drains. While Green Streets may be seen as an environmentally-friendly approach to water management, the natural processes which are used are often more efficient and more cost-effective than traditional engineering approaches. Green Streets treatments include pervious pavement, rain gardens, bioswales, and retention basins.

Bicycle Network Functional Classification



While the use of a Functional Classification system for streets is mandated by Federal regulations, there are no regulatory requirements to establish a system for other modes, including the bicycle mode. This bicycle Functional Classification system is therefore offered as a tool to define a hierarchy of bicycle facilities which can be implemented as appropriate.

A balanced bicycle network defines infrastructure to provide safe, convenient, and comfortable access to the street network. This does not conflict with the right of bicycles to use any street in the network. Bicycles are legally defined as vehicles and have the same rights to the road and obligations to obey traffic laws as other vehicles. Bicycles are prohibited only from controlled access facilities such as Interstates, Freeways, and Expressways. For all other streets, including Frontage Roads, every street is a bicycle street, regardless of its bikeway designation or infrastructure.

Purpose

While the basis for a Functional Classification system for the auto network is primarily that of balancing the purposes of access and mobility, in contrast, the basis for a bicycle Functional Classification system can be seen primarily as addressing safety. Bicyclists operate a vehicle and are legitimate road users, but they are slower and less visible than motor vehicles. Bicyclists are also more vulnerable in a crash than motorists.

Conversely, when bicycles interact with pedestrians, it is the bicycle that is the higher speed and higher mass object, and the pedestrians who are the more vulnerable users. Bicycles travel 15 to 20 mph faster than pedestrians, so mixing bicycle and pedestrian traffic is inappropriate in most cases. Therefore, within the regional multimodal network, the purpose of bicycle infrastructure is managing the interactions of the bicycle network with all other modal networks, not just the automobile.

Benefits

The best evidence of the quality and fitness of a region's bicycle infrastructure is its volume of users. The highest-volume examples are in Europe, where significant bicycle facilities, denser development patterns, high gas prices, and a cycling culture combine to give the bicycle mode shares which are commonly in the 20% to 40% range. The average bicycle mode share for U. S. cities is 1.0%. American cities with high bicycle mode shares reported in the American Community Survey include Portland, Oregon with a 7.0% share, and only four other cities with mode shares of 4.0% or higher.

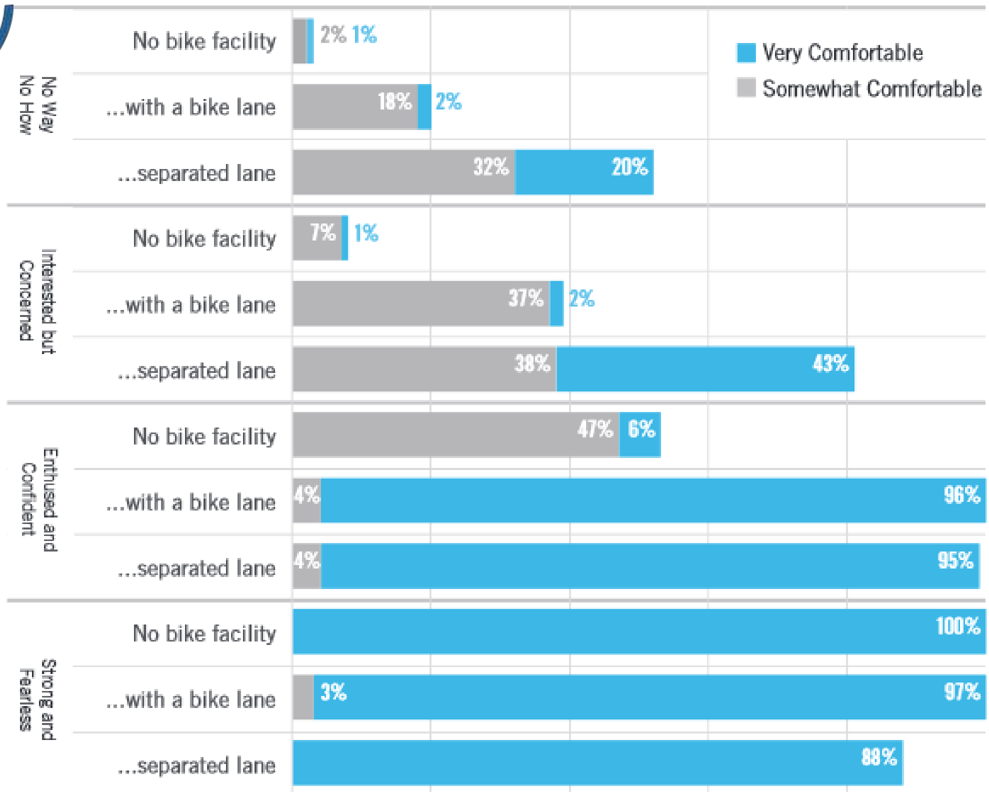
The data for Texas cities shows even smaller bicycle mode shares. Only four Texas cities are in the top fifty as reported by the Census Journey-to-Work data: Austin, ranked # 19 with a 1.3% mode share; Corpus Christi, ranked #43 with 0.5%; Houston, with a 0.5% mode share and a #44 ranking; and Plano, ranked #50 with an 0.4% share. The overall bicycle mode share for Texas is 0.6%. The bicycle mode share for the KTMPO region is reported in the Census data as rounded to 0.0%.

The low volumes of bicycle ridership in U. S. cities as compared to European cities validates a common saying among advocates that bicycling in the United States is geared towards **"the young, the fit, and the brave…and not too many of them"**. It also illustrates the challenge of bringing the existing bicycle network in the KTMPO region into balance.

The bicycling environment in Portland, Oregon illustrates the need for bicycle infrastructure. Portland is known for its extensive bicycle infrastructure and has the highest bicycle mode share of any U. S. city, yet a 2013 survey revealed that fully 80% of residents were "very concerned" or "extremely concerned" about the safety of cycling in their city. Commenting on the survey, Portland Bicycle Planning Coordinator Roger Geller estimated that about 60 percent of people in Portland would like to bike more, but are **afraid to ride**.

As shown in **Figure 4-1**, the survey classified respondents into four groups based on their confidence in riding, ranging from "No Way No How" to "Interested but Concerned", "Enthused and Confident" and "Strong and Fearless". The survey showed that bike infrastructure, particularly a separated (protected) bike lane, had a significant impact on the perception of safety.

Figure 4-1: Portland, Oregon Survey on Safety and Bike Infrastructure

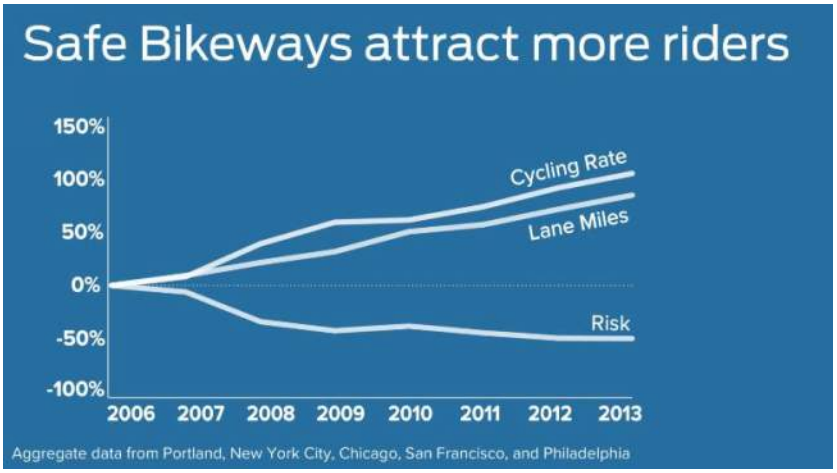


Source: https://peopleforbikes.org/blog/selling-biking-perceived-safety-the-barrier-that-still-matters/

One benefit of balancing the bicycle network is that developing a network of safe bicycling infrastructure has been shown to increase ridership, which in turn increases the visibility of bicyclists and improves safety. **Figure 4-2** uses data from five U. S. cities which have been active in building protected bike lanes. The chart shows a clear correlation: as more bike lanes are built, people feel more safety in riding, and ridership increases. The inverse is also true: if bicycle infrastructure is not built, then people will continue to be **afraid to ride**, bicycle safety and fatalities will continue to be an issue, and bicycle ridership will continue at very low levels.

If you always do what you always did, you'll always get what you always got

Figure 4-2: Safety and Bicycle Use



Bicycle infrastructure can also be seen as an educational and visibility tool. Although it is historically, logically, and legally inaccurate, some motorists have the attitude that bicycles do not have a right to the road. Developing highly visible bicycle infrastructure provides riders with protection from these motorists and reminds them of the fact of bicyclists' rights.

> **One of the challenges that we often have in communities is that there can be a perspective that roads are for cars, and cyclists are interfering with the use of cars. This mindset can lead to aggressive driving and potentially endanger lives.**
> **- Derek Bouchard-Hall**
> **CEO, USA Cycling**

Figure 4-3: Ridership and Safety

Others accept the rights of bicycles as vehicles, but feel that bike lanes are not necessary because bicycles can share the lane with cars, trucks, and buses. Safety data and ridership data show the error of this attitude, as shown in **Figure 4-3**. This data from the International Transport Forum shows a strong correlation between higher volumes of ridership and lower rates of fatalities. The Netherlands logged the highest amount of travel by bicycle and the lowest fatalities rate. In contrast, the United States showed a much lower travel volume of travel and a much higher rate of fatalities. Bicycle infrastructure clearly plays a role in establishing safety and ridership volumes.

Dr. John Snow is regarded as one of the founding fathers of modern epidemiology. As London suffered a series of cholera outbreaks during the mid-19th century, Snow theorized that cholera was spread through contaminated water. During the September 1854 cholera outbreak, he mapped known cholera deaths around thirteen public water wells and noted a strong correlation for one particular location. He had the pump handle removed and the outbreak quickly subsided.

Noah Budnick, Deputy Director of the Transportation Alternatives advocacy group, uses this historic example to promote bicycle infrastructure as a safety measure. "…then they built infrastructure, and people stopped dying", says Budnick. "If you build infrastructure like protected bike lanes, then people stop dying."

Applications

The bicycle Functional Classification system as proposed in this Plan is based on promoting visibility, safety, convenience, and building ridership volumes. Each of the bicycle Functional Classes, ranging from **Protected Bike Lanes** to **Shared Roadways**, therefore has multiple roles in developing a balanced regional multimodal network.

The ***Protected Bike Lane Functional Class*** is defined as conventional bicycle lanes paired with a designated buffer space and some type of barrier that physically separates the bicycle lane from the adjacent travel lane or parking lane. The protected bike lane is designed to heighten safety and, perhaps even more importantly, to promote the perception of safety among bicyclists in order to appeal to a wider cross-section of potential riders.

Facility Types for Protected Bike Lanes

The advocacy group *People for Bikes* has developed a guide of different treatments for a protected bike lane, which may be inferred as defining different Facility Types. The guide is based on information developed for the 2014 Austin Bicycle Plan. Summarizing the treatments found in this Plan, six general Facility Types for Protected Bike Lanes are proposed:

Curbs Facility Type can be cast-in-place or prefabricated to provide a visible physical barrier that is mountable for emergency vehicles, but which discourages routine encroachment from autos.

A curb-protected bike lane may have issues accommodating street cleaning equipment, so debris may accumulate in the lane.

Flexible Bollards Facility Type have a higher profile and so are more visible to motorists. They also have the advantage of being readily recognized as lane barriers.

Debris in the bike lane is still an issue, but the bollards do not interfere with stormwater drainage in any way.

Several varieties of **Low Bumps Facility Type** are available. Low Bumps have the advantage of defining the lane while still being mountable for emergency vehicles and street sweepers, so they perform well for debris sweeping and stormwater drainage. However, this can also be a disadvantage if motorists disrespect the laws and park in the bike lane.

The **Parking Stops Facility Type** is readily available and recognizable for defining the edges of lanes. Drainage is unimpeded, and the spacing between parking stops can be adjusted to allow access to the bike lanes or turning requirements at intersections.

In this example from Boulder, Colorado, the parking stops are augmented with flexible bollards and a painted buffer to further define the bike lane.

The **Parking Facility Type** can provide a solid physical barrier. As shown in this illustration from Austin, a second form of physical barrier is sometimes provided to prevent the cars from encroaching on the bike lane. In this example, Flexible Bollards were installed. Opening car doors can also present an issue for bikes in the lane.

This installation also shows the use of colored green pavement to define the bike lane.

The **Planters or Jersey Barriers Facility Type** provides a permanent and highly visible insurmountable barrier to protect the bike lane. They also provide space for landscaping to make the entire street more attractive, although this imposes a maintenance cost.

Jersey Barriers can also be used, which have the advantage of being a readily-recognized form of traffic control. Jersey Barriers may also be painted or have cast-in decorative treatments.

The **Rigid Bollards Facility Type** has all the advantages of flexible bollards, while at the same time having the advantages of a permanent and insurmountable barrier.

Installation costs for Rigid Bollards are higher than for other Facility Types. They are more susceptible to damage than linear treatments such as Jersey Barriers, but can be replaced more readily.

In practice, multiple Facility Types for Protected Bike Lanes can be implemented on the same facility when they are appropriate to reinforce the message of the protected lanes, heighten visibility of the lanes, or direct motorists and bicyclists at the entrances to the lanes. In this example, planting and a wider buffer help define the entrance to a protected bike lane.

As a special instance of a Protected Bike Lane, a ***Cycle Track Functional Class*** is an on-road facility with bicycle traffic in two directions. It is located on one side of the road. As shown in the illustration, applications can be placed on one-way streets, so the Cycle Track allows two-way movement within the street grid.

A cycle track may be at the same level as the street, as shown here, or may be raised to the level of the sidewalk to deter encroachment from autos wherever the track does not have a barrier.

Facility Types for a Cycle Track would be the same as for the Protected Bike Lane. With two directions of bicycle traffic and two delineated lanes, separation from pedestrian traffic is important as well. Treatments of the Cycle Track at intersections are more complex and require careful consideration of auto turning movements conflicting with both directions of bicycle traffic.

A ***Conventional Bike Lane Functional Class*** is defined as a portion of the roadway that has been designated for bicyclists by pavement markings. Bike lanes are intended to enable bicyclists to ride without conflicts with other traffic. As an upgrade in protection over shared wide travel lanes, Conventional Bike Lanes provide a greater space for bicycles without making the bike lane appear so wide that it might be mistaken for a travel lane or a parking lane.

Conventional bike lanes are a common Functional Class of facility in use in the US, and most jurisdictions are familiar with their design and application as described in the MUTCD and AASHTO Guide for the Development of Bicycle Facilities. Safety and volume data show that Conventional Bike Lanes have largely been unsuccessful in making bike trips on high-speed, high-volume streets comfortable for most bicyclists. They can be more effective in lower-speed, lower-volume situations.

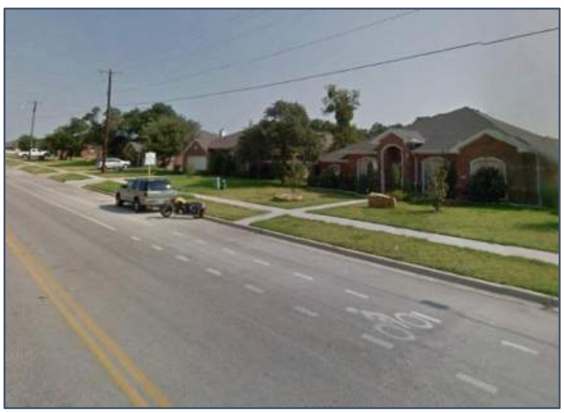
Since a Conventional Bike Lane has no physical barrier that restricts motorized traffic or parking, in practice encroachment on bike lanes by traffic, parked vehicles, and curbside trash containers has been common. Protected Bike Lanes were developed in part to address this issue.

Facility Types for Conventional Bike Lanes

The Conventional Bike Lane Functional Class is marked with painted lines rather than with physical barriers. Three Facility Types can be defined: Outboard, Inboard, and Buffered.

The **Outboard Facility Type** is illustrated by this bike lane in Temple. It is also known as a Curbside Facility Type, with the wide travel lane marked with a consistent white stripe against the curb. Bike lane symbols are provided at intersections to guide motorists and alert them of the definition of the lane.

In this application, there is no designated parking strip to conflict with the bike lane.



Killeen provides an example of an **Inboard Facility Type** for a Conventional Bike Lane, where the bike lane is defined inboard of a parking lane. This Facility Type recognizes the need to park along the curb while still providing a bike lane. It also addresses a common issue of debris in a bike lane by placing it more into the street.

The **Buffered Facility Type** separates an Outboard or Curbside Bike Lane from traffic with a painted buffer, but unlike the Protected Bike Lane, it does not have physical barrier. Styles of the painted buffer can vary, with the MUTCD providing guidance on buffer widths and on the use of stripes and chevrons to define the buffer.

Bicycle Boulevard Functional Class

Bicycle boulevards are streets with low motorized traffic volumes and speeds, designed to give priority to bicycles over motorized vehicles. The goal of the Bicycle Boulevard is to divert bicycle trips to alternate routes, avoiding high-speed and high-volume arterial streets and intersections. Bicycle Boulevards use signs, pavement markings, and speed and volume management measures which are typically consistent with Complete Streets treatments to discourage through trips by motorized vehicles and create safe, convenient bicycle crossings of busy arterial streets.

Bicycle boulevards have the potential to play a key role in a low-stress bikeway network, as they can complement and provide strategic connections between dedicated bicycle lane treatments, multi-use trails, and off-street paths. They can make cost-effective use of existing roadways and connections with a series of relatively minor treatments that substantially improve bicycling conditions on local streets. Many local streets offer the basic components of a safe bicycling environment. These streets can be enhanced using a range of design treatments to create bicycle boulevards. Many of the treatments not only benefit people on bicycles, but also help create and maintain quiet streets that benefit residents and improve safety for all road users.

Bicycle boulevards should be kept in good condition, with a smooth riding surface. Many cities have maintenance schedules for resurfacing and rehabilitating road surfaces that give priority to higher-volume streets. Local streets are typically the lowest priority for repaving, but bicycle boulevards should have a higher priority for repaving or spot improvements than other local streets.

The goal of the Bicycle Boulevard is to divert bicycle trips to alternate routes, so good wayfinding signs and markings are critical to clearly establish and publicize the routes

Shared Roadway Functional Class

A shared roadway is a street in which bicyclists ride in the same travel lanes as other traffic. There are no specific dimensions for shared roadways. On narrow travel lanes, motorists have to cross over into the adjacent travel lane to pass a cyclist. Shared roadways work well and are common on low-volume, low-speed neighborhood residential streets, rural roads, and even low-volume highways.

On streets where bike lanes would be more appropriate but with insufficient width for bike lanes, wide curb lanes may be provided. This may occur on retrofit projects where there are physical constraints and all other options, such as narrowing travel lanes, have been pursued. Wide curb lanes are not particularly attractive to most cyclists; they simply allow a passenger vehicle to pass cyclists within a travel lane, if cyclists are riding far enough to the right.

Shared-lane marking stencils, commonly called “sharrows”, may be used as an additional treatment for shared roadways. The stencils can make motorists aware of bicycles potentially in the travel lane, and they show bicyclists the correct direction of travel.

Among other benefits, shared lane markings and signs reinforce the legitimacy of bicycle traffic on the street, recommend proper bicyclist positioning, and may be configured to offer directional and wayfinding guidance. The shared lane marking is a pavement marking or a sign with a variety of uses to support a complete bikeway network; it should not be considered as equivalent bike lanes, cycle tracks, or other separation treatments.

Off-Street Multi-Use Trail Functional Class

An off-street trail provides the greatest amount of separation and protection from traffic. Off-street trails are often multi-use, intended to serve bicycle and pedestrian trips. Multi-use trails must be wide enough to accommodate safe interactions between bicycles and pedestrians.

Depending on their width, alignment, connections to the street network, and connections to other bicycle facilities, off-street multi-use trails can accommodate recreational use, but have the potential to accommodate bicycles as a practical mode of transportation serving regional destinations.

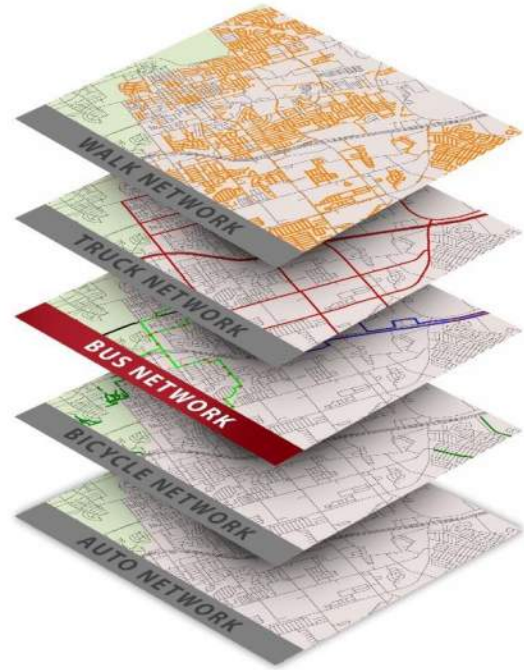
Facility Types for Multi-Use Trails

The **Hard Paved Facility Type** features a hard and smooth surface to provide a path free of impediments and to accommodate high-end road bikes and strollers. Concrete or asphalt are common surfaces. Brick or other paver types are not recommended for bicycle facilities because of their effects on the quality of the ride.

The **Soft Paved or Unpaved Facility Type** is paved with materials which can reduce costs or provide a more recreational user experience. This Facility Type is generally more amenable for recreational use. Gravel, decomposed granite, and dirt are typical soft paving materials.

The **Dual Track Facility Type** is designed to provide a greater separation of bicycle flows and pedestrian flows. Examples of implementation of Dual Track facilities are typically off-road because of the greater right-of-way required. The buffer between the bicycle and the pedestrian tracks may be a grassy strip, as shown in the example, or it may be a painted line. Sturdy barriers such as those used to separate bicycle flows from auto traffic are generally not necessary in this context.

Bus Network Functional Classification



As with other non-auto transportation modes, there are no regulatory requirements to establish a Functional Classification system for the bus network. This bus network Functional Classification system is therefore offered as a tool to define a hierarchy of bus stop facilities.

Purpose

The concept of Functional Classification for the bus network does not relate to routes or operations, but to the transit system infrastructure of bus stops. A consideration of passenger amenities is the primary driver in this Plan's definition of bus stop Functional Class. The definition of Facility Types considers other aspects of bus stop infrastructure related to the context of the stops. Context considerations for Facility Types include bus pull-outs or on-street placements, pedestrian access and ADA compliance, and stormwater treatments.

Bus stops operated by The HOP in the KTMPO region are internally classified as being located on the Near Side, Far Side, or Mid-Block relative to the closest intersection. This distinction is important, but it is primarily an operational issue rather than an infrastructure issue relating to a bus stop Functional Classification system, and so is not addressed in this Plan.

Benefits

Collating the various attributes of the passenger amenities and bus stop context into a defined Functional Classification system is intended to assist transportation planners in defining the inventories, needs, and gaps in the balanced multimodal network, and to develop and evaluate projects to address those gaps.

Increased ridership is an added benefit of a balanced bus network with improved passenger amenities at bus stops. *TCRP Synthesis 117: Better On-Street Bus Stops* cited data that supports the logical conclusion that transit ridership increases with bus stop improvements. However, most increases were found to occur at high-ridership stops; little or no increases were seen when amenities were improved at low-ridership stops. This finding indicates that the overriding requirement of the bus system is that it must provide safe, convenient, and practical trips. Transit coverage area, route orientation, service hours, and connectivity to desired destinations were shown to be more important than stop infrastructure in the Mineta Transportation Institute report *Investigating the Determining Factors for Transit Travel Demand by Bus Mode*. Convenient and comfortable access to the system is not a benefit if the system does not provide the desired services.

Applications

Each of the bus Functional Classes, ranging from **Station** to **Basic Bus Stop** is defined to support the development of a balanced regional multimodal network.

The selection of amenities at individual bus stops is generally driven by the volume of ridership. Stops with higher volumes generally support a higher level of amenities.

The ***Station Functional Class*** has the highest level of amenities. Stations are enclosed, weather-controlled facilities with waiting areas, seats, manned stations for tickets and information, and restrooms. Many stations also feature advanced amenities such as vending machines and wireless internet.

Intercity bus routes schedule rest stops and breaks for meals at commercial sites such as gas stations and fast food restaurants. Although not officially listed as stations, for the purposes of the Functional Classification system these facilities exhibit a high level of amenities, and so can reasonably be classed as Stations.

A consideration to be made for some stations, particularly intercity bus and AMTRAK, is that they are privately owned and operated. Some partner with The HOP to allow joint access to their stations and stops, but the stations remain private. Planning for stations must accommodate this fact.

The ***Shelter Functional Class*** in the KTMPO region includes two distinct styles of shelters. The Handi-Hut, as shown, is green metal with a peaked roof. The Brasco bus shelter has a black frame with flatter plexiglass. Both styles are open-fronted and have integral benches.

TCRP Synthesis 117: Better On-Street Bus Stops reports that the most common request for an amenity at a bus stop is a shelter, and nationally, transit agencies overwhelmingly rate shelters as the amenity most valued by their riders.

The ***Bench Functional Class*** uses a bench and typically includes a paved area, but does not have a shelter. Additional amenities such as informational signs and trash cans may also be present.

Bus stops with benches typically also have a hard surface paved landing pad to accommodate waiting. In this illustration, the bench is set back from the curb far enough to allow space for wheelchair users and the deployment of bus ramps.

The ***Basic Bus Stop Functional Class*** is typically used for the lowest-ridership locations. This Functional Class typically has a sign identifying the location as a bus stop. The sign may or may not include schedule information. Other amenities such as trash cans and paved places to wait are typically not provided with this Functional Class.

Facility Types for Bus Stops

In general, Facility Types are attributes which may be applied to any bus stop regardless of its Functional Class. Four Facility Types have been defined in this Plan.

The **ADA Access Facility Type** refers to the ease of pedestrian access to bus stops and to their compliance with the Americans with Disabilities Act (ADA). ADA details specific design parameters to ensure that users are able to access facilities regardless of their disabilities, which include mobility or vision impairments.

The illustrations shows an example of an access accommodation at a bus stop. The illustration shows an ADA-compliant stop with a loading platform connected to the sidewalk, and the bench is set back far enough to allow maneuvering a wheelchair and deployment of a bus ramp.

Cities throughout the country are incorporating rain gardens and planters in their streetscapes, either as Complete Streets projects or as Green Roads projects addressing stormwater runoff. The improved streetscapes can enhance the attractiveness of bus stops, but the design of streetscapes can impact the ADA compliance of bus stops by blocking access.

The **Bulb-Out Facility Type** is designed with two considerations in mind, both based on the needs of transit in high-volume areas. In practice, a bus bulb-out often is placed within a parking lane, rather than taking space out of the travel lane.

The first consideration is that a bus pulling out of the travel lane for a stop may have difficulty pulling back into traffic on a congested road. Breaks in traffic of sufficient size to allow a bus to safely enter can be infrequent, and can therefore impact the busses' on-time performance. A bus bulb-out addresses this by keeping the bus in the travel lane for the stop. This treatment gives the bus priority over other traffic, as the bus blocks the travel lane during its stop.

The second consideration in a bus bulb-out is pedestrian mobility. In high-volume areas, sidewalks are often crowded as well, and a bus stop can take up room on the sidewalk that is needed for walking. The bus bulb-out provides additional space on the sidewalk, and separates the waiting area from the walking area.

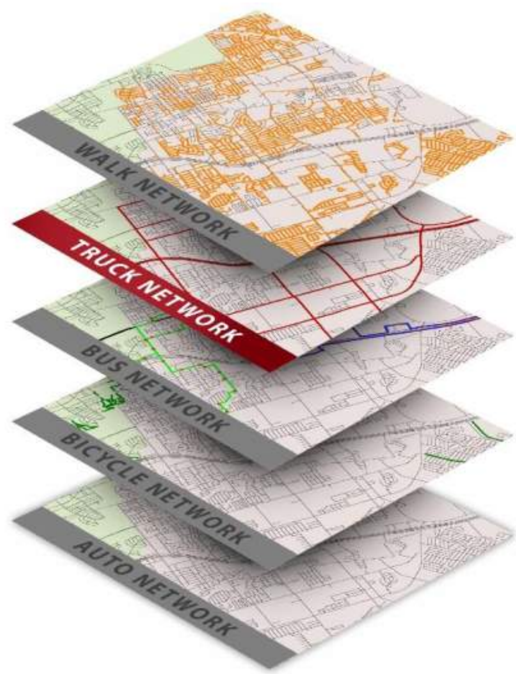
With the **In-Street Facility Type**, the bus stops directly in the travel lane to load passengers. This design is well suited to locations where traffic volumes are relatively low and the stopped bus blocking one lane is acceptable, or, as in the illustration, on multi-lane streets where traffic can change lanes to bypass the stopped bus. Since the bus stays in the travel lane, this design avoids issues with the bus merging back into traffic.

In contrast to the Bulb-Out and In-Street Facility Types, the **Pullout Facility Type** gives priority to keeping traffic moving by displacing the bus out of the travel lane for loading.

A Pullout can be appropriate in many locations where traffic volumes are low or Level of Service (LOS) is relatively high. Potential issues with a bus Pullout are shown in the illustration, and include the difficulty of the bus pulling back into traffic, narrowing of the sidewalk, and conflicts with bicycle facilities.

Truck Network Functional Classification

The definition of Functional Classes for trucks is intended to inform the street design process of the needs and impacts of trucks. As with other non-auto transportation modes, there are no regulatory requirements to establish a Functional Classification system for the truck network. This Functional Classification system is therefore offered as a tool to define a hierarchy of street facilities as used by trucks.



The definition of a truck is important when considering the different impacts of the different types of truck. While the FHWA and TxDOT use a very detailed classification system based on the number of axles and trailer combinations, for planning purposes the three types defined in the FHWA *Quick Response Freight Manual* (QRFM) are adequate.

The three truck types in the QRFM system are:

- Heavy trucks such as 18-wheeled tractor-trailers and single unit trucks with four or more axles.
- Medium trucks are typically 6-tire single-unit box trucks.
- Light trucks are two axle, 4-tire commercial vehicles, including standard pickup trucks.

Purpose
The purpose of a Functional Classification system for trucks is to provide a basis for planning which highlights the different needs and impacts that trucks have on the regional multimodal network. The concept of Functional Classification for trucks as proposed in this Plan is to define streets according to the differences in the desirability of the presence of trucks.

Benefits
The identification of the desirability of trucks on any particular street is the primary benefit to be developed from this Functional Classification system. This supports transportation planners in defining the needs and gaps in the regional multimodal network, and to develop and evaluate projects to address them.

Applications
The truck Functional Classification system defines facilities as:

The ***Truck Priority Functional Class*** designates preferred truck routes documented in plans or policies. In all cases for this Functional Class, the routes are defined as a preference, and no regulations mandate that trucks use the routes. Both Federal and Texas State plans have designated certain routes as preferred truck routes. Planning networks which define preferred truck routes include:

- National Highway System (NHS), which includes the Interstate Highway system. The NHS includes only 4% of the total mileage of road in the nation, but carries 75% of all heavy truck traffic.
- National Highway Freight Network (NHFN), defined in the FAST Act highway authorization bill.
- Primary Highway Freight System, a component of the NHFN focusing on roads.
- Strategic Highway Network (STRAHNET), a component of the NHS focusing on access for military installations.
- Texas Highway Freight Network, defined in the Texas Freight Mobility Plan.

The ***Truck Restricted Functional Class*** is defined as facilities where some trucks are denied access, but others are allowed. The restrictions are typically based on truck heights, widths, or weights. In the cases of height and weight, the restrictions are often points such as bridges or overpasses where larger trucks do not have enough clearance to pass. Truck weight restrictions may apply to entire roads where the road structure is not adequate to bear the weight, but may also apply to points such as bridges.

A truck's weight is distributed according to the number and the spacing of axles, so the configuration as well as the weight is one of the issues to consider. Therefore, some weight-restricted roads or bridges specify different weight limits based on the configuration of the truck.

The ***Truck Hazardous Material Functional Class*** is a hybrid of the Truck Priority and the Truck Restricted Functional Classes. This designation is more than a preference, as there is a legal mandate for trucks carrying non-radioactive hazardous materials loads to travel only on the designated routes. Likewise, all other routes are restricted for these trucks, and the restrictions are legally defined. Radioactive hazardous materials form a special class, and the routes for those loads are "preferred routes".

The ***Truck Prohibited Functional Class*** refers to streets or bridges where all medium and heavy trucks are legally prohibited, regardless of their dimensions or weights. Prohibitions typically apply to residential streets, although exceptions may be made for trucks making deliveries. Trucks are also often prohibited from High Occupancy Vehicle (HOV) and High Occupancy or Toll Managed Lanes (HOT).

Walk Network Functional Classification

As with the other non-auto transportation modes, there is no regulatory requirement to establish a Functional Classification system for the walk mode. This walk network Functional Classification system is therefore offered as a tool to define a hierarchy of facilities which can be implemented as appropriate when the walk network interacts with the other modal networks.

Purpose

The bicycle and the pedestrian modes are often grouped together in transportation planning under the label of "active transportation". This is appropriate in many contexts, including the definition of the primary purpose of the walk network Functional Class System: to promote the safety of the user. Pedestrians are the most vulnerable of all road users, and the mix of pedestrians can include children, children in strollers, the elderly, wheelchair users, and others with limited mobility. Defining pedestrian infrastructure is therefore not only a matter of balancing the regional multimodal network; it is a vital element in planning for the safety of the network.

Benefits

The definition of a Functional Classification system for the walk network is intended to support planning for a balanced regional multimodal network. By describing the attributes of walk Functional Classes, a more precise and more accurate inventory of facilities can be developed. This is a critical tool in defining network attributes, needs, and gaps, and in developing projects to address any needs and gaps which are identified in the network.

Applications

As the "active transportation" modes of bicycles and pedestrians share many attributes, they also appropriately share some but not all infrastructure. Bicycles and pedestrians have different speeds, different trip lengths, and different mixes of users. Therefore, while some of the infrastructure and Functional Classes are common between the two transportation modes, there are also some differences.

Off-Street Multi-Use Trail Functional Class

An off-street trail provides the greatest amount of separation and protection from traffic. Off-street trails are often multi-use, intended to serve bicycle and pedestrian trips. Multi-use trails must be wide enough to accommodate safe interactions between bicycles and pedestrians.

Facility Types for Multi-Use Trails

The **Hard Paved Facility Type** features a hard and smooth surface to provide a path free of impediments and to accommodate high-end road bikes and strollers. Concrete or asphalt are common surfaces.

The **Soft Paved or Unpaved Facility Type** is paved with materials which can reduce costs or provide a more recreational user experience. This Facility Type is generally more amenable for recreational use. Gravel, decomposed granite, and dirt are typical soft paving materials.

The **Dual Track Facility Type** is designed to provide a greater separation of bicycle flows and pedestrian flows. Examples of implementation of Dual Track facilities are typically off-road because of the greater right-of-way required. The buffer between the bicycle and the pedestrian tracks may be a grassy strip, it may be a painted line, or the separation may be unmarked, as in this illustration. Sturdy barriers such as those used to separate bicycle flows from auto traffic are generally not necessary in this context.

The ***Sidewalk Functional Class*** is the most common type of pedestrian infrastructure, and is unique in that it is the only facility in the balanced multimodal network that is intended solely for a single mode of transportation. This is an instance where the grouping of bicycle and pedestrian modes into the "active transportation" category is not appropriate for shared infrastructure.

The illustration shows some of the best practices in sidewalk design as well as some common limitations. The curb cut for ADA compliance is generous, well-marked, and has a bordering tactile surface for traction and to alert the visually impaired. The sidewalk is set well back from the driveway cut, allowing cars to complete their turns so that they are oriented at 90^0 when they meet the sidewalk, allowing better visibility of pedestrians and giving more space to stop out of the flow of traffic on the street. The sidewalk width of three to four feet is generous for pedestrians in this suburban context, but is not sufficient for pedestrians and bicyclists to share the same space. For this reason, sidewalks are not intended for bicycles. Many jurisdictions prohibit adult riders from sidewalks, allowing only children on smaller bikes.

Facility Types for Sidewalks

Three Facility Types are suggested for Sidewalks to distinguish their design and attributes within the context of their environment.

The **Conventional Sidewalk Facility Type** is common in both urban and suburban settings. These types of sidewalks are generally three to four feet wide, which is adequate for their purposes and for their existing volumes of traffic.

An issue with conventional sidewalks is that their relatively narrow width may not be sufficient in special circumstances. The illustration shows a conventional sidewalk on the Adams Ave. bridge crossing over the railroad tracks in Temple. Because the necessary side rails on the bridge line one edge of the sidewalk, the width seems inadequate to protect pedestrians from traffic in the travel lanes.

Other instances where conventional sidewalks may be too narrow to function adequately include cases where barriers lie within the sidewalk, such as telephone poles, fire hydrants, curb cuts, and street furniture.

The **Landscaped Sidewalk Facility Type** is often wider than the Conventional Sidewalk, and can be as wide as twelve feet. This Facility Type often features decorative pavement or trim, landscaping, street trees, and pedestrian-scaled lighting.

While a Landscaped Sidewalk addresses contextual issues to build a pleasant and "walkable" pedestrian environment, its primary purpose still focuses on walking rather than on urban development.

In a further development of the Landscaped Sidewalk, the **Urbanized Sidewalk Facility Type** is intended to stimulate an active street environment. Urbanized Sidewalks are divided into zones for storefronts, walking, street furniture, landscaping, and buffer areas. Total sidewalk width may be greater than twelve feet. Urbanized Sidewalks may include “parklets” or “pocket parks”, which convert one or two curbside parking spots into street furniture areas. Urbanized Sidewalks with their specialized zones are a part of the movement for Context-Sensitive Solutions, which has been endorsed by TxDOT.

Desire Lines are not infrastructure like the other Functional Classes, but they rather are facilities that define the need for infrastructure. They are defined as a Functional Class to recognize a unique feature of the walk network, where pedestrians create their own infrastructure. Where sidewalks are missing but a demand exists, pedestrians will wear a path into the ground that reveals their desire for travel in the area. Desire Lines can be found where there are short gaps in the sidewalk network, but also in places where there are no sidewalks at all. They may be located alongside a road as shown in the illustration, or may be “short cuts” across vacant fields.

Transportation planners should be aware of Desire Lines as the public’s demonstrations of their needs for walk network infrastructure.

Another unique aspect of the walk network is that movements crossing the street are as important as movements along designated pedestrian routes. The ***Crosswalk Functional Class*** is proposed so that transportation planners can define infrastructure to evaluate and to promote safety as pedestrians interact with vehicles when they cross streets.

Texas state law specifically outlines the responsibilities of vehicles and of pedestrians in marked and in unmarked crosswalks. Essentially, every intersection is a crosswalk, and pedestrians have the right-of-way over vehicles in every instance. In this respect, the Texas Transportation Code does not distinguish between marked and unmarked crosswalks.

Vehicles have the right-of-way over pedestrians when they are crossing the street anywhere other than at intersections (mid-block crossings).

Facility Types for Crosswalks

The **Complete Streets Crosswalk Facility Type** is defined to accommodate the various types of Complete Streets treatments as they apply to street crossings. The illustration shows a raised crosswalk that lifts the street surface up to the same level as the sidewalk as a way to emphasize the presence of pedestrians and to capture motorists' attention. Other Complete Streets treatments relative to crosswalks include median refuge islands, sidewalk bulb outs, and traffic calming.

The **Creative Crosswalk Facility Type** references an international movement to augment the standard markings of crosswalks with innovative designs or colors in order to highlight the crossing and to better capture motorists' attention. Common approaches to Creative Crosswalks have included artistic designs, painted patterns to simulate brick or paving stones, actual brick or paving stones laid in designs and with enough texture to draw attention to the crossing, or a combination of all treatments.

Creative Crosswalks may be considered as related to decorative treatments for intersections or streets that help define specific areas or neighborhoods. In all cases, one of the purposes of the treatments is to improve safety by emphasizing the presence of the crosswalk.

The MUTCD has recognized Creative Crosswalks, but recommends restrictions on the colors and patterns to be used so as not to cause confusion. From a practical standpoint, painted treatments will wear down and need maintenance, so designs which can be applied with templates are recommended rather than freehand artwork.

The MUTCD also stipulates that the Creative Crosswalk is not permitted to give information, as that would make it a traffic control device, which is governed by a different set of regulations.

The **Marked Crosswalk Facility Type** marks the crossing with MUCTD-mandated white bars or white bars within a set of parallel bars.

In this illustration from Killeen, the various legs of the intersection are marked separately. The crosswalk is placed mid-way through the dedicated right turn lane to heighten the visibility of the pedestrian. The curb cuts in the pedestrian refuge island serve as the anchor for the crosswalks going in each direction across the streets of the intersection.

The **Unmarked Crosswalk Facility Type** is assumed at every unmarked crossing of every intersection by Texas state law. In this illustration, the crosswalks are marked on three legs of the intersection. The dashed green lines show the Unmarked Crosswalk.

Summary

A Functional Classification system is required for the auto network by Federal legislation. Functional Classes and their associated Facility Types are useful in defining the inventory of streets by their types to support a more precise analysis of modal needs and gaps.

Although it not required, extending the concept of Functional Class and Facility Type to the bicycle, bus, truck, and walk networks is proposed in order to bring the same level of precision to the analysis of these modes' needs. This augmentation of the transportation process is intended to address each mode's unique needs and to support the development of a more balanced regional multimodal network.

Chapter 5: Current Conditions Inventories

CHAPTER HIGHLIGHTS

- The Auto Network
- The Bicycle Network
- The Bus Network
- The Truck Network
- The Walk Network
- The Airport and Rail Systems

Introduction

Inventories of current conditions by mode are vital to define the extent of the respective infrastructure by Functional Class, along with the notable constraints and barriers faced by each network. This data is the basis for defining and evaluating potential network improvement projects.

The inventories by mode have been gathered from available data in Geographic Information System (GIS) layers provided primarily by KTMPO. Layers were verified through a review of online data, aerial photos, and limited on-site field work. For almost every layer, the verification effort showed that the GIS layers were generally complete and accurate, and only minor editing was required. The only GIS layer which was discovered to need more extensive updates is the sidewalk inventory. For this layer, several specific areas where an update of the inventory is needed were noted, as shown in the Walk Network section.

In addition to the five modal networks, the airport and railroad system are also inventoried to document their points of interaction with the networks. For the airport system, this refers to the individual streets providing access to the terminals. For the railroad system, a layer of rail routes was developed, but the primary interaction with the networks is the layer of railroad crossings.

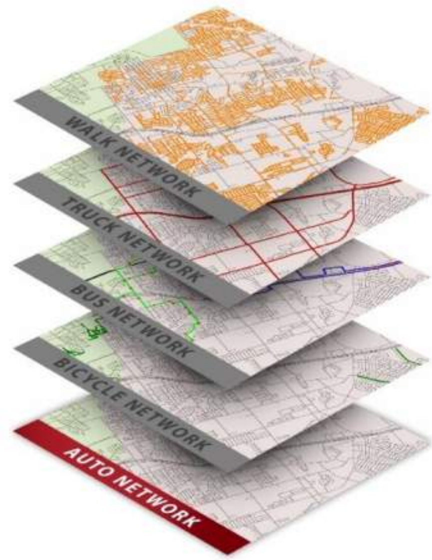
Because of the scale of the region, detailed illustrations of each modal network for each KTMPO member jurisdiction would require a document of excessive length, so the inventories are primarily documented through GIS layers to support further work for this Plan. The GIS layers which were used in the inventories are shown in **Table 5-1**. Sources of the layers and the methods used to verify their coverage and accuracy are also listed.

Table 5-1: GIS Layers for the Modal Inventories

GIS Layers, Sources, and Verification Methods		
Modal Network	**GIS Layer**	**Notes on GIS Layer**
Auto	2017 Network	Updated from the 2010 network based on TIPs and verified through aerial photos.
Bicycle	Bike Ped Paths and Trails	Layer provided by KTMPO and verified.
	Bike Ped Bridges	Layer developed through review of aerial photos.
Bus	The HOP Fixed Routes	Layer provided by KTMPO and verified.
	The HOP Bus Stops	Layer provided by KTMPO and verified. Added data for shelters.
Truck	Truck Priority Routes	Developed layer from Federal and State data.
	Load Restricted Routes	Developed layer from Federal and State data.
	Load Restricted Bridges	Developed layer from Federal and State data.
	HAZMAT Routes	Developed layer from Federal and State data.
	Truck Prohibited Routes	Developed layer from field review.
Walk	Bike Ped Paths and Trails	Layer provided by KTMPO and verified.
	Sidewalks	Layer provided by KTMPO and verified.
	Sidewalk Inventory Needed Areas	Layer developed from review of aerial photos.
Airport	Airports	Layer developed from review of aerial photos.
Railroad	Railroads	Developed layer from GIS layer and updated based on aerial photos.
	Railroad Crossings	Layer developed through review of aerial photos.

To provide a compromise between the high-level regional view and a detailed view of networks at local scales, each modal network is provided with three Figures: an overall view showing the entire region, a western area view showing cities from Kempner to Salado, and an overlapping eastern area showing cities from Harker Heights to Troy and Rogers.

The **auto network** is the base layer for the Thoroughfare Plan, with Functional Classes for ***Controlled Access***, ***Major Arterial***, ***Minor Arterial***, and ***Collector.***



For the use of the regional travel demand model, the ***Controlled Access Functional Class*** is divided into three components: ***Interstate Highway***, ***Freeway***, and ***Expressway***.

The model standards from TxDOT defines ***Interstate Highways*** as fully controlled access facilities with no at-grade intersections and an Interstate designation. These facilities typically have grassy medians or raised concrete dividers, and frontage roads. Examples of Interstate Highways in the region include IH-35 and IH-14.

Freeways have similar standards, but are not designated as Interstates. Like Interstates, their primary function is to provide mobility for regional and through trips. The Copperas Cove bypass is an example of the Freeway Functional Classification in the region.

Expressways generally are multi-lane arterials with a mix of grade-separated and signal-controlled at-grade intersections. There is no exact specification on signal spacing, but signals are typically spaced no closer than at four-mile intervals. Examples of Expressways in the region include SH 195, the southwest portion of Loop 363, and US 190 / SH 36 between Temple and Rogers.

These Functional Classes for ***Controlled Access*** facilities are supported by the addition of ***Frontage Roads*** and ***Ramps*** to allow detailed network coding.

Figure 5-1 shows the 2017 regional inventory of the Thoroughfare Network by Functional Class. The following **Figure 5-2** and **Figure 5-3** are insets for the western and eastern areas to show the data in greater detail.

Figure 5-1: 2017 Regional Inventory of the Auto Network

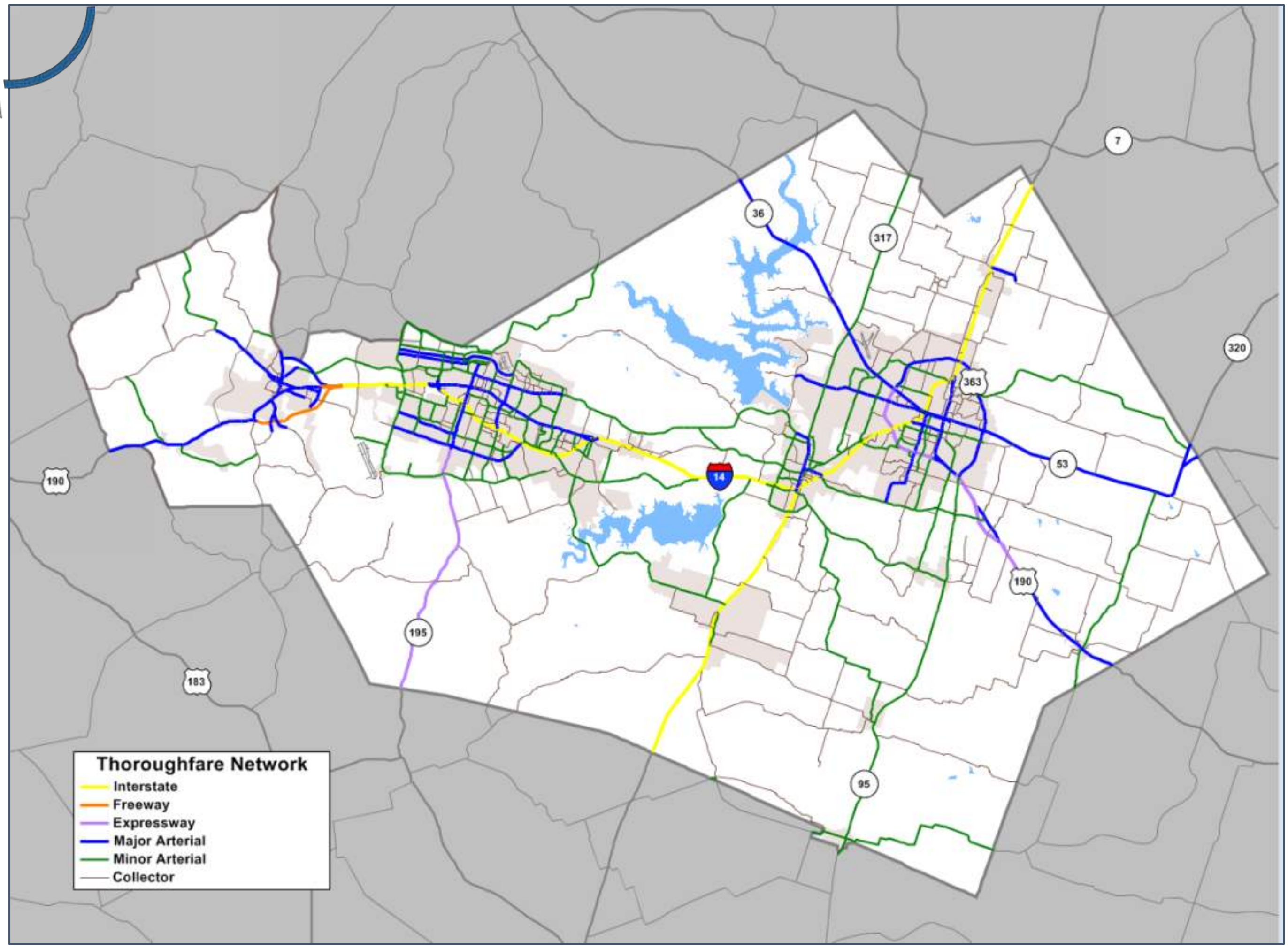


Figure 5-2: 2017 Regional Inventory of the Auto Network in the Western Area

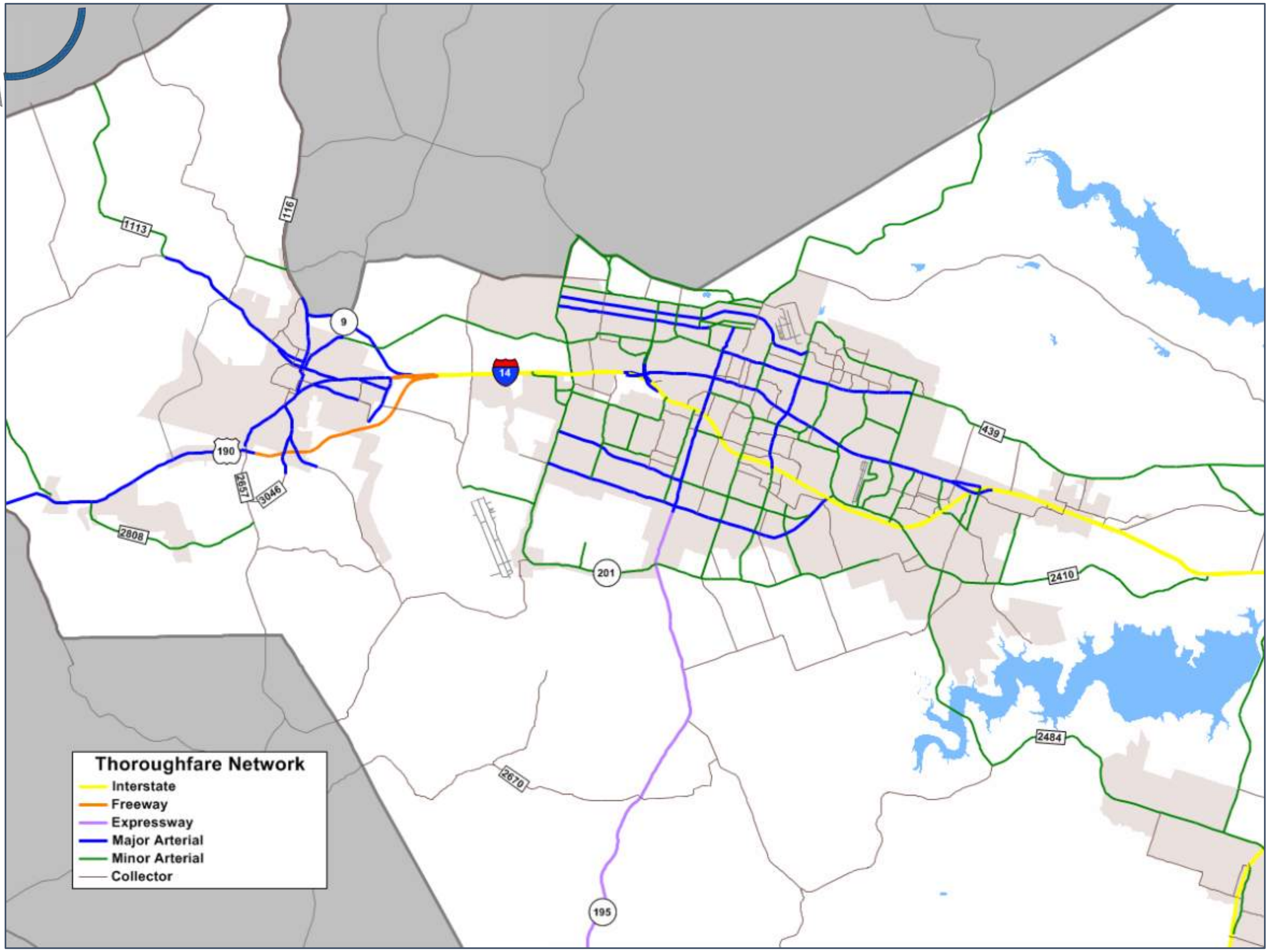
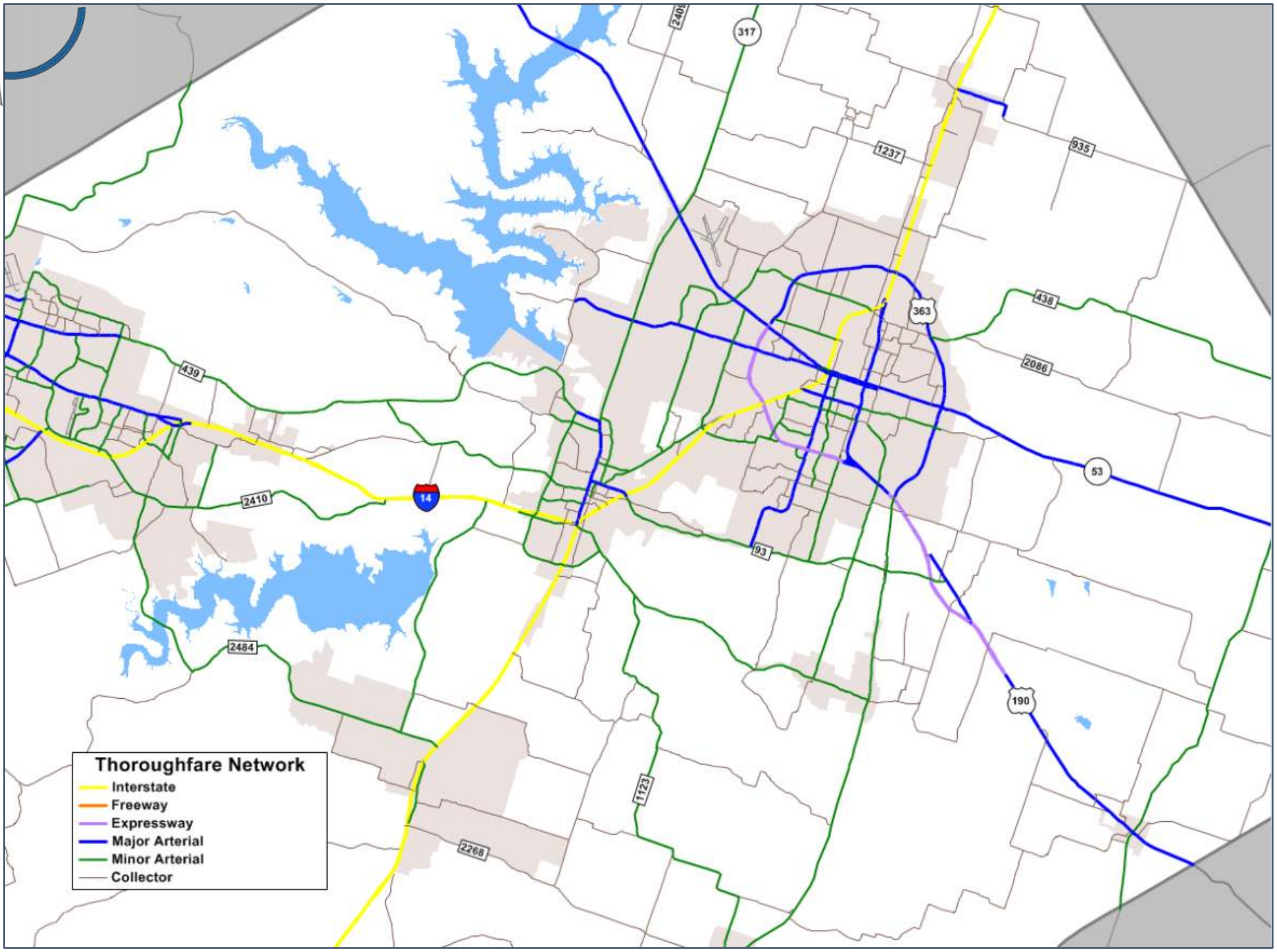


Figure 5-3: 2017 Regional Inventory of the Auto Network in the Eastern Area



As bicycles are legally defined as vehicles, the **bicycle network** includes all streets where they are not specifically prohibited, regardless of the designation of formal bicycle facilities. Bicycles are prohibited only from high speed, limited access facilities such as Interstate Highways.

Not all the Functional Classes which were defined for the bicycle network are present in the 2017 inventory. Those which are present include the ***Conventional Bike Lane***, the ***Shared Roadway***, and the ***Off-Street Multi-Use Trail***.

The 2017 inventory of bicycle facilities is shown in **Figure 5-4**, with insets of the western and eastern areas shown in **Figure 5-5** and **Figure 5-6**.

Figure 5-4: 2017 Regional Inventory of the Bicycle Network

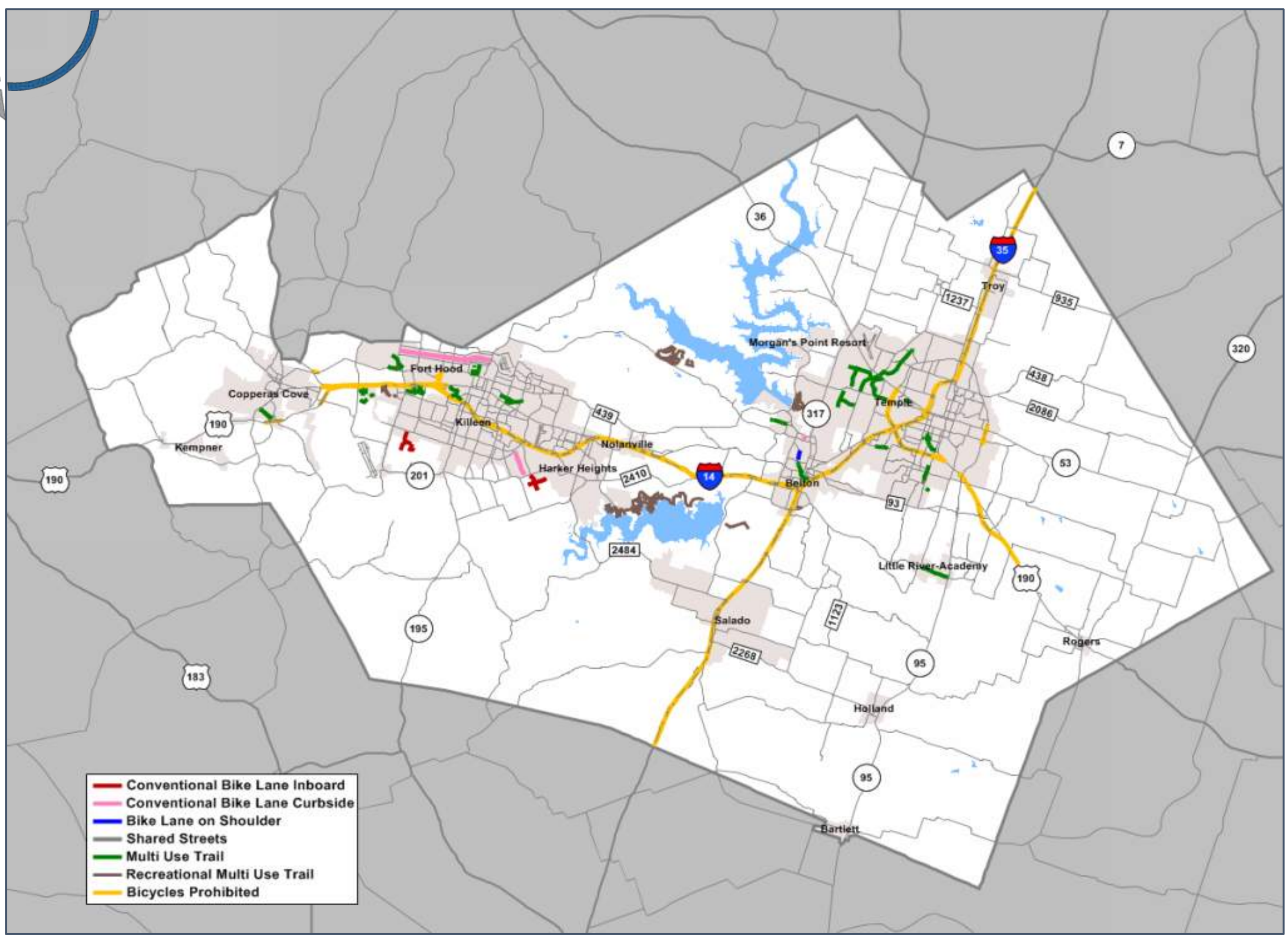


Figure 5-5: 2017 Regional Inventory of the Bicycle Network in the Western Area

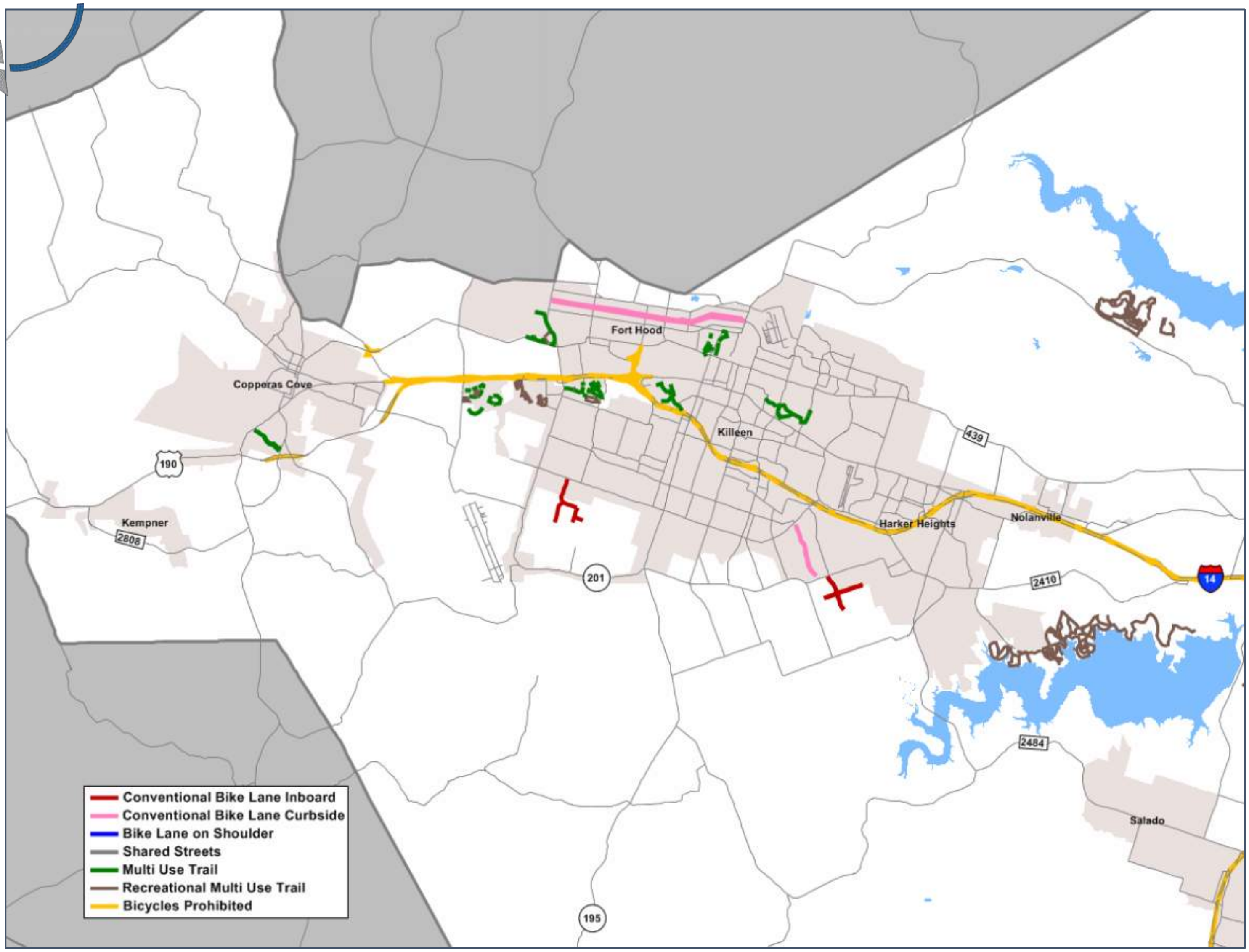
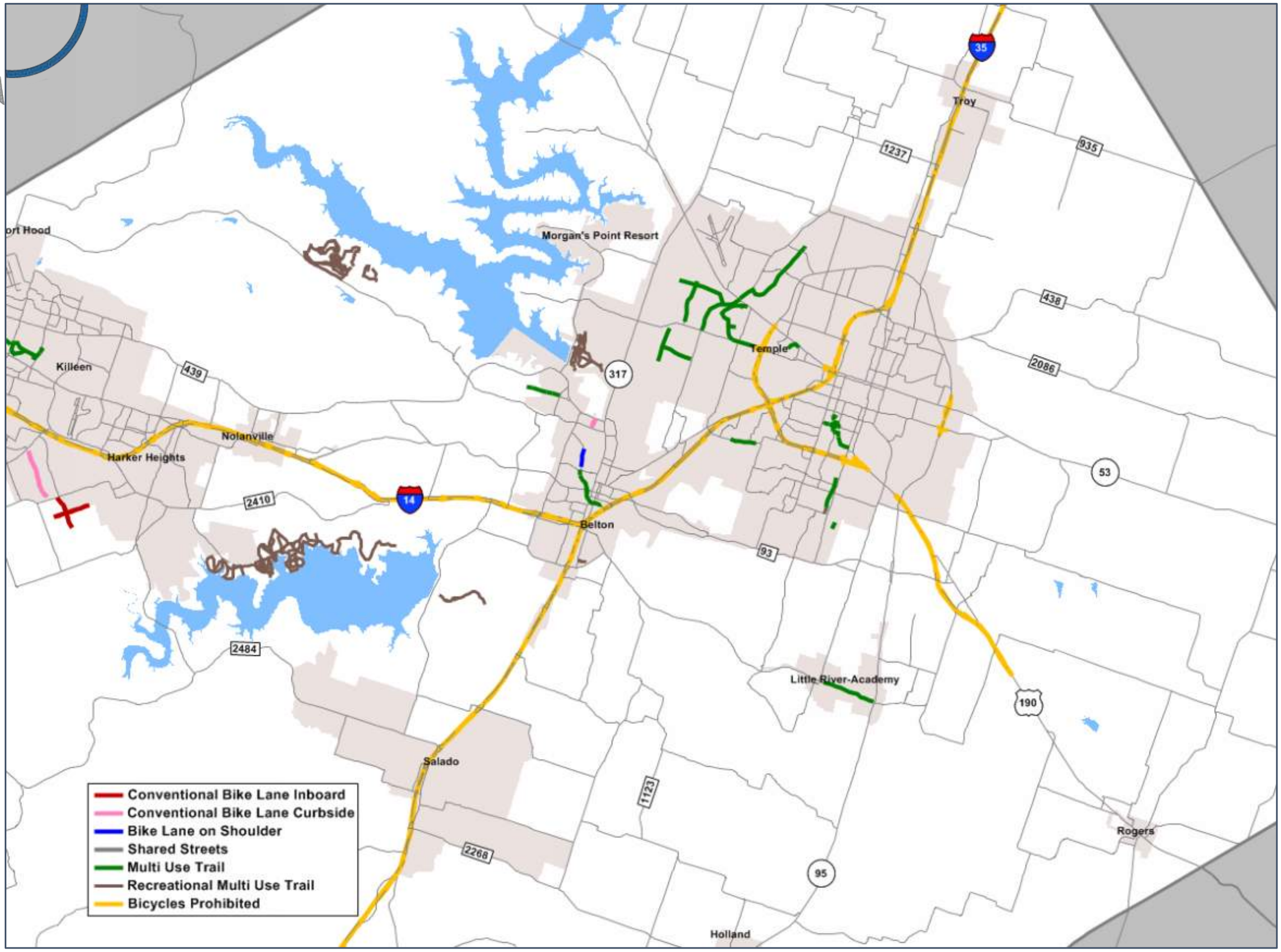


Figure 5-6: 2017 Regional Inventory of the Bicycle Network in the Eastern Area



For the **bus network**, Functional Classes were defined to establish a hierarchy of passenger amenities at bus stops. Four Functional Classes were defined as ***Station***, ***Shelter***, ***Bench***, and ***Basic Bus Stop***. All Functional Classes are present in the 2017 inventory of the region.

The HOP's bus system has a greater proportion of stops with shelters when compared to other transit systems. Overall, 43% of all stops have shelters. The system has a total of 359 active stops serving its 10 fixed routes. Of these, 154 stops have shelters, 1 has a bench only, and 204 are basic stops.

Figure 5-7 shows the 2017 regional inventory of the Bus Network by Functional Class. The following **Figure 5-8** and **Figure 5-9** are insets for the western and eastern areas to show the data in greater detail.

Figure 5-7: 2017 Regional Inventory of the Bus Network

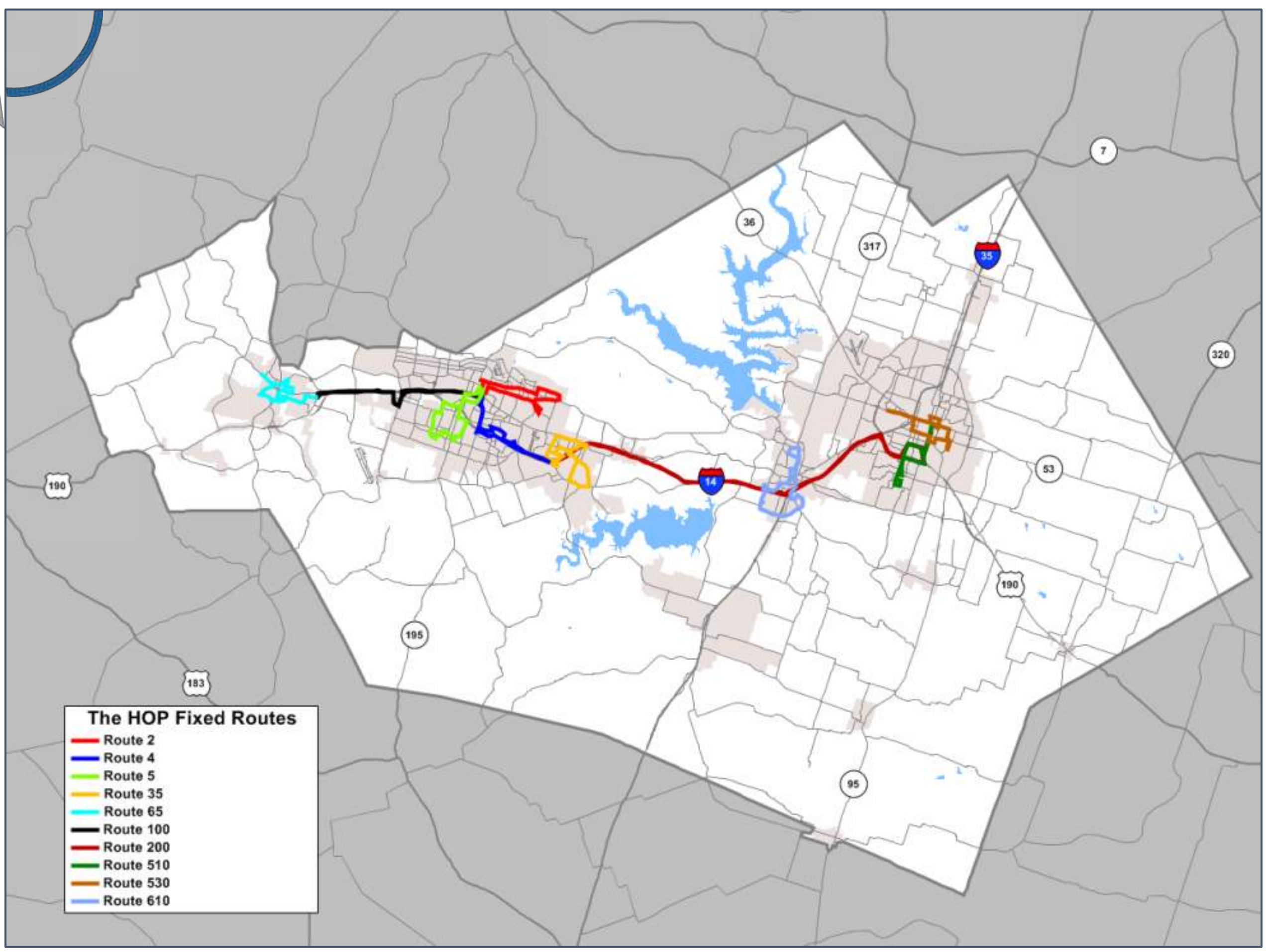


Figure 5-8: 2017 Regional Inventory of the Bus Network in the Western Area

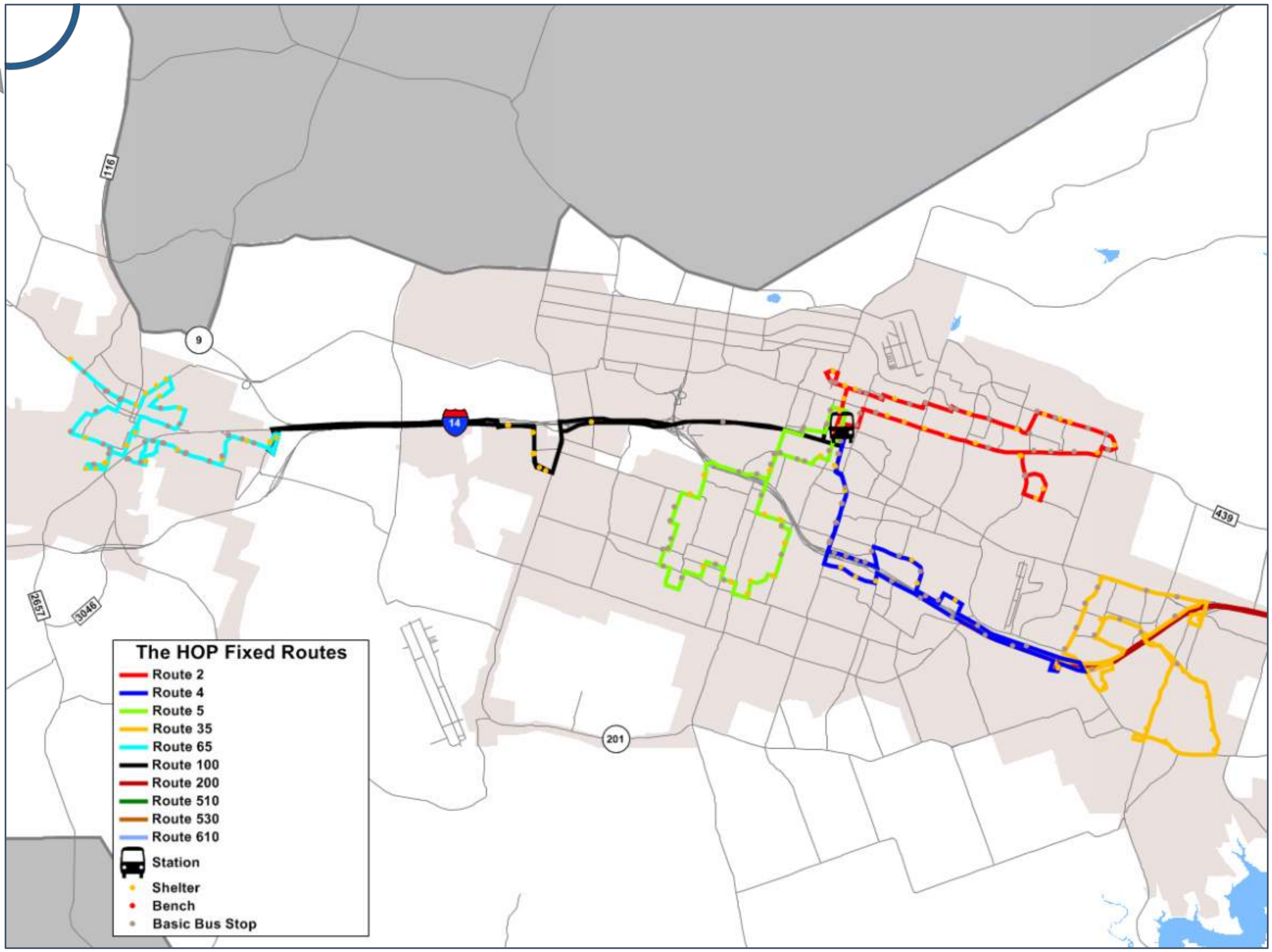
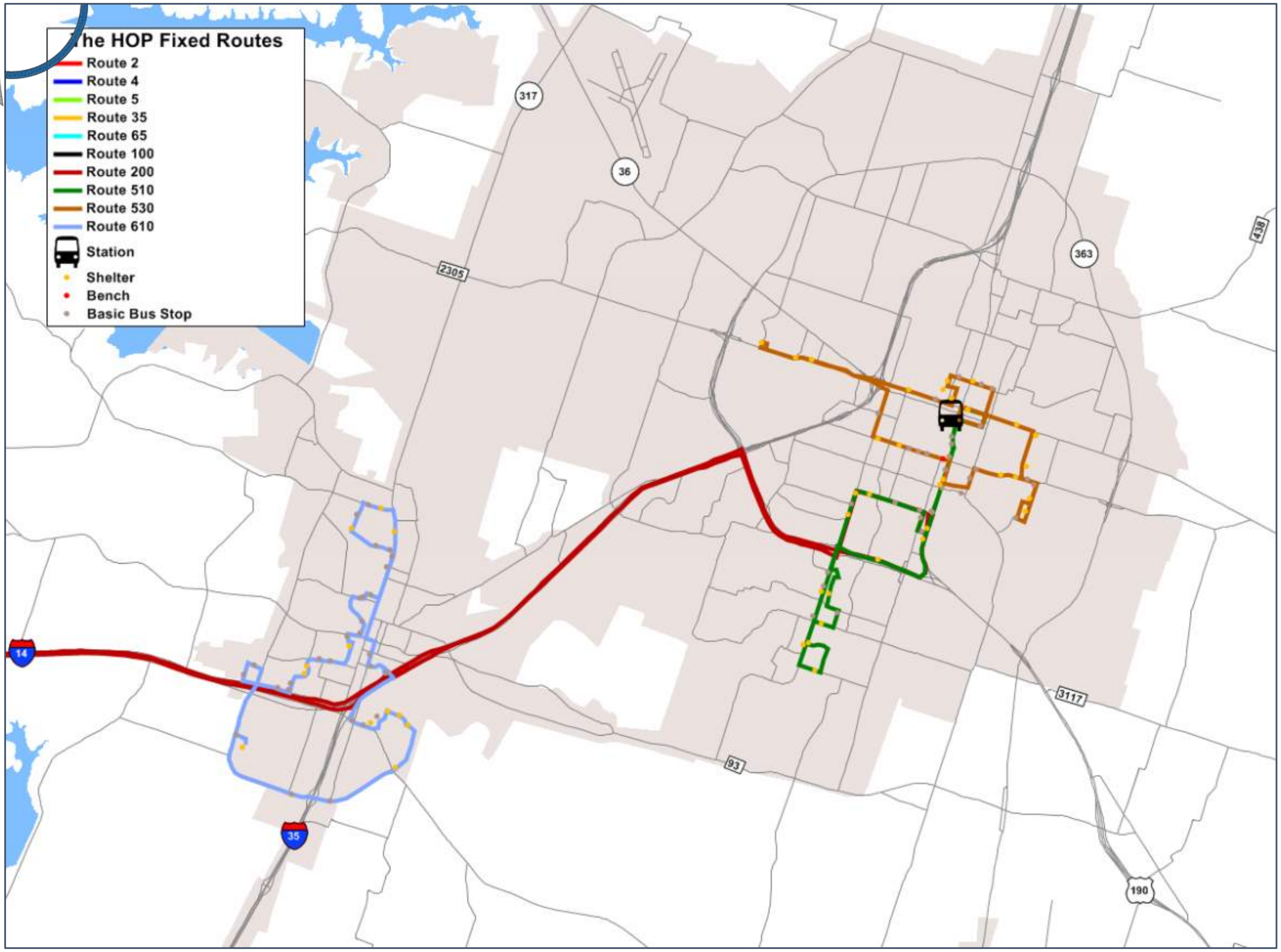


Figure 5-9: 2017 Regional Inventory of the Bus Network in the Eastern Area



Functional Classes for the **truck network** were defined to establish a hierarchy of streets based on the desirability of truck traffic. Four Functional Classes were defined as ***Priority***, ***Restricted***, ***Hazardous Materials***, and ***Prohibited***. All Functional Classes are present in the 2017 inventory of the region.

The ***Truck Priority Functional Class*** as shown for the region in **Figure 5-10**, with insets for the western and eastern areas in **Figure 5-11** and **Figure 5-12**, is a composite of several designated networks for trucks. Component networks include the National Highway System (NHS), the Eisenhower Interstate Highway System, other NHS routes and connectors, NHS intermodal connectors, and the Strategic Highway Network (STRAHNET). Truck priority networks introduced through the FAST Act include the National Highway Freight Network (NHFN) with its component Primary Highway Freight System (PHFS), other Interstate portions, Critical Rural Freight Corridors (CRFC) and Critical Urban Freight Corridors (CUFC). At the State planning level, Texas has defined a Texas Highway Freight Network complementing the Federal designations. There is considerable overlap among the designations, with critical regional routes such as IH-35 being listed in several different truck priority networks.

Truck Restricted Functional Class roads are based on the TxDOT listing of load-restricted roads, found online at http://www.txdot.gov/apps/gis/loadzone. Roads are restricted by gross vehicle weight or by the number of axles, or both. Bridges with load restrictions are listed by TxDOT at http://apps.dot.state.tx.us/apps/gis/lrbm. The data show thirty-five routes in Bell County and four routes in Coryell County with designated load restrictions. Thirteen bridges in Bell County are also designated with load restrictions. These published truck restrictions are supplemented by local ordinances which define general restrictions without specifically designating truck routes.

There are additional areas where trucks have not been officially prohibited, but where infrastructure or conditions do not support their safe or efficient operation. The geometric constraints at certain railroad crossings illustrate the issue. While the majority of railroad crossings in the KTMPO region are either at-grade or are grade separated with generous vertical and horizontal clearances, trucks have special needs and railroad crossings may present issues. Four locations are inventoried with geometric restrictions: two at-grade railroad crossings with high crowns, and two railroad underpasses with constrained clearances. The February 26, 2018 crash of a train and an 18-wheeler at an at-grade crossing on Teague Dr. in Moody (outside the KTMPO region) illustrates the issue.

Photo: Temple Daily Telegram

The crown of the road is such that the jacks on truck trailers can get caught, so the truck is unable to move forwards or backwards off the tracks. The crossing is well known locally and local officials say that trucks are prohibited from that crossing, but there are no signs prohibiting trucks and the crossing is not on the TxDOT list of restricted routes. This shows that the available routing data may not be sufficient in all cases, and very specific local knowledge of truck restrictions, constraints, and barriers is needed.

Local jurisdictions may also designate certain routes for their ***Hazardous Materials Functional Class*** roads, and enter them into the National Hazardous Materials Route Registry, which is maintained by the Federal Motor Carrier Safety Administration (FMCSA) and posted online at https://www.fmcsa.dot.gov/regulations/hazardous-materials/national-hazardous-materials-route-registry-state. In the KTMPO region, only Loop 363 in Temple and the portion of IH-35 inside the Loop are designated in the national registry.

Only one example of a route or bridge absolutely ***Prohibited*** to trucks was found in the KTMPO region: the bridge on W. Central Ave in Belton, which is not only load restricted, but also is narrow, one-lane, one-way, with concrete guardrails which constrict the horizontal clearance.

Figure 5-10: 2017 Regional Inventory of the Truck Network

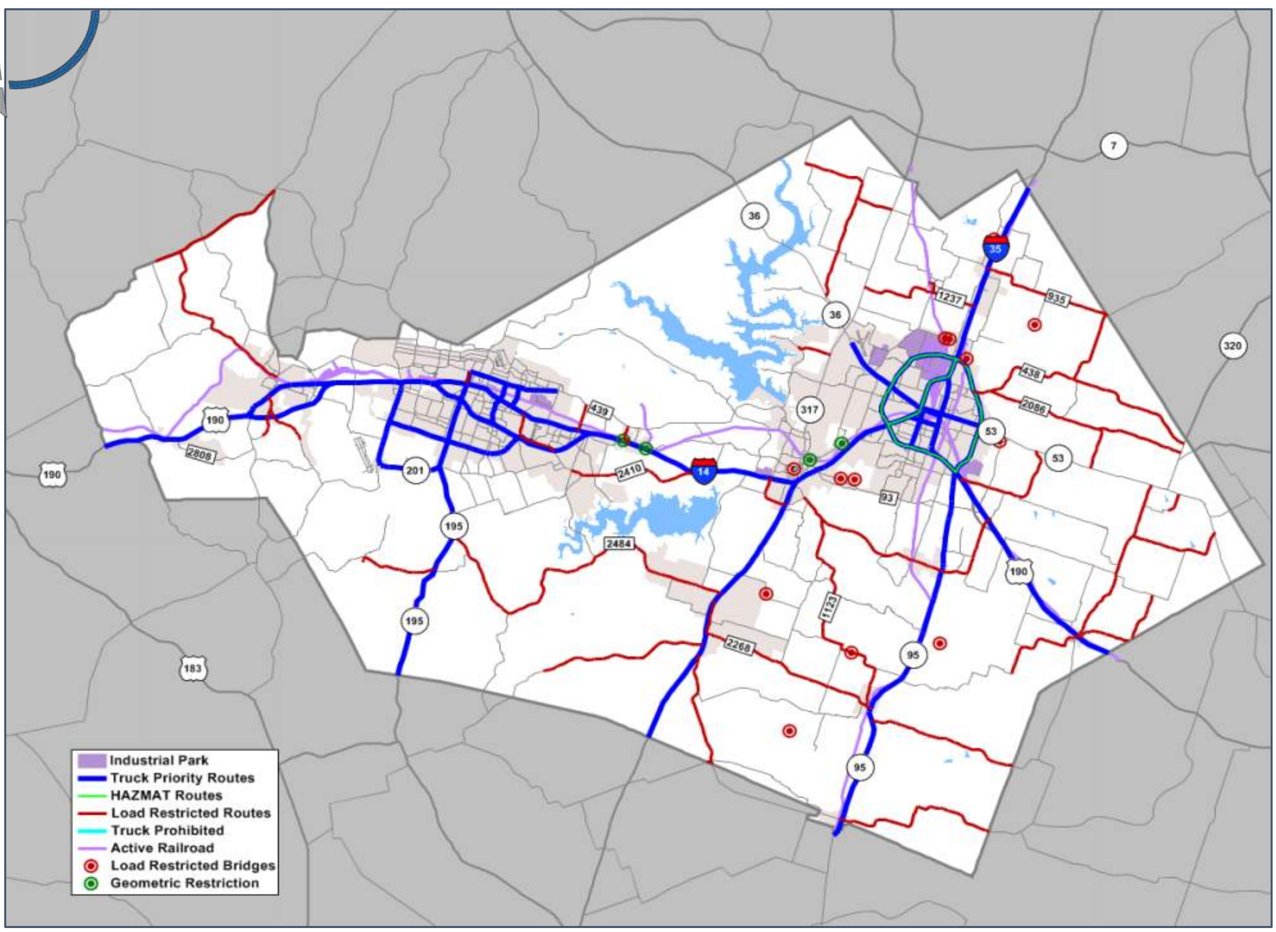


Figure 5-11: 2017 Regional Inventory of the Truck Network in the Western Area

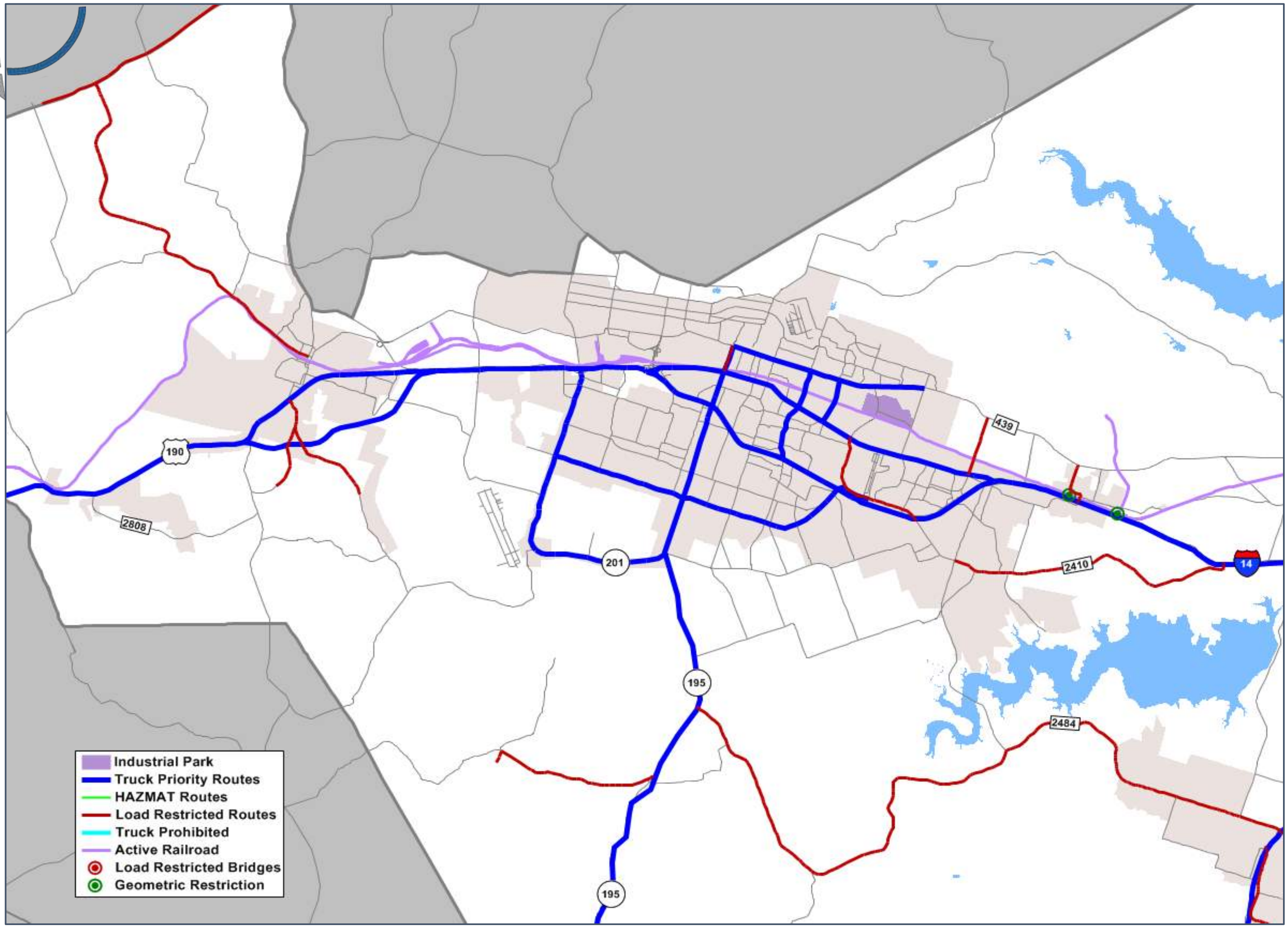
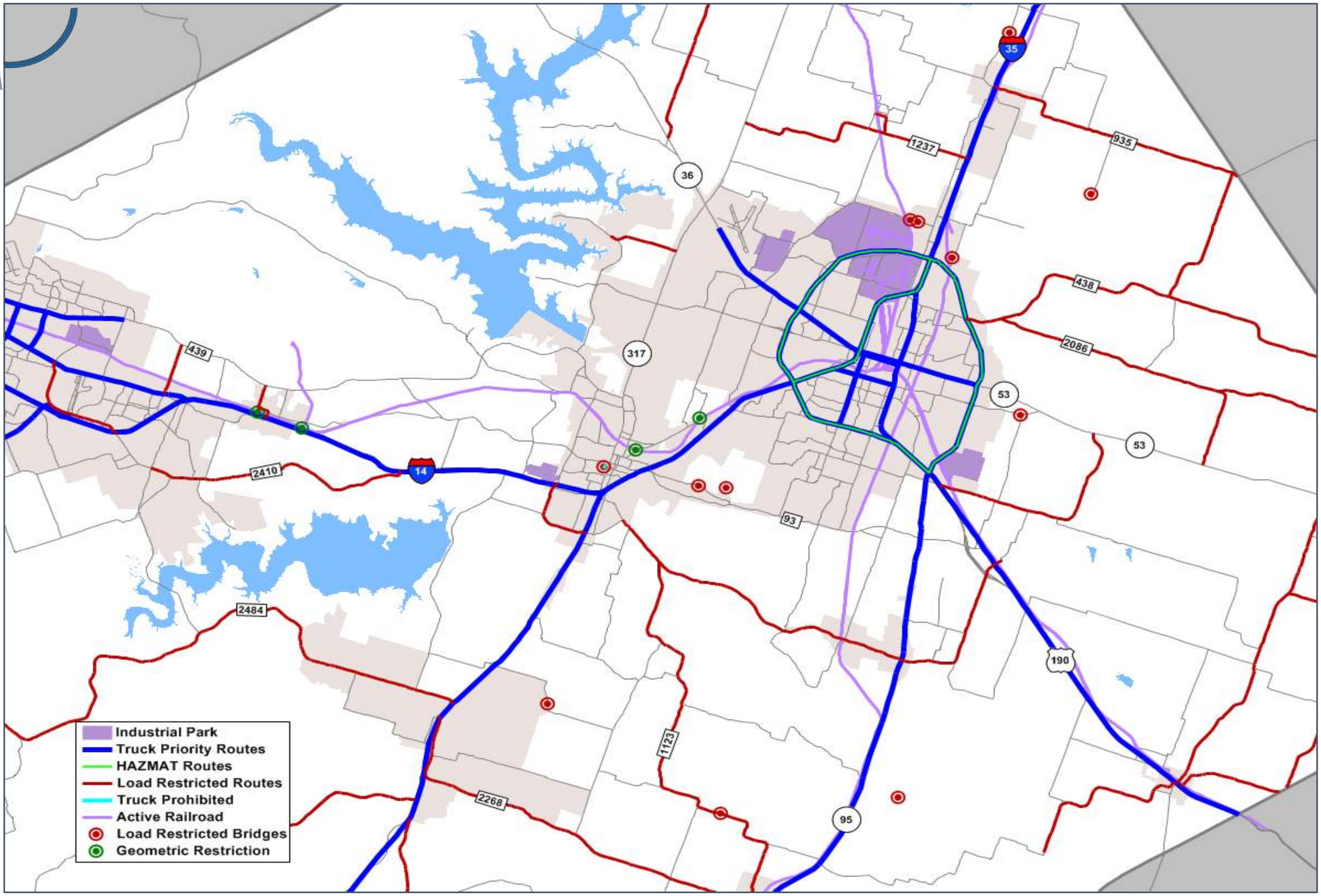


Figure 5-12: 2017 Regional Inventory of the Truck Network in the Eastern Area



The **walk network** has been defined with four Functional Classes. ***Sidewalks*** and ***Multi-Use Trails*** are included in the inventories, and are tracked by KTMPO with current infrastructure and projects. Inventories of these two Functional Classes are shown in **Figure 5-15**, with insets for the western area in **Figure 5-16** and for the eastern area in **Figure 5-17**.

The review of the inventories found several areas where the sidewalk inventory needs to be updated. The areas needing inventory updates are noted in the Figures with key "Sidewalk Inventory Needed". The areas needing inventory updates include both new developments and older residential areas in Copperas Cove, south of Killeen and Harker Heights, north of Belton, Temple, and Troy.

The exact distinction between on-street multi-use trails and sidewalks should be defined to add more precision to the network inventory. In general, the width of the facility is the most important distinction, with multi-use trails serving both bicycles and pedestrians requiring a width of at least five feet. Neither the current bicycle path and trails inventory nor the sidewalk inventory include width as an attribute, so adding this level of precision will require additional field work to update the inventories.

Compliance of the walk network with the requirements of the Americans with Disabilities Act (ADA) is also an important attribute which will add precision to the inventories. Extensive efforts to make the walk network ADA compliant are evident throughout the region, particularly with curb cuts, ramps, and texturing. However, the nuances of ADA compliance are complicated. **Figure 5-13** shows a bus stop which is set back from the curb to allow room for buses to drop their wheelchair ramps, while still allowing room for wheelchairs to maneuver to get into position. However, while this setup is compliant for access to the bus for wheelchair users, the shelter blocks the path of the sidewalk and may not be compliant for sight-impaired users. These types of nuances and the potentially conflicting needs of multiple users mean that an inventory of ADA compliance would be complex, and would require extensive

Figure 5-13: Sidewalk ADA Compliance at a Bus Stop

knowledge of requirements as well as extensive field work.

The ***Multi-Use Trails*** are shared with the **bicycle network**, and are shown here as well. Two Facility Types of Multi-Use Trails are distinguished: on-street and recreational. As shown in the Figures, the recreational multi-use trails are typically located in parks or recreational areas and form closed loops rather than forming connections to the network.

The ***Desire Line*** and the ***Crosswalk*** Functional Classes have been newly defined for the walk network in this Plan, and therefore are not included in the KTMPO inventories. **Figure 5-14** shows the walk network along S. 31st Street in Temple to illustrate the issues. Several residential and commercial areas are shown which have no walk network coverage, and some sidewalks are shown to have linear gaps. Desire line paths are shown on both sides of S 31st Street: on the east side along the gap in the line of sidewalks, and on the west side where there are no sidewalks. An inventory for sidewalks, desire lines, and crosswalks will require extensive field work. A review of aerial photos could contribute to the inventories but would not be sufficient to fully describe the networks.

Figure 5-14: Sample of Sidewalks and Desire Lines

In general, the regional view in **Figure 5-15** shows how the walk network inventory varies by area. Killeen and Harker Heights show an extensive sidewalk network in their newly-developed residential areas both north and south of IH-14. In contrast, the eastern area has a much less dense sidewalk network, even in its areas of recent residential development along SH 317 north of Belton and around S 5th Street south of Temple.

Figure 5-15: 2017 Regional Inventory of the Walk Network

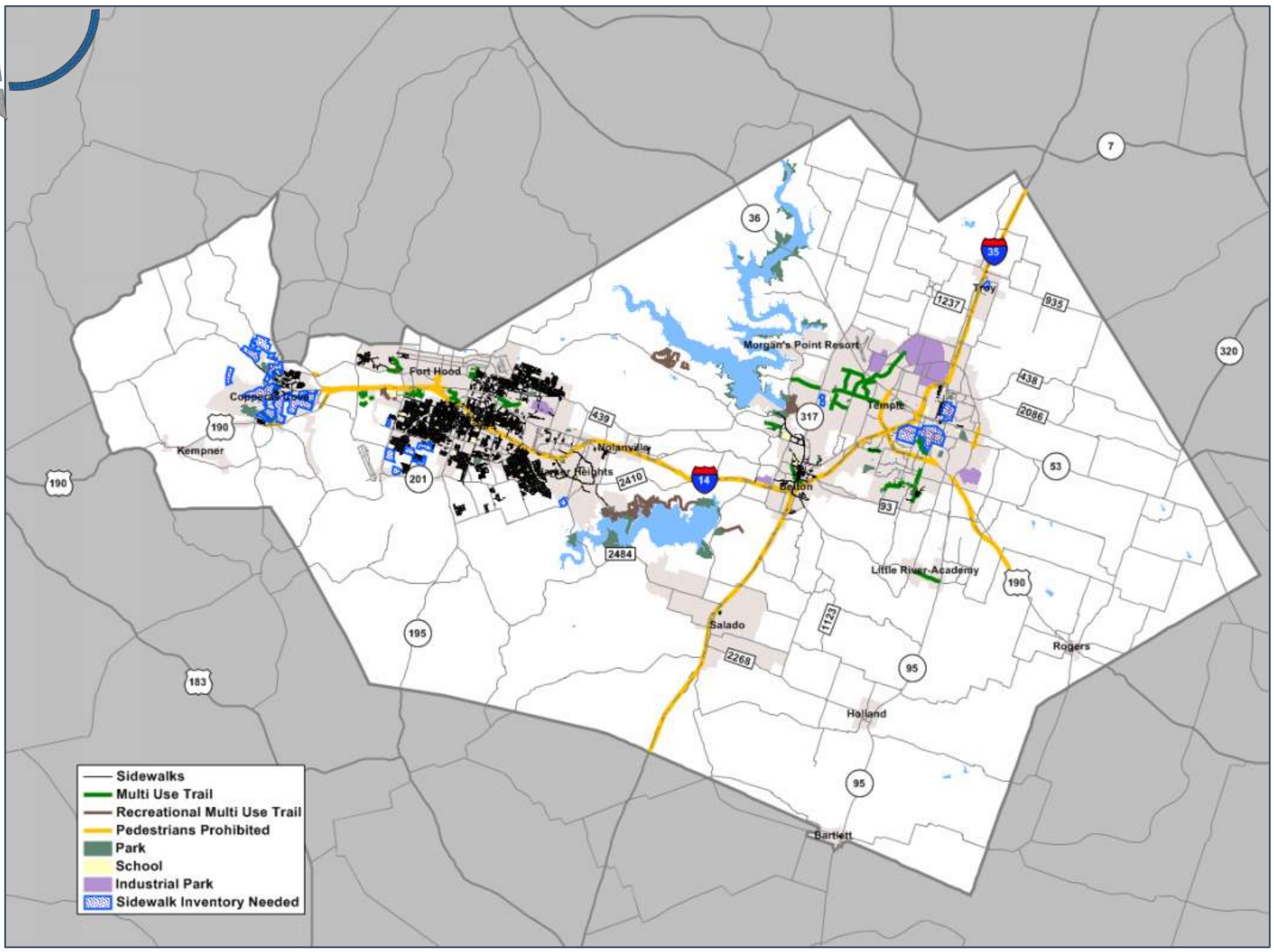


Figure 5-16: 2017 Regional Inventory of the Walk Network in the Western Area

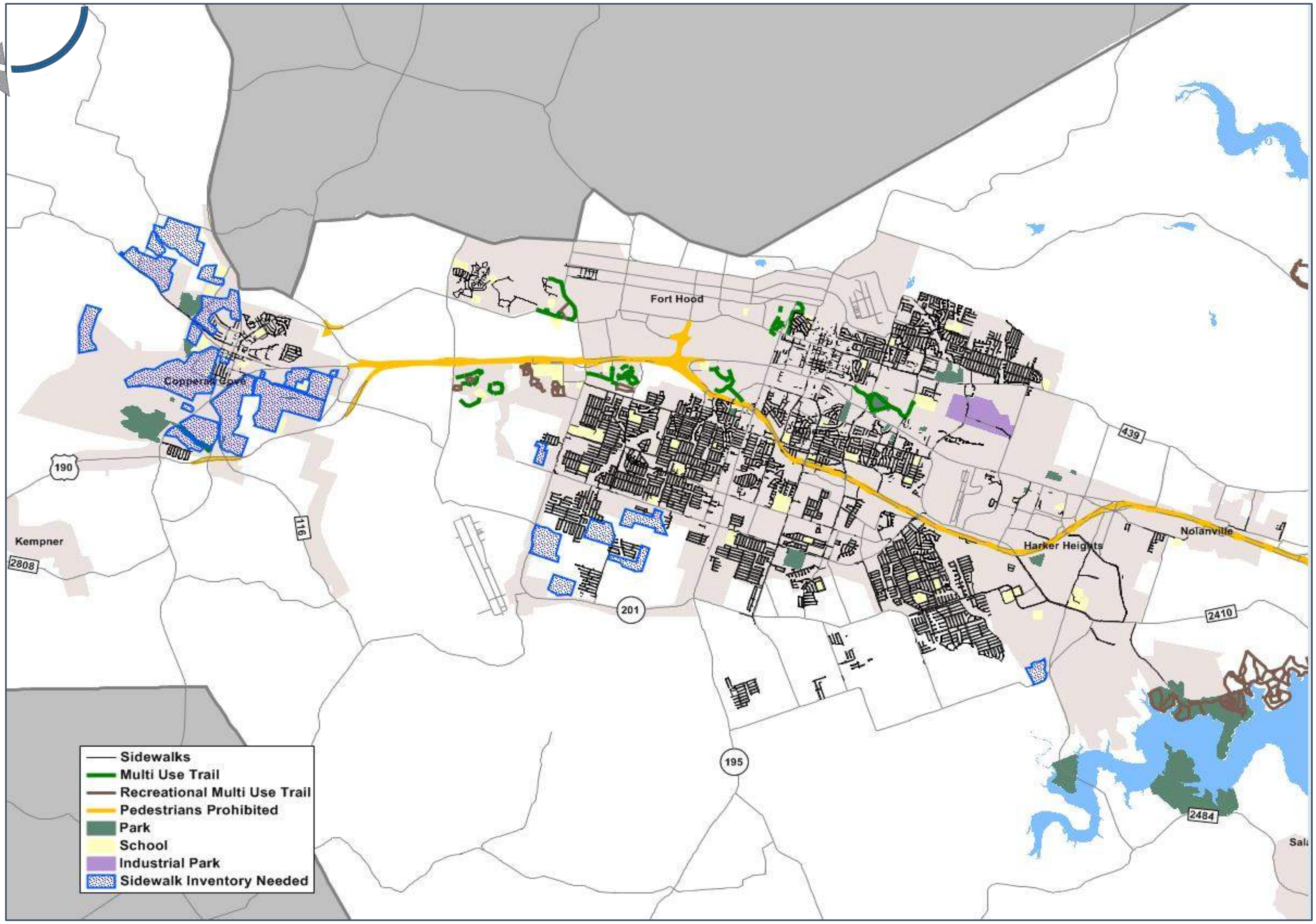
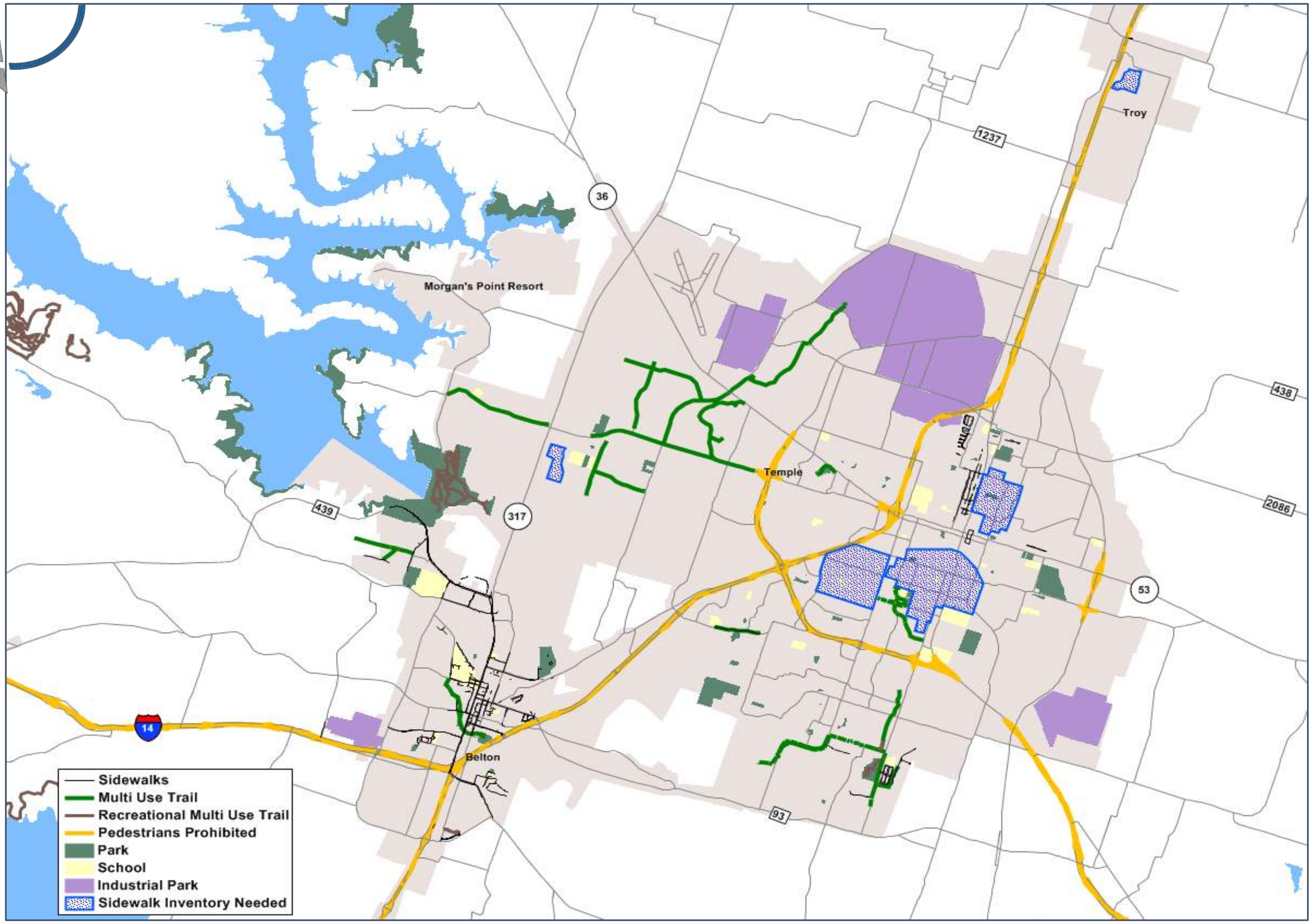


Figure 5-17: 2017 Regional Inventory of the Walk Network in the Eastern Area



The **Airport System** and the **Rail System** are not treated as networks in this Plan, but as points that are accessed by the other networks. For airports, those points are the single roads that serve the airport entrances. The interaction of railroads with the other networks is primarily found at railroad crossings. Railroad crossings can be either at-grade or grade separated with an overpass or underpass.

The airport and railroad system inventories are shown in **Figure 5-19**, with insets for the western area in **Figure 5-20** and for the eastern area in **Figure 5-21**.

There are four major airports in the region. The Killeen-Fort Hood Regional Airport is a shared field with the Robert Gray Army Airfield. Access to the civilian side of the airport is provided by Chet Edwards Loop. It is classed as a primary commercial service airport, and is served by American Eagle and United Airlines. Service by Delta Airlines was terminated in January 2018. The Hood Army Airfield is not open to civilian air traffic, but is noted for completeness of the inventory. Skylark Field is the former Killeen Municipal Airport; commercial operations were moved to the Killeen-Fort Hood Regional Airport in 2004. Airport Drive provides access to the terminal. It is not served by scheduled passenger air service, but is open for general aviation. The Draughon-Miller Central Texas Regional Airport is also a general aviation facility. One street provides access to the airport's administrative buildings, and three other streets provide access to individual areas of hangers.

At-grade railroad crossings impact the network with the quality of the crossing. All of the 140 at-grade crossings in the KTMPO region have a smooth crossing, typically with pre-cast concrete pads between the rails. The only issues found with at-grade crossings were at two locations in Nolanville: N 5th Street and Levy Crossing Road, where a high crown with a steep grade on both sides of the tracks may cause issues with longer vehicles bottoming out.

There are twenty-seven grade separated railroad crossings in the region. All except two provide generous horizontal and vertical clearance for crossing traffic. The two exceptions, on Waco Road and on Charter Oak Drive (which are actually the same road) in Belton, have low horizontal and vertical clearance that may constrain larger trucks. They are also both located on curves and in dips, which can restrict visibility and speed. The crossing on Charter Oaks Drive is shown in **Figure 5-18**. Neither the two at-grade crossings with high crowns nor the two grade-separated crossings with constrained geometries are posted as truck restricted, but larger trucks may have difficulty with the routes.

Figure 5-18: Railroad Overpass on Charter Oaks Drive

This shows that the available routing data may not be sufficient in all cases, and very specific local knowledge of truck restrictions, constraints, and barriers is needed.

Figure 5-19: 2017 Regional Inventory of the Airport and Rail Systems

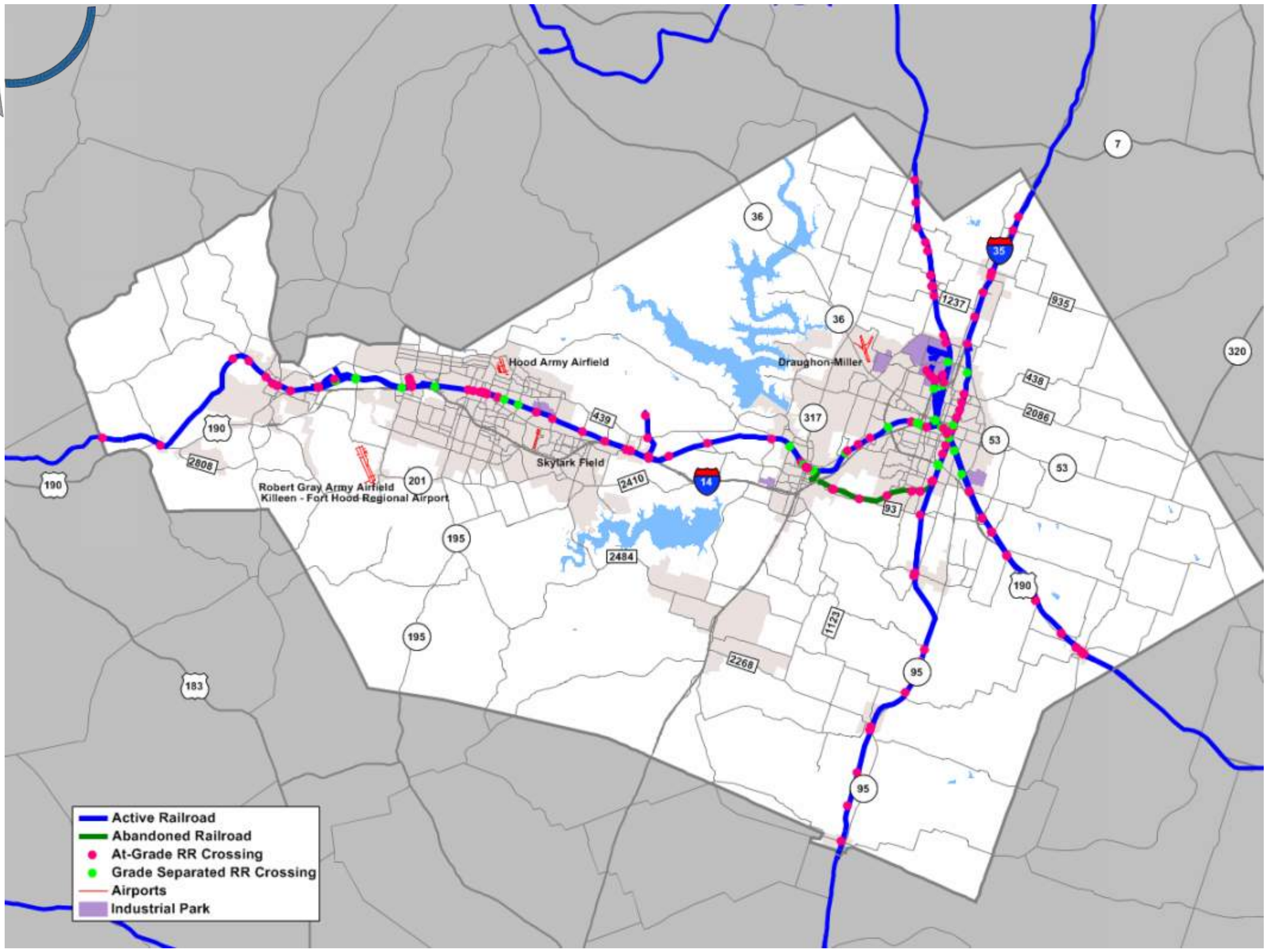


Figure 5-20: 2017 Regional Inventory of the Airport and Rail Systems in the Western Area

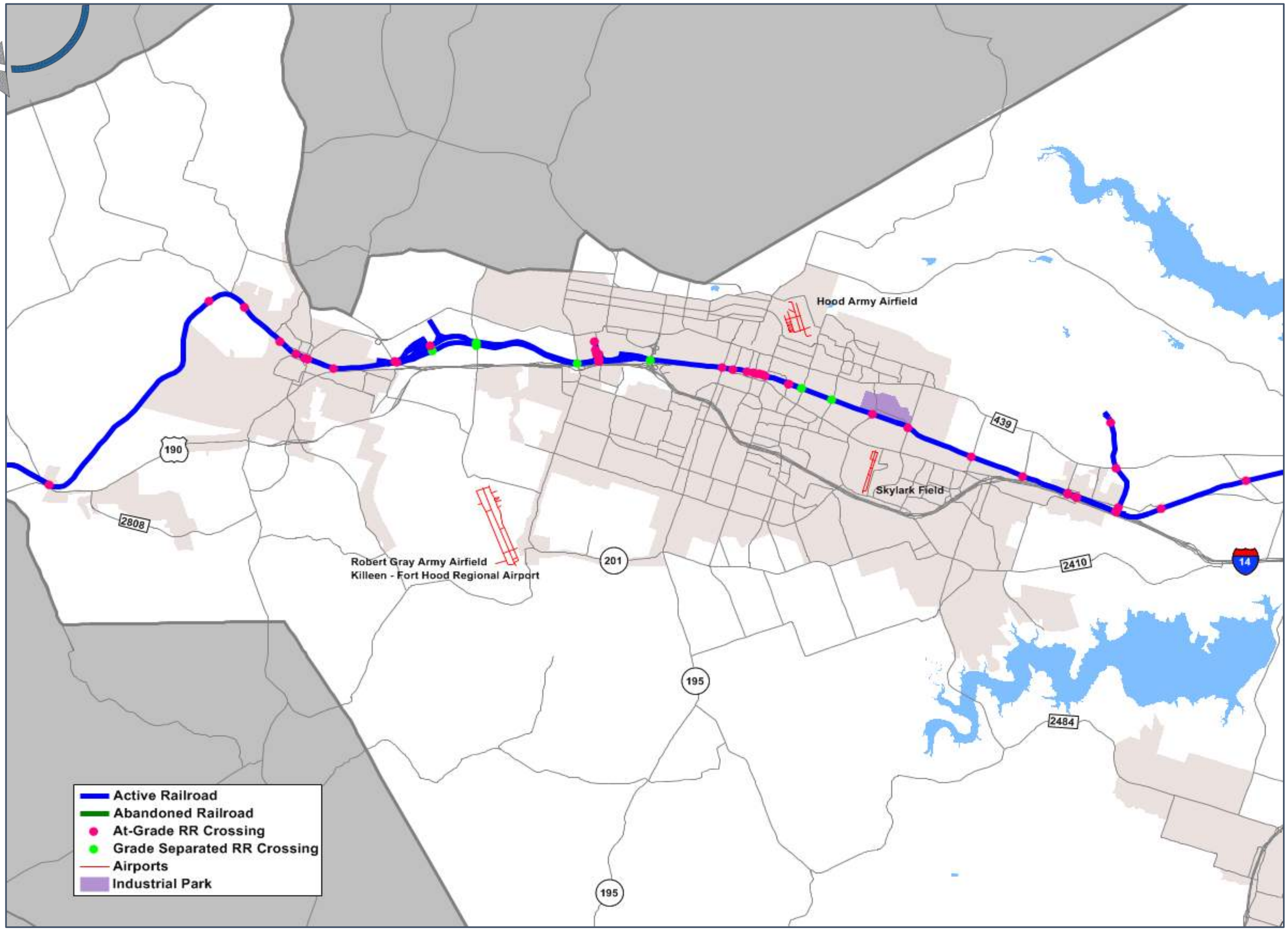
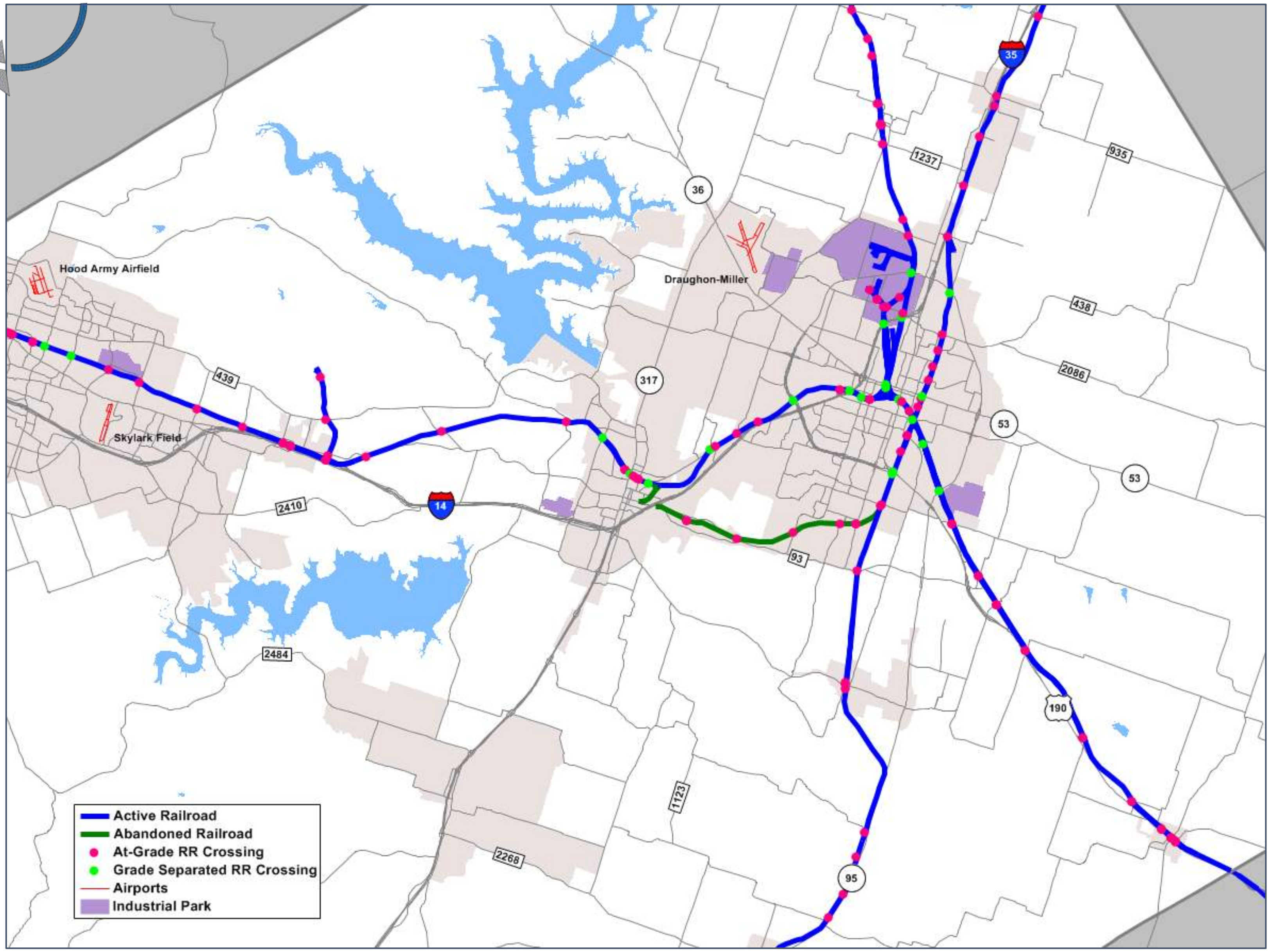


Figure 5-21: 2017 Regional Inventory of the Airport and Rail Systems in the Eastern Area



Summary

Inventories of current conditions by mode are vital to define the extent of the respective infrastructure by Functional Class, along with the notable constraints and barriers faced by each network. This data is vital to both define and to evaluate potential network improvement projects.

Inventories were developed as GIS layers and verified for each of the five modal networks and the airport and railroad systems. The inventories are primarily documented through GIS layers rather than paper maps to support further work for this Plan because of their necessary level of detail, which is cumbersome to show in printed maps. The inventories were primarily based on available data gathered from the KTMPO and other sources and extensive field work was not intended. The verification effort showed that the GIS layers were generally complete and accurate, and only minor editing was required. The only GIS layer which was discovered to need more extensive updates is the sidewalk inventory, which showed several areas where updates to the inventory are needed. Additionally, the inventories, coupled with the definitions of Functional Classes and Facility Types by mode which were developed for this Plan in Chapter 4, show the need for additional data attributes to add precision to the inventories for several of the modal networks.

The **auto network** is the base layer for the Thoroughfare Plan, with Functional Classes for the Plan generally following the defined Functional Classes for the regional travel demand model. Important differences are that the model breaks the Controlled Access Functional Class down to Interstate, Freeway, and Expressway, and includes frontage roads and ramps for detailed coded sections. Additionally, the model Principal Arterial Functional Class is re-named as Major Arterial for the Plan. The auto network was reviewed and updated for all street projects up to the year 2017.

For the **bicycle network**, the Facility Types defined in Chapter 4 can be added to the inventories to distinguish the Conventional Bike Lane Functional Class as either the Inboard or the Curbside Facility Type. The Multi-Use Trail Functional Class, which is shared with the Walk Network, needs additional data to define its Facility Types as Hard Paved or Soft Paved. In addition, the exact and consistent definitions and the distinctions between a Multi-Use Trail and a sidewalk need to be established, and data collected accordingly to supplement the inventories. In general, the width of the facility is the most important distinction, with multi-use trails serving both bicycles and pedestrians requiring a width of at least five feet. Neither the current bicycle path and trails inventory nor the sidewalk inventory include width as an attribute, so adding this level of precision will require additional field work to update the inventories.

The **bus network** includes a Facility Type for ADA Access to define pedestrian access to bus stops. Defining this Facility Type would require extensive field work to supplement the bus stop inventory with this attribute. The bus network includes The HOP's ten fixed routes and three stations where these routes connect with intercity bus and AMTRAK passenger rail.

All Functional Classes in the **truck network** have been adequately defined and inventoried, but there are additional areas where trucks have not been officially prohibited, but where infrastructure or conditions do not support their safe or efficient operation. This shows that the available routing data may not be sufficient in all cases, and very specific local knowledge of truck restrictions, constraints, and barriers can be added as attributes in the truck network inventory.

For the **walk network**, several areas needing an update to the sidewalk inventory were defined in a GIS layer. In addition, the exact distinction between the Multi-Use Trail and the Sidewalk Functional Classes needs to be established, and the inventories updated accordingly. Additional attributes to establish the Conventional, Landscaped, and Urbanized Sidewalk Facility Types would add precision to the inventory.

Finally, Desire Lines and Crosswalks are new Functional Classes for the walk network, and inventories should be established for them.

The updated inventories and attributes are based on the need to support the definition and evaluation of network improvement projects. The full level of precision specified by the new Functional Classes and Facility Types for each modal network may or may not be immediately necessary, based on the network projects that are under consideration in order to build a fully **integrated regional multimodal transportation system**. In general, the updates would require extensive field work to complete. A review of aerial photos could contribute to the inventories, but would not be sufficient to fully describe the networks and their attributes.

Chapter 6: Thoroughfare Plan

CHAPTER HIGHLIGHTS

- Typical Cross Sections by Functional Class
- Funded and Unfunded Projects
- Thoroughfare Plan

Introduction

The concept of Functional Classes for the street network was introduced in Chapter 4, followed by an inventory of the network in Chapter 5. In this Chapter, these two concepts are combined with potential projects for the street network and developed into a future Thoroughfare Plan. This Thoroughfare Plan applies to the street network only, but typical bicycle and pedestrian facilities are shown in the street cross sections to detail the full right-of-way needs. Additional detail for other transportation modes in the Regional Multimodal System are detailed in other Chapters for each mode.

The purpose of this regional Thoroughfare Plan is to define the future street network so that all potential projects may be displayed and reviewed together, and so that the appropriate right-of-way may be identified and planned for. A key component of this planning task is to define the Functional Class for each proposed project, and to define a typical cross-section for each Functional Class.

Typical cross sections are intended to illustrate the maximum right-of-way needed for each street Functional Class. It is recognized that the actual cross section needed for any specific project at a given time depends on several factors, including the physical characteristics of the street, traffic volumes, mix of multimodal traffic, safety considerations, local standards and preferences, and funding. Therefore, the cross sections presented in this plan are meant as guidance for the typical conditions, and should be refined as needed for each specific project.

Typical Cross Sections by Street Functional Classification

General design standards for ***Controlled Access Functional Class*** call for a minimum right-of-way width of 250’ for four lanes, with the desirable standard being six lanes and 500’. Design details are determined by TxDOT. Bicycles and pedestrians are prohibited due to the high speeds of these classes of roads, so the design of supporting bicycle and pedestrian infrastructure (including shared use of wide shoulders) is not applicable.

Figure 6-1: Six Lane Controlled Access Facility with Frontage Roads

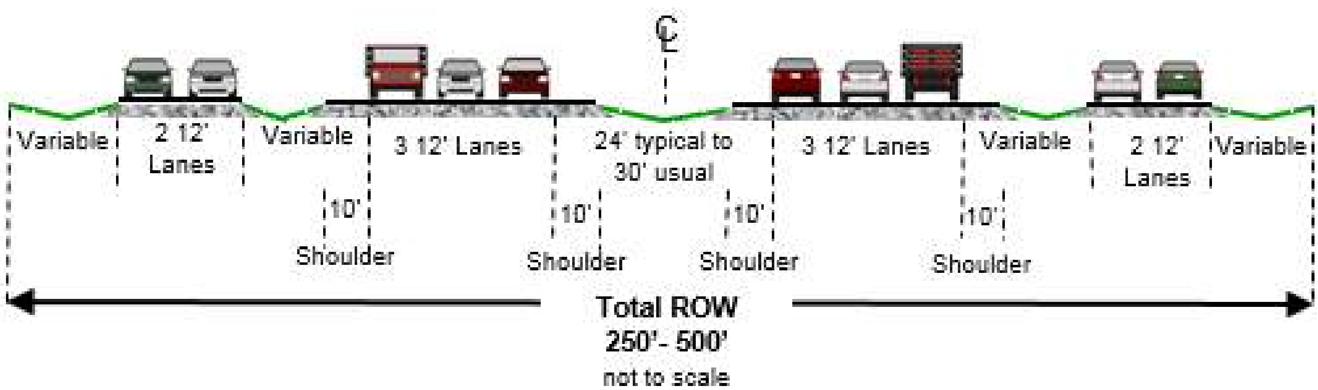
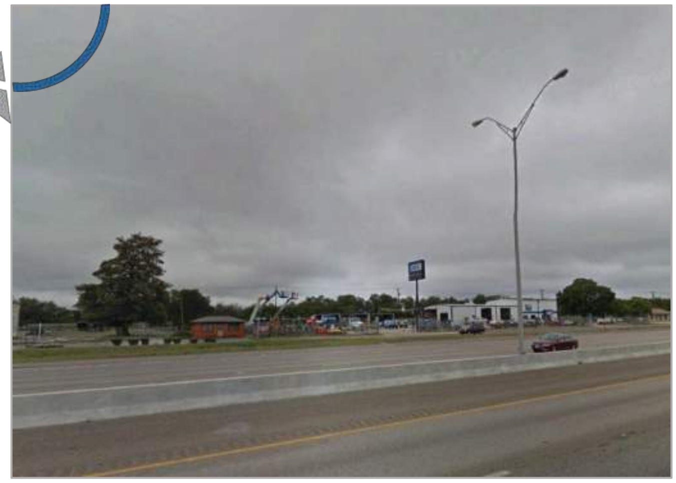


Figure 6-1 shows a typical cross section for a Controlled Access Facility with six lanes. The figure shows a grassy center median with a typical 24’ to 30’ width, and smaller median areas buffering between the main lanes and the frontage roads. Safety treatments in the medians or road margins such as guardrails and cable barriers are common to prevent vehicle cross-overs, but are not shown in the illustration.

Where a wide grassy median is not desired, a raised concrete median such as a “Jersey barrier” can be installed. **Figure 6-2** shows a Jersey barrier in the median IH-35, with a wide inside shoulder and rumble strip also visible. In this location, the light standards have been installed on the Jersey barrier as a safety measure to protect them from vehicle crashes.

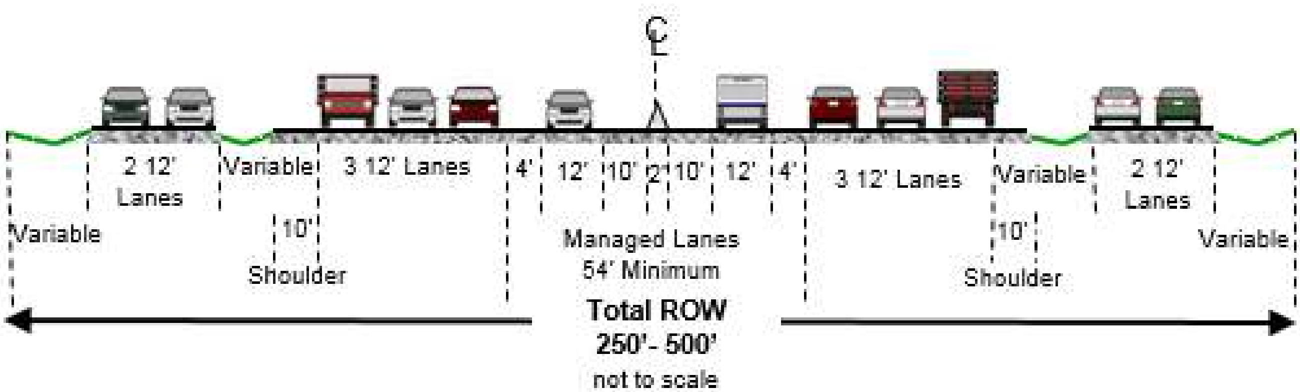
Figure 6-2: Jersey Barrier on IH-35



The use of Jersey barriers on IH 35 at the newly-reconstructed US 190 overpass shows the flexibility that is possible. In that installation, Jersey barriers were placed on either side of the median, about 12’ apart, and the middle section was filled and paved. The middle section serves as the base for light sandards and for sign posts. Jersey barriers also serve as the bases for the retaining walls between the main lanes and the frontage roads, allowing landscaping in those medians.

When toll roads or managed lanes are developed, they are typically placed in the inside lanes of Controlled Access facilities. **Figure 6-3** shows a typical cross section for a six lane Controlled Access facility with frontage roads and with managed lanes. In this design, a 10’ inside shoulder and a 4’ painted median buffer the managed lanes.

Figure 6-3: Six Lane Controlled Access Facility with Frontage Roads and Managed Lanes



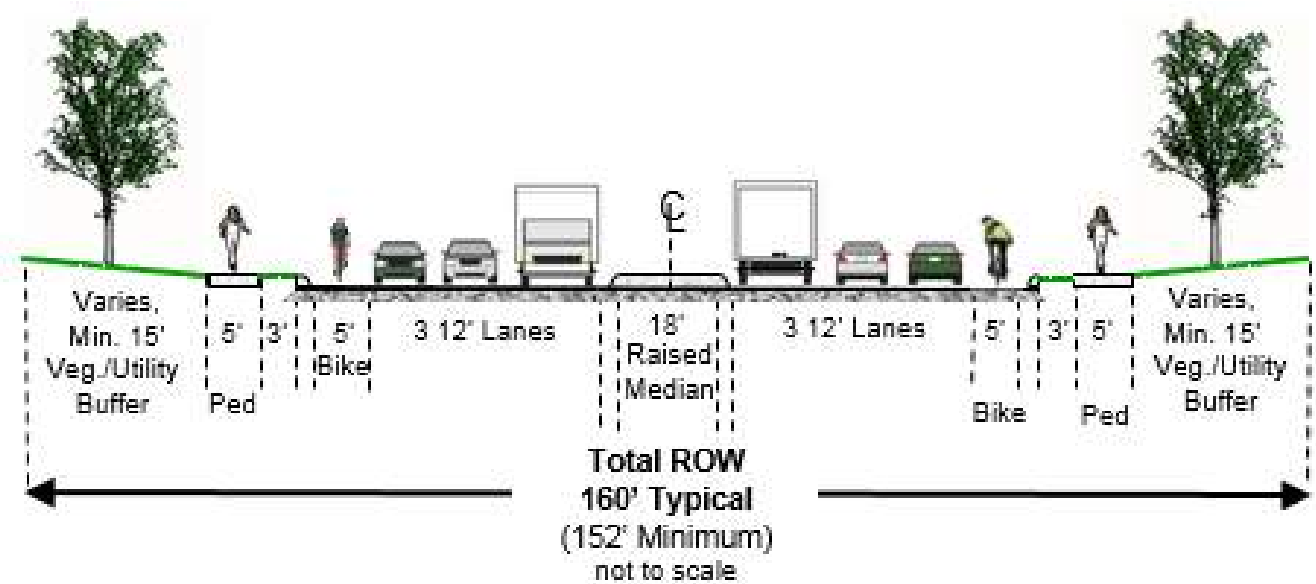
Major Arterial Functional Class general design standards call for a 130' minimum right-of-way for a four lane facility, with 160' desirable for six lanes. A travel lane width of 12' as specified is common for existing Major Arterials in the KTMPO region, but Complete Streets and Vision Zero guidance calls for narrowing travel lanes to 11' to slow traffic to speeds that are more safe for all road users.

For divided Major Arterials, a minimum median width of 18" is desirable for a curb or a raised concrete barrier. For landscaped medians, a minimum width of 15' is recommended. Typical practice in the KTMPO region has been to install wider grassy medians, with widths of 15' typical for older urban streets such as Ave H in Temple, and 20' to 40' typical for new construction streets in suburban areas such as SH 201 in Killeen and S. 5th Street in Temple.

Bicycle and pedestrian facilities are permitted on Major Arterial and lower Functional Classes. Therefore, the cross sections for typical Major Arterials include sample variations in the different classes of bicycle and pedestrian infrastructure as well as differences in the number of lanes, lane widths, medians, and other road attributes.

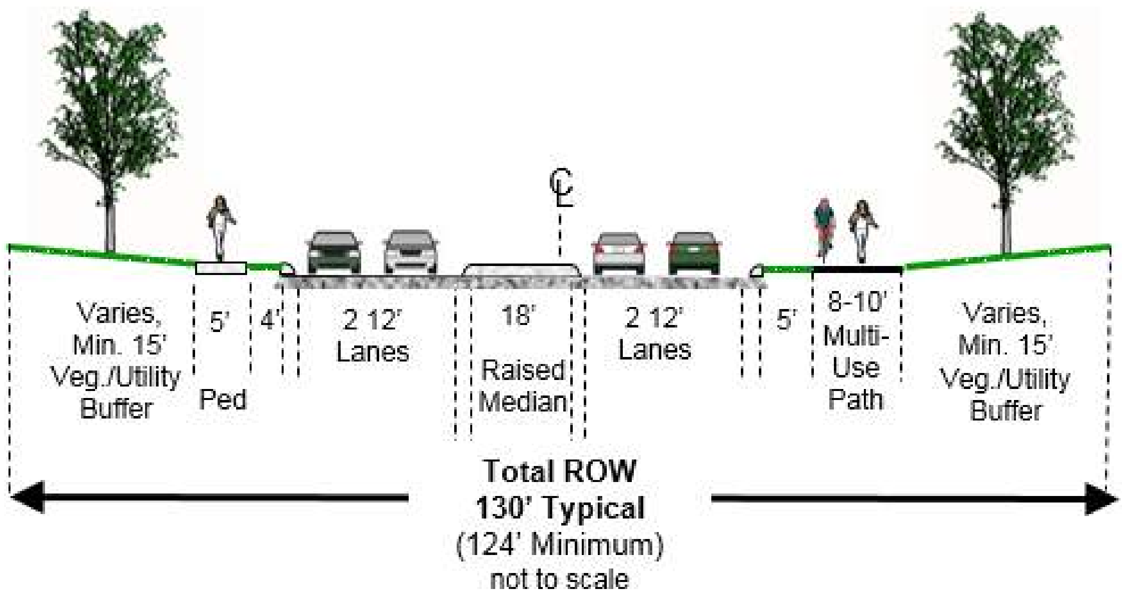
Figure 6-4 shows a typical six lane Major Arterial with bicycle and pedestrian accommodations of separated off-street paths or sidewalks and on-street conventional unbuffered bike lanes. This illustration shows a raised median, which is often paved and defined with curbs; other installations may use a landscaped median.

Figure 6-4: Six Lane Major Arterial



A typical cross section for a Major Arterial with four lanes and bicycle and pedestrian accommodations consisting of separated off-street paths or sidewalks and a separated off-street multi-use path is shown in **Figure 6-5**. In this instance there are no distinct on-street bicycle facilities, but this does not affect the bicycle's status as a vehicle and their right to the road.

Figure 6-5: Four Lane Major Arterial



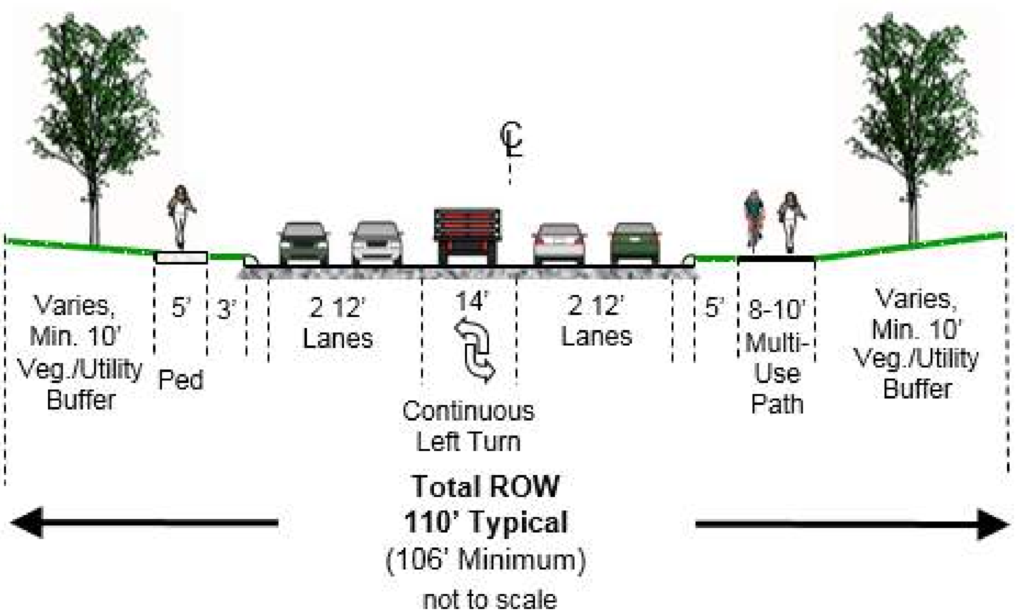
Minor Arterial Functional Class general design standards call for a minimum right-of-way of 80' for three lanes, increasing to 110' for four lanes. The desirable right-of-way is 120', which will accommodate five lanes.

As with Major Arterials, a travel lane width of 12' is common in the KTMPO region. The Complete Streets and Vision Zero guidance calling for travel lanes of 11' to slow traffic to speeds that are more safe for all road users is even more pertinent for Minor Arterials, given their position in the access/mobility continuum that has greater emphasis on access and on multimodal uses.

A continuous center turn lane has been recommended as an appropriate median treatment for Minor Arterials, with a desirable width of 16'. Landscaped buffer areas on the edges of a Minor Arterial are recommended with a 10' width.

Figure 6-6 shows a typical cross section for a four lane Minor Arterial with a continuous center turn lane. Minor Arterials may have greater accommodations for bicycles and pedestrians than Major Arterials, as they typically have lower speeds, lower traffic volumes, and a smaller percentage of trucks in the traffic stream. The figure also shows separated off-street paths or sidewalks and a separated off-street multi-use path. Although bikes may share the roadway with other vehicles, no special infrastructure is represented in this cross section.

Figure 6-6: Four Lane Minor Arterial with a Continuous Center Turn Lane



More extensive bicycle and pedestrian accommodations are shown in the cross section in **Figure 6-7**. Separated off-street paths or sidewalks and on-street conventional unbuffered bike lanes are shown.

Figure 6-7: Four Lane Minor Arterial with Bike Lanes

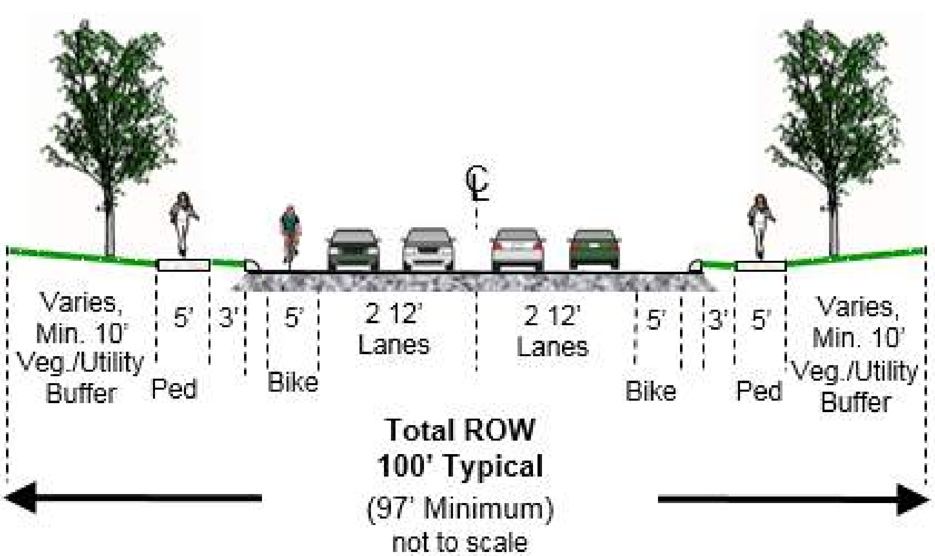
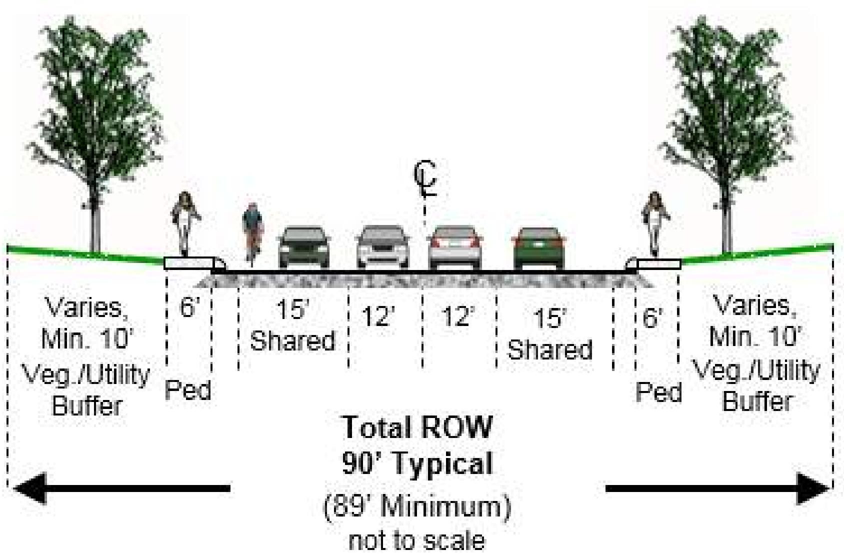


Figure 6-8 shows a typical four-lane Minor Arterial with wide outside lanes, intended to permit autos and bicycles to safely share a lane. The recommended width of the shared lane is 15'. The wider outside lanes should be carefully marked with visual clues to discourage excessive vehicle speeds and preserve street safety for all users. The width of the street can compromise the safety of the pedestrian crossing, but this can be mitigated by the use of median pedestrian refuges and well-marked crosswalks.

Figure 6-8: Four Lane Minor Arterial with Shared Outside Lanes



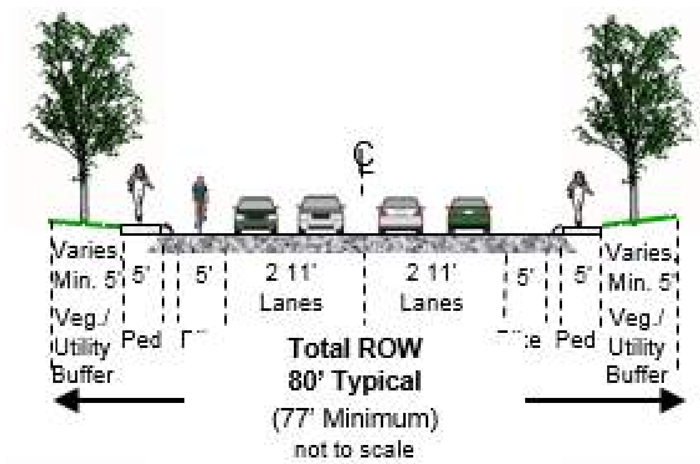
Collector Functional Class is the Functional Class which is most geared to providing access. With mobility as a less critical attribute, narrower lane widths of 11' are recommended, although widths as narrow as 10' are cited in Complete Streets and Vision Zero guidelines. Shared auto and bicycle outside lanes may be as narrow as 14'. Minimum right-of-way of 60' for two lanes and 70' for three lanes are listed in the guidance. For four lanes, a desirable right-of-way is 80'.

Due to the lower speeds and lower volumes of traffic, continuous center turn lanes on Collector streets may be as narrow as 14'. Medians and buffers should have a minimum width of 5'.

More extensive bicycle and pedestrian treatments should be expected on Collector streets.

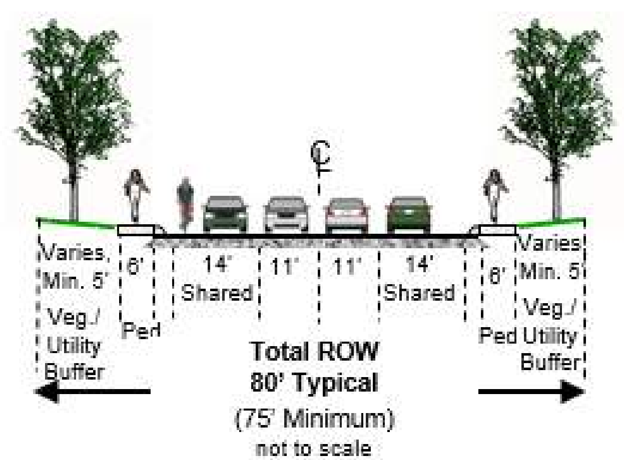
Figure 6-9 through **Figure 6-11** show how different configurations of travel lanes, bike lanes, and parking can fit within an 80’ right-of-way. **Figure 6-9** shows a four lane Collector configured with on-street bike lanes and off-street paths or sidewalks.

Figure 6-9: Four Lane Collector with Bike Lanes



In an alternate on-street treatment, **Figure 6-10** does not have discrete bike lanes, but has 11’ inside lanes and 14’ shared outside lanes. With this configuration, the shared outside lanes would typically be marked with sharrows to emphasize the rights of bicycles to use the lane.

Figure 6-10: Four Lane Collector with Shared Outside Lanes



Also fitting with an 80' right-of-way, **Figure 6-11** has two 12' travel lanes and 8' parking lanes. Pedestrian and bicycle facilities are placed off-street.

Figure 6-11: Two Lane Collector with Parking

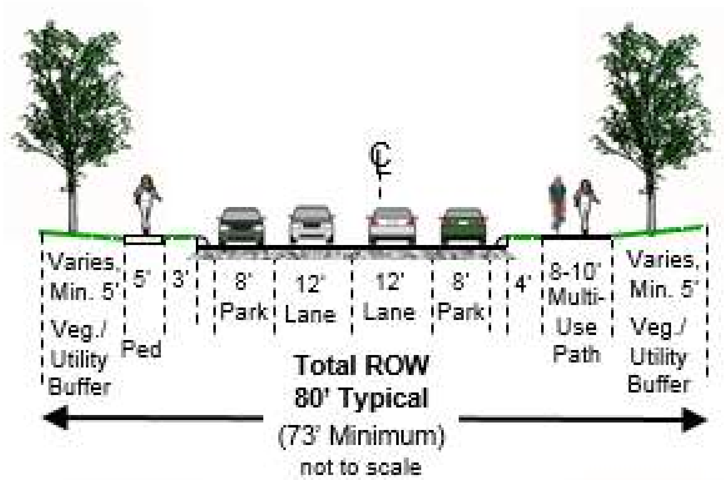
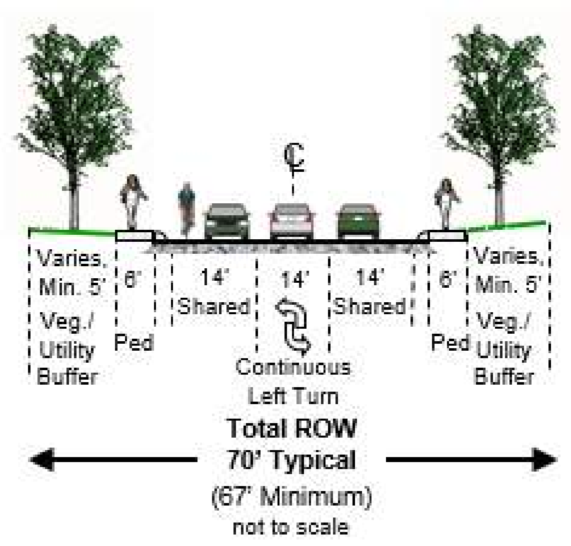


Figure **6-12** illustrates a two lane Collector with shared lanes and a continuous center turn lane. With a width of 14', the shared lanes recommended for Collectors are narrower than the 15' shared lanes recommended for Minor Arterials. This difference is consistent with the lower speeds and traffic volumes which are typically found on Collector streets.

Figure 6-12: Two Lane Collector with a Continuous Center Turn Lane and Shared Lanes



Local Functional Class streets have the lowest speeds and volumes of all the Functional Classes. With these attributes, travel lane widths can consistently be narrower, with 10.5' recommended as a minimum. Widths as narrow as 10' are cited in Complete Streets and Vision Zero guidelines.

A right-of-way width of 50' is recommended for Local streets.

Figure 6-13 shows a typical cross section for a two lane local street. In this illustration, shared lanes of 13.5' are provided. Narrower travel lane widths may be implemented to reduce traffic speeds to levels that are safe for users of all ages and abilities.

Figure 6-13: Two Lane Local Street with Shared Lanes

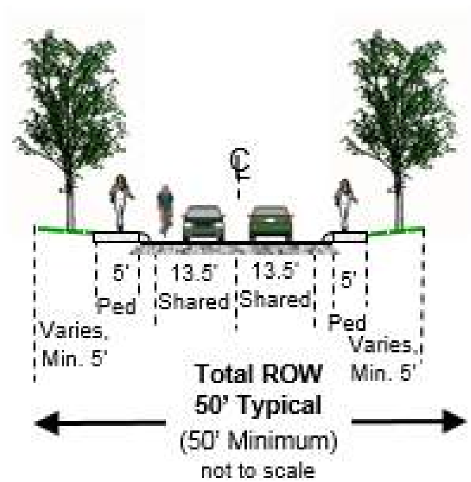


Table 6-1 summarizes the recommendations for right-of-way (ROW) considerations by street Functional Class. Minimum ROW is based on 4 lanes for Major Arterials, 3 lanes (two travel lanes and a center turn lane) for Minor Arterials, and 2 lanes for Collectors and Local streets.

Table 6-1: Summary of ROW Recommendations by Functional Class

Functional Class	Minimum ROW	Preferred ROW	Lane Width	Pavement Width	Median	Outside Buffer	Notes
Controlled Access	250'	Varies, up to 500'	Minimum 12'	Varies	Minimum 36' rural Minimum 10' urban	Varies	Inside shoulder minimum 4' Outside shoulder minimum 10' Vertical clearance minimum 14'
Major Arterial	130'	160'	Preferred 12'	82' to 106'	Preferred 18'	15'	ROW may be greater with parking, bicycle and pedestrian facilities, bus stops, and intersection treatments
Minor Arterial	80'	120'	Preferred 12'	47' to 75'	Center Turn Lane 14'	10'	
Collector	60'	80'	Minimum 11'	31' to 57'	Center Turn Lane 14'	5'	
Local	44'	50'	Minimum 10.5'	23' to 29'	None	5'	

Potential Thoroughfare Projects

The thoroughfare network is developed based on a regional network updated to 2017 conditions, with the addition of potential projects from KTMPO and its six member jurisdictions which have their own Thoroughfare Plans. The individual Thoroughfare Plans were introduced in Chapter 2: Planning Context, and include:

- Belton Thoroughfare Plan, embedded within the 2017 Comprehensive Plan.
- Copperas Cove Thoroughfare Plan, embedded within the 2007 Comprehensive Plan.
- Harker Heights Thoroughfare Plan.
- Fort Hood Post-Wide Traffic Engineering and Safety Study
- Killeen Thoroughfare Plan, developed in 2015.
- Temple Thoroughfare Plan, embedded within the 2008 Comprehensive Plan.

The previous KTMPO Regional Thoroughfare Plan, which is embedded in the Mobility 2040 Metropolitan Transportation Plan (MTP), also provided potential projects, both as compilations of projects from member jurisdictions and for coverage of other urban and rural areas in the region. A listing of potential projects which are identified by the MTP as funded is provided in **Table 6-2**. **Table 6-3** lists the remaining projects in the region for which funding has not been identified. Additional projects which were sourced from the individual Thoroughfare Plans from KTMPO member jurisdictions are listed in **Table 6-4**.

Table 6-2: Potential Thoroughfare Projects Identified as Funded in the 2040 MTP

Project ID	Project	Project Description	Limits From	Limits To	City	Status	Year
W30-17	FM 93	Widen from 2 to 4 lanes	SH 317	Wheat Rd	Belton	Long Range Funded	2030
B40-11	Lake-to-Lake Road (FM 2271)	Construct 4 lane divided roadway	FM 439	US 190	Belton	Long Range Funded	2030
W40-04a	Loop 121 Phase 1	Widen from 2 to 4 lanes with bike/ped improvements	FM 439 (Lake Rd)	IH 35	Belton	August 2017, KTMPO selected project	2021
W40-04b	Loop 121 Phase 2	Widen from 2 to 4 lanes with bike/ped improvements	IH 35	FM 436	Belton	Funded for project development	2040
W40-05	US 190	Widen from 4 to 6 lanes with ramp realignments	FM 2410 in W Belton	IH 35	Belton	Short Range Funded Prop 1	2040
C30-03b	Business US 190 Phase I	Construct a median and repurpose lanes	FM 1113 (Avenue D)	Constitution Dr	Copperas Cove	Short Range Funded	2020
G03-MT	FM 116	Construct a left turn lane	Cactus Lane	House Creek Bridge	Copperas Cove	Grouped Projects	2018
W35-01	US 190 Bypass	Phase 2 - Construct final 2 lanes of ultimate 4 lane divided highway	East of Copperas Cove	.5 mi W of Lampasas County Line	Copperas Cove	Short Range Funded	2035
H15-02b	FM 2410	Widen from 2 to 4 lanes with sidewalks, median and turn lanes	Harker Heights City Limit	US 190	Harker Heights	Short Range Funded Prop 1	2018
H40-02	Heights Drive Roundabout	Construct traffic circle	Commercial Dr.	Heights Dr.	Harker Heights	Funded MPO CAT 7	2018
W40-02	US 190	Widen from 4 to 6 lanes with bridge improvements	1 mi W of FM 2410	FM 3423 (Indian Trail)	Harker Heights	Short Range Funded Prop 1	2018
G03-MT	SH 95	Widen and add passing lanes	FM 436	Holland City Limits	Holland	Grouped Projects	2018
K30-02	Rosewood Dr Extension	New construction 4 lane road	Riverstone Dr	Chaparral Rd	Killeen	Funded MPO CAT 7	2018
K35-03	W. Trimmier Rd	Widen and add continuous left turn lanes	Jasper Dr	Elms Rd	Killeen	Funded MPO CAT 7	2017
W40-06	US 190	Widen from 4 to 6 lanes with ramp realignments	FM 3423 (Indian Trail)	FM 2410 in W Belton	Nolanville	August 2017, KTMPO selected project	2019
H30-05	Warriors Path	New construction 2 lane road	Knights Way/FM 2410	Old Nolanville Rd	Nolanville	Long Range Funded	2030
S40-04b	Main St Sidewalks Phase 2	Widen and add bike paths, with drainage improvements	College Hill Dr	Salado Plaza Dr	Salado	Funded for project development	2040
T40-07	Outer Loop 3b	Widen from 2 to 4 lanes with hike & bike trail	South of FM 2305	S of Jupiter Drive	Temple	Long Range Funded	2040
T35-24	Realign Prairie View Road	Realign FM 2483 and Prairie View Road	West of SH317	N. Pea Ridge	Temple	Funded MPO CAT 7	2018
G03-MT	SH 317	Widen and add shoulders and passing lanes	McLennan Co Line	SH 36	Temple	Grouped Projects	2018
W40-01	SH 317	Widen from 2 to 4 lanes with a raised median	FM 2305	FM 439	Temple	Short Range Funded Prop 1	2018
G01-PE	Spur 290 / S. 1st St.	Roadway operational and landscape improvements	Avenue O	0.2 mi S of Avenue U	Temple	Grouped Projects	2017

Table 6-3: Potential Thoroughfare Projects Identified as Unfunded in the 2040 MTP

Project ID	Project	Project Description	Limits From	Limits To	City	Status
B30-03	Belton Outer Loop East	Construct 2 lane road with shoulder and 10' hike/bike trail	IH 35 at Shanklin	IH 35 at Shanklin	Belton	Unfunded
B40-07	Connell Street	Widen from 2 to 4 lanes with center turn lane and 5' wide sidewalks	US 190	Loop 121	Belton	Unfunded
B40-10	FM 1670	Widen from 2 to 4 lanes with a 10' hike and bike trail	US 190	Three Creeks Boulevard	Belton	Unfunded
B30-01	George Wilson Extension	Construct 2 lane road with shoulder	FM 93 at George Wilson Road	FM 439	Belton	Unfunded
B40-01	Huey Drive	Construct 2 lane road with center turn lane	Washington Drive	IH 35 Frontage Rd	Belton	Unfunded
T15-06k	IH 35	Widen to 8 lanes	South Loop 363	US 190	Belton	Unfunded
B30-02	Shanklin Road West, Outer Loop	Construct 4 lane road with 10' hike/bike trail	IH 35	Existing roundabout	Belton	Unfunded
B40-02	Southwest Parkway	Construct 2 lane road with center turn lane	Loop 121	W Avenue O	Belton	Unfunded
B40-08	Sparta Rd	Construct protected turn lane with 10' ft wide hike/bike trail	Loop 121	Dunn's Canyon Rd	Belton	Unfunded
B40-09	West Avenue D	Construct 2 lane roadwith sidewalks and bike lanes	Loop 121	Wheat Rd	Belton	Unfunded
C25-03	Big Divide Loop	Widen from 2 to 4 lanes with raised median	US 190	FM 1113	Copperas Cove	Unfunded
C30-03a	Business US 190 Phase II	Road diet with bike/ped accommodations	FM 116 S @ Business US 190	Avenue D	Copperas Cove	Unfunded
C25-02	FM 1113	Widen from 2 to 4 lanes with sidewalks	Signal Light at FM 116/Ave B	Summers Road	Copperas Cove	Unfunded
C35-02a	FM 116 Railroad Underpass	Create a 2 lane railroad underpass with 10' sidewalks	S. Main	Ave. B	Copperas Cove	Unfunded
C40-01	FM 116 South	Widen and upgrade to Farm to Market status	Copperas Cove City Limits	SH 201	Copperas Cove	Unfunded
C25-04	Northside Loop	Widen from 2 to 4 lanes with raised median	FM 1113	FM 116	Copperas Cove	Unfunded
H30-03	FM 3219	Widen from 2 lane to 4 lanes with 6' sidewalks	Veterans Memorial Blvd	FM 439	Harker Heights	Unfunded
H15-01	FM 3423/Indian Trail	New construction road with pedestrian enhancements	Veterans Memorial Blvd	US 190	Harker Heights	Unfunded
H30-07	FM 3481	Widen from 2 to 4 lanes	Prospector Dr	FM 2484	Harker Heights	Unfunded
W35-04	FM 439	Widen from 4 to 6 lanes	Roy Reynolds Dr	FM 3219	Harker Heights	Unfunded

Table 6-3: Potential Thoroughfare Projects Identified as Unfunded in the 2040 MTP (continued)

Project ID	Project	Project Description	Limits From	Limits To	City	Status
K30-13	Chaparral Rd	Widen from 2 to 4 lanes with center turn lane	SH 195	FM 3481	Killeen	Unfunded
K40-26	Cunningham Rd	Widen from 2 to 4 lanes with hike/bike trail	US 190	FM 3470	Killeen	Unfunded
K40-16	East Trimmier Road Improvements	Widen from 2 to 4 lanes with center turn lane	Stagecoach Rd	Chaparral Rd	Killeen	Unfunded
K40-24	Featherline Drive	Widen from 2 to 4 lanes with center turn lane and roundabouts	Stagecoach Rd	Chaparral Rd	Killeen	Unfunded
K25-05	Florence Rd	Widen from 2 to 5 lanes	Elms Road	Jasper Drive	Killeen	Unfunded
K40-03	FM 3470 (Stan Schlueter Loop)	Construct 4 lane FM Road with countinous turn lane and shoulders	SH 201	US 190 Bypass	Killeen	Unfunded
W35-03	SH 195	Reconstruct to 4 lane freeway with frontage roads	FM 3470	Chaparral Rd	Killeen	Unfunded
K40-17	Trimmier Road Improvements	Widen from 2 to 4 lanes with center turn lane	Stagecoach Rd	Chaparral Rd	Killeen	Unfunded
K40-11	WS Young	Add turn lane and operational improvements	Mall Dr	AJ Hall Blvd	Killeen	Unfunded
H40-04	E FM 2410	Widen from 2 to 4 lanes with access management	.16 mi west of Indian Trail	Simmons Rd	Nolanville	Unfunded
N40-03	Old Nolanville Road	Widen bridge and construct multi-use trail	Warriors Path	US 190	Nolanville	Unfunded
N40-07	Warrior's Path Extension Phase 1	Construct 2 lane road with shoulder	Old Nolanville Rd	US 190	Nolanville	Unfunded
N40-08	Warrior's Path Extension Phase 2	Construct 2 lane road with shoulder	US 190	FM 439	Nolanville	Unfunded
W35-12	US 190	Widen to 4 lane divided rural highway	2 mi south of FM 436	Milam County Line	Rogers	Unfunded
W30-13	FM 2484	Widen from 2 to 4 lanes	FM 1670	IH 35	Salado	Unfunded
S40-03	Salado West Village Road	Widen road, add turn lanes and bike/ped facilities	Thomas Arnold Rd	IH 35	Salado	Unfunded
T35-36a	1st Street	Widen from undivided to divided road with hike/bike trails	SE Loop 363	Avenue M	Temple	Unfunded
W35-08	FM 93	Widen from 2 to 4 lanes with railroad grade separation	FM 1741 (S 31st)	SH 95	Temple	Unfunded
W35-09	FM 93	Widen from 2 to 4 lanes with a raised median	SH 95	SH 36	Temple	Unfunded
T40-04	Hogan Road	Widen from 2 to 3 lanes with sidewalks and hike/bike trail	SH 317	S Pea Ridge Rd	Temple	Unfunded
T15-02	Kegley Road (Phase 2)	Widen road, add turn lanes and bike/ped facilities	856 ft S of FM 2305	450' S of Wildflower Lane	Temple	Unfunded
W30-23	Loop 363	Reconstruct to 4 lane freeway with continuous frontage roads	SP 290	SH 95	Temple	Unfunded
W35-07	NW Loop 363	Reconstruct to 4 lane freeway	Lucious McCelvey Dr	Industrial Blvd	Temple	Unfunded
T40-10	Outer Loop	Extend divided road, with hike/bike trail	Floodplain	IH 35	Temple	Unfunded
T25-09	Outer Loop / Research Parkway	Widen from 2 to 4 lanes with hike/bike trail	IH 35	Central Pointe Pkwy	Temple	Unfunded
T40-09	Outer Loop 4	Widen from 2 to 4 lanes with hike/bike trail	S of Jupiter	Floodplain	Temple	Unfunded
W25-02	SH 36	Widen from 2 to 4 lanes	SH 317	Lake Belton Bridge	Temple	Unfunded
T25-06	SL 363	Construct at grade Interchange at US 190 and Spur 290	SP 290	SP 290	Temple	Unfunded
T40-05	Westfield Blvd (Phase 2)	New construction 4 lane road with sidewalk and hike/bike trail	Prairie View Rd	Airport Rd/SH 36	Temple	Unfunded
D40-01	North Waco Rd. (Old 81)	Widen from 2 to 4 lanes with bridge improvements.	West Main St	West Big Elm	Troy	Unfunded
D40-03	Old 81 South	Widen from 2 to 4 lanes with bike lanes	FM 1237	Loves Overpass	Troy	Unfunded
K40-06	FM 2484	Widen from 2 to 4 lanes divided	SH 195	IH 35	Youngsport	Unfunded

Table 6-4: Potential Projects Identified in Local Thoroughfare Plans

Project ID	Project	Project Description	Limits From	Limits To	City	Status
NewB 16	190 Ln	Extend & connect existing roads	190 Ln	Mesquite Ln extension	Belton	Unfunded
NewB 11	22nd Ave	Construct new road	Hilltop St	S Pea Ridge Rd	Belton	Unfunded
NewB 18	2nd St	Construct new road	Mesquite Ln extension	Loop 121	Belton	Unfunded
NewB 19	2nd St	Construct new road	Shanklin Rd	0.6 mi S	Belton	Unfunded
NewB 35	Armstrong Rd	Extend, realign, & connect existing roads	Armstrong Rd	FM 1123	Belton	Unfunded
NewB 26	Belton Outer Loop East	Construct new road	IH 35 S	IH 35 N	Belton	Unfunded
NewB 24	Capital Way	Construct new road	Elm Grove Spur	Mesquite Ln extension	Belton	Unfunded
NewB 2	DIGBY DR	Extend & connect existing roads	S Wheat Rd	George Wilson Rd	Belton	Unfunded
NewB 33	Dillard Rd	Construct new road	Amity School Rd	Smith Dairy Rd	Belton	Unfunded
NewB 34	E Amity Rd	Construct new road	Heritabe Ln	Armstrong Rd	Belton	Unfunded
NewB 23	Elm Grove Rd	Realign existing road	Elm Grove Spur	Shady Grove Ln	Belton	Unfunded
NewB 28	Elm Grove Rd	Construct new road	FM 436	IH 35	Belton	Unfunded
NewB 36	Elm Grove Rd	Extend existing road	Elmer King Rd	E Amity Rd	Belton	Unfunded
NewB 37	Elmer King Rd	Construct new road	Elm Grove Rd	Armstrong Rd realignment	Belton	Unfunded
NewB 14	Kegley Rd	Upgrade existing road	Tem Bel Ln	IH 35	Belton	Unfunded
NewB 27	Laila Ln	Construct new road	Loop 121	IH 35	Belton	Unfunded
NewB 17	Mesquite Ln	Extend & connect existing roads	Mesquite Ln	190 Ln extension	Belton	Unfunded
NewB 25	Mesquite Ln	Extend existing road	IH 35	Elm Grove Rd	Belton	Unfunded
NewB 20	New road	Construct new road	2nd St extension	IH 35	Belton	Unfunded
NewB 21	New road	Construct new road	IH 35	Elm Grove Rd	Belton	Unfunded
NewB 29	New road	Construct new road	IH 35 at E Ave K	FM 93	Belton	Unfunded
NewB 3	New road	Construct new road	N Wheat Rd	FM 93	Belton	Unfunded
NewB 31	New road	Construct new road	FM 93	S 5th St	Belton	Unfunded
NewB 4	New road	Construct new road	West Avenue D	Powell Dr	Belton	Unfunded
NewB 6	New road	Construct new road	George Wilson Rd extension	Spring Canyon Rd	Belton	Unfunded
NewB 8	New road	Construct new road	Sparta Rd	N Wheat Rd extension	Belton	Unfunded
NewB 12	Park Ave	Extend existing road	Park Ave	Guthrie Dr	Belton	Unfunded
NewB 13	Poison Oak Rd	Construct new road	N Main St	Kegley Rd	Belton	Unfunded
NewB 15	Rocking M Ln	Construct new road	Rocking M Ln	Outer Loop	Belton	Unfunded
NewB 22	Sand and Gravel Ln	Extend existing road	Sand and Gravel Ln	Elm Grove Rd	Belton	Unfunded
NewB 1	Simmons Rd	Extend existing road	US 190	FM 93	Belton	Unfunded
NewB 30	Spanish Oak Rd	Extend existing road	Stratford Dr	FM 93	Belton	Unfunded
NewB 5	Spring Canyon Rd	Construct new road	US 190	FM 439	Belton	Unfunded
NewB 32	Tahuaya Rd	Construct new road	Smith Dairy Ln	FM 1670	Belton	Unfunded
NewB 10	W 9th Ave	Construct new road	N Main St	N Beal St	Belton	Unfunded
NewB 9	W 9th Ave	Construct new road	University Dr	Loop 121	Belton	Unfunded
NewB 38	West Village Rd	Construct new road	Williams Rd	FM 1670	Belton	Unfunded
NewB 39	Williams Rd	Realign existing road	W of West Village Rd	IH 35	Belton	Unfunded
NewB 40	Williams Rd	Construct new road	Williams Rd	0.4 mi S	Belton	Unfunded
NewB 7	Yturria Rd	Construct new road	Spring Canyon Rd	Dunns Canyon Rd	Belton	Unfunded

Table 6-4: Potential Projects Identified in Local Thoroughfare Plans continued)

Project ID	Project	Project Description	Limits From	Limits To	City	Status
NewCC 21	Arista Rueda Rd	Extend existing road	FM 2808	Herradura Calzada Rd	Copperas Cove	Unfunded
NewCC 4	Ashley Rd	Upgrade and extend existing road	FM 116	Big Divide Rd	Copperas Cove	Unfunded
NewCC 11	Big Divide Rd	Extend existing road	Grimes Crossing Rd	Outer Loop	Copperas Cove	Unfunded
NewCC 16	Big Divide Rd	Extend existing road	US 190	FM 2808	Copperas Cove	Unfunded
NewCC 13	Courtney Ln	Extend & connect existing roads	W Ave B	Oak Hill Dr	Copperas Cove	Unfunded
NewCC 5	Coy Dr	Construct new road	Ashley Rd	Lutheran Church Rd	Copperas Cove	Unfunded
NewCC 14	CR 24	Construct new road	CR 3340	Big Divide Rd	Copperas Cove	Unfunded
NewCC 8	CR 24	Re-align intersection	CR 3300	N of CR 3300	Copperas Cove	Unfunded
NewCC 7	CR 3300	Re-align intersection	W of CR 24	E of CR 24	Copperas Cove	Unfunded
NewCC 9	CR 3340	Extend & connect existing roads	CR 314	FM 1113	Copperas Cove	Unfunded
NewCC 18	Edward Dr	Extend & connect existing roads	Edward Dr	Big Divide Rd	Copperas Cove	Unfunded
NewCC 22	FM 2808	Extend existing road	FM 2657	US 190	Copperas Cove	Unfunded
NewCC 23	FM 2808	Extend existing road	Risen Star Ln	US 190	Copperas Cove	Unfunded
NewCC 19	FM 3046	Extend existing road	FM 3046	US 190	Copperas Cove	Unfunded
NewCC 17	FM 3046/Pony Express Ln	Extend existing road	FM 3046	US 190	Copperas Cove	Unfunded
NewCC 1	Glass Rd	Extend existing road	Kubitz Rd	FM 116	Copperas Cove	Unfunded
NewCC 2	New Collector	Construct new road	Lutheran Church Rd	Glass Rd	Copperas Cove	Unfunded
NewCC 27	New Collector	Construct new road	FM 3046	FM 2808	Copperas Cove	Unfunded
NewCC 24	Northern Dancer Dr	Extend existing road	Joe Morse Dr	FM 2808	Copperas Cove	Unfunded
NewCC 25	Northern Dancer Dr	Extend existing road	Joe Morse Dr	FM 2808	Copperas Cove	Unfunded
NewCC 26	Ogletree Pass	Extend existing road	Ogletree Pass	US 190	Copperas Cove	Unfunded
NewCC 3	Outer Loop	Construct new road	Lutheran Church Rd	FM 1113	Copperas Cove	Unfunded
NewCC 6	Outer Loop	Construct new road	US 190	FM 1113	Copperas Cove	Unfunded
NewCC 20	Sikes Dr	Extend existing road	FM 2808	FM 3046	Copperas Cove	Unfunded
NewCC 12	Skyline Dr	Extend existing road	Skyline Dr	Bradford Dr	Copperas Cove	Unfunded
NewCC 15	Winchester Ln	Extend existing road	Winchester Ln	Big Divide Rd	Copperas Cove	Unfunded
NewHH 4	Deer Trail	Extend existing road	Cattail Cir	Vineyard Trl	Harker Heights	Unfunded
NewHH 6	Douglas Fir Dr	Extend & connect existing road	Hazelnut Dr	Mesa Oaks Cir	Harker Heights	Unfunded
NewHH 7	Hazelnut Dr	Construct new road	Douglas Fir Dr N	Douglas Fir Dr S	Harker Heights	Unfunded
NewHH 2	New road	Extend existing road	Deer Trail extension	Rosewood Dr	Harker Heights	Unfunded
NewHH 8	New road	Construct new road	Hazelnut Dr	Comanche Gap Rd	Harker Heights	Unfunded
NewHH 3	Prospector Trl	Extend existing road	Cedar Knob Rd	Stillhouse Lake Rd	Harker Heights	Unfunded
NewHH 1	Scarlet Ln	Extend existing road	Brooke Ln	Rosewood Dr	Harker Heights	Unfunded
NewHH 9	Shoreline Dr	Extend & connect existing road	Lakeview Dr	Rummel Rd	Harker Heights	Unfunded
NewHH 5	Waco Trce	Construct new road	Osage Trce	Warriors Path	Harker Heights	Unfunded

Table 6-4: Potential Projects Identified in Local Thoroughfare Plans (continued)

Project ID	Project	Project Description	Limits From	Limits To	City	Status
NewK 30	Atkinson Ave	Extend existing road	N 52nd St	N Twin Creek Dr	Killeen	Unfunded
NewK 7	Atlas Ave	Extend existing road	Fort Hood St	W of Trimmier Rd	Killeen	Unfunded
NewK 27	Barrington Trl	Extend existing road	Jim Ave	Elms Rd	Killeen	Unfunded
NewK 28	Black Orchid Dr	Extend existing road	Autumn Valley Dr	Watercrest Rd	Killeen	Unfunded
NewK 9	Bridgewood Dr	Construct new road	Tumut Ln	SH 201	Killeen	Unfunded
NewK 2	Chaparral Rd	Extend existing road	Chaparral Rd	Maxdale Rd	Killeen	Unfunded
NewK 1	FM 116 South	Extend existing road	SH 201	Maxdale Rd	Killeen	Unfunded
NewK 11	Founders Trail	Extend existing road	John Helen Dr	SH 201	Killeen	Unfunded
NewK 14	Love Rd	Extend and connect existing roads	Onion Rd	Riley Dr	Killeen	Unfunded
NewK 6	Mohawk Dr	Extend existing road	E of Clear Creek Rd	Fort Hood St	Killeen	Unfunded
NewK 29	N 60th St	Extend existing road	Lake Rd	E Rancier Ave	Killeen	Unfunded
NewK 26	New Bacon Ranch Rd	Extend existing road	New Bacon Ranch Rd	Cunningham Rd extension	Killeen	Unfunded
NewK 4	New FM	Construct new road	SH 195	FM 2843	Killeen	Unfunded
NewK 10	New road	Construct new road	Bunny Trl	Founders Trl extension	Killeen	Unfunded
NewK 12	New road	Construct new road	Atlas Ave extension	Stagecoach Dr	Killeen	Unfunded
NewK 16	New Road	Construct new road	SH 195	Featherline Rd	Killeen	Unfunded
NewK 17	New Road	Extend existing road	SH 195	Onion Rd Extension	Killeen	Unfunded
NewK 18	New Road	Construct new road	Onion Rd Extension	Platinum Dr Extension	Killeen	Unfunded
NewK 21	New Road	Construct new road	Stagecoach Rd	New Road	Killeen	Unfunded
NewK 22	New Road	Construct new road	New Road	New Road	Killeen	Unfunded
NewK 3	New Road	Construct new road	Oakalla Rd	SH 195	Killeen	Unfunded
NewK 31	New road	Construct new road	Roy J Smith Dr extension	FM 439	Killeen	Unfunded
NewK 8	New road	Construct new road	Clear Creek Rd	Bridgewood Dr extension	Killeen	Unfunded
NewK 13	Nichols Dr	Construct new road	Nichols Dr	Stan Schleuter Loop	Killeen	Unfunded
NewK 23	Onion Rd	Extend existing road	Stagecoach Rd	Chaparral Rd	Killeen	Unfunded
NewK 24	Platinum Dr	Extend existing road	Platinum Dr	Chaparral Rd	Killeen	Unfunded
NewK 32	Roy J Smith Dr	Extend existing road	N Roy Reynolds Dr	0.6 mi east	Killeen	Unfunded
NewK 5	Trimmier Rd	Extend existing road	Chaparral Rd	New FM	Killeen	Unfunded

Table 6-4: Potential Projects Identified in Local Thoroughfare Plans (continued)

Project ID	Project	Project Description	Limits From	Limits To	City	Status
NewT 22	1st Street	Extend & realign existing road	SE Loop 363	S 5th St	Temple	Unfunded
NewT 16	Apple Cider Rd	Construct new road	Middle Rd	SH 53	Temple	Unfunded
NewT 33	Asa Rd	Construct new road	Cedar Creek Rd	Willow Grove Rd extension	Temple	Unfunded
NewT 15	Berger Rd	Upgrade existing road	Elm Rd	FM 438	Temple	Unfunded
NewT 21	Blackland Rd	Extend & realign existing road	Little River Rd	Barnhardt Rd	Temple	Unfunded
NewT 12	Bottoms East Rd	Extend and connect existing roads	IH 35	Lower Troy Rd	Temple	Unfunded
NewT 13	Bottoms East Rd	Extend and connect existing roads	Bottoms Rd	Arthur Cemetery Rd	Temple	Unfunded
NewT 14	Bottoms Rd	Extend and connect existing roads	Bottoms East Rd	FM 438	Temple	Unfunded
NewT 40	Brewster Rd	Extend existing road	Luther Curtis Rd	Shine Branch Rd	Temple	Unfunded
NewT 32	Cedar Creek Rd	Upgrade existing road	SH 317	Asa Rd	Temple	Unfunded
NewT 9	Enterprise Rd	Extend existing road	NW HK Dodgen Loop	Eberhardt Rd	Temple	Unfunded
NewT 28	FM 2483	Extend & realign existing road	Westfield Blvd	Old Howard Rd	Temple	Unfunded
NewT 11	Gun Club Rd	Construct new road	Cottonwood Creek Rd	Berger Rd	Temple	Unfunded
NewT 7	Hopi Trl	Extend existing road	Keller Rd	IH 35	Temple	Unfunded
NewT 18	Lorraine Ave	Construct new road	SE HK Dodgen Loop	Outer Loop	Temple	Unfunded
NewT 2	Lower Troy Rd	Extend existing road	Zenith Ave	E Adams Ave	Temple	Unfunded
NewT 41	Luther Curtis Rd	Extend & connect existing roads	FM 2409	Community Center Ln	Temple	Unfunded
NewT 42	Luther Curtis Rd	Extend & connect existing roads	Willow Grove Rd	Guyton Rd	Temple	Unfunded
NewT 43	Luther Curtis Rd	Extend & connect existing roads	W of Vaughn Rd	Vaughn Rd	Temple	Unfunded
NewT 44	Luther Curtis Rd	Extend & connect existing roads	Franklin Rd	Pendleton Troy Loop	Temple	Unfunded
NewT 34	Mouser Rd	Upgrade existing road	Willow Grove Rd extension	Moores Mill Rd	Temple	Unfunded
NewT 25	N Pea Ridge Rd	Extend & connect existing roads	Prairie View Rd	W Adams Ave	Temple	Unfunded
NewT 30	N Pea Ridge Rd	Construct new road	Airport Rd	FM 2483	Temple	Unfunded
NewT 27	New road	Construct new road	SH 317	Old Howard Rd	Temple	Unfunded
NewT 29	New road	Construct new road	SH 317	Westfield Blvd	Temple	Unfunded
NewT 35	New road	Construct new road	Moores Mill Rd	McLane Pkwy	Temple	Unfunded
NewT 46	New road	Construct new road	FM 2483	W Adams Ave	Temple	Unfunded
NewT 10	Outer Loop	Construct new road	IH 35	SH 53	Temple	Unfunded
NewT 17	Outer Loop	Construct new road	SH 53	FM 93	Temple	Unfunded
NewT 3	Private Dr	Construct new road	Young Ave	HK Dodgen Loop	Temple	Unfunded
NewT 20	Red Barn Ln	Extend & connect existing roads	S of SH 53	N of FM 3117	Temple	Unfunded
NewT 5	S 17th St	Construct new road	W Ave T	Arrangement Way	Temple	Unfunded
NewT 26	S Pea Ridge Rd	Extend & connect existing roads	Tarver Dr	Hogan Rd	Temple	Unfunded
NewT 37	Shine Branch Rd	Realign & connect existing roads	Willow Grove Rd	W of Willow Grove Rd	Temple	Unfunded
NewT 45	Shine Branch Rd	Extend & connect existing roads	SH 317	FM 2409	Temple	Unfunded
NewT 23	Tarver Dr	Extend & realign existing road	Coastal Dr	Kegley Rd	Temple	Unfunded
NewT 19	Tower Rd	Extend existing road	Payne Ln	Apple Cider Rd	Temple	Unfunded
NewT 6	Tower Rd	Extend existing road	MLK Dr	SE HK Dodgen Loop	Temple	Unfunded
NewT 38	Vaughan Rd	Extend existing road	Pendleton Troy Rd	1237 Spur	Temple	Unfunded
NewT 39	Vaughan Rd	Realign & connect existing roads	FM 1237	Old Howard Rd	Temple	Unfunded
NewT 4	W Ave U	Construct new road	S 11th St	Scott & White Blvd	Temple	Unfunded
NewT 36	Wendland Rd	Upgrade existing road	NW HK Dodgen Loop	Wilsonart Dr	Temple	Unfunded
NewT 8	Wendland Rd	Extend existing road	Industrial Blvd	W Nugent Ave	Temple	Unfunded
NewT 24	Westfield Rd	Extend & connect existing roads	W Adams Ave	Tarver Dr	Temple	Unfunded
NewT 31	Willow Grove Rd	Construct new road	Shine Branch Rd	Industrial Blvd	Temple	Unfunded
NewT 1	Zenith Ave	Realign & extend existing road	Zenith Ave	Young Ave	Temple	Unfunded

Future Regional Thoroughfare Network

All the potential projects defined by KTMPO and by its member jurisdictions' individual Thoroughfare Plans have been included in the future network, as shown for the region in **Figure 6-14**. Insets to show better detail of projects are included as **Figure 6-15** for Copperas Cove, **Figure 6-16** showing Killeen, Harker Heights, and Nolanville, **Figure 6-17** for Belton and Salado, and **Figure 6-18** for Temple. The Figures distinguish all streets by their Functional Class for Controlled Access through Collector streets. Local streets are not shown in this Thoroughfare Plan. The Figures include two ongoing studies which affect planning: coordination with the Capital Area Metropolitan Planning Organization (CAMPO) for six roads which cross the KTMPO study area into Williamson and Burnet Counties, and five alternative alignments for upgrades or new routes for US 190, which are identified in the study as "Primary Routes". The five Primary Routes for the US 190 study are shown in **Figure 6-19**.

All Figures show the existing 2017 streets and the proposed projects for upgrades to existing streets and for construction of new streets. The alignments of new construction streets are presented as approximations for planning purposes, and are not intended to represent the final alignments or to constrain KTMPO member jurisdictions in any way.

The key purpose of the Thoroughfare Plan is to identify future projects so that right-of-way can be planned for. Supporting this purpose, the Plan is coded with all projects defined by KTMPO and by its member jurisdictions, not just the projects which have been identified as funded in the previous Mobility 2040 Metropolitan Transportation Plan (MTP). This listing has been developed as an input into the updated KTMPO MTP for the year 2045. One of the functions of the 2045 MTP will be to prioritize the listing of projects and to balance them against the anticipated available funding to derive funded and unfunded project listings.

Figure 6-14: Regional Future Thoroughfare Network

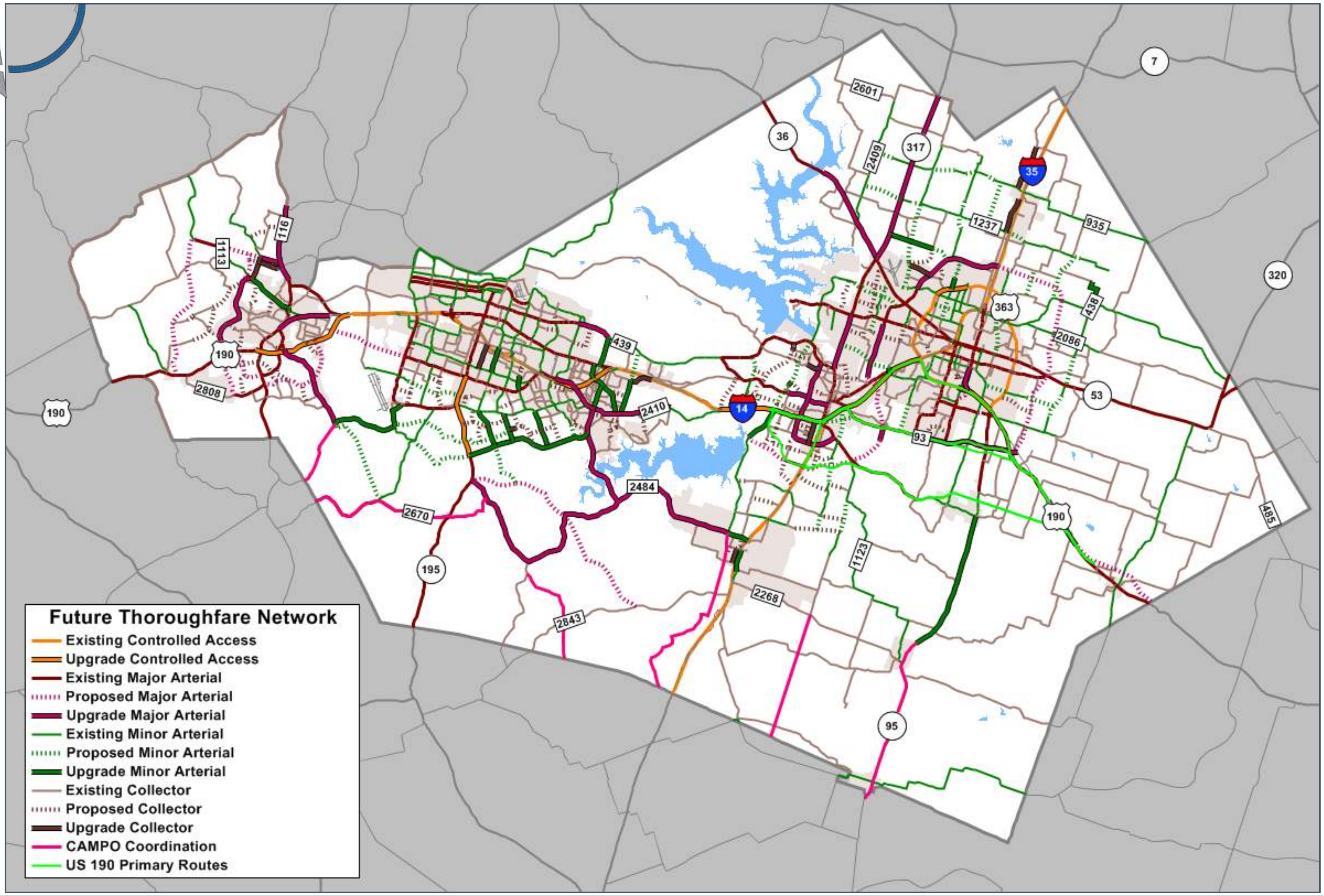


Figure 6-15: Future Thoroughfare Network Around Copperas Cove

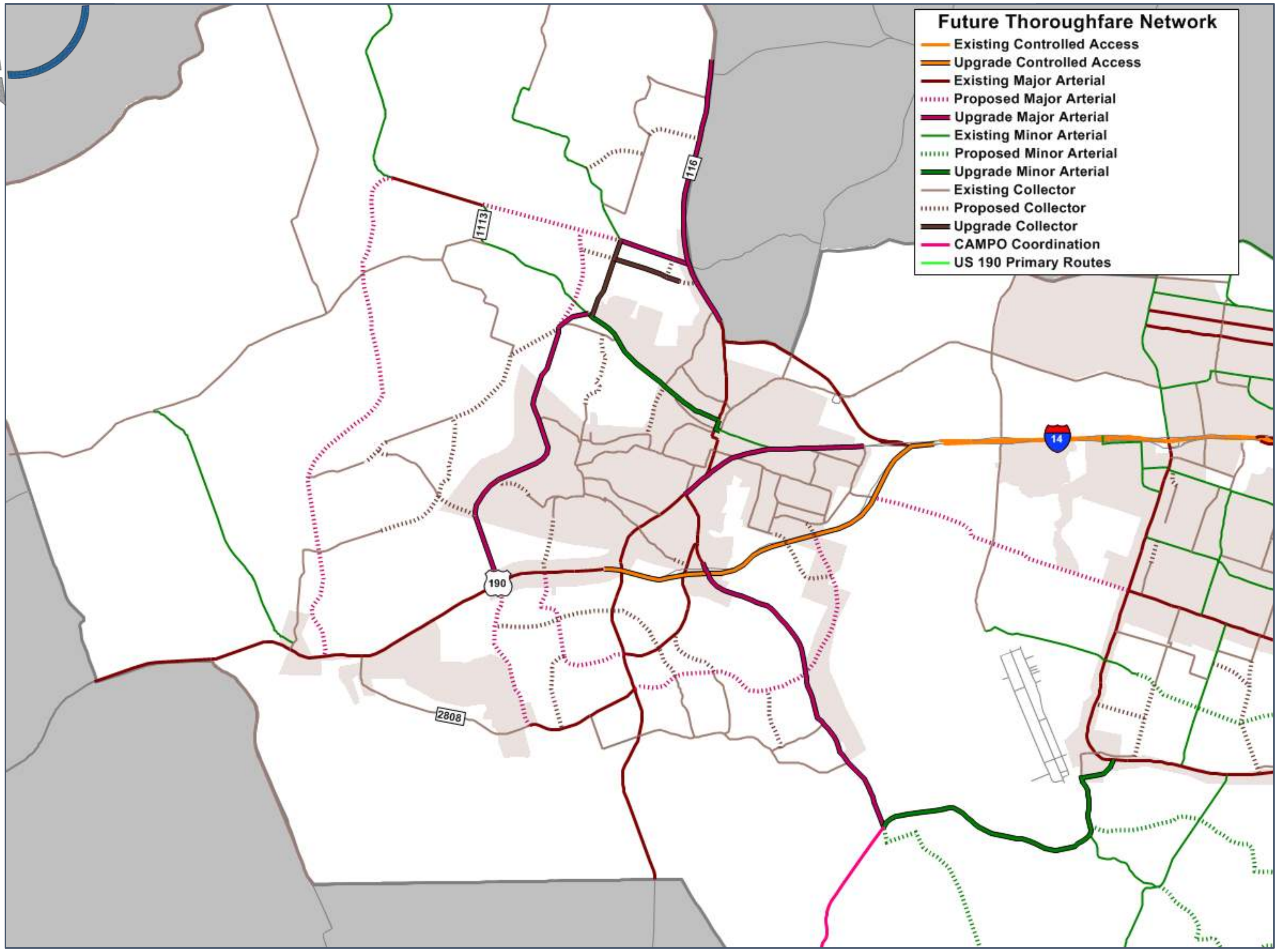


Figure 6-16: Future Thoroughfare Network Around Killeen, Harker Heights, and Nolanville

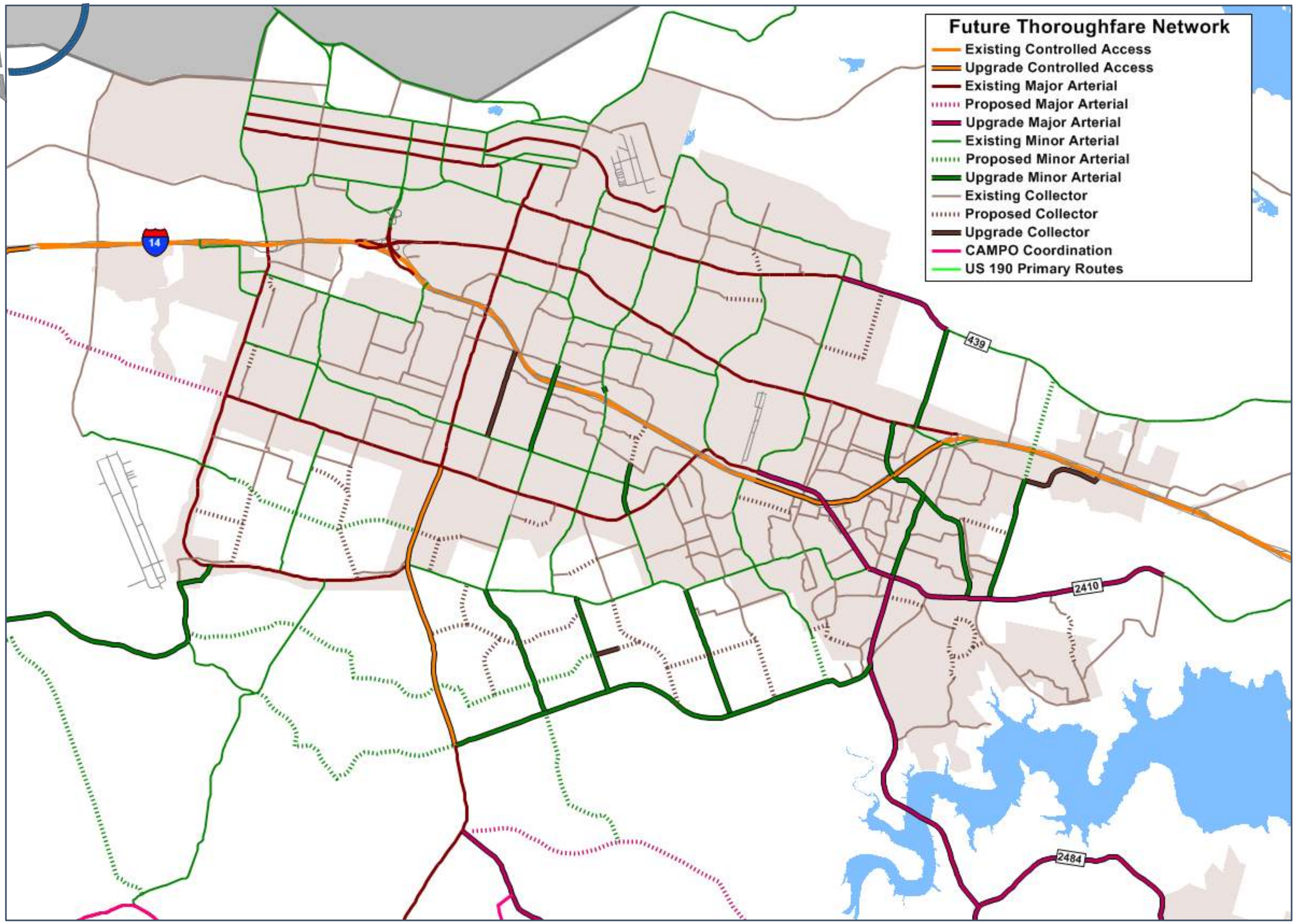


Figure 6-17: Future Thoroughfare Network Around Belton and Salado

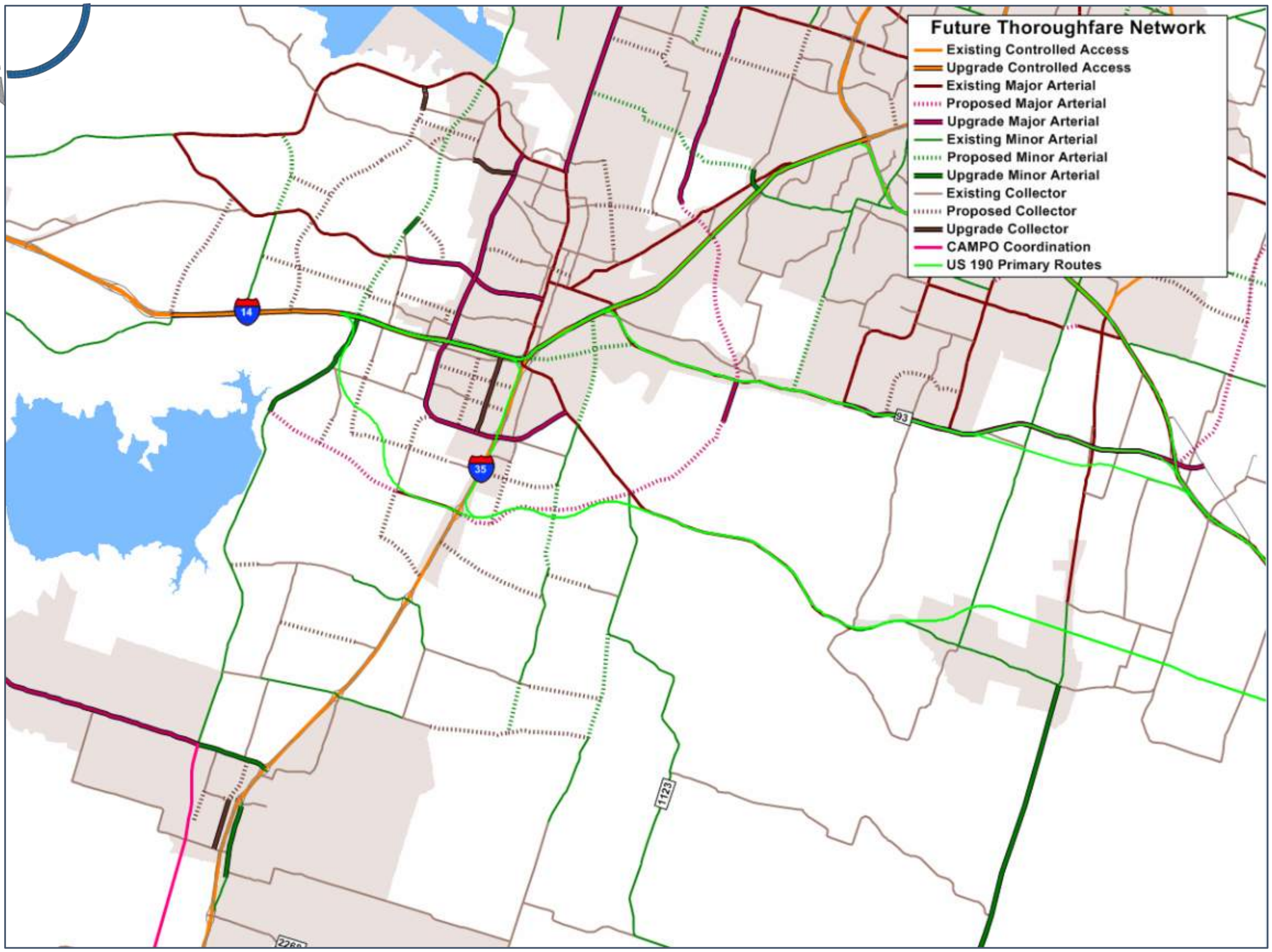
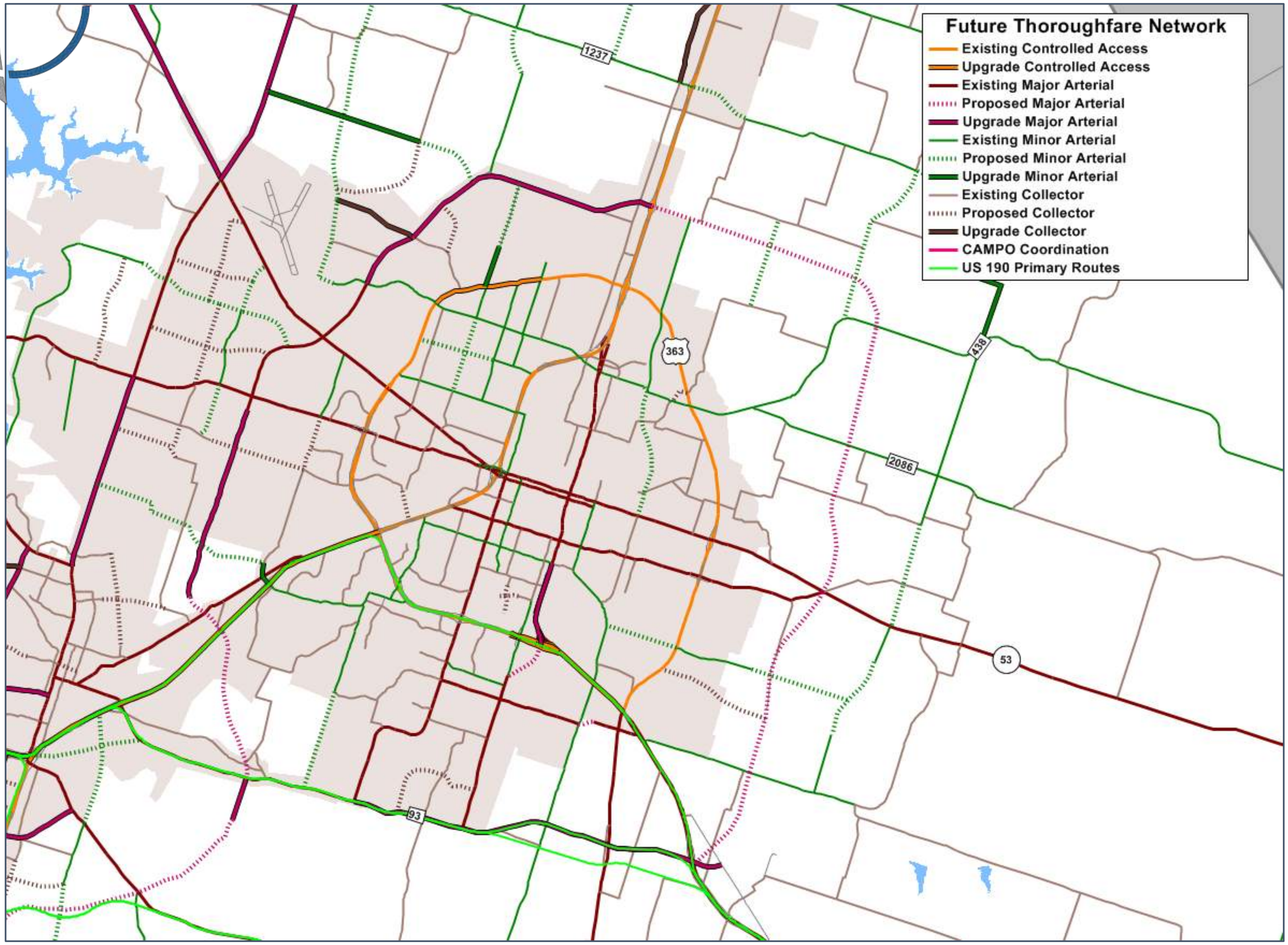


Figure 6-18: Future Thoroughfare Network Around Belton and Temple



The US 190 feasibility study being conducted jointly by the KTMPO and TxDOT is exploring options for upgrades and possible new alignments of US 190 between FM 1670 west of I-35 and the proposed relief route north of Rogers. The forty route options identified in early stages of the study have been parsed to five options, labeled as "Primary Routes", which will be the basis for further study and public participation. Only one of the Primary Routes will ultimately be selected, but at this stage of the study and for the purposes of the Regional Multimodal Plan, all options are presented in Figure 6-19.

The five Primary Routes include:

- Pink Route, 21.9 miles long, which maximizes the use of existing roads but is the most indirect.
- Blue Route, 19.1 miles long, one of the most direct routes.
- Brown Route, 19.3 miles long, one of the most direct routes.
- Black Route, 20.5 miles long, which avoids heavily populated areas.
- Aqua Route, 19.6 miles long, which maximizes the use of existing roads.

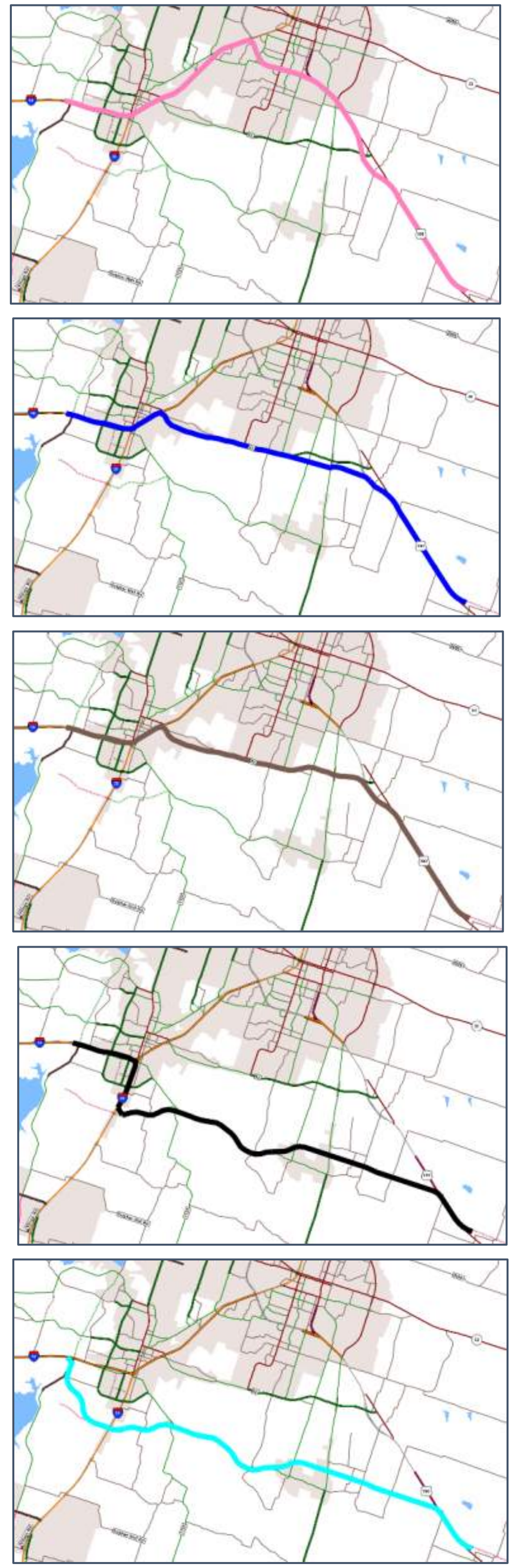
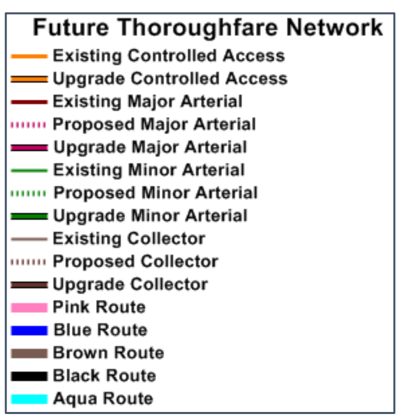


Figure 6-19: US 190 Study Designated Primary Routes



Summary

Based on the definitions of Functional Class for the street network, general design guidance for typical street cross sections have been provided. The guidance is generalized to recognize that the implemented Functional Class and cross section for each project must consider that the specific context of the project at any given time. Specific details depend on several factors, including the physical characteristics of the street, traffic volumes, mix of multimodal traffic, safety considerations, local standards and preferences, and funding. Therefore, the cross sections presented in this Thoroughfare Plan are meant as guidance for typical conditions, and should be refined as needed for each specific project.

Potential projects for this Thoroughfare Plan are derived from the Thoroughfare Plans and studies from KTMPO and its member jurisdictions. At this stage of the planning process, the project list includes all projects, regardless of any designation as funded or unfunded in the previous Mobility 2040 MTP.

Each region is different with its own specific mix of Functional Classes, conditions, and geography, so there is no hard and fast guidance on the appropriate mix of classes. However, FHWA has listed general guidelines for the appropriate percentages of each Functional Class within a typical region. A comparison of the 2017 conditions and the future conditions with all network projects implemented is shown in **Table 6-5**. The tabulation shows that the majority of potential projects are proposed streets rather than upgrades to existing streets. In general, the Functional Classes with the most mileage of potential projects to upgrade existing streets are Major Arterials and Minor Arterials. For new construction streets, the Functional Classes with the most mileage of potential projects are Minor Arterials and Collectors.

The overall statistics for the mix of streets by Functional Class does not change significantly with the future network. With all potential projects implemented, the mix of Functional Classes in the KTMPO region remains appropriate when compared to the general FHWA standards.

Table 6-5: Regional Mix of Functional Classes for 2017 and the Future Thoroughfare Plan Network

Regional Mix of Functional Classes							
	2017 Network		Potential Projects		Future Network		
Functional Class	Mileage	Percent	Upgrades	New Construction	Mileage	Percent	Guidelines
Controlled Access	143	4%	20	10	144	4%	0 - 9%
Interstate	71	1.9%	20	5	76	2.1%	
Expressway	51	1.4%		5	56	1.5%	
Freeway	21	0.6%			12	0.3%	
Major Arterial	110	3%	9	7	115	3%	2 - 4%
Mnor Arterial	246	7%	86	12	258	7%	4 - 8%
Collector	760	21%	43	5	765	21%	20 - 25%
Local	2,406	66%	0	0	2,406	65%	65 - 75%

Construction costs for the types of projects listed in this Thoroughfare Plan can vary significantly based on site geologic conditions, drainage, subsurface utilities, and materials specifications. Environmental and social considerations can also have a significant impact on project costs. However, average costs for typical projects may be estimated based on a review of costs for multiple instances of project types. Typical costs for projects were developed in **Table 6-6** based on compilations of typical project costs documented from several sources: the American Road & Transportation Builders Association (ARTBA), the Arkansas Department of Transportation (ARDOT), the Florida Department of Transportation (FDOT), the North Carolina Department of Transportation (NCDOT), the United States Department of Transportation (USDOT), the Texas Department of Transportation (TxDOT), and the Victoria Transport Policy Institute (VTPI). The resultant costs for projects listed in the table cannot be considered as appropriate for budget estimates, but can be valuable in comparing the relative costs of different types of projects.

Table 6-6: Typical Construction Costs

Typical Construction Costs for Street Project Types		
General Project Description	**Typical Cost**	**Cost Units**
New Construction Streets		
New construction 2 lane undivided	2,800,000	per mile
New construction 2 lane, curb & gutter, parking each side	4,000,000	per mile
New construction 4 lane, curb & gutter, raised median	4,700,000	per mile
New construction auxiliary lane	180,000	per mile
New construction turn lane	180,000	per mile
Upgrade Existing Streets		
Widen 2 lane undivided to 4 lane undivided	3,100,000	per mile
Widen 2 lane undivided to 4 lane divided	3,600,000	per mile
Widen 4 lane to 6 lane divided	3,600,000	per mile
Intersections		
Diamond intersection	20,500,000	each
Grade separation	3,300,000	each
Traffic signal	180,000	intersection
Protected intersection	70,000	each
Roundabout	250,000	each
Multi-lane Roundabout	350,000	each
Crosswalk	3,000	each
Bicycle & Pedestrian Facilities		
Widen street 4' for bike lane	300,000	per mile
12' multi use trail	200,000	per mile
5' sidewalk, both sides	250,000	per mile
Curb bulb-out	13,000	each
Pedestrian median island	13,000	each
Crosswalk	2,500	intersection
Utilities & Bridges		
Extend or relocate underground water line	70	linear foot
Extend or relocate underground sewer line	60	linear foot
Single-circuit overhead power line	285,000	per mile
New construction bridge over stream	105	square foot of deck
Wetland mitigation	60,000	acre

Chapter 7: Bicycle & Pedestrian Plan

CHAPTER HIGHLIGHTS

- General Design Guidance
- Typical Cross Sections by Functional Class
- Funded and Unfunded Projects
- Bicycle & Pedestrian Plan

Introduction

The concept of Functional Classes for the bicycle and pedestrian networks was introduced in Chapter 4, followed by an inventory of the networks in Chapter 5. In this Chapter, these two concepts are combined with potential projects and developed into a future Plan. While the bicycle and pedestrian networks are distinct and have different operational requirements, they do share many similarities and can be treated together. In particular, they share the Multi-Use Path Functional Class and can have similar treatments at intersections.

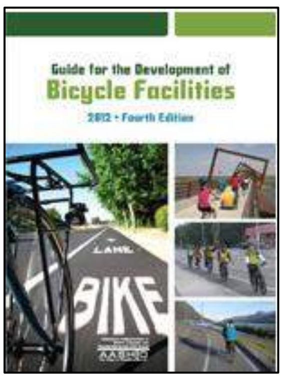
The purpose of this Regional Multimodal Plan is to define the future networks for all transportation modes so that all potential projects may be displayed and reviewed together, and so that the appropriate right-of-way may be identified and planned for. A key component of this planning task is to define the Functional

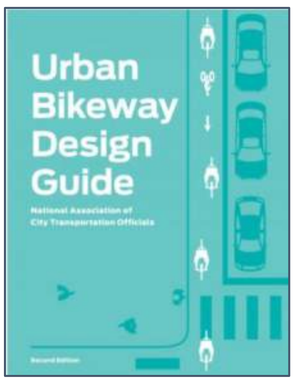
Class for each proposed project. Unlike the auto network, the bicycle and pedestrian networks do not feature specific cross-sections for each Functional Class. This Chapter presents general design guidance instead of specific cross-sections.

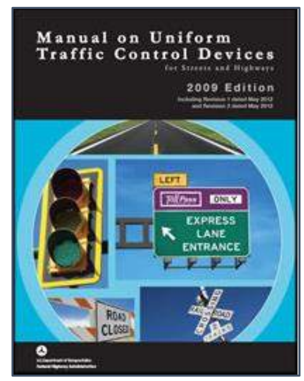
Bicycle & Pedestrian Networks General Design Guidance

General Design Guidance for the Bicycle Network

Design guidance for all types of bicycle facilities is provided at the national and state levels. Guidance for infrastructure is provided at the national level by the *AASHTO Guide to Bikeway Facilities* and by the *NACTO Urban Bikeway Design Guide*. Both guides provide detailed design standards with an emphasis on flexibility in design to encourage sensitivity to local context in travelers' needs. TxDOT has endorsed both guides, and has collated their guidance and standards into their own *Opportunities for TxDOT's Bicycle Program*. National-level guidance on pavement markings, signs, and traffic signals is provided by the *Manual on Uniform Traffic Control Devices* (MUTCD).







All the guidebooks recommend a minimum bike lane width of 4 feet, but 5 feet is common and 6 feet is desirable. Bike lanes should be as wide as possible to allow bikes to ride side by side, but where the bike lane is not protected by an insurmountable barrier, the width may be reduced to discourage vehicles from illegally driving or parking in the bike lanes. TxDOT guidance calls for either a 5 foot bike lane or a shared outside lane with a width of 14 feet.

The MUTCD specifies that painted buffer strips be marked with solid white lines. Buffers should be at least 18 inches wide. If the buffer strip is 36 inches or wider, it should have interior diagonal cross hatching or chevron markings.

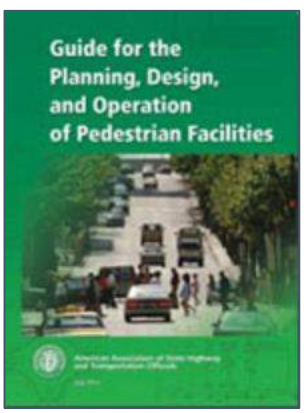
Table 7-1 summarizes the recommendations for right-of-way (ROW) considerations by street Functional Class. Minimum ROW is based on 4 lanes for Major Arterials, 3 lanes (two travel lanes and a center turn lane) for Minor Arterials, and 2 lanes for Collectors and Local streets.

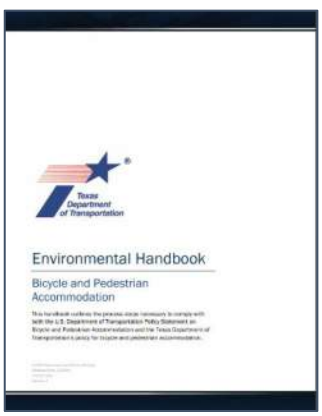
Table 7-1: Summary of ROW Recommendations by Functional Class

Functional Class	Minimum ROW	Preferred ROW	Lane Width	Pavement Width	Median	Outside Buffer	Notes
Controlled Access	250'	Varies, up to 500'	Minimum 12'	Varies	Minimum 36' rural Minimum 10' urban	Varies	Inside shoulder minimum 4' Outside shoulder minimum 10' Vertical clearance minimum 14'
Principal Arterial	130'	160'	Preferred 12'	82' to 106'	Preferred 18'	15'	ROW may be greater with parking, bicycle and pedestrian facilities, bus stops, and intersection treatments
Minor Arterial	80'	120'	Preferred 12'	47' to 75'	Center Turn Lane 14'	10'	
Collector	60'	80'	Minimum 11'	31' to 57'	Center Turn Lane 14'	5'	
Local	44'	50'	Minimum 10.5'	23' to 29'	None	5'	

General Design Guidance for the Pedestrian Network

Bicycles are defined as vehicles and are therefore entitled to the use of the street, so bicycle facility design is treated in a similar manner as the auto network street design. Conversely, pedestrian facilities are defined to separate pedestrians from vehicle traffic, and so the design standards are markedly different. Guidance for the pedestrian network as provided by the *AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities* and the *TxDOT Handbook for Bicycle and Pedestrian Accommodation* therefore provides more guidance on the provision of pedestrian facilities than on their design. In fact, the TxDOT handbook is published by the Environmental Division (responsible for the Transportation Enhancements program) rather than the Design Division.





In general, design guidance for the pedestrian network relates to the Sidewalk Functional Classes. Sidewalks are generally specified at a minimum of 5 feet wide. New construction multi-use trails are specified with widths of up to 12 feet. Curb ramps for ADA compliance are required for all sidewalks.

Other Design Features for the Bicycle & Pedestrian Networks

Because of the vulnerability of bicycles and pedestrians, several additional design features in their networks are appropriate to properly and safely manage the interactions between all the networks.

Intersection Treatments

There is a conflict between curbside conventional bike lanes and right turning autos at intersections. The state-of-the-practice for mitigating the conflict is to shift the bike lane to the left side of the turn lane, as shown in **Figure 7-1**. This is the conventional treatment as recommended in Federal and State design guidance, but it creates a weaving movement between autos and bicycles prior to the intersection. On intersection approaches with right turn only lanes, the bike lane should be transitioned to a through bike lane to the left of the right turn only lane, or a combined bike lane/turn lane should be used if available road space does not permit a dedicated bike lane. On intersection approaches with no dedicated right turn only lane, the buffer markings should transition to a conventional dashed line. Where the bike lane has merging movement approaching the intersection, the recommendation is to dash the lane stripe 50 to 200 feet in advance.

Figure 7-1: Conventional Treatment of Bike Lanes at an Intersection

A **protected intersection** is a design intended to avoid this conflict by carrying the bike lane through the intersection while still preserving its separation from car traffic. The protected intersection, shown in **Figure 7-2**, has two main features: corner islands and the backset stop bar. The corner islands direct cars into a wider turn. This places the vehicle at a 90° angle to the cross street before its crosswalk, so bicycles or pedestrians in the crosswalk are more visible. Turning cars also have room to stop without blocking through traffic.

Figure 7-2: Protected Intersection

The backset stop bar places the car stopping line behind the bike lane at the intersection. Like the corner island, the setback places the vehicle at a 90° angle to the cross street to improve visibility. The setback also provides more room within the intersection.

Curbside Treatments

Outboard bike lanes, shared use streets, bike boulevards, and other infrastructure types that place bicycles close to the curbside should consider the effect of gutter seams, drainage inlets, grates, and utility covers. Grates in particular have the potential to trap bicycle tires if they are not properly designed.

Although Federal and State design guidelines do not mention this issue, anything which encroaches on bike lanes should be flush and designed to cause no conflicts with bicycle tires.

Bicycle Parking

Bicycle parking is a related issue that is recognized in the AASHTO guide. The Association of Pedestrian and Bicycle Professionals (APBP) have also contributed guidance with their publication *Essentials of Bike Parking*. The APBP guide defines four criteria for practical and usable bike racks for parking:

- Supports the bike upright without stressing the wheels.
- Accommodates a variety of bikes and attachments.
- Allows locking of the frame and at least one wheel with a single U-lock.
- Proper use is intuitive, not needing extensive instructions to operate.

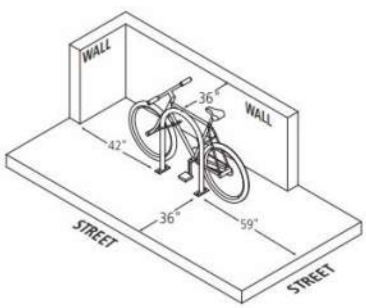
The APBP guide recommends two types of bike racks as meeting these criteria, and lists other types of racks as not meeting the criteria and as not recommended for use.

The two types of bike racks which are recommended by the APBP guide are the Inverted U and the Post & Ring types, as shown in **Figure 7-3**.

Figure 7-3: APBP-Recommended Bike Rack Types

Both these types of bike racks meet the criteria by providing a solid locking surface and keeping the bike's wheels on the ground. A wide variety of bikes are accommodated by their simple design, and several ways to attach a U-lock to the frame, wheel, and rack are accommodated.

Figure 7-4: Recommended Installation Setbacks for Bike Racks



Recommended setbacks between the bike rack, walls, and the street are shown in **Figure 7-4**. These setbacks are defined by the bike rack manufacturer, and are listed on the Maintenance Agreement and Installation Guide for bike racks by the City of San Antonio.

Requirements of the MUTCD are that a bicycle parking space should be a minimum of 2 feet wide and 6 feet long. Parallel racks should be at least 30 inches apart; and if they are 48 inches apart the rack may be considered as serving two bikes (one on each side).

The types of bike parking racks which are not recommended include the schoolyard rack and wheel well racks, which do not provide sufficient support points or locking points, wave racks and bollard racks, which are not intuitive to use, and types such as the swing arm, spiral, and coat hanger, which in practice accommodate only limited types of bikes and are cumbersome to use.

Pavement Treatments

The MUTCD allows for the use of color to distinguish special - use lanes, and green is specified as the preferred color for bicycle lanes. Color is intended to "…enhance the conspicuity of where bicyclists are required to operate, and areas of the bicycle lane where bicyclists and other roadway traffic might have potentially conflicting weaving or crossing movements." Dashes of color may also be used to highlight weaving movements, as when a curbside bike lane crosses to the left of a dedicated right turn lane.

Green pavement marking a protected intersection has been constructed at Ross St. and Bizzell St. on the Texas A&M University main campus in College Station. This installation features an experimental treatment of luminous paint that is intended to make them glow in the dark. The paint absorbs solar energy during the day and glows with a soft light during the night.

Potential Bicycle & Pedestrian Projects

The listing of potential bicycle and pedestrian projects is developed from the KTMPO 2040 Metropolitan Transportation Plan (MTP) and from public input on desired projects which was received through the KTMPO website.

A listing of potential projects which are identified by the MTP as funded is provided in **Table 7-2**. **Table 7-3** lists the remaining projects in the region for which funding has not been identified. Projects sourced from the public through the KTMPO website are listed in **Table 7-4**.

Table 7-2: Bicycle & Pedestrian Projects Listed in the 2040 MTP as Funded

Project ID	Project	Project Description	Limits From	Limits To	City	Status	Year
B40-03	Main Street Sidewalk	Repair and installation of sidewalks	Avenue C	Avenue J	Belton	Funded MPO CAT 7	2020
B40-04	Chisholm Trail Corridor Hike and Bike Phase II	Construct multi-use path	Judge Baylor Dr.	Sparta Road	Belton	Funded Statewide TAP	2020
C30-03b	Business US 190 Phase I	Conversion of one travel lane in each direction to a multiuse path	FM 1113 (Avenue D)	Constitution Dr	Copperas Cove	Short Range Funded	2020
C35-02b	FM 116 Railroad Underpass Sidewalks	Constuct 10' wide sidewalk	S Main	Ave B	Copperas Cove	Short Range: Livability	2035
C40-04a	The Narrows-Phase 1	Construction of sidewalks for pedestrian/bicycle use	Constitution Dr	0.2 mi S of MLK Blvd	Copperas Cove	August 2017 KTMPO Selected Projects	2020
C40-04b	The Narrows-Phase 2	Construction of sidewalks for pedestrian/bicycle use	RG III from Constitution Dr	Old Copperas Cove Road	Copperas Cove	August 2017 KTMPO Selected Projects	2020
C40-04c	The Narrows-Phase 3	Construction of sidewalks for pedestrian/bicycle use	Charles Tillman Way	Charles Tillman Way	Copperas Cove	August 2017 KTMPO Selected Projects	2019
C40-05	FM 116 & FM 3046 Sidewalks	Construct ADA-compliant sidewalks and bike lanes	Business 190	Dennis St	Copperas Cove	August 2017 KTMPO Seleceted Projects	2019
H15-02b	FM 2410	Widen with sidewalks in a context sensitive design	Harker Heights City Limit	US 190	Harker Heights	Short Range Funded Prop 1	2019
H30-05	Warriors Path	Construct a 6' multiuse path	Knights Way/FM 2410	Old Nolanville Rd	Harker Heights	Long Range Funded	2040
K35-02	Killeen - Fort Hood Regional Trail, Segment 3	Construct multi-use path	Elms Rd	Watercrest	Killeen	Funded MPO TAP	2019
K40-21a	Heritage Oaks Hike and Bike Trail, Segment 4	Construct multi-use path	Platinum Drive	Chaparral Road	Killeen	Funded Statewide TAP	2017
K40-21b	Heritage Oaks Hike and Bike Trail, Segment 5	Construct multi-use path	Chaparral Rd	USACE Property	Killeen	August 2017 KTMPO Selected Project	2019
K40-23	Heritage Oaks Hike and Bike Trail, Segment 3A	Construct multi-use path	Nickelback Dr	Pyrite Dr.	Killeen	Funded MPO TAP	2018
N40-01	Main Street Connectivity	Construct multi-use path along Main Street and under US 190	Avenue I	US190 Frontage	Nolanville	Funded MPO CAT 7	2019
N40-02	Nolanville Elementary Sidewalk	Construct multi-use path near school	Warriors Path	Bluebonnet	Nolanville	Funded Statewide TAP	2019
S40-01	Salado Creek SUP	Construct multi-use path	Salado Creek	Royal Street	Salado	Funded Statewide TAP	2019
S40-04a	Main St	Construct sidewalks, lighting and striping for bicycles	Salado Plaza Drive	College Hill Dr	Salado	August 2017 KTMPO Selected Project	2020
S40-04b	Main St	Pavement widening & bike paths	College Hill Dr	Salado Plaza Dr	Salado	Funded for project development	2035
T40-07	Outer Loop 3b	Construct multi-use trail	S. of FM 2305	S. of Jupiter Drive	Temple	Long Range Funded	2040
T40-11	N. 31st St.	Construct multi-use trail	Adams Ave (SH 53)	Nugent Ave	Temple	Funded MPO TAP	2020
T40-12	31st St Sidewalks	Installation of 6' sidewalks on both sides	Marlandwood Rd	Canyon Creek Rd	Temple	August 2017 KTMPO Selected Project	2020
T40-15	Adams Ave	Construct on-street bike lane and sidewalks	IH 35	Martin Luther King Jr. Blvd	Temple	August 2017 KTMPO selected projects	2020
W40-04a	Loop 121 Phase 1	Bike/ped improvements	FM 439	IH 35	Belton	August 2017 KTMPO selected project	2021
W40-04b	Loop 121 Phase 2	Bike/ped improvements	IH 35	FM 436	Belton	Funded for project development	2035

Table 7-3: Bicycle & Pedestrian Projects Listed in the 2040 MTP as Unfunded

Project ID	Project	Project Description	Limits From	Limits To	City	Status	Year
B30-02	Belton Outer Loop West	Construct 10' multi-use trail	IH 35	Three Creeks Subdivision	Belton	Unfunded	2040
B30-03	Belton Outer Loop East	Construct 10' multi-use trail	IH 35	Shanklin	Belton	Unfunded	2040
B40-05	Belton Hike and Bike Trail Extension South	Construct 10' multi-use trail	Confederate Park	Griggs Field	Belton	Unfunded	2040
B40-06	Belton Hike and Bike Trail Extension North	Construct 10' multi-use trail	Confederate Park	Nolan Creek	Belton	Unfunded	2040
B40-07	Connell Street	Construct 5' sidewalks	US 190	Loop 121	Belton	Unfunded	2040
B40-08	Sparta Rd	Construct 10' multi-use trail	Loop 121	Dunn's Canyon Rd	Belton	Unfunded	2040
B40-09	West Avenue D	Construct sidewalks and bike lanes	Loop 121	Wheat Rd	Belton	Unfunded	2040
B40-10	FM 1670	Construct 10' multi-use trail	US 190	Three Creeks Boulevard	Belton	Unfunded	2040
B40-12	Belton Hike and Bike Trail Extension SW	Construct 10' multi-use trail	Conferedate Park	Nolan Creek Pedestrian Bridge	Belton	Unfunded	2040
C25-02	FM 1113	ADA compliant sidewalks	FM 116 / Ave B	Summers Road	Copperas Cove	Unfunded	2025
D40-02	North Waco Rd.	Construct 10' multi-use path	West Main St	West Big Elm	Troy	Unfunded	2040
D40-03	Old 81 South	Construct on-street bike lane	FM 1237	Loves Overpass	Troy	Unfunded	2040
H30-03	FM 3219	Construct 6' sidewalk	Veterans Memorial Blvd	FM 439	Harker Heights	Unfunded	2040
K40-26	Cunningham Rd	Construct bike/ped facility	US 190	FM 3470	Killeen	Unfunded	2040
N40-03	Old Nolanville Road	Construct multi-use path	Warriors Path	US 190	Nolanville	Unfunded	2040
N40-04	City Park Connectivity	Construct 10' wide sidewalk, ramps, and crosswalks	Mesquite	10th Street	Nolanville	Unfunded	2040
N40-05	FM 439 Spur Connectivity	Construct 10' wide sidewalk, ramps, and crosswalks	Main Street	North Drive	Nolanville	Unfunded	2040
N40-09	Pleasant Hill Road Bicycle Ln	Construct buffered on-street bike lane	Lonsesome Oak Drive	Avenue I	Nolanville	Unfunded	2040
N40-11	Nolan Creek Off-System Trail	Construct 10' multi-use path bordering Nolan Creek	Bridge on Old Nolanville Rd	Levy Crossing	Nolanville	Unfunded	2040
N40-12	Jack Rabbit Road Bike Thoroughfare	Constuct bike lanes	US 190	FM 439	Nolanville	Unfunded	2040
N40-13	Wild Wood Trail	Construct 8' multi-use trail	Lonsesome Oak Drive	Avenue I	Nolanville	Unfunded	2040
S40-02	Salado Creek/Pace Park Off-Road Trail	Construct 10' wide concrete trail, ped/bike crossing	SW Pace Park Road	NE Pace Park Rd	Salado	Unfunded	2040
S40-03	Salado West Village Road	Construct bike/ped facilities	Thomas Arnold Rd	IH 35	Salado	Unfunded	2040
T15-02	Kegley Road (Phase 2)	Construct 12' multi-use path	856 ft S of FM 2305	450' S of Wildflower Lane	Temple	Unfunded	2040
T25-05	FM 2271	Construct 8' hike/bike trail	FM 2305	Miller Springs Park	Temple	Unfunded	2025
T25-09	Outer Loop / Research Parkway	Construct on-street bike lane and sidewalks	IH 35	Central Pointe Pkwy	Temple	Unfunded	2040
T35-36a	1st Street	Construct multi-use trail	SE Loop 363	Avenue M	Temple	Unfunded	2035
T40-04	Hogan Road	Construct multi-use trail	SH 317	S Pea Ridge Rd		Unfunded	2040
T40-05	Westfield Blvd (Phase 2)	Extend sidewalk and multi-use path	Prairie View Rd	Airport Rd/SH 36		Unfunded	2040
T40-09	Outer Loop 4	Construct multi-use trail	S of Jupiter	Floodplain	Temple	Unfunded	2040
T40-10	Outer Loop	Construct multi-use trail	Floodplain	IH 35	Temple	Unfunded	2040
T40-13	Georgetown RR Trail	Construct 10' multi-use trail	S. 5th Street	Belton City Limits	Temple	Unfunded	2040
T40-25	Bird Creek Interceptor Trail	Construct 8' multi-use path	Lions Community Park	Midway Drive	Temple	Unfunded	2040

Table 7-4: Bicycle & Pedestrian Projects Sourced from Public Input from the KTMPO Website

Project ID	Project	Project Description	Limits From	Limits To	City	Status
B00-14	Old Belton Railroad	Construct "rails to trails" multi-use path	IH 35	Leon River	Belton	Unfunded public suggested project
B00-15	Pearl St	Construct sidewalk	Avenue A	US 190 Westbound Service Rd	Belton	Unfunded public suggested project
B00-17	Belton Dam Trail	Construct multi-use trail	FM 2271	Miller Springs Park	Belton	Unfunded public suggested project
B00-6	Commerce St	Construct multi-use path	Sparta Rd	Industrial Park Rd	Belton	Unfunded public suggested project
B00-7	Industrial Park Rd	Construct multi-use path	Commerce St	SH 317/Main St	Belton	Unfunded public suggested project
B00-8	Waco Rd	Construct sidewalk	FM 93/6th Ave.	E 13th St.	Belton	Unfunded public suggested project
C00-58	Big Divide Rd	Construct multi-use path	FM 1113	US 190	Copperas Cove	Unfunded public suggested project
H00-36	Comanche Gap	Construct multi-use path	End of Shared-Use Path	Dana Peak Park	Harker Heights	Unfunded public suggested project
H00-37	FM 2410	Construct on-street bike lane	Simmons Rd	Stan Schlueter LP	Harker Heights	Unfunded public suggested project
H00-40	FM 3423 (Indian Trail)	Construct sidewalk	Veteran's Memorial Blvd	IH 14	Harker Heights	Unfunded public suggested project
H00-41	FM 3481 (Stillhouse Lake Rd)	Construct sidewalk	Knight's Way	Cedar Knob	Harker Heights	Unfunded public suggested project
H00-42	FM 3481 (Stillhouse Lake Rd)	Construct sidewalk	Knight's Way	Nevaeh Dr	Harker Heights	Unfunded public suggested project
H00-43	Verna Lee Blvd	Construct sidewalk	Indian Trail	Knight's Way	Harker Heights	Unfunded public suggested project
H00-44	FM 3481 (Stillhouse Lake Rd)	Construct on-street bike lane	Knight's Way	Stillhouse Hollow Lake	Harker Heights	Unfunded public suggested project
H00-47	W. US 190 Service Rd	Construct on-street bike lane	Paddy Hamilton Rd	Ft. Hood St.	Harker Heights	Unfunded public suggested project
K00-39	FM 439	Construct on-street bike lane	W.S. Young	Jackrabbit Flat Rd	Killeen	Unfunded public suggested project
K00-45	Mountain Lion Rd/Stagecoach Rd	Construct on-street bike lane	SH 195	Stillhouse Hollow Lake	Killeen	Unfunded public suggested project
K00-46	SH 195 (S. Ft. Hood St.)	Construct on-street bike lane	Stagecoach Rd to US 190/IH 14	Knight's Way	Killeen	Unfunded public suggested project
K00-49	MLK Blvd	Construct on-street bike lane	FM 2410	BUS 190	Killeen	Unfunded public suggested project
K00-50	Twin Creek Dr	Construct on-street bike lane	BUS 190	FM 439	Killeen	Unfunded public suggested project
K00-51	W.S. Young	Construct on-street bike lane	US 190	Rancier Ave	Killeen	Unfunded public suggested project
K00-52	Trimmier Rd	Construct sidewalk	Stan Schlueter LP	Stagecoach Rd	Killeen	Unfunded public suggested project
K00-54	Tiffany Circle	Construct sidewalk	SH 201	Clear Creek Rd	Killen	Unfunded public suggested project
K00-55	Lance Loop	Construct sidewalk	SH 201	Clear Creek Rd	Killen	Unfunded public suggested project
K00-56	SH 201 (Clear Creek Rd)	Construct sidewalk	Elms Rd	Mohawk Dr	Killeen	Unfunded public suggested project
K00-57	US 190	Construct multi-use path	Constitution Dr	Clear Creek Rd	Killen	Unfunded public suggested project
L00-19	FM 436	Upgrade existing trail to a multi-use path	SH 95	Lamar St	Little River-Acader	Unfunded public suggested project
N00-38	FM 439	Construct on-street bike lane	FM 93	Sparta Rd	Nolanville	Unfunded public suggested project
S00-21	College Hill Dr	Construct multi-use path	Main St	Main St	Salado	Unfunded public suggested project
S00-22	Table Rock Trail	Construct multi-use path	Table Rocks	FM 2268 (Main St.)	Salado	Unfunded public suggested project
S00-23	Center Circle	Construct multi-use path	Royal St	Royal St	Salado	Unfunded public suggested project
S00-24	Pace Park Rd	Construct multi-use path	FM 2268	Main St.	Salado	Unfunded public suggested project
S00-25	Pace Park Trail Connection	Construct multi-use path	Royal St	Pace Park	Salado	Unfunded public suggested project
S00-26	Art Fair Rd	Construct multi-use path	Pace Park Rd	Pace Park Rd	Salado	Unfunded public suggested project
S00-27	Van Bibber Rd	Construct multi-use path	FM 2268	Salado Plaza Dr	Salado	Unfunded public suggested project
S00-28	Salado Plaza Dr	Construct multi-use path	FM 2268	Van Bibber Rd	Salado	Unfunded public suggested project
S00-29	N IH 35 Service Rd	Construct multi-use path	FM 2268	Rose Lane	Salado	Unfunded public suggested project
S00-30	Rose Lane	Construct multi-use path	IH 35	Salado Youth Sports Field	Salado	Unfunded public suggested project
S00-31	FM 2484	Construct sidewalk	IH 35	Williams Rd	Salado	Unfunded public suggested project
S00-33	Williams Rd	Construct sidewalk	IH 35	FM 2484	Salado	Unfunded public suggested project
S00-34	Salado Schools Rd	Construct sidewalk	West Village Rd	Thomas Arnold Rd	Salado	Unfunded public suggested project
S00-35	Thomas Arnold Rd	Construct sidewalk	IH 35	West Creek Dr	Salado	Unfunded public suggested project
T00-1	Kegley Rd	Construct multi-use path	IH 35	FM 2305/Adams Ave	Temple	Unfunded public suggested project
T00-10	Midway Rd	Construct multi-use path	IH 35	Bonham Middle School	Temple	Unfunded public suggested project
T00-11	Shallowford Rd	Construct multi-use path	Shallowford Rd	Taylor's Valley Rd	Temple	Unfunded public suggested project
T00-12	West Shallowford Rd	Construct multi-use path	Midway Rd	Temple Lions Park	Temple	Unfunded public suggested project
T00-13	Taylor's Valley Rd	Construct on-street bike lane	IH 35	FM 93	Temple	Unfunded public suggested project
T00-18	FM 93	Construct bike lanes on shoulders	IH 35	BUS 190 in Heidenheimer	Temple	Unfunded public suggested project
T00-2	N. Pea Ridge Rd	Construct sidewalk	SH 317	Prairie View Rd	Temple	Unfunded public suggested project
T00-4	Apache Dr	Construct sidewalk	FM 2305	Arapaho Dr	Temple	Unfunded public suggested project
T00-5	Poison Oak Rd	Construct sidewalk	SH 317	Carriage House Dr	Temple	Unfunded public suggested project
T00-9	Charter Oak Rd	Construct multi-use path	E 13th St.	Kegley Rd	Temple	Unfunded public suggested project

Future Bicycle & Pedestrian Networks

The potential projects as listed in Table 7-2 through Table 7-4 have been included in the future network, as shown for the region in **Figure 7-5**. Insets to show better detail of projects are included as **Figure 7-6** for the western area and **Figure 7-7** for the eastern area. For clarity, the existing sidewalk network is not shown in these Figures.

All Figures show the existing 2017 facilities and the proposed projects for upgrades to existing facilities and for construction of new facilities. The alignments of new construction facilities are presented as approximations for planning purposes, and are not intended to represent the final alignments or to constrain KTMPO member jurisdictions in any way.

The key purpose of the Bicycle & Pedestrian Plan is to identify future projects so that right-of-way can be planned for. Supporting this purpose, the Plan is coded with all projects defined by KTMPO and by its member jurisdictions, not just the projects which have been identified as funded in the previous Mobility 2040 MTP. This listing has been developed as an input into the updated KTMPO MTP for the year 2045. One of the functions of the 2045 MTP will be to prioritize the listing of projects and to balance them against the anticipated available funding to derive funded and unfunded project listings.

Figure 7-5: Future Bicycle & Pedestrian Plan for the Region

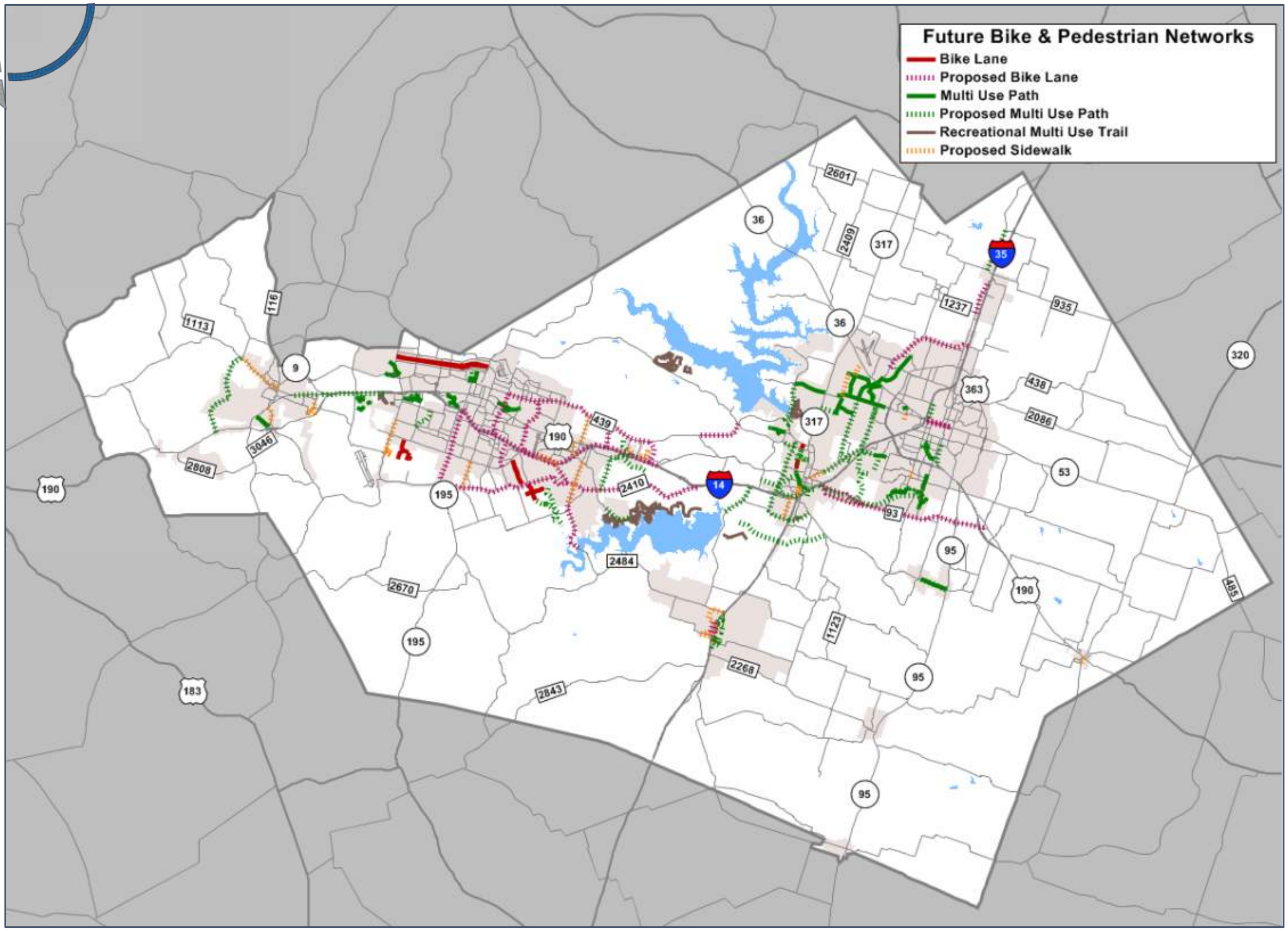


Figure 7-6: Future Bicycle & Pedestrian Plan for the Western Area

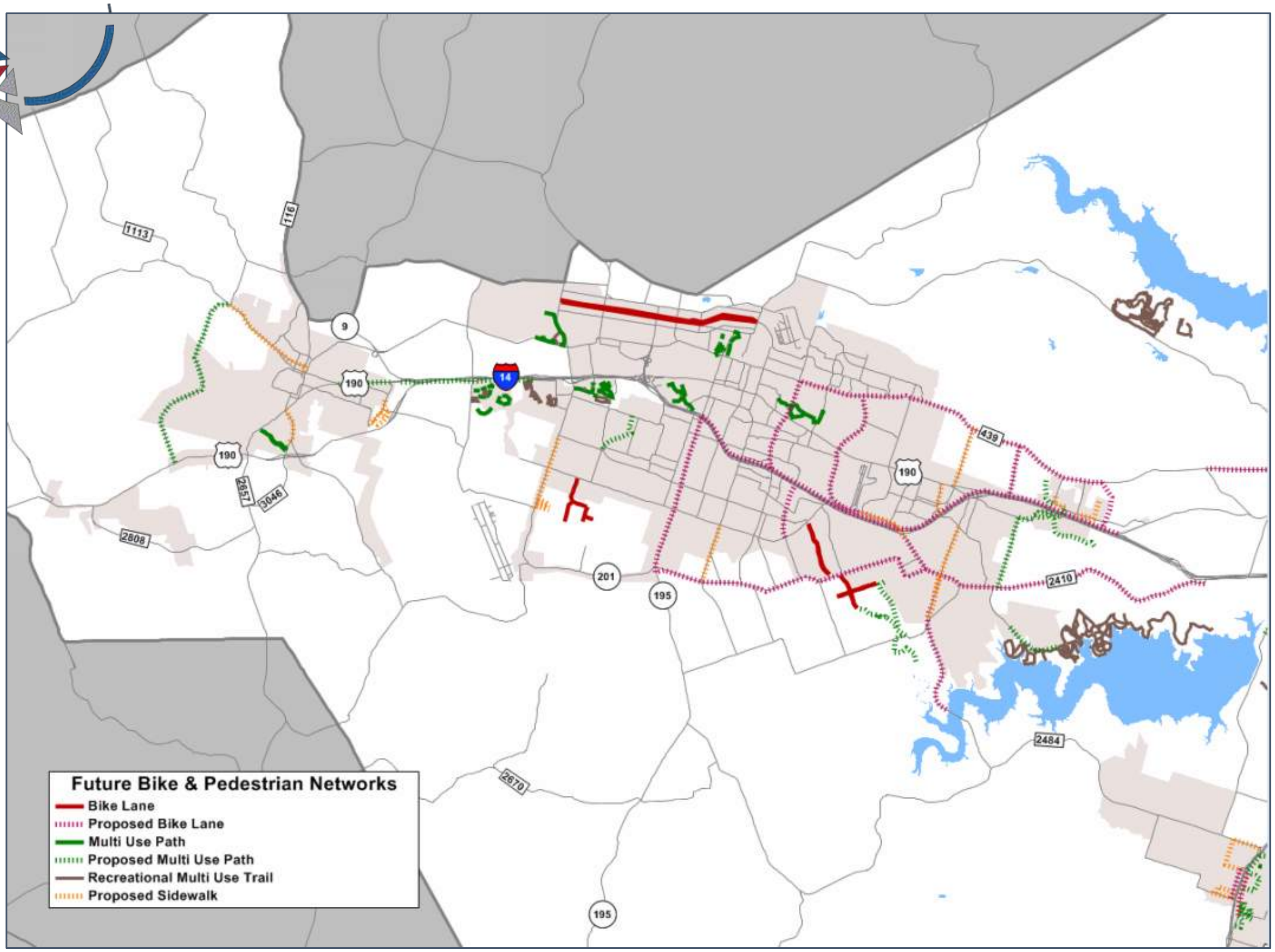
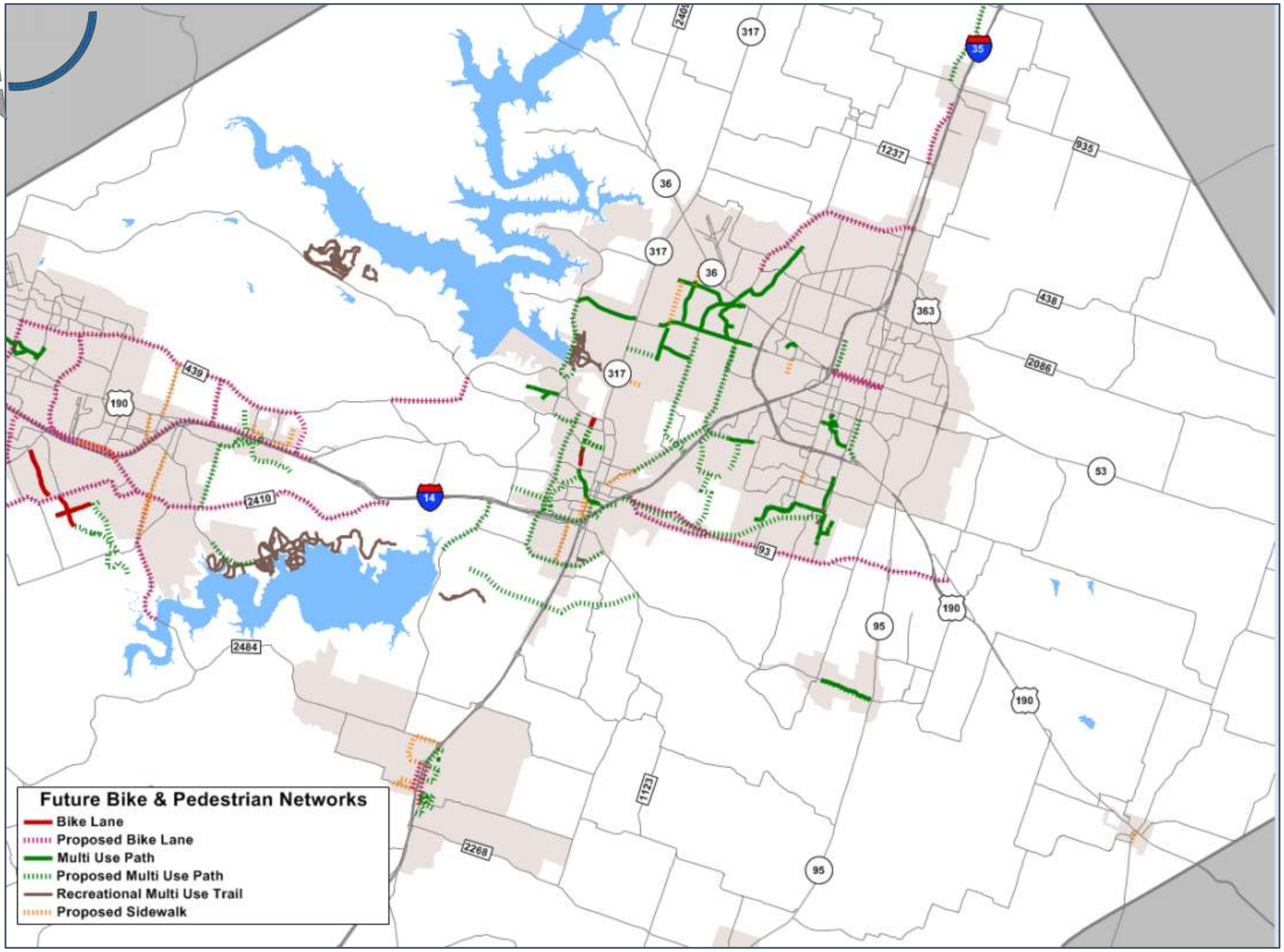


Figure 7-7: Future Bicycle & Pedestrian Plan for the Eastern Area



Summary

Based on the definitions of Functional Class for the bicycle and pedestrian networks, general design guidance for facilities and for other features such as intersection treatments, curbside treatments, bike parking, and pavement coloring was listed. Specific details depend on several factors, including the physical characteristics of the street, traffic volumes, mix of multimodal traffic, safety considerations, local standards and preferences, and funding. Therefore, the treatments presented in this Bicycle & Pedestrian Plan are meant as guidance for typical conditions, and should be refined as needed for each specific project.

Potential projects for this Bicycle & Pedestrian Plan are derived from the previous Mobility 2040 MTP and from public input received through the KTMPO website. At this stage of the planning process, the project list includes all projects, regardless of their source or of any designation as funded or unfunded in the previous MTP.

Typical construction costs for bicycle and pedestrian facilities are listed in **Table 7-5**. Construction costs can vary significantly based on site geologic conditions, drainage, subsurface utilities, and materials specifications. Environmental and social considerations can also have a significant impact on project costs.

Table 7-5: Typical Construction Costs for Bicycle & Pedestrian Projects

Typical Construction Costs for Bicycle & Pedestrian Project Types		
General Project Description	Typical Cost	Cost Units
Bicycle Facilities		
Widen street 4' for bike lane	300,000	per mile
Painted stripes for a conventional bike lane	15,000	per mile
Painted buffers for a conventional bike lane	20,000	per mile
Protected bike lane	100,000	per mile
Fixed bollard for protected bike lane	1,000	each
Off-street bike track	600,000	per mile
10' Off-street bike lane with 2' shoulders and signage	1,000,000	per mile
Signs for bike route	5,000	per mile
Bike lane signs, wayfinding signs, and pavement stencils	23,000	per mile
Bicycle Parking		
Inverted U bike rack, single	250	each
Multi-Use Trails & Paths		
12' multi use trail, concrete	200,000	per mile
12' multi use trail, ashphalt	100,000	per mile
6' multi use trail, gravel	55,000	per mile
Pedestrian Facilities		
5' sidewalk, both sides	250,000	per mile
Paved multi-use trail	100,000	per mile
Unpaved multi-use trail	50,000	per mile
Curbs, Medians, & Bridges		
Curb bulb-out	13,000	each
Pedestrian median island	13,000	each
ADA-compliant sidewalk ramp	2,000	each
Mid-block crossing with bulbouts and landscaping	60,000	each
100' wooden pedestrian bridge	100,000	each
Intersections		
Protected intersection	70,000	each
Painted crosswalk	3,000	each
Imprented decorative paved crosswalk	4,000	each

The costs for projects listed in Table 7-5 are sourced from the Pedestrian and Bicycle Information Center, which has compiled almost 2,000 observations of built projects referenced by the Robert Wood Johnson Foundation's Active Living Research Program and the Federal Highway Administration (FHWA). The costs are often reported with a wide range of values, with the high-end costs reaching ten to one hundred times the low-end cost. The exceptionally wide range in the estimates means that the resultant costs for projects listed in the table cannot be considered as reliable or appropriate for budget estimates, but can be valuable in comparing the relative costs of different types of projects. A general observation is that costs for bicycle and pedestrian infrastructure are consistently only a small fraction of the costs of street infrastructure.

Chapter 8: Group Transportation

CHAPTER HIGHLIGHTS

- General Design Guidance
- Potential Projects

Introduction

Group Transportation is defined as the bus, passenger rail, and passenger air modes. Of these three, only the transit mode is defined as having a network; the other modes gain access to the transportation network at specific points, which typically are intermodal stations. The three modes within Group Transportation category therefore define five distinct sub-modes:

- Bus, defined as The HOP's local bus network.
- Intercity bus, defined by the stations served by commercial long-distance bus.
- AMTRAK, defined by the station directly serving AMTRAK passenger rail.
- Bus-AMTRAK Connection, defined by the station linking the two services.
- Air, defined by the airports with regularly-scheduled commercial service.

The purpose of this regional Plan is to define the group transportation modes so that all potential projects may be displayed and reviewed together, and so that the appropriate right-of-way may be identified and planned for. A key component of this planning task is to define the Functional Class for each appropriate proposed project, and to define typical designs for each Functional Class. The concept of Functional Class is used as an organizing element for the bus network only; the other modes of intercity bus, AMTRAK, the bus-AMTRAK connection, and passenger air do not have associated networks or defined Functional Classes.

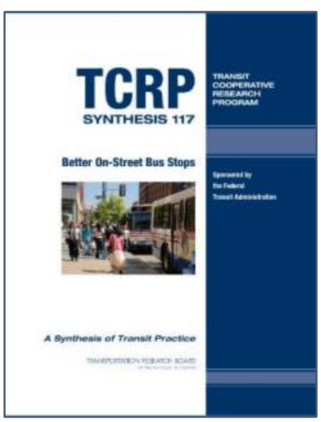
Typical designs are intended to illustrate the maximum right-of-way needed for each mode. It is recognized that the actual design needed for any specific project at a given time depends on several factors, including the needs of the bus stop, physical characteristics of the street, traffic volumes, ADA compliance and safety considerations, local standards and preferences, and funding. Therefore, the designs presented in this plan are meant as guidance for the typical conditions, and should be refined as needed for each specific project.

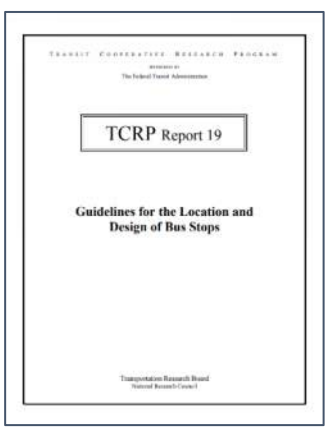
Group Transportation Systems General Design Guidance

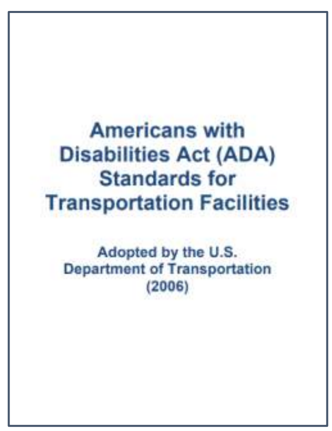
General Design Guidance for the Bus Network

Functional Classes for the bus network have been defined in terms of the amenities present at stops. The four bus Functional Classes include the ***Station Functional Class***, ***Shelter Functional Class***, ***Bench Functional Class***, and the ***Basic Bus Stop Functional Class***.

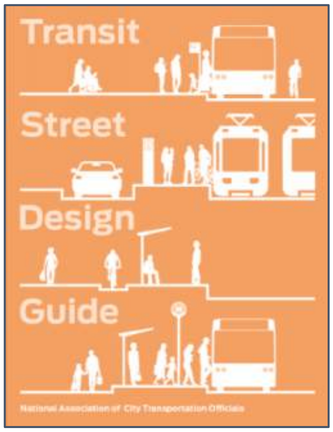
General design guidance for bus stops is provided at the national and state levels. Guidance includes national-level research studies such as *TCRP Synthesis 117: Better On-Street Bus Stops* and *TCRP Report 19: Guidelines for the Location and Design of Bus Stops*, and regulatory guidance such as the *USDOT's Americans with Disabilities Act (ADA) Standards for Transportation Facilities* and *FTA Circular FTA C 4710.1* providing ADA guidance.

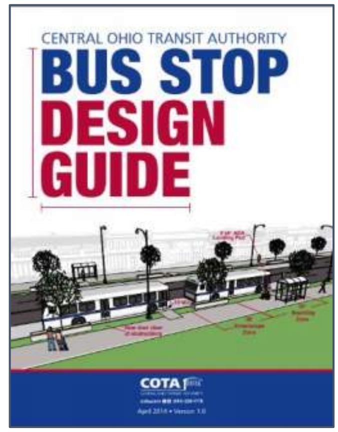






Optional and unofficial design guidance for transit stops and for transit operations on streets are provided by widely-recognized best practices from national organizations and from prominent transit agencies such as the *NACTO Transit Street Design Guide*, the *Enhanced Transit Corridors Plan Toolbox* from Tri-Met in Portland, Oregon, and the *Bus Stop Design Guide* from the Central Ohio Transit Authority in Columbus, Ohio. These types of publications provide guidance on state-of-the-practice facilities for bus stops.





ADA requirements pertain to surfaces, clearances from curbs and roadways, cross slopes, and accessible connections to streets, sidewalks, and pedestrian paths. The U.S. Access Board publishes *ADA Accessibility Guidelines* (ADAAG) and *ADA Standards for Transportation Facilities*. Pertinent sections of the ADA Standards are Section 810.2: Transportation Facilities, Bus Boarding & Alighting Areas and Section 402: Accessible Routes.

ADA standards are not “best practices” for the industry; they are the minimum requirements to comply with Federal legislation. Going beyond the ADA minimum requirements, a new concept of Universal Design (UD) has been developed. Universal Design is intended to provide improved access for people with disabilities while also going further to accommodate the needs of the whole population who may have no protected disabilities, but who do have special needs related to their need for ramps, slower walking speeds, or other issues. Targeted groups with special needs include children, parents pushing strollers, and older adults. General design guidance and background information on Universal Design is available through the Center for Inclusive Design and Environmental Access at the University of Buffalo at http://www. udeducation.org/.

There are three examples of the ***Station Functional Class*** in the region: the Southwestern Coaches intercity bus station on 4th Street in Killeen, which supports linking bus service to the AMTRAK station in Temple; the Greyhound intercity bus station on S 5th Street in Temple; and the AMTRAK station on W Avenue B in Temple. All three facilities are privately owned and operated, but all are served by the regional transit system and have public access. ADA compliance and Universal Design for the facilities and for access to the facilities are issues for consideration in station design.

General design guidelines for the ***Shelter Functional Class***, the ***Bench Functional Class***, and the ***Basic Bus Stop Functional Class*** all have a similar basis because of their physical and functional similarities.

In general, the overall design guidance for all Functional Classes of bus stops is that all stops must include a 5' x 8' pad for wheelchair loading at the bus door. If a shelter is present, a 2.5' x 4' wheelchair space for maneuvering must be provided within the shelter. Other bus stop attributes, including the adjacent sidewalk and sidewalk access, must comply with ADA standards.

Compliance to ADA requirements for every bus stop in the system is an expensive and complex task. Oftentimes, balancing passenger needs, physical constraints, and budget constraints in planning for full ADA compliance requires the development of a facility Capital Improvement Plan to inventory gaps, define and prioritize projects, and develop a project implementation plan and schedule.

Two general placements of the required ADA landing pad for wheelchairs are possible. **Figure 8-1** shows the landing pad placed partially within the shelter, combining the required maneuvering room with the pad. In **Figure 8-2**, the landing pad is placed fully outside the shelter and the maneuvering room is separate. This configuration affects the distance that the shelter must be placed from the curb.

Figure 8-1: Bus Stop With Shelter with Wheelchair Landing Pad at the Shelter

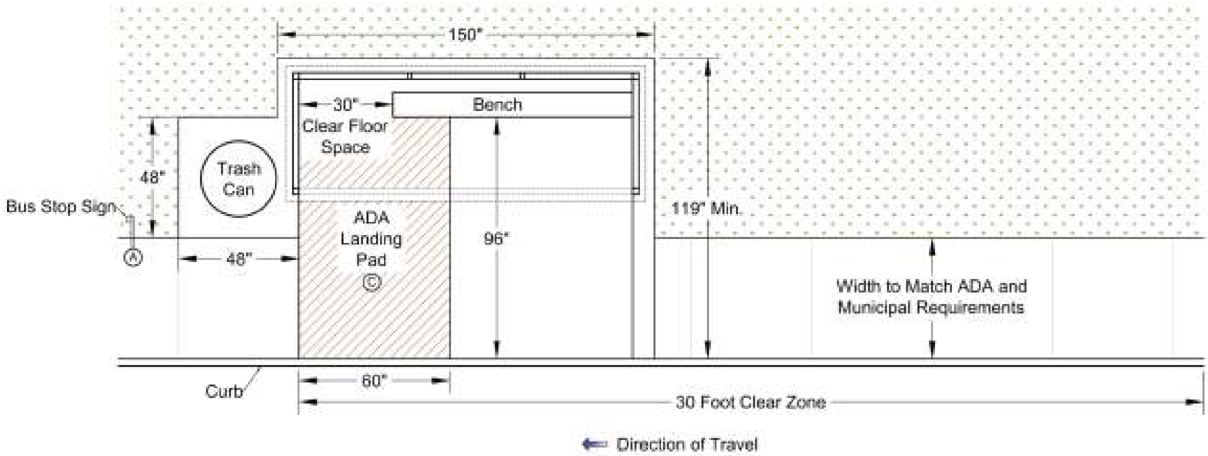


Figure 8-2: Bus Stop With Shelter with Wheelchair Landing Pad Outside the Shelter

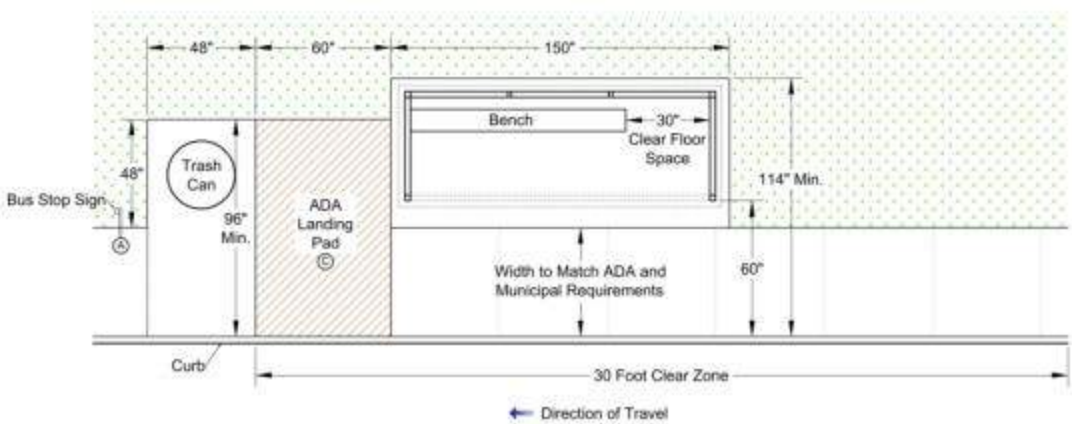


Figure 8-3: Sidewalk Placed Behind a Bus Stop

Figure 8-3 shows another configuration with just a bench, with the sidewalk placed on the back side of the pad rather than against the curb. The general design guidance for the bus stop is not affected; the same requirements for the ADA landing pad and maneuvering room must be met.

Figure 8-4: Bus Stop With Bench and Wheelchair Landing Pad

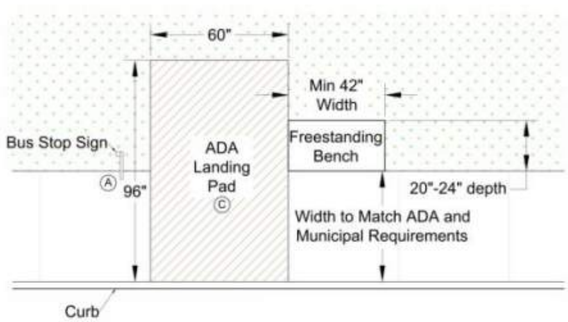


Figure 8-4 illustrates the general design criteria for a bench or a simple bus stop. Since the size of the 5’ x 8’ landing pad is deeper than the sidewalk, it extends further back than the sidewalk or the bench. This configuration also provides room for a wheelchair to be placed out of the walking path of the sidewalk.

In addition to the consideration of ADA compliance for the design of bus stops and the placement of stops in relation the street, the placement of stops in relation to adjacent buildings should also be considered as a general design guideline.

Figure 8-5: Bus Stop Separated from Building

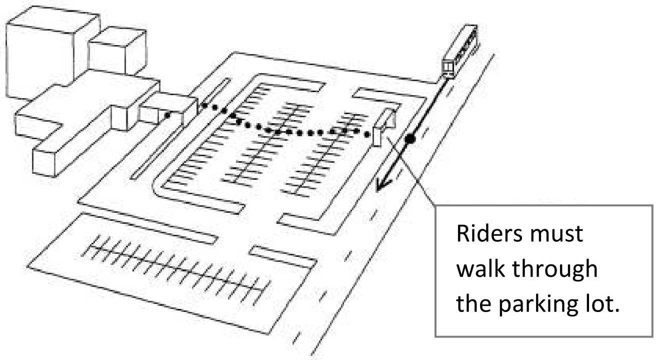


Figure 8-6: Bus Stop Adjacent to Building

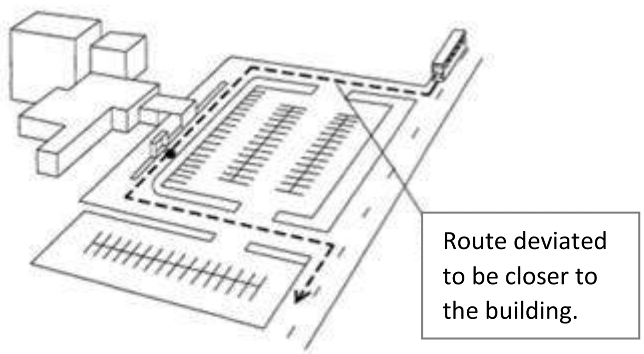


Figure 8-7: Bus Stop Connected with a Path

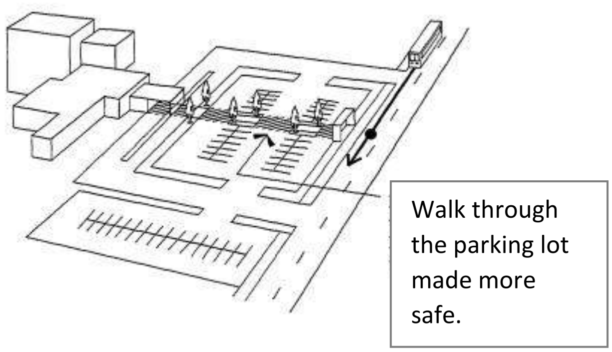


Figure 8-5 shows a configuration of a bus stop and an adjacent building that is typical for suburban areas. In this instance, a large parking lot is placed between the street and the building entrance. With the bus stop placed on the street on the periphery of the site, riders must walk through the parking lot in order to access the bus stop or the building. This configuration is present in the region at places such as the VA Hospital and the Scott & White Hospital in Temple, some entrances to the Temple Mall, Central Texas College in Killeen, and shopping destinations such as Wal-Mart, HEB, and strip malls throughout the region.

Figure 8-6 shows one way that this access, convenience, and safety issue can be addressed. This design has the bus route deviated into the parking lot, allowing the stop to be placed closer to the building. This placement eliminates the need for riders to walk through the parking lot, but it increases length of the bus route.

Figure 8-7 shows another alternative for increasing access and safety for a bus stop. This design provides a distinct pedestrian path between the bus stop and the building. While the riders still must walk through the parking lot to access the bus stop and the building, the path is designed for pedestrians to make the access more visible and thus safer. This design also has the advantage of not impacting the length of the bus route with any deviations.

Table 8-1 summarizes the recommendations for right-of-way applicable to all transit network Functional Classes. It includes ADA requirements for the landing pad, sidewalks, accessible ramps, surfaces, and cross slopes.

Table 8-1: Summary of Design Guidelines for Bus Network Functional Classes

Feature	Minimum Dimensions	Preferred Dimensions	Max Slope	Clearance	From	Notes
Bus Stop Sign on Pole				2.5'	Curb	
Landing Pad	5' x 8'	10' x 8'				5' wide parallel to road; 8' deep perpendicular to road
Bench	20" x 42"	24" x 42"		4'	Pedestrian Path	
Maneuvering Space	2.5' x 4'				Bench or Shelter	Clear space for wheelchair
Bus Shelter				11'	Curb	Must not block the pedestrian path
				5'	Sidewalk	
				2'	Curb	
				12'	Buildings or Walls	
Sidewalk Accessible Path	4'	5'				
Ramp Detectable Warnings						Truncated domes in aligned pattern, with color contrast
Ramp			1:12			Max ramp length 15'
Ramp Flared Sides			1:10			
Adjacent Road & Gutter			1:20			
Surface of Path	3'		1:20			
Cross Slope			1:48			

General Design Guidance for Other Group Transportation Modes

The remaining four group transportation modes of intercity bus, AMTRAK, the Bus-AMTRAK connection, and passenger air are all privately owned and operated and all relate to operations rather than

to infrastructure. Since the design standards for their facilities are both limited and are under the jurisdiction of the private sector, only the general requirements for ADA compliance that apply to all public facilities are relevant for these modes. ADA compliance must be applied to all public facilities that interface with these private group transportation modes.

Potential Group Transportation Mode Projects

In contrast to the road network which provides physical infrastructure, the bus network primarily provides transportation services through bus operations. The concepts of road projects and bus projects are therefore significantly different. Where the road network cites specific physical infrastructure projects such as new construction or adding lanes to existing roads, projects for the bus network are typically grouped projects. The 2019 – 2022 Transportation Improvement Program (TIP) listings for the bus network includes items for vehicle purchases, capital preventative maintenance, and operating funds. No physical infrastructure projects are listed.

For other group transportation modes, the 2040 Metropolitan Transportation Plan (MTP) lists two lighting projects for the Draughon-Miller Central Texas Regional Airport. MTP projects for group transportation are shown in Table 8-2.

Table 8-2: Group Transportation Projects from the 2040 MTP

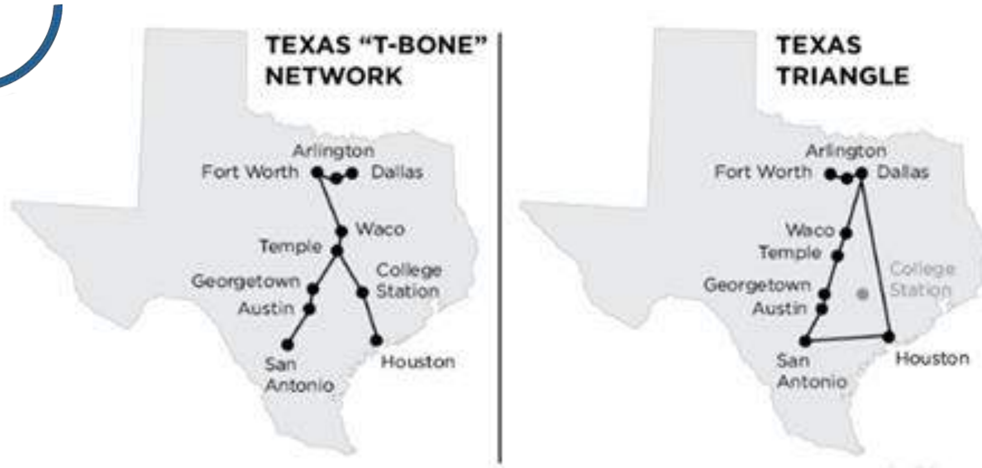
Mode	Project ID	Project	Project Description	City	Source	Year
Bus	A40-15	Fleet Replacement	Purchase new buses	N/A	Funded Cat 7	2020
Passenger Air		Draughon-Miller Central Texas Regional Airport	Engineering & lighting design	Temple	Aviation Capital Improvement Program	2019
Passenger Air		Draughon-Miller Central Texas Regional Airport	Lighting on runways and apron	Temple	Aviation Capital Improvement Program	2020

There is, therefore, not a set of specific group transportation projects which can be built into a network and plan which is equivalent to the Thoroughfare Plan for the road network.

Although there are no specific public sector projects for other group transportation modes, there are several private sector projects in planning stages related to passenger rail service through Temple.

The Federal Railroad Administration (FRA) has issued a Draft Environmental Impact Statement (DEIS) for the Texas Central bullet train between Houston and Dallas. This planning document sets the approval for the project's planning, design, and pre-construction phases. The preferred route as designated in the DEIS follows existing electrical transmission lines and has only one mid-point stop, so the route does not pass through the KTMPO region. However, Texas Central has reached an agreement with AMTRAK for through tickets and seamless connections between the services, which will link the high-speed rail service to AMTRAK the Texas Eagle route through Temple. The Texas Central service is distinct from both the related "Texas T-Bone" and the "Texas Triangle" high-speed rail alternatives shown in **Figure 8-8**, both of which feature routes directly through Temple.

Figure 8-8: Proposed High Speed Rail Routes in Texas



At the state level, TxDOT partnered with the Oklahoma DOT and FRA on the *Texas-Oklahoma Passenger Rail Study*, which was concluded in 2017 with a service-level Environmental Impact Statement, a Record of Decision, and a service development plan. This study examined various options for enhanced passenger rail service, but the three NEPA-preferred alternatives are all for high-speed service, with twelve to twenty daily round trips passing through Temple. The three preferred alternatives are identical from Hillsboro to San Antonio, as shown in **Figure 8-9**.

Figure 8-9: NEPA-Preferred Alternatives from the Texas-Oklahoma Passenger Rail DEIS

The TxDOT *2016 Texas Rail Plan Update* reviewed potential near-term improvements to current AMTRAK service. The report noted a strong connection between the Texas Eagle route through Temple and the Sunset Limited route running east-west through San Antonio. Its core recommendations were for projects to increase the current three-times-a-week service on both routes to daily service. While daily service was shown to be efficient and is a cost-effective project with a return on investment of 2.45, the plan noted that the project was not supported by the Union Pacific Railroad because of the need for double-tracking to address capacity issues. The 2016 estimate for the capital funding required to upgrade the tracks for daily service was $750 million.

Summary

Based on the definitions of Functional Class for the bus network, general design guidance for bus stops and for the placement of stops in relation to adjacent buildings was listed. Specific details depend on several factors, including the needs of the bus stop, physical characteristics of the street, traffic volumes, ADA compliance and safety considerations, local standards and preferences, and funding. Therefore, the treatments are presented as guidance for typical conditions, and should be refined as needed for each specific project.

Potential projects for group transportation modes typically relate to operations rather than infrastructure. Project listings in the 2017-2020 TIP and the Mobility 2040 MTP generally are grouped categories rather than specific physical projects. As a result, there can be no physical map or plan of group transportation projects equivalent to the Thoroughfare Plan. Conceptual specific and system-wide projects for group transportation are listed in Chapter 12.

Chapter 9: Freight Plan

CHAPTER HIGHLIGHTS

- **Freight General Design Guidance**
- **Potential Freight Projects**
- **Future Freight Network**

Introduction

Freight modes for the KTMPO region include truck, freight rail, and freight air. Because the freight rail and freight air modes access the network only at specific intermodal points, Functional Classes have been defined as an organizing element only for trucks. Truck Functional Classes are defined in Chapter 4 according to the differences in the desirability of the presence of trucks on the road network. They include the ***Truck Priority***, ***Truck Restricted***, ***Truck Hazardous Material***, and ***Truck Prohibited*** Functional Classes.

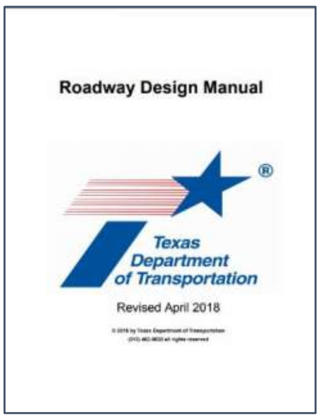
The purpose of this Plan is to define the freight transportation modes so that all potential projects may be displayed and reviewed together, and so that the appropriate right-of-way and the interaction between modes may be identified and planned for.

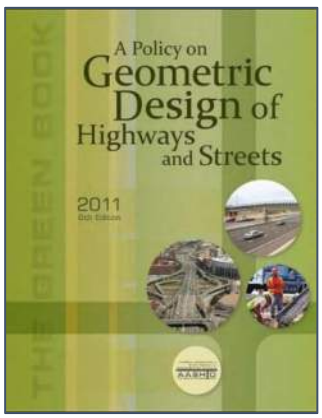
Freight General Design Guidance

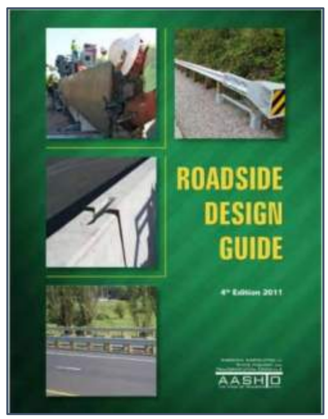
General Design Guidance for the Truck Network

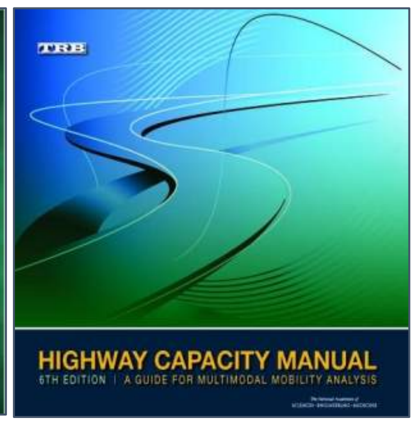
Since the truck network corresponds to the road network, general design guidance follows the cross-sections by Functional Class as defined in the Thoroughfare Plan in Chapter 6. Truck Functional Classes are envisioned as being a complementary overlay on road Functional Classes.

General design guidance for on-system roads in Texas is provided by the *TxDOT Roadway Design Manual*. The manual includes general and basic design guidance, with additional guidance addressing the specific needs of urban streets, suburban streets, two-lane and multi-lane rural highways, and freeways. It references several other publications, such as the *AASHTO Policy on Geometric Design of Highways and Streets* (the green book), the *AASHTO Roadside Design Guide*, and the TRB *Highway Capacity Manual*.







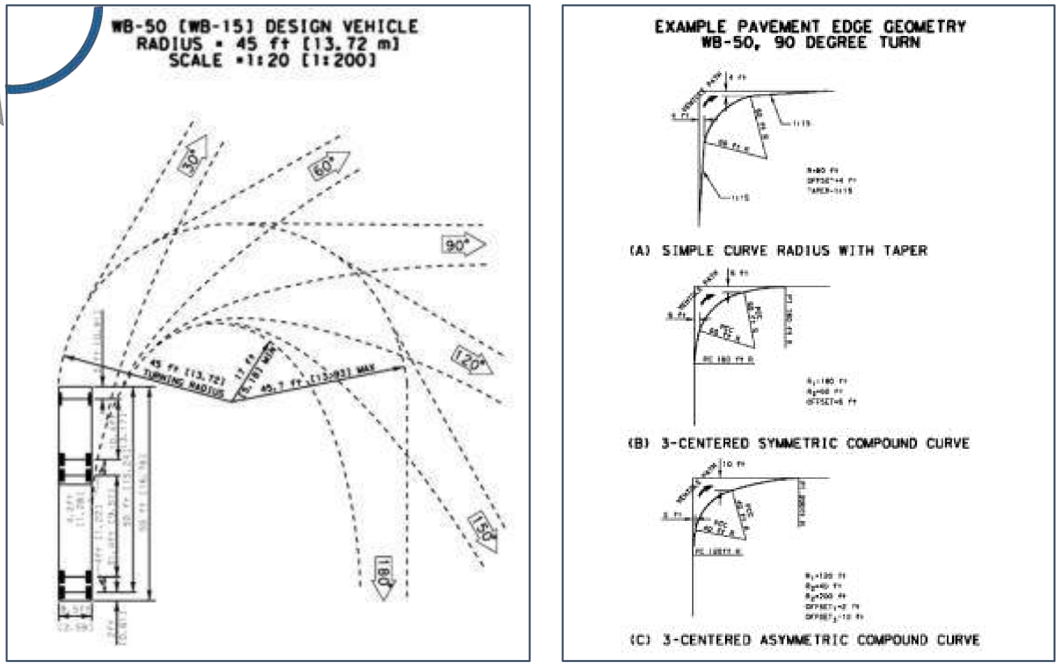


The presence of trucks within any particular road Functional Class is accommodated through the concept of the "design vehicle." Larger vehicles such as trucks, emergency response vehicles, and buses have specific needs which must be addressed in road design; particularly turning radius, lane width, vertical clearance, and horizontal clearance. The specific design vehicle which is chosen for a particular road impacts the speed and safety of the road for all users. The *TxDOT Roadway Design Manual* does not define firm guidelines for the selection of the design vehicle for road design. It recognizes several factors which impact the selection of the design vehicle:

- Functional Class of the road and of intersection roads
- Frequency of use of the road by large vehicles (i.e., truck percentage of ADT)
- Types of large vehicles that use the road
- Available right-of-way

Templates defining the minimum turn radius and pavement edge geometries for turns for various types of large vehicles are provided, as shown in **Figure 9-1**.

Figure 9-1: Sample TxDOT Templates for Design Vehicle Geometrics



The *TxDOT Roadway Design Manual* provides special design criteria for the Texas Highway Freight Network (THFN). TxDOT policy for roads designated as the THFN calls for a minimum 18.5’ vertical clearance. Horizontal clearance is shown as dependent on the design speed of the roadway, with higher speeds requiring greater clearance. A horizontal clearance of 80’ from the edge of the road to the closest vertical element of the roadside is required for design speeds up to 90 mph; higher design speeds require a 90’ clearance.

The NACTO *Urban Street Design Guide* provides additional general guidance on the definition of the design vehicle. Rather than focusing road design on the needs of the largest vehicle, it brings an alternate viewpoint of designing for the most vulnerable user while providing reasonable accommodation for all vehicles within the full road network. This approach considers two vehicles: the “design vehicle,” which is a frequent user of a particular road setting the minimum turning radius and other geometrics, and the “control vehicle,” which is an infrequent user of the road but which still must be accommodated.

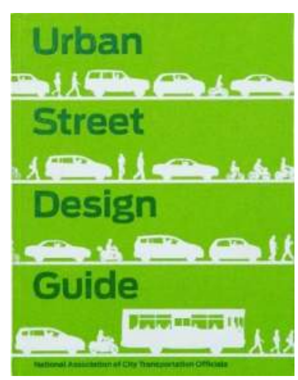
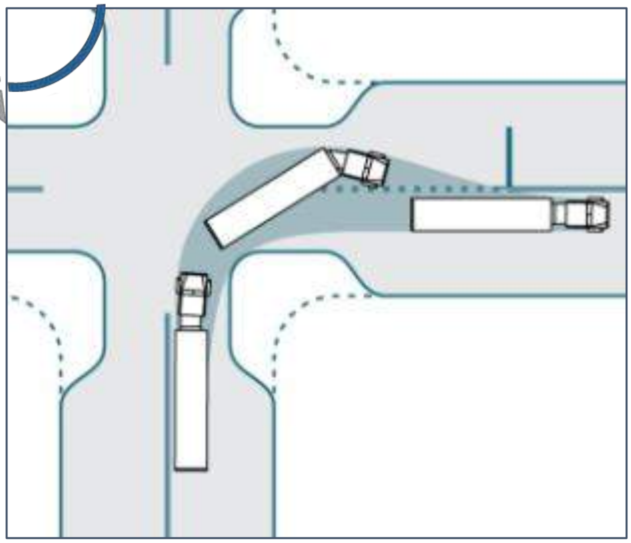


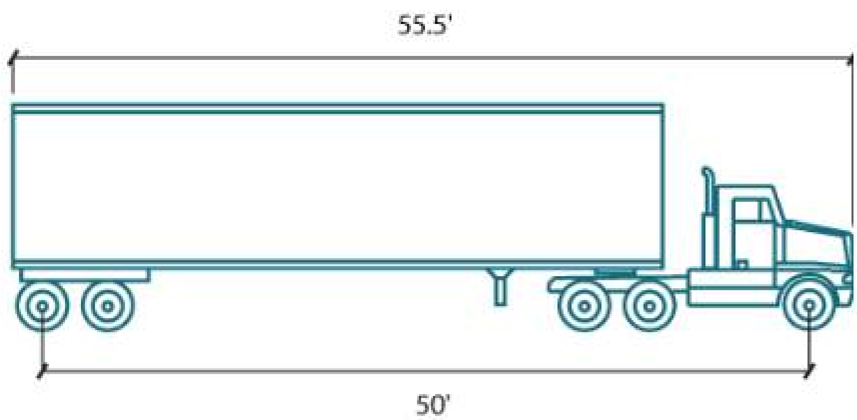
Figure 9-2: Control Vehicle Using Multiple Lanes for a Turn



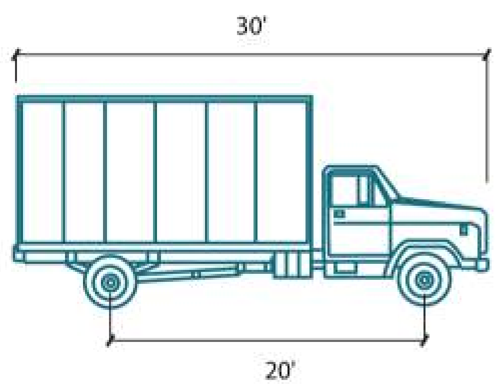
The NACTO guide recommends defining both a design vehicle and a control vehicle for each road based on its context. In reference to this Plan, road context is defined by the combination of road and truck Functional Classes. The NACTO guide posits that roads should be designed so that the design vehicle can make a turn using one turning lane. In contrast, the infrequent control vehicle is still accommodated, but its turns may use multiple lanes within an intersection. **Figure 9-2** shows how a setback stop line accommodates the larger turn radius of a control vehicle to allow it to encroach on the adjacent lane to make its turn. The intent of this design guidance is to reduce the width of the intersection and to slow traffic to improve road safety for all users.

The NACTO guide recommends the use of different design vehicles for different contexts, which correspond to road and truck Functional Classes.

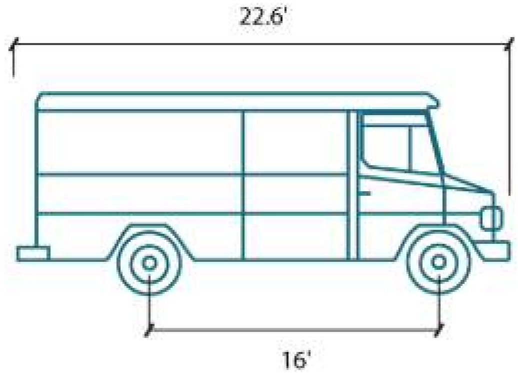
For designated truck routes, corresponding to the ***Truck Priority*** and ***Truck Hazardous Material*** Functional Classes, a WB-50 design vehicle is recommended. The standard WB-50 is an 18-wheeler with a 50' wheelbase and an overall length of 55.5'.



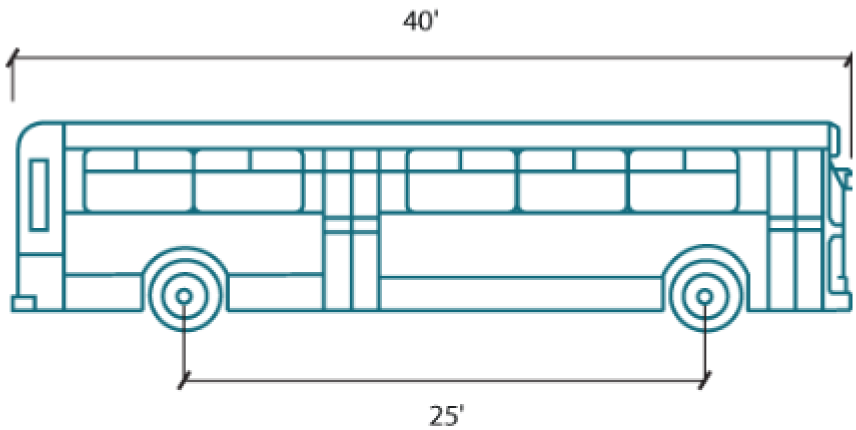
A smaller SU-30 design vehicle is recommended for downtown and commercial streets, which serve land uses requiring deliveries of goods. As a single unit vehicle with a smaller wheelbase, the SU-30 requires a smaller turning radius to stay within one lane on its turns. The larger WB-50 may be used as a control vehicle for these roads, with stop line setbacks accommodating turns which use the full intersection. The use of this class of design vehicle is appropriate for roads in the ***Truck Restricted*** Functional Class.



For the ***Truck Prohibited*** Functional Class on neighborhood and residential streets, the smaller single unit DL-23 delivery truck is an appropriate design vehicle. This choice allows the greatest flexibility to reduce lane widths, reduce the size of intersections, and slow traffic to design the road for the safety and convenience of all users.



Bus routes are defined independently of other design considerations, and may be present on any road Functional Class from Interstate Highway down to Local Streets. The needs of the BU-40 bus should be considered when selecting the design vehicle and control vehicle for all designated bus routes. When selecting the appropriate design vehicle based on truck access to land uses in a particular context, care should be taken that buses do not routinely have difficulty in managing turns on their routes.



The use of different design vehicles for each road and truck Functional Class is a concept that emphasizes the need for planning to define road rights-of-way. Roads built with a specific turning radius, lane width, vertical clearance, and horizontal clearance cannot easily be updated if land use changes create a need for accommodating larger vehicles. This makes the designation of truck routes and bus routes dependent on the design of the adjacent roads and their ability to accommodate larger vehicles. This is also a consideration in the development of industrial parks and intermodal areas. The size and characteristics of fire trucks should be considered when setting the design vehicle and control vehicle for all streets in order to ensure access.

General Design Guidance for Other Freight Modes

Freight railroads access the road network only at specific intermodal points and, in addition, are privately owned. Design standards and construction projects for railroad infrastructure are, therefore, largely defined by their private sector owners. TxDOT provides *Plans, Specifications, & Estimates Requirements on Projects with Railroads*, which provides guidance to road contractors when their projects interact with at-grade crossings. However, the TxDOT document does not specify standards for railroad infrastructure.

The exception on freight railroad design standards involves specific guidance from the Federal Railroad Administration (FRA) on infrastructure for railroad crossings for designated railroad quiet zones. A quiet zone is an exception to the FRA rules requiring trains to sound their horns when approaching at-grade crossings. To ensure safety, the quiet zone requires active warning devices, which typically include four-quadrant gates with warning lights, road channelization, and medians.

There are currently no designated railroad quiet zones in the KTMPO region.

Similar to rail freight, air freight accesses the road network only at specific intermodal points. Design guidance for roadside access to airports corresponds to the road design guidance by Functional Class as defined in the Thoroughfare Plan in Chapter 6.

Potential Freight Transportation Projects

The 2017 Texas Freight Mobility Plan provides insights into the scope of freight projects by detailing project evaluation criteria for freight transportation modes, as shown in **Table 9-1**. These criteria show that freight projects have multiple goals and, therefore, may also have multiple sources.

Table 9-1: Project Evaluation Criteria from the Texas Freight Mobility Plan

Texas Multimodal Freight Network (TMFN) Project Evaluation Criteria
On the Texas Multimodal Freight Network
Eliminates an at-grade rail crossing on the Texas Multimodal Freight Network
Improves structurally deficient or functionally obsolete facility
Improves access to a terminal or certified development site
Reduces travel time
Improves travel time reliability
Improves efficient movement
Encourages truck to rail diversion
Improves a safety hot spot
Improves safety on a high-volume hazmat route

To address this, potential future projects for freight modes have been derived from sources that address the range of the listed project evaluation criteria. They include:

- Routes defined by the KTMPO Freight Advisory Committee, as shown in **Table 9-2**.
- Load-restricted bridges, as shown in **Table 9-3**.
- Load-restricted roads, as shown in **Table 9-4**.
- Roads with geometric restrictions, as shown in **Table 9-5**.
- At-grade railroad crossings, shown in **Table 9-6**.

The listing of truck routes identified by the KTMPO Freight Advisory Committee in Table 9-2 also includes a proposed new intermodal site. The Civilian-Military Joint Use Rail-Truck Multimodal Facility is under study for a site on Fort Hood, located between the railroad tracks and IH-14 in an area bounded by Clarke Rd to the west and Clear Creek Rd to the east. While this site is not itself a rail or a road project, and has not been proposed by KTMPO, it is a proposed multimodal terminal which may generate the need for projects, and so should be considered.

Table 9-2: Truck Routes Identified by the KTMPO Freight Advisory Committee

Freight Advisory Committee Identified Truck Routes		
Road	**Limits From**	**Limits To**
FM 93	IH 35	US 190
FM 436	IH 35	US 190
FM 439	SH 195	SH 317
FM 1741	US 190	FM 93
LP 121	FM 436	FM 439
SH 36	Coryell Co line	Loop 363
SH 53	Loop 363	Falls Co line
SH 317	FM 439	McLennan Co line
Temple Outer Loop	IH 35 at Hart Rd	IH 35 S of Temple

Table 9-3: Load Restricted Bridges

Load Restricted Bridges		
Road	**Crossing**	**Weight Limit**
BIG ELM CREEK	#100	36,000
BIG ELM CREEK	#607	15,000
BIRD CREEK	#67	12,000
LEON RIREV	#62	36,000
LITTLE ELM CREEK	#507	21,000
LITTLE ELM CREEK	#618	21,000
LITTLE ELM CREEK	#95	12,000
LITTLE ELM CREEK	#98	12,000
NOLAN CREEK	#1	12,000
RUNNELLS CREEK		28,000
S DARRS CREEK	#52	21,000
SALADO CREEK	#60	24,000
WILLOW CREEK	#18	21,000

Table 9-4: Load Restricted Roads

Load Restricted Roads		
Road	Limits From	Limits To
FM 116	US 190	0.3 mi S of Abbot Ln
FM 436	Loop 121	US 190
FM 437	US 190	SH 53
FM 438	Loop 363	FM 935
FM 487	Williamson Co line east	Williamson Co line west
FM 487	SH 95	Milam Co line
FM 580	CR 3270	FM 116
FM 935	IH 35	Falls Co line
FM 940	FM 437	FM 485
FM 964	Farmers Rd	FM 485
FM 1113	FM 580	N 1st St
FM 1123	Holland Rd	SH 95
FM 1237	SH 317	IH 35
FM 2086	FM 438	SH 53
FM 2115	FM 487	IH 35
FM 2184 North	US 190	New Colony Rd
FM 2184 South	Reeds Cemetery Rd	US 190
FM 2268	FM 1123	IH 35
FM 2268	SH 95	Milam Co line
FM 2409	SH 36	FM 2601
FM 2410	Verna Lee Blvd	IH 14
FM 2483	FM 2271	SH 317
FM 2484	SH 195	IH 35
FM 2601	Moody Leon Rd	SH 317
FM 2670	Wolfridge Rd	FM 440
FM 2843	Cedar Valley Rd	IH 35
FM 2904	FM 2086	SH 320
FM 3046	Lampasas Co line	FM 116
FM 3117	US 190	SH 53
FM 3219	Bus 190	FM 439
FM 3369	FM 438	SH 320
LOOP 121	IH 14	IH 35
MARTIN LUTHER KING JR BLVD	Bus 190	IH 14
N FORT HOOD ST	Bus 190	Rancier Ave
SPUR 1237	FM 1237	Southerland Rd
SPUR 439	IH 14	FM 439

Table 9-5: Roads with Geometric Restrictions

Geometric Restricted Roads	
Road	**Restrictions**
Charter Oak Dr	RR underpass 13' 8", curve, narrow, hill
Levy Crossing Rd	At grade crossing with excessive crown
N 5th St	At grade crossing with excessive crown
Waco Rd	RR underpass 14' 5", curve, narrow, hill

Table 9-6 lists the 109 at-grade railroad crossings in the region. There are also 29 grade-separated crossings, which are not included in the table.

Table 9-6: At-Grade Railroad Crossings

Railroad	City	Crossing Street	Number of Tracks	Angle of Crossing
UP	Bartlett	E Bell St	1	90
BNSF	Belton	College St	2	60
BNSF	Belton	N Beal St	1	70
BNSF	Belton	N Penelope St	1	70
BNSF	Belton	N Wall St	1	70
UP	Belton	Hubbard Ln	2	70
BNSF	Copperas Cove	7th St	1	90
BNSF	Copperas Cove	Bradford Dr	1	90
BNSF	Copperas Cove	FM 116	1	90
BNSF	Copperas Cove	Grimes Crossing Rd	1	80
BNSF	Copperas Cove	Main St	1	90
BNSF	Copperas Cove	Unnamed Rd	1	90
BNSF	Copperas Cove	Wolf Rd	1	90
BNSF	Fort Hood	Ammo Rd	2	70
BNSF	Fort Hood	S 79th St	2	90
Fort Hood	Fort Hood	S 79th St	1	90
Fort Hood	Fort Hood	Santa Fe Ave	1	90
Fort Hood	Fort Hood	Spur Dr	1	90
Fort Hood	Fort Hood	Spur Dr	1	90
Fort Hood	Fort Hood	Warehouse Ave	1	90
BNSF	Harker Heights	FM 3219	1	90
UP	Holland	Fannin St	2	80
UP	Holland	FM 1123	1	90
BNSF	Kempner	FM 2313	1	90

Table 9-6: At-Grade Railroad Crossings (continued)

Railroad	City	Crossing Street	Number of Tracks	Angle of Crossing
BNSF	Killeen	2nd St	1	90
BNSF	Killeen	College St	1	90
BNSF	Killeen	Ft Hood St	1	85
BNSF	Killeen	Gilmer St	1	90
BNSF	Killeen	N 10th St	1	90
BNSF	Killeen	N 28th St	2	90
BNSF	Killeen	N 4th St	1	90
BNSF	Killeen	N 8th St	1	90
BNSF	Killeen	N Gray St	1	90
BNSF	Killeen	N Roy Reynolds Dr	1	85
BNSF	Killeen	Twin Creeks Dr	1	90
UP	Little River-Academy	Bill Money Rd	1	80
UP	Little River-Academy	FM 436	1	80
UP	Little River-Academy	W Church St	1	80
BNSF	Nolanville	Jack Rabbit Flat Rd	1	90
BNSF	Nolanville	Levy Crossing Rd	2	90
BNSF	Nolanville	N 5th St	2	90
BNSF	Nolanville	Old Nolanville Rd	3	90
BNSF	Nolanville	Pleasant Hill Cemetery Rd	1	90
Spur	Nolanville	E Ave H	1	90
Spur	Nolanville	FM 439	1	80
BNSF	Rogers	Benton Rd	2	90
BNSF	Rogers	FM 2184	3	90
BNSF	Rogers	FM 437	3	90
BNSF	Rural Bell Co	1237 Spur	3	60
BNSF	Rural Bell Co	Brewster Rd	1	70
BNSF	Rural Bell Co	FM 1237	1	60
BNSF	Rural Bell Co	FM 93	1	45
BNSF	Rural Bell Co	Franklin Rd	1	45
BNSF	Rural Bell Co	Guyton Rd	1	45
BNSF	Rural Bell Co	Heidenheimer Rd	3	90
BNSF	Rural Bell Co	Highland School Rd	2	90
BNSF	Rural Bell Co	Knob Creek Rd	2	45
BNSF	Rural Bell Co	Luther Curtis Rd	1	60
BNSF	Rural Bell Co	Neroc Rd	2	90
BNSF	Rural Bell Co	Pritchard Rd	2	45

Table 9-6: At-Grade Railroad Crossings (continued)

Railroad	City	Crossing Street	Number of Tracks	Angle of Crossing
BNSF	Rural Bell Co	Southerland Rd	2	60
BNSF	Rural Bell Co	Tem Bel Ln	1	70
BNSF	Rural Bell Co	Wheat Rd	1	90
BNSF	Rural Bell Co	Willow Grove Rd	1	45
Spur	Rural Bell Co	Levy Crossing Rd	1	50
UP	Rural Bell Co	E Big Elm Rd	1	90
UP	Rural Bell Co	Harber Rd	1	90
UP	Rural Bell Co	Hillyard Rd	1	90
UP	Rural Bell Co	Landfill Rd	1	80
UP	Rural Bell Co	Lindemann Rd	1	90
UP	Rural Bell Co	Mills Ln	1	90
UP	Rural Bell Co	Roberts Rd	1	90
UP	Rural Bell Co	Stag Rd	1	80
BNSF	Rural Lampasas Co	FM 1715	1	90
BNSF	Rural McLennan Co	Stampede Rd	1	45
BNSF	Temple	49th St	2	60
BNSF	Temple	Center St	1	90
BNSF	Temple	FM 3117	2	45
BNSF	Temple	Industrial Blvd	2	85
BNSF	Temple	Industrial Blvd	1	60
BNSF	Temple	Industrial Blvd	1	60
BNSF	Temple	Kegley Rd	1	70
BNSF	Temple	Lucius McCelvey Dr	2	90
BNSF	Temple	Martin Luther King Jr Dr	2	45
BNSF	Temple	Moore's Mill Rd	1	70
BNSF	Temple	S 25th St	2	70
BNSF	Temple	S Main St	2	70
BNSF	Temple	Unnamed Rd	1	70
UP	Temple	31st St	1	45
UP	Temple	Berger Rd	1	80
UP	Temple	Blackland Rd EB	1	90
UP	Temple	Blackland Rd WB	1	90
UP	Temple	E Ave C	1	80
UP	Temple	E Central Ave	1	90
UP	Temple	E Houston Ave	1	90
UP	Temple	E Munroe Ave	1	90

Table 9-6: At-Grade Railroad Crossings (continued)

Railroad	City	Crossing Street	Number of Tracks	Angle of Crossing
UP	Temple	E Shell Ave	1	80
UP	Temple	E Young Ave	1	90
UP	Temple	FM 93	1	80
UP	Temple	Hatrick Bluff Rd	1	45
UP	Temple	Martin Luther King Jr Dr	2	50
UP	Temple	S 5th St NB	1	75
UP	Temple	S 5th St SB	1	75
UP	Temple	Taylors Valley Rd	1	45
UP	Temple	Unnamed Rd	1	90
UP	Troy	Bottoms East Rd	1	90
UP	Troy	E Austin St	1	45
UP	Troy	Lely Dr	1	90
UP	Troy	Main St	1	70

Future Regional Freight Network

All the truck routes identified by the KTMPO Freight Advisory Committee and load restricted bridges, load restricted roads, and roads with geometric restrictions have been included in the future network, as shown for the region in **Figure 9-3**. Insets to show better detail of projects are included as **Figure 9-4** for the western area and as **Figure 9-5** for the eastern area.

The Figures show the existing 2017 streets and the proposed projects for upgrades to the freight network. There are three instances of overlaps among categories of projects where a load restricted road is also on an existing truck priority route or on a freight route identified by the KTMPO Freight Advisory Committee:

- Fort Hood Street from BUS 190 and Tank Destroyer Blvd in Killeen, which is an existing truck priority route. Fort Hood Street is also SH 195.
- Loop 121 from IH 14 to IH 35 in Belton. This is not on an existing truck priority route, but is an upgrade project proposed by the KTMPO Freight Advisory Committee.
- FM 436 from Loop 121 to US 190 south of Killeen. This is not on an existing truck priority route, but is an upgrade project proposed by the KTMPO Freight Advisory Committee.

The key purpose of the Freight Plan is to identify future projects so that right-of-way can be planned for. Supporting this purpose, the Plan is coded with all projects defined by KTMPO from relevant sources, as detailed in Table 9-2 through Table 9-5. This listing has been developed as an input into the updated KTMPO MTP for the year 2045. One of the functions of the 2045 MTP will be to prioritize the listing of projects and to balance them against the anticipated available funding to derive funded and unfunded project listings.

Figure 9-3: Regional Future Freight Network

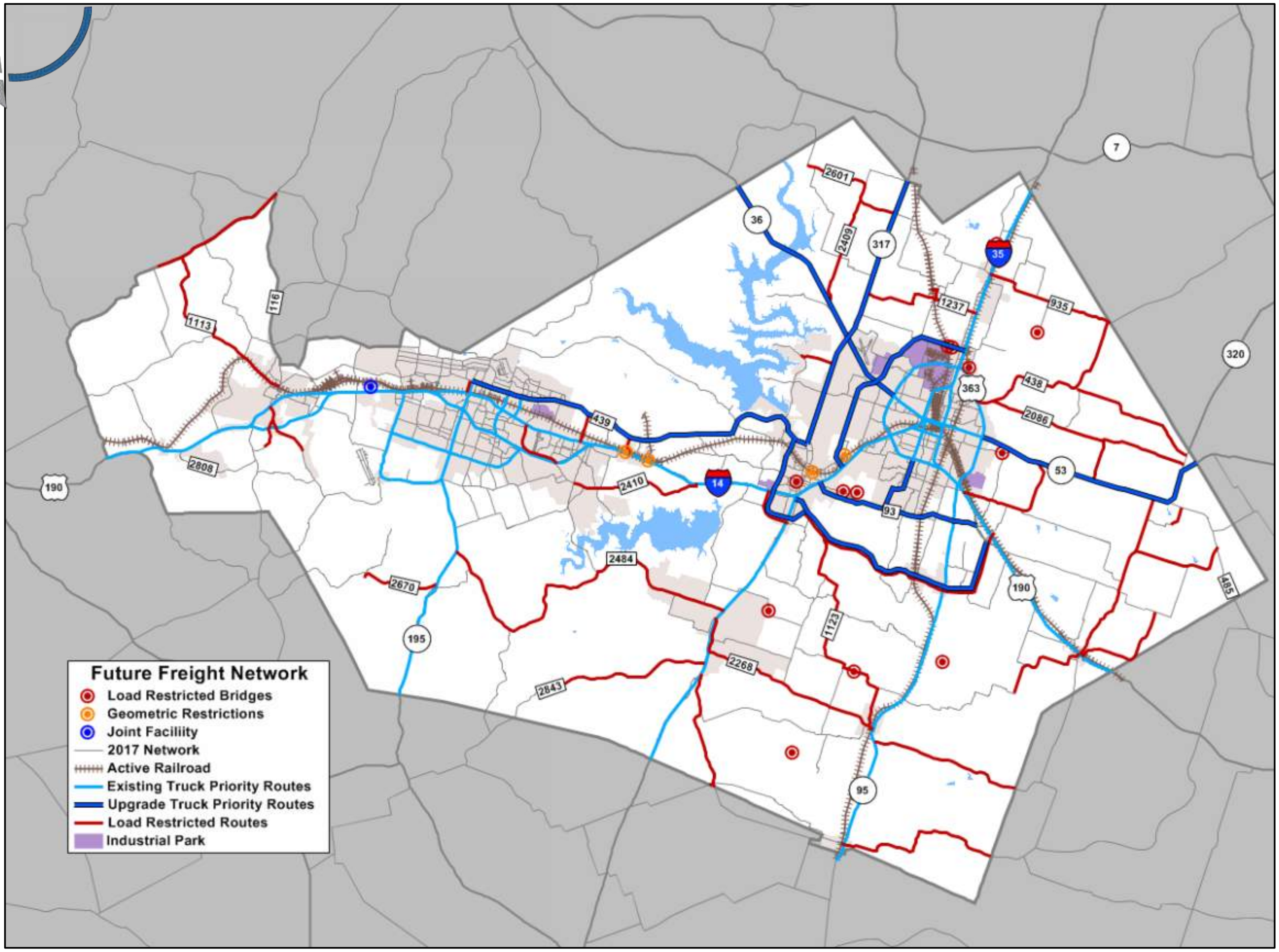


Figure 9-4: Future Freight Network in the Western Area

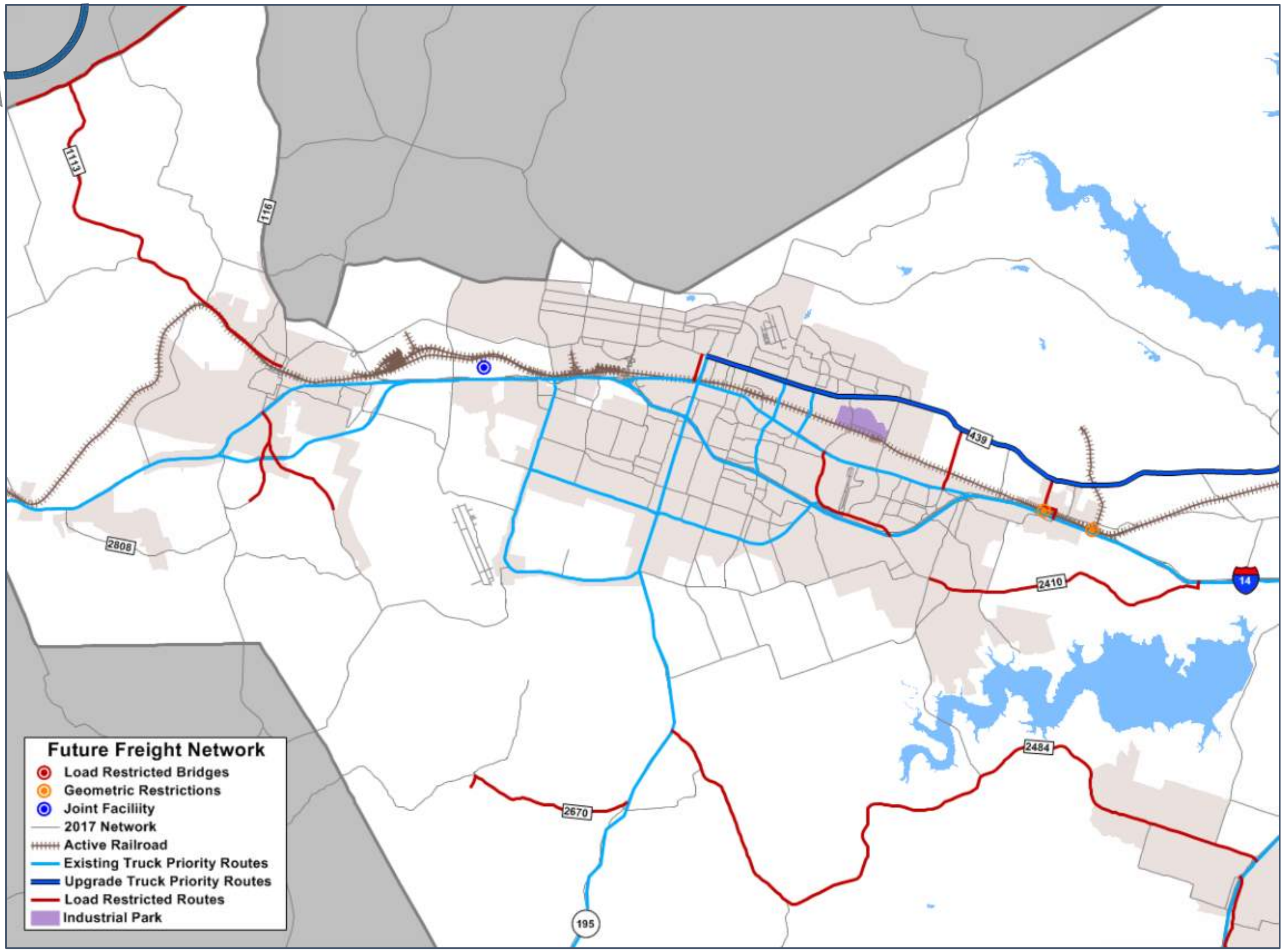
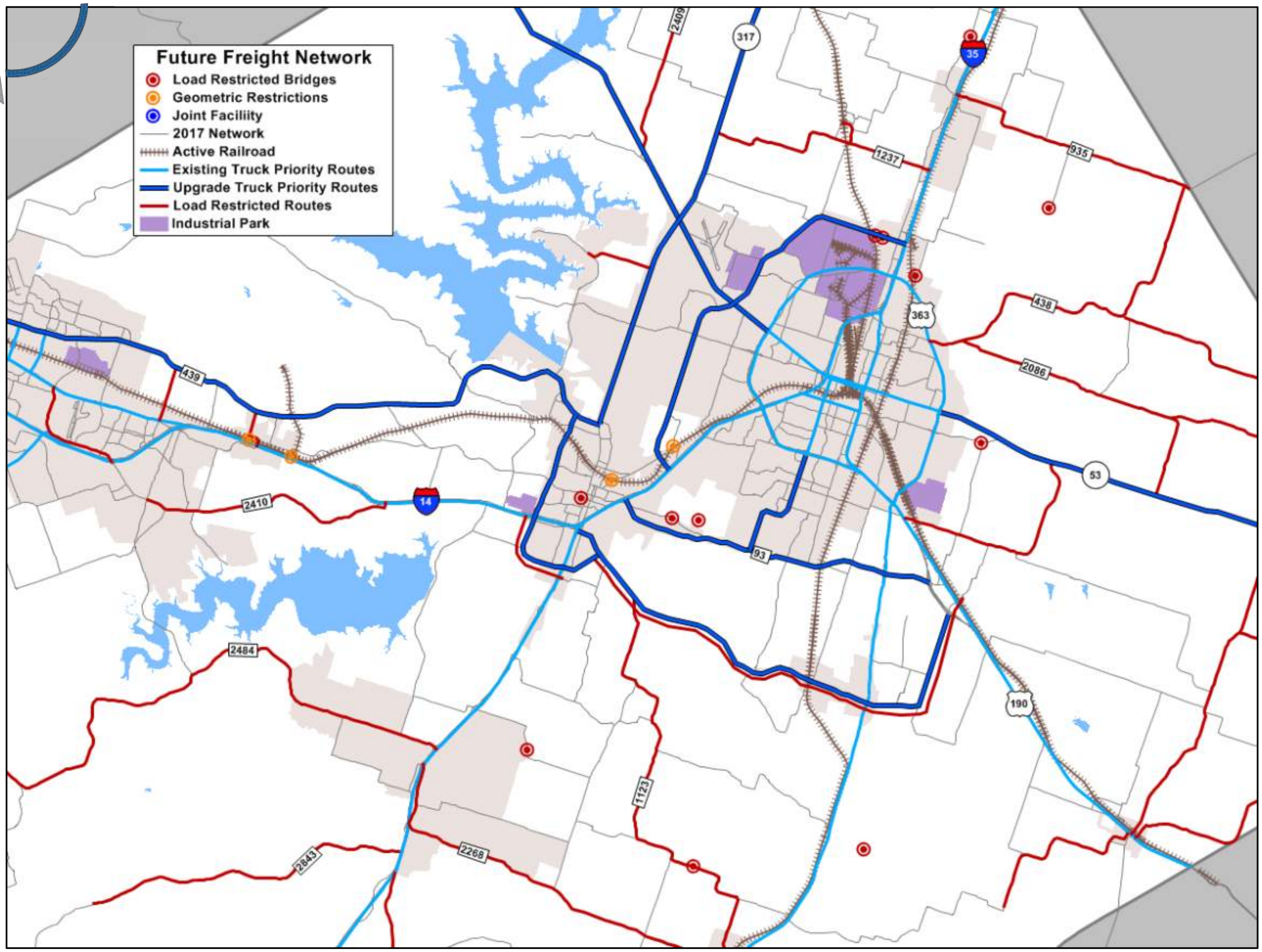


Figure 9-5: Future Freight Network in the Eastern Area



Summary

General design guidance for the truck network follows the auto network; the respective Functional Classes are designed to be complementary layers. National and TxDOT general design guidance relative to the truck network focuses on the definition of the design vehicle, which impacts the geometrics of the road for turning radius, lane width, vertical clearance, and horizontal clearance. These design criteria in turn affect vehicle speeds and the safety of the road for all users.

The *TxDOT Roadway Design Manual* does not define firm guidelines for the selection of the design vehicle for road design, but recognizes that various factors influence the appropriate choice. The NACTO *Urban Street Design Guide* considers two vehicles: the “design vehicle,” which is a frequent user of a particular road and which sets the minimum turning radius and other geometrics, and the “control vehicle,” which is an infrequent user of the road, but which still must be accommodated. It recommends defining both a design vehicle and a control vehicle for each road based on its context.

The use of different design vehicles for different road and truck Functional Classes is a concept that emphasizes the need for planning to define road rights-of-way. The size and characteristics of heavy trucks, fire trucks, and buses and their need for access should be considered when setting the design vehicle and control vehicle for all streets.

Since the rail freight and the air freight modes only interact with the road network at specific points, general design guidance on their infrastructure is not considered as a part of this Plan. However, guidance on the development of infrastructure for designated quiet zones for at-grade rail crossings is referenced. There are currently no designated railroad quiet zones in the KTMPO region.

Potential projects for the truck network are sourced to reflect the project evaluation criteria from the *Texas Freight Mobility Plan*. Sources include routes identified by the KTMPO Freight Advisory Committee and listings of load restricted bridges, load restricted roads, and geometric restricted roads.

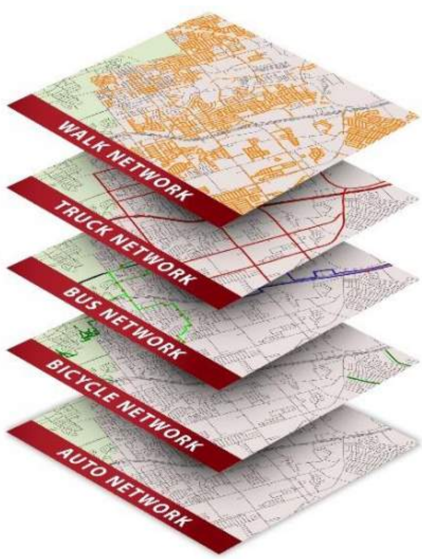
Chapter 10: Complete Streets

CHAPTER HIGHLIGHTS

- Context of the Region
- Context of the Street
- Complete Street Design Examples

Introduction

In chapter 3, the concept of Complete Streets was introduced to describe a shift from the traditional transportation engineering practice of optimizing streets for vehicle throughput towards a more multimodal approach that seeks to design streets that are usable, convenient, and safe for all users.



Chapters 6, 7, 8, and 9 have built on this by describing design guidance and potential projects for the full range of transportation modes which are available in the KTMPO region. In those chapters, each transportation mode has been treated separately and independently. This chapter on Complete Streets follows up by considering how each transportation mode can form integrated layers in a balanced regional multimodal network.

Complete Streets treatments are intended to bring the different layers of the multimodal system into a proper balance. This balance does not mean that every street must provide full accommodation for every transportation mode. It does mean that that every street should be designed with an appropriate consideration of all transportation modes to see how they can be balanced together.

> **…we could lay out an ideal street type, but in an existing city with constrained rights of way…not all streets can do all things at one time.**
>
> **David Gaspers**
> **Principal Planner**
> **City of Denver**

The definition of appropriate users for a street is a subjective judgement; not measurable in terms of its current uses. While Complete Streets treatments may not be immediately perceived as appropriate on specific streets that currently have low volumes of multimodal traffic, that perception is based on the use that has been driven by past street design where the street is optimized for automobiles. The inverse may be true; if a street is designed with all users in mind, then the convenience and the safety of the street will attract users. The goal is to build streets that will attract and serve new users for all modes, rather than merely accommodating existing users.

Implementing the desired Complete Streets design may be a challenge with the available right-of-way, funding constraints, and regulatory environment. Two general approaches are used:

The Complete Streets policy which has been adopted in Minneapolis is an example of an approach, where regulations aggressively call for Complete Streets treatments on every street. In this policy, top priority for every street is required to be given to pedestrians first, followed by bicycles & transit, with automobiles receiving the last priority. This is a deliberate decision to upend the traditional pyramid of placing automobiles as the first priority.

The other approach is illustrated by the Complete Streets policy being proposed in the Blueprint Denver Plan, which sets multimodal priorities in separate network layers. The pedestrian network is the first layer and is set as the highest priority for all streets. Each street is then evaluated individually for the appropriate modal priorities for the other layers of bicycling, transit, freight, and automobile. A particular street may therefore be optimized for automobiles, with a nearby parallel street prioritized for transit and bicycles. Conversely, another street may accommodate all modes. This approach is intended to implement a balanced system of modal layers rather than accommodating all networks ubiquitously.

With either approach, the very specific and objective design guidelines for each mode (as described in Chapters 4 through 9) are brought together and balanced under the very general and subjective concepts of Complete Streets (as described in this Chapter). Guidance for developing the proper balance of modes for Complete Streets therefore relies as much on imagination and judgement as it does on engineering.

> **Logic will take you from point A to point B. Imagination will take you anywhere.**
>
> **Albert Einstein**

Two contexts are important when considering the balance of modes for Complete Streets: the region and the street.

The context of the region considers variations of how Complete Streets principles can be applied with the transect of activity density, ranging from undeveloped rural areas to the high-density and high-activity urban cores.

The second context of Complete Streets is that of the street itself. The street may be considered as having various zones dedicated to different modes and uses, such as the sidewalk, the curbside, parking, travel lanes, and medians.

Complete Streets and the Context of the Region

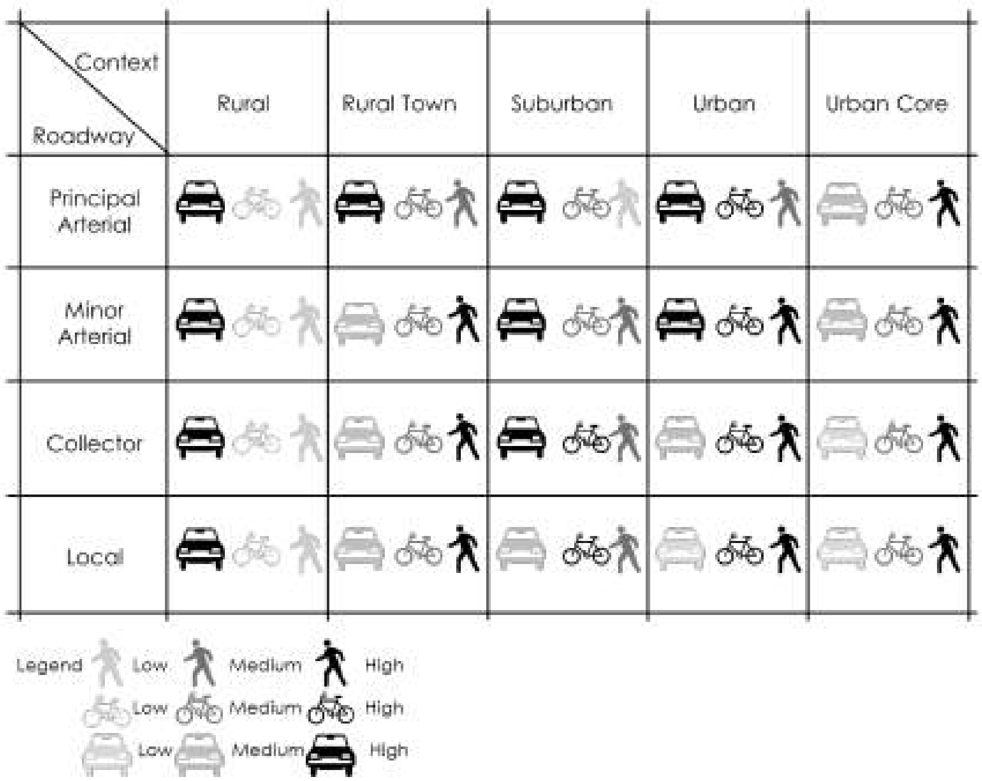
When considering the context of the region, street types are matched to land use characteristics. This context starts with defining a transect of land uses, ranging from undeveloped rural areas to the more intense activity zone in the urban core. **Figure 10-1** shows how activity density increases from rural areas to urban areas in a transect of regional context. This is designed to recognize how the differences in the regional context of density and activity affect street characteristics such as speed, capacity, and lane width.

Figure 10-1: Rural to Urban Transect in the Regional Context

The context of the region is employed in the approach taken by the *ITE Walkable Thoroughfares Manual*, which has been adopted by TxDOT and referenced for its Context-Sensitive Solution, and by the recently published *NCHRP Report 855: An Expanded Functional Classification System for Highways and Streets*. Both publications use the regional context and the type of street to set the appropriate balance and priorities of the street characteristics and the appropriate transportation modes accommodated.

The NCHRP report illustrates this concept with a matrix of street functional class versus regional context, as shown in **Figure 10-2**. It is based on the concept that street design cannot accommodate the best facilities for all modes and users on every street, every time. Street design must therefore consider conceptual priorities for all modes so that the appropriate priorities may be selected.

Figure 10-2: Matrix of Regional Context and Modal Appropriateness



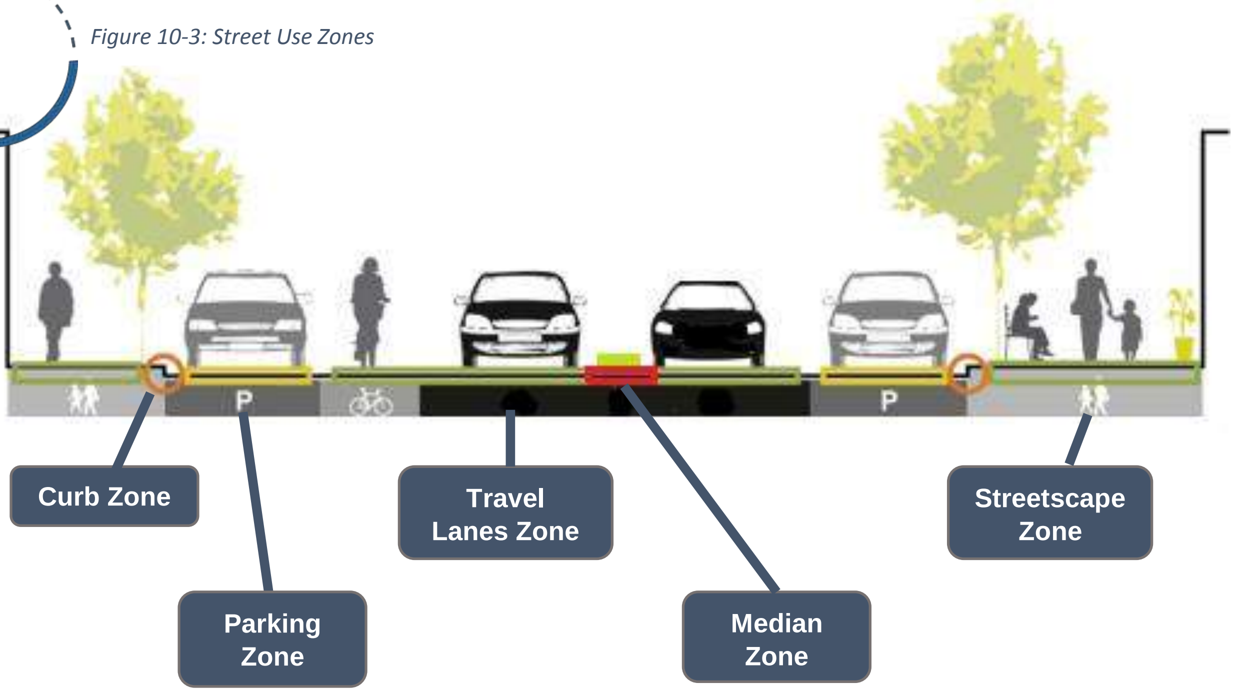
For example, on Principal Arterials, for most contexts the function of the street is to provide regional mobility, so high vehicle speeds are appropriate. The high speeds make Principal Arterials less appropriate for bicycles and pedestrians, and therefore they may be best accommodated with a parallel route whose function allows for lower speeds. Conversely, in the urban core, the functions to provide access and the greater density of sites means that speeds are lower and that pedestrians and bicycles have greater priorities. The presence of facilities such as bicycle lanes, which may reduce automobile speeds and capacity, is seen as appropriate in this context.

It should be noted that this approach defines the general appropriateness of the balance between transportation modes. Safety is an additional layer of consideration. Regardless of any other design parameters, every road should be safe for all its users. Dana Peak Park provides an example; the route for bicyclists to access the park requires traveling on rural streets, which are shown in the matrix as conceptual low-priority areas for bicycles. However, specific routes such as FM 2410 and Comanche Gap Rd should consider the safety of riders with specific bicycle facilities regardless of the conceptual balance of modes.

Complete Streets and the Context of the Street

The street cross section also provides context for Complete Streets treatments because of the different zones of use. **Figure 10-3** shows different zone uses which have typically been recognized.

Figure 10-3: Street Use Zones



The **Streetscape Zone** is the area dedicated to pedestrians. It can be further divided into the frontage zone along the building face, the walking zone, and the street furniture & landscaping zone. Streetscaping can improve the sense of place of a street and create pleasant environments.

The **Curb Zone** provides a clear distinction between the sidewalk and the street, and is important for the street's function and safety. Curb bulb-outs may be provided for safety and transit loading, and illustrate how the relationship between the zones can be malleable.

Strategies that impact the **Parking Zone** are often the most controversial element of Complete Streets design. Various orientations of the parking zone in relation to other zones can be developed to protect bike lanes. Bus turnouts and loading zones may be included with the parking zone.

The **Travel Lanes Zone** ranges from 9' to 12' feet wide. This zone may include dedicated bike lanes or bus lanes as well as general purpose automobile lanes.

Treatments in the **Median Zone** treatments include landscaped swales, raised and paved medians with intermittent turn bays, and continuous turn lanes. Pedestrian treatments in the median may be added to provide for safety islands to reduce the width of the street to be crossed.

Complete Streets General Design Examples

With the two approaches of either specifying full treatments for all streets or modal layers in a balanced network, and considering both the regional and the street contexts, the general and subjective guidance for Complete Streets design can be applied together with the very specific and objective design guidelines for each mode. Bringing all these concepts, approaches, contexts, and guidance together can be seen to require imagination as well as engineering.

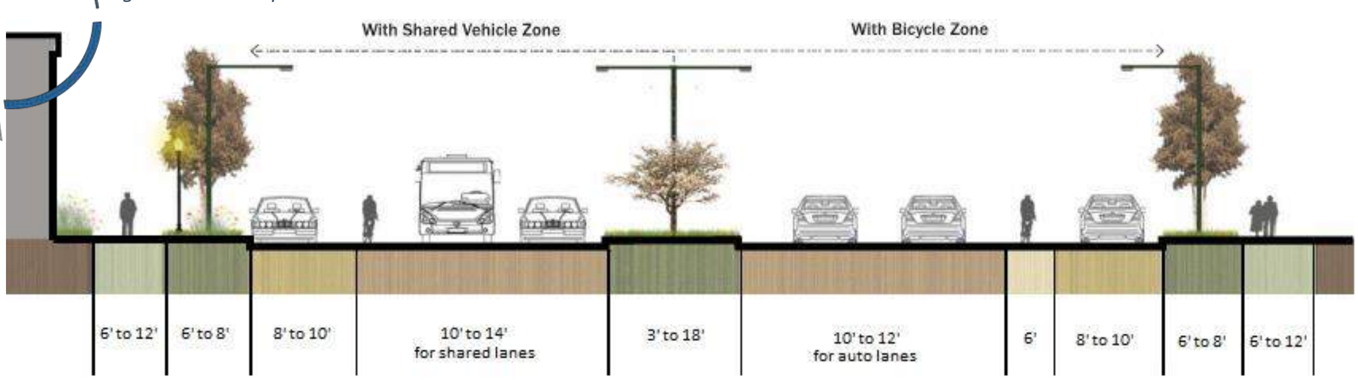
Whatever philosophy is used for Complete Streets design, the streets should address the regional goals as specified in the Metropolitan Transportation Plan (MTP) and in this Regional Multimodal Plan to ensure that the results are convenient and safe for all users and contribute to the development of a balanced regional multimodal system.

The options and artistry involved in implementing Complete Streets projects while conforming to the specific design guidance for the component transportation modes can be illustrated with several examples. **Figure 10-4** shows two examples of treatments on a multi-lane avenue. In the example on the left side, the outside lane is made wider to implement shared lanes. On the right side, the example shows the bicycle lane made separate and placed between the travel lanes and the parking zone.

These types of configurations are suitable for multi-lane streets with low to moderate speeds and traffic volumes to accommodate the shared streets strategy. The separate bicycle facilities as shown on the right side can be justified when traffic volumes or speeds are higher and bicyclist safety becomes more of an issue.

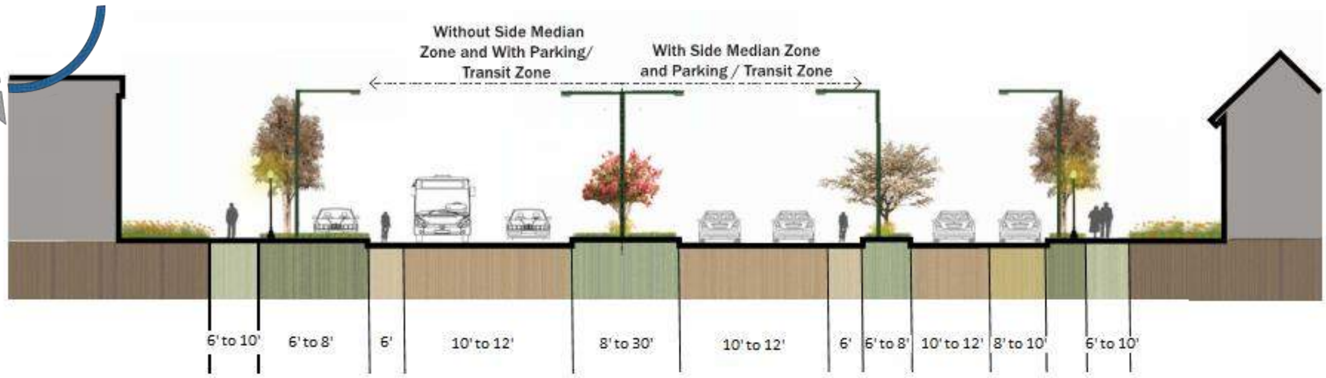
Either example may have a median with intermittent turn bays or a continuous center turn lane. Either treatment may include landscaping, islands, or pedestrian refuges.

Figure 10-4: Complete Streets Treatments on a Multi-Lane Avenue



Higher functional classed facilities with significant traffic volumes and high speeds are also amenable to Complete Streets treatments, as shown in **Figure 10-5**. In this example, the left side shows multiple travel lanes and a bicycle lane against the curb. Parking is accommodated with intermittent bays located in the curb and landscaping zone. On the right side, the example uses an intermediate median to separate the travel lanes from the parking and curb zones. This example includes a slower-speed travel lane along with the parking lane to provide access. This configuration separates slow-speed traffic and parking from the higher-speed main travel lanes, and features separate bicycle facilities in both examples.

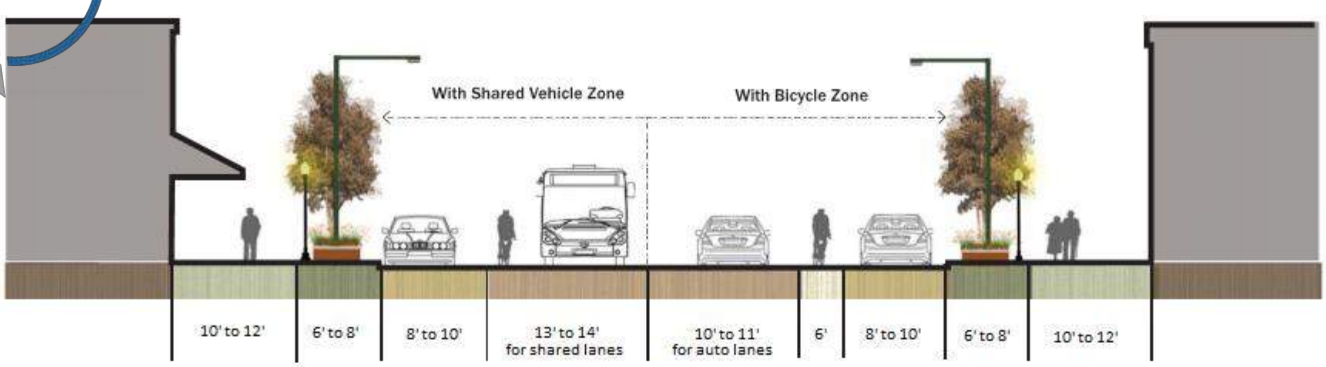
Figure 10-5: Complete Streets Treatments on a High Speed Multi-Lane Boulevard



Complete Streets treatments for a small urban core are shown in **Figure 10-6**. This kind of street is a destination, featuring more intense density and points of access in a smaller area. Traffic speeds are lower, but traffic volumes may be higher. Separate bicycle lanes are shown on the right, but the lower speeds in the area may make shared lanes a viable option, as shown on the left.

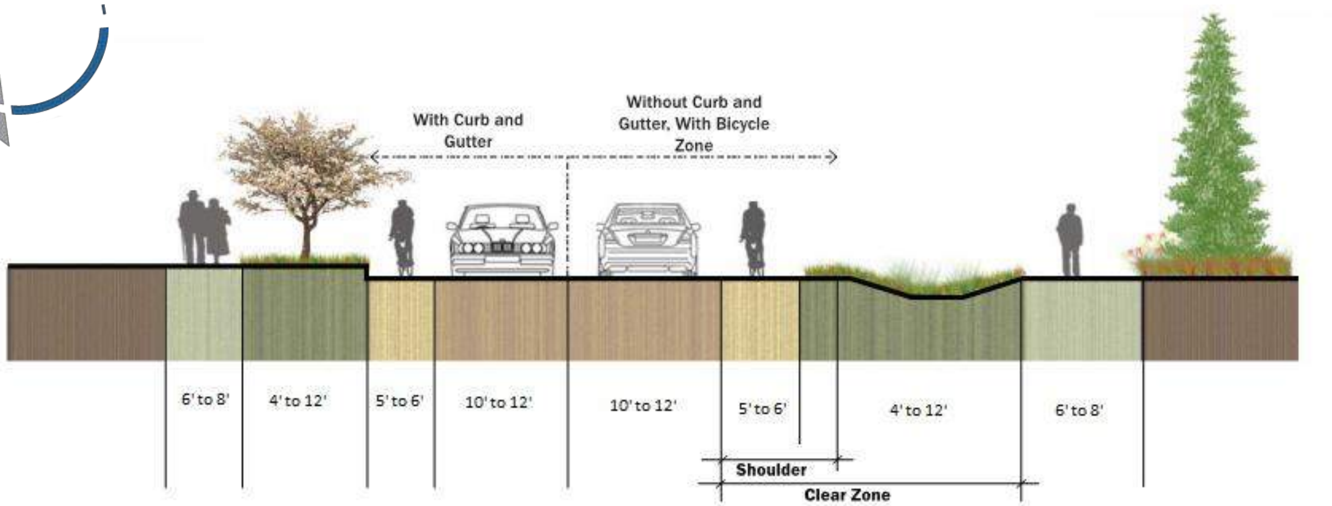
The sidewalk zones may be made wider to support pedestrian volumes and activities.

Figure 10-6: Complete Streets Treatments on a Small Urban Main Street



Complete Streets treatments for a suburban or rural two-lane road are shown in **Figure 10-7**. These street configurations are suitable for Local Streets, Collectors, and Minor Arterials with low to moderate traffic speeds and volumes. They may not include curbs & gutters or parking zones. In both examples, a separate bicycle lane is shown on the outside and the sidewalk zone is separated from the travel lanes with a generous landscaping zone.

Figure 10-7: Complete Streets Treatments on a Two-Lane Road



Complete Streets As-Built Examples

While Complete Streets is still a fairly recent concept, many examples have been completed to show the effects of the treatments. **Figure 10-8** shows a built example of a road diet on East Blvd in Charlotte, NC. The "before" configuration of a 4-lane undivided street through a residential area was under capacity and contributed to speeding and to safety issues for pedestrians and bicyclists. While the posted speed was 35 mph, cars were frequently observed traveling up to 50 mph. After the road diet was implemented to convert the street to 2 lanes with a center turn lane, pedestrian islands, and conventional bicycle lanes on the outside, the instances of speeding dropped measurably. Traffic data showed that the speed traveled by 85% of vehicles (the 85th percentile speed, which is a traffic engineering measure) dropped from 43 mph to 40 mph, but the average travel time remained constant. These results show that speeding dropped but that the mobility of the corridor was not affected.

Figure 10-8: Road Diet Example from Charlotte, NC

An example on Lancaster St in Lancaster, CA shows an imaginative treatment of the median in a commercial area. As shown in **Figure 10-9**, the parallel parking zone along the curb was supplemented by angle-in parking in a landscaped median. The landscaping in the median includes pedestrian amenities at the crosswalks.

Figure 10-9: Median Treatment Example from Lancaster, CA

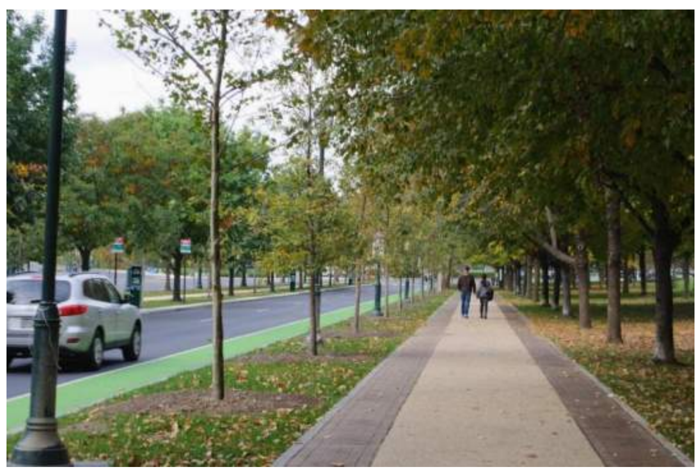
This example dropped the posted speed from 35 mph to 15 mph. The combination of fewer travel lanes, the median, and the change in posted speed reduced total crashes on the street by 50%, and reduced crashes with injuries by 86%. The corridor also saw extensive economic development with the Complete Streets treatment, with forty-nine new businesses totaling 116,000 square feet of commercial space being added to the 8-block long project.

The landscaped median also provides space for special events. Farmer's Market days, holidays, and special events take advantage of the space by restricting median parking and using the space to set up vendor's booths.

Ben Franklin Parkway in Philadelphia, PA illustrates another way to configure bicycle and pedestrian facilities with medians. **Figure 10-10** is an aerial photo, showing the paved central median on a 6-lane arterial. On both sides, a landscaped intermediate median separates flanking 2-lane streets with slower speeds and access to adjacent sites with curbside conventional bicycle lanes. **Figure 10-11** shows how the intermediate medians and the street edge both have multi-use lanes.

Figure 10-10: Multiple Medians Example in Philadelphia, PA

Figure 10-11: Multi-Use Paths in Medians in Philadelphia, PA



Octavia Blvd in San Francisco, CA shows a slightly different use of intermediate medians. In this example shown in **Figure 10-12**, the center median serves as a center turn bay in some locations. The intermediate medians separate the high speed traffic focused on mobility form the flanking streets serving lower-speed traffic focused on access. The flanking streets feature parking zones and sharrows.

Figure 10-12: Multiple Medians Example in San Francisco, CA

Summary

The KTMPO regional network consists of layers of interrelated networks for the auto, bicycle, bus, truck, and walk networks. Each of these networks has its own specific design standards specified by law or by professional practice. The Complete Streets concept is one tool that can help develop these individual networks into a balanced and integrated multimodal network.

Actually implementing the desired Complete Streets design may be a challenge with the available right-of-way, funding constraints, and regulatory environment. Two general approaches are used to define a policy: either applying Complete Streets treatments to every street, or defining layers of modal networks and determining the appropriate mix of treatments for each street.

Complete Streets treatments also depend upon the regional and the street contexts, which define the intensity and character of activities and where they take place on the street for each mode.

With either approach, the very specific and objective design guidelines for each mode are brought together and balanced under the very general and subjective concepts of Complete Streets. Guidance for developing the proper balance of modes for Complete Streets therefore relies as much on imagination and judgement as it does on engineering.

Chapter 11: Performance Measures

CHAPTER HIGHLIGHTS

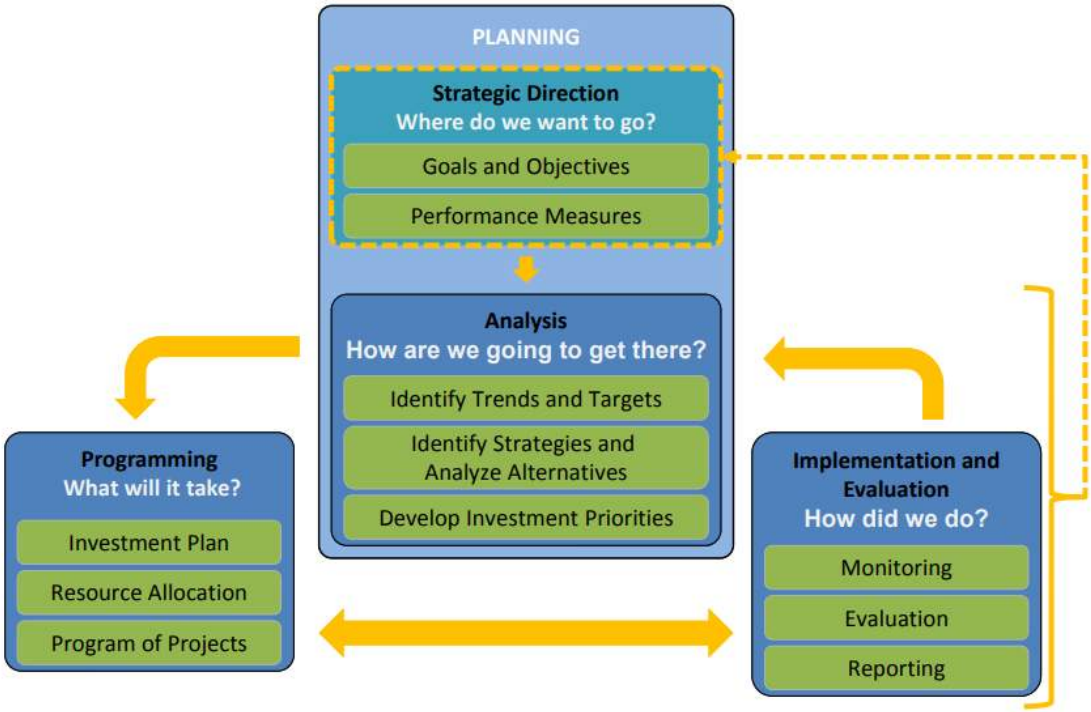
- Suggested Performance Measures by Mode
- Summary

Introduction

The concept of performance-based transportation planning is mandated by federal legislation, starting with its introduction in the Moving Ahead for Progress in the 21st Century (MAP-21) funding authorization in 2012, and continuing through the Fixing America's Surface Transportation Act (FAST Act) in 2015. Performance-based planning is a strategic approach that uses system data to guide decisions to progress towards goals. Defining performance measures and targets is a key component of the process to set objectives, define measurable targets, and monitor progress.

Figure 11-1 illustrates the role of performance measures in the planning process. Performance measures are grouped with goals & objectives defining the overall strategic direction. Together, they are the method for defining the "Where do we want to go?" portion of the planning process. The Implementation & Evaluation box defining the "How did we do?" portion of the process also relates to performance measures as the basis for monitoring, evaluation, and reporting progress.

Figure 11-1: Performance-Based Planning Process



The performance measures set at the national level by the Federal Highway Administration (FHWA) have been oriented towards motorized traffic, as shown in **Figure 11-2**. This is entirely appropriate given their geographic scope and the preponderance of motorized vehicles in the traffic mix.

Figure 11-2: National-Level Goals

Goal Area	National Goal
Safety	To achieve a significant reduction in traffic fatalities and serious injuries on all public roads
Infrastructure Condition	To maintain the highway infrastructure asset system in a state of good repair
Congestion Reduction	To achieve a significant reduction in congestion on the National Highway System
System Reliability	To improve the efficiency of the surface transportation system
Freight Movement and Economic Vitality	To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
Environmental Sustainability	To enhance the performance of the transportation system while protecting and enhancing the natural environment

Transportation planning in the KTMPO 2045 Metropolitan Transportation Plan (MTP) will address these performance targets and how they fit into federal requirements, the eleven Planning Factors, and regional transportation goals. This Regional Multimodal Plan complements that process at a finer level of detail with suggested performance measures for specific transportation modes. Following the performance-based transportation planning process as shown in Figure 11-1 and in accordance with federal regulations for public involvement, this Regional Multimodal Plan may only suggest performance measures for consideration. Adopting the performance measures and setting the specific targets must be a part of the larger planning process to ensure that they follow regional goals, are feasible and achievable, and that they have the support of all KTMPO member jurisdictions.

Suggested Performance Measures by Transportation Mode

Using this approach, the designation of regional performance measures can be used to complement and supplement those defined for the national and state levels. The full system can be used to help build, monitor, and evaluate a more balanced regional transportation system.

Performance measures for the ***Auto Network*** can closely follow the precedents set at the national and state levels. More specific performance measures can be defined to track performance towards integrating the auto network more closely into a balanced regional multimodal system.

Auto Network Performance Measure: Crashes Involving All Modes
Safety is one of the primary performance measures for the automobile network. Current performance measures include:

- Number of fatalities
- Fatality rate
- Number of serious injuries
- Serious injury rate

These performance measures treat all crashes as a single group. Additional safety-related measures are suggested to establish performance-based planning for the auto network within a balanced multimodal network.

This suggested performance measure would track the number of automobiles crashes with bicycles, buses, trucks, and pedestrians. It would be a gauge of how well the balance between modes is being implemented, which is particularly important as the use of other modes increase. This measures the safety of the balanced multimodal system.

Data for this performance measure would come from the Texas Crash Records Information System (CRIS) maintained by TxDOT. The system is based on reports from police responding to crashes, and so may contain some entry errors and omissions. It also misses the minor crashes which are not reported to police and incidents of near misses. However, the data is maintained by the state, is readily available, and is available for multiple years to allow comparisons to trends.

Auto Network Performance Measure: Speeding, Distracted Driving, and Driving Under the Influence

The TxDOT CRIS system reports a total of 6,753 crashes in Bell County for the year 2016. The data indicates that speeding is a factor in 525 crashes, distracted driving contributed to 1,206 crashes, and driving under the influence of alcohol or drugs was involved in 353 crashes. Taken together, these three factors account for almost 31% of all crashes in the county.

A performance measure to monitor one or more of these factors can complement the more general measures of the numbers and rates of fatalities and serious injuries caused by crashes. These suggested performance measures would focus more on the causes of crashes than on the results. For speeding in particular, the suggested measures would directly monitor the effects of Complete Streets treatments such as road diets, traffic calming, and lane narrowings that are intended improve safety by reducing vehicle speeds.

Data for these performance measures could be sourced from the CRIS crash records, as noted above. This would provide information on how these measures contribute to crashes. Alternately, data for any of the three suggested measures could come from police reports of tickets issued. This would have the advantage of capturing a broader base of data. However, it would require contacting the individual police departments in the KTMPO region for each year's data.

Auto Network Performance Measure: Mode Share

Mode shares for the journey-to-work trip as reported by the Census report that automobiles are used for 92.9% of all these trips in Bell County. Developing a more balanced regional multimodal network would increase the share of trips that use the bicycle, bus, and walk modes. A suggested performance measure to track the mode balance would monitor mode shares to track progress towards a more balanced network.

Journey to work data is collected by the American Community Survey (ACS) with annual updates. However, the sample size for Bell County is small, so an accurate capture of any change in mode shares may be difficult to obtain. Additionally, the journey to work trip is only about 30% of all daily trips, and so the ACS data would capture only a portion of the total. Proxy data for mode shares may include counted bus ridership and counts of bicycles and pedestrians at specific monitored sites.

Auto Network Performance Measure: Barriers, Bottlenecks, and Connectivity

Mobility and access depend on the network being configured to provide connections between origins and destinations. The connections may be interrupted by barriers or gaps in the network which force more circuitous routing, or bottlenecks which cause congestion. The suggested performance measure calls for an inventory of these undesirable network features, and measures their reduction.

The adopted KTMPO Project Selection Process has a category for scoring network connectivity. A project is scored for either closing a physical gap (in two categories for collector or arterial or higher streets), or for closing a gap in the number of lanes (in two categories for collector or arterial or higher streets).

While performance measures for the auto network focus on a mature system, those suggested for the ***Bicycle Network*** are geared towards the development of the network. Building the bicycle network as a convenient, safe, and pleasant system is a strategy to increase bicycle ridership.

Bicycle Network Performance Measure: Safety

The perceived lack of safety of riding in traffic is often cited as the primary reason why people do not ride bicycles as much as they would like. Improving the safety of the bicycle network therefore can have a significant impact on increasing ridership.

A suggested performance measure for safety would use TxDOT CRIS data to track the number of reported crashes involving bicycles. The system is based solely on reports from police responding to crashes, and therefore does not report incidents of near misses, which bicycles are particularly vulnerable to.

Bicycle Network Performance Measure: Barriers and Connectivity

Barriers and connectivity are particularly important to active transportation modes such as bicycles. Additionally, the barriers that are faced by bicycles are not the same as the barriers faced by automobiles in the general street network. The parameters for this suggested performance measure therefore focus on the connectivity of the dedicated network of conventional and protected bike lanes. A separate performance measure is suggested to track barriers and connectivity of bicycle boulevards.

A performance measure for reducing the number of barriers in the bicycle network is suggested to be based on an inventory of specific points and intersections impacting the full network, including shared-use streets.

Bicycle Network Performance Measure: Mileage of Bicycle Lanes

The existing bicycle network includes eighteen miles of bike lanes of all types and forty-three miles of multi-use paths. Monitoring progress in expanding the bicycle network mileage is a suggested performance measure. The suggested performance measure could refer to total mileage or to mileage by functional class to distinguish the characteristics of the bicycle network.

Data for this performance measure would come from direct observation of the network.

In developing the Functional Classification system for the ***Bus Network***, the primary concern was how the network addresses the comfort and convenience of its riders. Suggested performance measures for the bus network continue with this focus.

Operational performance measures such as passengers per mile and cost per mile are common in the transit industry, but are not listed in this plan. These types of measures are typically monitored by the transit agency for operational purposes, rather than the MPO, which plans more for capital project prioritization.

Bus Network Performance Measure: Connectivity

Connectivity for the bus network is a measure of rider convenience in that it measures how the system connects trip origins to destinations. Using origin-destination connectivity as a performance measure monitors how well the transit system serves the needs of its riders.

This performance measure could be modeled by defining origins and destinations as discrete points and evaluating how the system's fixed routes connect them. An alternate methodology would be to build ¼ mile buffers around all fixed routes and then calculating the population and employment that lie within the buffers. This methodology could also be considered as measuring system coverage.

Bus Network Performance Measure: Comfort

Functional Classes for bus stops have been defined as stations, shelters, benches, and simple stops. A performance measure for passenger comfort could measure the proportion of each functional class in the total mix of stops.

Data for this performance measure would be from the inventory of facilities at stops.

Bus Network Performance Measure: On-Time Performance & Travel Time Reliability

On-time performance as a performance measure monitors how well the buses adhere to their schedules for every stop. It is an operational measure, but it is also a planning measure because it is a proxy for the appropriate design of the routes. If a fixed route is not properly designed, drivers will have difficulty in meeting their schedules and time points.

On-time performance is also a proxy for the reliability of the transit system. Issues with on-time performance can lead to issues with transfers to other routes.

Data for this performance measure would have to come from The HOP.

Bus Network Performance Measure: Transit Asset Management and Safety Plan

Performance-based asset management is a new planning requirement mandated by the Federal Transit Administration (FTA). This separate Transit Asset Management Plan (TAMP) is intended to be coordinated with the regional 2045 MTP and with the Transportation Improvement Program (TIP). The plan sets performance targets for transit revenue vehicles, non-revenue vehicles, facilities, and equipment based on their Useful Life Benchmarks (ULB) or Transit Economic Requirements Model (TERM) scale. The HOP is required to develop a Transit Asset Management Plan, but as it has less than 100 vehicles, a Transit Safety Plan is not required.

The related performance measures are contained in the separate TAMP, and so are not detailed here.

The ***Truck Network*** shares its road system with the auto network. Special considerations for trucks are roads that are restricted due to geometric, weight, or regulatory considerations.

Truck Network Performance Measure: Load Restricted Bridges

Load restricted bridges are an issue not only in terms of safety, but also in routing. Trucks that must avoid load restricted bridges may have to travel more circuitous routes to go to their destinations. A suggested performance measure is to monitor the load restricted bridges in the region.

It should be recognized that some bridges on low volume rural roads would typically not serve truck trips. A modification of this performance measure can be to only inventory the load restricted bridges that lie on designated truck routes.

Data for this performance measure would come from the TxDOT load restricted bridge inventory. This inventory can form the primary database, but should be verified against local inventories from KTMPO member jurisdictions.

Truck Network Performance Measure: Barriers & Connectivity

This suggested performance measure would relate to two inventories: the designated truck high-priority network and the designated industrial parks and other freight origins and destinations. The performance measure would track the geometric, weight, or regulatory considerations that form barriers to trucks connecting the two inventories.

An alternate version of this performance measure would track designated hazardous materials routes and the local origins and destinations that serve them. This would require information on commercial sites in the region which are origins or destinations for hazardous materials. In order to make the measure practical, gasoline tanker trucks, which have destinations throughout the region, would have to be excluded.

While the ***Walk Network*** is robust and nearly ubiquitous throughout the KTMPO area, the sidewalk and trail inventories revealed gaps and barriers. However, the review of the inventories notes several geographic areas where the sidewalk inventory needs to be updated. Useful performance measures to gauge progress are dependent upon having a robust inventory of existing conditions.

Walk Network Performance Measure: Sidewalk Network

This suggested performance measure would monitor the linear feet of the sidewalk network.

Since the sidewalk network is nearly ubiquitous, monitoring the entire network for the region would not be useful; relatively small improvements in the network would not be revealed in the data. To address this, smaller geographies can be defined for measurement. This can cover either cities, defined neighborhoods, or a subset of regional TAZs with residential or commercial development where sidewalks are appropriate.

Another alternative for sidewalk inventory and performance measure would be to monitor sidewalks by their functional class.

In addition to a performance measure to simply monitor the inventory of sidewalks, another possible measure is to monitor their quality. Sidewalk attributes such as width and condition may also be inventoried and monitored with a performance measure.

Walk Network Performance Measure: ADA Compliance

Compliance with the requirements of the Americans with Disabilities Act (ADA) may be considered as a special performance measure. Compliance is required by law, so identifying the needs for projects and progress towards eliminating issues is vital.

Monitoring this suggested performance measure would require inventorying the locations of all non-ADA compliant facilities. This is a very specific and local-level task, so neither standard databases nor a review of aerial photos would provide sufficient information. As with the suggested sidewalk inventory, stratifying into smaller geographies is suggested so that network changes will show in the data. A performance measure for ADA compliance may also be stratified by category, such as sidewalk ramps, street crossings, and bus stops.

Walk Network Performance Measure: Barriers and Connectivity

Barriers in the walk network include missing sidewalks, gaps in sidewalks, and facilities which are in poor condition or obstructed. Streets crossing high-volume roads and limited access roads may also form barriers. Narrowed sidewalks on bridges are also an issue with the walk network.

The desire line functional class should also be included in the inventory, as they define paths where there is demand for a sidewalk network, but no infrastructure is in place.

Special connectivity paths may also be defined as an alternate performance measure. Connecting all the parks and schools within a defined neighborhood is one example of such a measure. Other connectivity paths may include sidewalk access to all bus stops, access to major employers, and access to defined government and social services sites.

Walk Network Performance Measure: Mileage of Trails

In addition to the sidewalk system, the walk network includes multi-use trails, recreational trails, and isolated trails within parks which do not form part of the transportation network, but are important components of the total walk network. A suggested performance measure would monitor these types of facilities separately.

As with most components of the walk network, actual field data is needed for the inventory. Developing the initial inventory and maintaining it up-to-date will be a significant task, and can only be accurately accomplished through field work.

The ***airport system*** and the ***rail system*** are special cases of transportation modes, since their networks do not directly impact the street network and they have access only as a very few specific points. In addition, these networks are largely privately owned and operated, so the KTMPO transportation planning process treats them for their effects on the street network, rather than as networks themselves. Therefore, no specific performance measures are suggested for these modes.

Summary

Federal legislation mandates performance-based planning, and defining performance measures is an integral part of the process. Legislation provides guidance for regional-level measures in areas such as safety, condition, and congestion.

To complement and supplement this process, additional performance measures are suggested at the modal level. The suggested performance measures are intended to help monitor progress towards a more balanced multimodal system for the KTMPO region.

To be useful within the planning process, performance measures should be objective, measurable, and feasible. To be appropriate, they should contribute to the regional vision and goals identified through the public involvement process. For these reasons, the performance measures outlined in this chapter can only be suggestions. Final measures and targets should be set as part of the overall planning process for the KTMPO 2045 Metropolitan Transportation Plan.

Chapter 12: Conceptual Projects

CHAPTER HIGHLIGHTS

- Policy Projects
- Planning Projects
- Events Projects
- Auto Network Projects
- Bicycle Network Projects
- Bus Network Projects
- Truck Network Projects
- Walk Network Projects
- Rail System Projects
- Summary

Introduction

Previous chapters of this plan have detailed specific physical network projects which are candidates for analysis and prioritization as part of the fiscally-constrained KTMPO 2045 Metropolitan Transportation Plan (MTP). These projects all have been proposed or reviewed by KTMPO member jurisdictions or committees, or have been received through a public outreach process. All fit under one or more of the funding categories defined for MTP projects. Therefore, all these previous project may be viewed as "official" candidate projects which are directly relevant to the KTMPO 2045 MTP.

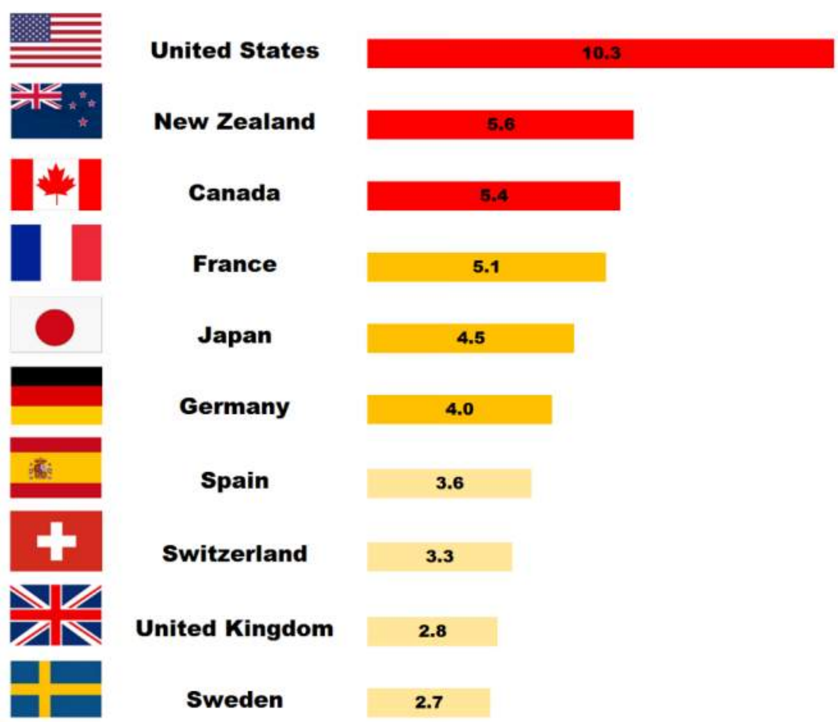
This chapter introduces a complementary set of projects that are "unofficial" in terms of their source, conceptual rather than specific, and may not fall into one of the MTP funding categories. These conceptual projects therefore may not be directly relevant to the KTMPO 2045 MTP. However, taken together with the MTP projects, these conceptual projects can contribute to developing a balanced regional multimodal network.

Policy Conceptual Projects

Project Py.1 The topic of safety is important in the KTMPO region and in its transportation planning. Safety is a specified performance measure, and many of the candidate projects from previous chapters focus on safety. This plan also defined a Functional Class system for the bicycle network that emphasized how infrastructure can contribute to safety.

In spite of this ongoing activity, traffic safety continues to be an issue in the United States as a whole. **Figure 12-1** shows the fatality rate per 100,000 persons for the United States and ten peer countries, with data taken from the World Health Organization Status Report on Road Safety.

Figure 12-1: Traffic Death Rates in Ten Comparison Countries



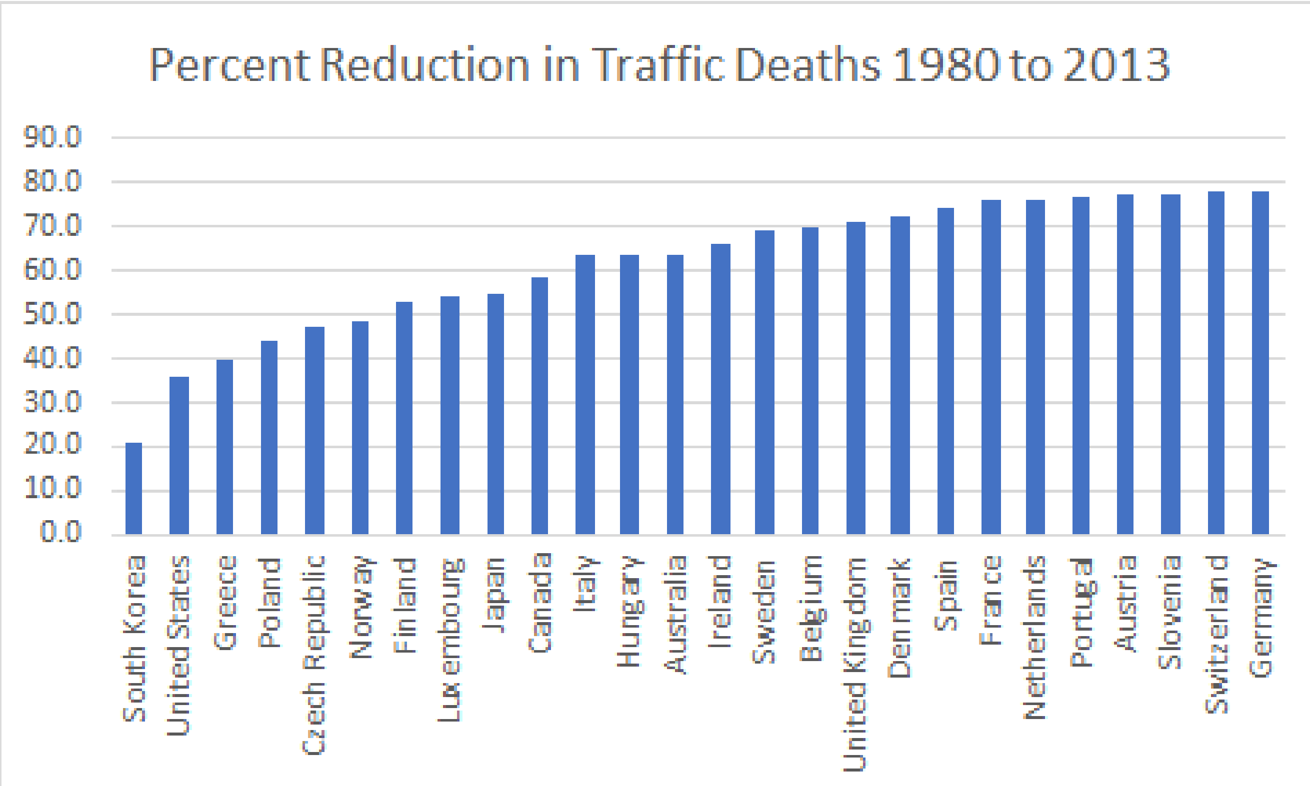
The data show a disturbing and undeniable trend of the United States leading its peer countries in Europe, Asia, and North America. Our traffic death rate is almost twice that of Canada's, with no significant difference in culture or quality of infrastructure to explain the difference. Compared to other peer countries like the United Kingdom and Sweden, our traffic death rate is almost four times as high.

The traffic death rate and general traffic safety can be addressed through specific safety projects, as has been done in the past. Another approach is to implement a specific **Vision Zero Policy** with the stated goal of developing infrastructure, policy, and behavioral changes to completely eliminate traffic deaths. Incidentally, the Vision Zero concept was developed in Sweden, which is shown with the lowest traffic death rate in Figure 12-1.

One of the core principles of Vision Zero is that road users share responsibility for traffic safety with road designers. Educational efforts to make drivers aware of safety issues are therefore an important component. Another core principle is that the road design should be forgiving; so that when crashes do occur, the risks of fatalities or serious injuries are lessened.

Since its inception in 1977, Vision Zero policies have been adopted in numerous countries worldwide and in numerous U. S. cities, with results that have been described as "outstanding". **Figure 12-2** shows the percentage reduction in traffic deaths from 1980 to 2013. The United States is near the bottom of the chart, but still has an impressive 36% reduction. Traffic deaths in the United States dropped from 51,100 in 1980 to 32,700 in 2013. However, the records of other countries show how significantly traffic deaths can be reduced with a more robust implementation of Vision Zero policies. Twenty countries showed a reduction of 50% or more, and seven countries showed over 75%.

Figure 12-2: Reduction In Traffic Deaths 1980 - 2013



The Federal Highway Administration (FHWA) has embraced Vision Zero as one of its policies supporting traffic safety and the development of a safety culture. Its website at https://safety.fhwa.dot.gov/zerodeaths/ highlights FHWA's commitment to the vision of implementing "zero deaths and serious injuries on the nation's highways." Likewise, the TxDOT Texas Strategic Highway Safety Plan 2017-2022 specifically lists a vision of "…a future with zero traffic fatalities and serious injuries," and includes sample MTPs from four Texas MPOs which have implemented Vision Zero initiatives. A Vision Zero policy is therefore a conceptual project suggested for consideration for the KTMPO region.

Project Py.2 To emphasize safety and help define, implement, and monitor safety projects, a separate **Safety Plan** is a suggested conceptual project. A separate plan is not a requirement, but has been implemented by some MPOs. The Houston-Galveston Area Council (H-GAC, the MPO for the Houston region) has developed a safety plan. It is featured as a link on the safety page of their website at http://h-gac.com/transportation-safety/default.aspx. H-GAC's safety program is guided by a Regional Safety Council. In addition to their safety plan, they monitor progress with an annual *State of Safety* report, which includes statistics, performance measures, and graphics showing locations with the highest number of crashes. Their safety planning shows how they have developed strategies for focus areas of impaired & distracted driving, bicycles & pedestrians, speeding, and intersections.

Project Py.3 Speeding is not only a leading contributor to crashes, it also makes crashes more severe and exponentially increases the risk of death for bicyclists and pedestrians struck by cars. **Slow Zones** are a suggested conceptual policy to improve safety. Slow Zones are small geographic areas of local streets with infrastructure designed to reduce vehicle speeds to 20 mph. In the implementation in London, a variety of traffic calming measures such as curb extensions, raised crosswalks, raised intersection, chicanes, pedestrian refuges, and mini-roundabouts were installed. Slow Zones have been implemented in 400 neighborhoods since 2009, with 880 more sites planned. The data show a 46% reduction in fatalities and serious injuries, with a spillover effect of an 8% reduction in the areas adjacent to the Zones. Results of the London implementation are discussed at https://nyc.streetsblog.org/2010/03/22/how-london-is-saving-lives-with-20-mph-zones/. In New York City, the 28 Slow Zones which have been implemented have not had the same level of positive results. Two reasons are cited for the difference: first, the London examples used a wider variety of traffic calming measures, and second, London implemented the measures more densely than New York City did. Overall, the more robust implementation in London had significantly better results.

Figure 12-3: Slow Zone in London

Although Slow Zones are intended only for local streets and include measures which may cause issues with transit buses and emergency vehicle access, they are a suggested safety conceptual project.

Project Py.4 Conventional project delivery follows the very understandable desire to "do the project right the first time", requiring extensive studies and a complex design process before implementation. The result is that implementation is relatively slow, which can be an issue with a safety project when the desire is for immediate action. A suggested conceptual policy is **Tactical Urbanism**, also known as **Rapid Prototyping** or **Iterative Development**. Rather than taking the conventional approach of fully implementing a perfect solution in a permanent construction, this approach emphasizes the speed of construction. It implements rapid, low-cost, temporary solutions, tests them for a limited period of time, modifies them if needed, and then implements the permanent solution after the optimal solution is determined. Tactical Urbanism is often used as a method for public involvement, as it readily allows for experimental treatments to be implemented. It is also used to very rapidly implement safety projects where the conditions are such that an immediate response is wanted.

The City of Burlington, Vermont has developed a Tactical Urbanism policy with an emphasis on community-led development of projects. The intent of the policy is to develop short-term, low-cost projects that can be implemented and tested, leading to longer-term permanent projects. Their guide to Tactical Urbanism is published by their Public Works Department website at https://www.burlingtonvt.gov/DPW/Tactical-Urbanism-and-Demonstration-Projects.

Planning Conceptual Projects

Project Pg.1 Chapter 4 of this plan defined new Functional Classification systems for the bicycle, bus, truck, and walk networks, followed by inventories in Chapter 5. Some of these new Functional Classifications defined new attributes for their respective networks that are not fully described in the existing inventories. A conceptual project for planning is suggested to **Update the Inventories** for all modes to capture any additional attributes which are detailed in the new systems.

Project Pg.2 The chapters also noted the need to update the sidewalk inventory to cover newly developed areas. Based on the proposed new inventory, **Inventories of Gaps and Barriers** for the bicycle and the walk networks is also a suggested conceptual project.

Figure 12-4: Gaps and Barriers in the Sidewalk Network

Figure 12-4 illustrates a gap and a barrier in the sidewalk network. An inventory to identify all the places and specifics of these types of issues is an important component of forming a plan to address them.

An inventory of gaps and barriers should be considered in the context of the severity of the issue, safety issues, any alternative routes, and the origin-to-destination paths which are served, particularly for sidewalks serving schools and activity centers. Being aware of this context will assist in setting priorities for addressing the gaps and barriers.

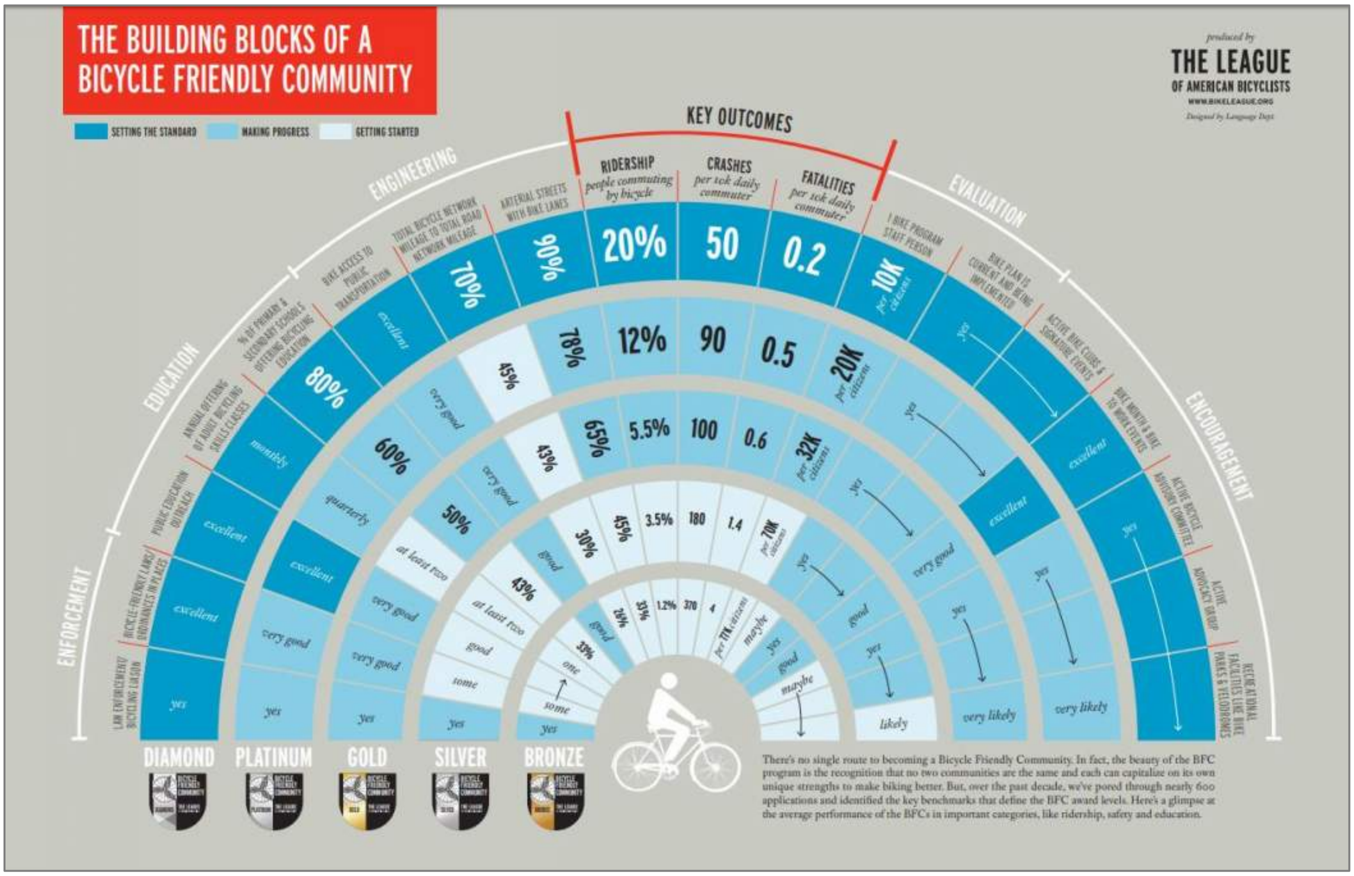
Project Pg.3 A **GIS Analysis of Priority Demographics Areas, Social Service Destinations, and Job Centers** is a conceptual project suggested to inform the process of evaluating walk, bike, and transit connectivity.

Project Pg.4 The GIS analysis can be supplemented by a related **Inventory of ADA Compliance** to describe paths between vital origins and destinations which have barriers for persons with disabilities. An additional layer of detail in the Inventory of ADA Compliance would specifically describe ADA compliance issues at bus stops and stations.

Project Pg.5 Plans for pursuing the **Bicycle Friendly Community Designation** is a conceptual project that has a well-organized path. The program was developed by the League of American Bicyclists in 1995, and currently has 450 designated communities. The designation follows a discrete chart with five attainment levels. Information is found on the League's website at www.bikeleague.org/community.

Figure 12-5 shows the chart of criteria and thresholds for qualification under the five levels of a Bicycle Friendly Community, ranging from Bronze Level to Diamond Level. The five categories include three items that are common to other implementation plans: Engineering, Enforcement, and Education.

Figure 12-5: Bicycle Friendly Community Chart



Events Conceptual Projects

Project E.1 Of the three criteria of Engineering, Enforcement, and Education which are designated as important for successfully implementing new projects and new modes in the region, Education to promote awareness and change drivers' attitudes can be seen as the most vital. Conceptual projects for various events are therefore suggested to highlight the possibilities to Educate the public.

One of the most prominent types of events promoting multimodal transportation is a **Ciclovía**. The event closes city street to motorized traffic and permits only active transportation. The original Ciclovía in Bogotá, Colombia, is held every Sunday on 75 miles of city streets. Other Ciclovía events, such as in San Antonio, are held once every two years on select streets in the downtown area.

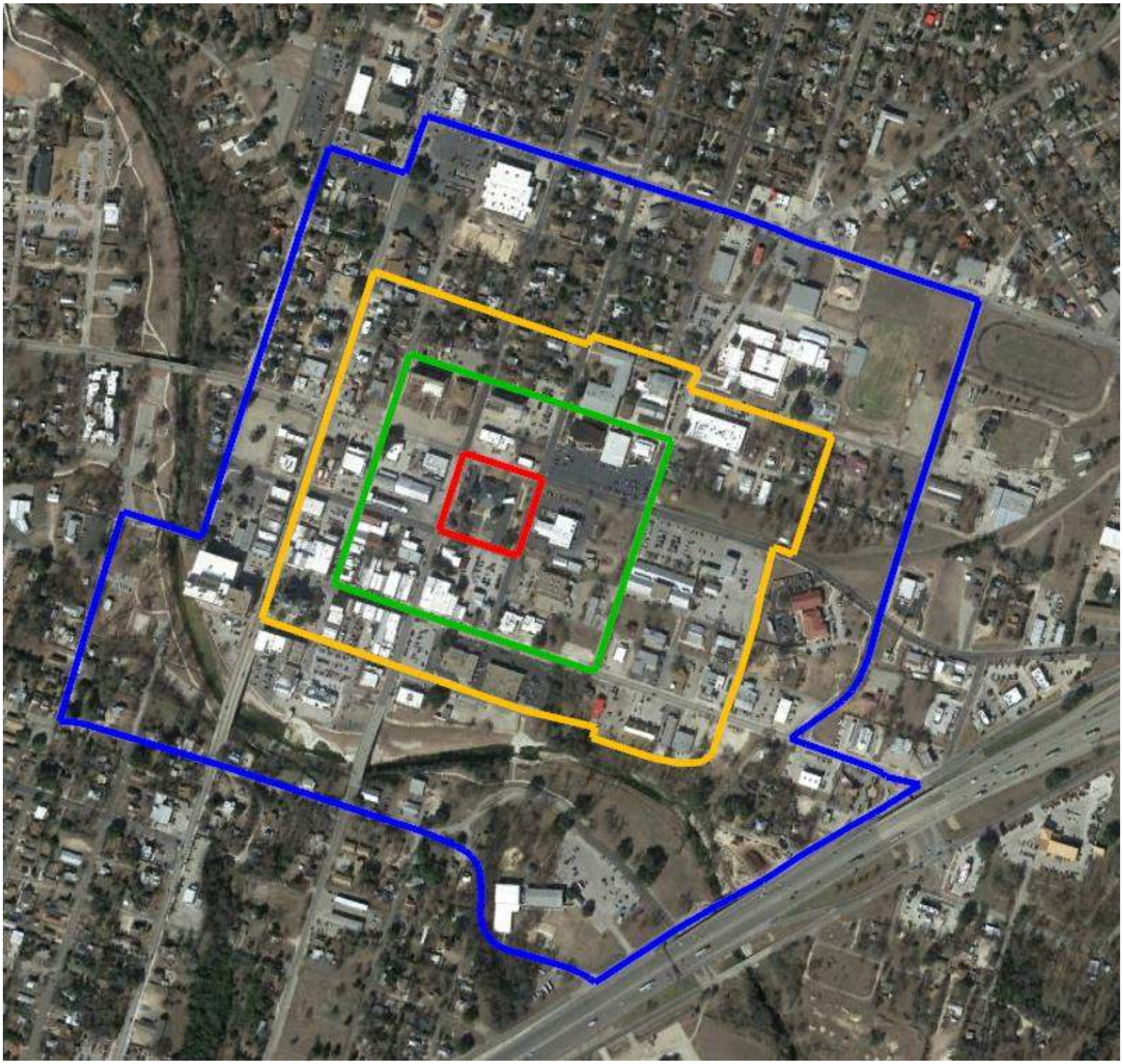
The power of the Ciclovía event is how vividly it demonstrates the wide range of activities that can take place in the streetscape once it is free of the danger of motorized traffic. The issue with implementing a Ciclovía is that motorized traffic comprises about 92% of all trips in the KTMPO region. Closing even a small portion of streets to 92% of traffic is a dramatic undertaking, which should be carefully planned.

The suggested conceptual project for holding a Ciclovía in the KTMPO region is to implement it at two different scales. If only a small portion of streets at the core area of the Ciclovía were closed to motorized traffic and a larger selection of streets were involved while remaining open, the event would simultaneously be large enough to make be noticeable, but small enough to not seriously impede traffic.

The configuration of downtown Belton supports this strategy with a central courthouse square and a surrounding series of rings on streets with relatively low traffic volumes and speeds. **Figure 12-6** illustrates the concept. To hold a Ciclovía event, the inner red ring immediately surrounding the courthouse could be closed to motorized traffic, with all street space opened to bicycle and pedestrian traffic and an intense variety of events. One or more of the surrounding green, yellow, and blue rings and cross streets connecting the rings could host less intense activities, while remaining open to all traffic. The ring-and-spoke system would also serve to orient specific activity sites on the rings. Ciclovía event signs throughout the area would alert motorists to drive with caution.

The San Antonio Ciclovía is predominantly themed to active transportation, and so captures only a limited interest group. A suggested conceptual project for the KTMPO region would layer wider-ranging themes onto the event to generate interest from a broader group of people, and to integrate and publicize active transportation modes within the greater theme.

Figure 12-6: Ciclovía Rings in Downtown Belton



The Ciclovía conceptual project would use different themes each year to present the public with new events, include a wider range of people and interests, and to keep the event fresh in the public's mind. Possible ring themes and approaches include:

- Class Rings – a theme with heavy involvement from local high schools. Specific events and booths may include sports, games, contests between schools, marching band events, and alumni events for different graduation years.
- Culinary Rings – focusing on different cooking styles. The theme may include food trucks and local restaurants.
- Tree Rings – extension courses and materials on gardening, landscaping, composting, and xeriscaping would bring in people who are not normally associated with transportation. The regularly-scheduled farmer's market could contribute to this theme.
- Bell Rings – local history, people, and events would be the theme. Contacts with local museums, including the Fort Hood museums, would broaden this theme.
- Birding Rings – the Texas Parks & Wildlife Department sponsors several bird watching events in Central Texas, and these could be integrated into a theme.
- Piston Rings – extending the theme of transportation would be an obvious choice, with the Rodchopperz Car Show already a regularly scheduled calendar event. Transportation-related events in the main ring could include basic car and bicycle mechanics' courses, and car washes. Driver's education seminars could be held for specific topics such as driving in congestion, driving in the presence of bicycles and pedestrians, safety tips, and avoiding distractions.
- Planetary Rings – local high schools could contribute to this theme emphasizing STEM education and fun events such as a scale model solar system, a physics circus, and competitive knowledge-based events.
- Der Nibelungen – Wagner's ring cycle of operas could introduce a general musical theme, with local bands as featured on the regularly-scheduled calendar of events. Local high schools could also compete in a "battle of the bands".
- Lord of the Rings – a fantasy & science fiction theme could include themed obstacle courses and costumed races.
- Book Rings – events could focus on authors, plots, or places from literature.

Regardless of the theme chosen for the Ciclovía, it could include core events such as a Safety City for children as shown in **Figure 12-7**, an obstacle course of unsafe infrastructure and practices, demonstration setups of bike lanes and protected intersections, scavenger hunts, contests, and other events designed to educate people on the balanced multimodal network.

Figure 12-7: Children's Safety City

Auto Network Conceptual Projects

Project A.1 Excessively wide streets in some locations, coupled with changing demographics trends, has sometimes resulted in roads that operate significantly under their design capacities. This presents an issue of costly maintenance for unneeded road surface, balanced with the opportunity for re-purposing the street right-of-way for other uses. The concept of a **Road Diet** takes advantage of this opportunity to "right size" a road. A typical Road Diet converts an underutilized 4-lane undivided road into a 2-lane road with a center turn lane and bicycle and pedestrian facilities. The turn lane often improves traffic flow, so Level of Service (LOS) can be better after the Road Diet. A conceptual project for Road Diet planning would inventory streets with an existing LOS lower than a defined threshold in both the base year and forecast year and a potential need for bicycle and pedestrian facilities. The project would then perform analyses to determine Road Diet candidates.

Project A.2 Resiliency planning prepares for natural disasters with designated evacuation routes and identified floodplains. An additional area of resiliency planning would **Identify Critical Infrastructure** that forms choke points. A threshold level of detour mileage or time would have to be defined in order to select infrastructure whose failure would have a significant impact on the network.

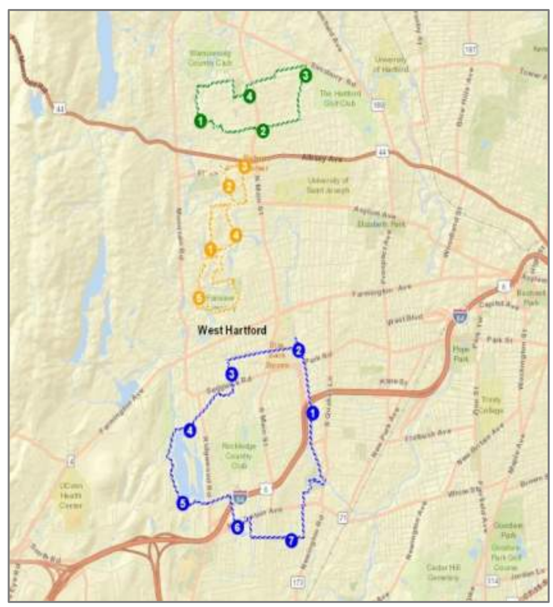
Project A.3 Complete Streets treatments, Slow Zones, and other safety and livability treatments draw from a range of design techniques that often result in narrower travel lanes and tighter turning radii at intersections. A conceptual project to **Define a Hierarchy of Emergency Access Routes** would identify a network for which emergency vehicle access would have priority. The planning may define preferred and prohibited traffic calming treatments for the hierarchy of routes.

Bicycle Network Conceptual Projects

Project By.1 The bicycle Functional Classification system defined the Bicycle Boulevard as a low speed, low volume, low stress route where bicycles would have priority over automobiles. A conceptual project for **Bicycle Boulevard Branding** would follow the precedent of routes implemented in Hartford, CT. As shown in **Figure 12-8**, the Hartford example brands three separate Bicycle Boulevards with colors, similar to the way that transit routes are coded. Wayfinding and route marking signs are also color-coded to heighten awareness of the routes.

These Bicycle Boulevards follow the recommendations to define routes on local streets within neighborhoods where a 25 mph speed limit is practical. They are less than optimum in that the three loops are totally separate, not connecting to each other or to other bicycle infrastructure for practical trip making. However, the precedent of high-profile branding with reference to higher-status transit systems is practical for raising awareness and identity of the Bicycle Boulevards. This is an important consideration for introducing a new Functional Class to the KTMPO region.

Figure 12-8: Bicycle Boulevards in Hartford, CT



Project By.2 The city of Seville, Spain increased its bicycle ridership to eleven times its previous levels in just a few years by a **Lightening Implementation of Protected Bike Lanes**. It is referenced as proof that any city can boost ridership significantly by building connected, safe bicycle infrastructure. The core of the implementation in Seville is that the infrastructure was built robustly and rapidly throughout the city. The implementation constructed forty miles of protected bike lanes in one year, with another forty-six miles added over the next six years. The bicycle mode share rose from 0.5% of all trips to 6% almost overnight, or from 6,000 daily trips to over 70,000. An study of Seville's new bike lanes found a direct correlation between the mileage of protected bike lanes and total ridership. Conversely, the connectivity of the protected bike lanes in a comprehensive system was found to be directly correlated to safety.

Following this successful precedent, a conceptual project would be to identify priority routes, right-of-way, and design elements for a full-fledged protected bike lane network for Lightening Implementation on a robust scale.

Project By.3 Even the most extensive public transit system fall shorts of providing door-to-door connectivity that covers the complex transportation needs of its riders. This first-mile, last-mile issue has been partially addressed in the KTMPO region. This concept may be extended further with a **Dockless Bike Share System**, similar to that already implemented on a limited scale on the Temple College Campus.

One recent option introduced in the industry is integrated fare cards with common payment for transit and bike share. This option eases the process of registering for the bike share system as well as the daily use of both systems.

Project By.4 Another conceptual project for bike share is to **Identify First-Mile, Last-Mile Opportunities**. Integrating bicycles with the transit system is largely complete with bike racks on all The HOP's buses, but the locations for shared ride stations and corrals needs to be determined. An analysis of the ultimate trip origins and destinations of transit riders will help in that placement. It can also provide insight on whether a docked or a dockless ride share system is most appropriate for a given area.

Project By.5 Parking for dockless bike share systems is a major concern. A new option couples the bikes' GPS with a Radio Frequency Identification (RFID) to define set areas for bike parking. Users simply scan the parking QR code in defined areas, as shown in **Figure 12-9** for a **Bike Corral** in Washington DC.

Figure 12-9: Bike Corral in Washington DC

Project By.6 The undeniable maintenance and clutter issues associated with the systems have been addressed in several areas with the conceptual project of **Dockless Bike Share Fees**, which are often supported by the bike share providers. The City of Seattle collects a $250,000 annual fee from each provider, while other systems such as Dallas charge per bike. The electric scooter company Bird has offered to pay $1 per scooter per day to fund dedicated bike lanes.

Project By.7 A conceptual project to **Identify Locations for Protected Intersections** would serve to help prioritize the locations where this important new infrastructure type can be introduced into the KTMPO region. Locations may be evaluated based on forecast ridership, safety need, and available right-of-way. In the Oakland, CA example illustrated in **Figure 12-10**, the treatment includes curb bulb-outs, protected bike lanes, pedestrian refuges, and permanent bollards.

Figure 12-10: Protected Intersection in Oakland, CA

An interesting aspect of the Oakland implementation is that they are constructing their protected intersections before their protected bike lanes. Crash data show that intersections are more dangerous for bicyclists than travel along the streets, so they see the safety treatments of the intersections first as more effective.

Project By.8 **Themed Bike Rides** are a conceptual project suggested to increase ridership with fun events and to promote awareness of bicycling by aggregating a larger and more visible group of riders. They may include intense races or training runs for the advanced and serious rider, or fun events for the more general rider.

Examples of Themed Bike Rides include the 15-mile tour of taco restaurants held in Chicago and the annual Bike Houston Moonlight Ramble. The Moonlight Ramble is held on the Saturday before Halloween and features costumes, music, and prizes. It has a 10-mile route and a 20-mile option, with rest stops along both routes that distribute water and snacks.

Project By.9 Additional conceptual projects for bicycles are **Previous Bicycle Network Projects** which were included in the previous *Regional Thoroughfare and Pedestrian/Bicycle Plan*, but which were not re-submitted in the latest call for projects or noted in other public outreach or city sources. While these projects are therefore "unofficial", they contain valuable information and demonstrate the desire for projects in specific locations. There projects are listed in Appendix A as conceptual projects.

Bus Network Conceptual Projects

Project Bu.1 The HOP has proportionally more stops with shelters than is typical, providing for passenger comfort and establishing the system's presence. This can be augmented with a conceptual project to **Develop Bus Shelters** with enhanced treatments. Corporate sponsors could be given the opportunity to customize their stops, and community groups could decorate stops and add their own amenities such as landscaping, bulletin boards, or lending libraries.

Project Bu.2 The transit system in Nashville, TN uses numbers and colors to identify their routes. A proposal for a conceptual project for that system has been to **Name Transit Routes** reflecting local features or history. Nashville proposed route names that are related to country music stars; KTMPO could name routes after local figures such as Captain Waskow, historic routes such as the M-K-T line, or local references such as the 1st Cavalry route.

Truck Network Conceptual Projects

Project T.1 A suggested conceptual project to expand an inventory for a transportation mode is a **Truck Barrier Inventory**. This is to identify areas where trucks are not legally excluded, but where local conditions such as rough roads, narrow clearances, and lines of sight make truck operations troublesome.

Project T.2 An **Inventory of Hazardous Materials Origins and Destinations** is a suggested conceptual project that would provide information to plan for truck operations and possible Hazmat Route designations.

Project T.3 A conceptual project for an **Inventory of Truck Parking Areas** would locate higher-volume truck locations that are independent of employment-based freight origins and destinations. Identifying these sites would help for planning street projects to accommodate trucks.

Project T.4 The regional truck network is generally identified by higher-Functional Class streets and local industrial parks. A conceptual project for a **Definition of the Regional Truck Network** would refine the truck network with more precise evaluations of truck movements based on actual truck counts. This project may identify truck movements and needs which have been overlooked.

Walk Network Conceptual Projects

Project W.1 To be practical, the walk network is dependent on direct routings. A suggested conceptual project to **Verify Efficient Paths** for the walk network would be to develop a general street connectivity policy, which could be based on a walkability index. Several indices are in popular use, such as the one developed by the Environmental Protection Agency at https://catalog.data.gov/dataset/walkability-index. A walkability program for KTMPO may identify areas with connectivity issues at the scale of the walk network, and identify priority locations for alleys and cut-throughs.

Project W.2 Many of the sidewalks in the KTMPO region are three to four feet wide. This is perfectly adequate for the occasional person walking a short distance, but is less fit for longer walks, for shared use with more people, for multi-use paths, or for a pleasant walking experience. It may also be inadequate for downtown areas where more intense activity make a wider sidewalk necessary. A conceptual project would review the sidewalk inventory with all its attributes, and determine the appropriate **Design of the Sidewalk** in specific locations. Sidewalk design may reference the area type in the transect from rural to urban core areas, the expected levels of activity, and the origins and destinations which are served. Design may include attributes of width, landscaping, shade, street furniture, lighting, and pavement.

Project W.3 Artistic designs on the pavement can be considered as part of this conceptual project for sidewalk design. **Figure 12-11** shows a sidewalk in Montreal, Canada. The simple painted decorations and maze attract activity to the sidewalk.

Figure 12-11: Sidewalk in Montreal

Figure 12-12 shows a sidewalk in Eindhoven, the Netherlands, which was inspired by Van Gogh's painting *Starry Night*. The half-mile long installation is powered by LED lights, but other similar installations use treated luminescent pebbles that glow in the dark. As with the painted sidewalk, this type of installation heightens awareness, increases livability, and promotes activity.

Figure 12-12: Glow-in-the-Dark Sidewalk

Project W.4 Prioritization of the walk network is an important issue. A conceptual project to **Connect Parks and Schools** with low stress, pleasant, and barrier-free paths that avoid circuitous routes would define a high priority network for planning.

Project W.5 Additional conceptual projects to stimulate activity include **Pocket Parks** in the place of one or two parking spaces. As shown in **Figure 12-13**, Pocket Parks repurpose one or two parking spaces on the edge of the street to extend the sidewalk and create small livable spaces. The concept is both an item of infrastructure and an event; there is an annual Park(ing) Day event held in cities throughout the nation to promote Pocket Parks by constructing temporary installations. The event is promoted by the American Society of Landscape Architects (ASLA). Information on the ASLA website at https://www.asla.org/contentdetail.aspx?id=46872 includes background, information on insurance and licensing, and an implementation manual.

Figure 12-13: Pocket Parks

Project W.6 Walkability increases when people have some pleasant path and destination where they would actually want to walk. A conceptual project to increase walkability would **Discover Hidden Places** in the KTMPO region that could be developed and publicized for walkability. **Figure 12-14** shows a Hidden Place at Buffalo Bayou in Houston. The area was previously described as a "trash-soaked eyesore under a near-impossible mess of freeways", but the potential of the Hidden Place was recognized. The Buffalo Bayou Promenade was developed as a path 1.2 miles long in twenty-three acres of park. It now connects the Buffalo Bayou Park to the downtown and the Theater District with a pleasant and walkable multi-use path. The development received the 2009 Professional Award of Excellence from the American Society of Landscape Architects.

Figure 12-14: Buffalo Bayou Hidden Place

Other potential Hidden Places which can be developed into walkable paths or destinations include historic structures, significant trees, and short alleyways connecting activity centers.

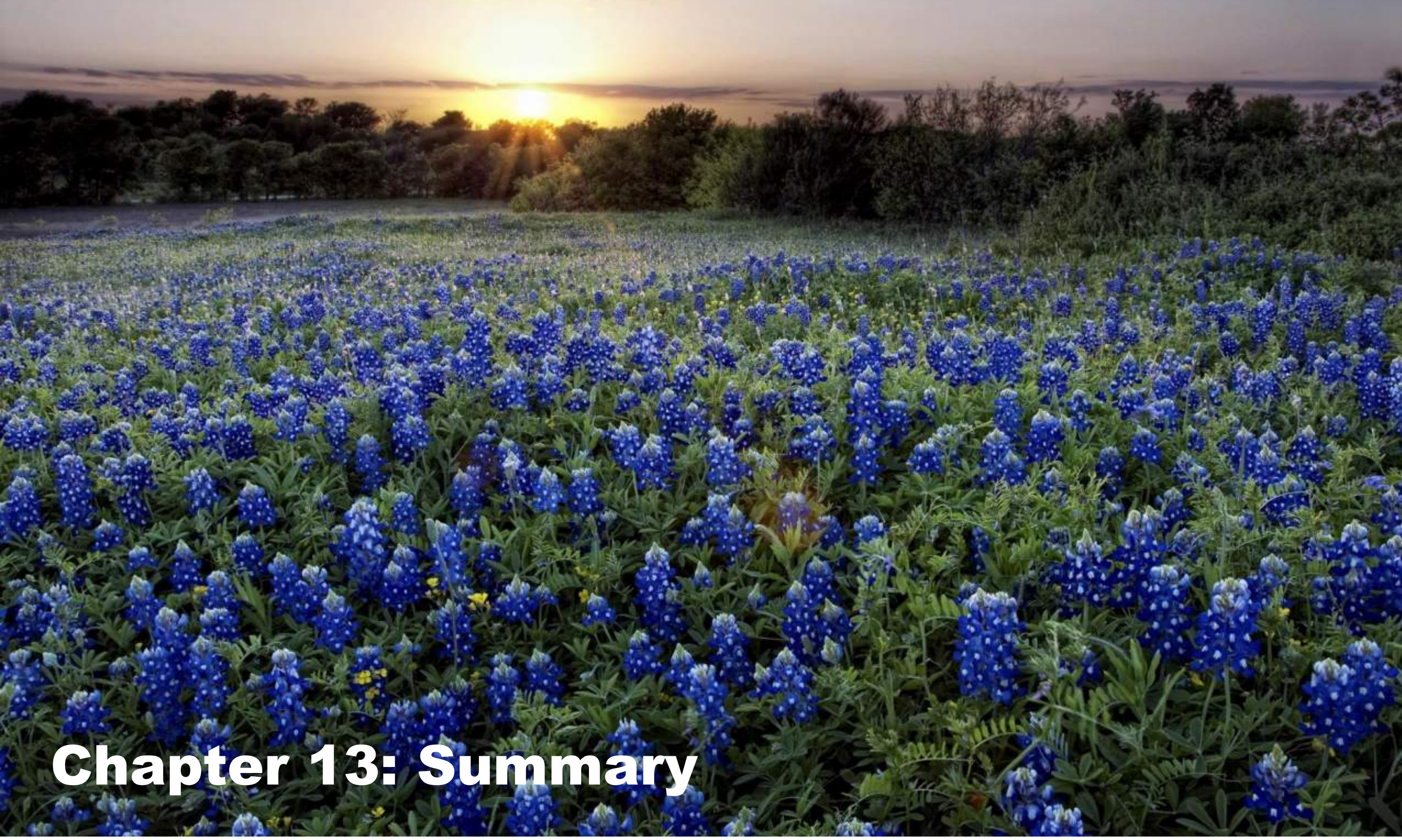
Rail System Conceptual Projects

Project R.1 The Federal Railroad Administration (FRA) promotes safety at all at-grade railroad crossings through their regulations requiring trains to sound their horns at least fifteen seconds before the crossing. Recognizing that this may be an annoyance in some residential areas, there is a provision for establishing **Rail Quiet Zones**. Designation requires the use of the FRA Quiet Zone Calculator, which calculates the risk of the crossing and the Supplemental Safety Measures (SSMs) which mitigate the risk. Development and designation of Rail Quiet Zones are overseen by FRA and monitored by the TxDOT Rail Division.

Supplemental Safety Measures for a Rail Quiet Zone most often include four-quadrant gates which block both sides of the road in both directions. Median barriers may also be implemented to help prevent cars from going around the gates.

Summary

The specific physical network projects which are candidates for analysis and prioritization as part of the fiscally-constrained KTMPO 2045 Metropolitan Transportation Plan (MTP), which are listed for the various transportation modes in Chapters 6 through 9, are complemented by the conceptual projects listed in this Chapter. These projects are "unofficial" in terms of their source, conceptual rather than specific, and may not fall into one of the MTP funding categories. These conceptual projects therefore may not be directly relevant to the KTMPO 2045 MTP. However, taken together with the MTP projects, these conceptual projects can contribute to developing a balanced regional multimodal network.



CHAPTER HIGHLIGHTS

- The Transportation Planning Process
- Auto Network
- Bicycle Network
- Bus Network
- Truck Network
- Walk Network
- Complete Streets
- Summary

Introduction

Historically, the dominant mode of travel in the Killeen-Temple Metropolitan Planning Organization (KTMPO) region has been the personal automobile, and a transportation planning process that focused on automobile mobility was appropriate and adequate. However, people and industries are rethinking their transportation needs, preferences, and habits. It is now critical to consider multiple options for mobility and access, and the way we plan for transportation must progress to include all transportation modes for people and freight. Transportation planning must shift from its historic focus on the automobile mode and expand to consider all modes within an **integrated multimodal transportation system**.

The vehicle for accomplishing the transportation planning task is this **Regional Multimodal Plan**. The change in names from the previous Regional Thoroughfare Plan to this Regional Multimodal Plan reflects the greater emphasis that this update places on planning for all transportation modes.

The integrated multimodal transportation system can be considered as a series of layered networks with some links shared among transportation modes, some links exclusive to one modes, and some modes interfacing with the system as points rather than as links. Multimodal transportation planning must consider the features of each mode individually, and must also plan for how each mode interacts with the others. While each mode in theory can operate independently, in practice the interface between modes can be vital in establishing how well each mode performs.

The goal of a regional multimodal system is to develop complementary modal networks that interact to provide safe, convenient, and practical transportation options for all users. Within this balanced system, all transportation modes are not equal, nor are all modes equally used. The private automobile is the predominant mode of transportation in the KTMPO area. Transportation planning must recognize this fact, and take care to balance the needs and traditional accommodation of this mode while increasing the integration of all modes into the regional multimodal system.

The Transportation Planning Process

The regional multimodal transportation system operates within the context of regional goals, regional demographics, regional plans, and the travel demand model setup and definitions. The intensities and patterns of existing demographics and projected growth show that the road infrastructure is generally well patterned to serve transportation demand. A review of each of these contexts shows that the existing transportation planning process and transportation infrastructure in the region are robust and supportive of this Regional Multimodal Plan.

The task of updating the previous Regional Thoroughfare Plan into this Regional Multimodal Plan is to extend a robust regional automobile-oriented planning process to include planning for all transportation modes. This extension and update must also include the consideration of new planning concepts. The Complete Streets, Vision Zero, and Context-Sensitive Solutions movements contribute to planning for an integrated multimodal system with a compatible focus on supporting and protecting all transportation modes and users. Consideration of these new concepts is a valuable addition to the traditional concept of typical street cross sections which have historically been used.

The purpose of a plan is not to predict the future; it is to enable it.

The Auto Network

The **auto network** is the base layer for the Thoroughfare Plan, with Functional Classes defined as providing a balance of access and mobility.

The Functional Classes for the auto network are:

- Controlled Access
- Major Arterial
- Minor Arterial
- Collector
- Frontage Roads & Ramps
- Local Streets

Facility Types distinguish between different features that can be applied to any Functional Class street. The traditional auto network Facility Types are divided, undivided, and continuous center turn lane. This plan has extended the list of Facility Types to include Complete Streets and Green Streets as well.

The inventory of current conditions for the auto network reviewed the existing GIS files, previous Transportation Improvement Program (TIP) documents, and aerial photos to update the network to the year 2017. The network inventory is robust and aligns with the Functional Class system.

Design guidance for typical street cross sections have been provided for the auto network. The guidance is generalized to recognize that the implemented Functional Class and cross section for each project must consider the specific context of the project. Street cross sections provided in the Thoroughfare Plan are meant as guidance for typical conditions, and should be refined as needed for each specific project.

Table 13-1 summarizes the recommendations for right-of-way (ROW) considerations by street Functional Class.

Table 13-1: Summary of ROW Recommendations by Functional Class

Functional Class	Minimum ROW	Preferred ROW	Lane Width	Pavement Width	Median	Outside Buffer	Notes
Controlled Access	250'	Varies, up to 500'	Minimum 12'	Varies	Minimum 36' rural Minimum 10' urban	Varies	Inside shoulder minimum 4' Outside shoulder minimum 10' Vertical clearance minimum 14'
Major Arterial	130'	160'	Preferred 12'	82' to 106'	Preferred 18'	15'	ROW may be greater with parking, bicycle and pedestrian facilities, bus stops, and intersection treatments
Minor Arterial	80'	120'	Preferred 12'	47' to 75'	Center Turn Lane 14'	10'	
Collector	60'	80'	Minimum 11'	31' to 57'	Center Turn Lane 14'	5'	
Local	44'	50'	Minimum 10.5'	23' to 29'	None	5'	

The Thoroughfare Plan for the auto network includes:

- 22 projects from the KTMPO GIS layer of projects
- 24 funded projects from the 2040 MTP
- 28 unfunded projects from the 2040 MTP

Conceptual projects for the auto network include the ideas of inventorying candidates for road diets, identifying critical chokepoints in the network, and defining a hierarchy of access routes for emergency services.

To assist in project evaluation and planning, new performance measures were suggested to help balance the auto network within the integrated multimodal system. Suggested measures included evaluations of speeding, distracted driving, and driving under the influence (DUI) from crash data, measures of mode share from Census data, and inventories of network barriers, bottlenecks, and connectivity.

The Bicycle Network

While the basis for a Functional Classification system for the auto network is primarily that of balancing the purposes of access and mobility, in contrast, the basis for the **bicycle network** Functional Classification system can be seen primarily as addressing safety, which in turn directly affects convenience and building ridership volumes. Each of the bicycle Functional Classes therefore has multiple roles in developing a balanced regional multimodal network.

The Functional Classes for the bicycle network are:

- Protected Bike Lane
- Cycle Track
- Conventional Bike Lane
- Bicycle Boulevard
- Shared Road
- Off-Street Multi-Use Trail

The Facility Types applied to the bicycle network vary among the Functional Classes. They relate to the facilities' design, surface, and levels of protection.

The inventory of current conditions for the bicycle network reviewed the existing GIS files, previous Transportation Improvement Program (TIP) documents, and aerial photos to update the network. Not all the Functional Classes which were defined for the bicycle network are present in the 2017 inventory, but the inventory aligns with the Functional Class system.

Design guidance for the bicycle network included treatments for bicycle lanes, and was extended to discuss the design of intersections, curbsides, parking, and pavement color.

Projects for the bicycle network were sourced from the 2040 MTP and through public input through the KTMPO website. Since many projects are for multi-use trails which serve both the bicycle and the walk network, their projects were presented together. The combined list of projects includes 25 funded and 33 unfunded projects from the 2040 MTP and 52 suggested by the public.

Nine conceptual projects for the bicycle network included ideas for expanding the coverage and safety of the network and its connections to the transit mode. A separate listing of conceptual bicycle and pedestrian projects from the 2040 MTP is presented in Appendix A.

Suggested performance measures for the bicycle network included measures of safety, barriers and connectivity, and mileage of the bicycle network by Functional Class.

The Bus Network

The concept of Functional Classification for the **bus network** relates to the transit system infrastructure of bus stops. A consideration of passenger comfort and amenities is the primary driver in the definition of bus stop Functional Class.

The Functional Classes for the bus network are:

- Station
- Shelter
- Bench
- Basic Bus Stop

Facility Types for the bus network distinguish stops based on their relation with the street. ADA compliance is also established as a separate Facility Type that layers onto all other considerations.

The bus network inventory of current conditions was based on a GIS file of bus stops provided by The HOP and reconciled through field work. The inventory was updated for the recent route changes.

Design guidance for the bus network referenced the configuration of bus stops for ADA compliance and the placement of stops with relation to the street. Guidance for other group transportation modes recognized that they are controlled by the private sector, but stipulated the ADA compliance standards that is required of for all spaces serving the public.

Only three projects for group transportation were noted: one as a funded project from the 2040 MTP to purchase new buses, and two from the Aviation Capital Improvement Program for the Draughon-Miller Central Texas Regional Airport. Conceptual projects for high speed rail service and improvements to AMTRAK service were noted, but these are in the early planning stages and were therefore not listed.

Conceptual projects for the bus network were to develop bus shelters with enhanced treatments, and to improve the branding of transit routes.

Suggested performance measures for the bus network included measures of connectivity, comfort as rated by the presence of amenities at stops, on-time performance and reliability, and a measure of the completeness of the required Transit Asset Management Plan.

The Truck Network

The definition of Functional Classes for the **truck network** is intended to inform the street design process of the needs and impacts of trucks. This Functional Classification system is a tool to define a hierarchy of street facilities as used by trucks.

The Functional Classes for the bus network are:

- Truck Priority
- Truck Restricted
- Truck Hazardous Materials
- Truck Prohibited

The truck network inventory of current conditions was based on available GIS files and on designations of routes from planning sources such as the National Highway System (NHS) and the Texas Highway Freight Network. TxDOT designations such as the listings of load-restricted routes and load-restricted bridges were also referenced.

Design guidelines for the truck network are treated by referencing the concept of the “design vehicle.” Larger vehicles such as trucks, emergency response vehicles, and buses have specific needs which must be addressed in road design; particularly turning radius, lane width, vertical clearance, and horizontal clearance. Design guidance for the truck network is therefore similar to the auto network.

Truck network projects were derived from a variety of sources, including routes defined by the Freight Advisory Committee, inventories of routes with restrictions, and at-grade railroad crossings. Projects include:

- 9 routes identified by the Freight Advisory Committee
- 11 load-restricted bridges
- 34 load-restricted roads
- 4 roads with geometric restrictions
- 109 at-grade railroad crossings

Three conceptual projects were suggested for the truck network: inventorying hazardous materials origins and destinations, inventorying truck parking, and defining a more robust regional truck network.

Suggested performance measures for the truck network included evaluations of load restricted bridges and network barriers and connectivity. A conceptual project for railroad quiet zones was also included.

The Walk Network

The Functional Classes defined for the **walk network** set a hierarchy of facilities which can be implemented as appropriate when the walk network interacts with the other modal networks. This is considered in many contexts, supporting the primary purpose of promoting safety.

The Functional Classes for the walk network are:

- Off-Street Multi-Use Trail
- Sidewalk
- Desire Lines
- Crosswalk

Functional Classes for the walk network cover a wide range of infrastructure, so their associated Facility Types vary considerably.

The review of the inventories for the walk network revealed several topics and geographic area which need updates.

The definition of new Functional Classes for the walk network has established the need for new inventories in the topics of Desire Lines and Crosswalks. Additional attributes also need to be inventoried for some Functional Classes, including pavement width, surface, and ADA Compliance. To support the inventories, a more precise definition of the distinction between on-street multi-use trails and sidewalks is needed.

Geographically, there are new developments and older residential areas in Copperas Cove, south of Killeen and Harker Heights, north of Belton, Temple, and Troy where the sidewalk inventory is incomplete and needs to be extended.

Design guidance for the walk network generally reference the need for the provision of pedestrian facilities rather than their design. In general, design guidance for the pedestrian network relates to the sidewalk Functional Classes and ADA compliance.

Projects for the walk network were sourced from the 2040 MTP and through public input through the KTMPO website. Since many projects are for multi-use trails which serve both the bicycle and the walk network, their projects were presented together. The combined list of projects includes twenty-five funded and thirty-three unfunded projects from the 2040 MTP and fifty-two suggested by the public. A separate listing of conceptual bicycle and pedestrian projects is presented in Appendix A, and is not included in this count.

Six conceptual projects were suggested for the walk network, focusing on the efficiency and design of paths, connectivity, and the provision of livable spaces such as pocket parks and hidden places.

Suggested performance measures for the walk network included measures of the sidewalk network, ADA compliance, barriers and connectivity, and the mileage of trails.

Complete Streets

The KTMPO regional network consists of layers of interrelated networks for the auto, bicycle, bus, truck, and walk networks. Each of these networks has its own specific design standards specified by law or by professional practice. The **Complete Streets** concept is one tool that can help develop these individual networks into a balanced and integrated multimodal network. Complete Streets treatments are intended to bring the different layers of the multimodal system into a proper balance. This balance does not mean that every street must provide full accommodation for every transportation mode. It does mean that that every street should be designed with an appropriate consideration of all transportation modes to see how they can be balanced together.

> **…we could lay out an ideal street type, but in an existing city with constrained rights of way…not all streets can do all things at one time.**
>
> **David Gaspers**
> **Principal Planner**
> **City of Denver**

Implementing the desired Complete Streets design may be a challenge within the available right-of-way, funding constraints, and regulatory environment.

Complete Streets treatments and the balance of all the individual modes in the integrated multimodal network depends upon the regional and the street contexts, which define the intensity and character of activities and where they take place on the street for each mode.

Recognizing the contexts, the very specific and objective design guidelines for each mode are brought together and balanced under the very general and subjective concepts of Complete Streets. Guidance for developing the proper balance of modes for Complete Streets therefore relies as much on imagination and judgement as it does on engineering.

To support the planning of implementation of Complete Streets and bring the integrated multimodal network into a better balance, several conceptual projects were defined in the categories of policy, planning, and events. Conceptual projects include suggestions to adopt Vision Zero policies, safety strategies, rapid implementation of projects, updated inventories for transportation modes, and pursuing designations as

Bicycle Friendly Communities. A conceptual project for an annual Ciclovía was suggested as an education event to promote awareness of the balanced multimodal system and change drivers' attitudes towards other transportation modes.

Summary

The traditional transportation process and previous Regional Thoroughfare Plan supported a street network that is robust, well distributed, and well suited to serve the automobiles that serve over 92% of all trips in the region. However, a new vision for the region as expressed in the 2040 Metropolitan Transportation Plan (MTP) established the goal **to preserve and enhance the KTMPO area by developing a fully-integrated, multi-modal transportation system focusing on moving people and freight**. Accomplishing this vision calls for a shift in the way transportation planning is carried out in the region.

This Regional Multimodal Plan builds on the new vision to depart from the traditional automobile-oriented planning and pursue the development of a more balanced and integrated multimodal transportation system. The approach used in this Plan developed several new approaches to support the process:

If you always do what you always did, you'll always get what you always got.

- The transportation network was defined as several interrelated and interactive layers, with individual auto, bicycle, bus, truck, and walk networks. Transportation modes for passenger air and rail were also considered, but they interact with the regional network as discrete points rather than as networks, so planning for those modes was approached slightly differently.
- The existing Functional Class and Facility Type system as defined for the auto network was extended to cover all transportation networks. This approach supported more precision in modal inventories of current conditions and network issues.
- Projects for network improvements were compiled from various official and unofficial sources to develop potential future networks for planning. These lists of projects are not fiscally constrained or prioritized, and so form an input into the 2045 KTMPO MTP.
- Planning and projects are stimulated with conceptual projects suggested in the categories of policy, planning, and events, and for each transportation modal network. These projects are conceptual rather than specific, and may not fall into one of the MTP funding categories, and they therefore may not be directly relevant to the KTMPO 2045 MTP. However, taken together with the MTP projects, these conceptual projects can contribute to developing a balanced regional multimodal network.

Appendix A: Referenced Bicycle and Pedestrian Projects

The previous 2011 *Killeen-Temple MPO Regional Thoroughfare and Pedestrian/Bicycle Plan* presented a list of projects that were not all carried through into the 2040 Metropolitan Transportation Plan. Further, these projects were not carried forward into the KTMPO inventories and GIS files, and were not re-submitted. These projects may therefore be considered as "unofficial" or "conceptual", even though they have been documented in the previous plan. However, they have been vetted by that planning process, and therefore represent real needs and potential solutions for the bicycle and pedestrian networks. These projects are therefore presented for reference.

The projects are shown for the region in **Figure A-1**. **Figure A-2** through **Figure A-6** are insets to show more detail for Copperas Cove, Killeen, Harker Heights, Belton – Salado, and Temple.

Each project is listed in **Table A-1** through **Table A-15**, with separate tables for the major jurisdictions in the KTMPO region as follows:

- **Table A-1** covers the City of Belton, with 70 projects
- **Table A-2** covers the City of Copperas Cove, with 44 projects
- **Table A-3** covers the City of Harker Heights, with 27 projects
- **Table A-4** covers the City of Kempner, with 3 projects
- **Table A-5** covers the City of Killeen, with 102 projects
- **Table A-6** covers the City of Little River / Academy, with 2 projects
- **Table A-7** covers the City of Morgan's Point Resort, with 2 projects
- **Table A-8** covers the City of Nolanville, with 6 projects
- **Table A-9** covers the City of Temple, with 147 projects
- **Table A-10** covers the Village of Salado, with 7 projects
- **Table A-11** covers Bell County, with 60 projects
- **Table A-12** covers Coryell County, with 13 projects
- **Table A-13** covers Lampasas County, with 17 projects
- **Table A-14** covers the Army Corps of Engineers, with 2 projects
- **Table A-15** covers Fort Hood, with 20 projects

Figure A-1: 2011 Reference Bicycle and Pedestrian Projects

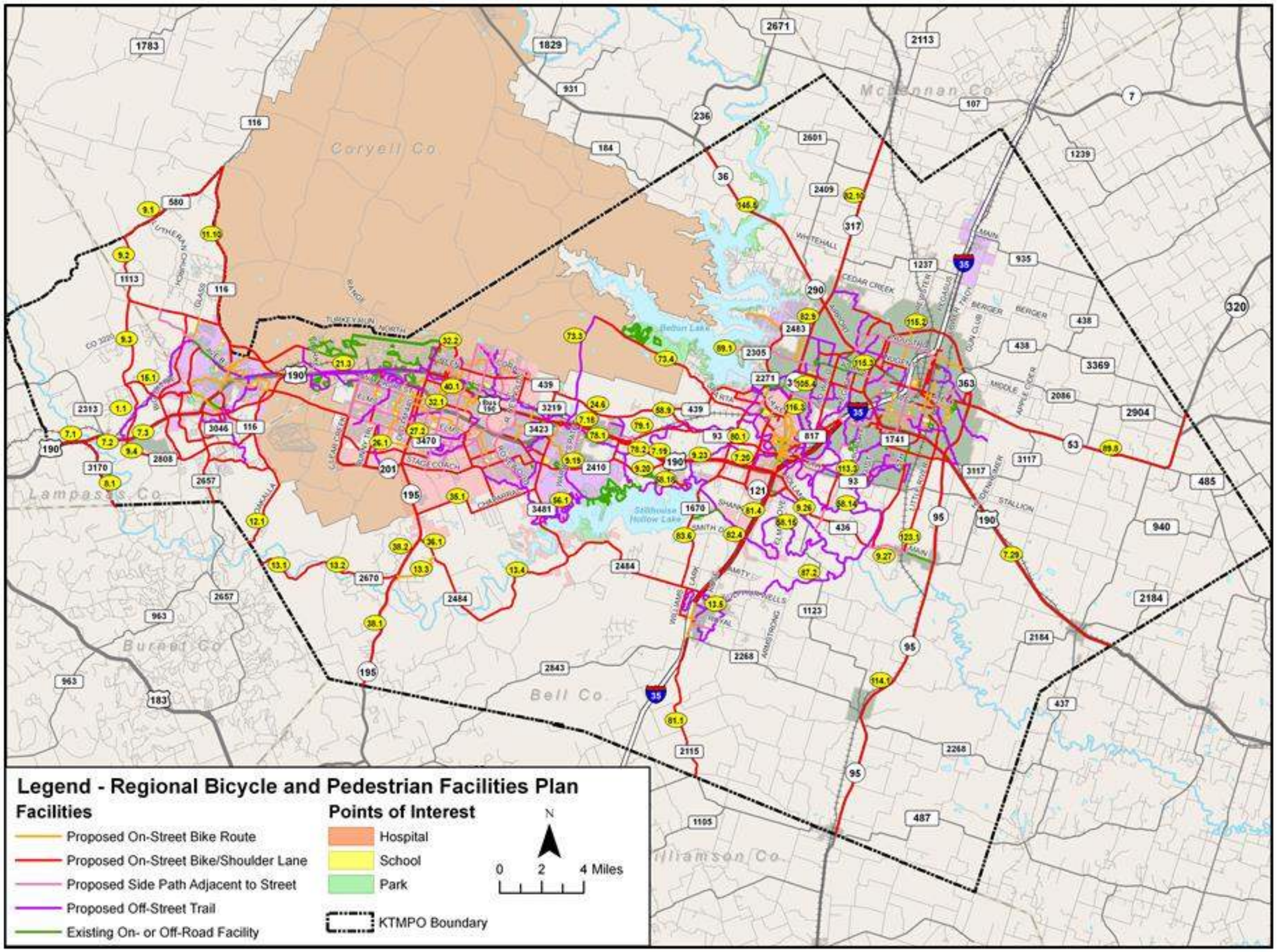


Figure A-2: 2011 Reference Bicycle and Pedestrian Projects Copperas Cove Inset

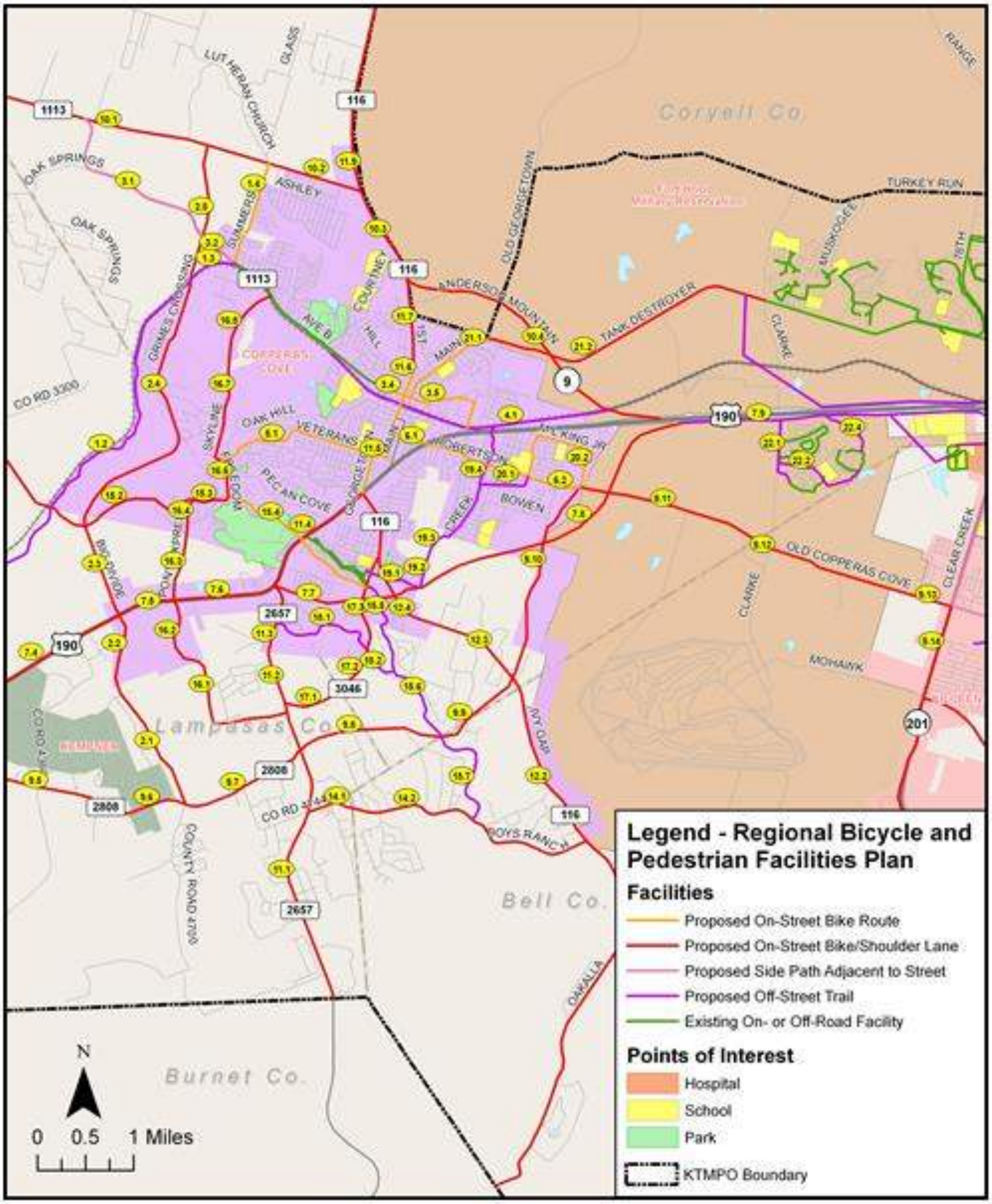


Figure A-3: 2011 Reference Bicycle and Pedestrian Projects Killeen Inset

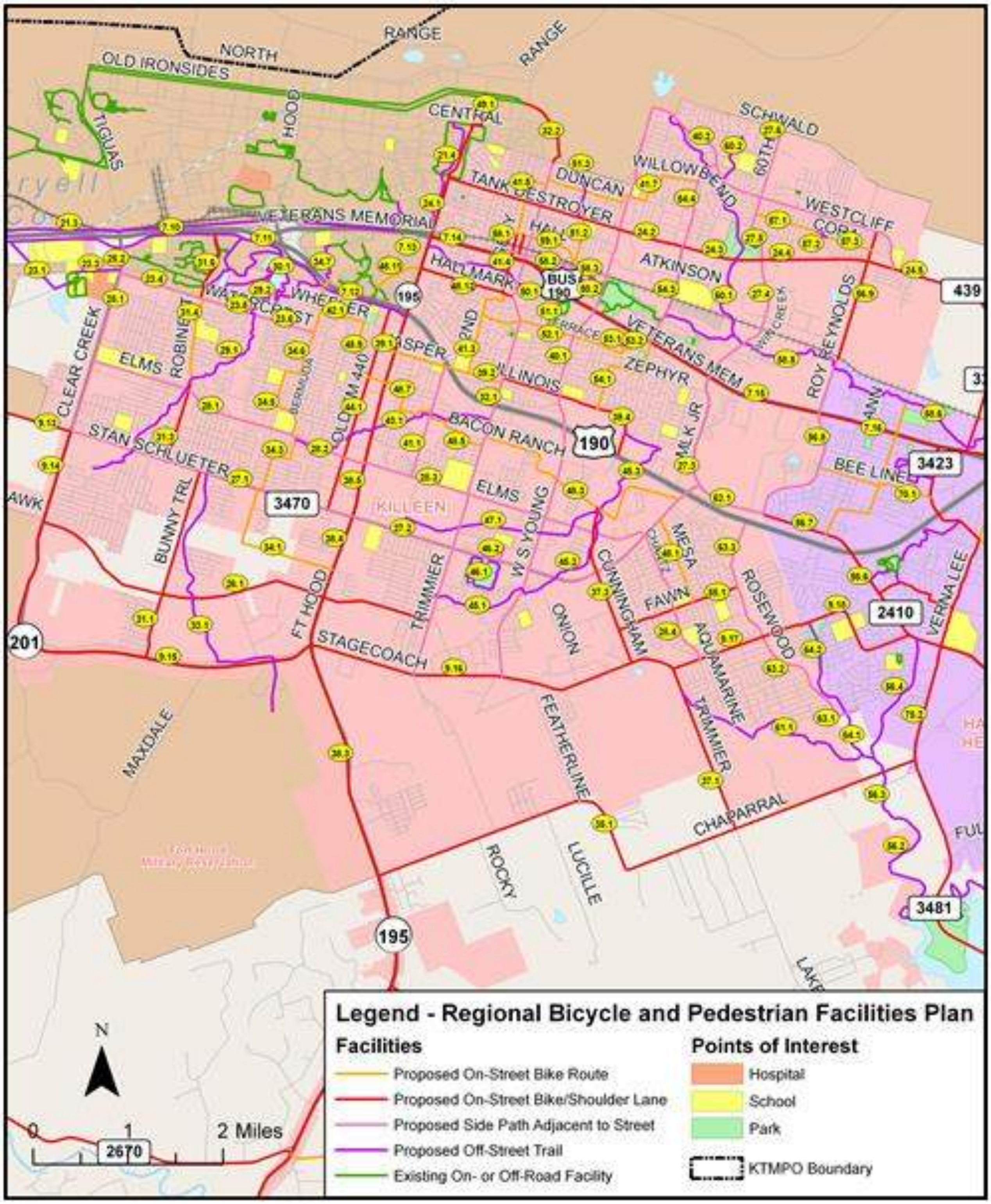


Figure A-4: 2011 Reference Bicycle and Pedestrian Projects Harker Heights Inset

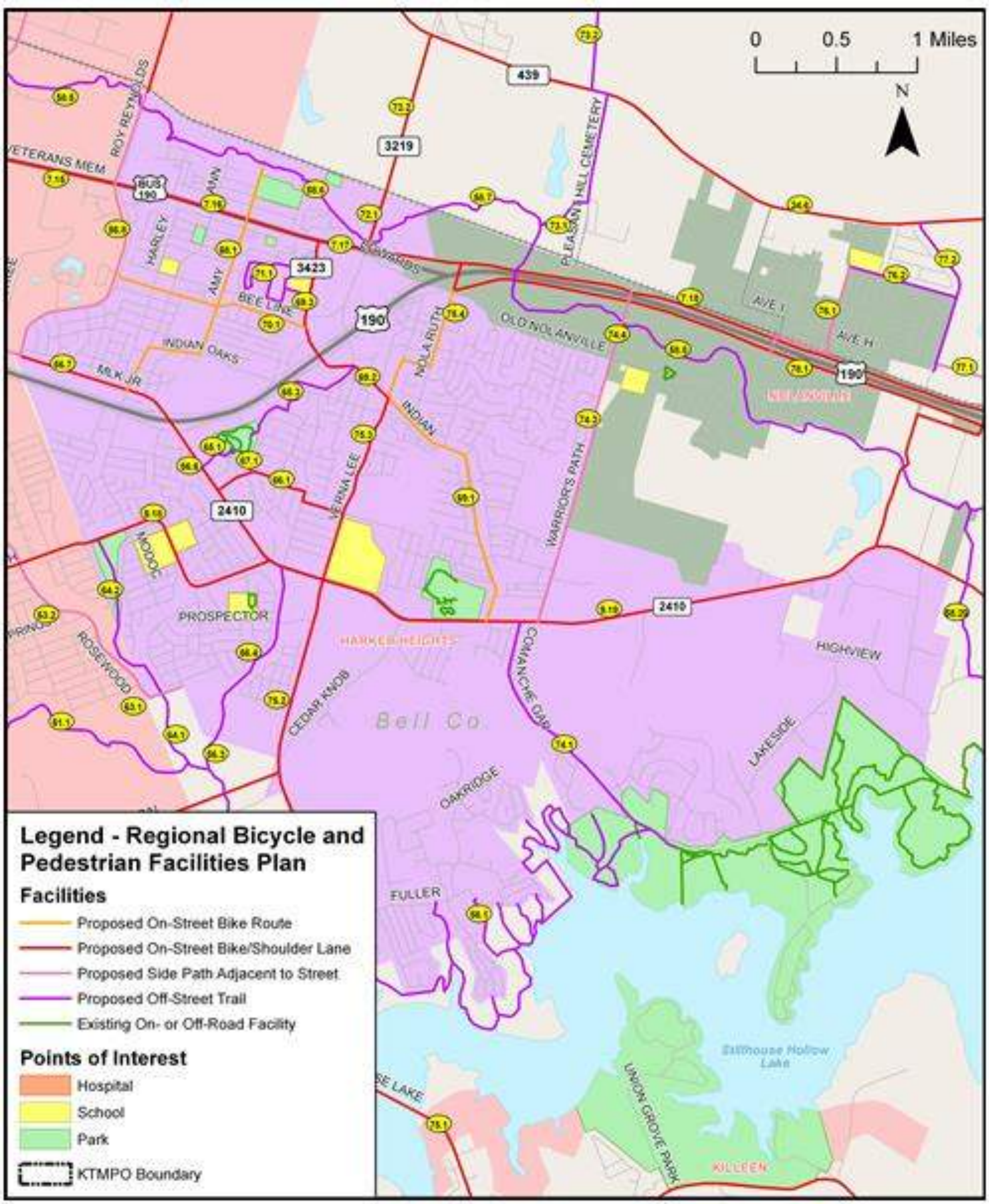


Figure A-5: 2011 Reference Bicycle and Pedestrian Projects Belton – Salado Inset

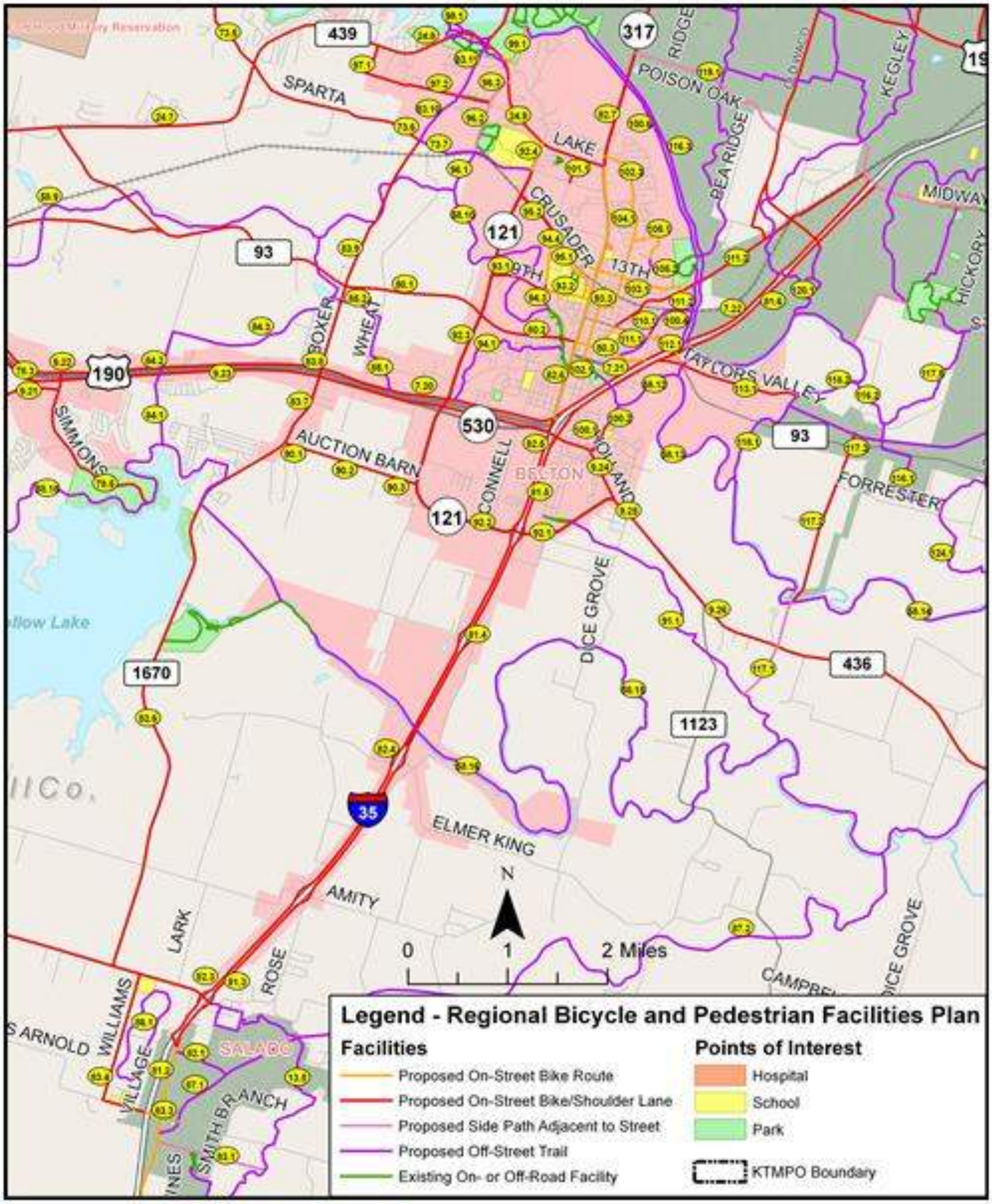


Figure A-6: 2011 Reference Bicycle and Pedestrian Projects Temple Inset

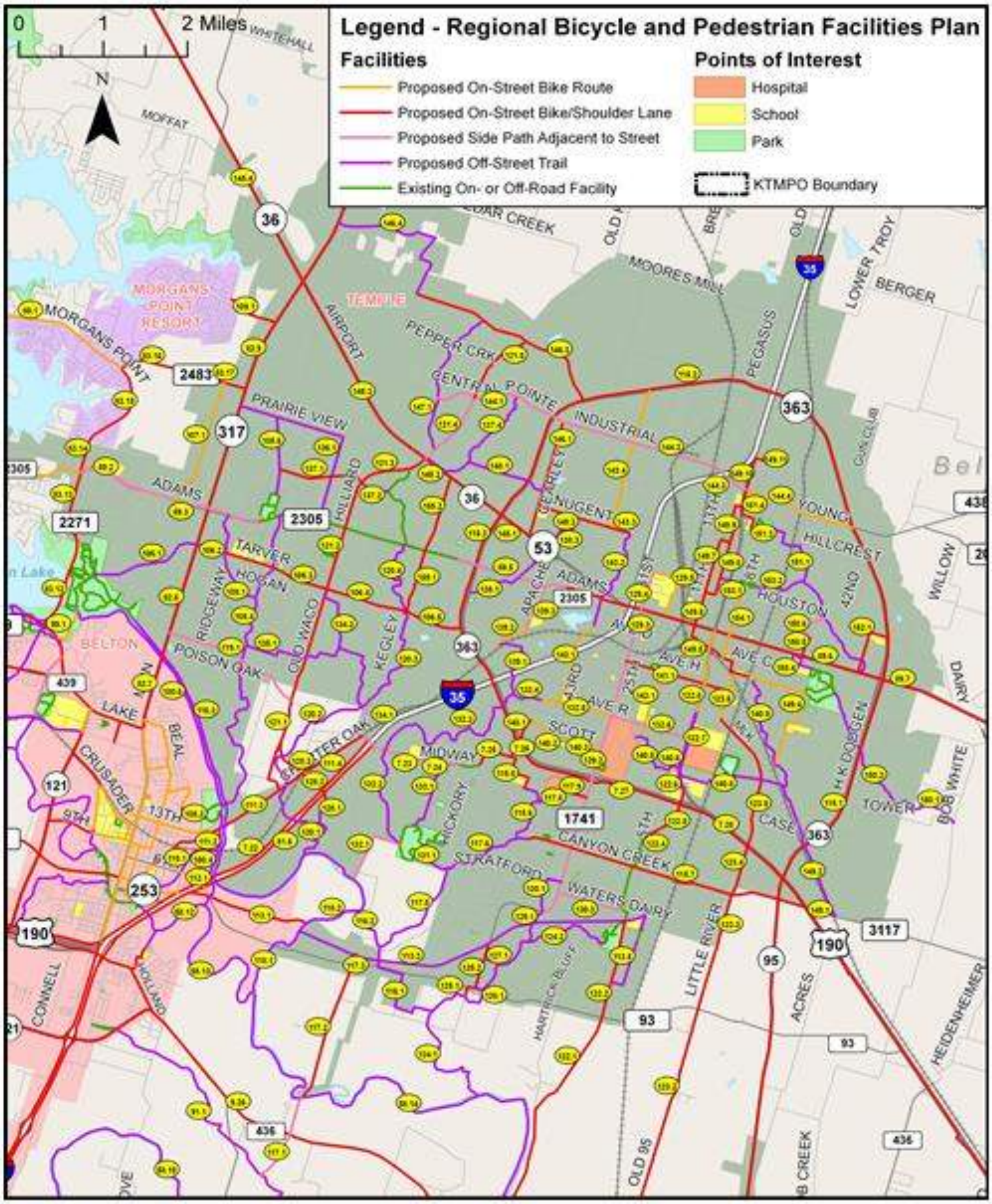


Table A-1: 2011 Reference Projects for the City of Belton

City of Belton									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
7.20	Shoulder Lane	Add signs and markings for shoulder lanes	On US190 WB FR	From western city limit easterly to Main Street	2 lane one-way roadway with shoulders	No	Yes	5.63	$225,200
7.21	Shoulder Lane	Include shoulder lane with future roadway improvement	On IH 35 SB FR	From US190 WB/Main St northerly to northern city limits	2 lane one-way roadway	No	Yes	1.52	$0
9.21	Shoulder Lane	Add shoulders, signs, and markings	On FM 2410	From western city limit easterly to Simmons Rd	2 lane roadway with narrow shoulders	No	Yes	0.51	$127,500
9.22	Shoulder Lane	Add shoulders, signs, and markings	On FM2410/Simmons Rd	From FM2410 northerly to US 190 WB FR	2 lane roadway	No	Yes	0.17	$42,500
9.23	Shoulder Lane	Add shoulders, signs, and markings	On US190 EB FR	From Simmons Rd easterly to IH 35 NB FR	2 lane one-way roadway	No	Yes	4.97	$1,242,500
9.24	Shoulder Lane	Add shoulders, signs, and markings	On FM 436	From IH 35 SB Service Rd easterly and southerly to Loop 121 at Shady Ln	4 lane roadway	Yes	Yes	0.99	$247,500
9.25	Shoulder Lane	Add shoulders, signs, and markings	On FM 436	From Loop 121 at Shady Ln easterly to eastern city limit	4 lane roadway	No	Yes	0.21	$52,500
24.8	Shoulder Lane	Add shoulders, signs, and markings	On FM 439	From Wild Wood Dr easterly to FM2271	4 lane roadway	No	Yes	1.15	$287,500
24.9	Shoulder Lane	Add shoulders, signs, and markings	On FM439/Lake Rd	From FM2271 easterly to Main St	5 lane roadway	Yes	Yes	1.86	$465,000
58.10	Trail	Add 10ft wide multi-use trail	Along Nolan Creek	From proposed trail at Belton western city limit southerly to existing trail in Lions/Harris Park	Creekside land	Yes	No	2.82	$846,000
58.12	Trail	Add 10ft wide multi-use trail	Along Nolan Creek	From existing trail in Confederate Park easterly to proposed trail south of FM93	Creekside land	Yes	No	1.10	$330,000
58.13	Trail	Add 10ft wide multi-use trail	Along Nolan Creek	From proposed trail south of FM93 easterly to proposed trail along Leon River	Creekside land	No	No	2.33	$699,000
58.16	Trail	Add 10ft wide multi-use trail	Along Lampasas River	From city limit west of Elm Grove Rd westerly to existing trail east of Chalk Ridge Falls Park	Riverside land	No	No	3.81	$1,143,000
73.6	Shoulder Lane	Add shoulders, signs, and markings	On Sparta Rd	From western city limit to proposed trail along proposed road west of Wheat Rd	2 lane roadway	No	No	0.28	$70,000
73.7	Trail	Add 10ft wide multi-use trail	Along Sparta Rd	From proposed trail west of Wheat Rd easterly to Loop 121	2 lane roadway	Yes	No	1.20	$360,000

Table A-1: 2011 Reference Projects for the City of Belton (continued)

City of Belton									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
78.3	Shoulder Lane	Add shoulders, signs, and markings	On US 190 EB FR	From western city limit west of FM2410 easterly to FM2410	2 lane one-way roadway with shoulders	No	Yes	0.60	$150,000
78.5	Shoulder Lane	Add shoulders, signs, and markings	On Simmons Rd	From FM2410 southerly to proposed trail in Stillhouse Park	2 lane roadway	No	No	1.72	$430,000
80.2	Bike Lane	Add signs and markings for bicycle lanes	On FM93/2nd Ave	From western city limit easterly to Main St	2 lane roadway with shoulders	Yes	Yes	1.17	$46,800
80.3	Bike Route	Add bike route signs	On 2nd Ave	From Main St easterly to IH35 SB FR	3 lanes roadway to the west of Penelope, 2 lanes to the east	Yes	No	0.73	$5,000
81.4	Shoulder Lane	Include shoulder lane with future roadway improvement	On IH 35 NB FR	From southern city limit north of FM2484 northerly to Loop 121	2 lane roadway	No	Yes	5.26	$0
81.5	Shoulder Lane	Include shoulder lane with future roadway improvement	On IH 35 NB FR	From Loop 121 northerly to northern city limit at Leon River	2 lane roadway	Yes	Yes	2.66	$0
82.4	Shoulder Lane	Include shoulder lane with future roadway improvement	On IH 35 SB FR	From southern city limit north of FM2484 northerly to Loop 121	2 lane roadway	No	Yes	5.29	$0
82.5	Shoulder Lane	Include shoulder lane with future roadway improvement	On IH 35 SB FR	From Loop 121 northerly to US 190 WB FR	2 lane roadway	Yes	Yes	1.21	$0
82.6	Bike Route	Add bike route signs	On SH317/Main St	From US 190 WB FR northerly to FM439	3-5 lane roadway	Yes	Yes	2.60	$15,000
82.7	Bike Lane	Add signs and markings for bicycle lanes	On SH 317/Main St	From FM439 northerly to northern city limit at Leon River	2 lane roadway with shoulders	Yes	Yes	0.90	$36,000
83.7	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 1670	From southern city limit at Sunflower Ln northerly to US 190 EB FR	2 lane roadway with shoulders	No	Yes	1.03	$41,200
83.8	Shoulder Lane	Add shoulders, signs, and markings	On FM 1670	From US 190 EB FR northerly to northern city limits south of Springer St	2 lane roadway	No	Yes	0.16	$40,000
83.10	Trail	Add 10ft wide multi-use trail	Along proposed southern extension of FM 2271	From Sparta Rd northerly to Red Rock Dr	Future roadway	Yes	No	0.96	$288,000
83.11	Trail	Add 10ft wide multi-use trail	Along proposed southern extension of FM 2271	From Red Rock Dr northerly to FM439	Future roadway	No	No	0.23	$69,000

Table A-1: 2011 Reference Projects for the City of Belton (continued)

City of Belton									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
83.12	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 2271 in Miller Spring Park	From FM439 northerly to north city limits east of Belton Lake	2 lane roadway with shoulders	Yes	Yes	0.98	$39,200
84.2	Trail	Add 10ft wide multi-use trail	Along George Wilson Rd	From city limit at Dogridge Rd northerly to city limit north of US190 WB FR	2 lane roadway	No	No	0.35	$105,000
85.1	Trail	Add 10ft wide multi-use trail	North of US190 and east of Wheat Rd	From US 190 WB FR northerly to northern city limit north of Digby Dr	Open land	No	No	0.52	$156,000
90.1	Shoulder Lane	Add shoulders, signs, and markings	On Auction Barn Rd	From FM 1670 easterly to city limit at Village Hill Rd	2 lane roadway	No	No	0.18	$45,000
90.3	Shoulder Lane	Add shoulders, signs, and markings	On Auction Barn Rd	From city limit west of Loop 121 easterly to Loop 121	2 lane roadway	No	No	0.15	$37,500
92.1	Shoulder Lane	Add shoulders, signs, and markings	On Loop 121	From FM436 westerly to IH35 NB FR	2 lane roadway	No	Yes	1.01	$252,500
92.2	Shoulder Lane	Add shoulders, signs, and markings	On Loop 121	From IH35 NB FR westerly to Auction Barn Rd	2 lane roadway with shoulders	Yes	Yes	1.26	$315,000
92.3	Bike Lane	Add signs and markings for bicycle lanes	On Loop 121	From Auction Barn Rd northerly to Sparta Rd	2-4 lane roadway with shoulders	Yes	Yes	3.38	$135,200
92.4	Bike Route	Add bike route signs	On Loop 121	From Sparta Rd northerly to FM439	4 lane roadway	Yes	Yes	0.29	$5,000
93.1	Bike Lane	Include bike lane in future roadway	On proposed western extension of and existing 9th Avenue	From Loop 121 easterly to University Drive	Future roadway and 2 lane roadway	Yes	No	0.56	$0
93.2	Bike Route	Add bike route signs	On 9th Avenue	From University Drive easterly to Main Street	2 lane roadway	No	No	0.46	$5,000
93.3	Bike Route	Add bike route signs	On 9th Avenue	From Main Street easterly to Beal Street	2 lanes local residential roadway	No	No	0.25	$5,000
94.1	Trail	Add 10ft wide multi-use trail	East of Loop 121 and south of 1st Ave	From US190 WB FR northerly to existing trail along Nolan Creek near Central and Davis	Wooded area	No	No	1.59	$477,000
94.3	Trail	Add 10ft wide multi-use trail	Northern extension of existing trail, east of Sparks St	From northern end of existing trail in Lions/Harris Park northerly to 10th Ave on UMHB campus	Wooded area	Yes	No	0.25	$75,000
94.4	Bike Route	Add bike route signs	On University Dr	From 10th St W northerly to Crusader Way	2 lane roadway	No	No	0.50	$5,000
95.1	Bike Route	Add bike route signs	On Pearl St and Crusader Way	From 9th Ave northerly to University Dr	2 lane roadways	No	No	0.76	$5,000
95.2	Bike Lane	Add signs and markings for bicycle lanes	On Crusader Way	From University Dr northerly to Loop 121	2 lane roadway	Yes	No	0.50	$20,000

Table A-1: 2011 Reference Projects for the City of Belton (continued)

City of Belton									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
96.1	Trail	Add 10ft wide multi-use trail	Southwest of Chisholm Trail Park and Belton Intermediate School	From proposed trail along Nolan Creek northerly to Sparta Rd	Open land	Yes	No	0.44	$132,000
96.2	Side Path	Add 8ft wide multi-use side path	Along Dunns Canyon Rd	From Sparta Rd northerly to Chisholm Trail Rd	3 lane roadway	Yes	No	0.51	$102,000
96.3	Side Path	Add 8ft wide multi-use side path	Along Dunns Canyon Rd	From Chisholm Trail Rd northerly to FM439	3 lane roadway	No	No	0.28	$56,000
97.1	Shoulder Lane	Include shoulder lane with future roadway improvement	On proposed western extension of Chisholm Trail Pkwy and other proposed road	From FM439 southerly and easterly to southern end of Spring Canyon Rd	Future roadways	No	No	0.69	$0
97.2	Shoulder Lane	Add shoulders, signs, and markings	On existing and proposed extension of Chisholm Trail Pkwy	From Spring Canyon Rd easterly to Dunns Canyon Rd	2 lane roadway and future roadway	Yes	No	0.88	$220,000
98.1	Trail	Add 10ft wide multi-use trail	In Miller Springs Park	Interconnected segments In Miller Spring Park southerly to Red Rock Dr	Park land	No	No	1.67	$501,000
99.1	Bike Route	Add bike route signs	On unnamed road In Miller Springs Park	From FM439 northerly to existing trail in Miller Springs Park	2 lane roadway	No	No	0.45	$5,000
100.1	Bike Lane	Add signs and markings for bicycle lanes	On Ave O, Ray St, Ave M, and Fairway Dr	From FM436 northerly to Avenue J at Miller Heights Elementary School	2 lane roadways	Yes	No	0.34	$13,600
100.2	Trail	Add 10ft wide multi-use trail	North of Griggs Park and Miller Heights Elementary School	From Miller Heights Elem northerly to proposed trail along Nolan Creek	Open land and wooded area	Yes	No	0.27	$81,000
100.4	Trail	Add 10ft wide multi-use trail	Along west side of Leon River	From proposed trail south of FM93 northerly to existing trail in Heritage Park	Open land and riverside land	Yes	No	1.20	$360,000
100.6	Trail	Add 10ft wide multi-use trail	Along west side of Leon River	From existing trail in Heritage Park northerly to existing trail in Miller Spring Park	Riverside land	Yes	No	3.28	$984,000
101.1	Bike Lane	Include bike lane in future roadway	On proposed northern extension of Commerce St	From Sparta Rd northerly to FM439	Future roadway	No	No	0.25	$0
102.1	Bike Route	Add bike route signs	On Beal St, Water St, and Penelope St	From existing trail in Confederate Park northerly to 9th Ave	2 lane roadways	Yes	No	0.78	$5,000
102.3	Bike Route	Add bike route signs	On Beal St	From 9th Ave southern jct w/ Beal northerly to Main St	2 lane roadway	No	No	1.75	$10,000
103.1	Bike Route	Add bike route signs	On College St and 13th Ave	From Crusader Way northerly and easterly to Waco Rd	2 lane roadways	Yes	No	1.16	$10,000

Table A-1: 2011 Reference Projects for the City of Belton (continued)

City of Belton									
ID	**Type**	**Action**	**Location**	**Limits**	**Existing Condition**	**In Local Plan**	**State Highway**	**Length (mi.)**	**Cost ($)**
104.1	Bike Route	Add bike route signs	On 22nd Ave	From Main St easterly to Beal St	2 lane roadway	No	No	0.26	$5,000
105.1	Bike Route	Add bike route signs	On Hastings Rd and Landmark Dr	From Beal St easterly and southerly to southern end of Landmark Dr	2 lane roadways	No	No	0.53	$5,000
105.2	Trail	Add 10ft wide multi-use trail	West of Heritage Park	From southern end of Landmark Dr southerly and easterly to existing trail in Heritage Park	Wooded area	No	No	0.36	$108,000
110.1	Trail	Add 10ft wide multi-use trail	East of Birdwell St and west of Palmetto Dr	From 2nd Ave easterly to proposed trail along Leon River	Open land	No	No	0.95	$285,000
111.1	Bike Route	Add bike route signs	On Blair St	From 2nd Ave northerly to 6th Ave	2 lane roadway	No	No	0.25	$5,000
111.2	Shoulder Lane	Add shoulders, signs, and markings	On FM817/Old Waco Rd	From 6th St northerly to proposed trail at eastern city limit along Leon River at eastern city limit	2 lane roadway	No	Yes	0.94	$235,000
112.1	Bike Route	Add bike route signs	On FM93/6th Ave	From proposed trail west of Cori Dr easterly and southerly to Taylors Valley Rd	4-5 lane roadway	No	Yes	0.47	$5,000
113.1	Shoulder Lane	Add shoulders, signs, and markings	On Taylors Valley Rd	IH35 NB FR easterly to proposed trail along Leon River	2 lane roadway	Yes	No	1.46	$365,000
118.1	Trail	Add 10ft wide multi-use trail	Along Leon River	From proposed trail south of FM93 northerly to Taylors Valley Rd	Creekside land	No	No	1.18	$354,000
TOTAL								86.41	$12.79m

Table A-2: 2011 Reference Projects for the City of Copperas Cove

City of Copperas Cove									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
1.2	Trail	Add 10ft wide multi-use trail	Along west side of Taylor Creek	From southern city limit northerly to Grimes Crossing Rd	Land between Taylor Creek and Railroad	No	No	3.07	$921,000
1.3	Trail	Add 10ft wide multi-use trail	Along north side of railroad	From Grimes Crossing Rd easterly to Avenue B	Land between Grimes Crossing Road and Railroad	No	No	0.52	$156,000
1.4	Bike Route	Add bike route signs	On Summers Rd	From Avenue B northerly to Lutheran Church Rd	2 lane roadway	No	No	1.11	$10,000
2.2	Shoulder Lane	Include shoulder lane with future roadway improvement	On proposed Big Divide Rd southern extension	From southern city limit northerly to US190	Future roadway	No	No	0.76	$0
2.3	Shoulder Lane	Include shoulder lane with future roadway improvement	On Big Divide Rd	From US190 northerly to proposed minor arterial	Narrow 2 lane roadway	No	No	0.98	$0
2.4	Shoulder Lane	Add shoulders, signs, and markings	On Big Divide Rd and Grimes Crossing Rd	From proposed minor arterial northerly to northern city limits	2 lane roadway	No	No	3.21	$802,500
3.2	Side Path	Add 8ft wide multi-use side path	Along FM 1113	From western city limit easterly to Summers Rd (west end of existing side path)	2 lane roadway	No	Yes	0.41	$82,000
3.4	Bike Route	Add bike route signs	On FM1113/Avenue B	From 7th St (east end of existing side path) easterly to FM116/1st St	2 lanes, 4 lanes between Main and 3rd St	No	Yes	0.21	$5,000
3.5	Bike Route	Add bike route signs	On Avenue B, North Dr, and Wolfe Rd	FM116/1st St easterly to Avenue D/Wolfe Rd	2 lanes, 4 lanes between Main and 3rd St	No	No	1.06	$10,000
4.1	Trail	Add 10ft wide multi-use trail	Along south side of railroad tracks	From proposed road just west of Myra Lou Ave easterly to proposed north bypass	Land between railroad and Avenue D	No	No	3.13	$939,000
5.1	Bike Route	Add bike route signs	On Veterans Ave	From Freedom Ln easterly to Georgetown Rd	Wide unmarked 2 lane road through neighborhoods	No	No	1.77	$10,000
6.1	Bike Route	Add bike route signs	On Robertson Ave	From Lee Rd/Veterans Dr easterly to proposed extension of Constitution just north of Virginia Ave	2 lanes, side walks along most of the road	No	No	1.77	$10,000
6.2	Bike Route	Add bike route signs	On future Constitution southern extension	From Robertson Rd easterly to southern end of existing Constitution Dr	Future roadway	No	No	0.24	$5,000

Table A-2: 2011 Reference Projects for the City of Copperas Cove (continued)

City of Copperas Cove									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
7.5	Shoulder Lane	Add signs and markings for shoulder lanes	On US 190	From western city limit easterly to proposed road west of Suja Ln	5 lanes with shoulders	No	Yes	0.70	$28,000
7.6	Bike Lane	Add signs and markings for bicycle lanes	On US 190	From proposed road west of Suja Ln easterly to proposed southern bypass	5 lanes with shoulders	No	Yes	1.07	$42,800
7.7	Shoulder Lane	Include shoulder lane in future roadway	On future southern bypass	From US190 easterly to FM116	Future roadway	No	Yes	1.29	$0
7.9	Trail	Add 10ft wide multi-use trail	Along US 190 EB FR	From proposed southern bypass easterly to Central Texas College at Bell Tower Dr	2 lane one-way road	No	Yes	2.87	$861,000
9.10	Shoulder Lane	Include shoulder lane with future roadway improvement	On proposed FM 2808 future eastern extension	From southern city limit near Abbott Ln northerly to Constitution Dr	Future roadway	No	No	1.84	$0
10.2	Shoulder Lane	Add signs and markings for shoulder lanes	On Lutheran Church Rd	From city limit east of Woodland Dr easterly to FM 116	Narrow 2 lane roadway	No	No	0.81	$32,400
10.3	Shoulder Lane	Add signs and markings for shoulder lanes	On FM116/1st St	From Lutheran Church Rd southerly to proposed north bypass	2 lane roadway with shoulders	No	Yes	1.06	$42,400
11.3	Shoulder Lane	Include shoulder lane with future roadway improvement	On FM 2657	From southern city limit northerly to US190	2 lane roadway	No	Yes	0.74	$0
11.4	Bike Lane	Add signs and markings for bicycle lanes	On US 190	From proposed southern bypass easterly to FM 116	5 lane roadway with shoulders	No	Yes	1.37	$54,800
11.5	Bike Route	Add bike route signs	On Georgetown Rd, Veterans Ave, Lee St, Meggs St, and 1st St	From US 190 northerly to Avenue F	2 lane roadway	No	No	1.04	$10,000
11.6	Bike Route	Add bike route signs	On FM116/1st St	From Avenue F northerly to Sherman Ave	2 lane roadway	No	Yes	0.56	$5,000
11.7	Bike Lane	Add signs and markings for bicycle lanes	On FM116/1st St	From Sherman Ave northerly to proposed northern bypass	2 lane roadway with shoulders	No	Yes	0.89	$35,600
11.9	Shoulder Lane	Add signs and markings for shoulder lanes	On FM116/1st St	From Lutheran Church Rd northerly to northern city limit	2 lane roadway with shoulders	No	Yes	0.49	$19,600
12.4	Shoulder Lane	Add shoulders, signs, and markings	On FM 116	From eastern city limit northerly to US 190	2 lane roadway south of Tyler Dr, 5 lanes to the north	No	Yes	1.68	$420,000

Table A-2: 2011 Reference Projects for the City of Copperas Cove (continued)

City of Copperas Cove									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
15.2	Bike Lane	Include bike lane with future roadway improvement	On future roadway and Winchester Dr, and Freedom Ln	From proposed road near CR 3340 easterly to Pony Express Ln	Future roadway and wide 2 lane roadway	No	No	1.93	$0
15.3	Bike Lane	Include bike lane with future roadway improvement	On Freedom Ln	From Pony Express Ln easterly to Ogletree Pass	2 lane roadway	No	No	0.38	$0
15.4	Bike Route	Add bike route signs	On Ogletree Pass and Walker Place	From Freedom Ln easterly to FM3046	2 lane roadway	No	No	1.85	$10,000
15.5	Trail	Add 10ft wide multi-use trail	Along Clark Creek	From FM3046 southerly to southern city limit	Creekside land	No	No	0.54	$162,000
16.2	Bike Lane	Include bike lane in future roadway	On future Pony Express southern extension	From southern city limit northerly to city limit north of US190	Future roadway	No	No	0.98	$0
16.4	Bike Lane	Include bike lane with future roadway improvement	On Pony Express Ln	From city limit south of Buckboard Trail northerly to Freedom Ln	Narrow 2 lane roadway	No	No	0.40	$0
16.6	Bike Lane	Add signs and restripe for bicycle lanes	On Freedom Ln	From Ogletree Pass northerly to Veterans Ave	Wide unmarked 2 lane roadway	No	No	0.42	$21,000
16.7	Bike Lane	Add signs and restripe for bicycle lanes	On Skyline Dr	From Veterans Ave northerly to northern end of Skyline Dr	Wide unmarked 2 lane roadway	No	No	0.97	$48,500
16.8	Bike Lane	Include bike lane in future roadway	On Skyline Dr proposed northern extension	From northern end of Skyline Dr northerly to Avenue B	Future roadway	No	No	0.95	$0
17.3	Bike Lane	Include bike lane with future roadway improvement	On FM 3046	From southern city limit northerly to FM116	2 lane roadway	No	Yes	1.20	$0
18.1	Trail	Add 10ft wide multi-use trail	Along Clark Creek	From FM 2657 easterly to FM 3046	Creekside land	No	No	1.20	$360,000
19.1	Trail	Add 10ft wide multi-use trail	South of Phyllis Dr	From existing trail in City Park South easterly to proposed southern bypass	Wooded area and open land south of subdivision	No	No	0.59	$177,000
19.2	Trail	Add 10ft wide multi-use trail	East of Phyllis Dr	From proposed southern bypass northerly to eastern city limit east of Phyllis Dr	Wooded area east of subdivision	No	No	0.29	$87,000
19.4	Trail	Add 10ft wide multi-use trail	Between Judy Ln and Creek St	From southern city limit south of Northern Dancer Dr northerly to US190	Partly concrete-lined channel through residential neighborhood	No	No	1.31	$393,000
20.1	Trail	Add 10ft wide multi-use trail	Between Virginia Ave and Amthor Ave	From proposed trail along Clear Creek easterly to Robertson Ave	Along power line corridor	No	No	0.56	$168,000

Table A-2: 2011 Reference Projects for the City of Copperas Cove (continued)

City of Copperas Cove									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
20.2	Bike Route	Add bike route signs	On Williams St, MLK Dr, and Constitution Dr	From Robertson Ave at Williams St clockwise to existing end of Constitution Dr	2 lane roadways (Williams and MLK) and 4 lane roadway (Constitution)	No	No	1.44	$10,000
21.1	Bike Route	Add bike route signs	On Main St	From Avenue B northerly to Old Georgetown Rd	2 lane roadway	No	No	1.04	$10,000
TOTAL								50.70	$5.95m

Table A-3: 2011 Reference Projects for the City of Harker Heights

City of Harker Heights									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
7.16	Shoulder Lane	Add shoulders, signs, and markings	On BU190/Veterans Memorial Blvd	From Roy Reynolds Dr easterly to Indian Trail	5 lane roadway with 1-2 ft shoulders	No	Yes	1.28	$320,000
7.17	Shoulder Lane	Add signs and markings for shoulder lanes	On BU190/Veterans Memorial Blvd	From Indian Trail easterly to eastern city limits	5 lane roadway with shoulders	No	Yes	0.72	$28,800
9.18	Bike Lane	Add signs and restripe for bicycle lanes	On Mountain Lion Rd	From western city limit at Sun Dance Dr easterly to FM 2410	3-4 lane roadway	No	No	1.44	$72,000
9.19	Shoulder Lane	Add shoulders, signs, and markings	On FM 2410	From Mountain Lion Rd easterly to eastern city limit east of High Oak Dr	5 lane roadway west of Cedar Knob Rd, 2 lanes to the east	No	Yes	4.43	$1,107,500
56.4	Trail	Add 10ft wide multi-use trail	Between Mustang Trl and Snowbird Ave	From southern city limit northerly to FM2410	Creekside land	No	No	1.22	$366,000
56.6	Shoulder Lane	Add shoulders, signs, and markings	On FM 2410	From Mountain Lion Rd northerly to US190 EB FR	5 lane roadway	No	Yes	0.98	$245,000
56.7	Bike Lane	Include bike lane with future roadway improvement	On FM 2410	From US 190 EB FR westerly to Roy Reynolds Rd	2 lane roadway	No	Yes	1.11	$0
58.6	Trail	Add 10ft wide multi-use trail	Along South Nolan Creek north of Summit Soccer Complex	From Roy Reynolds Dr easterly to easterly city limits near railroad	Creekside land	No	No	2.41	$723,000
63.1	Side Path	Add 8ft wide multi-use side path	Along proposed southern extension of Rosewood Dr and proposed connection to Deer Trail	From Deer Trail westerly and northerly to Siltstone Loop	Future roadway	No	No	0.45	$90,000

Table A-3: 2011 Reference Projects for the City of Harker Heights (continued)

City of Harker Heights									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
64.1	Trail	Add 10ft wide multi-use trail	Along creek east of Rosewood Dr	From proposed trail west of FM3481 northerly to proposed trail west of southern end of Iowa Dr	Creekside land	No	No	1.01	$303,000
64.2	Trail	Add 10ft wide multi-use trail	Through park east of Nickelback/Rosewood Dr	From proposed trail west of southern end of Iowa Dr northerly to Mountain Lion Rd	Creekside land	No	No	0.75	$225,000
65.1	Trail	Add 10ft wide multi-use trail	Southwest of Carl Levin Park near City Hall	From FM2410 easterly to existing trail in Carl Levin Park	Open land	No	No	0.27	$81,000
65.3	Trail	Add 10ft wide multi-use trail	Northeast of Carl Levin Park	From existing trail in Carl Levin Park easterly to Indian Trail	Around residential development	No	No	1.00	$300,000
66.1	Bike Lane	Add signs and restripe for bicycle lanes	On Pioneer Trl, Wildewood Dr, and Ramblewood Dr	From FM2410 easterly to Verna Lee Blvd	2 lane roadways	No	No	0.92	$46,000
67.1	Trail	Add 10ft wide multi-use trail	Between Grizzly Trl and Caribou Trl	From Pioneer Trail northerly to existing trail in Carl Levin Park	Drainage channel	No	No	0.12	$36,000
68.1	Bike Route	Add bike route signs	On Ann Blvd, Indian Oaks Dr, and Amy Ln	From FM 2410 northerly to proposed trail along South Nolan Creek	2 lane roadways	No	No	1.86	$10,000
69.1	Bike Route	Add bike route signs	On Indian Trail	From FM 2410 northerly to Verna Lee Blvd	2 lane roadway	No	No	1.67	$10,000
69.2	Bike Lane	Add signs and markings for bicycle lanes	On Indian Trail	From Verna Lee Blvd northerly to US190 EB FR	2-4 lane roadway	No	No	0.50	$20,000
69.3	Bike Lane	Add signs and markings for bicycle lanes	On FM3423/Indian Trail	From US190 EB FR northerly to Veterans Memorial Blvd	2-4 lane roadway	No	Yes	0.78	$31,200
70.1	Bike Route	Add bike route signs	On Bee Line Ln	From Roy Reynolds Dr easterly to Indian Trail	2 lane roadway	No	No	1.20	$10,000
71.1	Trail	Add 10ft wide multi-use trail	West of Eastern Hills Middle School	From Indian Trail westerly to from loop trail west of Eastern Hills Middle School	Open land	No	No	1.49	$447,000
72.1	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 3219	From Veterans Memorial Blvd northerly to northern city limits	2 lane roadway with shoulders	No	Yes	0.36	$14,400
74.1	Trail	Add 10ft wide multi-use trail	Along Comanche Gap Rd	From existing trail in Dana Peak Park northerly to FM2410	2 lane roadway	Yes	No	1.85	$555,000
74.3	Side Path	Add 8ft wide multi-use side path	Along Warrior's Path	From FM 2410 northerly to Old Nolanville Rd	2 lane roadway	No	No	1.69	$338,000

Table A-3: 2011 Reference Projects for the City of Harker Heights (continued)

City of Harker Heights									
ID	**Type**	**Action**	**Location**	**Limits**	**Existing Condition**	**In Local Plan**	**State Highway**	**Length (mi.)**	**Cost ($)**
75.2	Shoulder Lane	Add shoulders, signs, and markings	On FM3481/Stillhouse Lake Rd	From southern city limit south of Del Rey Dr northerly to FM2410	2 lane and 4 lane roadways	No	Yes	2.51	$627,500
75.3	Shoulder Lane	Add shoulders, signs, and markings	On Verna Lee Blvd	From FM2410 northerly to Indian Trail	2 lane and 4 lane roadways	No	No	1.19	$297,500
75.4	Bike Route	Add bike route signs	On Verna Lee Blvd, Shine Ln, and Nola Ruth Blvd	From Indian Trail northerly to Old Nolanville Rd	2 lane roadways	No	No	0.92	$5,000
TOTAL								34.13	$6.31m

Table A-4: 2011 Reference Projects for the City of Kempner

City of Kempner									
ID	**Type**	**Action**	**Location**	**Limits**	**Existing Condition**	**In Local Plan**	**State Highway**	**Length (mi.)**	**Cost ($)**
7.2	Shoulder Lane	Add signs and markings for shoulder lanes	On US 190	From western city limits easterly to FM2808	5 lanes with shoulders	No	Yes	1.21	$48,400
7.3	Shoulder Lane	Add signs and markings for shoulder lanes	On US 190	From FM2808 easterly to eastern city limit	5 lanes with shoulders	No	Yes	1.13	$45,200
9.4	Shoulder Lane	Add shoulders, signs, and markings	On FM 2808	From US190 southerly to southern city limit	2 lane roadway	No	Yes	0.57	$142,500
TOTAL								2.91	$236.1k

Table A-5: 2011 Reference Projects for the City of Killeen

City of Killeen									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
7.11	Trail	Add 10ft wide multi-use trail	Along US 190 EB FR, south of interchange at Fort Hood main gate	From proposed trail on south side of US190 easterly to proposed trail just west of Willow Springs Rd	2 lane one-way road	Yes	Yes	1.02	$306,000
7.12	Trail	Add 10ft wide multi-use trail	Along US 190 EB FR	From proposed trail west of Willow Springs Rd easterly to Fort Hood St	2 lane one-way road	No	Yes	0.98	$294,000
7.13	Shoulder Lane	Add signs and markings for shoulder lanes	On SH195/Fort Hood St	From US190 EB FR northerly to Veterans Memorial Blvd	7 lane roadway	Yes	Yes	0.89	$35,600
7.14	Bike Lane	Add signs and markings for bicycle lanes	On Veterans Memorial Blvd	From Fort Hood St easterly to 28th St	5 lane roadway	Yes	Yes	1.57	$62,800
7.15	Bike Lane	Add signs and markings for bicycle lanes	On BU190/Veterans Memorial Blvd	From 28th St easterly to Roy Reynolds Dr	5 lane roadway with shoulders	No	Yes	3.00	$120,000
9.13	Shoulder Lane	Add shoulders, signs, and markings	On Old Copperas Cove Rd	From western city limit easterly to Clear Creek Rd	2 lane roadway	Yes	No	0.36	$90,000
9.14	Shoulder Lane	Add shoulders, signs, and markings	On SH201/Clear Creek Rd	From Stan Schlueter Loop southerly and easterly to Bunny Trail	4 lane divided roadway	Yes	Yes	3.61	$902,500
9.15	Shoulder Lane	Add shoulders, signs, and markings	On SH201	From Bunny Trail easterly to SH195	2 lane roadway	Yes	Yes	1.80	$450,000
9.16	Shoulder Lane	Add shoulders, signs, and markings	On Stagecoach Rd	From SH195 easterly to Stagecoach/Trimmier	2 lane roadway	Yes	No	3.95	$987,500
9.17	Bike Lane	Add signs and markings for bicycle lanes	On Stagecoach Rd	From Trimmier Rd easterly to eastern city limit at Nickelback Rd	2 lane roadway west of Rosewood, 3 lanes to the east	Yes	No	1.43	$57,200
23.4	Side Path	Add 8ft wide multi-use side path	Along Water Crest Rd	From Clear Creek Rd easterly to Robinett Rd	Roadway under construction	Yes	No	0.92	$184,000
23.5	Side Path	Add 8ft wide multi-use side path	Along Water Crest Rd	From Robinett Rd easterly to Cody Poe Rd	2 lane roadway	No	No	0.72	$144,000
23.6	Side Path	Add 8ft wide multi-use side path	Along Water Crest Rd	From Cody Poe Rd easterly to Willow Springs Rd	Along north side of 2 lane road	Yes	No	0.49	$98,000
24.1	Shoulder Lane	Add signs and markings for shoulder lanes	On SH195	From Veterans Memorial Blvd northerly to FM439	4 lane roadway	Yes	Yes	0.64	$25,600
24.2	Bike Lane	Add signs and markings for bicycle lanes	On Rancier Ave	From Fort Hood St easterly to 38th St/FM439	4-5 lane roadway	Yes	No	2.56	$102,400

Table A-5: 2011 Reference Projects for the City of Killeen (continued)

City of Killeen									
ID	**Type**	**Action**	**Location**	**Limits**	**Existing Condition**	**In Local Plan**	**State Highway**	**Length (mi.)**	**Cost ($)**
24.3	Bike Lane	Add signs and markings for bicycle lanes	On FM439/Rancier Ave	From 38th St easterly to Twin Creek Dr	4-5 lane roadway	Yes	Yes	0.86	$34,400
24.4	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 439/Rancier Ave	From Twin Creek Dr easterly to Roy Reynolds Dr	5 lane roadway	Yes	Yes	1.12	$44,800
24.5	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 439/Rancier Ave	From Roy Reynolds Dr easterly to eastern city limit	4 lane roadway to the west of Glover, 2 lanes to the east	Yes	Yes	0.89	$35,600
25.1	Side Path	Add 8ft wide multi-use side path	Along SH201/Clear Creek Rd	From Stan Schlueter Loop northerly to Watercrest Rd	5 lane roadway	Yes	Yes	1.73	$346,000
26.1	Shoulder Lane	Include shoulder lane with future roadway improvement	On Atlas Rd western extension	From SH 201/Clear Creek Rd easterly to Trimmier Rd	Future roadway and existing 2 lane roadway	No	No	4.44	$0
27.1	Side Path	Add 8ft wide multi-use side path	Along Stan Schlueter Loop	From SH201/Clear Creek Rd easterly to SH195/Fort Hood St	5 lane roadway	Yes	Yes	3.09	$618,000
27.2	Side Path	Add 8ft wide multi-use side path	Along Stan Schlueter Loop	From SH195/Fort Hood St easterly to FM2410/MLK Blvd	5 lane roadway	Yes	Yes	4.12	$824,000
27.3	Side Path	Add 8ft wide multi-use side path	Along FM2410/MLK Blvd	From FM2410/MLK Blvd northerly to BU190	5 lane roadway	Yes	Yes	1.18	$236,000
27.4	Side Path	Add 8ft wide multi-use side path	Along Twin Creek Dr	From BU190 northerly to FM439	5 lane roadway	Yes	No	1.50	$300,000
27.5	Side Path	Add 8ft wide multi-use side path	Along proposed Twin Creek northerly extension	From FM439 northerly to Lake Rd	Future roadway	Yes	No	0.38	$76,000
27.6	Side Path	Add 8ft wide multi-use side path	Along 60th St	From Lake Rd northerly to northern city limits at Schwald Rd	2 lane roadway	Yes	No	1.05	$210,000
28.1	Side Path	Add 8ft wide multi-use side path	Along Elms Rd	From SH201/Clear Creek Rd easterly to Carpet Ln	3-5 lane roadway	Yes	No	2.31	$462,000
28.2	Side Path	Add 8ft wide multi-use side path	Along proposed Elms Rd extension	From Carpet Ln easterly to SH195/Fort Hood St	Future roadway	No	No	0.77	$154,000
28.3	Side Path	Add 8ft wide multi-use side path	Along Elms Rd	From SH195/Fort Hood St easterly to Stan Schlueter Loop	3-5 lane roadway	Yes	No	3.09	$618,000
28.4	Side Path	Add 8ft wide multi-use side path	Along Chantz Dr	From Stan Schlueter Loop southerly to Stagecoach Rd	2 lane roadway	Yes	No	1.45	$290,000
29.1	Trail	Add 10ft wide multi-use trail	Along South Nolan Creek	From eastern end of Rimes Ranch Rd northerly to Watercrest Rd	Creekside land between subdivisions	Yes	No	2.74	$822,000
29.2	Trail	Add 10ft wide multi-use trail	Southwest of US190 interchange at Ft Hood main gate	From Watercrest Rd northerly to proposed trail along US190 EB FR	Open land near ponds	Yes	No	2.43	$729,000

Table A-5: 2011 Reference Projects for the City of Killeen (continued)

City of Killeen									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
30.1	Trail	Add 10ft wide multi-use trail	Southeast of US190 interchange at Ft Hood main gate	From proposed trail east of Roberts Rd easterly to proposed trail west of Willow Springs Rd	Open land near ponds	Yes	No	2.06	$618,000
31.1	Bike Lane	Include bike lane in future roadway	On Bunny Trail	From SH201 northerly to Stan Schlueter Loop	Narrow 2 lane roadway and future roadway	Yes	No	2.04	$0
31.3	Bike Lane	Include bike lane with future roadway improvement	On Robinett Rd	From Stan Schlueter Loop northerly to Edgefield Rd	2 lane roadway	Yes	No	0.86	$0
31.4	Bike Route	Add bike route signs	On Robinett Rd	From Edgefield Rd northerly to Watercrest Rd	3 lane roadway	Yes	No	0.90	$5,000
32.1	Side Path	Add 8ft wide multi-use side path	Along Trimmier Rd and 10th St	From Stagecoach Rd northerly to northern city limit south of Warrior Way	2-5 lane roadway	Yes	No	5.65	$1,130,000
33.1	Trail	Add 10ft wide multi-use trail	East of Bunny Trail and south of Reese Creek Rd	From proposed Texas A&M campus south of SH201 northerly to Stan Schlueter Loop	Open land	Yes	No	3.38	$1,014,000
34.1	Bike Route	Add bike route signs	On Omar Dr western extension and Littlerock Dr southern extension	From SH195 westerly and northerly to Stan Schlueter Loop	Future roadway	No	No	1.58	$10,000
34.3	Bike Route	Add bike route signs	On Littlerock Dr, Ledgestone Dr, and Carpet Ln	From Stan Schlueter Loop northerly to Elms Rd	2 lane roadways	No	No	0.84	$5,000
34.5	Bike Route	Add bike route signs	On Tallwood Dr, Edgefield St, South Hill Dr, and Westwood Dr	From Elms Rd northerly to Willow Spring Rd	2 lane roadways	No	No	1.03	$10,000
34.6	Bike Route	Add bike route signs	On Willow Springs Rd	From Westwood Dr northerly to US190 WB FR	2 lane roadway	Yes	No	1.07	$10,000
37.1	Shoulder Lane	Add shoulders, signs, and markings	On East Trimmier Rd	From Chaparral Rd northerly to Stagecoach Rd	2 lane roadway	No	No	1.81	$452,500
37.3	Bike Lane	Include bike lane with future roadway improvement	On Cunningham Road	From Stagecoach Rd northerly to Little Nolan Rd	2 lane roadway	Yes	No	1.71	$0
38.2	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 195	From FM 2670 northerly to Chaparral Rd	4 lane divided highway with shoulders	No	Yes	3.25	$130,000
38.3	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 195	From Chaparral Rd northerly to SH201	4 lane divided highway with shoulders	No	Yes	2.54	$101,600

Table A-5: 2011 Reference Projects for the City of Killeen (continued)

City of Killeen									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
38.4	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 195	From SH201 northerly to Stan Schlueter Loop	4 lane divided highway with shoulders	Yes	Yes	1.43	$57,200
38.5	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 195	From Stan Schlueter Loop northerly to US190 EB FR	5 lane roadway	Yes	Yes	2.17	$86,800
39.1	Bike Route	Add bike route signs	On Jasper Dr	From Old FM 440 easterly to Fort Hood St	2 lane roadway	No	No	0.18	$5,000
39.2	Bike Route	Add bike route signs	On Jasper Dr	From Fort Hood St easterly to Trimmier Rd	4 lane roadway	Yes	No	1.16	$10,000
39.4	Bike Lane	Add signs and markings for bicycle lanes	On Illinois Avenue	From Trimmier Rd easterly to US 190 WB FR	2-3 lane roadway	Yes	No	1.72	$68,800
40.1	Side Path	Add 8ft wide multi-use side path	Along WS Young Dr	From Stagecoach Rd northerly to Westcliff Rd	2-5 lane roadway	Yes	No	6.38	$1,276,000
40.2	Side Path	Add 8ft wide multi-use side path	Along Westcliff Rd	From WS Young Dr easterly to FM439	2 land roadway	Yes	No	3.34	$668,000
41.1	Side Path	Add 8ft wide multi-use side path	Along Florence Rd	From Elms Rd northerly to Jasper Dr	2 lane roadway	Yes	No	1.21	$242,000
41.3	Bike Route	Add bike route signs	On 2nd St, Bryce Ave, and Gray St	From Jasper Dr northerly to Hallmark Ave	2 lane roadways	No	No	1.09	$10,000
41.4	Bike Lane	Add signs and markings for bicycle lanes	On Gray St	From Hallmark Ave northerly to Avenue C	2 lane roadway with angled parking	No	No	0.64	$25,600
41.5	Bike Route	Add bike route signs	On Gray St and Dean Ave	From Avenue C at Gray northerly to 10th St at Dean	2 lane roadways	No	No	0.74	$5,000
41.7	Bike Route	Add bike route signs	On Duncan Ave, Massey St, Poage Ave, Ruiz Dr, and Willowbend Dr	From 10th St easterly to 38th St	2 lane roadways	No	No	1.86	$10,000
42.1	Bike Route	Add bike route signs	On Wheeler Ave	From Willow Springs Rd easterly to Alta Vista Dr	2 lane roadway with on-street parking	No	No	0.48	$5,000
43.1	Trail	Add 10ft wide multi-use trail	Along creek between residential subdivisions	From Carpet Ln easterly to Trimmier Rd	Creekside land	Yes	No	2.31	$693,000
44.1	Bike Lane	Add signs and markings for bicycle lanes	On Old FM 440	From Stan Schlueter Loop northerly to US190 EB FR	2 lane roadway	No	No	2.22	$88,800
45.1	Trail	Add 10ft wide multi-use trail	North of Saegert Ranch Rd and Schorn Dr	From Constellation Dr easterly to Onion Rd	Creekside land	Yes	No	1.42	$426,000

Table A-5: 2011 Reference Projects for the City of Killeen (continued)

City of Killeen									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
45.2	Trail	Add 10ft wide multi-use trail	East of Sunflower Dr and east of Cunningham Rd	From Onion Rd northerly to Cunningham Rd	Creekside land	No	No	1.18	$354,000
45.3	Trail	Add 10ft wide multi-use trail	East of proposed Cunningham Rd extension and on east and north side of shopping plaza	From Cunningham Rd northerly to Illinois Ave	Creekside land and drainage channel	No	No	1.44	$432,000
46.1	Trail	Add 10ft wide multi-use trail	In Lions Club Park	Series of trails inside Lions Club Park	Park land	Yes	No	1.58	$474,000
46.2	Side Path	Add 8ft wide multi-use side path	Along Dartmouth Dr	From proposed trails in Lions Club Park northerly to Granex Dr (Trimmier Elementary)	2 lane roadway	No	No	0.21	$42,000
47.1	Trail	Add 10ft wide multi-use trail	Between Stan Schlueter Loop and Elms Rd	From Old Florence Rd easterly to Cunningham Rd	Creekside land	Yes	No	2.20	$660,000
48.1	Bike Route	Add bike route signs	On Mesa Dr	From Fawn Dr northerly to Stan Schlueter Loop	2 lane roadway	No	No	0.93	$5,000
48.3	Bike Route	Add bike route signs	On Bacon Ranch, Little Nolan, and Bacon Ranch	From Stan Schlueter Loop westerly to Trimmier Rd	2 lane road	No	No	2.67	$15,000
48.5	Bike Route	Add bike route signs	On Turtle Bend Dr, Tortoise Ln, Pondview Dr, Minthorn Dr, Cobblestone Dr, and Turtle Creek Dr	From Trimmier Rd westerly to Florence Rd	2 lane roadways	No	No	0.86	$5,000
48.7	Bike Route	Add bike route signs	On Daffodil Dr, Andover Dr, and Kathey Dr	From Florence Rd westerly to Old FM440	2 lane roadways	No	No	1.01	$10,000
48.9	Bike Route	Add bike route signs	On Leader Dr, Meadow Dr, and Alta Vista Dr	From Old FM440 westerly and northerly to US 190 EB FR	2 lane roadways	No	No	0.84	$5,000
48.12	Bike Lane	Add signs and markings for bicycle lanes	On Hallmark Ave	From Fort Hood St easterly to 10th St/Trimmier Rd	2 lane roadway	Yes	No	1.01	$40,400
50.1	Trail	Add 10ft wide multi-use trail	Along South Nolan Creek	From Fort Hood St easterly to 28th St	Creekside land	Yes	No	1.68	$504,000
50.2	Trail	Add 10ft wide multi-use trail	Along South Nolan Creek, west of Community Center park	From 28th St easterly to existing trail in Community Center Park west of WS Young Dr	Creekside land	Yes	No	0.32	$96,000

Table A-5: 2011 Reference Projects for the City of Killeen (continued)

City of Killeen									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
51.1	Bike Route	Add bike route signs	On Conder St, 28th St, and Greenwood Ave	From Terrace Dr northerly to Alexander St	2 lane roadways	No	No	0.87	$5,000
51.2	Bike Route	Add bike route signs	On Alexander St	From Greenwood Ave northerly to Rancier Ave	2 lane roadway	No	No	0.47	$5,000
51.3	Trail	Add 10ft wide multi-use trail	West of Stewart St and east of 24th St	From Alexander St northerly to northern city limits south of Warrior Way	4 lane roadway and drainage channel	Yes	No	0.61	$183,000
52.1	Bike Route	Add bike route signs	On Fowler Ave, Terrace Dr, and Rev Abercrombie Dr	From 2nd St easterly to Veterans Memorial Blvd	2 lane roadways	No	No	1.83	$10,000
53.1	Bike Route	Add bike route signs	On Highland Ave	From Rev Abercrombie Dr northerly to Marlboro Park	2 lane roadway	No	No	0.06	$5,000
53.2	Trail	Add 10ft wide multi-use trail	Within Marlboro Park	Within Marlboro Park	Park land	Yes	No	0.39	$117,000
54.1	Bike Route	Add bike route signs	On Becker Dr, Zephyr Rd, and Jeffries Ave	From Illinois Ave northerly to Veterans Memorial Blvd	2 lane roadways	No	No	1.18	$10,000
54.3	Side Path	Add 8ft wide multi-use side path	Along FM439/38th St	From Veterans Memorial Blvd northerly to Rancier Ave	4-5 lane roadway with shoulders	Yes	Yes	1.07	$214,000
54.4	Side Path	Add 8ft wide multi-use side path	Along 38th St	From Rancier Ave northerly to Westcliff Rd	4-5 lane roadway with shoulders	Yes	No	0.98	$196,000
55.1	Bike Lane	Add signs and markings for bicycle lanes	On Fawn Dr	From Cunningham Rd easterly to Rosewood Dr	Wide unmarked 2 lane road with on-street parking and sidewalks	No	No	1.33	$53,200
56.2	Trail	Add 10ft wide multi-use trail	Along Trimmier Creek	From FM3481 west of Stillhouse Lake northerly to city limit east of FM3481	Creekside land	No	No	1.96	$588,000
56.8	Side Path	Add 8ft wide multi-use side path	Along Roy Reynolds Dr	From MLK Dr northerly to city limits at railroad	2 lane roadway	No	No	2.06	$412,000
56.9	Bike Lane	Add signs and markings for bicycle lanes	On Roy Reynolds Dr	From city limits at railroad northerly to Westcliff Rd	4 lane roadway	No	No	1.39	$55,600
57.1	Bike Route	Add bike route signs	On Cora Ave	From 60th St easterly to Windward Dr	2 lane roadway	No	No	0.67	$5,000
57.2	Trail	Add 10ft wide multi-use trail	Connecting Cora Ave to Greengate Dr	From Windward Dr easterly to Cedarhill Dr	Open land between neighborhoods	No	No	0.13	$39,000
57.3	Bike Route	Add bike route signs	On Greengate Dr	From Cedarhill Dr easterly to Roy Reynolds Dr	2 lane roadway	No	No	0.48	$5,000

Table A-5: 2011 Reference Projects for the City of Killeen (continued)

City of Killeen									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
58.1	Bike Lane	Add signs and markings for bicycle lanes	On 4th and 8th Sts	From Ave C southerly to Ave G	2 lane roadways	Yes	No	0.40	$16,000
58.2	Side Path	Add 8ft wide multi-use side path	Along Ave G	From 4th St easterly to 28th St	2 lane roadway	Yes	No	0.76	$152,000
58.3	Trail	Add 10ft wide multi-use trail	Northwest of Community Center Park	From 28th St easterly to existing trail in Community Center Park	Wooded area	Yes	No	0.31	$93,000
58.5	Trail	Add 10ft wide multi-use trail	Along South Nolan Creek	From 38th St easterly to Roy Reynolds Dr	Creekside land	Yes	No	2.12	$636,000
59.1	Bike Route	Add bike route signs	On Ave C, Hall Ave, and Greenwood Ave	From Gray St easterly to Alexander St	2 lane roadway	No	No	0.71	$5,000
60.1	Trail	Add 10ft wide multi-use trail	Along creek east of Killeen High School, west of Wright Way	From proposed trail along South Nolan Creek west of Twin Creek Dr northerly to Westcliff Rd	Creekside land	Yes	No	2.87	$861,000
60.2	Trail	Add 10ft wide multi-use trail	Between Beretta Dr and Kilgore Dr and through Brookhaven Elementary campus	From proposed trail east of Brookbend Dr eastern end northerly to Traverse Dr	Creekside land	Yes	No	0.73	$219,000
61.1	Trail	Add 10ft wide multi-use trail	Along Trimmier Creek	From Trimmier Rd easterly to proposed trail east of Rosewood Dr proposed extension	Creekside land	Yes	No	2.34	$702,000
62.1	Side Path	Add 8ft wide multi-use side path	Along FM2410/MLK Blvd	From Stan Schlueter Loop easterly to Roy Reynolds Rd	2 lane roadway	No	Yes	0.75	$150,000
63.2	Side Path	Add 8ft wide multi-use side path	Along Rosewood Dr	From Siltstone Loop northerly to Fawn Dr	Wide unmarked roadway	Yes	No	1.58	$316,000
63.3	Side Path	Add 8ft wide multi-use side path	Along proposed northern extension of Rosewood Dr	From Fawn Dr northerly to US190 EB FR	Future roadway	Yes	No	0.70	$140,000
TOTAL								158.84	$24.66m

Table A-6: 2011 Reference Projects for the City of Little River/Academy

City of Little River/Academy									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
9.27	Side Path	Add 8ft wide multi-use side path	Along FM436	From proposed trail along Leon River easterly to Lamar St (west end of existing side path)	Along 2 lane road	No	Yes	1.96	$392,000
123.1	Shoulder Lane	Add shoulders, signs, and markings	On Kings Trl	From Main St northerly to northern city limit	2 lane roadway	No	No	0.33	$82,500
TOTAL								2.29	$474.5k

Table A-7: 2011 Reference Projects for the City of Morgan's Point Resort

City of Morgan's Point Resort									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
83.15	Shoulder Lane	Add signs and markings for shoulder lanes	On Morgan's Point Rd	From southern city limit at Bonnie Ln northerly to FM2483	2 lane roadway	No	No	1.16	$46,400
88.1	Bike Route	Add bike route signs	On Morgan's Point Rd	From FM 2483 westerly to Camp Kachina Rd near west city limit	2 lane roadway	No	No	1.77	$10,000
TOTAL								2.93	$56.4k

Table A-8: 2011 Reference Projects for the City of Nolanville

City of Nolanville									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
7.18	Shoulder Lane	Add signs and markings for shoulder lanes	On US190 WB FR	From western city limit easterly to eastern city limit	2 lane one-way roadway	No	Yes	4.03	$161,200
58.8	Trail	Add 10ft wide multi-use trail	Along South Nolan Creek	From northern city limits west of Pleasant Hill Cemetery Rd easterly to eastern city limit	Creekside land	No	No	3.15	$945,000
74.4	Side Path	Add 8ft wide multi-use side path	Along proposed northern extension of Warrior's Path	From Old Nolanville Rd northerly to US190 WB FR	Future roadway	No	No	0.43	$86,000
76.1	Side Path	Add 8ft wide multi-use side path	Along Main St, railroad, and 10th St	From US190 EB FR northerly to proposed trail north of Nolan Ridge Dr	2 lane roadways and open land	No	No	1.01	$202,000
76.2	Trail	Add 10ft wide multi-use trail	Between Nolan Ridge Dr and Wyatt Earp Ln	From 10th St easterly to proposed trail along private road	Open land	No	No	0.69	$207,000
78.1	Shoulder Lane	Add signs and markings for shoulder lanes	On US 190 EB FR	From US190 WB FR easterly to eastern city limits	2 lane one-way roadway	No	Yes	4.07	$162,800
TOTAL								13. 38	$1.76m

Table A-9: 2011 Reference Projects for the City of Temple

City of Temple									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
7.22	Shoulder Lane	Add signs and markings for shoulder lanes	On IH 35 SB FR	From southern city limit northerly to Kegley Rd	2 lanes one-way roadway with shoulders	No	Yes	2.49	$99,600
7.23	Side Path	Add 8ft wide multi-use side path	Along Kegley Rd and Midway Dr	From IH35 SB FR easterly to Camelot Ln	4 lane roadway	Yes	No	0.62	$124,000
7.24	Side Path	Add 8ft wide multi-use side path	Along Midway Dr	From Camelot Ln easterly to Las Moras Dr	4 lane roadway	Yes	No	0.51	$102,000
7.25	Bike Lane	Add signs and markings for bicycle lanes	On Hickory Rd and Thornton Lane	From Midway Dr at Hickory Rd easterly to Oakdale Dr	4 lane roadway	Yes	No	0.48	$19,200
7.26	Bike Lane	Add signs and restripe for bicycle lanes	On Oakdale Dr	From Thorton Ln northerly to Dodgen Loop	4 lane roadway	No	No	0.18	$9,000
7.27	Shoulder Lane	Include shoulder lane with future roadway improvement	On H K Dodgen Loop EB FR	From Oakdale Dr easterly to 1st St	2 lane one-way roadway	No	Yes	2.25	$0
7.28	Shoulder Lane	Include shoulder lane with future roadway improvement	On SH36/US190	From 1st St southerly to southern city limit at Barnhardt Rd	4 lane divided roadway	No	Yes	1.81	$0
81.6	Shoulder Lane	Add signs and markings for shoulder lanes	On IH 35 NB FR	From southern city limit at Leon River northerly to Midway Dr	2 lane roadway with shoulders	No	Yes	2.50	$100,000
82.8	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 317/Main St	From southern city limit at Leon River northerly to Adams Ave	2 lane roadway with shoulders	Yes	Yes	1.84	$73,600
82.9	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 317/Main St	From Adams Ave northerly to northern city limit north of Triple Heart Ln	2 lane roadway with shoulders	Yes	Yes	4.88	$195,200
83.13	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 2271	From southern city limit east of Belton Lake northerly to FM2305/Adams Ave	3 lanes with shoulders	Yes	Yes	0.96	$38,400
83.14	Shoulder Lane	Add signs and markings for shoulder lanes	On Morgan's Point Rd	From FM2305/Adams Ave northerly to northern city limit at Bonnie Ln	3 lanes with shoulders	Yes	No	0.37	$14,800
83.17	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 2483	From western city limit easterly to SH 317	2 lane roadway	Yes	Yes	0.61	$24,400

Table A-9: 2011 Reference Projects for the City of Temple (continued)

City of Temple									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
89.1	Bike Route	Add bike route signs	On FM 2305	From Temple Lake Park easterly to FM 2271	2 lane roadway with shoulders	Yes	Yes	1.55	$10,000
89.2	Side Path	Add 8ft wide multi-use side path	Along FM2305/Adams Ave (both sides)	From FM 2271 easterly to St. Andrews Place	2 lane roadway	Yes	Yes	1.59	$318,000
89.3	Side Path	Add 8ft wide multi-use side path	Along FM2305Adams Ave	From St. Andrews Place easterly to western end of existing side path at Montpark Rd	4 lane roadway	Yes	Yes	1.46	$292,000
89.5	Side Path	Add 8ft wide multi-use side path	Along FM2305/Adams Ave	From eastern end of existing trail west of Dodgen Loop easterly to West Gate Dr	5 lane roadway	Yes	Yes	1.35	$270,000
89.6	Bike Lane	Add signs and markings for bicycle lanes	On FM2305 and SH53/Adams Ave	From West Gate Dr easterly to Dodgen Loop east	4 lane roadway	Yes	Yes	3.90	$156,000
89.7	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 53	From Dodgen Loop east easterly to eastern city limit	2 lane roadway with shoulders	Yes	Yes	0.42	$16,800
105.4	Trail	Add 10ft wide multi-use trail	Along creek and west of Pea Ridge Rd	From existing trail in Heritage Park northerly to existing side path along Adams Ave	Creekside and open land	Yes	No	4.17	$1,251,000
105.6	Trail	Add 10ft wide multi-use trail	East of SH317	From existing trail in West Temple Community Park northerly and westerly to SH317	Open land	Yes	No	1.38	$414,000
106.1	Trail	Add 10ft wide multi-use trail	East of Miller Spring Park	From existing trail in Miller Springs Park easterly to SH 317 at Tarver Dr	Wooded area and open land	Yes	No	1.34	$402,000
106.2	Bike Lane	Add signs and restripe for bicycle lanes	On Tarver Dr	From SH 317 easterly to Pirtle Elementary	4 lane roadway	Yes	No	0.72	$36,000
106.3	Bike Lane	Add signs and restripe for bicycle lanes	On existing and proposed eastern extension of Tarver Dr	From Pirtle Elementary easterly to Old Waco Rd	2 lane roadway and future roadway	No	No	0.90	$45,000
106.4	Bike Lane	Add signs and restripe for bicycle lanes	On existing and proposed eastern extension of Jupiter Dr	From Old Waco Rd easterly to Kegley Rd at Wildflower Ln	2 lane roadway and future roadway	Yes	No	0.98	$49,000
106.5	Bike Lane	Add signs and restripe for bicycle lanes	On Wildflower Ln	From Kegley Rd easterly to Dodgen Loop	2 lane roadway	No	No	0.68	$34,000
107.1	Bike Route	Add bike route signs	On existing and proposed northern extension of Starlight Dr	From Adams Ave northerly to FM2483	2 lane roadway and future roadway	Yes	No	1.57	$10,000

Table A-9: 2011 Reference Projects for the City of Temple (continued)

City of Temple									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
108.1	Trail	Add 10ft wide multi-use trail	Along creek west of Tarver Intermediate School	From proposed trail south of Pea Ridge/Hogan northerly to Adams Ave	Creekside land	Yes	No	1.20	$360,000
109.1	Shoulder Lane	Add shoulders, signs, and markings	On North Point Rd	From Armadillo Circle easterly to SH317	2 lane roadway	Yes	No	0.62	$155,000
111.3	Shoulder Lane	Add shoulders, signs, and markings	On FM817/Charter Oak Dr	From proposed trail at western city limit along Leon River northerly to Pea Ridge Rd	2 lane roadway	Yes	Yes	0.83	$207,500
111.4	Shoulder Lane	Add shoulders, signs, and markings	On FM817/Charter Oak Dr	From Pea Ridge Rd northerly to Kegley Rd	2 lane roadway	No	Yes	1.20	$300,000
113.3	Trail	Add 10ft wide multi-use trail	Along Abandoned RR and east of Ray Allen Elementary	From proposed trail along Leon River easterly to existing trail at Ray Allen Elementary	Abandoned railroad	Yes	No	4.50	$1,350,000
113.5	Trail	Add 10ft wide multi-use trail	East of Southern Crossing Dr	From southern end of existing trail at Pullman Place Blvd southerly to 5th St	Open land	Yes	No	0.68	$204,000
115.1	Shoulder Lane	Include shoulder lane with future roadway improvement	On H K Dodgen Loop	From Barnhardt Rd northerly to Adams Ave (east)	2 lane roadway	No	Yes	2.98	$0
115.2	Shoulder Lane	Include shoulder lane with future roadway improvement	On H K Dodgen Loop and proposed FRs	From Adams Ave (east) northerly to McLane Pkwy	2 lane roadway	Yes	Yes	6.18	$0
115.3	Shoulder Lane	Include shoulder lane with future roadway improvement	On H K Dodgen Loop proposed FRs	From McLane Pkwy southerly to Oakdale Dr	2 lane undivided, 4 lane divided roadway	No	Yes	4.76	$0
115.5	Bike Lane	Add signs and markings for bicycle lanes	On Thorton Ln, Oaklawn Dr, Cottonwood Ln, and Oakview Dr	From Oakdale Dr southerly to Pin Oak Dr	2 lane roadways	Yes	No	0.60	$24,000
115.6	Trail	Add 10ft wide multi-use trail	West and south of Oak Creek Park	From Oakview Dr southerly to proposed trail south of Canyon Creek Dr	Wooden area	Yes	No	1.00	$300,000
115.7	Bike Lane	Add signs and markings for bicycle lanes	On Canyon Creek Dr, Blackland Rd, and Barnhardt Rd	From Canyon Creek Dr easterly to US190 just north of FM3117	2 lane roadways	Yes	No	3.40	$136,000
116.1	Trail	Add 10ft wide multi-use trail	Along Dubose Rd and FM 93	From prop. trail along creek north of Forrester northerly to prop. trail along Bird Creek	Open land	Yes	No	1.46	$438,000
116.3	Trail	Add 10ft wide multi-use trail	Along Leon River	From Shallow Ford Rd westerly and northerly to existing trail in Miller Springs Park	Riverside land	Yes	No	5.49	$1,647,000

Table A-9: 2011 Reference Projects for the City of Temple (continued)

City of Temple									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
117.3	Shoulder Lane	Include shoulder lane with future roadway improvement	On Witter Ln	From southern city limit northerly to Taylor's Valley Rd	2 lane roadway	No	No	0.26	$0
117.6	Trail	Add 10ft wide multi-use trail	East of Ramblewood Park	From proposed Hickory Rd extension easterly to proposed trail south of Canyon Cliff Dr	Wooded area	Yes	No	0.96	$288,000
117.8	Trail	Add 10ft wide multi-use trail	East of Oak Creek Park and south of King's Daughters Hospital	From proposed trail north of Forest Trail easterly to Market Loop	Park and open land	Yes	No	0.55	$165,000
117.9	Bike Lane	Add signs and restripe for bicycle lanes	On Market Loop	From proposed trail on south side of Cottonwood Dr easterly to 31st St	2 lane roadway	Yes	No	0.19	$9,500
119.1	Side Path	Add 8ft wide multi-use side path	Along existing and proposed easterly extension of Poison Oak Rd	From SH 317 easterly to Old Waco Rd	2 lane roadway and future roadway	No	No	1.71	$342,000
120.1	Trail	Add 10ft wide multi-use trail	Along Pepper Creek	From proposed trail along Leon River northerly to city limit at Charter Oak Dr	Creekside land	Yes	No	1.64	$492,000
120.3	Trail	Add 10ft wide multi-use trail	Along Pepper Creek	From proposed trail west of Kegley Rd northerly to proposed trail just south of Wildflower Ln	Creekside land	Yes	No	1.46	$438,000
120.4	Trail	Add 10ft wide multi-use trail	Along Pepper Creek	From proposed trail west of Kegley Rd northerly to Adams Ave	Creekside land	Yes	No	1.18	$354,000
121.2	Shoulder Lane	Add shoulders, signs, and markings	On Old Waco Rd	From Riverside Trail at Old Waco Rd northerly to Adams Ave	2 lane roadway	Yes	No	2.16	$540,000
121.3	Bike Lane	Add signs and restripe for bicycle lanes	On Hilliard Rd and Research Pkwy	From Adams Ave northerly to SH36/Airport Rd	4 lane divided roadway	Yes	No	1.42	$71,000
121.4	Side Path	Add 8ft wide multi-use side path	Along Old Howard Rd	From SH36/Airport Rd northerly to Central Pointe Pkwy	4 lane divided roadway	Yes	No	0.94	$188,000
121.5	Bike Lane	Add signs and restripe for bicycle lanes	On Old Howard Rd	From Central Pointe Pkwy northerly to McLane Pkwy	2 lane roadway	Yes	No	0.94	$47,000
122.2	Bike Lane	Add signs and restripe for bicycle lanes	On 5th Street	From FM 93 northerly to proposed trail along abandoned railroad	4 lane divided roadway	No	No	1.18	$59,000
122.4	Trail	Add 10ft wide multi-use trail	At northern end of existing trail west of 5th St	From north end of existing trail west of 5th St to 5th St	Wooded area	Yes	No	0.10	$30,000
122.5	Shoulder Lane	Include shoulder lane in future roadway	On proposed southern extension of 1st St	From proposed trail at 5th St northerly to Temple College Pedestrian overpass	Future roadway	Yes	No	0.67	$0

Table A-9: 2011 Reference Projects for the City of Temple (continued)

City of Temple									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
122.6	Trail	Add 10ft wide multi-use trail	Along SS290/1st St (both sides)	From Temple College Pedestrian overpass northerly to proposed trail north of Felder Dr (both sides)	5 lane roadway	Yes	Yes	0.52	$156,000
122.7	Trail	Add 10ft wide multi-use trail	Along SS290/1st St (both sides)	From proposed trail north of Felder Dr northerly to Avenue M	4 lane roadway	Yes	Yes	1.40	$420,000
122.8	Bike Route	Add bike route signs	On SS290/1st St and 3rd St	From Avenue M northerly to Adams Ave	4 lane roadway	Yes	Yes	1.00	$10,000
123.3	Shoulder Lane	Add shoulders, signs, and markings	On Little River Rd	From southern city limit northerly to Blackland Rd	2 lane roadway	No	No	0.65	$162,500
123.4	Shoulder Lane	Add shoulders, signs, and markings	On Little River Rd	From Blackland Rd northerly to Dodgen Loop	2 lane roadway	Yes	No	0.60	$150,000
123.5	Bike Lane	Add signs and markings for bicycle lanes	On Martin Luther King Jr Dr	From Dodgen Loop northerly to 8th St	4 lane roadway	Yes	No	1.71	$68,400
123.6	Bike Route	Add bike route signs	On Martin Luther King Jr Dr	From Avenue M northerly to Avenue E	4 lane roadway	Yes	No	0.58	$5,000
124.2	Trail	Add 10ft wide multi-use trail	Along Creek	From FM 93 northerly to existing trail in South Temple Community Park	Creekside land	Yes	No	1.90	$570,000
125.1	Shoulder Lane	Add signs and markings for shoulder lanes	On Boutwell Rd	From proposed trail south of FM93 at Boutwell Rd northerly to FM93	2 lane and 5 lane roadways	Yes	No	0.10	$4,000
125.2	Shoulder Lane	Add signs and markings for shoulder lanes	On FM93, and FM1741/31st St	From FM93 northerly to proposed trail along abandoned railroad	2 lane and 5 lane roadways	Yes	Yes	0.65	$26,000
126.1	Trail	Add 10ft wide multi-use trail	Along FM93	From FM1741/31st easterly to proposed trail along creek	4 lane roadway	Yes	Yes	0.11	$33,000
127.1	Trail	Add 10ft wide multi-use trail	South of Fox Glen Ln	From FM1741/31st easterly to proposed trail along creek	Open land	Yes	No	0.21	$63,000
128.1	Trail	Add 10ft wide multi-use trail	East of IH35	From proposed trail along Pepper Creek northerly to proposed road just east of IH35	Wooded area	Yes	No	0.31	$93,000
128.2	Shoulder Lane	Include shoulder lane with future roadway improvement	On proposed road connecting Old Waco Rd and Taylors Valley Rd	From proposed road just east of IH35 northerly to city limit west of Charter Oak Dr	Future roadway	Yes	No	0.46	$0
129.1	Trail	Add 10ft wide multi-use trail	South of bend in 31st St	From proposed trail south of abandoned railroad northerly to 31st	Open land	Yes	No	0.43	$129,000
129.2	Side Path	Add 8ft wide multi-use side path	Along FM1741/31st Street	From proposed trail east of Warwicke Dr northerly to Avenue D	5 lane roadway	Yes	Yes	3.47	$694,000

Table A-9: 2011 Reference Projects for the City of Temple (continued)

City of Temple									
ID	**Type**	**Action**	**Location**	**Limits**	**Existing Condition**	**In Local Plan**	**State Highway**	**Length (mi.)**	**Cost ($)**
129.3	Side Path	Add 8ft wide multi-use side path	Along 31st Street	Avenue D northerly to SH53/Adams Ave	5 lane roadway	Yes	Yes	0.36	$72,000
129.4	Side Path	Add 8ft wide multi-use side path	Along 31st Street	SH53/Adams Ave northerly to just north of Bray St	5 lane roadway	Yes	No	0.47	$94,000
129.5	Bike Route	Add bike route signs	On north side of Temple High School and 23rd St	From 31st St easterly and southerly to Adams Dr	2 lane roadway	Yes	No	0.75	$5,000
130.1	Trail	Add 10ft wide multi-use trail	Along drainage channel and Winchester Dr	From 31st east of Warwicke to 31st at Winchester Dr	Drainage channel and 2 lane roadway	Yes	No	0.57	$171,000
130.3	Side Path	Add 8ft wide multi-use side path	Along Waters Dairy Rd	From 31st St easterly to existing trail just west of 5th St	3 lane roadway	Yes	No	0.78	$156,000
131.1	Trail	Add 10ft wide multi-use trail	North of Bird Creek	From existing trail in Temple Lions Park easterly to proposed Hickory Rd	Open land	Yes	No	0.39	$117,000
132.1	Side Path	Add 8ft wide multi-use side path	Along Shallow Ford Rd	From proposed trail along Leon River northerly to existing trail in Temple Lions Park	Narrow 2 lane roadway	No	No	0.88	$176,000
132.2	Trail	Add 10ft wide multi-use trail	Along Bird Creek	From existing trail in Temple Lions Park northerly to Battle Dr	Creekside land	Yes	No	1.92	$576,000
132.3	Trail	Add 10ft wide multi-use trail	Along Bird Creek and into Hodge Park	From Battle Drive easterly to proposed trail between Avenues R and T	Creekside land	No	No	1.72	$516,000
132.4	Trail	Add 10ft wide multi-use trail	Through Hodge Park and between Ave R and Ave S	From proposed trail along Bird Creek easterly to 57th St	Wooded area between houses	Yes	No	0.34	$102,000
132.5	Bike Route	Add bike route signs	On Ave R	From 57th St easterly to 31st St	2 lane roadway	Yes	No	0.88	$5,000
132.6	Side Path	Add 8ft wide multi-use side path	Along Avenue R	From 31st St easterly to 1st St	4 lane roadway	Yes	No	0.95	$190,000
133.1	Trail	Add 10ft wide multi-use trail	North of Temple Lions Park west of Valley View Dr	From existing trail in Temple Lions Park northerly to Midway Dr	Wooded area	Yes	No	0.86	$258,000
134.1	Side Path	Add 8ft wide multi-use side path	Along Midway Dr and Kegley Rd	From IH35 SB FR northerly to proposed trail along Pepper Creek	2 lane roadway	Yes	No	0.44	$88,000
134.2	Trail	Add 10ft wide multi-use trail	West of Kegley Rd and east of Old Waco Rd	From proposed trail along Pepper Creek northerly to Jupiter Dr	Open land	Yes	No	1.77	$531,000
135.1	Trail	Add 10ft wide multi-use trail	North of Wind Chime Rd	From proposed trail north of Poison Oak Rd easterly to proposed trail east of Old Waco Rd	Open land	Yes	No	1.30	$390,000

Table A-9: 2011 Reference Projects for the City of Temple (continued)

City of Temple									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
136.1	Trail	Add 10ft wide multi-use trail	Along Prairie View Rd and west of Hilliard Rd	From Dewberry Ln easterly-southerly to existing side path along Adams Ave	2 lane roadway and open land	Yes	No	1.84	$552,000
137.1	Bike Lane	Add signs and markings for bicycle lanes	On existing and proposed easterly extension of Stonehollow Dr	From proposed trail west of Pea Ridge Rd to Hilliard Rd at Research Loop	2 lane roadway and future roadway	Yes	No	1.02	$40,800
137.2	Trail	Add 10ft wide multi-use trail	Along Research Loop	From Hilliard Rd easterly to existing Pepper Creek Trail	2 lane roadway and open land	Yes	No	0.34	$102,000
137.4	Trail	Add 10ft wide multi-use trail	Along SH36/Airport Rd and Pepper Creek	From Old Howard Rd easterly and northerly to Central Pointe Pkwy	5 lane roadway and creekside land	Yes	No	1.69	$507,000
138.1	Trail	Add 10ft wide multi-use trail	Southwest of Woodbridge Park and north of Antelope Trl	From Dodgen Loop NB FR easterly to existing trail in Woodbridge Park	Greenbelt	Yes	No	0.92	$276,000
138.3	Trail	Add 10ft wide multi-use trail	West of John Paul Jones Dr	From existing trail in Woodbridge Park northerly to Nugent Ave	Open land	Yes	No	0.62	$186,000
139.1	Trail	Add 10ft wide multi-use trail	North of Hodge Park and between shopping center and Sammons Golf Course	From proposed trail between Avenues R and T northerly to western end of Keller Rd	Wooded area east and 2 lane roadway	Yes	No	0.98	$294,000
139.2	Bike Route	Add bike route signs	On Keller Rd	From western end of Keller easterly to Apache Dr	2 lane roadway	Yes	No	0.38	$5,000
139.3	Side Path	Add 8ft wide multi-use side path	Along Apache Dr	From Keller Rd northerly to Adams Ave	2 roadway	Yes	No	0.61	$122,000
140.1	Bike Lane	Add signs and restripe for bicycle lanes	On 57th St	From Dodgen Loop SB FR northerly to Scott Blvd	4 lane roadway	No	No	0.31	$15,500
140.2	Bike Route	Add bike route signs	On Scott Boulevard	From 57th St easterly to 43rd St	2 lane roadway	No	No	0.50	$5,000
140.3	Bike Route	Add bike route signs	On Scott Boulevard	From 43rd St easterly St to 31st St	2 lane roadway	Yes	No	0.42	$5,000
140.5	Trail	Add 10ft wide multi-use trail	East of Scott and White Hospital and west and south of Avenue V	From Scott and White Blvd easterly and southerly to 5th St	Drainage channel	Yes	No	0.67	$201,000
140.6	Trail	Add 10ft wide multi-use trail	North of Felder Dr	From proposed trail connecting to Scott & White Hospital northerly and easterly to 1st St	4 lane roadway and to-be-redeveloped land	Yes	No	0.16	$48,000
140.8	Trail	Add 10ft wide multi-use trail	Through Temple College, south of Tarrant Park, and along Knob Creek	From 1st St easterly to current southern end of 30th St (crossing railroad)	2 lane roadway, open land, future roadway, and creekside land	Yes	No	1.75	$525,000

Table A-9: 2011 Reference Projects for the City of Temple (continued)

City of Temple									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
140.9	Trail	Add 10ft wide multi-use trail	Along Knob Creek and east of railroad	From southern end of 30th St northerly to Avenue E at Jeff Hamilton Park	Creekside land and drainage channel	Yes	No	1.24	$372,000
141.1	Bike Lane	Add signs and restripe for bicycle lanes	On Avenue H	From 31st St easterly to MLK Blvd	4 lane roadway	Yes	No	1.26	$63,000
142.1	Bike Route	Add bike route signs	On 19th Street	From proposed trail along Avenue T northerly to Avenue H	2 lane roadway	Yes	No	0.81	$5,000
143.1	Bike Route	Add bike route signs	On 49th St	From Avenue R northerly to Avenue D	2 lane roadway	Yes	No	1.05	$10,000
143.2	Trail	Add 10ft wide multi-use trail	Along Bird Creek and east of Sammons Golf Course	From Avenue D/49th St northerly to Nugent Ave	Creekside land	Yes	No	1.31	$393,000
143.3	Bike Lane	Add signs and markings for bicycle lanes	On Nugent Ave	From Allegiance Dr westerly to Eberhardt Rd	2 lane roadway	Yes	No	0.21	$8,400
143.4	Bike Route	Add bike route signs	On Eberhardt Road	From Nugent Ave northerly to Dodgen Loop	4 lane roadway	Yes	No	1.70	$10,000
144.1	Side Path	Add 8ft wide multi-use side path	Along Central Pointe Rd	From proposed trail west of Entrepreneur Way easterly to Dodgen Loop	4 lane roadway	Yes	No	1.49	$298,000
144.2	Side Path	Add 8ft wide multi-use side path	Along Industrial Blvd	From Dodgen Loop easterly to just west of IH35 ramps at FM1143	4 lane roadway	Yes	No	1.99	$398,000
144.3	Side Path	Add 8ft wide multi-use side path	Along FM1143/Industrial Blvd	From just west of IH35 ramps at FM1143 easterly to 3rd St	4 lane roadway	Yes	Yes	0.46	$92,000
144.4	Bike Route	Add bike route signs	On Zenith St and Young Ave	From 3rd Ave easterly to Dodgen Loop	2 lane roadway	No	No	1.36	$10,000
145.1	Shoulder Lane	Add signs and markings for shoulder lanes	On SH53/SH36/Airport Rd	From existing trail in Woodbridge Park northerly to Kegley Rd	5 lane roadway with shoulders	No	Yes	1.42	$56,800
145.2	Shoulder Lane	Add signs and markings for shoulder lanes	On SH36/Airport Rd	From Kegley Rd northerly to Old Howard Rd	5 lane roadway with shoulders	Yes	Yes	0.37	$14,800
145.3	Shoulder Lane	Add signs and markings for shoulder lanes	On SH36/Airport Rd	From Old Howard Rd northerly to SH317	5 lane roadway with shoulders	No	Yes	2.60	$104,000
145.4	Shoulder Lane	Add signs and markings for shoulder lanes	On SH36/Airport Rd	From SH317 northerly to northern city limits at Clear Ridge Park Dr	2 lane roadway with shoulders	No	Yes	2.00	$80,000
146.1	Shoulder Lane	Add shoulders, signs, and markings	On Cearley Rd	From SH36/Airport Rd northerly to Industrial Blvd	2 lane roadway	Yes	No	1.40	$350,000

Table A-9: 2011 Reference Projects for the City of Temple (continued)

City of Temple									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
146.3	Shoulder Lane	Add shoulders, signs, and markings	On Mouser Rd and McLane Parkway	From Dodgen Loop westerly to Airport Trail	2 lane roadway	Yes	No	2.51	$627,500
146.4	Trail	Add 10ft wide multi-use trail	Along Airport Trail and creek	From Mouser Rd northerly and westerly to SH317	2 lane roadway, and creekside land	Yes	No	2.05	$615,000
147.1	Trail	Add 10ft wide multi-use trail	West of Old Howard Rd and east of Central Texas Regional Airport	From Old Howard Rd northerly to Mouser Rd	Open land	Yes	No	1.84	$552,000
148.1	Trail	Add 10ft wide multi-use trail	North of SH36/Airport Rd	From proposed trail east of Old Howard Rd easterly to Cearley Rd	Open land	Yes	No	0.96	$288,000
148.3	Bike Lane	Add signs and markings for bicycle lanes	On Nugent Ave	From Cearley Rd easterly to Eberhardt Rd	2 lane roadway	Yes	No	0.89	$35,600
149.1	Trail	Add 10ft wide multi-use trail	Along FM3117	From US190 at FM 3117 easterly to railroad	2 lane roadway and railroadside land	Yes	Yes	0.33	$99,000
149.2	Trail	Add 10ft wide multi-use trail	Along railroad	From FM 3117 northerly to proposed trail along proposed western extension of Tower Rd	2 lane roadway and railroadside land	Yes	No	1.69	$507,000
149.4	Bike Route	Add bike route signs	On 30th St, Avenue J, 34th St, and Avenue E	From southern end of 30th St south of Ave N northerly and westerly to 14th St	2 lane roadways	Yes	No	1.70	$10,000
149.5	Bike Lane	Add signs and markings for bicycle lanes	On Avenue E, 6th St, Avenue C, Avenue B, and Avenue A	From 14th St westerly to 11th St	2 lane roadways	Yes	No	0.95	$38,000
149.6	Bike Lane	Add signs and markings for bicycle lanes	On 11th St	From Avenue A northerly to Garfield Ave	2 lane roadway	Yes	No	0.56	$22,400
149.7	Bike Lane	Add signs and markings for bicycle lanes	On 11th St and Park Ave	From Garfield Ave northerly to 7th St at Park Ave	2 lane roadways	Yes	No	0.77	$30,800
149.8	Bike Lane	Add signs and markings for bicycle lanes	On Garfield Ave and 7th St	From 11th St easterly and northerly to Park Ave	2 lane roadways	Yes	No	0.77	$30,800
149.9	Bike Lane	Add signs and markings for bicycle lanes	On 7th St, Mayborn Dr, 8th St, and Walker Ave	From Park Ave northerly to 3rd St	2 lane roadways	Yes	No	0.55	$22,000
149.10	Bike Lane	Add signs and markings for bicycle lanes	On SS290/3rd St	From Walker Ave northerly to Bellaire North	2 lane roadways	Yes	Yes	0.60	$24,000
149.11	Bike Lane	Add signs and markings for bicycle lanes	On Bellaire North	From 3rd St easterly to eastern end of Bellaire North at Visitors Center	2 lane roadways	Yes	No	0.20	$8,000

Table A-9: 2011 Reference Projects for the City of Temple (continued)

City of Temple									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
150.2	Trail	Add 10ft wide multi-use trail	Along creek, southeast of James Wilson Park	From eastern city limit northerly to existing trail in James Wilson Park	Creekside land and open land	Yes	No	1.85	$555,000
150.4	Trail	Add 10ft wide multi-use trail	North of Emerson Elementary and in Ferguson Park	From existing trail in James Wilson Park westerly to Ferguson Park	Park land	Yes	No	0.53	$159,000
150.5	Bike Lane	Add signs and markings for bicycle lanes	On Fowler Rd	From proposed trail in Ferguson Park northerly to proposed trail north of Downs Ave	2 lane roadway	Yes	No	0.29	$11,600
150.6	Side Path	Add 8ft wide multi-use side path	Along proposed northern extension of Fowler Rd and French Ave	From current northern end of Fowler Rd northerly-easterly to proposed trail along Williamson Branch	Future roadway and 2 lane roadway	Yes	No	0.44	$88,000
151.1	Trail	Add 10ft wide multi-use trail	Along Williamson Branch Creek and Shell Ave	From Adams Ave northerly to existing trail in Miller Park	Creekside land and 2 lane roadway	Yes	No	2.49	$747,000
151.3	Bike Lane	Add signs and markings for bicycle lanes	On 1st St and Virginia Ave	From existing trail in Miller Park northerly and westerly to 3rd St	2 lane and 4 lane divided roadways	Yes	No	0.26	$10,400
151.4	Bike Lane	Add signs and markings for bicycle lanes	On SS290/3rd St	From Virginia Ave northerly to Walker Ave	2 lane and 4 lane divided roadways	Yes	Yes	0.09	$3,600
152.1	Bike Lane	Add signs and markings for bicycle lanes	On 50th St and Lavendusky Dr	From Adams Ave northerly and easterly to Dodgen Loop	2 lane roadways	Yes	No	0.72	$28,800
153.1	Trail	Add 10ft wide multi-use trail	West of Jackson Park	From 7th St easterly to existing trail in Jackson Park	Drainage channel	Yes	No	0.24	$72,000
153.3	Trail	Add 10ft wide multi-use trail	South of King Cir and through King Circle Park	From existing trail in Jackson Park easterly to proposed trail west of Dodgen Loop	Wooded area	Yes	No	0.62	$186,000
154.1	Bike Route	Add bike route signs	On 2nd St	From Avenue C northerly to existing trail in Jackson Park	2 lane roadway	No	No	0.93	$5,000
155.1	Bike Lane	Include bike lane with future roadway improvement	On South Kegley Rd	From proposed trail just south of Wildflower Ln northerly to Adams Ave	2 lane roadway	Yes	No	0.81	$0
155.2	Bike Lane	Add signs and restripe for bicycle lanes	On Kegley Road	From Adams Ave northerly to SH36/Airport Rd	4 lane roadway	Yes	No	0.93	$46,500
TOTAL								179.70	$28.25m

Table A-10: 2011 Reference Projects for the Village of Salado

Village of Salado									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
13.5	Trail	Add 10ft wide multi-use trail	Along Mill Creek Golf Course, Smith Branch Creek, and Salado Cemetery	From IH35 NB FR easterly-southerly-northerly existing trail in Tablerock Ampitheatre	Parkland, wooded area, and creekside land	No	No	5.36	$1,608,000
81.2	Bike Route	Add bike route signs	On FM2268	From FM2268 northerly to Mill Creek Dr	2 lane roadway	No	Yes	1.62	$10,000
82.1	Trail	Add 10ft wide multi-use trail	South of Southridge Rd and along Salado Plaza and	From proposed trail along Salado Creek westerly to Main St	Open land and 2 lane roadway	No	No	0.59	$177,000
83.1	Side Path	Add 8ft wide multi-use side path	Along proposed eastern extension of and existing Royal St	From proposed Trail along Smith Branch Creek westerly to Main St	Future roadway and 2 lane roadway	No	No	1.11	$222,000
83.3	Bike Route	Add bike route signs	On Pace Park Rd and Thomas Arnold Rd	From proposed trail along Salado Creek westerly to IH 35 SB FR	2 lane roadway	No	No	0.33	$5,000
86.1	Trail	Add 10ft wide multi-use trail	South of Salado High School	Loop within area bounded by FM2484, Village Rd, Salado School Rd and Williams Rd	Open land	No	No	2.27	$681,000
87.1	Trail	Add 10ft wide multi-use trail	Along Salado Creek	From Main St easterly to northern city limit at Chisholm Trail	Creekside land	No	No	1.79	$537,000
TOTAL								13. 07	$3.24m

Table A-11: 2011 Reference Projects for Bell County

Bell County									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
7.19	Shoulder Lane	Add signs and markings for shoulder lanes	On US190 WB FR	From Nolanville eastern city limit easterly to Belton western city limit	2 lane one-way roadway with shoulders	No	Yes	1.20	$48,000
7.29	Shoulder Lane	Add signs and markings for shoulder lanes	On US190 and Old US190	From Temple southern city limit at Barnhardt Rd southerly to Milam County Line	2 lane road with shoulders	No	Yes	11.92	$476,800
9.20	Shoulder Lane	Add shoulders, signs, and markings	On FM 2410	From Harker Heights city limit easterly to Belton eastern city limit	2 lane roadway with narrow shoulders	No	Yes	2.00	$500,000
9.26	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 436	From Belton eastern city limit easterly to proposed trail along Leon River	2 lane roadway with shoulders	No	Yes	4.71	$188,400
12.1	Shoulder Lane	Add shoulders, signs, and markings	On Oakalla Rd	From Burnet County Line northerly to FM 116	2 lane roadway	No	No	3.24	$810,000
12.2	Shoulder Lane	Add shoulders, signs, and markings	On FM 116	From Oakalla Rd northerly to Coryell County Line	2 lane roadway	No	Yes	2.80	$700,000
13.1	Shoulder Lane	Add shoulders, signs, and markings	On Maxdale Rd	From Burnet County Line easterly to Wolfridge Rd	2 lane roadway	No	No	3.44	$860,000
13.2	Shoulder Lane	Add shoulders, signs, and markings	On FM 2670	From Wolfridge Rd easterly to SH 195	2 lane roadway	No	Yes	4.03	$1,007,500
13.3	Bike Route	Add bike route signs	On Triple 7 Dr, Fire Ln, and Tally Ho Rd	From SH 195 easterly to FM 2484	2 lane roadways	No	No	2.51	$15,000
13.4	Shoulder Lane	Add shoulders, signs, and markings	On FM 2484	From Tally Ho Rd easterly to IH35 NB FR	2 lane roadway	No	Yes	17.80	$4,450,000
14.2	Shoulder Lane	Add shoulders, signs, and markings	On Boys Ranch Rd	From Lampasas County Line easterly to FM 116	2 lane roadway	No	No	2.69	$672,500
15.7	Trail	Add 10ft wide multi-use trail	Along Clark Creek	From Coryell County Line southerly to Boys Ranch Rd	Creekside land	No	No	1.25	$375,000
24.6	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 439	From Killeen eastern city limit easterly to FM93	2 lane roadway with shoulders	No	Yes	6.56	$262,400
24.7	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 439	From FM93 easterly to western Belton city limit	2 lane roadway with shoulders	No	Yes	3.80	$152,000
35.1	Shoulder Lane	Add shoulders, signs, and markings	On Chaparral Rd	From SH 195 easterly to FM 3481	2 lane roadway and future roadway east of future Rosewood southern extension	No	No	6.47	$1,617,500

Table A-11: 2011 Reference Projects for Bell County (continued)

Bell County									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
36.1	Shoulder Lane	Add shoulders, signs, and markings	On FM 2484	From Tally Ho Rd northerly to SH195	2 lane roadway	No	Yes	1.13	$282,500
38.1	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 195	From Williamson County Line northerly to FM2670	2 lane roadway with shoulders	No	Yes	5.69	$227,600
56.3	Trail	Add 10ft wide multi-use trail	Along Trimmier Creek	From Killeen city limit east of FM3481 northerly to Harker Heights southern city limit	Creekside land	No	No	1.15	$345,000
58.7	Trail	Add 10ft wide multi-use trail	Along South Nolan Creek	From Nolanville city limit east of FM3219 easterly to city limit west of Pleasant Hill Cemetery Rd	Creekside land	No	No	0.93	$279,000
58.9	Trail	Add 10ft wide multi-use trail	Along South Nolan Creek and Nolan Creek	From Nolanville eastern city limit easterly to proposed trail at Belton western city limit	Creekside land	No	No	9.67	$2,901,000
58.14	Trail	Add 10ft wide multi-use trail	Along Leon River and Lampasas River	From proposed trail along Leon River clockwise to Mitchell Branch Creek- SE of Belton	Riverside land	No	No	10.82	$3,246,000
58.15	Trail	Add 10ft wide multi-use trail	Along Lampasas River	From Mitchell Branch Creek- SE of Belton westerly to Belton city limit west of Elm Grove Rd	Riverside land	No	No	7.98	$2,394,000
58.20	Trail	Add 10ft wide multi-use trail	East of High Oak Dr	From existing trail at Stillhouse Hollow Lake northerly to proposed trail north of FM2410	Wooded area and open land	No	No	1.75	$525,000
72.2	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 3219	From Harker Heights northern city limit northerly to FM439	2 lane roadway with shoulders	No	Yes	1.02	$40,800
73.1	Trail	Add 10ft wide multi-use trail	Along creek and west Pleasant Hill Cemetery	From proposed trail along South Nolan Creek north of railroad easterly to Pleasant Hill Cemetery Rd	Creekside land and wooded area	No	No	0.38	$114,000
73.2	Trail	Add 10ft wide multi-use trail	Along Pleasant Hill Cemetery Rd and Quarry Rd	From proposed trail east of South Nolan Creek northerly to Fort Hood boundary	2 lane roadway and gravel roadway	No	No	2.10	$630,000
73.5	Shoulder Lane	Add shoulders, signs, and markings	On Sparta Rd	From Fort Hood east boundary easterly to Belton western city limits	2 lane roadway	No	No	3.66	$915,000
75.1	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 3481	From FM 2484 northerly to southern Harker Heights city limit south of Del Rey Dr	2 lane roadway with shoulders, except on bridge	No	Yes	2.66	$106,400
77.1	Side Path	Add 8ft wide multi-use side path	West of Shaw Branch Creek and along Jackrabbit Rd	From proposed trail along South Nolan Creek westerly to proposed trail along private road	Open land and 2 lane roadway	No	No	0.99	$198,000

Table A-11: 2011 Reference Projects for Bell County (continued)

Bell County									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
77.2	Trail	Add 10ft wide multi-use trail	Along private road between Wyatt Earp Ln and Shaw Branch Creek	From Jackrabbit Rd northerly to FM439	Open land	No	No	1.02	$306,000
78.2	Shoulder Lane	Add signs and markings for shoulder lanes	On US 190 EB FR	From Nolanville eastern city limit to Belton western city limit	2 lane one-way roadway with shoulders	No	Yes	1.23	$49,200
79.1	Shoulder Lane	Add shoulders, signs, and markings	On Levy Crossing Rd and Paddy Hamilton Rd	From FM 2410 northerly and easterly to FM93	2 lane roadways	No	No	4.62	$1,155,000
80.1	Bike Lane	Add signs and markings for bicycle lanes	On FM 93	From FM 439 easterly to Belton western city limit	2 lane roadway with shoulders	No	Yes	4.86	$194,400
81.1	Shoulder Lane	Add signs and markings for shoulder lanes	On FM2115 and IH35 NB FR	From Williamson County line northerly to FM2268	2 lane roadway with shoulder	No	Yes	7.19	$287,600
81.3	Shoulder Lane	Include shoulder lane with future roadway improvement	On IH 35 NB FR	From Mill Creek Dr northerly to Belton south city limit	2 lane roadway	No	Yes	1.06	$0
82.3	Shoulder Lane	Include shoulder lane with future roadway improvement	On FM2268 and IH 35 SB FR	From Main St at Mill Creek Dr northerly to Belton southern city limit	2 lane roadway	No	Yes	1.07	$0
82.10	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 317	From northern city limit northerly to McLennan County Line	2 lane roadway with shoulders	No	Yes	6.45	$258,000
83.4	Shoulder Lane	Add shoulders, signs, and markings	On Thomas Arnold Rd, Williams St, and proposed extension of Williams St	From IH 35 SB FR westerly and northerly to FM 2484	2 lane roadway and future roadway	No	No	1.76	$440,000
83.6	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 1670	From FM 2484 northerly to southern Belton city limit at Sunflower Ln	2 lane roadway with shoulders	No	Yes	5.70	$228,000
83.9	Bike Lane	Include bike lane in future roadway	On Boxer Rd and proposed southern extension of FM2271	From Belton northern city limit near US 190 northerly to Sparta Rd	Future roadway	No	No	2.43	$0
83.16	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 2483	From Morgan's Point Rd easterly to Temple western city limit west of SH317	2 lane roadway	No	Yes	0.92	$36,800
84.1	Trail	Add 10ft wide multi-use trail	North of Stillhouse Hollow Lake and east of Vista Trl	From proposed trail along Stillhouse Lake northerly to Belton city limit at Dogridge Rd	Wooded area	No	No	0.60	$180,000

Table A-11: 2011 Reference Projects for Bell County (continued)

Bell County									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
84.3	Trail	Add 10ft wide multi-use trail	North of US190 and wet of Boxer Rd	From Belton city limit north of US190 WB FR easterly-northerly to proposed trail along Nolan Creek	Wooded area	No	No	2.74	$822,000
85.2	Trail	Add 10ft wide multi-use trail	South of FM93	From Belton northern city limit north of Digby Dr northerly to proposed trail north of Airdale Dr	Open land	No	No	0.83	$249,000
87.2	Trail	Add 10ft wide multi-use trail	Along Salado Creek	From Salado northern city limit at Chisholm Trail easterly to proposed trail along Lampasas River	Creekside land	No	No	8.19	$2,457,000
89.8	Shoulder Lane	Add signs and markings for shoulder lanes	On SH 53 and SH320	From eastern Temple city limit easterly to Falls County Line	2 lane roadway with shoulders	No	Yes	12.26	$490,400
90.2	Shoulder Lane	Add shoulders, signs, and markings	On Auction Barn Rd	From Belton city limit at Village Hill Rd easterly to Belton city limit west of Loop 121	2 lane roadway	No	No	1.05	$262,500
91.1	Trail	Add 10ft wide multi-use trail	Along Mitchell Branch Creek	From proposed trail along Lampasas River northerly to Loop 121	Creekside land	No	No	3.50	$1,050,000
114.1	Shoulder Lane	Add signs and markings for shoulder lanes	On SH95	From Williamson County line northerly to southern Temple city limit	2 lane roadway with shoulders	No	Yes	19.19	$767,600
116.2	Trail	Add 10ft wide multi-use trail	Along Bird Creek and Leon River	From proposed trail along Leon River N of Burton northerly to Shallow Ford Rd	Creekside and riverside land	Yes	No	1.15	$345,000
117.1	Side Path	Add 8ft wide multi-use side path	Along proposed southern extension of Witter Ln	From proposed trail along Mitchell Branch Creek northerly to proposed trail along Leon River	Future roadway	No	No	1.07	$214,000
117.2	Shoulder Lane	Include shoulder lane with future roadway improvement	On proposed southern extension and existing Witter Ln	From proposed trail along Leon River northerly to Temple south city limit	Future and 2 lane roadway	No	No	1.57	$0
117.5	Trail	Add 10ft wide multi-use trail	Along Bird Creek	From proposed trail north of Burton Ln northerly to proposed Hickory Rd extension	Creekside land	Yes	No	1.36	$408,000
118.2	Trail	Add 10ft wide multi-use trail	Along Leon River	From Taylors Valley Rd easterly to proposed trail west of Shallow Ford Rd	Riverside land	Yes	No	0.60	$180,000
120.2	Trail	Add 10ft wide multi-use trail	Along Pepper Creek	From Temple city limit at Charter Oak Dr northerly to proposed trail west of Kegley Rd	Creekside land	Yes	No	1.68	$504,000

Table A-11: 2011 Reference Projects for Bell County (continued)

Bell County									
ID	**Type**	**Action**	**Location**	**Limits**	**Existing Condition**	**In Local Plan**	**State Highway**	**Length (mi.)**	**Cost ($)**
121.1	Bike Lane	Include bike lane with future roadway improvement	On Pea Ridge Rd and Old Waco Rd	From Charter Oak Dr northerly to Riverside Trail at Old Waco Rd	2 lane roadway	Yes	No	1.17	$0
122.1	Shoulder Lane	Include shoulder lane with future roadway improvement	On Hartrick Bluff Rd and proposed southern extension of 5th St	From FM436 northerly to FM93	2 lane roadway and future roadway	No	No	3.19	$0
123.2	Shoulder Lane	Add shoulders, signs, and markings	On Old TX-95	From northerly Little River City Limit northerly to southern Temple city limit	2 lane roadway	No	No	3.65	$912,500
124.1	Trail	Add 10ft wide multi-use trail	Along Creek	From proposed trail along Leon River northerly to FM 93	Creekside land	Yes	No	2.42	$726,000
128.3	Shoulder Lane	Include shoulder lane with future roadway improvement	On proposed road connecting Old Waco Rd and Taylors Valley Rd	From Temple city limit west of Charter Oak Dr northerly to Old Waco Rd	Future roadway	Yes	No	0.44	$0
145.5	Shoulder Lane	Add signs and markings for shoulder lanes	On SH36	From northern Temple city limits at Clear Ridge Park Dr northerly to Coryell County line	2 lane roadway with shoulders	No	Yes	7.57	$302,800
150.1	Trail	Add 10ft wide multi-use trail	Along creek, north of Tower Road	From Bob White Rd westerly to eastern Temple city limit	Creekside land	Yes	No	0.60	$180,000
TOTAL								237.49	$37.35m

Table A-12: 2011 Reference Projects for Coryell County

Coryell County									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
2.5	Shoulder Lane	Include shoulder lane with future roadway improvement	On future Grimes Crossing Rd northern extension	From northern Copperas Cove city limit northerly to proposed road east of Lawson Ln	Future roadway	No	No	1.43	$0
3.1	Side Path	Add 8ft wide multi-use side path	Along FM 1113	From proposed minor arterial easterly to Copperas Cove west limit	2 lane roadway	No	Yes	2.02	$404,000
7.8	Shoulder Lane	Include shoulder lane in future roadway	On future southern bypass	From FM116 easterly to US190	Future roadway	No	Yes	3.70	$0
9.1	Shoulder Lane	Add shoulders, signs, and markings	On FM 580	From FM 1113 easterly to FM 116	2 lane roadway	No	Yes	5.88	$1,470,000
9.2	Shoulder Lane	Add shoulders, signs, and markings	On FM1113	From FM580 southerly to CR3295	2 lane roadway	No	Yes	3.27	$817,500
9.9	Shoulder Lane	Include shoulder lane with future roadway improvement	On proposed FM 2808 future eastern extension	From Lampasas County line easterly and northerly to Copperas Cove city limit near Abbott Ln	Future roadway	No	No	2.14	$0
10.1	Shoulder Lane	Add shoulders, signs, and markings	On FM 1113 and future roadway	From proposed major arterial at CR3295 easterly to Copperas Cove city limit east of Woodland Dr	Narrow 2 lane roadway, future roadway	No	Yes	3.65	$912,500
11.10	Shoulder Lane	Add signs and markings for shoulder lanes	On FM 116	From Copperas Cove northern city limit northerly to FM 580	2 lane roadway with shoulders	No	Yes	7.26	$290,400
12.3	Shoulder Lane	Add shoulders, signs, and markings	On FM 116	From Bell County Line northerly to Copperas Cove eastern city limit	2 lane roadway	No	Yes	1.16	$290,000
15.6	Trail	Add 10ft wide multi-use trail	Along Clark Creek	From Copperas Cove southern city limits southerly to Bell County Line	Creekside land	No	No	1.41	$423,000
17.2	Bike Lane	Include bike lane with future roadway improvement	On FM 3046	From Lampasas County line northerly to Copperas Cove southern city limit	2 lane roadway	No	Yes	0.33	$0
18.2	Trail	Add 10ft wide multi-use trail	Along Clark Creek	From FM 3046 easterly to proposed trail along Clear Creek	Creekside land	No	No	0.44	$132,000
19.3	Trail	Add 10ft wide multi-use trail	Southwest of Northern Dancer Dr	From Copperas Cove eastern city limit northerly to city limit south of Northern Dancer Dr	Wooded area	No	No	0.38	$114,000
TOTAL								33. 07	$4.85m

Table A-13: 2011 Reference Projects for Lampasas County

Lampasas County									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
1.1	Trail	Add 10ft wide multi-use trail	Along west side of Taylor Creek	From US190 northerly to Copperas Cove City limit	Land between Taylor Creek and Railroad	No	No	3.02	$906,000
2.1	Shoulder Lane	Include shoulder lane with future roadway improvement	On proposed Big Divide Rd southern extension	From FM 2808 northerly to Copperas Cove southern city limit	Future roadway	No	No	1.44	$0
7.1	Shoulder Lane	Add signs and markings for shoulder lanes	On US 190	From CR4450 (western MPO boundary) easterly to western Kempner city limit	5 lanes with shoulders	No	Yes	2.55	$102,000
7.4	Shoulder Lane	Add signs and markings for shoulder lanes	On US 190	From Kempner east city limit easterly to Copperas Cove western city limit	5 lanes with shoulders	No	Yes	0.91	$36,400
8.1	Shoulder Lane	Add shoulders, signs, and markings	On FM3170	From Burnet County Line northerly to US190	2 lane roadway	No	Yes	3.59	$897,500
9.3	Shoulder Lane	Include shoulder lane with future roadway improvement	On Proposed Major Arterial	From FM1113 southerly to US 190	Future roadway	No	No	7.22	$0
9.5	Shoulder Lane	Add shoulders, signs, and markings	On FM 2808	From Kempner city limit at Cherokee easterly to Kempner city limit near Eagle Ln	2 lane roadway	No	Yes	1.88	$470,000
9.6	Shoulder Lane	Add shoulders, signs, and markings	On FM 2808	From city limit near Eagle Ln to city limit near CR4818	2 lane roadway	No	Yes	0.39	$97,500
9.7	Shoulder Lane	Add shoulders, signs, and markings	On FM 2808	From Kempner city limit near CR4818 to FM 2657	2 lane roadway	No	Yes	1.60	$400,000
9.8	Shoulder Lane	Include shoulder lane with future roadway improvement	On proposed FM 2808 future eastern extension	From FM 2657 easterly to Coryell County Line	Future roadway	No	No	0.71	$0
11.1	Shoulder Lane	Add shoulders, signs, and markings	On FM 2657	From Burnet County Line northerly to FM2808	2 lane roadway	No	Yes	2.74	$685,000
11.2	Shoulder Lane	Add shoulders, signs, and markings	On FM 2657	From FM 2808 northerly to Copperas Cove southern city limit	2 lane roadway	No	Yes	1.07	$267,500
14.1	Shoulder Lane	Add shoulders, signs, and markings	On CR 4931	From FM 2657 easterly to Bell County Line	2 lane roadway	No	No	0.48	$120,000
15.1	Shoulder Lane	Include shoulder lane in future roadway	On CR 3300 and Future roadway	From proposed road near CR 3300 easterly and southerly to proposed road near CR 3340	Narrow 2 lane roadway and future roadway	No	No	1.38	$0

Table A-13: 2011 Reference Projects for Lampasas County (continued)

Lampasas County									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
16.1	Bike Lane	Include bike lane in future roadway	On future Pony Express southern extension	From FM2657 westerly and northerly to Copperas Cove southern city limit	Future roadway	No	No	1.46	$0
16.3	Bike Lane	Include bike lane with future roadway improvement	On future Pony Express southern extension	From Copperas Cove city limit north of US190 northerly to south of Buckboard Trail	Future roadway	No	No	0.51	$0
17.1	Bike Lane	Include bike lane with future roadway improvement	On FM 3046	From FM2657 easterly to Coryell County Line	2 lane roadway	No	Yes	0.61	$0
TOTAL								31. 56	$3.98m

Table A-14: 2011 Reference Projects for the US Army Corps of Engineers

U.S. Army Corps of Engineers									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
56.1	Trail	Add 10ft wide multi-use trail	Along north shore of Stillhouse Hollow Lake	From Comanche Gap Rd westerly to FM3481 (with several spurs and loops)	Through wooded area around lake	No	No	8.82	$2,646,000
58.18	Trail	Add 10ft wide multi-use trail	Along north of Stillhouse Lake	From existing trail east of Chalk Ridge Falls westerly to existing trail near Elf Trail	Wooded area	No	No	7.54	$2,262,000
TOTAL								16.36	$4.91m

Table A-15: 2011 Reference Projects for Fort Hood

Fort Hood									
ID	**Type**	**Action**	**Location**	**Limits**	**Existing Condition**	**In Local Plan**	**State Highway**	**Length (mi.)**	**Cost ($)**
7.10	Trail	Add 10ft wide multi-use trail	Along US 190 EB FR	From Central Texas College at Bell Tower Dr easterly to proposed trail on south side of US190	2 lane one-way road	No	Yes	1.78	$534,000
9.11	Shoulder Lane	Add shoulders, signs, and markings	On Old Copperas Cove Rd	From Constitution Dr easterly to Coryell-Bell County Line	2 lane roadway with unpaved shoulders	No	No	1.94	$485,000
9.12	Shoulder Lane	Add shoulders, signs, and markings	On Old Copperas Cove Rd	From Coryell-Bell County Line easterly to Killeen west city limit	2 lane roadway	No	No	1.78	$445,000
10.4	Shoulder Lane	Include shoulder lane in future roadway	On proposed northern bypass	From FM116 easterly to US190	Future roadway	No	Yes	3.15	$0
21.2	Shoulder Lane	Include shoulder lane with future roadway improvement	On Tank Destroyer Blvd	From Old Georgetown Rd easterly to Clarke Rd	2 lane roadway	No	No	3.14	$0
21.3	Trail	Add 10ft wide multi-use trail	Along US190 WB FR and open land	From Tank Destroyer Blvd easterly to proposed trail near Coleman Rd	Open land and 2 lane one-way roadway	No	Yes	6.60	$1,980,000
21.4	Trail	Add 10ft wide multi-use trail	Along west side of Fort Hood St around New Patton Park and New Wainwright Housing Division	From existing trail near Coleman Rd easterly and northerly to existing trail along Central Dr	Through open land along back side of housing divisions	No	No	1.72	$516,000
22.1	Trail	Add 10ft wide multi-use trail	Along Clarke Rd	From US 190 EB FR southerly to existing trail at south end of Red Oak	2 lane roadway	No	No	0.71	$213,000

Table A-15: 2011 Reference Projects for Fort Hood (continued)

Fort Hood									
ID	Type	Action	Location	Limits	Existing Condition	In Local Plan	State Highway	Length (mi.)	Cost ($)
22.2	Trail	Add 10ft wide multi-use trail	Along Clement Rd, Live Oak, and south of Montague Village Elementary School	From Clarke Rd easterly to existing trail south of Main Ct	2 lane roadways and Open land	No	No	1.00	$300,000
22.4	Trail	Add 10ft wide multi-use trail	East of Rusk Circle and west of creek	From existing trail north of Fuentes Ct northerly to US 190 EB FR	Open land	No	No	0.62	$186,000
23.1	Trail	Add 10ft wide multi-use trail	Southwest of Central Texas College	From proposed trail along US 190 EB FR easterly to existing trails in Central Texas College	Open land	No	No	0.84	$252,000
23.3	Trail	Add 10ft wide multi-use trail	Along north side of University Dr	From existing trails in Central Texas College easterly to Clear Creek Rd	Open land	No	No	0.50	$150,000
25.2	Side Path	Add 8ft wide multi-use side path	Along SH201/Clear Creek Rd	From Watercrest Rd northerly to US 190 EB FR	5 lane roadway	No	Yes	0.28	$56,000
32.2	Bike Lane	Add signs and markings for bicycle lanes	On 10th St and Warrior Way	From Killeen city limit at gate northwesterly to Martin Dr	2 lane roadway	Yes	No	0.81	$32,400
31.6	Bike Lane	Add signs and markings for bicycle lanes	On Roberts Rd	From Watercrest Rd northerly to proposed trail along US 190 EB FR	2 lane roadway	No	No	0.73	$29,200
34.7	Trail	Add 10ft wide multi-use trail	South of Venable Village Elementary	From US190 WB FR northerly to existing trail near Venable Village Elementary	Open land	No	No	0.44	$132,000
48.11	Bike Route	Add bike route signs	On Hoover Hill Rd	From existing trail along Hoover Hill St northerly to Fort Hood St	2 lane roadway	No	No	0.52	$5,000
49.1	Bike Lane	Add signs and restripe for bicycle lanes	On Fort Hood St, Central Dr, and 16th St	From Tank Destroyer Rd northerly to Hell on Wheels Ave	2-4 lane roadway	No	No	1.06	$53,000
73.3	Trail	Add 10ft wide multi-use trail	Along Quarry Rd	From Fort Hood boundary northerly to Nolan Rd	Gravel roadway	No	No	2.85	$855,000
73.4	Shoulder Lane	Add shoulders, signs, and markings	On Nolan Rd	From Quarry Rd easterly to Fort Hood boundary	2 lane roadway	No	No	4.92	$1,230,000
TOTAL								34. 58	$7.45m

KTMP
KILLEEN-TEMPLE
metropolitan planning organization

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

Appendix F:

Regional Public Transit

MOBILITY 2045

Killeen-Temple Metropolitan Planning Organization

Appendix F: Transit

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

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Appendix F-1: RCTP Executive Summary

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REGIONALLY COORDINATED TRANSIT PLAN

The Regionally Coordinated Transportation Plan (RCTP) is a planning document intended to promote the most efficient use of regional transportation resources. Transit agencies receiving federal dollars are required to develop this plan and update it every 5 years. The update to the 2006 plan was started during 2011 and was completed in March, 2013.

EXECUTIVE SUMMARY (extract from the RCTP 2017 update)

The 2017 Regionally Coordinated Transportation Plan (RCTP) is an update to the 2013 Regional Transit Coordination Plan but incorporates new guidelines established by Texas Department of Transportation (TxDOT). As such, the format and components of the 2017 Plan are markedly different from the 2013 Plan. However, the Goals remain the same in both Plans as they were mandated by the Texas Transportation Code, Title 6, Subtitle K, Chapter 461. Although the Goals remain the same, the objectives may vary somewhat to address current issues and concerns.

As part of the Plan update, information was compiled identifying transportation resources in the nine-county region. Geographic and demographic information was gathered as was a listing of health and human services agencies and workforce agencies in the region. A needs assessment survey was required to assess transportation needs; however, due to time constraints, the survey was of a limited nature and was administered to a group of selected stakeholders.

Information was also compiled on various transportation programs, both government funded as well as privately funded, and various transportation planning processes and activities occurring in the region. Integrating these programs, processes and activities into the updated plan is a key component of conducting regionally coordinated transportation planning and promotes the most efficient use of available resources.

The Central Texas Regional Transportation Advisory Group (CTRTAG) members functioned as the Steering Committee for this project, approving deliverables and providing direction to the Killeen-Temple Metropolitan Planning Organization (KTMPO) staff housed within the Central Texas Council of Governments (CTCOG), the lead agency for the plan update. The Steering Committee's role and structure were evaluated to ensure continuation of regionally coordinated transportation planning activities in the future to include plan implementation and future updates. The CTRTAG established a vision statement, mission statement, goals, objectives and performance measures to promote a successful and meaningful plan. This plan will be regularly updated to sustain regionally coordinated transportation planning activities in the region.

Appendix F-2: HOP Cost Estimates

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COST PROJECTIONS

Year	Cost Projection	Year	Cost Projection
2014	10,810,100	2028	14,263,697
2015	11,026,302	2029	14,548,971
2016	11,246,828	2030	14,839,951
2017	11,471,765	2031	15,136,750
2018	11,701,200	2032	15,439,485
2019	11,935,224	2033	15,748,274
2020	12,173,928	2034	16,063,240
2021	12,417,407	2035	16,384,505
2022	12,665,755	2036	16,712,195
2023	12,919,070	2037	17,046,439
2024	13,177,452	2038	17,387,368
2025	13,441,001	2039	17,735,115
2026	13,709,821	2040	18,089,815
2027	13,984,017		
		Total:	**382,075,675**

SPECIAL PROJECTS

- In addition, HCTD special capital projects will include:
- Intelligent Transportations Systems (ITS)projects including:
    - ◊ Vehicle Monitoring Systems (surveillance cameras)
    - ◊ Transfer Center Kiosks
    - ◊ Upgraded Vehicle-to-Dispatch Communications System
    - ◊ Transfer Center Security Systems
    - ◊ Electronic Fare Payment Smart Cards
- Regional Multi-Modal Transportation Facility, including:
    - ◊ Transfer Terminal (urban-to-urban, rural-to-urban) - could also be used by intercity bus carriers and taxi cabs
    - ◊ Facility could be developed into a transit plaza, with day care center, ATM machines, coffee shop, and deli, etc.)

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Appendix F-3: HOP Route Maps and Timetables

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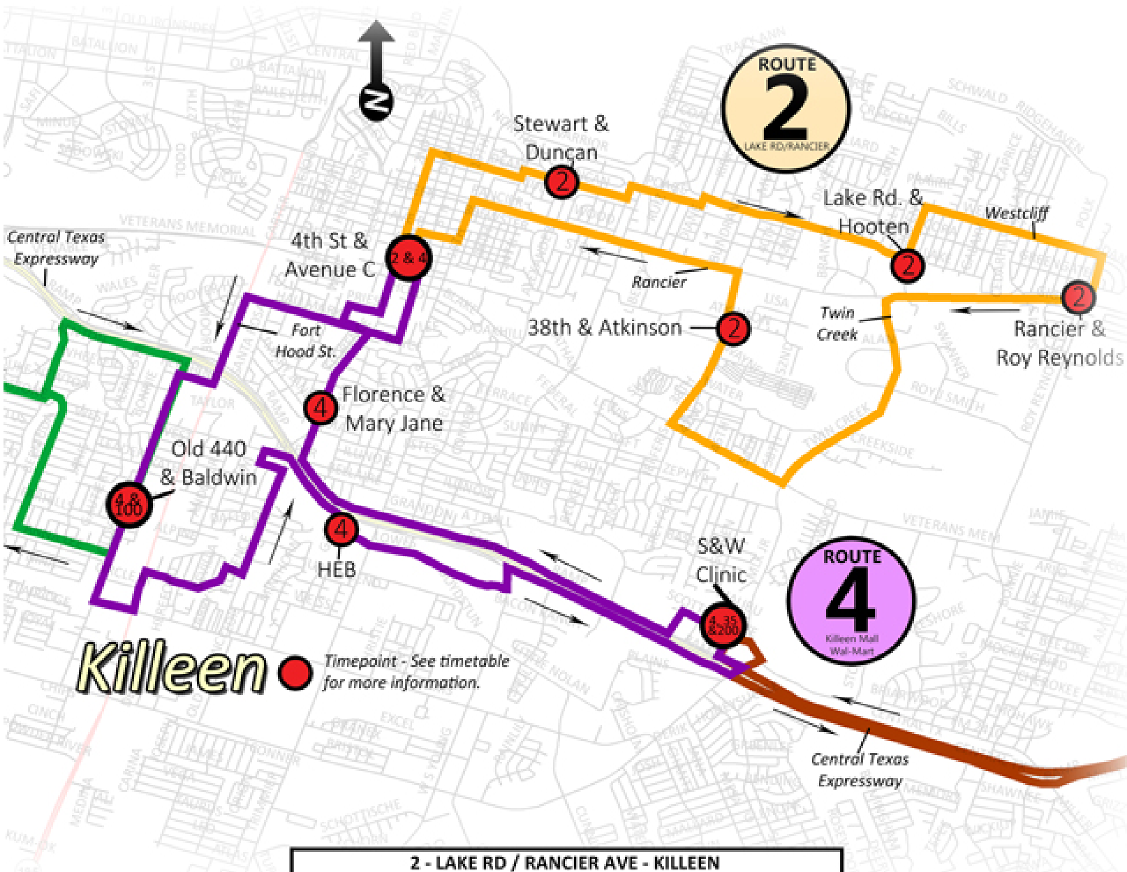
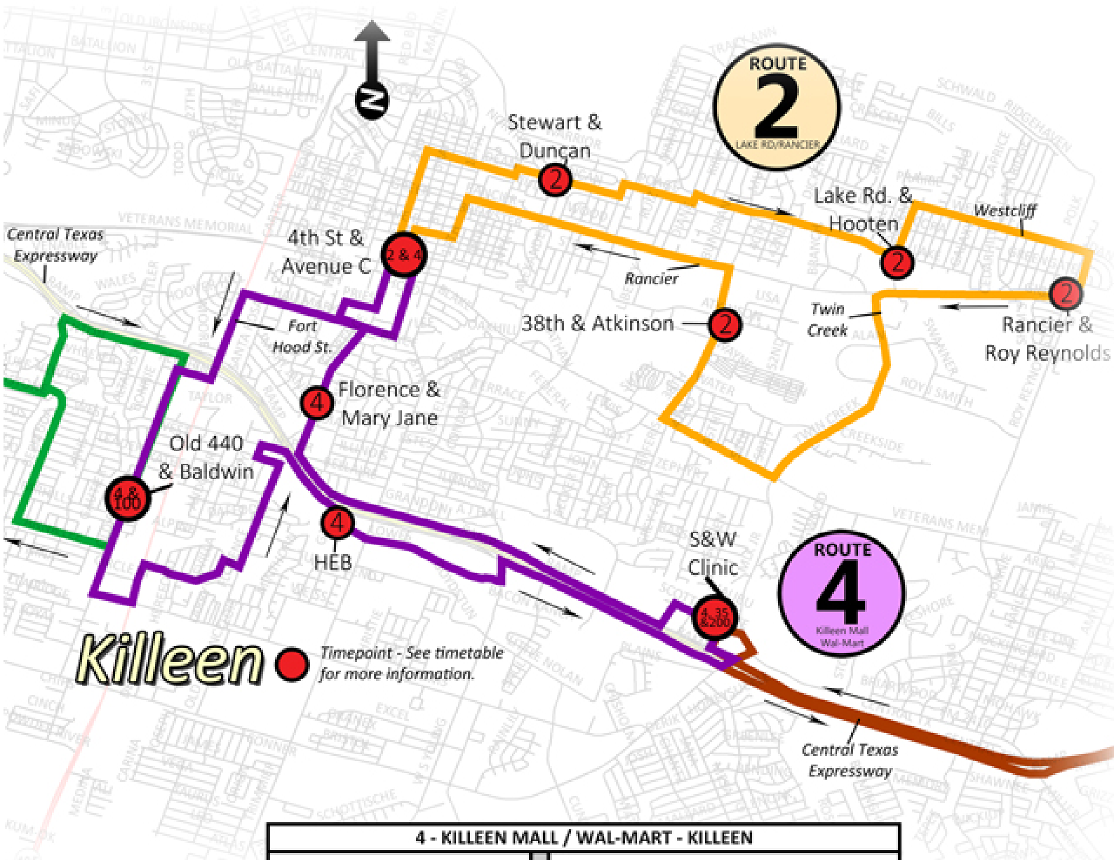
ROUTE MAPS AND TIMETABLES



2 - LAKE RD / RANCIER AVE - KILLEEN					
INBOUND			OUTBOUND		
ROY REYNOLDS & RANCIER	38TH & ATKINSON AVE	4TH & AVENUE C (TRANSFER RT 4)	4TH & AVENUE C (TRANSFER RT 4)	HOOTEN ST & LAKE RD	ROY REYNOLDS & RANCIER
5:25	**5:35**	**6:00**	**6:00**	**6:15**	**6:25**
6:25	6:35	7:00	7:00	7:15	7:25
7:25	**7:35**	**8:00**	**8:00**	**8:15**	**8:25**
8:25	8:35	9:00	9:00	9:15	9:25
9:25	**9:35**	**10:00**	**10:00**	**10:15**	**10:25**
10:25	10:35	11:00	11:00	11:15	11:25
11:25	**11:35**	**12:00**	**12:00**	**12:15**	**12:25**
12:25	12:35	1:00	1:00	1:15	1:25
1:25	**1:35**	**2:00**	**2:00**	**2:15**	**2:25**
2:25	2:35	3:00	3:00	3:15	3:25
3:25	**3:35**	**4:00**	**4:00**	**4:15**	**4:25**
4:25	4:35	5:00	5:00	5:15	5:25
5:25	**5:35**	**6:00**	**6:00**	**6:15**	**6:25**

ROUTE MAPS AND TIMETABLES



4 - KILLEEN MALL / WAL-MART - KILLEEN						
INBOUND			OUTBOUND			
S & W KILLEEN CLINIC	FLORENCE RD & MARY JANE DR	4TH & AVENUE C (TRANSFER RT 2)	4TH & AVENUE C (TRANSFER RT 2)	OLD FM 440 & BALDWIN LP	LOWES BLVD @ HEB	S & W KILLEEN CLINIC
5:35	**5:45**	**6:00**	**6:00**	**6:15**	**6:25**	**6:35**
6:35	6:45	7:00	7:00	7:15	7:25	7:35
7:35	**7:45**	**8:00**	**8:00**	**8:15**	**8:25**	**8:35**
8:35	8:45	9:00	9:00	9:15	9:25	9:35
9:35	**9:45**	**10:00**	**10:00**	**10:15**	**10:25**	**10:35**
10:35	10:45	11:00	11:00	11:15	11:25	11:35
11:35	**11:45**	**12:00**	**12:00**	**12:15**	**12:25**	**12:35**
12:35	12:45	1:00	1:00	1:15	1:25	1:35
1:35	**1:45**	**2:00**	**2:00**	**2:15**	**2:25**	**2:35**
2:35	2:45	3:00	3:00	3:15	3:25	3:35
3:35	**3:45**	**4:00**	**4:00**	**4:15**	**4:25**	**4:35**
4:35	4:45	5:00	5:00	5:15	5:25	5:35
5:35	**5:45**	**6:00**	**6:00**	**6:15**	**6:25**	**6:35**

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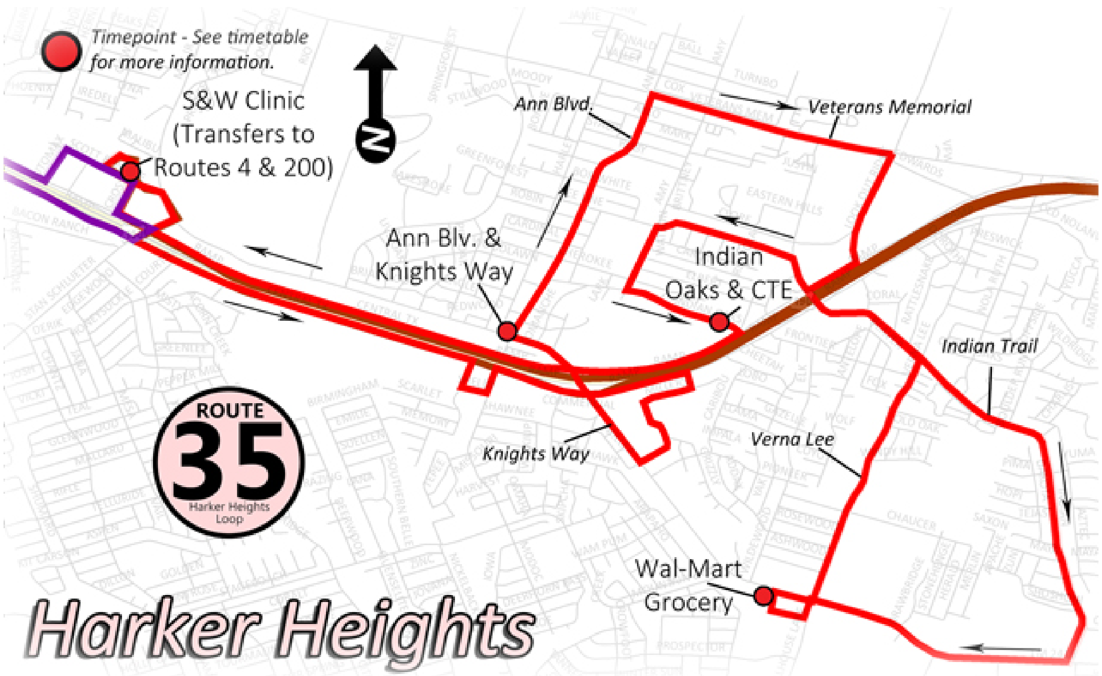
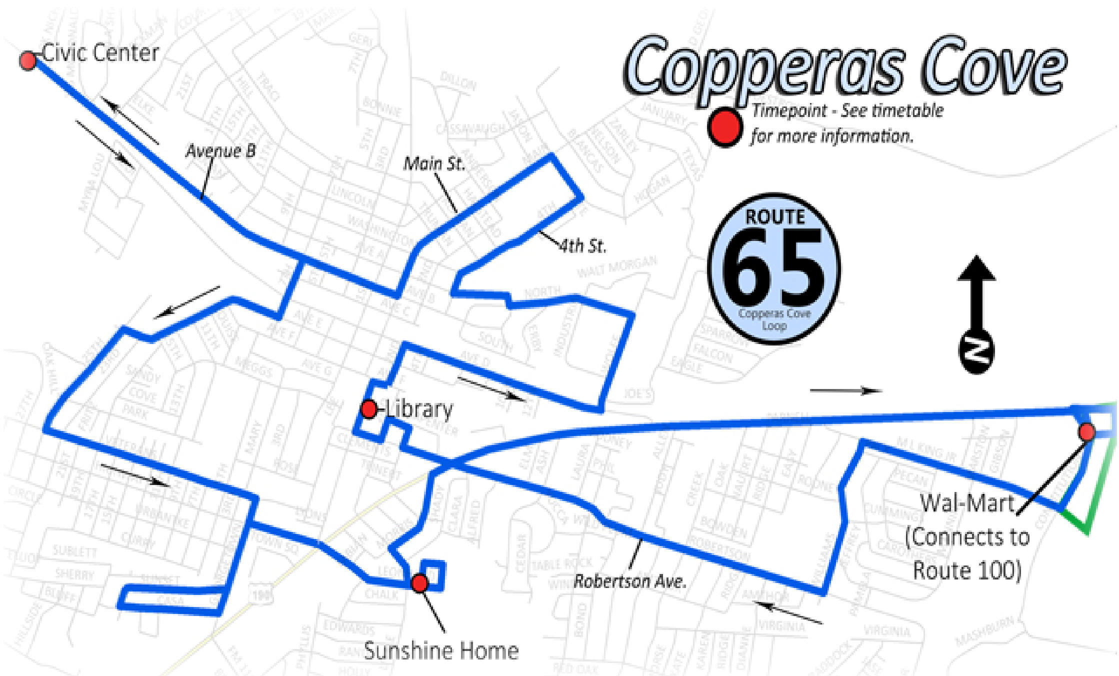
ROUTE MAPS AND TIMETABLES



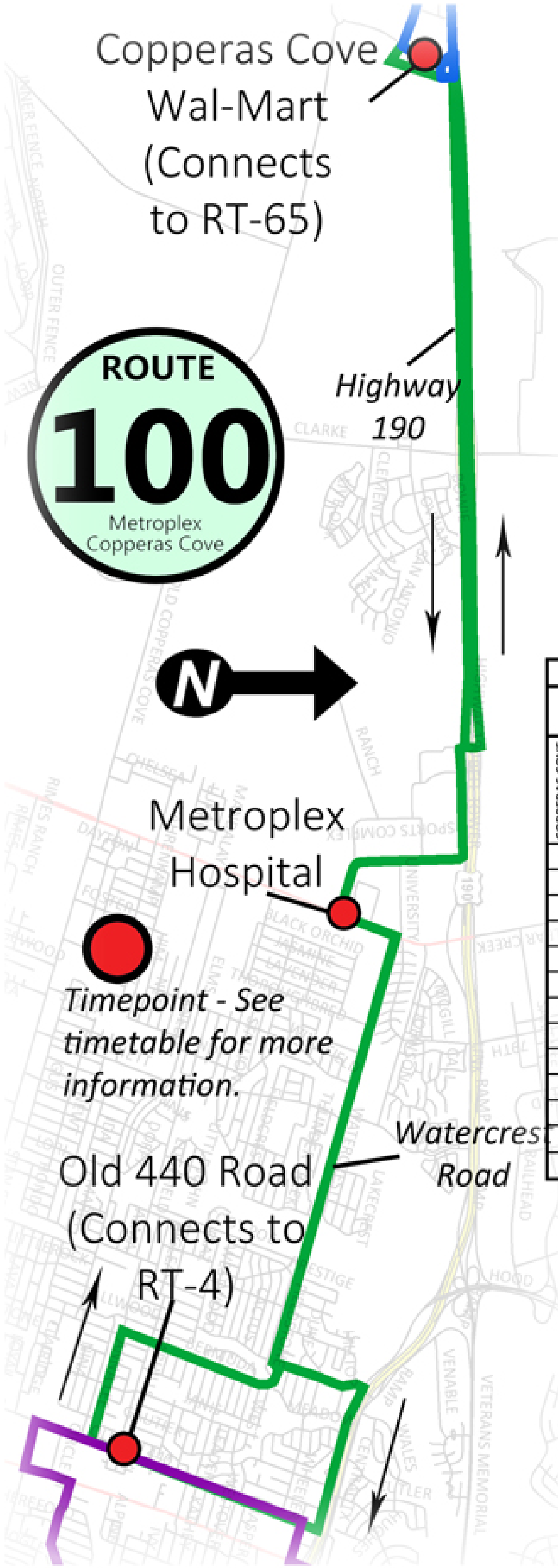
35 - HARKER HEIGHTS LOOP					
INBOUND			OUTBOUND		
WALMART NBHD MARET	INDIAN OAKS DR & CTE	S & W KILLEEN CLINIC (TRANSFER RT 4 & 200)	S & W KILLEEN CLINIC (TRANSFER RT 4 & 200)	ANN BLVD & KNIGHTS WAY	WALMART NBHD MARET
6:05	**6:20**	**6:35**	**6:35**	**6:50**	**7:05**
7:05	7:20	7:35	7:35	7:50	8:05
8:05	**8:20**	**8:35**	**8:35**	**8:50**	**9:05**
9:05	9:20	9:35	9:35	9:50	10:05
10:05	**10:20**	**10:35**	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	1:35	1:50	2:05
2:05	**2:20**	**2:35**	**2:35**	**2:50**	**3:05**
3:05	3:20	3:35	3:35	3:50	4:05
4:05	**4:20**	**4:35**	**4:35**	**4:50**	**5:05**
5:05	5:20	5:35	5:35	5:50	6:05

ROUTE MAPS AND TIMETABLES



65 - COPPERAS COVE LOOP					
INBOUND			OUTBOUND		
CIVIC CENTER	SUNSHINE HOME	WAL-MART (TRANSFER RT 100)	WAL-MART (TRANSFER RT 100)	LIBRARY	CIVIC CENTER
-	-	-	**6:45**	**6:58**	**7:15**
7:15	7:30	7:45	7:45	7:58	8:15
8:15	**8:30**	**8:45**	**8:45**	**8:58**	**9:15**
9:15	9:30	9:45	9:45	9:58	10:15
10:15	**10:30**	**10:45**	**10:45**	**10:58**	**11:15**
11:15	11:30	11:45	11:45	11:58	12:15
12:15	**12:30**	**12:45**	**12:45**	**12:58**	**1:15**
1:15	1:30	1:45	1:45	1:58	2:15
2:15	**2:30**	**2:45**	**2:45**	**2:58**	**3:15**
3:15	3:30	3:45	3:45	3:58	4:15
4:15	**4:30**	**4:45**	**4:45**	**4:58**	**5:15**
5:15	5:30	5:45	-	-	-

ROUTE MAPS AND TIMETABLES



100 - METROPLEX / COPPERAS COVE					
INBOUND			OUTBOUND		
COPPERAS COVE WAL-MART (TRANSFER RT 65)	METROPLEX HOSPITAL	OLD FM 440 & BALDWIN LP	OLD FM 440 & BALDWIN LP	METROPLEX HOSPITAL	COPPERAS COVE WAL-MART (TRANSFER RT 65)
-	-	-	**6:15**	**6:30**	**6:45**
6:45	7:00	7:15	7:15	7:30	7:45
7:45	**8:00**	**8:15**	**8:15**	**8:30**	**8:45**
8:45	9:00	9:15	9:15	9:30	9:45
9:45	**10:00**	**10:15**	**10:15**	**10:30**	**10:45**
10:45	11:00	11:15	11:15	11:30	11:45
11:45	**12:00**	**12:15**	**12:15**	**12:30**	**12:45**
12:45	1:00	1:15	1:15	1:30	1:45
1:45	**2:00**	**2:15**	**2:15**	**2:30**	**2:45**
2:45	3:00	3:15	3:15	3:30	3:45
3:45	**4:00**	**4:15**	**4:15**	**4:30**	**4:45**
4:45	5:00	5:15	5:15	5:30	5:45
5:45	**6:00**	**6:15**	-	-	-

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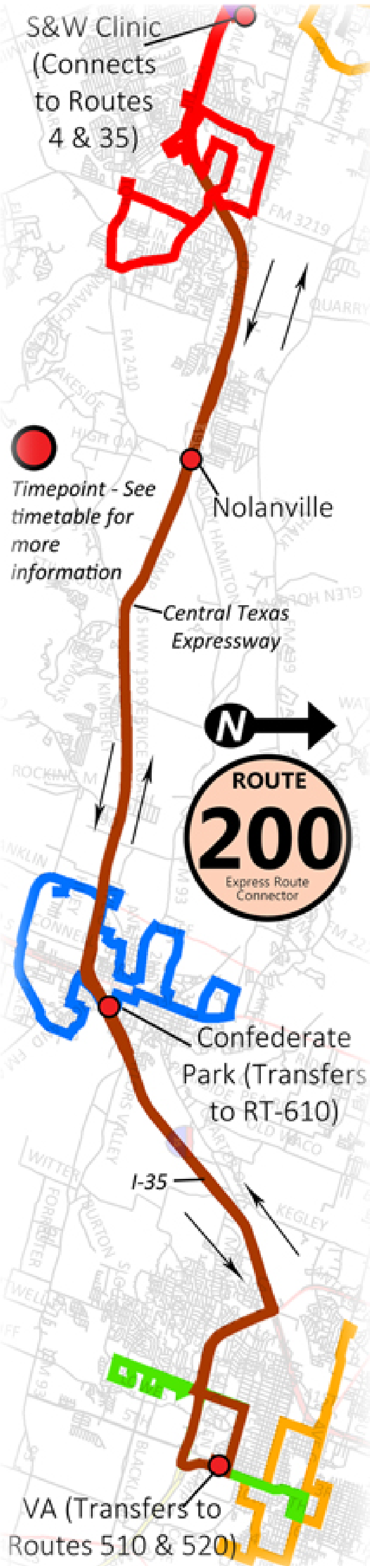
ROUTE MAPS AND TIMETABLES



Route 200

200 - CONNECTOR							
INBOUND				OUTBOUND			
AVENUE U (TRANSFER RT 510)	BELTON - CONFEDERATE PARK (TRANSFER RT 610)	NOLANVILLE	S & W KILLEEN CLINIC (TRANSFER RT 4 & 35)	S & W KILLEEN CLINIC (TRANSFER RT 4 & 35)	NOLANVILLE	BELTON - CONFEDERATE PARK (TRANSFER RT 610)	AVENUE U (TRANSFER RT 510)
-	-	6:20	6:35	6:35	6:45	7:10	7:40
-	-	-	-	-	-	-	-
7:40	8:10	8:20	8:35	8:35	8:45	9:10	9:40
-	-	-	-	-	-	-	-
9:40	10:10	10:20	10:35	10:35	10:45	11:10	11:40
-	-	-	-	-	-	-	-
11:40	12:10	12:20	12:35	12:35	12:45	1:10	1:40
-	-	-	-	-	-	-	-
1:40	2:10	2:20	2:35	2:35	2:45	3:10	3:40
-	-	-	-	-	-	-	-
3:40	4:10	4:20	4:35	4:35	4:45	5:10	5:40
-	-	-	-	-	-	-	-
5:40	6:10	6:20	6:35	-	-	-	-

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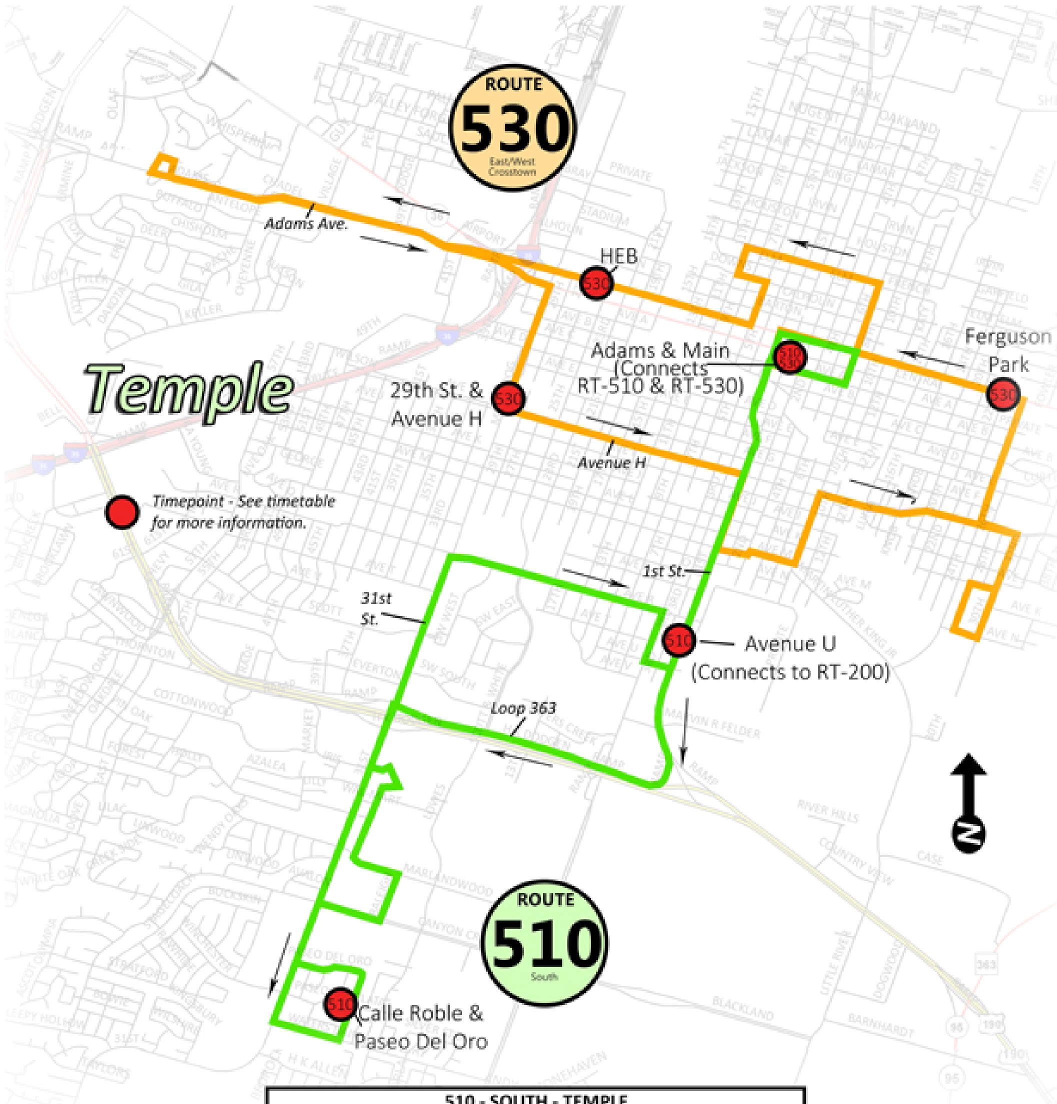
ROUTE MAPS AND TIMETABLES



510 - SOUTH - TEMPLE					
INBOUND			OUTBOUND		
CALLE ROBLE @ PASEO DEL ORO	AVENUE U (TRANSFER RT 510)	ADAMS & MAIN (TRANSFER RT 530)	ADAMS & MAIN (TRANSFER RT 530)	AVENUE U (TRANSFER RT 200)	CALLE ROBLE @ PASEO DEL ORO
-	-	-	6:30	6:40	6:55
6:55	7:15	7:30	7:30	7:40	7:55
7:55	8:15	8:30	8:30	8:40	8:55
8:55	9:15	9:30	9:30	9:40	9:55
9:55	10:15	10:30	10:30	10:40	10:55
10:55	11:15	11:30	11:30	11:40	11:55
11:55	12:15	12:30	12:30	12:40	12:55
12:55	1:15	1:30	1:30	1:40	1:55
1:55	2:15	2:30	2:30	2:40	2:55
2:55	3:15	3:30	3:30	3:40	3:55
3:55	4:15	4:30	4:30	4:40	4:55
4:55	5:15	5:30	5:30	5:40	5:55
5:55	6:15	-	-	-	-

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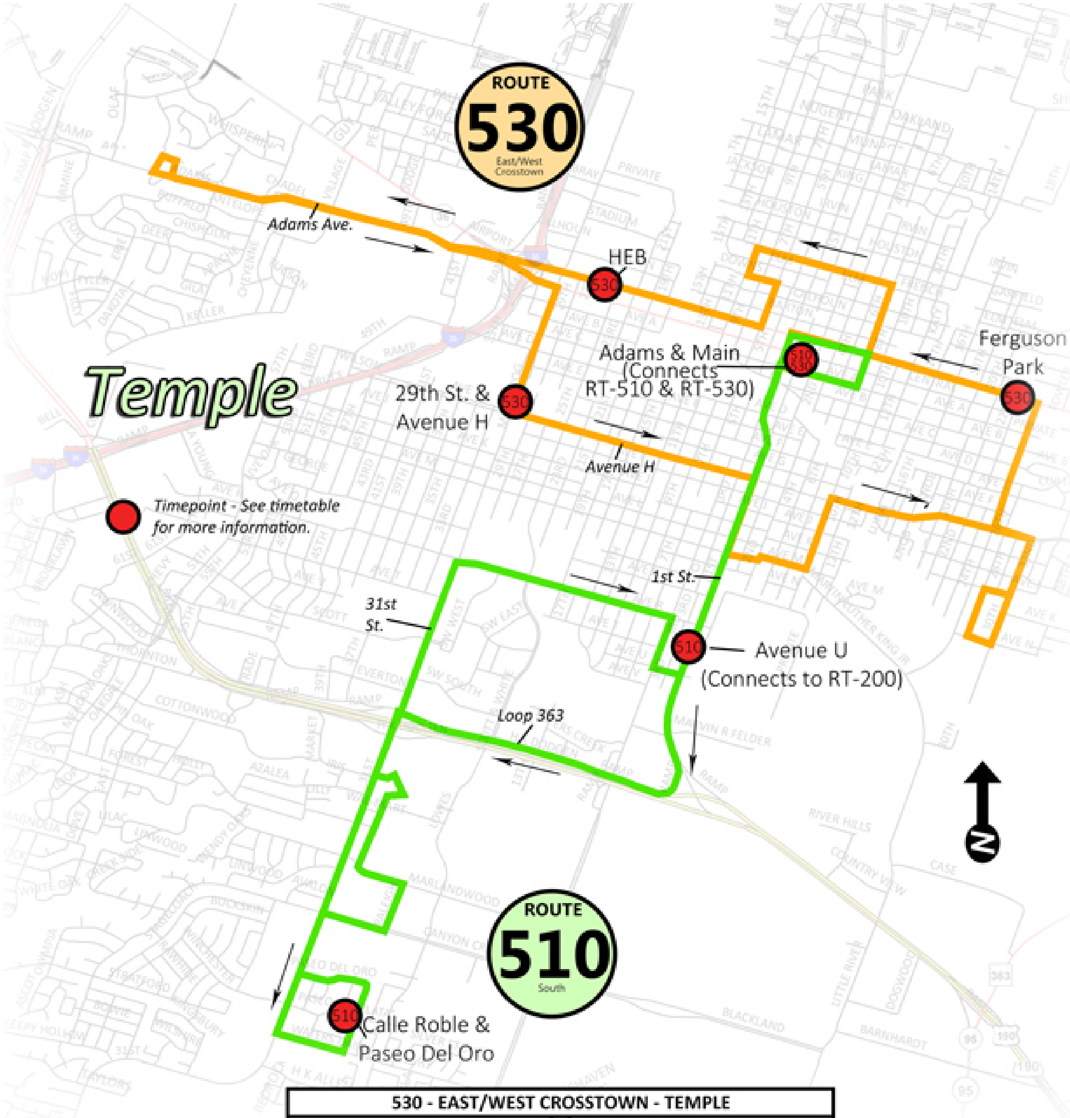
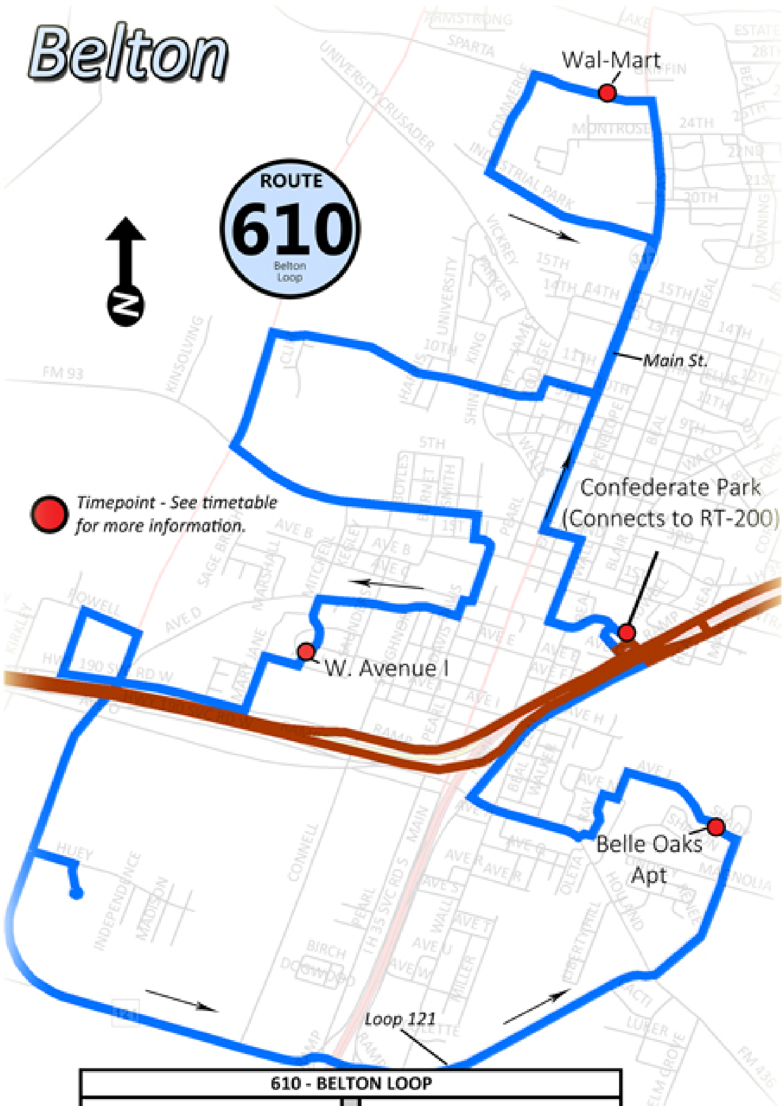
ROUTE MAPS AND TIMETABLES



530 - EAST/WEST CROSSTOWN - TEMPLE					
INBOUND			OUTBOUND		
AVENUE H & 29TH	FERGUSON PARK	ADAMS & MAIN (TRANSFER RT 530)	ADAMS & MAIN (TRANSFER RT 530)	HEB - ADAMS AVE	AVENUE H & 29TH
5:55	6:15	6:30	6:30	6:40	6:55
6:55	7:15	7:30	7:30	7:40	7:55
7:55	8:15	8:30	8:30	8:40	8:55
8:55	9:15	9:30	9:30	9:40	9:55
9:55	10:15	10:30	10:30	10:40	10:55
10:55	11:15	11:30	11:30	11:40	11:55
11:55	12:15	12:30	12:30	12:40	12:55
12:55	1:15	1:30	1:30	1:40	1:55
1:55	2:15	2:30	2:30	2:40	2:55
2:55	3:15	3:30	3:30	3:40	3:55
3:55	4:15	4:30	4:30	4:40	4:55
4:55	5:15	5:30	5:30	5:40	5:55
5:55	6:15	6:30	-	-	-

ROUTE MAPS AND TIMETABLES



610 - BELTON LOOP					
INBOUND			OUTBOUND		
W AVENUE I	BELLE OAKS APT	CONFEDERATE PARK (TRANSFER RT 200)	CONFEDERATE PARK (TRANSFER RT 200)	WAL-MART	W AVENUE I
-	-	-	6:10	6:20	6:35
6:35	6:53	7:10	7:10	7:20	7:35
7:35	7:53	8:10	8:10	8:20	8:35
8:35	8:53	9:10	9:10	9:20	9:35
9:35	9:53	10:10	10:10	10:20	10:35
10:35	10:53	11:10	11:10	11:20	11:35
11:35	11:53	12:10	12:10	12:20	12:35
12:35	12:53	1:10	1:10	1:20	1:35
1:35	1:53	2:10	2:10	2:20	2:35
2:35	2:53	3:10	3:10	3:20	3:35
3:35	3:53	4:10	4:10	4:20	4:35
4:35	4:53	5:10	5:10	5:20	5:35
5:35	5:53	6:10	6:10	6:20	6:35

Appendix G:

KTMPO Congestion Management Plan

Killeen-Temple Metropolitan Area

Congestion Management Process

2016 Update

Adopted by the KTMPO Transportation Planning Policy Board on October 19, 2016

Prepared for:

KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

Prepared by:

ALLIANCE
TRANSPORTATION GROUP

"The preparation of this report has been financed in part through grant[s] from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 [or Metropolitan Planning Program, Section 104(f)] of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation."

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This notice is available from the Title VI Coordinator in large print, on audiotape and in Braille.

Questions or other interests regarding the plan may be directed to:

Cheryl Maxwell, Planning Director
PO Box 729
2180 N. Main Street
Belton, TX 76513
(254) 770-2379
cheryl.maxwell@ctcog.org

Cover Photo: FM 3481 at Dusk
Inside Cover Photo: Stillhouse Lake Bridge
Photo Credit: Flickr user Moon Man Mike

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1. Introduction

This document is the 2016 Congestion Management Process (CMP) Update Report for the Killeen Temple Metropolitan Planning Organization (KTMPO) planning area (see Figure 1-2). The report describes the assumptions, methodology, performance measures, and potential congestion mitigation strategies included in the updated CMP.

Congestion Management Process (CMP)

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. A congestion management process (CMP) is a systematic approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs. The CMP is intended to produce transportation system performance measures and congestion management strategies that can be reflected in the regional metropolitan transportation plan (MTP) and transportation improvement program (TIP).

The CMP, as defined in federal regulation, is intended to serve as a systematic process that provides for safe and effective integrated management and operation of the multimodal transportation system. The process includes:

- Development of congestion management objectives;
- Establishment of measures of multimodal transportation system performance;
- Collection of data and system performance monitoring to define the extent and duration of congestion and determine the causes of congestion;
- Identification of congestion management strategies;
- Implementation activities, including identification of an implementation schedule and possible funding sources for each strategy; and
- Evaluation of the effectiveness of implemented strategies.

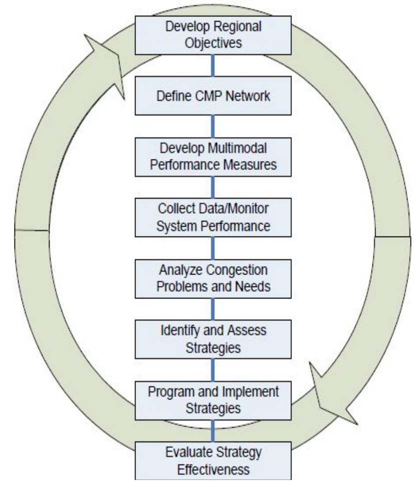
A CMP is required in metropolitan areas with population exceeding 200,000, these areas are known as Transportation Management Areas (TMAs). Federal requirements also state that all CMPs shall be developed and implemented as an integrated part of the metropolitan transportation planning process. The Congestion Management System (CMS) was first introduced by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and was continued under successive transportation authorization laws, including the current law, Fixing America's Surface Transportation (FAST) Act. The CMP is intended to be an ongoing process, fully integrated into the metropolitan transportation planning process. The CMP is a "living" document, continually evolving to address the performance measure results, concerns of the community, new objectives and goals of the MPO, and up-to-date information on congestion issues.

KTMPO Congestion Management Process

The Killeen Temple Metropolitan Planning Organization (KTMPO) is the metropolitan planning organization (MPO) for the urbanized region surrounding the two cities. The general population of the KTMPO planning area, according to the 2014 US Census American Community Survey estimates, is 355,747. Figure 1-2 shows the KTMPO planning area, which was designated as a TMA in 2012. Within this area, KTMPO has the responsibility of coordinating safe and efficient movement of people and goods on the multi-modal public transportation system. The KTMPO multi-modal transportation system includes faciliites for pedestrians, bicylists, transit users, air transport users, and automobile/truck users.

This KTMPO CMP is modeled after the process suggested in the Federal Highway Administration's *Congestion Management Process: A Guidebook*. Figure 1-1 visualizes the step-by-step process, emphasizing the ongoing nature of the CMP. The eight step process includes the following actions:

Figure 1-1: KTMPO CMP Model Process



Develop Regional Objectives – This step in the process answers the questions: "What is the desired outcome?" and "What do we want to achieve?" It may not be feasible or desirable to try to eliminate all congestion, and so in this step it is important to define the regional objectives for congestion management that are designed to achieve the desired outcome. Some MPOs also define congestion management principles, which shape how congestion is addressed from a policy perspective.

Define Network - This step in the process involves answering the question, "What components of the transportation system are the focus?" and involves defining both the geographic scope and system elements (e.g., freeways, major arterials, transit routes) that will be analyzed in the CMP.

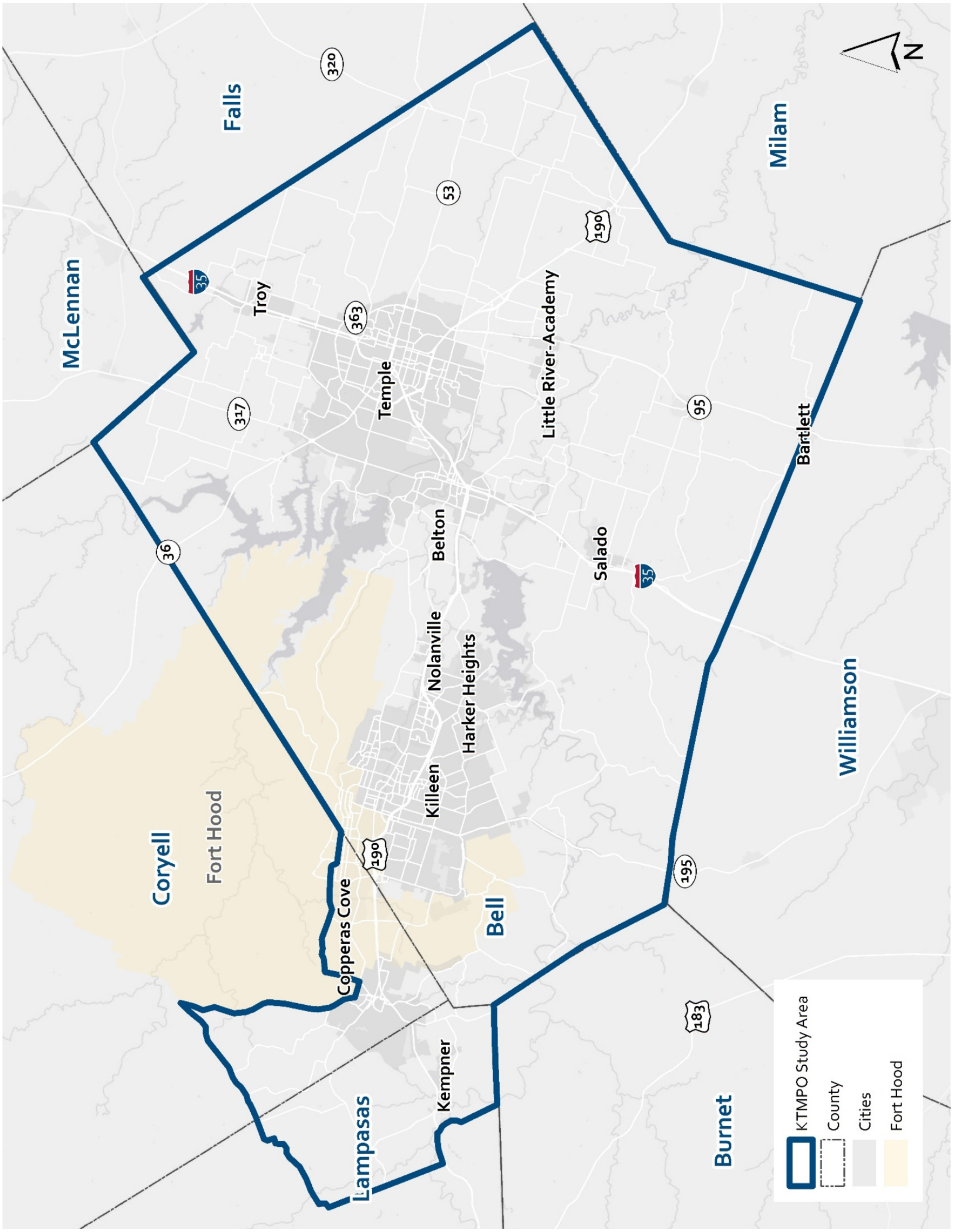
Develop Performance Measures – In this step in the process, the CMP addresses the question, "How do we define and measure congestion?" This step involves developing performance measures to be used to measure congestion on both a regional and local scale. These performance measures should support the regional objectives.

Collect Data/Monitor System Performance - After performance measures are defined, the next step in the process is to collect and analyze data to determine, "How does the transportation system perform?" Data collection may be on-going, and involve a wide range of data sources from various planning partners.

Analyze Congestion Problems and Needs - Using available data and analysis techniques, in the next step in the process the CMP should address the questions, "What congestion problems are present in the region, or are anticipated?" and "What are the sources of unacceptable congestion?"

Identify and Assess Strategies - Working together with the MPO's planning partners, in the next step in the process the CMP should address the question, "What strategies are appropriate to mitigate congestion?" This step involves both identifying and assessing potential strategies, and may include efforts conducted as part of the development of the Metropolitan Transportation Plan (MTP), corridor studies, or project studies.

Figure 1-2: KTMPO Planning Area



Program and Implement Strategies – This step involves answering the question, "How and when will solutions be implemented?" The step typically involves: including strategies in the MTP; determining funding sources; prioritizing strategies; allocating funding in the TIP; and, ultimately, implementing the strategies.

Monitor Strategy Effectiveness – This step should assess, "What have we learned about implemented strategies?" This step will be tied closely to monitoring system performance and is designed to inform future decision making about the effectiveness of transportation strategies. From the lessons learned in this step, the process begins again in a continuous process of monitoring and improving congestion management processes within the region.

Goals and Objectives

KTMPO CMP Vision:
"Maintain a safe efficient and convenient transportation system throughout the KTMPO region."

As with any process, it is important to establish the process objectives from the outset. The objectives define what the MPO wants to achieve regarding the congestion management process, and are an essential part of an objectives-driven, performance-based approach to planning for congestion management. These objectives will also serve as one of the primary points of connection and coordination between the CMP and the MTP. The MPO developed goals and objectives for the 2013 CMP based on existing KTMPO planning documents and national best practices. The 2016 CMP Update maintains the same goals and objectives, which guide the actions necessary to maintain a safe efficient and convenient transportation system throughout the KTMPO region. The MPO will continue working to promote projects and policies that support the stated vision, goals, and objectives of this 2016 CMP Update.

Goals and Objectives

Goal: Provide an efficient transportation system

- Promote policies and projects to reduce travel delay
- Promote awareness of alternative transportation modes

Goal: Provide a safe transportation system

- Promote policies and projects to reduce number of crashes and crash severity

Goal: Promote a variety of transportation alternatives

- Promote policies and programs to increase transit ridership on existing services
- Promote awareness of multi-modal facilities
- Promote carpool/shared-ride opportunities

Goal: Encourage programs and developments that promote a healthy environment

- Consider participation in air quality improvement programs
- Encourage community land development plans that balance access to all modes of transportation.

2. Congestion Management Data

Types of Congestion

- Recurring Congestion
  - Peak period
  - Freight
  - Intersection
  - Freeway corridor
  - Non freeway corridor
  - School related
  - Central Business District
  - Bottleneck or hot spot
  - Railroad crossing
  - Parking related
- Non-Recurring Congestion
  - Incident related
  - Special event traffic

Federal regulation 23 CFR 500.109 defines congestion as "the level at which transportation system performance is unacceptable due to excessive travel times and delays." According to the Federal Highway Administration (FHWA), roadway congestion is comprised of three key elements: severity, extent, and duration. However, congestion can have a different meaning depending on the context in which the congestion is experienced. Defining a CMP Network and developing performance measures to analyze congestion along the network are key steps in the CMP. These steps establish the foundation for the process, and are meant to define how congestion is perceived locally.

Congestion Data Sources

Before a CMP Network can be defined or performance measures can be determined, it is important to determine what data is available. The KTMPO CMP employs three main quantitative data sets, whose data coverage is shown in Figure 2-1, and one qualitative data set for analyzing congestion. The CMP also uses additional supplementary data from other sources that helps further the identification and analysis of congestion throughout the region.

National Performance Management Research Data Set (NPMRDS)

The NPMRDS is a vehicle probe-based data set developed by HERE and acquired by the FHWA to support the agency's Freight Performance Measures (FPM) and Urban Congestion Report (UCR) programs. The data set uses crowd-sourced GPS information, typically obtained from mobile phones, vehicles, and portable navigation devices, to provide monthly average travel times (in 5 minute intervals) along the National Highway System (NHS), Strategic Defense Network (STRAHNET), and principal arterials within five miles of a border crossing. The data is also packaged with a location referencing system, which is a network of segments called Traffic Message Channels (TMCs), which can be used in a geographic information system (GIS) to link travel time data to road segments. The data used in this CMP includes monthly data from 2014 for Bell, Coryell, and Lampasas Counties, and was obtained from TxDOT.

Although the NPMRDS separates probe data into passenger vehicle and freight vehicle data, this CMP Update uses the combined data to account for the effects of congestion on the movement of both people and goods throughout the region.

INRIX

The INRIX data set is similar to the NPMRDS in that it is a probe-based data set produced from GPS information taken from personal navigation devices. However, INRIX traffic data is presented in units of speed, instead of average travel time, averaged over 15 minute intervals. The INRIX speed data set used in this CMP is the 2013 version and was obtained from TxDOT, which packages the data with its Road-Highway Inventory Network (RHiNo) for location referencing and travel time calculation.

Regional Travel Demand Model (TDM)

A TDM is a representation of travel behavior throughout a transportation system network. The model uses roadway attributes and socioeconomic data such as population and employment to predict travel behavior. The latest KTMPO TDM uses 2010 and forecasted 2040 demographic inputs to forecast travel demand along the TDM roadway network for different time periods. The TDM does not model travel behavior of modes of travel other than the roadway system. The TDM results provide estimates of vehicle travel times, speed, and traffic volumes along the roadway system of the region.

Google Traffic

Google Traffic is a feature in Google Maps that displays typical traffic conditions along roadways based on travel speed. Google Traffic aggregates crowd-sourced GPS information from smartphones to calculate speeds along roadway segments, which is then used to create an overlay in Google Maps which show traffic conditions on a scale from "fast" to "slow"—with "fast" meaning there is little congestion and "slow" meaning there is heavy congestion for a specific time period. Because the raw data is not publicly available, the CMP utilizes this data source qualitatively. Congestion data from Google

Traffic is collected by reviewing the typical traffic conditions overlay in Google Maps for specific time periods and indicating the severity of congestion for segments consistently displaying congestion. The process involves skimming through several time periods to identify segments with reoccurring congestion, noting the extent and travel direction of the congested roadway segment, and recording the magnitude of congestion.

Supplementary Data Sources

Outside of the four main congestion data sources, KTMPO also designed a survey to gather feedback from the public to determine the location and other characteristics of regional congestion. The survey was hosted online and received 222 unique responses over the one-month period that the survey was open. The survey revealed that many of the respondents perceived daily congestion to be a significant problem in the region, and mostly caused by roadway construction, inadequate road capacity, or ineffective traffic signals. Respondents also identified locations where congestion was the worst (Table 2-1) and provided information about each respondent's commuting patterns and strategies to avoid congestion. A complete summary of the survey results is available in Appendix B.

Table 2-1: Survey Response - Worst Congestion Locations

Intersection	Segment
WS Young @ US 190	W. Adams Ave. (Temple)
FM 2410 @ US 190	WS Young Dr. (Killeen)
Trimmier Rd @ US 190	Trimmier Rd. (Killeen)

Crash data was also incorporated in the CMP as a way to account for non-recurring congestion, since incidents along a network may result in delays and unreliable travel times. Crash data for the region was obtained from TxDOT's Crash Records Information System (CRIS) from 2011 to 2015. The CRIS data provides information about the location of reported crashes (Figure 2-2), as well as different attributes that provide more detail about who was involved and the outcome of each crash (e.g. injury or fatality).

Figure 2-1: Quantitative Congestion Data Coverage

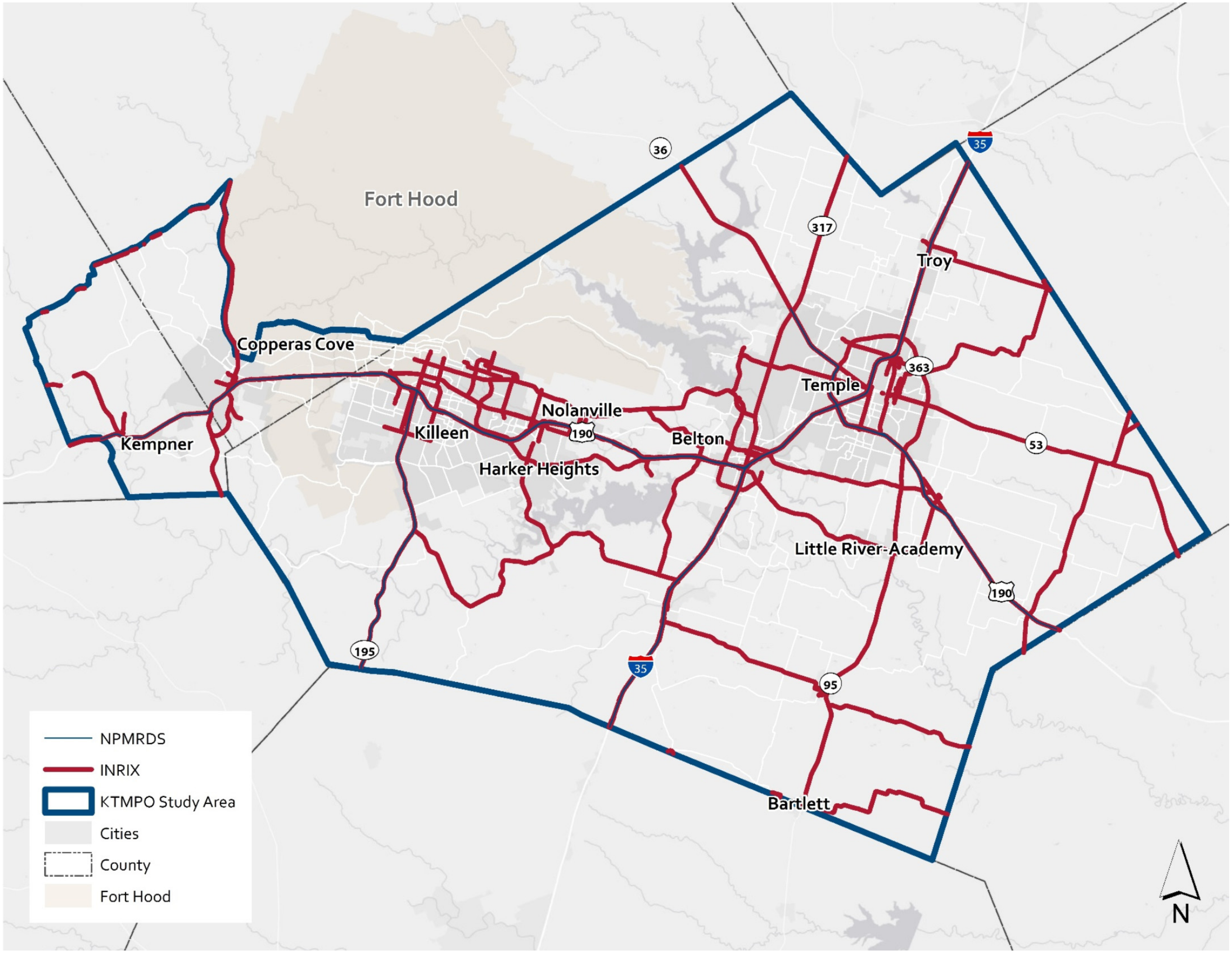
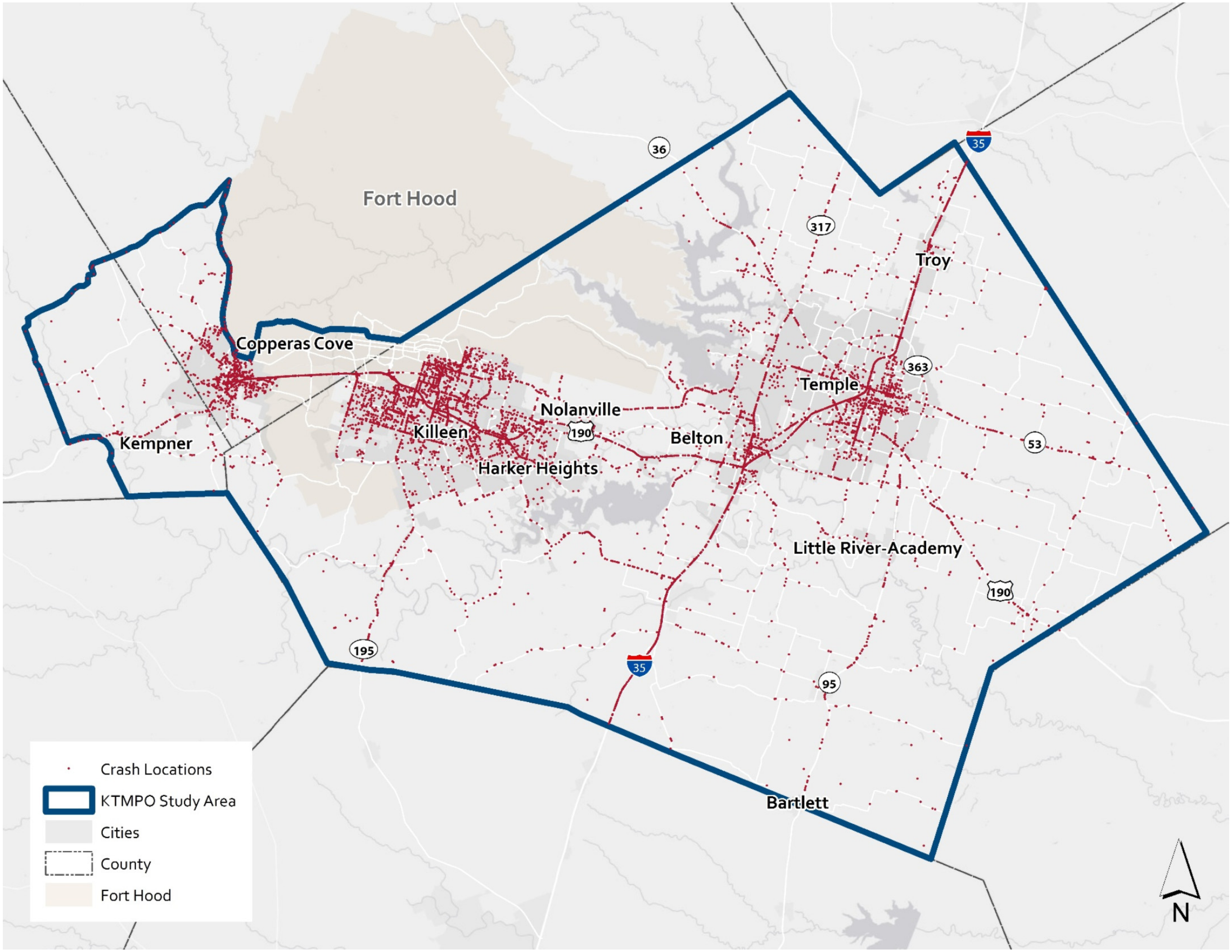


Figure 2-2: CRIS Crash Locations (2011-2015)



CMP Network

Defining a CMP Network involves specifying the geographic boundaries and transportation system components that are the basis of analysis and foundation of the congestion management process. Efforts to improve traffic conditions in the region begin on the CMP Network, and the level of congestion on this network serves as a gauge for overall congestion in the region.

Defining the CMP Network

In May 2013, KTMPO held a series of public workshops to collect input from the community on various transportation topics, including congestion. The public provided feedback about proposed CMP goals and identified congestion locations throughout the area (Figure 2-3). KTMPO staff combined the results from the workshops with congested corridor information provided by the regional public transit provider Hill Country Transit District (HCTD) and Texas Department of Transportation (TxDOT), creating a consolidated list of congested roadways. KTMPO Staff presented this list of roadways to the KTMPO Technical Advisory Committee and Transportation Planning Policy Board where it was approved as the official CMP Network for the region.

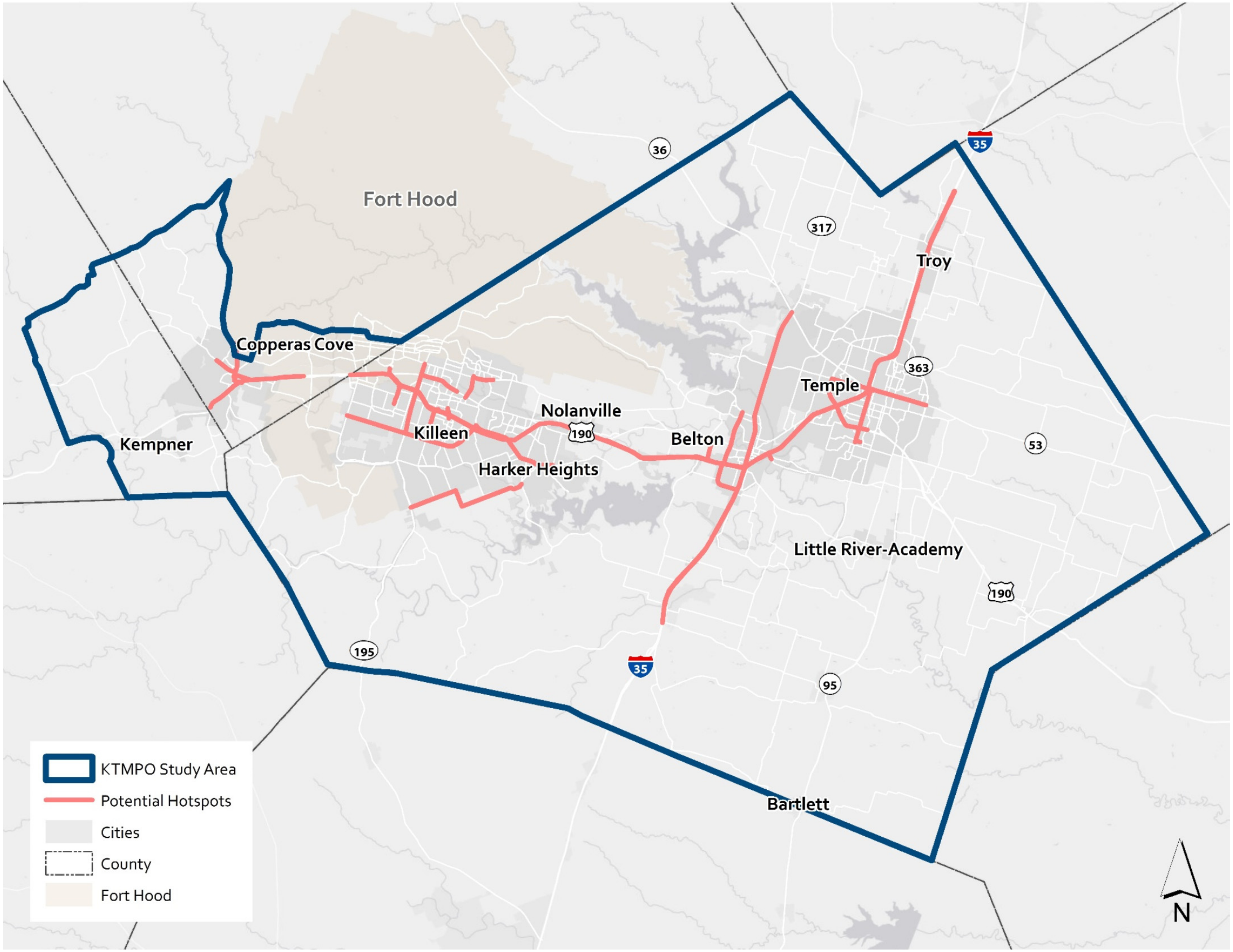
The 2013 CMP Network did not take into account quantitative data coverage. However, the 2016 CMP does use quantitative data. As a result of the analysis of this quantitative data, an expanded CMP Network was proposed for the 2016 CMP Update. The updated CMP Network (Figure 2-4) reflects the overlapping data coverage from the four congestion datasets mentioned previously, as well as information gathered from the congestion survey. The network is broken up into segments for analysis purposes, which are detailed in Table 2-2.

Performance Measures

Developing performance measures to identify, assess, and communicate to others about congestion is a critical element of the CMP. A performance measure is a quantifiable measure to assess how well the KTMPO region is meeting the established congestion management goals and objectives. Performance measures serve as indicators to better understand the usage of a transportation facility or the characteristics of travelers using the transportation system. Performance measures can also be assessed over time to indicate whether congestion management strategies are successful in meeting the establish goals and objectives of the CMP.

By monitoring performance and the outcomes from implemented improvement strategies, the quality of decision-making in the planning process can be improved and limited financial resources can be expended more wisely and effectively. The requirement for on-going assessment of the performance measures leads to the need to identify measures that are quantifiable, without placing a heavy burden on time, cost or training on KTMPO staff. This CMP establishes a set of performance measures that can be calculated from real world data on an annual basis and that provide KTMPO with useful information and trends to inform transportation investment decisions.

Figure 2-3: Public Defined Areas of Congestion



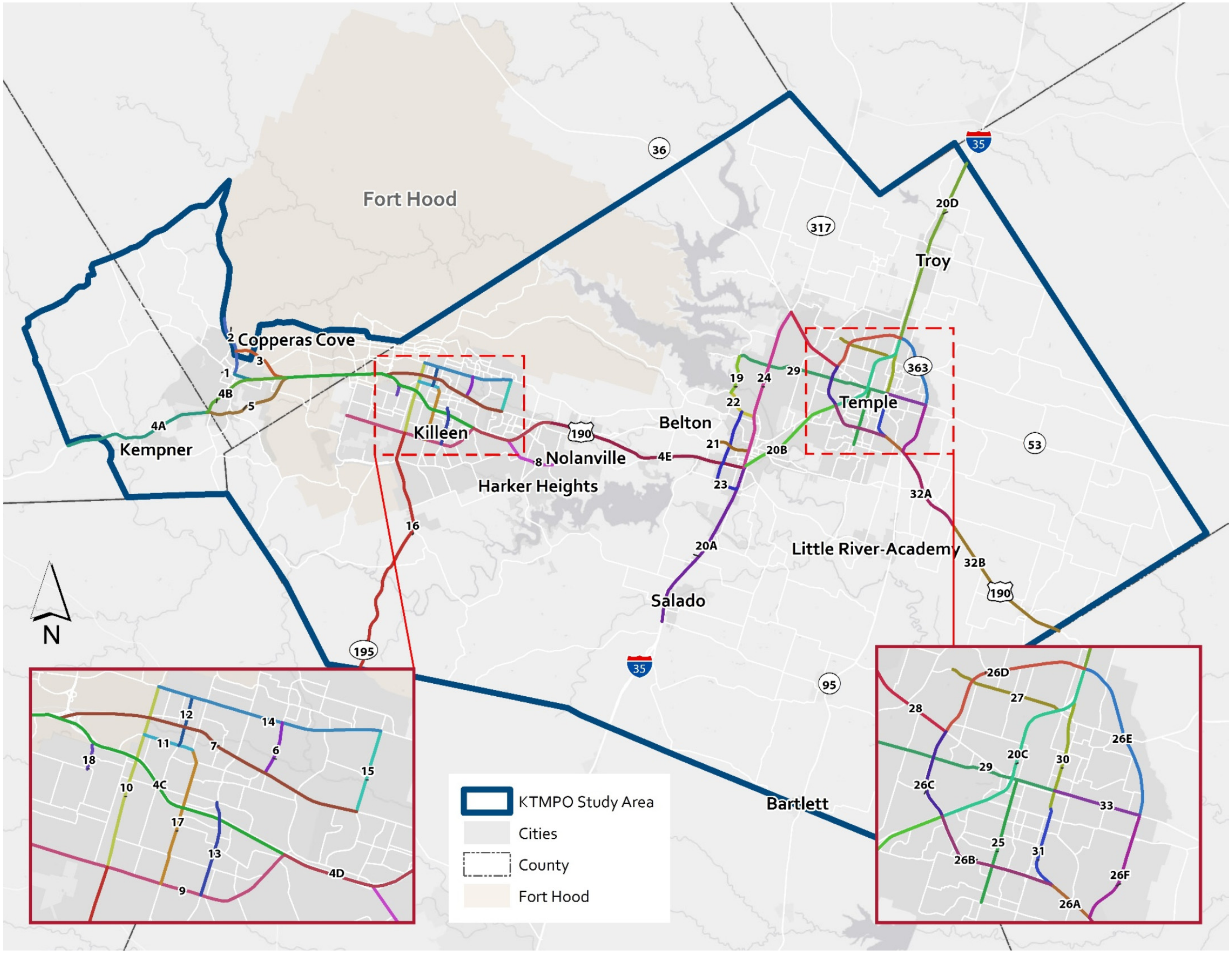


Figure 2-4: Updated CMP Network

Table 2-2: Updated CMP Network Segments

ID	Roadway	From	To	City
1	AVE D	N 1ST ST	BUSINESS 190	COPPERAS COVE
2	FM 116	AVE D	ELIJAH RD	COPPERAS COVE
3	SH 9[1]	US 190	FM 116	COPPERAS COVE
4A	US 190	FM 1715	BUSINESS 190	COPPERAS COVE
4B	US 190[2]	US 190 BYPASS W	US 190 BYPASS E	COPPERAS COVE
4C	US 190	SH 9	FM 3470/STAN SCHLUETER LOOP	KILLEEN
4D	US 190	FM 3470/STAN SCHLUETER LOOP	BUSINESS 190	KILLEEN
4E	US 190	BUSINESS 190	IH 35	BELTON
5	US 190 BYPASS[1]	US 190 W	US 190 E	COPPERAS COVE
6	38TH ST	BUSINESS 190	RANCIER AVE	KILLEEN
7	BUSINESS 190	US 190	ROY REYNOLDS DR	KILLEEN
8	FM 2410	US 190	WARRIORS PATH	KILLEEN
9	FM 3470/STAN SCHLUETER LOOP	SH 201/CLEAR CREEK RD	US 190	KILLEEN
10	FORT HOOD ST	FM 3470/STAN SCHLUETER LOOP	RANCIER AVE	KILLEEN
11	HALLMARK AVE	FORT HOOD ST	TRIMMIER RD	KILLEEN
12	N 2ND ST	HALLMARK AVE	RANCIER AVE	KILLEEN
13	WS YOUNG DR	ILLINOIS AVE	FM 3470/STAN SCHLUETER LOOP	KILLEEN
14	RANCIER AVE	FORT HOOD ST	ROY REYNOLDS DR	KILLEEN
15	ROY REYNOLDS DR	BUSINESS 190	RANCIER AVE	KILLEEN
16	SH 195	WILLIAMSON COUNTY LINE	FM 3470/STAN SCHLUETER LOOP	KILLEEN
17	TRIMMIER RD	FM 3470/STAN SCHLUETER LOOP	HALLMARK AVE	KILLEEN
18	WILLOW SPRINGS RD	US 190	WATERCREST RD	KILLEEN
19	FM 2271	LAKE RD	FM 2305/W ADAMS AVE	BELTON
20A	IH 35	SALADO (FM 2268)	US 190	BELTON
20B	IH 35	US 190	S LOOP 363	BELTON
20C	IH 35	S LOOP 363	N LOOP 363	TEMPLE
20D	IH 35	N LOOP 363	FALLS COUNTY LINE	TEMPLE
21	FM 93/NOLAN VALLEY RD	WHEAT RD	SH 317	BELTON
22	LAKE RD	FM 2271	SH 317	BELTON
23	LOOP 121	IH 35	LAKE RD	BELTON
24	SH 317	US 190	SH 36	BELTON
25	FM 1741/S 31ST ST	CANYON CREEK DR	SH 53/ADAMS AVE	TEMPLE
26A	LOOP 363	US 190	SPUR 290	TEMPLE
26B	LOOP 363	SPUR 290	IH 35 S	TEMPLE
26C	LOOP 363	IH 35 S	SH 36	TEMPLE
26D	LOOP 363	SH 36	IH 35 N	TEMPLE
26E	LOOP 363	IH 35 N	SH 53	TEMPLE
26F	LOOP 363	SH 53	US 190	TEMPLE
27	INDUSTRIAL BLVD	OLD HOWARD RD	IH 35	TEMPLE
28	SH 36/AIRPORT RD	LOOP 363	SH 317	TEMPLE
29	FM 2305/ADAMS AVE	FM 2271	3RD ST	TEMPLE
30	SPUR 290/3RD ST	AVE E	IH 35	TEMPLE
31	SPUR 290/S 1ST ST	S LOOP 363	AVE E	TEMPLE
32A	US 190 SE	LOOP 363	PRITCHARD RD	TEMPLE
32B	US 190 SE	PRITCHARD RD	MILAM COUNTY LINE	TEMPLE
33	SH 53/ADAMS AVE	3RD ST	E LOOP 363	TEMPLE

[1] Performance measures for this segment were not computed because the segment was not complete at the time data was collected for this CMP Update; future performance reports will likely include this segments as data becomes available.
[2] This segment will likely be referred to as Business 190 in future updates.

Identifying Performance Measures

The Federal CMP requirements do not mandate specific performance measures that must be used during the process. Identifying appropriate congestion performance measures is up to each MPO. Although there are a wide range of performance measures available, it was determined by KTMPO that those selected for this 2016 CMP Update must be understandable, outcome-oriented, and supported by readily available data sources.

The 2013 CMP recommended several performance measures. The 2016 CMP Update evaluated the 213 performance measures to determine whether the old performance measures meet current standards and need for quantifiable measurement. The following questions were considered to assist in identifying appropriate congestion management performance measures:

- Is the measure easily understandable to both the general public and elected officials?
- Does the MPO have the ability and adequate funding to collect the data to track the measure on an on-going basis?
- Does the measure provide the ability to track roadway congestion for the region overall, as well as for individual transportation facilities?
- Do the measures reflect the local definition of congestion?

Table 2-3 highlights the different performance measures previously considered for inclusion in the CMP, and the following sections below explain the measures in more detail.

Table 2-3: Performance Measures

Measure Category	(Sub-measures)	Recommended in: 2013 CMP	Recommended in: 2016 CMP	Data Source
Corridor Level-of-Service		Yes	No	TDM
Volume-to-Capacity Ratios		Yes	**Yes**	TDM
Travel Time	Travel Time	Yes	No	INRIX, NPMRDS, Bluetooth, TDM
	Travel Speed	Yes	No	INRIX, NPMRDS, Bluetooth, TDM
	Average Delay	No	**Yes**	INRIX, NPMRDS, TDM
	Travel Time Index	No	**Yes**	INRIX
Intersection LOS		No	No	TDM
Safety	Number of crashes along a specified corridor	Yes	No	TxDOT CRIS
	Number of crashes at a particular intersection	Yes	No	TxDOT CRIS
	Type of crashes along a specified corridor	No	Yes	TxDOT CRIS
	Type of crashes at a particular intersection	No	No	TxDOT CRIS
	Number of crashes per million vehicle-miles over a section of roadway	No	**Yes**	CRIS/TDM
Transit	Transit ridership	Yes	No	HCTD, NTD
	Transit capacity along congested corridors	No	No	HCTD
	Transit availability	Yes	**Yes**	HCTD
Transportation Options/Availability of Alternative Modes		*Yes*	*No*[3]	*?*

[3] Availability of Alternative Modes was not recommended as a measure in the 2016 CMP Update. As KTMPO continues updating its multi-modal plans and inventory of bicycle and pedestrian facilities, future CMP updates could consider incorporating a measure for transportation options.

Volume-to-Capacity Ratios

In addition to being part of the LOS determination for a roadway, volume-to-capacity (V/C) ratios can be used separately as measure of congestion. V/C ratio is defined as the ratio of demand flow rate to capacity for a traffic facility. Using V/C ratios is popular because data on existing traffic volumes is relatively easy to obtain and the measures (traffic volumes and roadway capacities) can be forecasted by employing the area's TDM.

Travel Time Measures

Travel time measures focus on the time it takes to travel along a selected portion of a highway corridor. Common variations of travel time measures include the following:

- Travel time – the amount of time needed to traverse a corridor segment
- Travel speed – the length of a segment divided by the travel time
- Travel time index – ratio of observed travel speed to free-flow travel speed

These travel time measures can be used for specific roadway segments, intersections, or corridors. The 2016 CMP Update uses the Travel Time Index (TTI) because it allows for direct comparison between different types of roadways in the region.

Delay Measures

Delay measures calculate the additional travel time experienced by drivers due to varying traffic conditions. In other words, delay is the difference between observed travel time and free flow travel time. Delay measures are dependent on how free flow travel time is defined. Free flow travel time could be derived from the posted speed limit or could be defined as the maximum observed travel time. Depending on how free flow travel time is defined, measures of delay can vary.

The 2016 CMP Update proposes using average delay per vehicle as the primary delay measure, supplemented by aggregated delay information where available.

Crash Measures

Crash measures identify high concentrations of crashes at particular locations along a corridor or at a particular turning movement at an intersection or cross street. Crashes certainly impact travel conditions, and can be the cause of nonrecurring congestion along corridors and intersections. Identifying "hot spot" crash locations, and examining the location in the field can assist in identifying potential projects to improve the safety and function of the roadway corridor or intersection. Common improvements could include improving sight distance, adding turn lanes, adding traffic signals, implementing street calming devices, etc. Crash data measures in the KTMPO area could include the following:

- Number of crashes along a specified corridor
- Number of crashes at a particular intersection
- Type of crashes along a specified corridor
- Type of crashes at a particular intersection
- Number of crashes per million vehicle-miles over a section of roadway

There are some constraints to using crash measures to alleviate congestion. For instance, the type of crashes and how they are recorded can make it difficult to measure congestion from reviewing crash data. There may be reporting inconsistencies in the crash data that is documented by local enforcement agencies. Crashes may not be reported or documented, and the exact crash location is not always recorded or accurate. While examining crash data is important in the overall planning process, the inconsistencies within crash data may detract from the suitability of crash measures to identify congested corridors. In the 2016 CMP Update, crash measures are used to supplement the primary congestion hotspot identification measures and prioritize the segments.

Transit Travel Condition Measures

Transit travel condition measures provide information on the conditions experienced by public transit users. Aspects of transit travel conditions include vehicle ridership vs. load capacity and on-time performance reliability. Thus, transit travel condition measures in the KTMPO area could include the following:

- Transit ridership
- Transit capacity along congested corridors
- Transit availability

Transit measures in the 2016 CMP Update are not used to identify congested locations, but are used during the congestion hotspot prioritization process.

Recommended Performance Measures

After considering the ease of access to and characteristics of the available quantitative data, the performance measures recommended for use in the 2016 CMP Update include:

Congestion Measures

- Travel Time Index
    - Average Daily
    - Maximum
- Delay
    - Average Daily
    - Peak Period
    - Annual Hours of Delay
- V/C Ratio (Current and Future)
    - Average Daily
    - Peak Period

Supplemental Measures

- Transit Availability
- Crash Rate
- Rear-end Crash Rate

3. Identification of Congestion Hotspots

Identifying congestion hotspots is part of determining specific congestion problems in the region. Part of the identification process also includes defining what levels of congestion are acceptable or unacceptable in the region. The process of congestion hotspot identification involves using the multiple available data sets to calculate performance measures along the CMP Network, and then aggregating those measures in a way that allows for easy comparison between segments. Finally, segments along the CMP Network are prioritized based on the results of the congestion data analysis, as well as other evaluation criteria, that support the goals and objectives of the CMP and ensure compatibility with other regional planning processes.

Data Analysis

There are many ways to analyze congestion, as reflected in the use of multiple performance measures and data sets throughout this CMP. By using these different measures in conjunction with one another, congestion hotspots can be identified with a relative degree of confidence. Using multiple performance measures and data sets also allows for flexibility in defining and identifying congestion, as certain measures from different sources can be weighted and presented differently to reflect congestion in a way that is specific to the region.

Before calculating congestion performance measures for the 2016 CMP Update, the data sets were first processed so that similar attributes or measures could be easily compared from one data set to the next. Using the three major quantitative congestion data sets (NPMRDS, INRIX, and the KTMPO TDM), performance measures were calculated depending on the data available within each data set. Table 3-1 shows how the quantitative congestion performance measures were calculated. Figures 3-1 through 3-4 show congestion in the region as measured through the Travel Time Index across the three quantitative datasets.

Table 3-1: Quantitative Congestion Performance Measure Descriptions

<table>
<tr><th></th><th></th><th></th><th>NPMRDS</th><th>INRIX</th><th>TDM</th><th>Units of Measure</th></tr>
<tr><td colspan="2" rowspan="2">Travel Time Index (TTI)</td><td>Average</td><td colspan="3">Average speed along segment/ average freeflow speed</td><td>Ratio</td></tr>
<tr><td>Max</td><td>Minimum speed of any TMC along segment/ average freeflow speed</td><td colspan="2">Minimum speed of any link along segment/ average freeflow speed</td><td>Ratio</td></tr>
<tr><td rowspan="5">Delay</td><td rowspan="3">Current</td><td>Average Daily</td><td>Average seconds of delay (per vehicle)[1] along segment / segment length</td><td>Average seconds of delay per vehicle along segment / segment length</td><td>Total seconds of delay for all links / Volume of all links averaged across segment/ segment length</td><td rowspan="2">Seconds per vehicle per mile</td></tr>
<tr><td>Peak[2]</td><td>Maximum seconds of delay (per vehicle) along segment/ segment length</td><td>Maximum seconds of delay along segment / segment length</td><td></td></tr>
<tr><td>Annual</td><td></td><td>Sum of all observations of delay for all vehicles for entire year</td><td></td><td>Hours</td></tr>
<tr><td rowspan="2">2040</td><td>Average</td><td></td><td></td><td></td><td>Ratio</td></tr>
<tr><td>Increase</td><td></td><td></td><td></td><td>Percentage</td></tr>
<tr><td rowspan="4">VC Ratio</td><td rowspan="2">Current</td><td>Average</td><td></td><td></td><td>Volume/capacity (24-hr)</td><td rowspan="3">Ratio</td></tr>
<tr><td>Peak[2]</td><td></td><td></td><td>Volume/capacity during peaks</td></tr>
<tr><td rowspan="2">2040</td><td>Average</td><td></td><td></td><td>Volume/capacity (24-hr) – 2040 forecast</td></tr>
<tr><td>Increase</td><td></td><td></td><td>% change VC ratio (current to 2040)</td><td>Percentage</td></tr>
</table>

[2] The peak period for KTMPO was defined as: 6AM-9AM for the AM Peak Period, and 4PM-7PM for the PM Peak Period. Peak period figures reflect observations from both the AM and PM peak period.

Figure 3-1: NPMRDS Travel Time Index

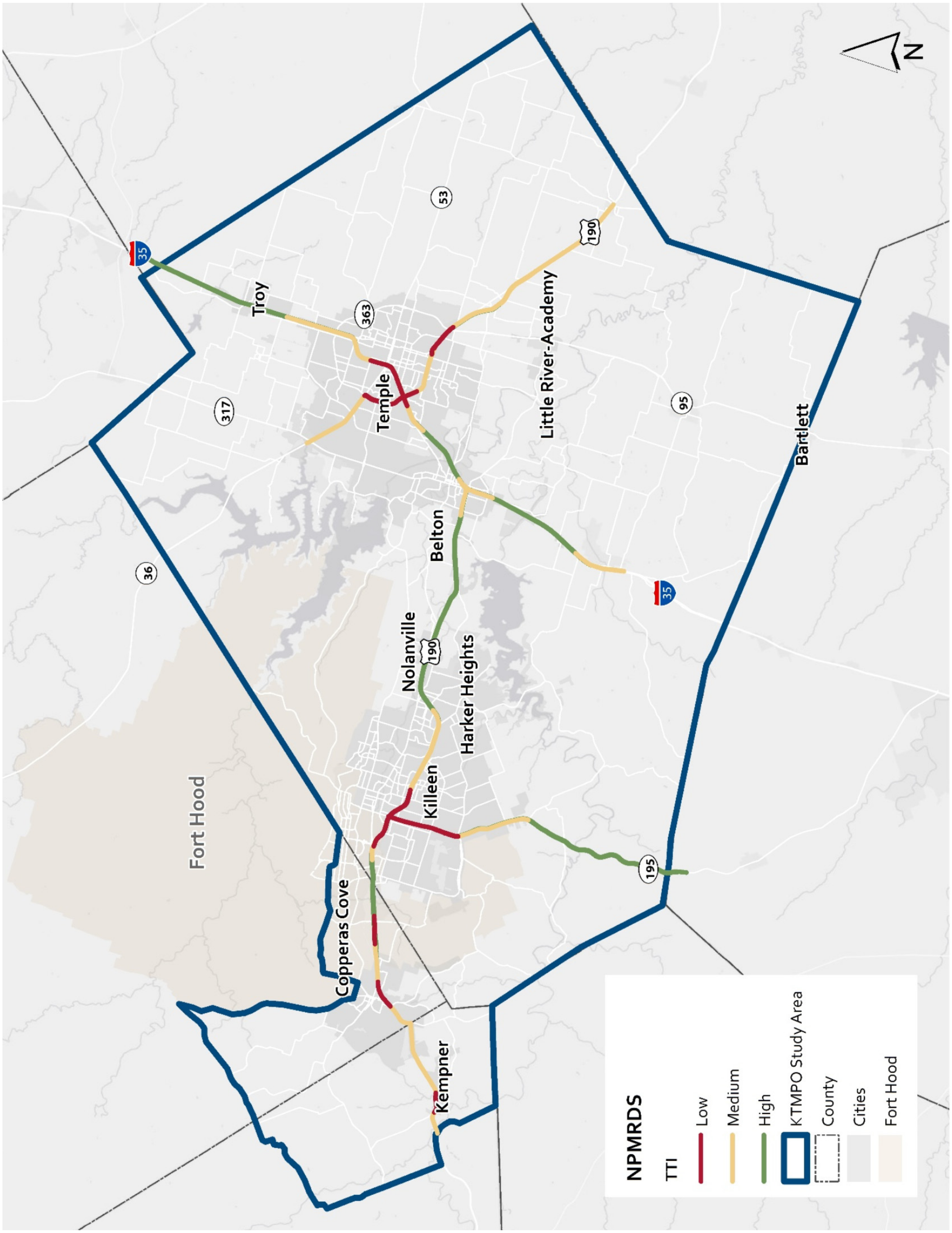


Figure 3-2: INRIX Travel Time Index

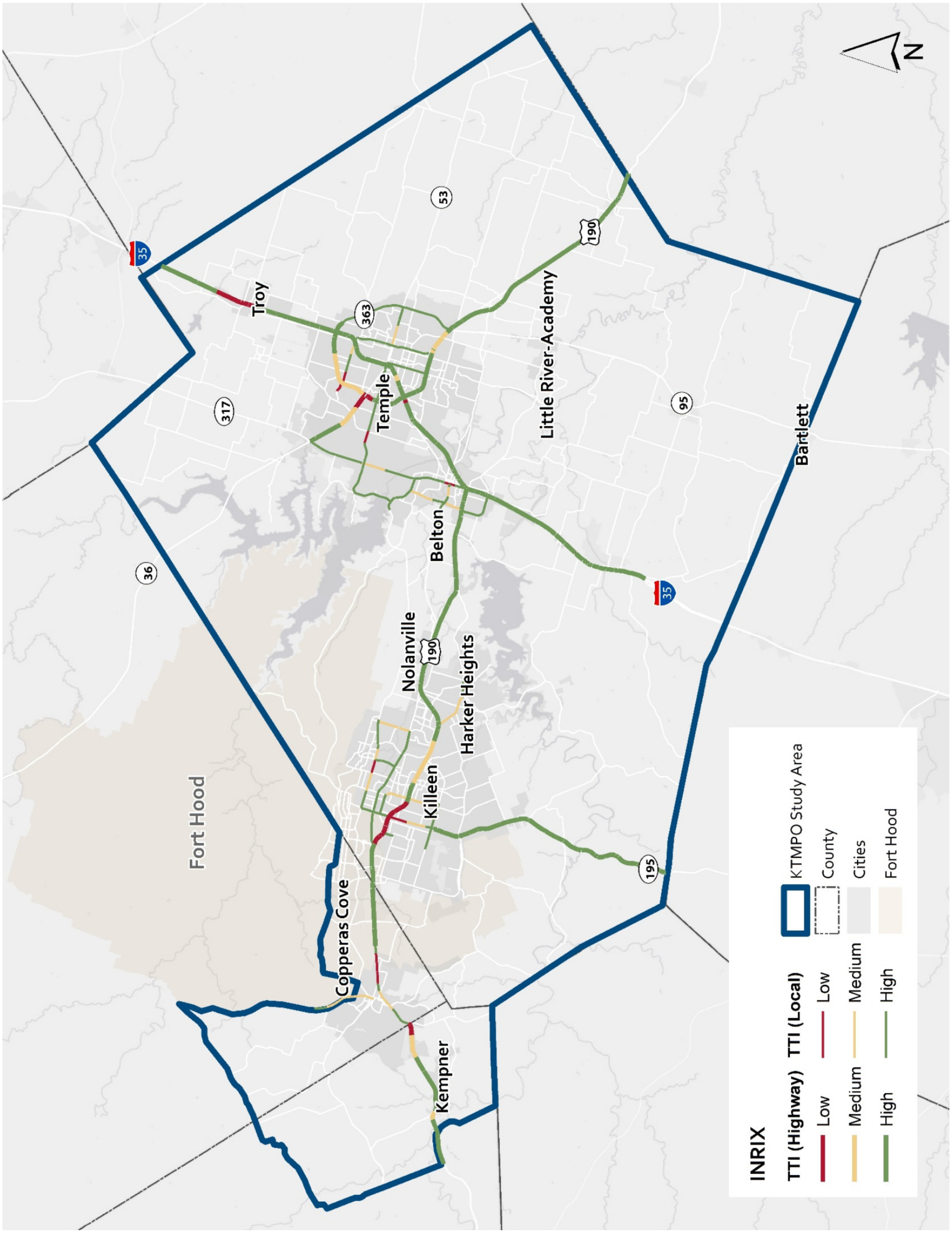


Figure 3-3: 2010 TDM Travel Time Index

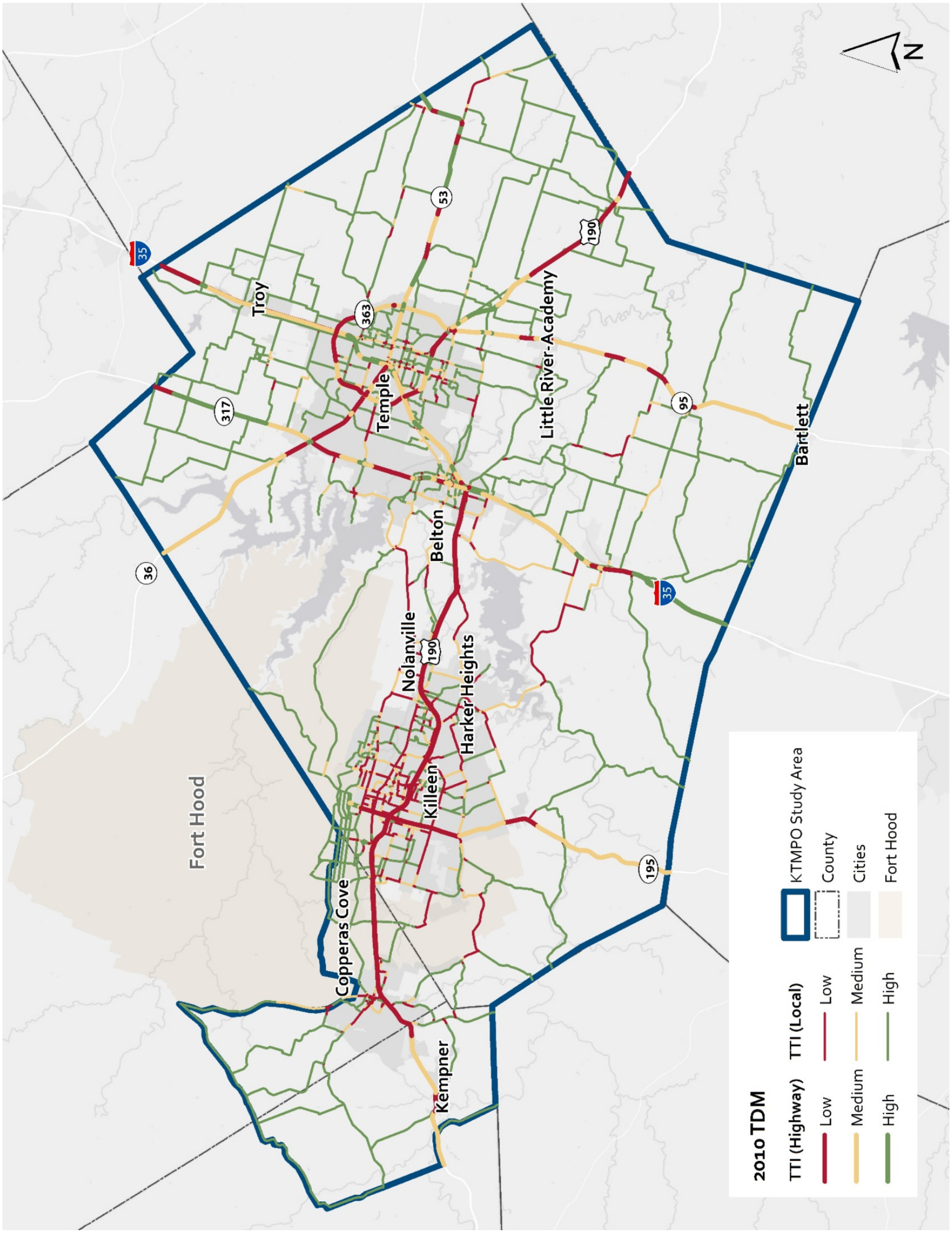
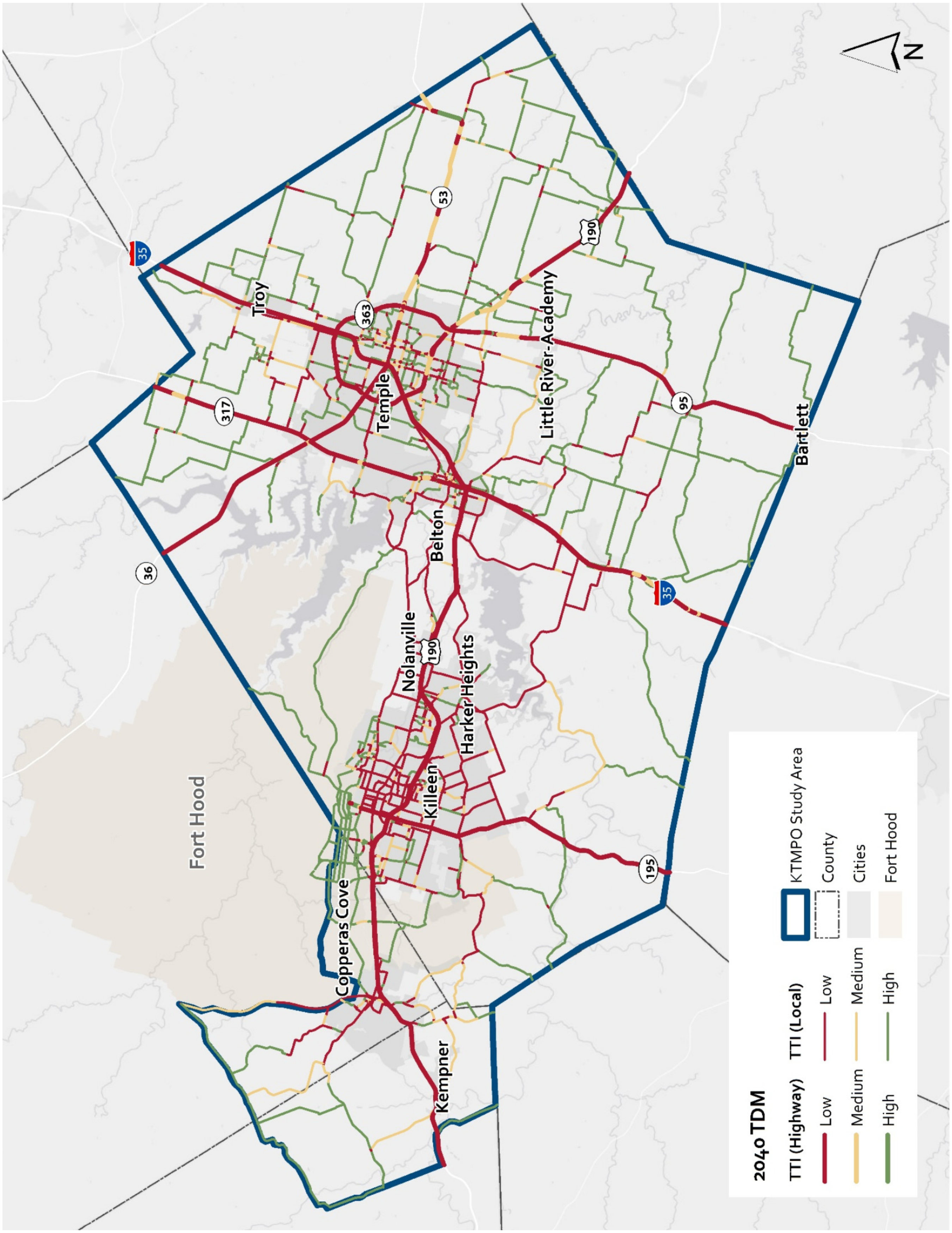


Figure 3-4: 2040 TDM Travel Time Index



Data Conflation

Data conflation is the process of combining the different quantitative congestion data sets that have dissimilar geographic extents. Because the geographic information included with each dataset originated from different sources, it was necessary to aggregate the data into one geographic layer to ensure the results for each segment of the CMP were directly comparable.

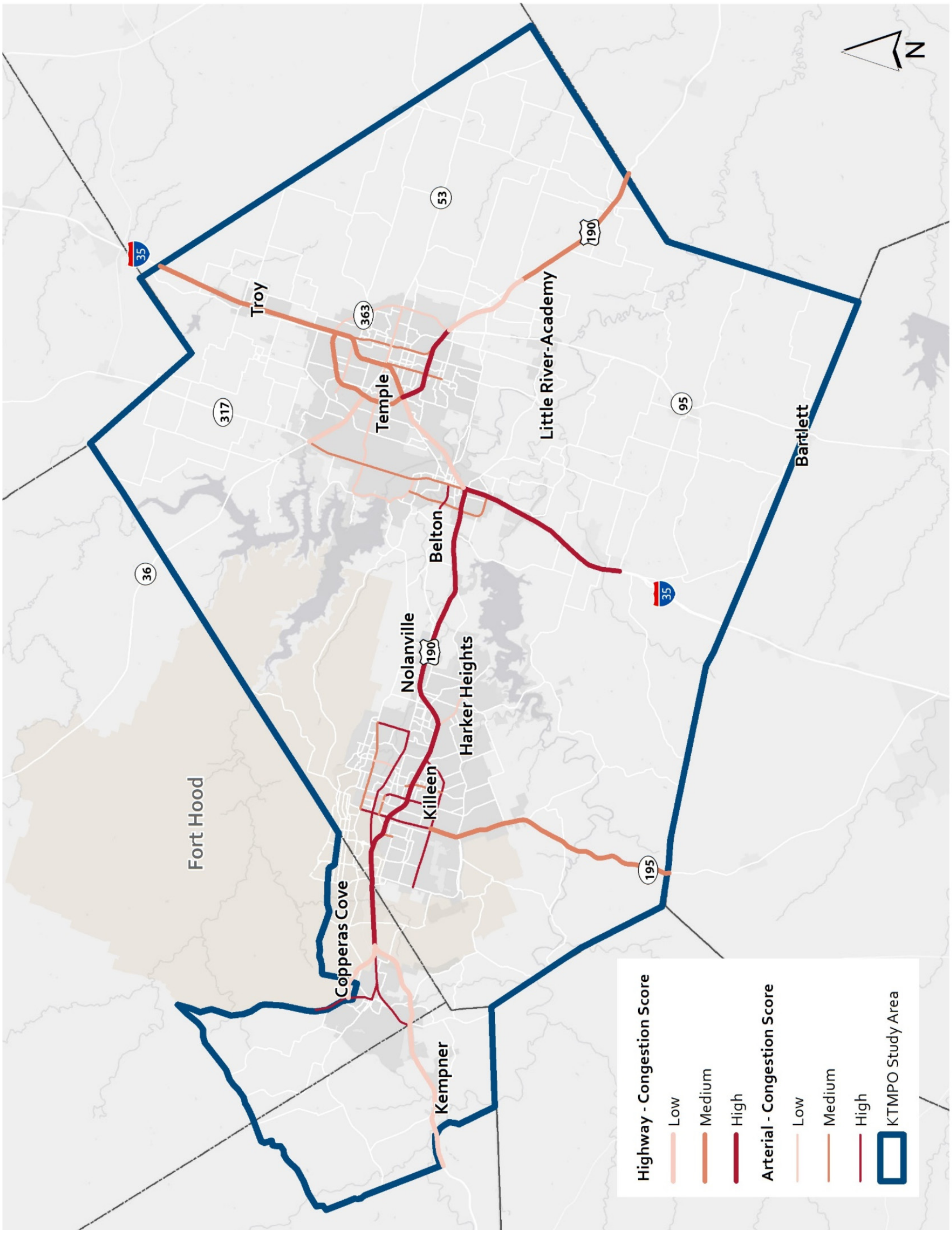
The conflation process involved generating a buffer region around each segment of the CMP Network, then using GIS geoprocessing tools to use the buffer as a "catchment area" to collect the segments from each data source. Once the quantitative data was collected on one layer, the previously computed performance measures from Table 3-1 were compared for each data source. The complete inventory of performance measures for each CMP segment can be found in Appendix B.

The final step in the conflation process was to apply weights to the quantitative congestion performance measures and qualitative congestion data (from Google Traffic) to create a composite congestion score. The weights assigned to the congestion data are shown in Table 3-2. This score represents a weighted measure of congestion generated from the various different data sets, both quantitative and qualitative, that identifies congestion hotspots within the region. Figure 3-5 displays congestion hotspots determined by the number of data sources which indicate there is congestion for a particular segment.

Table 3-2: Congestion Score Data Weighting

	Number of Sources	NPMRDS	INRIX	TDM	Google	Total
All Sources	5%	20%	50%	20%	5%	100%
TDM + INRIX	5%		60%	30%	5%	100%
TDM + NPMRDS	5%	50%		40%	5%	100%
TDM Only	25%			70%	5%	100%

Figure 3-5: KTMPO Congestion Hotspots (All Sources)



Prioritization Process

The data conflation process results in a combined measure of congestion that can be used to rank the segments of the CMP Network to determine the "worst" performing segments in terms of vehicle travel speed. However, the goals and objectives of the KTMPO CMP do not focus solely on speed data as the only means to target congestion mitigation strategies. For that reason, this 2016 CMP Update introduces a more robust congestion hotspot prioritization process that considers other elements of the transportation system as evaluation criteria to determine which congested hotspots should be the primary focus of congestion mitigation strategies in the region. The following section describes the elements of the prioritization process.

Congestion Score

As described in the section about data conflation, each segment of the CMP Network was given a congestion score that represents a weighted measure of congestion as determined through the quantitative and qualitative congestion data collected for the network. The congestion score was the most heavily weighted evaluation criteria used in the prioritization process.

Other Evaluation Criteria

The CMP uses the other evaluation criteria described in the following section to prioritize congestion hotspots in the region. The full results of the prioritization process, including tables detailing the values assigned for the evaluation criteria for each segment, can be found in Appendix B.

Traffic Volume

Using traffic volumes in the prioritization process allows the CMP to consider not only the severity of congestion on each segment, but also the magnitude of the congestion (i.e. how many people are affected by congestion). The volume data used in the prioritization process was taken from the Travel Demand Model, and represents the average flow along all TDM links within a segment.

Safety

One of the primary goals of the CMP is to facilitate the movement of people and goods in a safe manner. Therefore, safety was a major consideration in the prioritization process for the 2016 CMP Update. There were two evaluation criteria related to safety that were used to rank the congested hotspots:

- **Crash Rate** – The prioritization process uses the number of crashes normalized by the volume of traffic along each roadway in the CMP Network to prioritize congestion hotspots. The goal of including the crash rate is that segments with higher occurrences of crashes will receive higher priority so that future projects aimed at addressing congestion on that segment may also reduce crash rates.
- **Rear End Crash Rate** – In addition to considering the overall crash rate, the prioritization process also considers the percentage of crashes that are rear-end collisions. Rear end crashes could correspond to a higher prevalence of congestion where motorists may unexpectedly encounter congestion-related queues.

School Locations

The location of schools along the CMP Network may influence congestion due to the concentrated nature of school-related trips. The inclusion of school location in the prioritization process ensures that congestion hotspots that may either be affected by the presence of schools, or that may affect safety or access to schools in the region can be prioritized.

Transit Routes

Congestion along the CMP Network affects fixed-route buses in the Killeen-Temple area as much as it affects automobiles. Because the speed and travel time data available does not make any accommodation for the adverse impacts of congestion on public transportation, the prioritization process uses the presence of transit routes on CMP Network segments to ensure that congestion hotspots that affect transit vehicles are considered a higher priority for regional congestion reduction goals.

Public Need Identification

Finally, the prioritization process makes use of the public congestion survey that KTMPO produced at the beginning of the 2016 CMP Update process. Segments which survey respondents listed as congested with the highest frequency will receive greater priority in the final list of ranked congestion hotspots. Including the survey results in the process also ensures that KTMPO strongly considers public input when identifying congested locations in the region.

Evaluation Criteria Weighting

The process of determining weights for the evaluation criteria used to prioritize congestion hotspots was accomplished collaboratively with the project team, KTMPO staff, and members of the KTMPO Technical Advisory Committee (TAC). The TAC was presented with an initial list of recommended weights determined by the team in consultation with staff, and were given the opportunity to provide direct feedback on the criteria and initial weights at their July 6, 2016 meeting. The team also delivered an interactive spreadsheet tool that was distributed to both KTMPO staff and TAC members that allowed those surveyed to manually adjust the weights for each criteria and compare the shift in rank of each CMP Network segment that resulted with each change to the criteria weights.

After gathering feedback from the TAC, the project team revised the initial weights, and presented the revised weighting mix and resulting prioritized hotspot list back to the TAC at a meeting on August 3, 2016. After a final round of discussion and weighting adjustment, the TAC recommended that the Policy Board adopt the weighting mix shown in Table 3-3. The Policy Board approved the final evaluation criteria weights and resulting hotspot rankings on August 17, 2016. The complete prioritization matrix showing scores for each criteria on all segments of the CMP Network can be found in Appendix B.

Table 3-3: Final Evaluation Criteria Weighting

Criteria		Weight
Congestion Rank		30%
Volume		20%
Safety	Crashes	15%
	Rear-End Crashes	10%
Transit		15%
School		5%
Public Input		5%
Total		***100%***

Prioritized Hotspot List

Table 3-4 and Table 3-5 show the congested segments of the CMP Network, ranked based on the results of the prioritization process. The list is separated into highway and arterial elements of the CMP Network. The list represents a snapshot of the highest priority congestion hotspots along the transportation network in Killeen-Temple based on the data available during the 2016 CMP Update. As KTMPO continues to acquire data and update other regional planning documents, the evaluation criteria and weights used to sort this list should be revisited to ensure that the CMP continues to reinforce current planning efforts in the region.

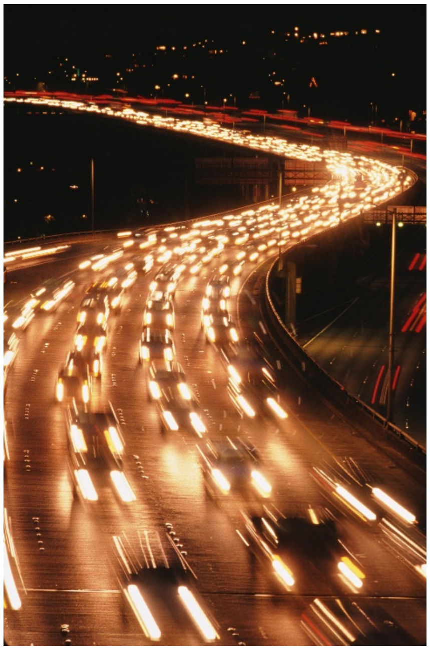
Table 3-4: Final Prioritized List of Congestion Hotspots – Highways

Segment ID	Description	Priority Rank
4C	US 190 - SH 9 TO FM 3470/STAN SCHLUETER LOOP	1
4D	US 190 - FM 3470/STAN SCHLUETER LOOP TO BUSINESS 190	2
4E	US 190 - BUSINESS 190 TO IH 35	3
20A	IH 35 - SALADO (FM 2268) TO US 190	4
20C	IH 35 - S LOOP 363 TO N LOOP 363	5
26B	LOOP 363 - SPUR 290 TO IH 35 S	6
20B	IH 35 - US 190 TO S LOOP 363	7
20D	IH 35 - N LOOP 363 TO FALLS COUNTY LINE	8
26C	LOOP 363 - IH 35 S TO SH 36	9
26A	LOOP 363 - US 190 TO SPUR 290	10
16	SH 195 - WILLIAMSON COUNTY LINE TO FM 3470/STAN SCHLUETER LOOP	11
32B	US 190 SE - PRITCHARD RD TO MILAM COUNTY LINE	12
4A	US 190 - FM 1715 TO BUSINESS 190	13
28	SH 36/AIRPORT RD - LOOP 363 TO SH 317	14
32A	US 190 SE - LOOP 363 TO PRITCHARD RD	15
26E	LOOP 363 - IH 35 N TO SH 53	16
26D	LOOP 363 - SH 36 TO IH 35 N	17
26F	LOOP 363 - SH 53 TO US 190	18

Table 3-5: Final Prioritized List of Congestion Hotspots – Arterials

Segment ID	Description	Priority Rank
17	TRIMMIER RD - FM 3470/STAN SCHLUETER LOOP TO HALLMARK AVE	1
9	FM 3470/STAN SCHLUETER LOOP - SH 201/CLEAR CREEK RD TO US 190	2
4B	US 190 - US 190 BYPASS W TO US 190 BYPASS E	3
14	RANCIER AVE - FORT HOOD ST TO ROY REYNOLDS DR	4
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	5
24	SH 317 - US 190 TO SH 36	6
7	BUSINESS 190 - US 190 TO ROY REYNOLDS DR	7
23	LOOP 121 - IH 35 TO LAKE RD	8
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	5
13	WS YOUNG DR - ILLINOIS AVE TO FM 3470/STAN SCHLUETER LOOP	9
1	AVE D - N 1ST ST TO BUSINESS 190	10
29	FM 2305/ADAMS AVE - FM 2271 TO 3RD ST	11
8	FM 2410 - US 190 TO WARRIORS PATH	12
25	FM 1741/S 31ST ST - CANYON CREEK DR TO SH 53/ADAMS AVE	13
18	WILLOW SPRINGS RD - US 190 TO WATERCREST RD	14
2	FM 116 - AVE D TO ELIJAH RD	15
22	LAKE RD - FM 2271 TO SH 317	16
31	SPUR 290/S 1ST ST - S LOOP 363 TO AVE E	17
21	FM 93/NOLAN VALLEY RD - WHEAT RD TO SH 317	18
30	SPUR 290/3RD ST - AVE E TO IH 35	19
11	HALLMARK AVE - FORT HOOD ST TO TRIMMIER RD	20
6	38TH ST - BUSINESS 190 TO RANCIER AVE	21
12	N 2ND ST - HALLMARK AVE TO RANCIER AVE	22
27	INDUSTRIAL BLVD - OLD HOWARD RD TO IH 35	23
15	ROY REYNOLDS DR - BUSINESS 190 TO RANCIER AVE	24
33	SH 53/ADAMS AVE - 3RD ST TO E LOOP 363	25
19	FM 2271 - LAKE RD TO FM 2305/W ADAMS AVE	26

4. Congestion Mitigation Strategies



The CMP is a tool to be utilized in the KTMPO region to address persistent congestion problems and prioritize transportation investments. There are many congestion management strategies and these strategies differ in terms of effectiveness, cost, complexity, and difficulty of implementation. Congestion management strategies are not one size fits all. Congested roadways and intersections need to be properly examined to evaluate which congestion mitigation strategy will effectively improve the congestion related problems. The CMP framework identifies numerous congestion mitigation strategies that can individually or collectively improve the operational efficiency of the KTMPO transportation system. When suitable strategies are implemented, the improvements impact auto, transit, pedestrian, and bicycle usage. The following sections identify several proven congestion management strategies that can be used to mitigate congestion in the KTMPO region.

Identifying Strategies

The mitigation strategies presented in the following section were selected based on their appropriateness for the KTMPO region and address congestion from a variety of angles. New infrastructure, infrastructure optimization, technological efficiency improvement, non-motorized improvement, and non-infrastructure program strategies have been considered for this plan. These strategies confront congestion at multiple scales so as to address deficiencies at specific locations as well as region-wide. Some strategies are more appropriate for highway projects, while others are more appropriate for arterial road projects.

How well each strategy can effectively mitigate operational, intersection, and capacity deficiencies depends on the specifics of each situation. There is no single best strategy for mitigating congestion. Instead, areas prone to congestion need to be reviewed on a case-by-case basis, and the most appropriate strategies for each situation need to be selected. This plan provides a toolbox of strategies that are already being used in the KTMPO area, as well as additional strategies that are being implemented in similar areas.

New Infrastructure

New infrastructure strategies, such as building new roadways, are typically used to significantly increase capacity in areas with high congestion. New infrastructure strategies typically do not aid in relieving non-recurring congestion, which accounts for about half of all congestion (FHWA, 2015). Non-recurring congestion, such as construction work, weather, and special events should be addressed by other means. Building new infrastructure can also be much more cost-intensive than improving existing infrastructure or operations, especially if new right-of-way must be procured.

Constructing Park-and-Ride Facilities

Park-and-ride facilities allow easy integration of multiple transportation modes and help facilitate the use of alternative transportation to and from areas with high traffic volumes. Motorists can leave their cars at the facility, then use transit to complete their journey. This relieves the motorists from the burden of finding parking at the final destination and can provide a more pleasant commute experience compared to driving in congested traffic.

Passenger Rail

Passenger rail can more efficiently move greater numbers of travelers further distances and relieve congestion between major destinations. Passenger rail is not likely to be an appropriate short-term strategy for the KTMPO region, but may become feasible as the region continues to grow and if KTMPO's transportation planning processes identify rail transportation as a regional preference.

New SOV Lanes

Additional single occupancy vehicle (SOV) lanes can be added to existing roadways and create additional capacity when necessary. While additional SOV lanes may address capacity deficiencies and relieve congestion in the short-term, studies have shown that they may also incentivize automobile trips to the point that the additional capacity is quickly occupied and congestion recurs shortly after expansion is complete (a phenomenon known as "induced demand.")

New Location Roadways

New location roadways create connections between popular destinations and relieve congestion in other areas. Particular attention should be paid to right-of-way preservation for identified new-location roadways as the area develops.

HOV Lanes

Incentivized capacity increases can reduce the number of SOVs on the roadway and reduce congestion. Only vehicles with multiple passengers may use HOV lanes, which are typically less crowded than other travel lanes. The possibility of a faster commute may encourage more people to carpool, reducing the number of cars on the road and, subsequently, congestion.

Infrastructure Operations

Strategies to improve infrastructure operations can significantly enhance the efficiency of the transportation system. These strategies are designed to allow more effective management of the supply and use of existing roadway facilities. Infrastructure operations strategies can effectively increase capacity without construction of additional general purpose lanes. These strategies typically have a lower cost, can be implemented faster, and require less right-of-way compared to new infrastructure mitigation strategies.

Access and Driveway Spacing

Steady traffic flows are more easily maintained when access points and intersections are spaced further apart. This strategy can also reduce conflict points with pedestrians and other roadway users. Similarly, wider driveway spacing can improve traffic flow and reduce the number of merging conflict points along roadways.

Median Treatments

Non-traversable and raised medians, as well as two-way left-turn lanes (TWLTL), can regulate access to a roadway and reduce the number of crashes.

Right-of-Way Management

Maintaining and preserving existing right-of-way makes it easier to make future roadway improvements, as the region grows and roadway enhancements become more necessary.

Highway Geometric Improvements

Improvements to highway geometry can reduce crashes and improved traffic flows.

Wayfinding and Signage Improvements

Clearly marked streets and wayfinding can help maintain steady traffic flows and direct vehicles down the most appropriate routes.

Transit Fixed Route Operations

Fixed route transit services, such as additional bus routes, can provide a more predictable and reliable service to transit users and encourage others to begin using this service instead of driving. The presence of transit service has the effect of increasing total capacity of a roadway due to the more efficient utilization of space needed to move several people by a bus or transit vehicle compared to several single-occupant automobiles.

Intersection Turn Lanes

By separating turning traffic from through traffic, movement can be maintained and the number of vehicle conflicts can be reduced.

Grade Separated Railroad Crossings

Grade separation can improve safety and reduce the amount of queued traffic caused by long trains.

Roundabout Intersections

Roundabouts can help facilitate a continuous flow of traffic and reduce the number of conflicts in an intersection. By reducing the amount of stop and go traffic, roundabouts can also improve air quality and reduce noise.

Acceleration/Deceleration Lanes

Additional lanes for accelerating or decelerating allow for vehicles to safely match speeds with other vehicles before merging.

Hill-Climbing Lanes

Hill-climbing lanes allow for safe passing of slower vehicles while ascending hills.

Grade-Separated Intersection

The separation of grades at intersections can reduce vehicle conflicts where crashes are more likely to occur.

Designated Truck Routes

Diverting commercial and truck traffic to designated roads can limit congestion, air pollution, and noise along those roads, while potentially relieving congestion on other roads.

Bus on Shoulder System (BOSS)

A bus on shoulder system allows for buses to operate on shoulders to bypass traffic. This frees up space on the roadway for other vehicles but also provides a higher level of service to transit users.

Bus Pullouts

Bus pullouts allow for buses to move off of the street when picking up or dropping off passengers, which prevents the disruption of traffic flow for automobile users on a roadway. Care should be taken when implementing bus pullouts that the transit vehicle is able to re-enter the flow of traffic in a reasonable way, which is typically accomplished through some sort of transit signal that stops automobile traffic once the transit vehicle is ready to leave the pullout.

Bottleneck Removal

By correcting and removing physical limitations that form capacity constraints, traffic can flow more freely without backing up.

Technological Efficiency Improvement

Technological efficiency improvement strategies utilize modern technology and computing capabilities to improve efficiency and operations in the existing transportation system. These strategies typically involve using sensors to collect and process data about traffic conditions. Information about traffic conditions can be directly presented to commuters in the form of electronic signage so that they can make travel decisions based on current conditions. The information can also be used to manipulate traffic operations based on current demands. Technological efficiency improvement strategies can effectively increase a transportation system's capacity without requiring costly and time-consuming construction.

Ramp Metering

Ramp metering maintains incoming and outgoing traffic flows to and from highways and can help manage high-traffic areas efficiently.

Traveler Information and Rerouting Systems

Through a system of communication means, such as electronic signs, traffic can be directed along alternative corridors when other corridors become congested.

Electronic Commercial Vehicle Clearance and Tolls

These tolls regulate the flow of commercial vehicles so as to reduce the freight demand on certain roadways during periods of high demand.

Bluetooth-Based Travel Time Measurement

Accurate travel-time estimates can help motorists make decisions on which routes to take and when to take them.

Route Information

By informing people about current travel conditions and recommended routes/detours, congestion can be avoided.

Traffic Signal Optimization

Optimizing timings and sensors for location specific needs can help maintain traffic flows.

Transit Signal Priority

By giving transit services priority at traffic signals, transit services can be improved and incentivized as a viable mode of transportation.

Demand-Responsive Signal System

Traffic signals modify timings based on traffic demand and help to maintain traffic flows when the transportation system is under heavy load.

Transit Vehicle Tracking

Tracking the exact locations and arrival times of transit vehicles can improve the user experience and incentivize transit use.

Non-Motorized Improvements

Non-motorized improvement strategies typically involve improving or creating new infrastructure that more effectively facilitates the use of active transportation. Active transportation includes modes such as walking or biking. Encouraging and facilitating active transportation can help reduce the number of trips made by single occupancy vehicles, thus reducing congestion on roadways. According to the National Travel Household Survey (2009), about half of all trips in metropolitan areas are three miles or less and about 28% of all trips are one mile or less. These distances can easily be made by bicycle or on foot, but 65% of trips one mile or less are made by automobile. Capacity improvements for non-motorized transportation often have no effect on motorized transportation capacity but can decrease the demand for motorized transportation. Non-motorized improvements can also improve safety conditions and reduce conflicts for people who currently already use active transportation.

Bicycle Paths/Lanes

Additional bicycle lanes/paths can improve safety for those who travel by bicycle and help to facilitate the use of bicycles to replace shorter trips usually taken by cars.

Sidewalks

Sidewalks along roadways can improve the safety conditions for pedestrians and help reduce conflicts between pedestrians and motorists.

Pedestrian Signals

Pedestrian signals can help to improve pedestrian safety as well as reduce conflicts at intersections.

Bicycle Racks

Secure, safe, and convenient bicycle parking options can encourage more cycling and reduce trips taken by car.

Safe Routes to School Program

This federally funded program helps to invest in and improve pedestrian and bicycle infrastructure near schools, allowing children and parents to use alternative modes of transportation to get to and from school.

Bike Sharing System

A network of bicycle rental stations allows for people to make short trips by bicycle. Bike sharing systems are good for resolving the "last mile problem," which refers to either the first or last leg of a transit trip that is often too far to walk. Bike sharing already exists in many cities across Texas and is seen as a good way to replace shorter car trips with bicycle trips.

Non-Infrastructure Improvement

These strategies often involve incentivized programs to help manage demand without the need to improve existing infrastructure or construct expensive new infrastructure. Some strategies can be directly implemented by a municipality or government, while others would be implemented by employers and incentivized through tax benefits. These strategies are often implemented region-wide to mitigate congestion rather than at specific locations and can be very low-cost.

Motorist Assistance Patrols

Special patrols can access accidents and stranded vehicles more quickly and get traffic moving again. An example of this is the HERO (Highway Emergency Response Operator) program, which operates in the Austin metropolitan area.

Strategies to Improve Accident Response and Clearance Time

Improved accident response and clearance times mean that accidents can be addressed sooner and normal traffic conditions can be restored more quickly.

Initiating and Managing a Rideshare Program

Ridesharing programs, which match employees that leave near one another to facilitate carpooling, can result in fewer cars on roads and less congestion, while also encouraging travelers to utilize an alternative mode of transportation.

Flexible Work Hours

Flexible work hours relieve stress on the transportation network during peak travel times by allowing people to commute to and from work at off-peak travel times.

Telecommuting

Telecommuting allows for people to work from home and reduces the number of trips between work and home during peak travel times.

Satellite Offices

Satellite offices can disperse jobs throughout a larger area, rather than in one office. This prevents concentrated congestion in one area.

Land Use Management

Controlling and regulating land uses can help control which types and how many trips are being made in specific areas. Managing growth and development can directly impact the transportation system as well as influence how commuters select their travel mode. Implementing land uses that contain a mix of residential, retail, and employment can improve the feasibility of conducting trips by walking or biking, therefore reducing automobile demand on congested corridors.

Commuter Choice Tax Benefits

Employers can provide incentives and discounted transit passes to encourage transit use in exchange for tax benefits.

HOV Toll Savings

Preferential pricing for multi-occupant vehicles on toll roads incentivizes ridesharing, which can again reduce the number of cars on the road at a particular time.

Parking Management

Preferential parking for vehicles that carry more than a single occupant can encourage ridesharing.

Driver Education

Driver education programs can inform drivers about choices that are available to avoid and reduce congestion.

CMP Strategy Toolbox

Table 4-1 displays the "toolbox" of strategies for the KTMPO region to consider when managing congestion. The toolbox includes several attributes for each strategy to help local policy-makers and transportation planners assess the applicability of each strategy to particular types of deficiencies/congestion in the region (columns 2 through 4). Columns 5 through 10 provide information about each strategy in terms of implementation period, inclusion in the 2013 CMP, and appropriate facility type for implementation: highway, arterial, or strategies that are not dependent on any particular location but are instead regional in extent (typically strategies that address demand management).

Table 4-1: CMP Strategy Toolbox

Strategies	Operational Deficiency	Intersection Deficiency	Capacity Deficiency	Short Term Strategy	Long Term Strategy	Included in 2013 Plan	Highway Strategies	Arterial Strategies	Regional Strategies	Cost
NEW INFRASTRUCTURE										
Constructing Park-and-Ride Facilities	X				X	X			X	$$
New SOV Lanes			X	X		X	X	X		$$$
New Location Roadways			X	X		X	X	X		$$$$
Passenger Rail			X		X	X			X	$$$$
HOV Lanes			X		X	X	X			$$$
INFRASTRUCTURE OPTIMIZATION										
Access Spacing	X			X		X	*	X		$
Driveway Spacing	X				X	X		X		$
Median Treatments	X			X		X		X		$
Right of Way Management	X		X		X	X	X	X		$
Highway Geometric Improvements	X				X	X	X	X		$$
Way Finding and Signage Improvements	X			X		X			X	$
Transit Fixed Route Operations			X		X		*	X	X	$$
Bus on Shoulder System (BOSS)	X		X	X			X	*		$
Bus Pullouts	X			X			*	X		$$
Intersection Turn Lanes	X	X			X	X		X		$$
Grade Separated Railroad Crossings	X				X	X	X	X		$$$
Roundabout Intersections		X			X	X		X		$$
Acceleration/Deceleration Lanes	X				X	X	X	X		$$
Grade-Separated Intersection		X			X	X	X	X		$$$
Designated Truck Routes	X				X				X	$
Bottleneck Removal	X				X		X	X		$$$
Hill-Climbing Lanes	X				X	X	X	X		$$
TECHNOLOGICAL EFFICIENCY IMPROVEMENTS										
Demand-Responsive Signal System	X	X		X				X		$$
Traveler Information and Rerouting Systems	X				X	X			X	$$
Traffic Signal Optimization	X	X		X				X		$$
Bluetooth-Based Travel Time Measurement	X			X		X			X	$
Route Information	X				X				X	$
Electronic Commercial Vehicle Clearance and Tolls	X				X	X	X	X		$$
Ramp Metering	X				X	X	X			$$
Transit Signal Priority	X	X			X			X		$$
Transit Vehicle Tracking	X			X					X	$$
NON-MOTORIZED IMPROVEMENTS										
Bicycle Paths/Lanes	X		X	X		X	X	X	X	$/$$
Bicycle Racks	X			X		X			X	$
Bikeshare System	X		X		X				X	$$$
Sidewalks	X		X	X		X		X	X	$/$$
Pedestrian Signals		X			X	X		X	X	$
Safe Routes to School Program	X			X					X	$
NON-INFRASTRUCTURE STRATEGIES										
Flexible Work Hours				X		X			X	$
Motorist Assistance Patrols					X	X			X	$$
Strategies to Improve Response Time				X		X			X	$
Strategies to Reduce Clearance Times					X	X			X	$
Initiating and Managing a Rideshare Program					X	X			X	$$
Parking Management				X				X	X	$$
Telecommuting				X		X			X	$
Satellite Offices					X	X			X	$$
Land Use Management					X	X			X	$
Commuter Choice Tax Benefits				X					X	$$
HOV Toll Savings					X		X		X	$$
Driver Education					X				X	$

Evaluating Strategy Effectiveness

The 2016 CMP update provides KTMPO with a prioritized list of congested roadway segments in the region, as well as a list of strategies that can be considered in future planning studies that may address congestion in those hotspot locations. This update also takes the initial step of assessing the effectiveness of each of these strategies towards addressing the particular congestion problems identified during data analysis. The matrices in Tables 4-2 through Table 4-4 show whether a highway or arterial congestion mitigation strategy is likely to be effective, marginally effective, or not applicable to each segment of the CMP Network. As the priorities and travel patterns in the region continue to change, new projects are implemented, and new mitigation strategies are identified, these matrices will be updated to reflect the most up-to-date assessment of how the region can best address its congestion needs. It should also be noted that these recommendations are no substitute for detailed corridor-level analyses, which will be necessary to conduct before any specific projects can be advanced through the region's Metropolitan Transportation Plan (MTP) and Transportation Improvement Plan (TIP) planning and implementation processes.

Table 4-2: CMP Strategy Effectiveness (Highways)

Segment ID	Description	Priority Rank	Operational Deficiency	Instersection Deficiency	Capacity Deficiency	Current Project	New SOV Lanes	New Location Roadways	HOV Lanes	Access Spacing	Right of Way Management	Highway Geometric Improvements	Transit Fixed Route Operations	Bus on Shoulder System (BOSS)	Bus Pullouts	Acceleration/Deceleration Lanes	Grade-Separated Intersection	Bottleneck Removal	Hill-Climbing Lanes	Electronic Commercial Vehicle Clearance & Tolls	Ramp Metering	Bicycle Paths/Lanes
4C	US 190 - SH 9 TO FM 3470/STAN SCHLUETER LOOP	1	-	-	X	✓	*	○	◐	○	●	◐	◐	●	○	●	○	●	◐	●	●	◐
4D	US 190 - FM 3470/STAN SCHLUETER LOOP TO BUSINESS 190	2	-	-	X	✓	*	○	◐	○	●	◐	◐	●	○	●	○	●	◐	●	●	◐
4E	US 190 - BUSINESS 190 TO IH 35	3	X	-	-	F	*	○	◐	○	●	◐	◐	●	○	●	○	●	◐	●	●	◐
20A	IH 35 - SALADO (FM 2268) TO US 190	4	-	-	X	✓	*	○	◐	○	●	◐	◐	●	○	●	○	●	◐	●	◐	◐
20C	IH 35 - S LOOP 363 TO N LOOP 363	5	-	-	X	✓	*	○	◐	○	●	◐	◐	●	○	●	○	●	◐	●	◐	◐
26B	LOOP 363 - SPUR 290 TO IH 35 S	6	X	-	!	-	◐	○	◐	○	●	●	◐	●	○	●	○	●	○	●	◐	◐
20B	IH 35 - US 190 TO S LOOP 363	7	-	-	X	✓	*	○	◐	○	●	◐	◐	●	○	●	○	●	◐	●	◐	◐
20D	IH 35 - N LOOP 363 TO FALLS COUNTY LINE	8	-	-	X	✓	*	○	◐	○	●	◐	◐	●	○	●	○	●	◐	●	◐	◐
26C	LOOP 363 - IH 35 S TO SH 36	9	X	-	-	-	◐	○	○	○	●	●	◐	●	○	●	○	●	○	●	◐	◐
26A	LOOP 363 - US 190 TO SPUR 290	10	X	X	-	F	◐	○	○	○	●	●	◐	●	○	●	●	●	○	●	◐	◐
16	SH 195 - WILLIAMSON COUNTY LINE TO FM 3470/STAN SCHLUETER LOOP	11	-	X	-	-	◐	○	○	◐	●	●	○	○	○	●	●	●	●	◐	○	◐
32B	US 190 SE - PRITCHARD RD TO MILAM COUNTY LINE	12	X	X	-	-	◐	◐	○	●	●	◐	○	○	○	●	●	●	○	◐	○	◐
4A	US 190 - FM 1715 TO BUSINESS 190	13	-	X	-	-	◐	◐	○	◐	●	●	○	○	○	●	●	●	◐	◐	○	◐
28	SH 36 - LOOP 363 TO SH 317	14	X	-	-	-	◐	○	○	●	●	◐	◐	◐	◐	●	◐	●	◐	◐	○	●
32A	US 190 SE - LOOP 363 TO PRITCHARD RD	15	X	X	-	-	◐	○	○	●	●	◐	○	○	○	●	●	●	○	◐	○	◐
26E	LOOP 363 - IH 35 N TO SH 53	16	-	-	!	-	◐	○	○	◐	●	●	◐	◐	○	●	◐	●	○	●	◐	◐
26D	LOOP 363 - SH 36 TO IH 35 N	17	-	-	!	-	◐	○	○	◐	●	●	◐	◐	○	●	◐	●	○	●	◐	◐
26F	LOOP 363 - SH 53 TO US 190	18	-	-	!	-	◐	○	○	◐	●	●	◐	◐	○	●	○	●	○	●	◐	◐

! - Potential Future Deficiency F - Future Planned Project * - Strategy Being Implemented by Current or Future Project

○ - N/A ◐ - Marginally Effective ● - Effective

Table 4-3: CMP Strategy Effectiveness (Arterials)

Segment ID	Description	Priority Rank	Operational Deficiency	Instersection Deficiency	Capacity Deficiency	Current Project	New SOV Lanes	New Location Roadways	Access Spacing	Driveway Spacing	Median Treatments	Right of Way Management	Highway Geometric Improvements	Transit Fixed Route Operations	Bus on Shoulder System (BOSS)	Bus Pullouts	Intersection Turn Lanes	Grade Separated Railroad Crossings	Roundabout Intersections	Acceleration/Deceleration Lanes	Grade-Separated Intersection	Bottleneck Removal	Hill-Climbing Lanes	Demand-Responsive Signal System	Traffic Signal Optimization	Electronic Commercial Vehicle Clearance and Tolls	Transit Signal Priority	Bicycle Paths/Lanes	Sidewalks	Pedestrian Signals
17	TRIMMIER RD - FM 3470/STAN SCHLUETER LOOP TO HALLMARK AVE	1	X	X	X	F	○	●	◐	◐	●	◐	○	●	○	◐	●	○	○	○	○	●	○	●	●	○	●	●	●	●
9	FM 3470/STAN SCHLUETER LOOP - SH 201/ CLEAR CREEK RD TO US 190	2	X	X	X	-	◐	●	◐	○	●	●	◐	●	◐	●	●	○	◐	◐	◐	●	○	●	●	◐	●	◐	●	●
4B	US 190 - US 190 BYPASS W TO US 190 BYPASS E	3	X	-	X	-	○	*	○	○	●	●	○	●	◐	●	●	○	◐	○	○	●	○	●	●	◐	●	◐	●	●
14	RANCIER AVE - FORT HOOD ST TO ROY REYNOLDS DR	4	X	-	-	-	○	●	○	○	●	◐	○	●	○	●	●	○	●	○	○	●	○	●	●	○	●	●	●	●
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	5	X	-	X	-	◐	●	◐	○	●	●	○	●	○	●	●	●	◐	◐	◐	●	○	●	●	◐	●	◐	●	●
24	SH 317 - US 190 TO SH 36	6	X	-	-	✓	◐	●	◐	◐	◐	●	◐	●	◐	●	◐	○	●	◐	◐	●	○	●	●	◐	◐	◐	●	●
7	BUSINESS 190 - US 190 TO ROY REYNOLDS DR	7	X	-	X	-	◐	●	○	○	●	●	◐	●	◐	●	◐	○	◐	◐	◐	●	○	●	●	○	●	●	●	●
23	LOOP 121 - IH 35 TO LAKE RD	8	-	X	-	-	●	●	◐	◐	◐	●	◐	●	○	●	●	○	●	○	○	●	○	●	●	○	◐	●	●	●
13	WS YOUNG DR - ILLINOIS AVE TO FM 3470/STAN SCHLUETER LOOP	9	X	X	-	-	○	●	◐	◐	●	◐	○	●	○	◐	◐	○	●	○	○	●	○	●	●	○	●	●	●	●
1	AVE D - N 1ST ST TO BUSINESS 190	10	-	-	X	-	◐	●	◐	◐	◐	◐	○	●	○	◐	●	○	●	○	○	●	○	●	●	○	◐	●	●	●
29	FM 2305/ADAMS AVE - FM 2271 TO 3RD ST	11	X	-	-	-	◐	●	◐	◐	●	●	◐	●	◐	●	◐	○	◐	◐	◐	●	○	●	●	◐	●	●	●	●
8	FM 2410 - US 190 TO WARRIORS PATH	12	X	X	-	-	◐	●	◐	◐	◐	●	◐	●	○	◐	●	○	◐	○	○	●	◐	●	●	○	◐	●	●	●
25	FM 1741/S 31ST ST - CANYON CREEK DR TO SH 53/ADAMS AVE	13	-	X	-	-	◐	◐	○	○	◐	●	●	●	○	●	◐	○	◐	○	○	●	○	●	●	○	●	●	●	●

Table 4-4: CMP Strategy Effectiveness Continued (Arterials)

Segment ID	Description	Priority Rank	Operational Deficiency	Instersection Deficiency	Capacity Deficiency	Current Project	New SOV Lanes	New Location Roadways	Access Spacing	Driveway Spacing	Median Treatments	Right of Way Management	Highway Geometric Improvements	Transit Fixed Route Operations	Bus on Shoulder System (BOSS)	Bus Pullouts	Intersection Turn Lanes	Grade Separated Railroad Crossings	Roundabout Intersections	Acceleration/Deceleration Lanes	Grade-Separated Intersection	Bottleneck Removal	Hill-Climbing Lanes	Demand-Responsive Signal System	Traffic Signal Optimization	Electronic Commercial Vehicle Clearance and Tolls	Transit Signal Priority	Bicycle Paths/Lanes	Sidewalks	Pedestrian Signals
18	WILLOW SPRINGS RD - US 190 TO WATERCREST RD	14	-	-	X	-	○	○	◐	◐	○	◐	◐	●	○	◐	◐	○	◐	○	○	●	○	●	●	○	●	●	●	●
2	FM 116 - AVE D TO ELIJAH RD	15	-	-	X	-	●	◐	●	●	◐	●	●	◐	○	◐	●	◐	◐	◐	◐	●	◐	●	●	◐	◐	◐	●	●
22	LAKE RD - FM 2271 TO SH 317	16	X	-	-	-	◐	◐	◐	◐	◐	●	●	◐	○	◐	◐	○	●	○	○	●	○	●	●	○	◐	●	●	●
31	SPUR 290/S 1ST ST - S LOOP 363 TO AVE E	17	X	-	-	-	○	○	●	●	○	◐	◐	●	○	●	●	○	●	○	○	●	○	●	●	○	●	●	●	●
21	FM 93/NOLAN VALLEY RD - WHEAT RD TO SH 317	18	-	X	-	-	●	◐	◐	◐	◐	●	●	◐	○	◐	●	○	●	○	○	●	○	●	●	○	◐	●	●	●
30	SPUR 290/3RD ST - AVE E TO IH 35	19	X	-	-	-	○	○	◐	◐	◐	◐	◐	●	○	●	◐	○	●	○	○	●	○	●	●	○	●	●	●	●
11	HALLMARK AVE - FORT HOOD ST TO TRIMMIER RD	20	-	-	X	-	○	○	●	●	○	◐	◐	●	○	◐	●	○	●	○	○	●	○	●	●	○	●	●	●	●
6	38TH ST - BUSINESS 190 TO RANCIER AVE	21	X	-	-	-	◐	○	◐	◐	◐	◐	○	●	○	◐	◐	○	◐	○	○	●	○	●	●	○	●	●	●	●
12	N 2ND ST - HALLMARK AVE TO RANCIER AVE	22	-	X	-	-	○	○	●	●	○	◐	○	●	○	◐	●	◐	●	○	○	●	○	●	●	○	●	●	●	●
27	INDUSTRIAL BLVD - OLD HOWARD RD TO IH 35	23	X	-	-	-	◐	◐	◐	◐	◐	◐	◐	●	○	◐	◐	◐	◐	○	○	●	○	●	●	◐	●	●	●	●
15	ROY REYNOLDS DR - BUSINESS 190 TO RANCIER AVE	24	-	-	!	-	◐	○	◐	◐	◐	◐	○	●	○	◐	◐	●	●	○	○	●	○	●	●	○	●	●	●	●
33	SH 53/ADAMS AVE - 3RD ST TO E LOOP 363	25	!	-	-	-	◐	○	◐	◐	◐	●	○	●	○	●	◐	○	●	○	○	●	◐	●	●	◐	●	●	●	●
19	FM 2271 - LAKE RD TO FM 2305/W ADAMS AVE	26	-	-	!	-	◐	○	◐	◐	○	●	◐	◐	○	◐	◐	○	●	○	○	●	○	●	●	○	◐	◐	●	●

5. Plan Monitoring and Performance Tracking

"…the most important element of the CMP is the Monitoring Plan…"

The Congestion Management Process is intended to be a dynamic guidebook for tracking progress towards the region's congestion management goals. As such, the most important element of the CMP is the Monitoring Plan, which guides the MPO through the process of tracking and reporting performance on the CMP Network and assessing progress made towards congestion reduction.

The general steps required to carry out an effective monitoring program for congestion management are:

1. Maintain and update the designated CMP network
    a. Evaluate available data sources to determine any expansion in coverage
2. Identify locations where CMP projects have been implemented and document these segments in the appropriate GIS layer
    a. Identify the strategy within the strategy matrix that each project implements
3. Obtain selected monitoring datasets from TxDOT or other available sources
4. Use the performance monitoring datasets to evaluate the CMP network performance
5. Document outcomes, particularly at locations where transportation investments have been made, to determine performance improvements or identify challenges remaining to be addressed

The first two steps in the monitoring plan are straightforward and are not expanded upon in this chapter. The following sections describe the data sources, processing, and outcome documentation that KTMPO should implement to monitor system performance.

Step 3: Obtain Performance Data

As discussed in Chapter 2, thanks in large part to the proliferation of smartphone data, there are now a number of travel time data sources available to KTMPO through its planning partners. In monitoring system performance, KTMPO should seek to acquire the following data sources:

- **National Performance Management Research Data Set (NPMRDS)** – The NPMRDS is readily available through TxDOT and delivered in a manner that is fairly user-friendly. As the official data source used by FHWA to calculate Federal performance measures, the NPMRDS also provides KTMPO with technical support from FHWA. Unfortunately, data coverage is limited to roadways on the National Highway System. At the time of the 2016 CMP Update, FHWA was in the process of re-procuring the NPMRDS, so in upcoming years there may be changes to the format of the data.
- **INRIX –** INRIX is a private travel data company that collects data and sells it to interested parties. In this case, TxDOT has partnered with the Texas A&M Transportation Institute (TTI) to purchase data from INRIX and have TTI process the data to produce the annual list of the top 100 congested roadway segments

in the state. TxDOT makes the processed data available to MPOs, and the coverage of the data in KTMPO includes most of the roadways on the CMP Network.

- KTMPO Regional Travel Demand Model – KTMPO may seek to supplement the observed travel time datasets with forecast travel information produced by the regional Travel Demand Model. The TDM is typically updated every four to five years when the MPO prepares updates to the Metropolitan Transportation Plan. The TDM should be used to supplement information from primary sources, but not to replace them because it does not contain observed data, only forecasts of possible future transportation scenarios.
- Google Traffic – The MPO may also supplement the quantitative data with observations from the typical traffic layer available in Google Maps. KTMPO can collect the data qualitatively from the web in a process described in the following section or may contact Google directly to inquire about data availability for public sector users and transportation planning purposes.
- Bluetooth – Bluetooth detectors are currently operational only along IH 35 through the KTMPO region. However, as Bluetooth technology increases in breadth and accuracy, KTMPO may partner with local jurisdictions and TxDOT to acquire and install Bluetooth detectors along key routes in the CMP Network that may not be covered by the other available quantitative data sources.

Source: Michael Miller; FME News Service

Step 4: Evaluate CMP Network Performance

This section briefly describes the process for taking data from the most readily available datasets and converting it into a format where performance measures can easily be recorded. Data processing for any other dataset that the MPO may obtain should be a key consideration in determining whether the MPO should pursue additional data.

NPMRDS

Data processing for the NPMRDS is relatively straightforward given the partnership between the data collection company (HERE) and FHWA. The data file given to KTMPO by TxDOT includes several PDF guides to help the MPO process the data and connect it to the regional roadway system in GIS. The major steps in the process are as follows:

- *Process Raw Travel Time Data* – the travel time data is delivered for reporting segments – known as Traffic Messaging Channels (TMCs) – for every 30 second period throughout the reporting period (typically data files are delivered monthly). This raw data travel time data can be aggregated into 15-minute average speeds for file size management, and during the aggregation process, outliers can be removed.
- *Compute free-flow travel speed* – with the raw data, the user can also compute the 85th percentile travel speed, which is used as the freeflow travel speed for each TMC.
- *Compute performance measures* – once the 15 minute averages and freeflow speeds are determined, the TTI and Delay measures can be computed. Refer to the table in Chapter 3 for the calculation methods for each performance measure.

- *Connect performance measure calculations to geographic data* – the process for joining the performance data to the shapefile is explained in detail by the guidebook provided by FHWA that accompanies the data.

INRIX

In the file format that TxDOT provides INRIX data to its planning partners, most of the data processing has already been accomplished. The data deliverable contains a spreadsheet that has 15-minute average travel speeds and freeflow travel speeds already computed for each RHiNo segment, and a shapefile with the RHiNo segments for all roadways in the region. The MPO can use the 15-minute and freeflow speed data to compute the TTI and Delay performance measures. Additional delay measures outlined in Chapter 3 are available in another spreadsheet, which contains the performance measures calculated by TTI for the Texas 100 Most Congested Roadways. Note that the Texas 100 roadway network may not contain performance data for as many roadways as may be available through the 15-minute spreadsheet. The data deliverable also contains a guidebook that the MPO may use to join the calculated performance data to the provided shapefiles, although some care is advised to ensure that the directionality of the speed data aligns with the directionality of the shapefile.

Google Traffic

The first step to collect congestion data from Google Traffic is to identify a reference network (e.g. CMP Network) to determine which roads to evaluate. The network as a whole is split into manageable sections or cells that should roughly reflect the scale to which Google Maps is being viewed during the data collection. The scale in Google Maps should be defined so that all roads are easily identified—that is, roads do not overlap others to the point that the level of congestion cannot be deciphered—but it should not be zoomed in so far that the traffic overlay shows data for small local roads not a part of the analysis. A half-mile to one-mile scale in Google Maps should be sufficient.

The next step is to set up a data log which records a unique ID, street name, direction, and extent identified by closest cross street. Extent of each segment is different and does not necessarily have to be from one major road to another. The log should also include the specified time periods and days for which data is being collected. Once the congestion log is set up, the next step is to work cell-by-cell screening for congested segments. This process involves observing the Google Traffic overlay for each specified time period and day, taking note of where there is reoccurring congestion. Then, focusing in on one of the identified congested segments, record the segment description information in the data log and work through the different time periods recording the magnitude of congestion, based on the scale provided in Google Traffic. Once this process is completed for a segment, the process is repeated for other segments along the reference network in that cell. Before moving on to the next cell, screenshots of the full extent of the cell in Google Maps should be taken as a QC measure.

After all congested segments have been identified for the reference network, the collected congestion information is aggregated and brought into GIS. This is done by either creating a new shapefile and manually drawing in the congested segments based on Google base maps and the descriptions provided in the data log or by using the data log to approximately match the congestion data to a current network. The final product should include congested segments with associated attributes that describe the magnitude and/or duration of congestion as specified by a given scale relative to the Google Traffic scale. The congested segments can then be compared with segments on the CMP Network to determine to what extent the CMP Network segments are congested.

TDM

Travel speed information is included in the outputs from the TDM. The TDM outputs also contain information about volume on the roadway network (referred to as "flow" in the TDM) that is used during the hotspot prioritization process.

Prioritization Data

In order to supplement the congestion data and calculate evaluation measures used during the prioritization process, the MPO should also collect data from the following sources:

- *TxDOT Crash Recording Information System (CRIS)* – This dataset provides crash location information in a format that is easily convertible to a shapefile that can be used to calculate the crash rates and rear-end crash rates along CMP Network segments.
- *Transit Availability* – The MPO may partner with Hill Country Transit District (HCTD) to obtain shapefiles containing current and/or future transit routes. If HCTD installs Automatic Passenger Counters in the future, it may also be possible to incorporate route- or stop-specific transit ridership data into the prioritization matrix.
- *School Location* – School location shapefiles are readily available through GIS providers such as ESRI, or through the State. The MPO may also partner with local school districts to obtain or create a school location shapefile for the region.
- *Public Input* – KTMPO may conduct a Congestion Survey at any time and use the responses to calculate the most frequently identified congested locations along the CMP Network.

Performance Measures

As listed in Chapter 2, the performance measures recommended for use in monitoring system performance are:

- Travel Time Index
  - Average Daily
  - Maximum
- Delay
  - Average Daily
  - Peak Period
  - Annual Hours of Delay
- V/C Ratio (Current and Future)
  - Average Daily
  - Peak Period
- Transit Availability
- Crash Rate
- Rear-end Crash Rate

Step 5: Documenting Performance Outcomes

Once performance measures have been calculated from the appropriate datasets, KTMPO should note year-over-year changes in each metric for each reporting segment of the CMP Network. This should result in a re-prioritization of the segments to determine what changes (if any) have occurred to the list of highest priority congested roadway segments. The MPO may choose to expand upon or re-weight the evaluation criteria used in the prioritization process to best align the process with current metropolitan planning goals and objectives.

While documenting performance changes, KTMPO should note which segments of the CMP Network had congestion mitigation projects implemented during the time since the last performance update (this should have been accomplished in Step 2 of the monitoring plan). Noting correlations between the types of strategies that are implemented and the changes in congestion performance will allow the MPO to develop metrics that predict the expected performance impacts for strategies in the CMP Toolbox.

For example, if one of the region's municipalities implements a signal re-timing project along several roadway corridors on the CMP Network, the MPO can record the changes in the TTI and delay on those corridors before and after the signal re-timing and develop an average improvement value that can be expected on similar corridors for which signal re-timing is an appropriate congestion mitigation strategy. Once specific projects are implemented, performance improvement metrics can be directly compared to project costs to identify the most cost-effective congestion mitigation strategies that are tailored to conditions in the region.

Conclusion

An ongoing monitoring program is one of the key steps in implementing the FAST Act performance management strategy. It not only allows KTMPO to identify emerging problems on the transportation system, but it also allows the MPO to measure the outcomes of transportation investment decisions to determine if the planning process is being effective in addressing local transportation challenges. Learning what works and doesn't work provides a basis for continuous improvement in the outcomes of the metropolitan planning process.

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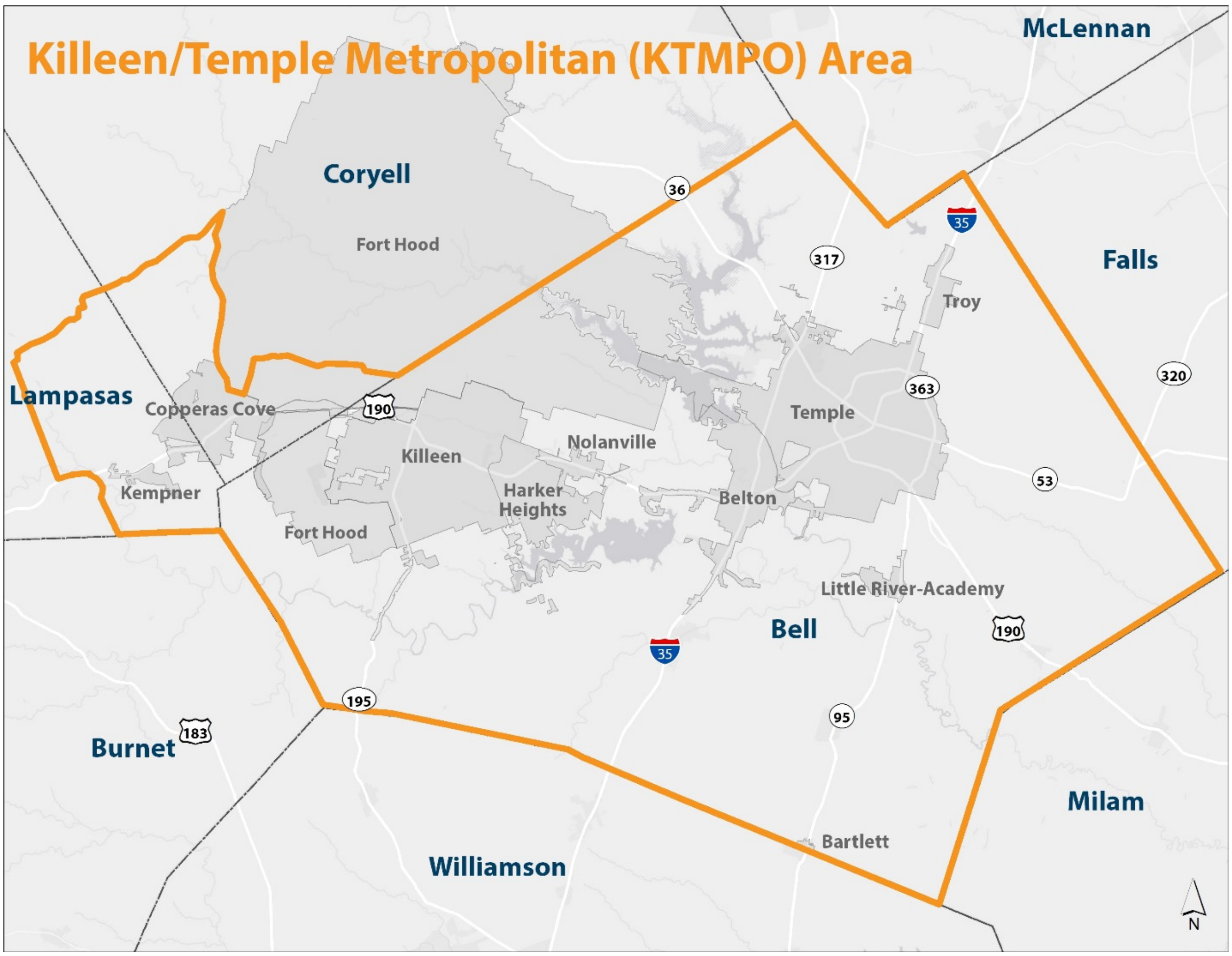
Appendix A

Congestion Survey Results Memo

KTMPO Congestion Management Process (CMP) | Survey Results

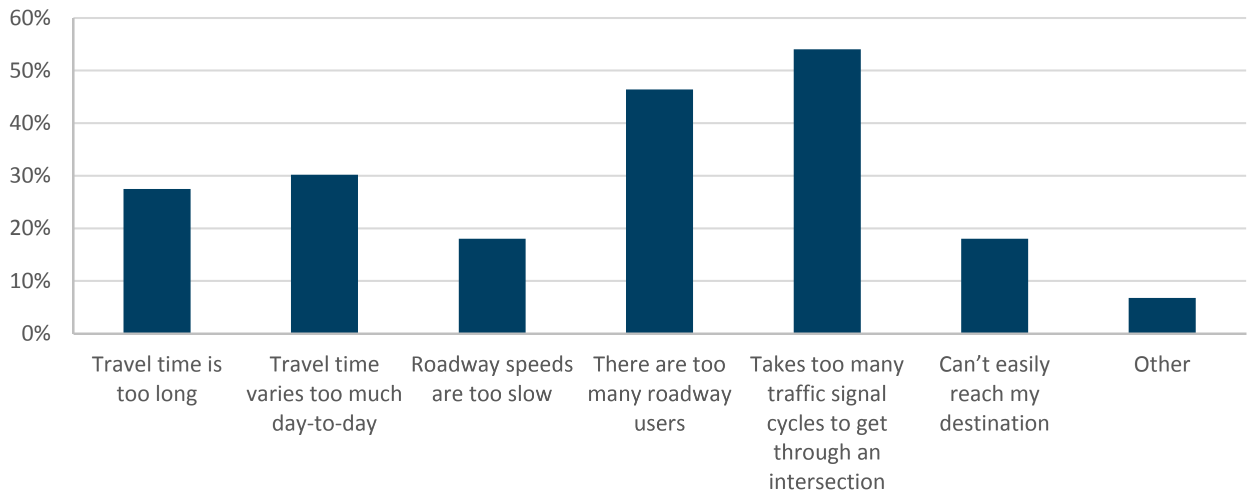
The congestion survey was designed to gather feedback on how travelers define and where they experience congestion in the Killeen/Temple metropolitan area (Fig. 1). This feedback was meant to supplement other quantitative/qualitative data sources in the process of identifying congested roadway segments and prioritizing which segments to focus congestion management efforts. The survey was open to the public from Feb. 29, 2016 to March 31, 2016 and received 222 responses. The following briefly summarizes and presents the results from the congestion survey.

Fig. 1: Killeen/Temple Metropolitan Area



In regards to overall congestion (i.e. Question 1 of the survey), 90% (200) of the respondents who answered the question agreed that traffic congestion was a significant problem in the Killeen/Temple metropolitan area. Since the definition of what is considered to be congestion changes from place to place, it was important to identify how Killeen/Temple travelers locally defined congestion. Fig. 2 illustrates the survey responses that helped to answer this question.

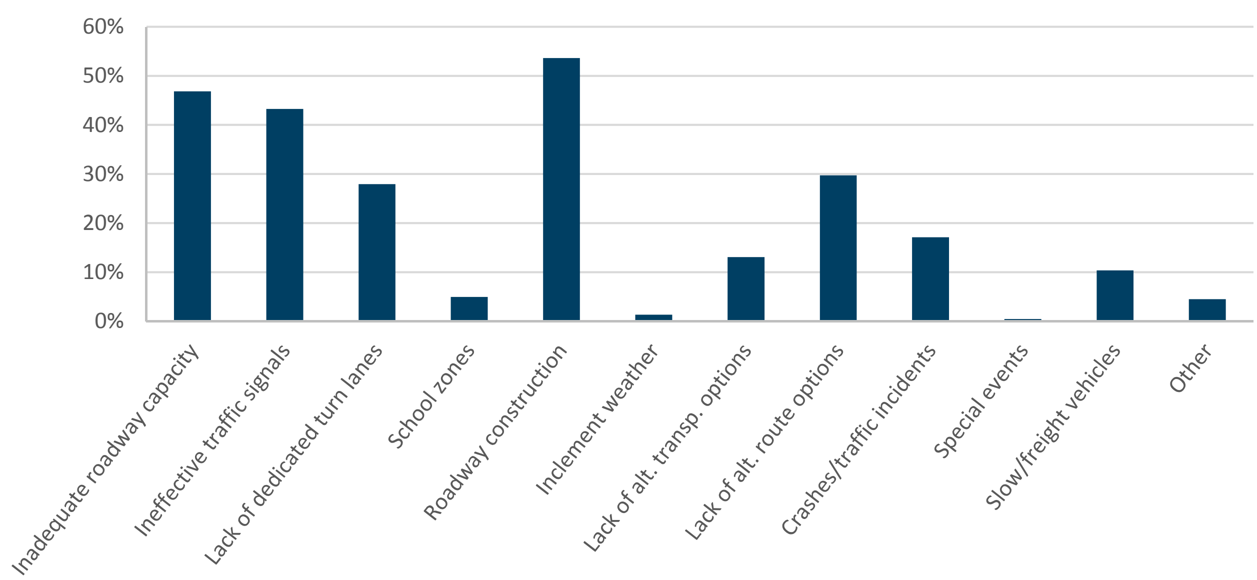
Fig. 2: Responses to survey Question 2 - Which of the following best fits your definition of traffic congestion?



Respondents to this question were given the option to select multiple answers, and 54% included "Takes too many traffic signal cycles to get through an intersection" in their definition of traffic congestion. This definition of congestion was agreed upon the most, while 46% believed traffic congestion in the area was defined as there being "…too many roadway users".

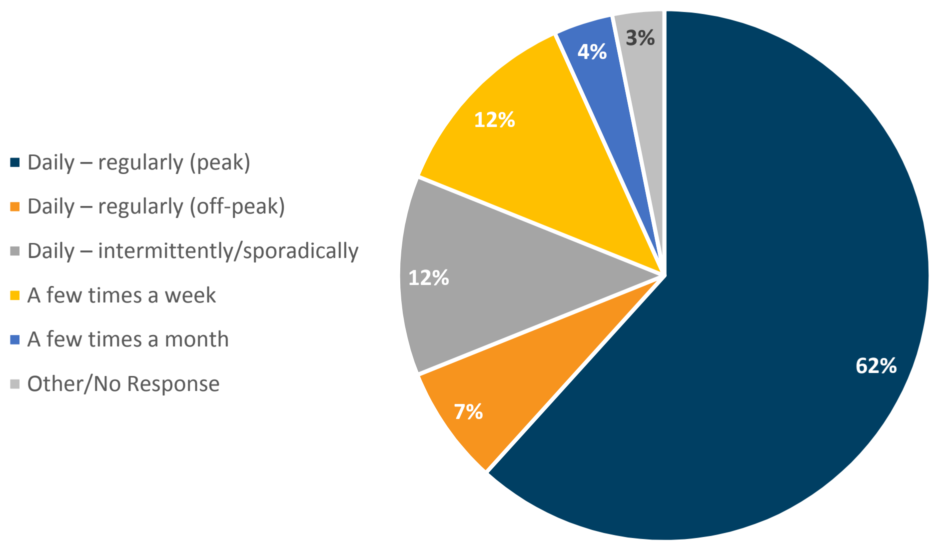
Additionally, survey respondents identified the causes of this type of traffic congestion. The biggest culprit for traffic congestion in the area, as pointed out by 54% of the respondents, was roadway construction—with inadequate roadway capacity (47%) and ineffective/poorly timed traffic signals (43%) being the next most identified causes of congestion. Fig. 3 presents the full results for the question linked to these answers; respondents were allowed choose multiple answers.

Fig. 3: Responses to survey Question 3 - What do you perceive are the biggest causes of traffic congestion in the Killeen/Temple metro area?



Looking at the frequency to which travelers experienced congestion in the area, 62% claimed to experience congestion daily during peak travel periods (7AM-9AM and 4PM-6PM). Fig. 4 provides the full results for determining the frequency in which respondents experienced congestion.

Fig. 4: Responses to survey Question 4 - How often do you experience traffic congestion in the Killeen/Temple metro area?



In terms of identifying where on the roadway network travelers were experiencing the most congestion (i.e. survey Question 5), the following table shows the top three most mentioned intersections and road segments.

Table 1: Responses to survey Question 5 - Worst Congestion Locations (Current)

Intersection	Mentions	Segment	Mentions
WS Young @ US 190	19	W. Adams Ave. (Temple)	19
FM 2410 @ US 190	15	WS Young Dr. (Killeen)	10
Trimmier Rd @ US 190	11	Trimmier Rd. (Killeen)	9

IH-35, in general, was also mentioned frequently by the respondents as being most heavily congested.

While it was crucial to understand how the community defines and where/how they experience congestion, it was also beneficial to understand more about the respondent's travel behavior. For instance, in response to Question 7 of the survey, 98% of the respondents reported that they travel in a personal car most often. Only one person of the 218 who answered the question reported taking an alternative mode of transportation (i.e. carpool). Looking at travel patterns, Figures 5 and 6 show which zip codes respondents travel from (i.e. where they live) and which they travel to most frequently (i.e. where they work). The following were the most frequently reported pairs of zip codes, including the number of mentions, in terms of origin and destination:

- 76513 – 76513 (13)
- 76502 – 76513 (10)
- 76502 – 76502 (10)

Fig. 5: Responses to survey Question 8 - In which zip code do you live?

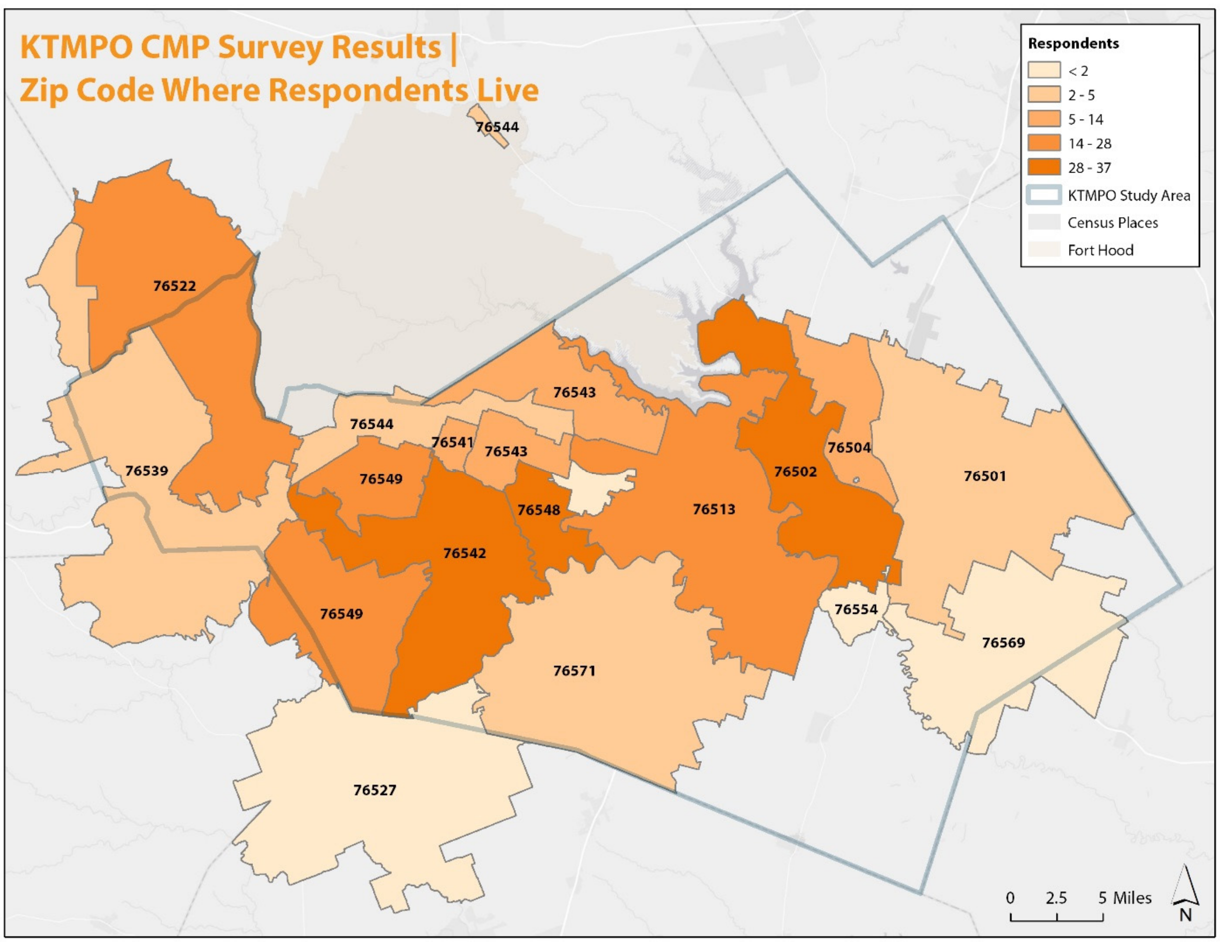
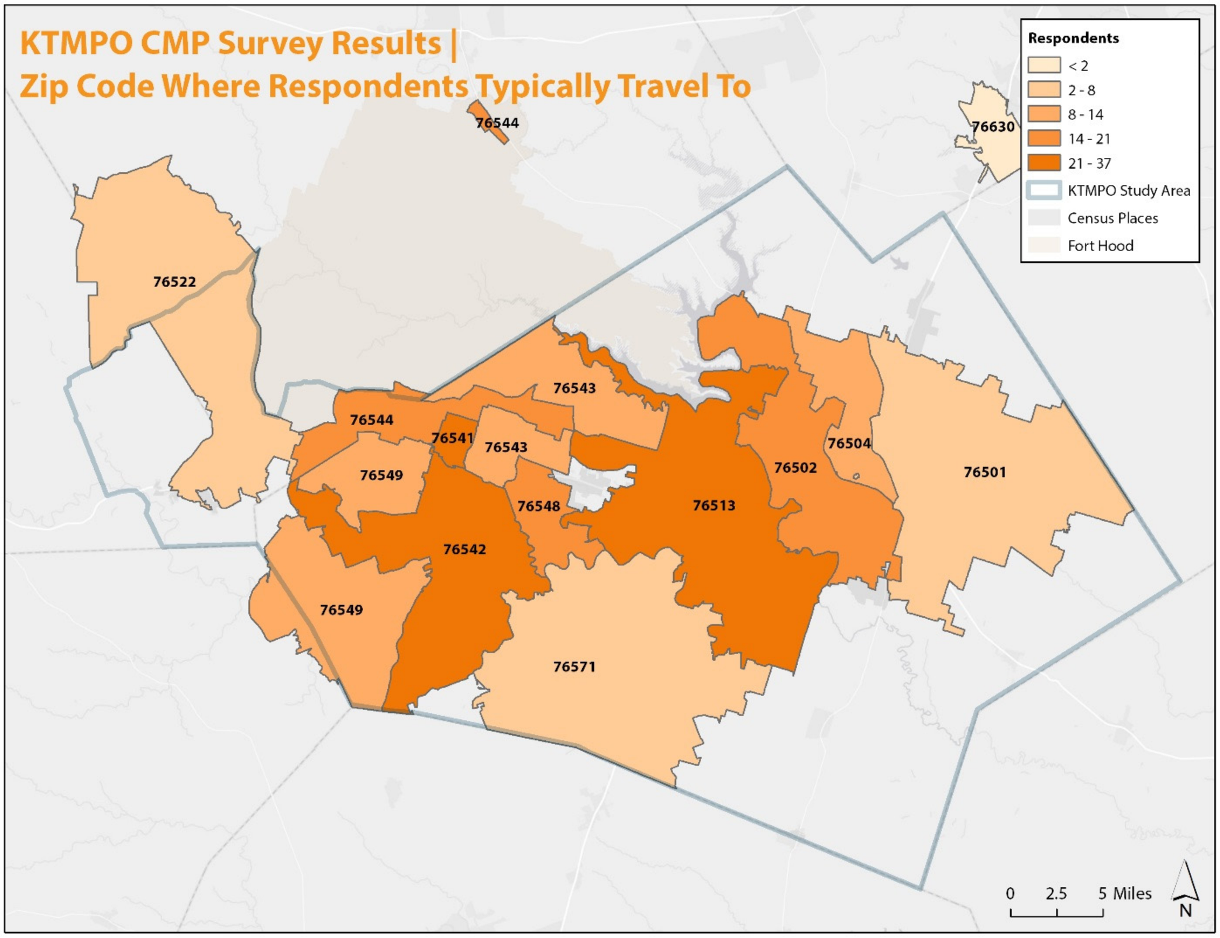


Fig. 6: Responses to survey Question 9 - To which zip code do you travel to the most?



The frequency of the mentioned zip code pairs reveals that the most common trip of the respondents is contained within the Belton/Temple area. However, it should be pointed out that these are relatively large zip codes that may capture more responses simply because of their size. Also, there were several zip codes respondents reported to travel to outside of the metro area, but no more than two people did so for each of those zip codes.

In response to Question 10 about how long it takes to get to a most frequent destination, on average, respondents stated that this type of trip would take about 15 minutes without traffic. However, in response to Question 11, they reported to need about 15 extra minutes to reach their most frequent destination on time while accounting for traffic congestion. In the worst case, up to one hour of extra time was needed.

In order to avoid congestion, respondents reported (in response to Question 12) that they would most likely leave at a different times (83%) or take alternative routes (66%). Fig. 6 provides the full results showing what decisions travelers in the Killeen/Temple metro area make to avoid congestion. Furthermore, respondents believed that the most effective strategies for addressing congestion in the metro area, in order of most reported, were to improve traffic signal coordination (59%), increase roadway capacity (58%), and implement dedicated turn lanes (43%). The full results are shown in Fig. 8

Fig. 7: Responses to survey Question 12 - What actions do you take to avoid traffic congestion?

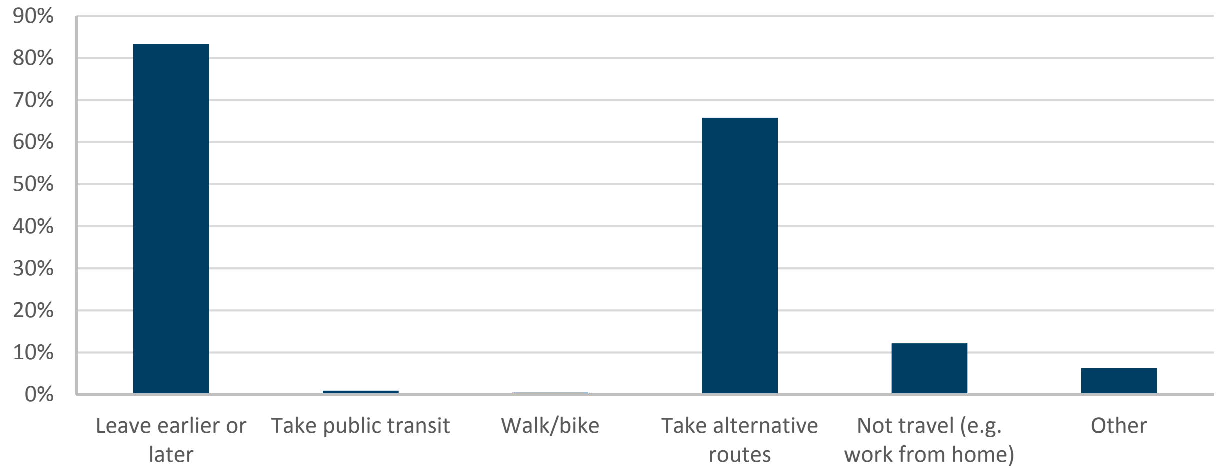
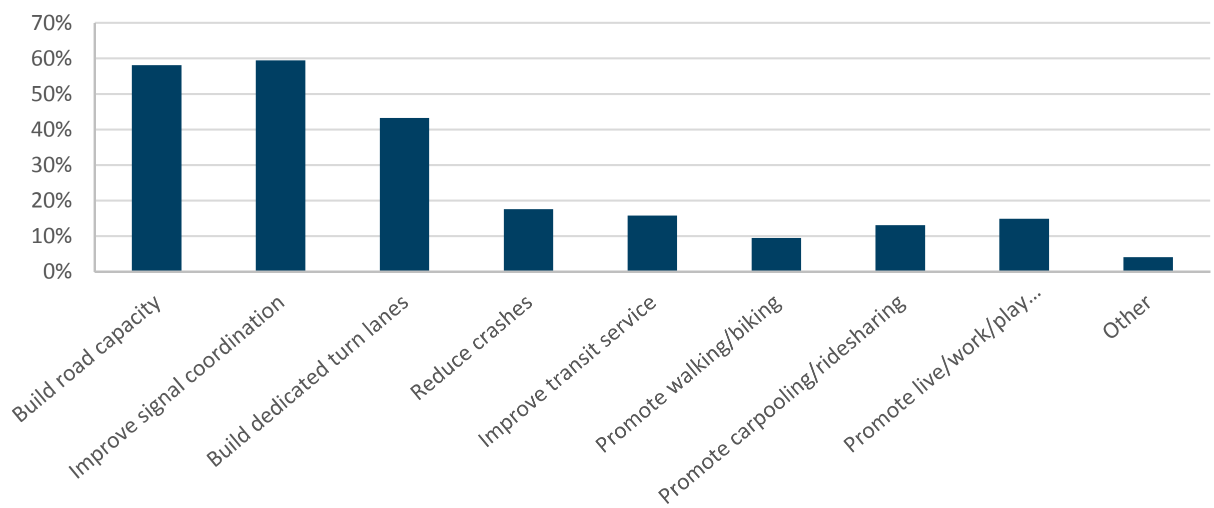


Fig. 8: Responses to survey Question 13 - What do you believe are the most effective strategies for addressing traffic congestion in the Killeen/Temple metro area?



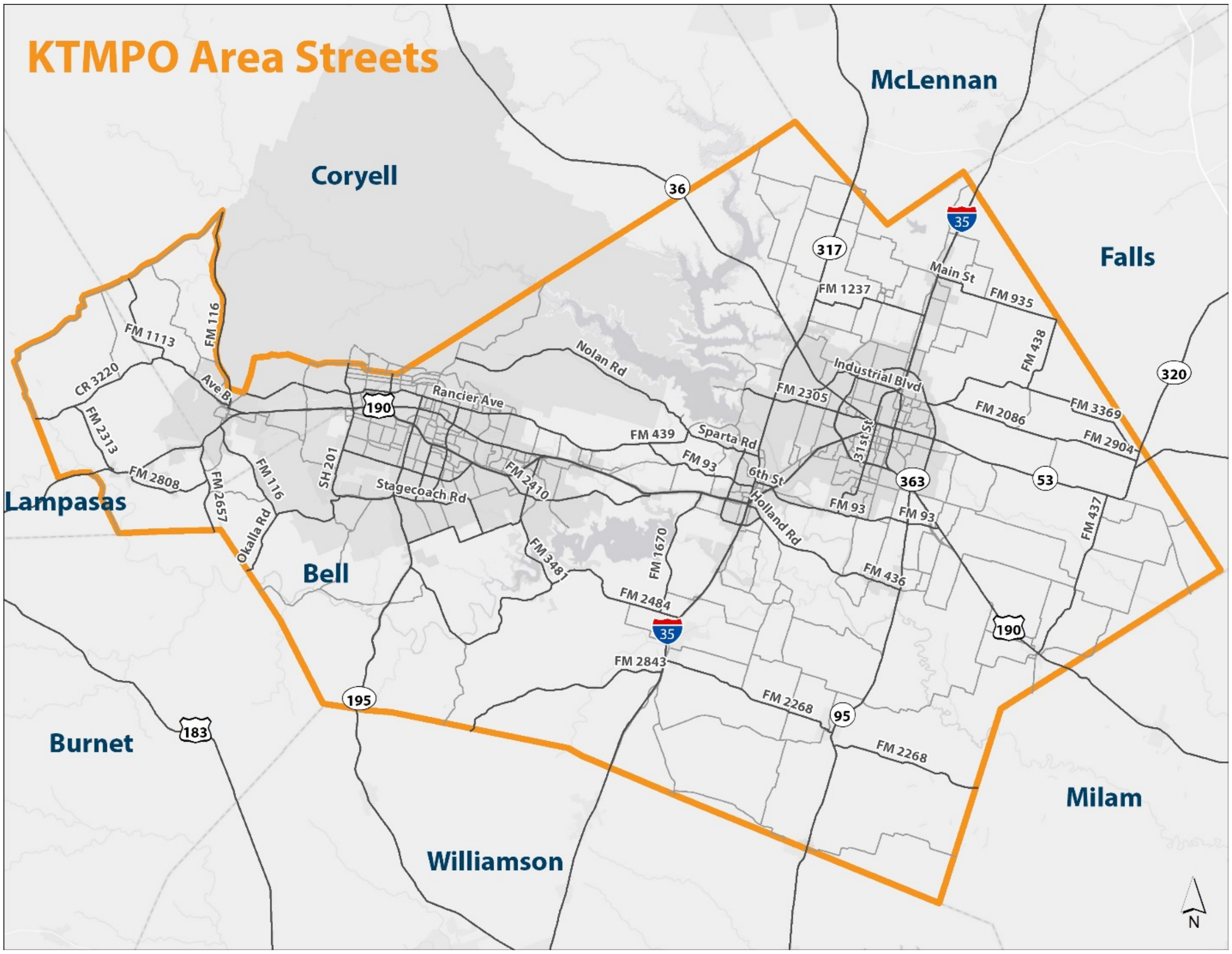
Overall, the respondents of this survey are reliant on their personal vehicles to mostly travel relatively short local trips within Killeen, Belton, or Temple. During these trips, respondents typically experience around 15 minutes of delay when traveling during peak periods—most often a result of bad traffic signal timing or roadway construction. Congestion is reported to be concentrated at important arterial/collector roads that connect with either US 190 or IH-35. Many of the respondents leave earlier or later than they normally would or search for alternative routes in order to avoid congestion and ensure they reach their most frequent destination on time. Many of the respondents believe the congestion issues of the metro area could be addressed with better traffic signal coordination and increased roadway capacity.

KTMPO Congestion Survey Questions

1. Based on your daily travel experience, do you believe traffic congestion is a significant problem in the Killeen/Temple metropolitan area?
   - ☐ Yes
   - ☐ No
2. Which of the following best fits your definition of traffic congestion? (Select up to 3)
   - ☐ Travel time is too long
   - ☐ Travel time varies too much day-to-day
   - ☐ Roadway speeds are too slow
   - ☐ There are too many roadway users
   - ☐ Takes too many traffic signal cycles to get through an intersection
   - ☐ Can't easily reach my destination
   - ☐ Other ____
3. What do you perceive are the biggest causes of traffic congestion in the Killeen/Temple metro area? (Select up to 3)
   - ☐ Inadequate roadway capacity
   - ☐ Ineffective/poorly timed traffic signals
   - ☐ Lack of dedicated turn lanes
   - ☐ School zones
   - ☐ Roadway construction
   - ☐ Inclement weather
   - ☐ Lack of alternative transportation options (e.g. transit, bicycle lanes, etc.)
   - ☐ Lack of alternative route options
   - ☐ Crashes/traffic incidents
   - ☐ Special Events
   - ☐ Slow-moving/freight vehicles
   - ☐ Other ____
4. How often do you experience traffic congestion in the Killeen/Temple metro area? (Select 1)
   - ☐ Daily – regularly, during peak travel periods (7AM-9AM and 4PM-6PM)
   - ☐ Daily – regularly, during off-peak travel periods
   - ☐ Daily – intermittently/sporadically
   - ☐ A few times a week

☐ A few times a month

☐ Other ____

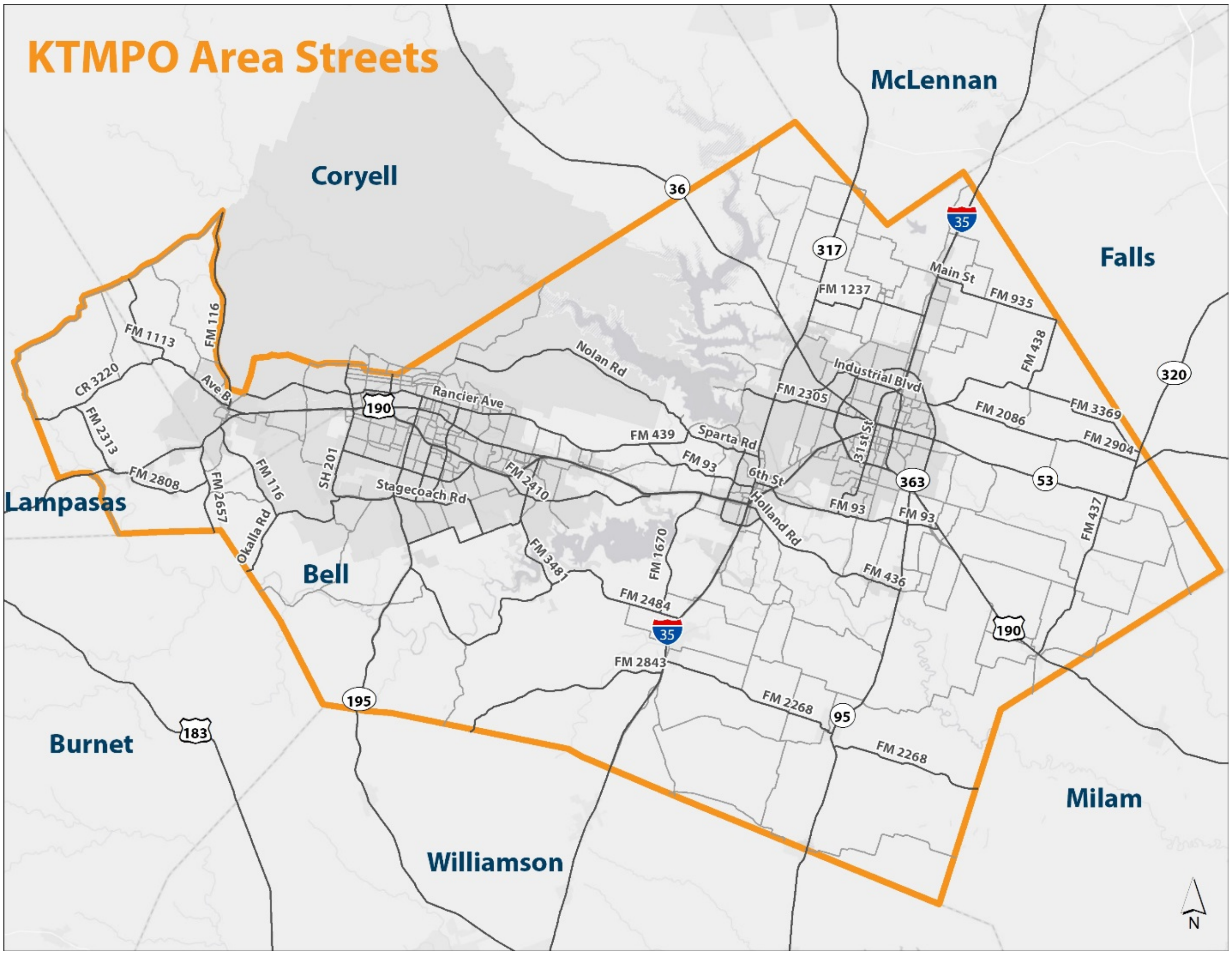


5. Using the map and/or the blanks below, locate three (3) road segments or intersections in the Killeen/Temple metro area where you believe congestion is currently the worst.

____

____

____



6. Using the map or the blanks below, locate three (3) road segments or intersections in the Killeen/Temple metro area where you think congestion will be the worst in 10 years.

____

____

____

7. What mode of transportation do you use most often? (Select 1)
   - ☐ Personal car
   - ☐ Public Transportation
   - ☐ Walking
   - ☐ Biking
   - ☐ Carpool/Rideshare
   - ☐ Other ____

8. In which zip code do you live? ____________________

9. To which zip code do you travel to the most (for work, school, etc.)? __________________

10. How long would it take (in minutes) to get to your most frequent destination (e.g. work) from home with no traffic congestion?

    ____

11. How much extra time do you allow yourself (in minutes) to get to your destination on time to account for traffic congestion along your route?

    ____

12. What actions do you take to avoid traffic congestion? (select any that apply)
    - ☐ Leave earlier or later than you normally would for certain trips
    - ☐ Take public transit
    - ☐ Walk/bike
    - ☐ Take alternative routes
    - ☐ Not travel (e.g. work from home)
    - ☐ Other ____

13. What do you believe are the most effective strategies for addressing traffic congestion in the Killeen/Temple metro area? (Select up to 3)
    - ☐ Construction of additional roadway capacity
    - ☐ Improved traffic signal coordination
    - ☐ Implementation of dedicated turn lanes
    - ☐ Projects/policies to reduce the number of crashes on roadways
    - ☐ Improving/expanding transit service to increase ridership
    - ☐ Projects/policies that promote walking and biking
    - ☐ Programs that incentivize carpooling/ridesharing, traveling at off-peak periods, or telecommuting
    - ☐ Land use policies that promote alternative forms of transportation and/or shorten travel times (e.g. mixed-use development featuring live/work/play options)

Appendix B

Detailed Congestion Hotspot Data

Congestion Data

The tables on pages B-3 through B-5 contain detailed data for each segment of the CMP network that was used to identify congestion hotspots in the region. The congestion scores were computed by first weighting the raw performance measure data based on how many data sources were reflected in each segment, as seen in the table below:

	Number of Sources	NPMRDS	INRIX	TDM	Google	Total
All Sources	5%	20%	50%	20%	5%	**100%**
TDM + INRIX	5%		60%	30%	5%	**100%**
TDM + NPMRDS	5%	50%		40%	5%	**100%**
TDM Only	25%			70%	5%	**100%**

The weighted raw data were then converted to scores on a scale of zero (0) to one (1), with a value of one representing the worst performing segment on the network and the remaining scores reflecting the relative performance of each segment against the rest. Finally, the individual performance measures were combined into a weighted "congestion score" metric for each direction of each segment that was then averaged for both directions on a segment to assign an overall congestion rank for the segment.

The weights for the congestion score computation are shown below:

Measure	TTI	Delay	V/C Ratio	2040 V/C Increase	Google Score	Data Availability Score
Weight	25%	25%	25%	5%	5%	15%

Prioritization Data

The table on page B-6 details the data for the individual weighting criteria used to prioritize the segments in the CMP network. The prioritization score calculation relies primarily on the severity of congestion on a segment, but also considers the volume of traffic, crash rates (overall and percentage that are rear-end collisions), presence of schools, presence of transit service, and number of times the segment was mentioned as a congestion hotspot in the 2016 KTMPO Congestion Survey (see Appendix A). The weights used for each criterion were developed in collaboration with the KTMPO Technical Advisory Committee (TAC) and are detailed below:

Criteria		Weight
Congestion Rank		30%
Volume		20%
Safety	Crashes	15%
	Rear-End Crashes	10%
Transit		15%
School		5%
Public Input		5%
Total		***100%***

Congestion Data (Arterial Segments)

Segment ID	Description	Direction	Street Type	Weighted TTI	Weighted Delay	Weighted VC	Weighted 2040 Change	Speed Score	Delay Score	Capacity Score	2040 Score	Google Score	Confidence Score	Congestion Score	Arterial Rank	Arterial Segment Score	Arterial Segment Rank
1	AVE D - N 1ST ST TO BUSINESS 190	EB	A	0.251	50.35	0.61	0.44	1.00	0.71	0.62	0.02	1.00	0.50	0.71	13	0.68	7
1	AVE D - N 1ST ST TO BUSINESS 190	WB	A	0.352	43.85	0.68	0.53	0.94	0.62	0.81	0.27	0.00	0.25	0.64	21		
2	FM 116 - AVE D TO ELIJAH RD	NB	A	0.515	40.13	0.66	0.59	0.65	0.54	0.79	0.79	0.50	0.75	0.67	15	0.71	6
2	FM 116 - AVE D TO ELIJAH RD	SB	A	0.508	69.65	0.63	0.64	0.67	0.90	0.69	0.87	0.50	0.75	0.75	10		
4B	US 190 - US 190 BYPASS W TO US 190 BYPASS E	EB	A	0.352	35.92	1.40	0.56	0.92	0.48	1.00	0.52	0.00	0.75	0.79	3	0.78	2
4B	US 190 - US 190 BYPASS W TO US 190 BYPASS E	WB	A	0.439	44.03	0.88	0.54	0.81	0.63	0.94	0.37	0.00	0.75	0.76	8		
6	38TH ST - BUSINESS 190 TO RANCIER AVE	NB	A	0.667	25.69	0.31	0.56	0.15	0.27	0.12	0.50	0.50	0.75	0.30	47	0.40	20
6	38TH ST - BUSINESS 190 TO RANCIER AVE	SB	A	0.521	20.54	0.57	0.55	0.63	0.17	0.56	0.38	0.50	0.75	0.50	27		
7	BUSINESS 190 - US 190 TO ROY REYNOLDS DR	EB	A	0.435	71.41	0.77	0.59	0.85	0.92	0.88	0.65	0.00	0.50	0.77	6	0.75	4
7	BUSINESS 190 - US 190 TO ROY REYNOLDS DR	WB	A	0.541	58.59	0.82	0.56	0.54	0.83	0.90	0.54	0.50	0.75	0.73	11		
8	FM 2410 - US 190 TO WARRIORS PATH	EB	A	0.641	28.30	0.43	0.53	0.29	0.35	0.29	0.23	0.00	0.50	0.32	44	0.36	23
8	FM 2410 - US 190 TO WARRIORS PATH	WB	A	0.595	29.56	0.52	0.53	0.38	0.40	0.50	0.21	0.00	0.50	0.41	38		
9	FM 3470/STAN SCHLUETER LOOP - SH 201/CLEAR CREEK RD TO US 190	EB	A	0.448	128.46	0.63	0.63	0.79	0.98	0.67	0.83	0.50	0.75	0.79	4	0.78	1
9	FM 3470/STAN SCHLUETER LOOP - SH 201/CLEAR CREEK RD TO US 190	WB	A	0.450	56.70	0.72	0.64	0.77	0.77	0.83	0.85	0.50	0.75	0.77	6		
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	NB	A	0.498	51.54	0.72	0.58	0.71	0.73	0.85	0.62	0.50	1.00	0.78	5	0.77	3
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	SB	A	0.495	56.85	0.62	0.59	0.73	0.79	0.65	0.71	0.50	1.00	0.75	9		
11	HALLMARK AVE - FORT HOOD ST TO TRIMMIER RD	EB	A	0.690	46.78	0.39	0.51	0.08	0.67	0.27	0.15	1.00	0.75	0.43	34	0.57	11
11	HALLMARK AVE - FORT HOOD ST TO TRIMMIER RD	WB	A	0.426	28.61	0.82	0.51	0.87	0.38	0.92	0.13	1.00	0.75	0.71	12		
12	N 2ND ST - HALLMARK AVE TO RANCIER AVE	NB	A	0.571	3.72	0.43	0.46	0.44	0.02	0.31	0.04	0.00	0.25	0.23	50	0.39	21
12	N 2ND ST - HALLMARK AVE TO RANCIER AVE	SB	A	0.385	5.75	0.65	0.49	0.88	0.04	0.77	0.06	1.00	0.50	0.55	24		
13	WS YOUNG DR - ILLINOIS AVE TO FM 3470/STAN SCHLUETER LOOP	NB	A	0.324	14.15	0.50	0.82	0.98	0.06	0.48	0.90	1.00	0.50	0.55	25	0.52	14
13	WS YOUNG DR - ILLINOIS AVE TO FM 3470/STAN SCHLUETER LOOP	SB	A	0.437	17.60	0.43	0.70	0.83	0.15	0.33	0.88	1.00	0.50	0.50	28		
14	RANCIER AVE - FORT HOOD ST TO ROY REYNOLDS DR	EB	A	0.538	42.49	0.50	0.59	0.56	0.58	0.42	0.73	0.50	0.75	0.56	23	0.60	10
14	RANCIER AVE - FORT HOOD ST TO ROY REYNOLDS DR	WB	A	0.493	43.18	0.60	0.56	0.75	0.60	0.60	0.44	0.50	0.75	0.65	19		
15	ROY REYNOLDS DR - BUSINESS 190 TO RANCIER AVE	NB	A	0.610	27.19	0.47	0.58	0.35	0.31	0.40	0.58	0.50	0.75	0.43	33	0.62	9
15	ROY REYNOLDS DR - BUSINESS 190 TO RANCIER AVE	SB	A	0.325	40.21	1.04	0.57	0.96	0.56	0.98	0.56	1.00	0.75	0.82	2		
17	TRIMMIER RD - FM 3470/STAN SCHLUETER LOOP TO HALLMARK AVE	NB	A	0.538	38.88	0.62	0.53	0.58	0.52	0.63	0.29	1.00	0.75	0.61	22	0.74	5
17	TRIMMIER RD - FM 3470/STAN SCHLUETER LOOP TO HALLMARK AVE	SB	A	0.368	117.00	0.96	0.49	0.90	0.96	0.96	0.10	1.00	0.75	0.87	1		
18	WILLOW SPRINGS RD - US 190 TO WATERCREST RD	NB	A	0.654	28.00	0.73	0.84	0.23	0.33	0.87	0.92	0.00	0.50	0.48	30	0.56	12
18	WILLOW SPRINGS RD - US 190 TO WATERCREST RD	SB	A	0.552	61.68	0.63	1.19	0.50	0.85	0.73	0.98	0.00	0.50	0.64	20		
19	FM 2271 - LAKE RD TO FM 2305/W ADAMS AVE	NB	A	0.571	16.03	0.56	0.55	0.42	0.12	0.54	0.40	0.00	0.50	0.36	40	0.27	25
19	FM 2271 - LAKE RD TO FM 2305/W ADAMS AVE	SB	A	0.725	15.63	0.35	0.54	0.04	0.08	0.19	0.31	0.00	0.50	0.17	52		
21	FM 93/NOLAN VALLEY RD - WHEAT RD TO SH 317	EB	A	0.500	49.18	0.64	0.54	0.69	0.69	0.75	0.35	0.50	0.75	0.69	14	0.67	8
21	FM 93/NOLAN VALLEY RD - WHEAT RD TO SH 317	WB	A	0.562	162.71	0.46	1.28	0.48	1.00	0.38	1.00	0.50	0.75	0.65	18		
22	LAKE RD - FM 2271 TO SH 317	EB	A	0.680	37.31	0.36	0.53	0.10	0.50	0.21	0.19	0.00	0.50	0.29	49	0.24	26
22	LAKE RD - FM 2271 TO SH 317	WB	A	0.855	16.51	0.20	0.55	0.02	0.13	0.02	0.42	0.50	0.75	0.20	51		

Congestion Data (Arterial Segments Continued)

Segment ID	Description	Direction	Street Type	Weighted TTI	Weighted Delay	Weighted VC	Weighted 2040 Change	Speed Score	Delay Score	Capacity Score	2040 Score	Google Score	Confidence Score	Congestion Score	Arterial Rank	Arterial Segment Score	Arterial Segment Rank
23	LOOP 121 - IH 35 TO LAKE RD	NB	A	0.532	67.87	0.57	0.52	0.62	0.87	0.58	0.17	0.50	0.75	0.66	17	**0.54**	**13**
23	LOOP 121 - IH 35 TO LAKE RD	SB	A	0.602	24.67	0.50	0.50	0.37	0.25	0.46	0.12	0.50	0.75	0.41	37		
24	SH 317 - US 190 TO SH 36	NB	A	0.641	15.75	0.53	0.49	0.27	0.10	0.52	0.08	0.50	0.75	0.36	41	**0.43**	**17**
24	SH 317 - US 190 TO SH 36	SB	A	0.565	21.86	0.63	0.53	0.46	0.21	0.71	0.25	0.50	0.75	0.50	28		
25	FM 1741/S 31ST ST - CANYON CREEK DR TO SH 53/ADAMS AVE	NB	A	0.543	34.20	0.50	1.07	0.52	0.44	0.44	0.96	0.50	0.75	0.54	26	**0.48**	**16**
25	FM 1741/S 31ST ST - CANYON CREEK DR TO SH 53/ADAMS AVE	SB	A	0.658	35.50	0.33	1.06	0.19	0.46	0.17	0.94	1.00	0.75	0.42	36		
27	INDUSTRIAL BLVD - OLD HOWARD RD TO IH 35	EB	A	0.699	28.43	0.26	0.59	0.06	0.37	0.04	0.77	0.50	0.75	0.29	48	**0.36**	**22**
27	INDUSTRIAL BLVD - OLD HOWARD RD TO IH 35	WB	A	0.592	26.11	0.44	0.61	0.40	0.29	0.35	0.81	0.50	0.75	0.44	32		
29	FM 2305 /ADAMS AVE - FM 2271 TO 3RD ST	EB	A	0.649	21.50	0.37	0.56	0.25	0.19	0.23	0.48	0.50	0.75	0.33	43	**0.32**	**24**
29	FM 2305/ADAMS AVE - FM 2271 TO 3RD ST	WB	A	0.662	23.05	0.33	0.59	0.17	0.23	0.13	0.69	0.50	0.75	0.31	46		
30	SPUR 290/3RD ST - AVE E TO IH 35	NB	A	0.532	84.00	0.44	0.58	0.60	0.94	0.37	0.60	1.00	0.75	0.67	16	**0.49**	**15**
30	SPUR 290/3RD ST - AVE E TO IH 35	SB	A	0.671	30.63	0.30	0.54	0.13	0.42	0.10	0.33	0.50	0.75	0.32	44		
31	SPUR 290/S 1ST ST - S LOOP 363 TO AVE E	NB	A	0.671	57.33	0.27	0.59	0.12	0.81	0.06	0.75	0.00	0.50	0.36	42	**0.41**	**18**
31	SPUR 290/S 1ST ST - S LOOP 363 TO AVE E	SB	A	0.658	68.75	0.28	0.58	0.21	0.88	0.08	0.63	0.50	0.75	0.46	31		
33	SH 53/ADAMS AVE - 3RD ST TO E LOOP 363	EB	A	0.625	56.05	0.37	0.56	0.31	0.75	0.23	0.46	0.00	0.50	0.42	35	**0.40**	**19**
33	SH 53/ADAMS AVE - 3RD ST TO E LOOP 363	WB	A	0.621	46.17	0.33	0.59	0.33	0.65	0.13	0.67	0.00	0.50	0.39	39		

Congestion Data (Highway Segments)

Segment ID	Description	Direction	Street Type	Weighted TTI	Weighted Delay	Weighted V/C Ratio	Weighted 2040 V/C Increase	TTI Score	Delay Score	Capacity Score	2040 Score	Google Score	Confidence Score	Congestion Score	Highway Rank	Highway Segment Score	Highway Segment Rank
4A	US 190 - FM 1715 TO BUSINESS 190	EB	H	0.833	17.99	0.19	0.62	0.39	0.83	0.08	0.81	0.00	0.75	0.48	25	0.46	15
4A	US 190 - FM 1715 TO BUSINESS 190	WB	H	0.826	13.50	0.20	0.58	0.42	0.58	0.17	0.72	0.00	0.75	0.44	30		
4C	US 190 - SH 9 TO FM 3470/STAN SCHLUETER LOOP	EB	H	0.658	53.33	0.78	0.54	0.94	0.97	0.75	0.47	0.00	0.75	0.80	1	0.79	1
4C	US 190 - SH 9 TO FM 3470/STAN SCHLUETER LOOP	WB	H	0.671	43.94	0.77	0.53	0.92	0.94	0.72	0.36	0.00	0.75	0.78	2		
4D	US 190 - FM 3470/STAN SCHLUETER LOOP TO BUSINESS 190	EB	H	0.735	12.82	0.62	0.53	0.72	0.50	0.64	0.39	0.00	0.75	0.60	11	0.59	5
4D	US 190 - FM 3470/STAN SCHLUETER LOOP TO BUSINESS 190	WB	H	0.719	10.58	0.70	0.52	0.78	0.33	0.69	0.33	0.00	0.75	0.58	14		
4E	US 190 - BUSINESS 190 TO IH 35	EB	H	0.730	19.42	0.68	0.48	0.75	0.86	0.67	0.22	0.00	0.75	0.69	4	0.66	2
4E	US 190 - BUSINESS 190 TO IH 35	WB	H	0.769	15.92	0.55	0.50	0.64	0.75	0.61	0.28	0.00	0.75	0.63	9		
16	SH 195 - WILLIAMSON COUNTY LINE TO FM 3470/STAN SCHLUETER LOOP	NB	H	0.781	16.14	0.26	0.81	0.56	0.78	0.31	0.94	0.00	0.75	0.57	17	0.57	8
16	SH 195 - WILLIAMSON COUNTY LINE TO FM 3470/STAN SCHLUETER LOOP	SB	H	0.769	13.84	0.29	0.83	0.67	0.64	0.36	0.97	0.00	0.75	0.58	15		
20A	IH 35 - SALADO (FM 2268) TO US 190	NB	H	0.694	11.84	0.87	0.50	0.86	0.44	0.78	0.25	0.00	0.75	0.65	6	0.59	4
20A	IH 35 - SALADO (FM 2268) TO US 190	SB	H	0.794	8.65	1.21	0.37	0.53	0.22	0.94	0.14	0.00	0.75	0.54	19		
20B	IH 35 - US 190 TO S LOOP 363	NB	H	0.862	8.72	1.23	0.36	0.17	0.25	0.97	0.11	0.00	0.75	0.47	26	0.46	14
20B	IH 35 - US 190 TO S LOOP 363	SB	H	0.862	8.22	1.24	0.35	0.19	0.19	1.00	0.06	0.00	0.75	0.46	28		
20C	IH 35 - S LOOP 363 TO N LOOP 363	NB	H	0.833	16.89	1.08	0.37	0.33	0.81	0.89	0.17	0.00	0.75	0.63	8	0.54	12
20C	IH 35 - S LOOP 363 TO N LOOP 363	SB	H	0.893	7.99	0.93	0.38	0.08	0.17	0.83	0.19	0.50	1.00	0.46	29		
20D	IH 35 - N LOOP 363 TO FALLS COUNTY LINE	NB	H	0.847	11.16	1.18	0.34	0.22	0.39	0.92	0.03	0.00	0.75	0.50	22	0.54	11
20D	IH 35 - N LOOP 363 TO FALLS COUNTY LINE	SB	H	0.885	14.16	0.96	0.36	0.11	0.67	0.86	0.08	0.50	1.00	0.59	12		
26A	LOOP 363 - US 190 TO SPUR 290	NB	H	0.800	23.02	0.23	0.58	0.50	0.89	0.28	0.64	0.00	0.75	0.56	18	0.62	3
26A	LOOP 363 - US 190 TO SPUR 290	SB	H	0.500	90.42	0.22	0.54	0.97	1.00	0.22	0.44	0.00	0.75	0.68	5		
26B	LOOP 363 - SPUR 290 TO IH 35 S	NB	H	0.840	15.37	0.38	0.59	0.28	0.72	0.53	0.75	0.00	0.75	0.53	20	0.58	7
26B	LOOP 363 - SPUR 290 TO IH 35 S	SB	H	0.709	13.08	0.45	0.58	0.81	0.53	0.58	0.69	0.00	0.75	0.63	9		
26C	LOOP 363 - IH 35 S TO SH 36	NB	H	0.800	23.10	0.28	0.60	0.47	0.92	0.33	0.78	0.00	0.75	0.58	13	0.55	9
26C	LOOP 363 - IH 35 S TO SH 36	SB	H	0.833	13.77	0.35	0.65	0.36	0.61	0.50	0.83	0.00	0.75	0.52	21		
26D	LOOP 363 - SH 36 TO IH 35 N	NB	H	0.704	11.51	0.30	0.57	0.83	0.42	0.39	0.61	0.50	0.75	0.58	15	0.53	13
26D	LOOP 363 - SH 36 TO IH 35 N	SB	H	0.813	10.75	0.35	0.56	0.44	0.36	0.47	0.56	0.50	0.75	0.48	24		
26E	LOOP 363 - IH 35 N TO SH 53	NB	H	0.840	4.81	0.21	0.84	0.31	0.03	0.19	1.00	0.00	0.50	0.26	34	0.37	16
26E	LOOP 363 - IH 35 N TO SH 53	SB	H	0.746	5.76	0.34	0.72	0.69	0.08	0.44	0.92	0.50	0.75	0.49	23		
26F	LOOP 363 - SH 53 TO US 190	NB	H	0.847	6.57	0.23	0.72	0.25	0.11	0.25	0.89	0.00	0.50	0.27	33	0.23	18
26F	LOOP 363 - SH 53 TO US 190	SB	H	0.885	5.32	0.16	0.72	0.14	0.06	0.06	0.86	0.00	0.50	0.18	36		
28	SH 36/AIRPORT RD - LOOP 363 TO SH 317	NB	H	0.775	9.28	0.20	0.58	0.61	0.28	0.14	0.67	0.00	0.75	0.40	31	0.58	6
28	SH 36/AIRPORT RD - LOOP 363 TO SH 317	SB	H	0.493	14.73	0.89	0.57	1.00	0.69	0.81	0.58	0.00	0.75	0.77	3		
32A	US 190 SE - LOOP 363 TO PRITCHARD RD	EB	H	0.893	12.62	0.20	0.51	0.03	0.47	0.11	0.31	0.00	0.75	0.28	32	0.23	17
32A	US 190 SE - LOOP 363 TO PRITCHARD RD	WB	H	0.893	7.01	0.16	0.53	0.06	0.14	0.03	0.42	0.00	0.75	0.19	35		
32B	US 190 SE - PRITCHARD RD TO MILAM COUNTY LINE	EB	H	0.694	13.39	0.44	0.56	0.89	0.56	0.56	0.53	0.00	0.75	0.64	7	0.55	10
32B	US 190 SE - PRITCHARD RD TO MILAM COUNTY LINE	WB	H	0.781	9.73	0.32	0.54	0.58	0.31	0.42	0.50	0.00	0.75	0.46	27		

Prioritization Data (All Segments)

	Street Name	CMP Segment ID	Type	Congestion Rank	Volume	Crash Count	Rear End Count	Crash Rate	Rear End Crash Rate	Rear End Crash %	School Count	Survey Mentions	Congestion Score	Volume Score	Crash Score	Rear End Crash Score	School Score	Transit Score	Survey Score	Prioritization Score
Arterials	Ave D	1	A	7	19,306	335	49	0.0174	0.0025	15%	0	0	0.68	0.5	0	0.5	0	1	0	**0.405**
	FM 116	2	A	6	9,127	280	24	0.0307	0.0026	9%	0	0	0.72	0	0.5	0	0	0	0	**0.292**
	US 190	4B	A	2	40,681	1485	307	0.0365	0.0075	21%	0	0	0.84	1	0.5	1	0	0	0	**0.626**
	38th St	6	A	20	13,580	206	20	0.0152	0.0015	10%	0	0	0.42	0.5	0	0	0	0	0	**0.225**
	BU 190	7	A	4	19,431	590	72	0.0304	0.0037	12%	0	7	0.76	0.5	0.5	0.5	0	0.5	0.5	**0.503**
	FM 2410	8	A	23	12,496	581	76	0.0465	0.0061	13%	0	7	0.38	0.5	0.5	0.5	0	0.5	0.5	**0.390**
	Stan Schleuter Loop	9	A	1	24,073	1161	106	0.0482	0.0044	9%	3	13	0.79	1	0.5	0	1	1	1	**0.763**
	Fort Hood St	10	A	3	21,831	799	124	0.0366	0.0057	16%	0	0	0.78	1	0.5	0.5	0	0.5	0	**0.583**
	Hallmark Ave	11	A	11	6,457	142	9	0.0220	0.0014	6%	0	0	0.58	0	0	0	0	1	0	**0.225**
	2nd St	12	A	21	8,109	88	9	0.0109	0.0011	10%	0	0	0.40	0	0	0.5	0	1	0	**0.220**
	WS Young Dr	13	A	14	18,250	662	61	0.0363	0.0033	9%	0	16	0.54	0.5	0.5	0	0	1	1	**0.436**
	Rancier Ave	14	A	10	14,750	482	54	0.0327	0.0037	11%	2	0	0.62	0.5	0.5	0.5	1	1	0	**0.610**
	Roy Reynolds Dr	15	A	9	6,013	56	4	0.0093	0.0007	7%	0	0	0.64	0	0	0	0	0	0	**0.191**
	Trimmier Rd	17	A	5	10,557	789	91	0.0747	0.0086	12%	3	16	0.75	0.5	1	0.5	1	1	1	**0.776**
	Willow Springs Rd	18	A	12	16,091	171	23	0.0106	0.0014	13%	0	0	0.57	0.5	0	0.5	0	1	0	**0.372**
	FM 2271	19	A	25	7,811	97	10	0.0124	0.0013	10%	0	1	0.28	0	0	0.5	0	0	0	**0.135**
	FM 93	21	A	8	7,213	87	15	0.0121	0.0021	17%	0	1	0.68	0	0	0.5	0	0	0	**0.254**
	FM 439	22	A	26	5,049	184	20	0.0364	0.0040	11%	1	2	0.26	0	0.5	0.5	0.5	0	0	**0.277**
	Loop 121	23	A	13	8,228	353	65	0.0429	0.0079	18%	2	8	0.55	0	0.5	0.5	1	0.5	0.5	**0.490**
	SH 317	24	A	17	7,698	639	108	0.0830	0.0140	17%	2	23	0.45	0	1	0.5	1	0.5	1	**0.560**
	31st St	25	A	16	16,410	757	65	0.0461	0.0040	9%	0	0	0.50	0.5	0.5	0	0	1	0	**0.374**
	Industrial Blvd	27	A	22	3,890	71	17	0.0183	0.0044	24%	0	0	0.38	0	0	1	0	0	0	**0.215**
	W Adams Ave	29	A	24	15,428	958	62	0.0621	0.0040	6%	0	9	0.34	0.5	1	0	0	0.5	0.5	**0.401**
	3rd St	30	A	15	9,682	170	10	0.0176	0.0010	6%	1	1	0.51	0	0	0	0.5	0.5	0	**0.252**
	1st St	31	A	18	11,883	159	13	0.0134	0.0011	8%	0	1	0.42	0.5	0	0	0	1	0	**0.276**
	E Adams Ave	33	A	19	6,800	164	6	0.0241	0.0009	4%	0	0	0.41	0	0	0	0	0.5	0	**0.149**
Highways	US 190	4A	H	15	10,872	96	7	0.0088	0.0006	7%	0	2	0.45	0.5	0	0	0	0	0	**0.234**
	US 190	4C	H	1	64,245	2733	585	0.0425	0.0091	21%	0	0	0.77	1	0.5	1	0	1	0	**0.657**
	US 190	4D	H	5	41,849	1205	166	0.0288	0.0040	14%	0	14	0.57	1	0.5	0.5	0	1	1	**0.595**
	US 190	4E	H	2	45,972	859	150	0.0187	0.0033	17%	0	10	0.63	1	0	0.5	0	1	1	**0.540**
	SH 195	16	H	8	12,929	379	30	0.0293	0.0023	8%	0	0	0.55	0.5	0.5	0	0	0	0	**0.341**
	IH 35	20A	H	4	55,734	943	201	0.0169	0.0036	21%	0	11	0.58	1	0	1	0	0	1	**0.524**
	IH 35	20B	H	14	94,603	985	223	0.0104	0.0024	23%	0	19	0.46	1	0	1	0	0	1	**0.487**
	IH 35	20C	H	12	58,041	1128	244	0.0194	0.0042	22%	0	15	0.53	1	0	1	0	0	1	**0.508**
	IH 35	20D	H	11	60,205	848	267	0.0141	0.0044	31%	0	0	0.53	1	0	1	0	0	0	**0.459**
	Loop 363	26A	H	3	16,726	104	14	0.0062	0.0008	13%	0	0	0.61	0.5	0	0.5	0	0.5	0	**0.357**
	Loop 363	26B	H	7	26,906	551	62	0.0205	0.0023	11%	0	9	0.56	1	0	0.5	0	1	0.5	**0.493**
	Loop 363	26C	H	9	20,870	369	38	0.0177	0.0018	10%	0	6	0.53	1	0	0.5	0	0	0.5	**0.435**
	Loop 363	26D	H	13	9,337	233	21	0.0250	0.0022	9%	0	1	0.52	0	0	0	0	0	0	**0.155**
	Loop 363	26E	H	16	5,931	144	16	0.0243	0.0027	11%	0	1	0.36	0	0	0.5	0	0	0	**0.159**
	Loop 363	26F	H	18	5,189	61	6	0.0118	0.0012	10%	0	1	0.22	0	0	0	0	0	0	**0.067**
	Airport Rd	28	H	6	15,469	155	8	0.0100	0.0005	5%	0	0	0.39	0.5	0	0	0	0	0	**0.216**
	US 190E	32A	H	17	11,077	126	8	0.0114	0.0007	6%	0	2	0.23	0.5	0	0	0	0	0	**0.169**
	US 190E	32B	H	10	11,403	104	9	0.0091	0.0008	9%	1	2	0.54	0.5	0	0	0.5	0	0	**0.336**

Appendix C

2018 CMP Update - Results and Methodology Summary

Congestion Data

The tables on pages C-4 through C-7 contain detailed data for each segment of the CMP network that was used to identify congestion hotspots in the region. The congestion scores were computed by first weighting the raw performance measure data based on the data sources available for each segment, as seen in the table below:

	NPMRDS	INRIX	TDM	Total
All Sources	50%	30%	20%	**100%**
TDM + INRIX		60%	40%	**100%**
TDM + NPMRDS	60%		40%	**100%**
TDM Only			100%	**100%**

The weighted performance measures were then converted to scores on a scale of zero (0) to one (1), with a value of one representing the worst performing segment on the network and the remaining scores reflecting the relative performance of each segment against the rest. Finally, the individual performance measure scores were combined into a weighted "congestion score" metric for each direction of each segment. The congestion score was then averaged for both directions of a segment to assign an overall congestion rank for the segment.

The weights for the congestion score computation are shown below:

Measure	TTI	Delay	V/C Ratio	2040 V/C Increase	Google Score	Data Availability Score
Weight	25%	25%	25%	5%	5%	15%

Prioritization Data

The tables on page C-8 and C-9 detail the data for the individual weighting criteria used to prioritize the segments in the CMP network. The prioritization score calculation relies primarily on the severity of congestion on a segment, but also considers the volume of traffic, crash rates (overall and percentage that are rear-end collisions), presence of schools, presence of transit service, and number of times the segment was mentioned as a congestion hotspot in the KTMPO Congestion Survey. The weights used for each criterion were developed in collaboration with the KTMPO Technical Advisory Committee (TAC) and are detailed below. Note that the Congestion Rank Change criteria was added in the 2018 CMP Update to consider how segments were performing over time in terms of congestion.

Criteria		Weight
Congestion Rank		25%
Congestion Rank Change		5%
Volume		20%
Safety	Crashes	15%
	Rear-End Crashes	10%
Transit		15%
School		5%
Public Input		5%
Total		***100%***

Congestion Data (Arterial Segments)

Segment ID	Description	Direction	Street Type	Weighted Speed Index	Weighted Delay	Weighted V/C Ratio	Weighted 2045 Change	Speed Score	Delay Score	Capacity Score	2045 Score	Google Score	Confidence Score	Congestion Score	Arterial Rank	Arterial Segment Score	Arterial Segment Rank
1	AVE D - N 1ST ST TO BUSINESS 190	EB	A	0.93	5.01	0.74	165%	0.11	0.86	0.84	0.86	0.00	0.50	0.57	23	0.572	10
1	AVE D - N 1ST ST TO BUSINESS 190	WB	A	0.93	5.51	0.76	101%	0.14	0.88	0.86	0.64	0.00	0.50	0.58	22		
2	FM 116 - AVE D TO ELIJAH RD	NB	A	0.84	3.93	0.61	90%	0.82	0.71	0.71	0.57	0.00	0.75	0.70	13	0.731	5
2	FM 116 - AVE D TO ELIJAH RD	SB	A	0.84	4.77	0.61	167%	0.80	0.82	0.68	0.89	0.50	0.75	0.76	8		
4B	BUSINESS 190 - US 190 BYPASS W TO US 190 BYPASS E	EB	A	0.75	77.31	0.57	139%	0.91	0.93	0.55	0.79	0.50	1.00	0.81	4	0.801	3
4B	BUSINESS 190 - US 190 BYPASS W TO US 190 BYPASS E	WB	A	0.74	86.13	0.56	159%	0.93	0.95	0.52	0.84	0.00	1.00	0.79	6		
6	38TH ST - BUSINESS 190 TO RANCIER AVE	NB	A	0.90	4.84	0.38	-6%	0.29	0.84	0.25	0.04	0.00	0.75	0.46	38	0.507	16
6	38TH ST - BUSINESS 190 TO RANCIER AVE	SB	A	0.88	5.85	0.40	-10%	0.55	0.89	0.32	0.02	0.00	0.75	0.56	26		
7	BUSINESS 190 - US 190 TO NOLA RUTH BLVD	EB	A	0.72	193.25	0.59	26%	0.96	0.98	0.61	0.30	0.50	1.00	0.83	2	0.822	2
7	BUSINESS 190 - US 190 TO NOLA RUTH BLVD	WB	A	0.73	207.66	0.57	35%	0.95	1.00	0.54	0.39	0.50	1.00	0.82	3		
8	FM 2410 - US 190 TO WARRIORS PATH	EB	A	0.89	3.12	0.38	133%	0.34	0.55	0.27	0.73	0.50	0.75	0.46	37	0.501	17
8	FM 2410 - US 190 TO WARRIORS PATH	WB	A	0.87	3.32	0.38	138%	0.57	0.59	0.29	0.77	0.50	0.75	0.54	29		
9	FM 3470/STAN SCHLUETER LOOP - SH 201/CLEAR CREEK RD TO US 190	EB	A	0.82	1.59	0.88	30%	0.86	0.30	0.98	0.34	0.50	0.75	0.69	14	0.702	7
9	FM 3470/STAN SCHLUETER LOOP - SH 201/CLEAR CREEK RD TO US 190	WB	A	0.79	1.65	0.88	34%	0.89	0.34	1.00	0.36	0.50	0.75	0.71	10		
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	NB	A	0.67	93.02	0.64	13%	1.00	0.96	0.77	0.23	0.50	1.00	0.87	1	0.834	1
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	SB	A	0.68	74.92	0.60	20%	0.98	0.91	0.64	0.29	0.00	1.00	0.80	5		
11	HALLMARK AVE - FORT HOOD ST TO TRIMMIER RD	EB	A	0.93	0.84	0.41	-3%	0.13	0.09	0.36	0.07	0.50	0.75	0.28	52	0.271	27
11	HALLMARK AVE - FORT HOOD ST TO TRIMMIER RD	WB	A	0.93	1.08	0.36	1%	0.16	0.13	0.18	0.11	0.50	0.75	0.26	54		
12	N 2ND ST - HALLMARK AVE TO RANCIER AVE	NB	A	0.98	0.63	0.23	1%	0.02	0.05	0.07	0.13	0.50	0.50	0.14	56	0.150	28
12	N 2ND ST - HALLMARK AVE TO RANCIER AVE	SB	A	0.98	0.67	0.25	-2%	0.04	0.07	0.11	0.09	0.50	0.50	0.16	55		
13	WS YOUNG DR - BUSINESS 190 TO FM 3470/STAN SCHLUETER LOOP	NB	A	0.82	3.79	0.82	12%	0.88	0.64	0.93	0.21	0.50	0.75	0.76	7	0.752	4
13	WS YOUNG DR - BUSINESS 190 TO FM 3470/STAN SCHLUETER LOOP	SB	A	0.84	3.95	0.79	15%	0.77	0.73	0.88	0.27	0.50	0.75	0.74	9		
14	RANCIER AVE - FORT HOOD ST TO ROY REYNOLDS DR	EB	A	0.91	1.12	0.52	10%	0.25	0.16	0.48	0.18	0.00	0.75	0.34	47	0.358	23
14	RANCIER AVE - FORT HOOD ST TO ROY REYNOLDS DR	WB	A	0.91	1.26	0.51	10%	0.23	0.20	0.46	0.20	0.50	0.75	0.37	46		
15	ROY REYNOLDS DR - BUSINESS 190 TO RANCIER AVE	NB	A	0.95	2.50	0.31	80%	0.05	0.43	0.14	0.54	0.00	0.75	0.30	51	0.315	26
15	ROY REYNOLDS DR - BUSINESS 190 TO RANCIER AVE	SB	A	0.94	3.07	0.29	115%	0.09	0.54	0.13	0.70	0.00	0.75	0.33	49		
17	TRIMMIER RD - FM 3470/STAN SCHLUETER LOOP TO HALLMARK AVE	NB	A	0.85	3.18	0.84	7%	0.75	0.57	0.95	0.16	0.50	0.75	0.71	11	0.713	6
17	TRIMMIER RD - FM 3470/STAN SCHLUETER LOOP TO HALLMARK AVE	SB	A	0.84	2.90	0.85	13%	0.79	0.50	0.96	0.25	0.50	0.75	0.71	11		
18	WILLOW SPRINGS RD - US 190 TO WATERCREST RD	NB	A	0.88	4.30	0.59	-5%	0.46	0.77	0.63	0.05	0.00	0.75	0.58	20	0.562	11
18	WILLOW SPRINGS RD - US 190 TO WATERCREST RD	SB	A	0.90	3.85	0.63	7%	0.30	0.66	0.73	0.14	0.00	0.75	0.54	28		
19	FM 2271 - LAKE RD TO FM 2305/W ADAMS AVE	NB	A	0.88	3.00	0.82	107%	0.54	0.52	0.91	0.68	0.00	0.75	0.64	17	0.663	8
19	FM 2271 - LAKE RD TO FM 2305/W ADAMS AVE	SB	A	0.86	3.49	0.79	99%	0.68	0.61	0.89	0.61	0.00	0.75	0.69	15		
21A	FM 93/NOLAN VALLEY RD - WHEAT RD TO IH 35	EB	A	0.87	4.30	0.39	192%	0.59	0.79	0.30	0.93	0.50	0.75	0.60	19	0.556	12
21A	FM 93/NOLAN VALLEY RD - WHEAT RD TO IH 35	WB	A	0.89	4.20	0.36	187%	0.36	0.75	0.20	0.91	0.50	0.75	0.51	33		
21B	FM 93 - IH 35 TO US 190	EB	A	0.93	0.22	0.41	300%	0.20	0.02	0.34	1.00	0.00	0.75	0.30	50	0.338	24
21B	FM 93 - IH 35 TO US 190	WB	A	0.89	0.38	0.46	238%	0.41	0.04	0.41	0.96	0.00	0.75	0.38	45		

Congestion Data (Arterial Segments - Continued)

Segment ID	Description	Direction	Street Type	Weighted Speed Index	Weighted Delay	Weighted V/C Ratio	Weighted 2045 Change	Speed Score	Delay Score	Capacity Score	2045 Score	Google Score	Confidence Score	Congestion Score	Arterial Rank	Arterial Segment Score	Arterial Segment Rank
22	LAKE RD - FM 2271 TO SH 317	EB	A	0.89	4.50	0.37	123%	0.43	0.80	0.23	0.71	0.00	0.75	0.51	31	0.475	19
22	LAKE RD - FM 2271 TO SH 317	WB	A	0.88	2.64	0.37	145%	0.45	0.46	0.21	0.82	0.00	0.75	0.43	39		
23	LOOP 121 - IH 35 TO LAKE RD	NB	A	0.87	2.54	0.49	99%	0.61	0.45	0.45	0.59	0.00	0.75	0.52	30	0.474	20
23	LOOP 121 - IH 35 TO LAKE RD	SB	A	0.89	1.86	0.44	133%	0.38	0.36	0.39	0.75	0.00	0.75	0.43	40		
24	SH 317 - US 190 TO SH 36	NB	A	0.85	1.43	0.69	99%	0.73	0.21	0.80	0.63	0.50	0.75	0.61	18	0.627	9
24	SH 317 - US 190 TO SH 36	SB	A	0.83	1.51	0.73	90%	0.84	0.27	0.82	0.55	0.50	0.75	0.65	16		
25	FM 1741/S 31ST ST - FM 93 TO SH 53/ADAMS AVE	NB	A	0.86	2.13	0.59	52%	0.70	0.39	0.59	0.43	0.50	0.75	0.58	21	0.537	13
25	FM 1741/S 31ST ST - FM 93 TO SH 53/ADAMS AVE	SB	A	0.88	1.53	0.58	56%	0.48	0.29	0.57	0.45	0.50	0.75	0.49	35		
27	INDUSTRIAL BLVD - OLD HOWARD RD TO IH 35	EB	A	0.89	1.61	0.15	198%	0.39	0.32	0.02	0.95	0.00	0.75	0.34	48	0.366	22
27	INDUSTRIAL BLVD - OLD HOWARD RD TO IH 35	WB	A	0.88	2.11	0.16	270%	0.50	0.38	0.04	0.98	0.00	0.75	0.39	43		
29	SH 53/ADAMS AVE - FM 2271 TO 3RD ST	EB	A	0.86	1.10	0.63	75%	0.66	0.14	0.75	0.52	0.50	0.75	0.55	27	0.532	15
29	SH 53/ADAMS AVE - FM 2271 TO 3RD ST	WB	A	0.87	1.15	0.61	68%	0.63	0.18	0.70	0.48	0.00	0.75	0.51	32		
30	SPUR 290/3RD ST - AVE E TO IH 35	NB	A	0.87	3.92	0.42	58%	0.64	0.70	0.38	0.46	0.00	0.75	0.56	24	0.479	18
30	SPUR 290/3RD ST - AVE E TO IH 35	SB	A	0.89	2.71	0.33	145%	0.32	0.48	0.16	0.80	0.00	0.75	0.39	42		
31	SPUR 290/S 1ST ST - S LOOP 363 TO AVE E	NB	A	0.94	2.50	0.52	38%	0.07	0.41	0.50	0.41	0.00	0.75	0.38	44	0.423	21
31	SPUR 290/S 1ST ST - S LOOP 363 TO AVE E	SB	A	0.90	3.72	0.47	71%	0.27	0.63	0.43	0.50	0.00	0.75	0.47	36		
33	SH 53/ADAMS AVE - 3RD ST TO E LOOP 363	EB	A	0.93	1.49	0.20	105%	0.18	0.23	0.05	0.66	0.00	0.75	0.26	53	0.332	25
33	SH 53/ADAMS AVE - 3RD ST TO E LOOP 363	WB	A	0.91	3.89	0.23	166%	0.21	0.68	0.09	0.88	0.00	0.75	0.40	41		
34	CLEAR CREEK RD - US 190 TO SH 195	NB	A	0.86	1.49	0.60	34%	0.71	0.25	0.66	0.38	0.50	0.75	0.56	25	0.534	14
34	CLEAR CREEK RD - US 190 TO SH 195	SB	A	0.88	1.00	0.64	28%	0.52	0.11	0.79	0.32	0.50	0.75	0.51	34		

Congestion Data (Highway Segments)

Segment ID	Description	Direction	Street Type	Weighted Speed Index	Weighted Delay	Weighted V/C Ratio	Weighted 2045 Change	Speed Score	Delay Score	Capacity Score	2045 Score	Google Score	Confidence Score	Congestion Score	Highway Rank	Highway Segment Score	Highway Segment Rank
3	SH 9 - US 190 to FM 116	EB	H	0.88	3.12	1.08	60%	0.30	0.08	1.00	0.15	0.00	0.75	0.46	30	0.447	16
3	SH 9 - US 190 to FM 116	WB	H	0.89	3.69	0.99	70%	0.18	0.10	0.95	0.23	0.00	0.75	0.43	33		
4A	US 190 - FM 1715 TO US 190	EB	H	0.83	83.75	0.27	355%	0.80	1.00	0.05	0.98	0.00	1.00	0.66	12	0.690	5
4A	US 190 - FM 1715 TO US 190	WB	H	0.84	79.06	0.49	363%	0.75	0.98	0.35	1.00	0.00	1.00	0.72	6		
4C	US 190 - SH 9 TO FM 3470/STAN SCHLUETER LOOP	EB	H	0.89	32.01	0.62	70%	0.15	0.73	0.48	0.25	0.00	1.00	0.50	26	0.524	12
4C	US 190 - SH 9 TO FM 3470/STAN SCHLUETER LOOP	WB	H	0.89	40.17	0.64	66%	0.13	0.93	0.50	0.20	0.00	1.00	0.55	23		
4D	US 190 - FM 3470/STAN SCHLUETER LOOP TO BUSINESS 190	EB	H	0.89	16.33	0.60	94%	0.23	0.38	0.43	0.38	0.00	1.00	0.43	35	0.435	17
4D	US 190 - FM 3470/STAN SCHLUETER LOOP TO BUSINESS 190	WB	H	0.89	16.61	0.61	88%	0.25	0.43	0.45	0.28	0.00	1.00	0.45	31		
4E	US 190 - BUSINESS 190 TO IH 35	EB	H	0.87	38.46	0.82	89%	0.48	0.90	0.85	0.33	0.00	1.00	0.72	4	0.713	3
4E	US 190 - BUSINESS 190 TO IH 35	WB	H	0.87	38.29	0.80	89%	0.50	0.88	0.78	0.30	0.00	1.00	0.70	8		
5	US 190 - BUSINESS 190 W TO BUSINESS 190 E	EB	H	0.91	1.98	0.68	46%	0.10	0.03	0.58	0.10	0.50	0.75	0.32	39	0.395	18
5	US 190 - BUSINESS 190 W TO BUSINESS 190 E	WB	H	0.87	2.13	0.81	43%	0.45	0.05	0.83	0.08	0.50	0.75	0.47	27		
16	SH 195 - WILLIAMSON COUNTY LINE TO FM 3470/STAN SCHLUETER LOOP	NB	H	0.88	35.17	0.49	139%	0.38	0.78	0.33	0.70	0.00	1.00	0.55	21	0.542	11
16	SH 195 - WILLIAMSON COUNTY LINE TO FM 3470/STAN SCHLUETER LOOP	SB	H	0.88	32.87	0.45	146%	0.33	0.75	0.30	0.73	0.00	1.00	0.53	24		
20A	IH 35 - US 190 TO WILLIAMSON COUNTY LINE	NB	H	0.94	20.95	0.65	100%	0.05	0.60	0.55	0.43	0.00	1.00	0.47	28	0.449	15
20A	IH 35 - US 190 TO WILLIAMSON COUNTY LINE	SB	H	0.95	18.68	0.65	96%	0.03	0.48	0.53	0.40	0.00	1.00	0.43	34		
20B	IH 35 - US 190 TO S LOOP 363	NB	H	0.91	9.96	0.77	125%	0.08	0.23	0.70	0.65	0.00	1.00	0.43	32	0.480	14
20B	IH 35 - US 190 TO S LOOP 363	SB	H	0.88	9.52	0.84	130%	0.28	0.20	0.90	0.68	0.00	1.00	0.53	25		
20C	IH 35 - S LOOP 363 TO N LOOP 363	NB	H	0.86	15.54	0.71	100%	0.58	0.33	0.63	0.45	0.00	1.00	0.55	21	0.589	10
20C	IH 35 - S LOOP 363 TO N LOOP 363	SB	H	0.84	18.66	0.75	94%	0.73	0.45	0.65	0.35	0.00	1.00	0.62	14		
20D	IH 35 - N LOOP 363 TO FALLS COUNTY LINE	NB	H	0.85	19.89	0.99	57%	0.65	0.58	0.93	0.13	0.00	1.00	0.69	9	0.636	7
20D	IH 35 - N LOOP 363 TO FALLS COUNTY LINE	SB	H	0.88	15.77	0.99	61%	0.35	0.35	0.98	0.18	0.00	1.00	0.58	19		
26A	LOOP 363 - US 190 TO SPUR 290	NB	H	0.80	19.34	0.34	205%	0.93	0.50	0.15	0.93	0.00	1.00	0.59	17	0.599	9
26A	LOOP 363 - US 190 TO SPUR 290	SB	H	0.80	19.45	0.35	177%	0.95	0.55	0.18	0.80	0.00	1.00	0.61	16		
26B	LOOP 363 - SPUR 290 TO IH 35 S	NB	H	0.86	16.54	0.29	340%	0.60	0.40	0.08	0.95	0.00	1.00	0.47	29	0.517	13
26B	LOOP 363 - SPUR 290 TO IH 35 S	SB	H	0.85	21.74	0.36	188%	0.68	0.63	0.20	0.85	0.00	1.00	0.57	20		
26C	LOOP 363 - IH 35 S TO SH 36	NB	H	0.89	6.27	0.25	181%	0.20	0.15	0.03	0.83	0.00	1.00	0.29	40	0.335	20
26C	LOOP 363 - IH 35 S TO SH 36	SB	H	0.87	13.08	0.32	117%	0.40	0.30	0.13	0.58	0.00	1.00	0.39	37		
26D	LOOP 363 - SH 36 TO IH 35 N	NB	H	0.77	55.73	0.40	175%	1.00	0.95	0.25	0.78	0.50	1.00	0.76	2	0.717	2
26D	LOOP 363 - SH 36 TO IH 35 N	SB	H	0.81	30.37	0.37	197%	0.90	0.68	0.23	0.90	0.50	1.00	0.67	11		
26E	LOOP 363 - IH 35 N TO SH 53	NB	H	0.83	25.52	0.77	149%	0.78	0.65	0.68	0.75	0.00	1.00	0.71	7	0.675	6
26E	LOOP 363 - IH 35 N TO SH 53	SB	H	0.87	19.39	0.71	193%	0.55	0.53	0.60	0.88	0.50	1.00	0.64	13		
26F	LOOP 363 - SH 53 TO US 190	NB	H	0.84	10.78	0.81	109%	0.70	0.28	0.80	0.48	0.00	1.00	0.62	15	0.602	8
26F	LOOP 363 - SH 53 TO US 190	SB	H	0.86	10.69	0.79	120%	0.63	0.25	0.75	0.60	0.00	1.00	0.59	18		
28	SH 36 - LOOP 363 TO SH 317	NB	H	0.79	36.52	0.59	122%	0.98	0.83	0.40	0.63	0.00	1.00	0.73	3	0.709	4
28	SH 36 - LOOP 363 TO SH 317	SB	H	0.82	35.38	0.56	114%	0.88	0.80	0.38	0.50	0.00	1.00	0.69	10		

Congestion Data (Highway Segments - Continued)

Segment ID	Description	Direction	Street Type	Weighted Speed Index	Weighted Delay	Weighted V/C Ratio	Weighted 2045 Change	Speed Score	Delay Score	Capacity Score	2045 Score	Google Score	Confidence Score	Congestion Score	Highway Rank	Highway Segment Score	Highway Segment Rank
32A	US 190 SE - LOOP 363 TO PRITCHARD RD	EB	H	0.87	6.04	0.41	116%	0.53	0.13	0.28	0.55	0.00	1.00	0.41	36	**0.380**	**19**
32A	US 190 SE - LOOP 363 TO PRITCHARD RD	WB	H	0.87	6.76	0.32	116%	0.43	0.18	0.10	0.53	0.00	1.00	0.35	38		
32B	US 190 SE - PRITCHARD RD TO MILAM COUNTY LINE	EB	H	0.83	36.73	0.82	34%	0.83	0.85	0.88	0.03	0.00	1.00	0.79	1	**0.755**	**1**
32B	US 190 SE - PRITCHARD RD TO MILAM COUNTY LINE	WB	H	0.82	31.29	0.79	35%	0.85	0.70	0.73	0.05	0.00	1.00	0.72	5		

Prioritization Data (All Segments)

	Street Name	CMP Segment ID	Type	Congestion Rank (2018)	Congestion Rank (2016)	Volume	Crash Count	Rear End Count	Crash Rate	Rear End Crash Rate	Rear End Crash %	School Count	Survey Mentions	Congestion Score	Congestion Rank Change Score	Volume Score	Crash Score	Rear End Crash Score	School Score	Transit Score	Survey Score	Prioritization Score
Arterials	Ave D	1	A	10	7	16,974	376	89	0.0222	0.0052	24%	0	4	0.572	0.5	0.5	0	1	0	1	0	0.518
	FM 116	2	A	5	6	8,264	263	86	0.0318	0.0104	33%	1	2	0.731	0.5	0	0.5	1	0.5	0	0	0.408
	Business 190	4B	A	3	2	28,565	1190	525	0.0417	0.0184	44%	0	14	0.801	0.5	1	0.5	1	0	0	1	0.650
	38th St	6	A	16	20	12,220	146	48	0.0119	0.0039	33%	1	1	0.507	0.5	0.5	0	1	0.5	0	0	0.377
	Business 190	7	A	2	4	19,686	753	286	0.0383	0.0145	38%	0	6	0.822	0.5	0.5	0.5	1	0	0.5	0.5	0.605
	FM 2410	8	A	17	23	10,489	469	169	0.0447	0.0161	36%	1	9	0.501	1	0.5	0.5	1	0.5	0.5	0.5	0.575
	Stan Schleuter Loop	9	A	7	1	26,256	1309	499	0.0499	0.0190	38%	3	14	0.702	0.0	1	0.5	1	1	0	1	0.650
	Fort Hood St	10	A	1	3	20,818	997	455	0.0479	0.0219	46%	0	13	0.834	0.5	1	0.5	1	0	0.5	1	0.733
	Hallmark Ave	11	A	27	11	4,971	137	45	0.0276	0.0091	33%	0	0	0.271	0.0	0	0.5	1	0	0.5	0	0.318
	2nd St	12	A	28	21	3,786	102	26	0.0269	0.0069	25%	0	0	0.150	0.0	0	0.5	1	0	1	0	0.363
	WS Young Dr	13	A	4	14	25,254	724	258	0.0287	0.0102	36%	1	15	0.752	1.0	1	0.5	1	0.5	0	1	0.688
	Rancier Ave	14	A	23	10	13,849	653	238	0.0472	0.0172	36%	2	8	0.358	0.0	0.5	0.5	1	1	1	0.5	0.589
	Roy Reynolds Dr	15	A	26	9	6,477	60	26	0.0093	0.0040	43%	0	2	0.315	0.0	0	0	1	0	0	0	0.179
	Trimmier Rd	17	A	6	5	17,885	684	245	0.0382	0.0137	36%	3	13	0.713	0.5	0.5	0.5	1	1	0.5	1	0.653
	Willow Springs Rd	18	A	11	12	8,922	98	35	0.0110	0.0039	36%	0	1	0.562	0.5	0	0	1	0	1	0	0.415
	FM 2271	19	A	8	25	9,686	100	33	0.0103	0.0034	33%	0	1	0.663	1.0	0	0	1	0	0	0	0.316
	FM 93/Nolan Valley Rd	21A	A	12	8	9,013	278	108	0.0308	0.0120	39%	0	6	0.556	0.5	0	0.5	1	0	0	0.5	0.364
	FM 93	21B	A	24	-	7,198	265	85	0.0368	0.0118	32%	0	0	0.338	0.5	0	0.5	1	0	0	0	0.284
	FM 439/Lake Rd	22	A	19	26	10,623	188	33	0.0177	0.0031	18%	1	5	0.475	1.0	0.5	0	0.5	0.5	0	0.5	0.369
	Loop 121	23	A	20	13	8,217	302	133	0.0368	0.0162	44%	2	10	0.474	0.0	0	0.5	1	1	0.5	1	0.469
	SH 317	24	A	9	17	13,108	737	364	0.0562	0.0278	49%	2	18	0.627	1.0	0.5	1	1	1	0.5	1	0.732
	31st St	25	A	13	16	19,022	880	255	0.0463	0.0134	29%	0	28	0.537	0.5	0.5	0.5	1	0	1	1	0.634
	Industrial Blvd	27	A	22	22	3,292	92	25	0.0279	0.0076	27%	0	1	0.366	0.5	0	0.5	1	0	0	0	0.292
	W Adams Ave	29	A	15	24	21,266	520	167	0.0245	0.0079	32%	1	23	0.532	1.0	1	0	1	0.5	0.5	1	0.633
	3rd St	30	A	18	15	11,561	195	39	0.0169	0.0034	20%	1	0	0.479	0.5	0.5	0	1	0.5	0.5	0	0.445
	1st St	31	A	21	18	13,445	196	36	0.0146	0.0027	18%	0	3	0.423	0.5	0.5	0	0.5	0	1	0	0.431
	E Adams Ave	33	A	25	19	6,439	178	25	0.0276	0.0039	14%	0	9	0.332	0.0	0	0.5	0.5	0	0.5	0.5	0.308
	Clear Creek Rd	34	A	14	-	19,648	620	235	0.0316	0.0120	38%	2	0	0.534	0.5	0.5	0.5	1	1	0	0	0.484
Highways	SH 9	3	H	16	-	12,102	118	18	0.0098	0.0015	15%	0	1	0.447	0.5	0.5	0	0.5	0	0	0	0.287
	US 190	4A	H	5	15	9,661	113	18	0.0117	0.0019	16%	0	5	0.690	1.0	0	0	0.5	0	0	0.5	0.298
	US 190	4C	H	12	1	71,713	1601	711	0.0223	0.0099	44%	0	13	0.524	0.0	1	0	1	0	1	1	0.631
	US 190	4D	H	17	5	50,367	634	246	0.0126	0.0049	39%	0	14	0.435	0.0	1	0	1	0	1	1	0.609
	US 190	4E	H	3	2	57,468	753	195	0.0131	0.0034	26%	0	10	0.713	0.5	1	0	1	0	1	1	0.703
	US 190	5	H	18	-	15,293	24	9	0.0016	0.0006	38%	0	7	0.395	0.5	0.5	0	1	0	0	0.5	0.349
	SH 195	16	H	11	8	11,378	399	96	0.0351	0.0084	24%	0	5	0.542	0.5	0.5	0.5	1	0	0	0.5	0.460
	IH 35	20A	H	15	4	59,453	1178	396	0.0198	0.0067	34%	0	10	0.449	0.0	1	0	1	0	0	1	0.462
	IH 35	20B	H	14	14	84,688	735	293	0.0087	0.0035	40%	0	21	0.480	0.5	1	0	1	0	1	1	0.645
	IH 35	20C	H	10	12	57,578	861	412	0.0150	0.0072	48%	0	31	0.589	0.5	1	0	1	0	0	1	0.522
	IH 35	20D	H	7	11	62,155	1070	659	0.0172	0.0106	62%	0	23	0.636	0.5	1	0	1	0	0	1	0.534
	Loop 363	26A	H	9	3	12,582	92	29	0.0073	0.0023	32%	0	9	0.599	0.0	0.5	0	1	0	0	0.5	0.375
	Loop 363	26B	H	13	7	21,119	223	73	0.0106	0.0035	33%	0	4	0.517	0.0	1	0	1	0	1	0	0.579
	Loop 363	26C	H	20	9	24,123	115	44	0.0048	0.0018	38%	0	7	0.335	0.0	1	0	1	0	0	0.5	0.409
	Loop 363	26D	H	2	13	12,392	198	60	0.0160	0.0048	30%	0	4	0.717	1.0	0.5	0	1	0	0	0	0.429
	Loop 363	26E	H	6	16	8,295	145	51	0.0175	0.0061	35%	0	12	0.675	1.0	0	0	1	0	0	1	0.369

	Loop 363	26F	H	8	18	9,217	55	10	0.0060	0.0011	18%	0	12	0.602	1.0	0	0	0.5	0	0	1	0.300
	SH 36/Airport Rd	28	H	4	6	17,094	177	55	0.0104	0.0032	31%	0	0	0.709	0.5	0.5	0	1	0	0	0	0.402
	US 190E	32A	H	19	17	8,434	97	7	0.0115	0.0008	7%	0	1	0.380	0.5	0	0	0	0	0	0	0.120
	US 190E	32B	H	1	10	9,694	95	19	0.0098	0.0020	20%	0	1	0.755	1.0	0	0	1	0	0	0	0.339

2018 Methodology Updates and Findings

The following summary documents the methodology changes and findings of the 2018 update to the Killeen-Temple Metropolitan Planning Organization (KTMPO) Congestion Management Process (CMP).

Congestion Data Sources

To analyze congestion along the CMP network, this CMP Update used three quantitative data sources: National Performance Management Research Data Set (NPMRDS), INRIX, and KTMPO's Regional Travel Demand Model (TDM). While the sources are similar to those used in the 2016 CMP Update, there are key differences in the data used for this most recent effort.

NPMRDS

Previously, the NPMRDS was developed by HERE. In 2017, the Federal Highway Administration (FHWA) chose INRIX, partnered with the Center for Advanced Transportation Technology Laboratory (CATT Lab) at the University of Maryland, to develop and manage the NPMRDS[1]. This 2018 CMP Update uses the 2017 data provided by INRIX through CATT Lab's Regional Integrated Transportation System (RITIS) data sharing application.

INRIX

The 2018 CMP again uses INRIX data provided by the Texas Department of Transportation (TxDOT); however, the newer version of the data was processed by the Texas A&M Transportation Institute (TTI) before distribution. Previously, the project team was responsible for processing the raw data.

TDM

The 2018 CMP uses an updated version of the KTMPO TDM and model runs for years 2018 (existing conditions) and 2045 (future no build). One major difference between the new (2045) and old (2040) TDM is that the new model does not include time-of-day functionality or outputs. For this reason, peak period TDM congestion measures were dropped from the congestion score calculations.

Congestion Score Weighting Changes

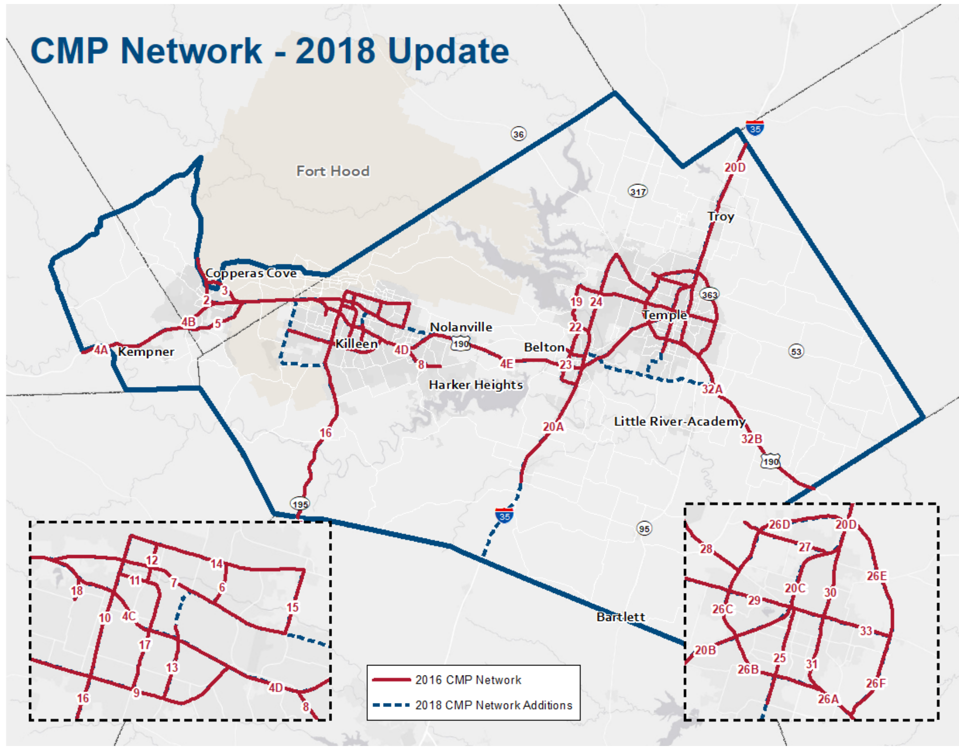
Due to changes and improvements in the quality of the different quantitative congestion data sources, the weights applied to the raw performance measures for the 2018 CMP Update were revised. The revised weighting is meant to reflect confidence in the quality of data for a particular source and aims to prioritize observed data (e.g. NPMRDS and INRIX). The first table included on page C-1 shows the weights used to create weighted congestion performance measures based on data availability.

CMP Network Update

The 2016 CMP network was updated to include additional roadways for which data was previously unavailable. Major additions to the network include FM 93 and Clear Creek Road. The updated CMP network also includes extensions to IH 35, S. 31st St, Business

[1] Source: http://inrix.com/press-releases/npmrds/

190 near Nolanville, and W.S. Young Drive. Additionally, data was available for Segment 3 (SH 9) and Segment 5 (US 190 Bypass), which were previously included in the CMP but did not have available data to include in the congestion scoring. The map below shows the 2016 CMP Network and the additions included in the 2018 network update.



Prioritization Process

The prioritization process for the 2018 CMP remained the same with the exception of an added evaluation criteria: Congestion Rank Change. This evaluation criteria compared the 2016 and 2018 congestion ranking. Segments where the ranking became significantly worse (i.e. higher congestion ranking) were assigned a higher prioritization score, segments where the ranking dropped significantly were given a lower prioritization score. The updated evaluation criteria weighting used to calculate prioritization score is included in the table below.

Criteria		Weight
Congestion Rank		25%
Congestion Rank Change		5%
Volume		20%
Safety	Crashes	15%
	Rear-End Crashes	10%
Transit		15%
School		5%
Public Input		5%
Total		***100%***

Findings

Due to differences in data, additions to the CMP network, and real-life changes to the region's roadway network, there were several significant changes to the prioritized list of CMP segments. The tables below show a comparison between the 2016 and 2018 priority rank for each CMP segment.

The largest increases in priority ranking for arterials occurred along Segments 24 (SH 317), 13 (WS Young Dr), 29 (SH 53/Adams Ave.), and 8 (FM 2410). The large increase in priority ranking for Segment 24 is due to a large increase in congestion, which may be attributed to major construction occurring along SH 317 during the congestion data collection period. The increased rankings for Segments 13 and 29 are also mostly associated with increases in congestion score. While the congestion ranking does increase for Segment 8 as well, the increase in priority ranking can also be attributed to an increase in the percentage of crashes along the roadway that are rear-end and an increase in the number of schools located along the segment[2]. In general, the priority ranking for arterials appear to be much more variable compared to highways from year-to-year. Note that the NPMRDS (which was determined to be the highest quality congestion data source of the three) was not available for the majority of arterial segments.

For highways, the largest increases in priority ranking occurred along Segments 20B, 20D, and 20C. The change in priority rank for Segments 20D and 20C is mostly due to congestion rank changes, which are an expected result of ongoing construction during the data collection period. Conversely, for segments where roadway projects were completed prior to the congestion data collection period (2017), the priority and congestion ranking decreased (i.e. congestion improved). Examples of projects improving congestion appear along Segments 4C and 20A.

[2] Harker Heights High School was not included in the 2016 version of the school location data.

Arterial Segments

Segment ID	Description	Priority Rank	2016 Rank	Ranking Change
10	FORT HOOD ST - FM 3470/STAN SCHLUETER LOOP TO RANCIER AVE	1	3	-2
24	SH 317 - US 190 TO SH 36	2	17	-15
13	WS YOUNG DR - BUSINESS 190 TO FM 3470/STAN SCHLUETER LOOP	3	14	-11
17	TRIMMIER RD - FM 3470/STAN SCHLUETER LOOP TO HALLMARK AVE	4	5	-1
9	FM 3470/STAN SCHLUETER LOOP - SH 201/CLEAR CREEK RD TO US 190	5	1	4
4B	BUSINESS 190 - US 190 BYPASS W TO US 190 BYPASS E	6	2	4
25	FM 1741/S 31ST ST - FM 93 TO SH 53/ADAMS AVE	7	16	-9
29	SH 53/ADAMS AVE - FM 2271 TO 3RD ST	8	24	-16
7	BUSINESS 190 - US 190 TO NOLA RUTH BLVD	9	4	5
14	RANCIER AVE - FORT HOOD ST TO ROY REYNOLDS DR	10	10	0
8	FM 2410 - US 190 TO WARRIORS PATH	11	23	-12
1	AVE D - N 1ST ST TO BUSINESS 190	12	7	5
34	CLEAR CREEK RD - US 190 TO SH 195	13	-	-
23	LOOP 121 - IH 35 TO LAKE RD	14	13	1
30	SPUR 290/3RD ST - AVE E TO IH 35	15	15	0
31	SPUR 290/S 1ST ST - S LOOP 363 TO AVE E	16	18	-2
18	WILLOW SPRINGS RD - US 190 TO WATERCREST RD	17	12	5
2	FM 116 - AVE D TO ELIJAH RD	18	6	12
6	38TH ST - BUSINESS 190 TO RANCIER AVE	19	20	-1
22	LAKE RD - FM 2271 TO SH 317	20	26	-6
21A	FM 93/NOLAN VALLEY RD - WHEAT RD TO IH 35	21	8	13
12	N 2ND ST - HALLMARK AVE TO RANCIER AVE	22	21	1
11	HALLMARK AVE - FORT HOOD ST TO TRIMMIER RD	23	11	12
19	FM 2271 - LAKE RD TO FM 2305/W ADAMS AVE	24	25	-1
33	SH 53/ADAMS AVE - 3RD ST TO E LOOP 363	25	19	6
27	INDUSTRIAL BLVD - OLD HOWARD RD TO IH 35	26	22	4
21B	FM 93 - IH 35 TO US 190	27	-	-
15	ROY REYNOLDS DR - BUSINESS 190 TO RANCIER AVE	28	9	19

Highway Segments

Segment ID	Description	Priority Rank	2016 Rank	Ranking Change
4E	US 190 - BUSINESS 190 TO IH 35	1	2	-1
20B	IH 35 - US 190 TO S LOOP 363	2	14	-12
4C	US 190 - SH 9 TO FM 3470/STAN SCHLUETER LOOP	3	1	2
4D	US 190 - FM 3470/STAN SCHLUETER LOOP TO BUSINESS 190	4	5	-1
26B	LOOP 363 - SPUR 290 TO IH 35 S	5	7	-2
20D	IH 35 - N LOOP 363 TO FALLS COUNTY LINE	6	11	-5
20C	IH 35 - S LOOP 363 TO N LOOP 363	7	12	-5
20A	IH 35 - US 190 TO WILLIAMSON COUNTY LINE	8	4	4
16	SH 195 - WILLIAMSON COUNTY LINE TO FM 3470/STAN SCHLUETER LOOP	9	8	1
26D	LOOP 363 - SH 36 TO IH 35 N	10	13	-3
26C	LOOP 363 - IH 35 S TO SH 36	11	9	2
28	SH 36 - LOOP 363 TO SH 317	12	6	6
26A	LOOP 363 - US 190 TO SPUR 290	13	3	10
26E	LOOP 363 - IH 35 N TO SH 53	14	16	-2
5	US 190 - BUSINESS 190 W TO BUSINESS 190 E	15	-	-
32B	US 190 SE - PRITCHARD RD TO MILAM COUNTY LINE	16	10	6
26F	LOOP 363 - SH 53 TO US 190	17	18	-1
4A	US 190 - FM 1715 TO US 190	18	15	3
3	SH 9 - US 190 to FM 116	19	-	-
32A	US 190 SE - LOOP 363 TO PRITCHARD RD	20	17	3

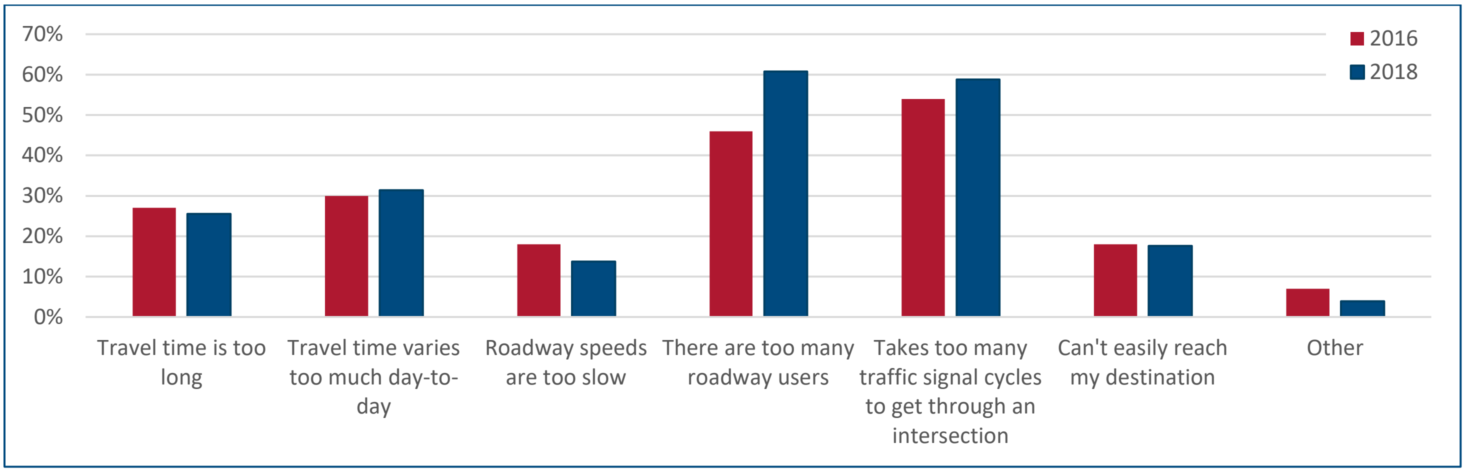
KTMPO CMP (2018) - Congestion Feedback Survey Results

The following presents the results of the 2018 KTMPO CMP Congestion Feedback Survey and compares these updated results to those generated from the 2016 version of the survey.

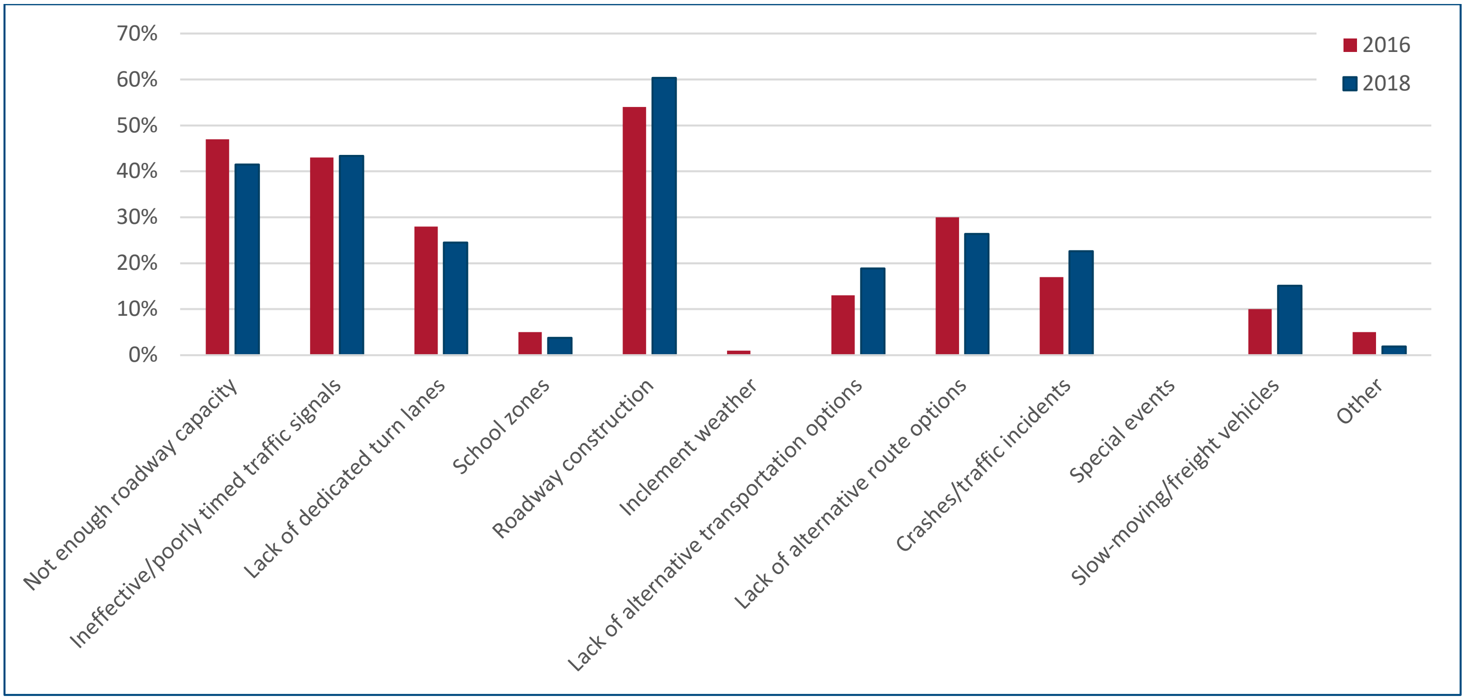
Question 1. Based on your daily travel experience, do you believe traffic congestion is a significant problem in the Killeen/Temple metropolitan area?

	2016	2018
Yes	91%	75%
No	9%	25%

Question 2. Which of the following best fits your definition of traffic congestion?



Question 3. What are the biggest causes of traffic congestion in the Killeen/Temple metro area?



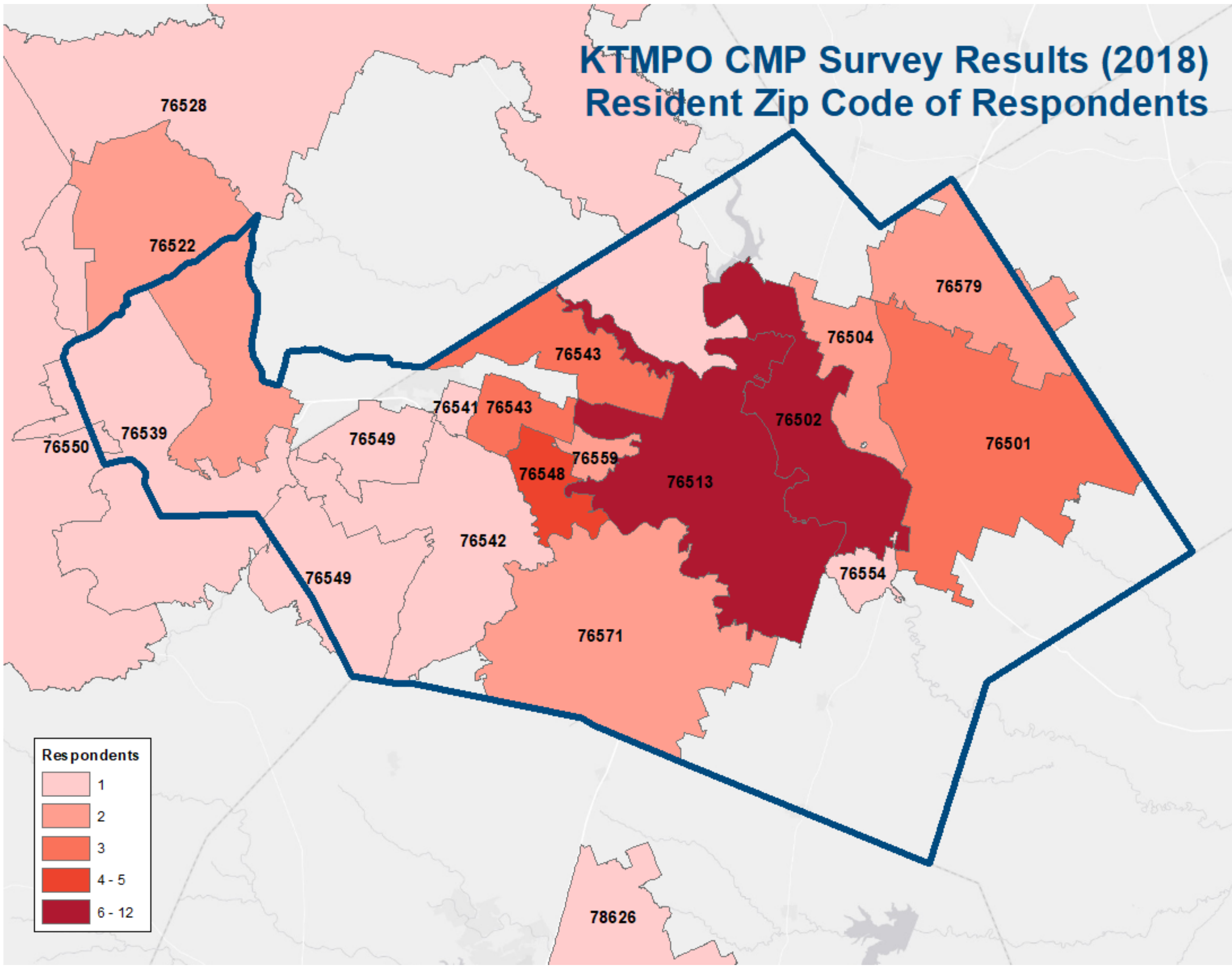
Question 4. How often do you experience traffic congestion in the Killeen/Temple metro area?

	2016	2018
Daily - regularly (peak)	62%	56%
Daily - regularly (off-peak)	7%	2%
Daily - intermittently/sporadically	12%	10%
A few times a week	12%	8%
A few times a month	4%	23%
Other/No Response	3%	2%

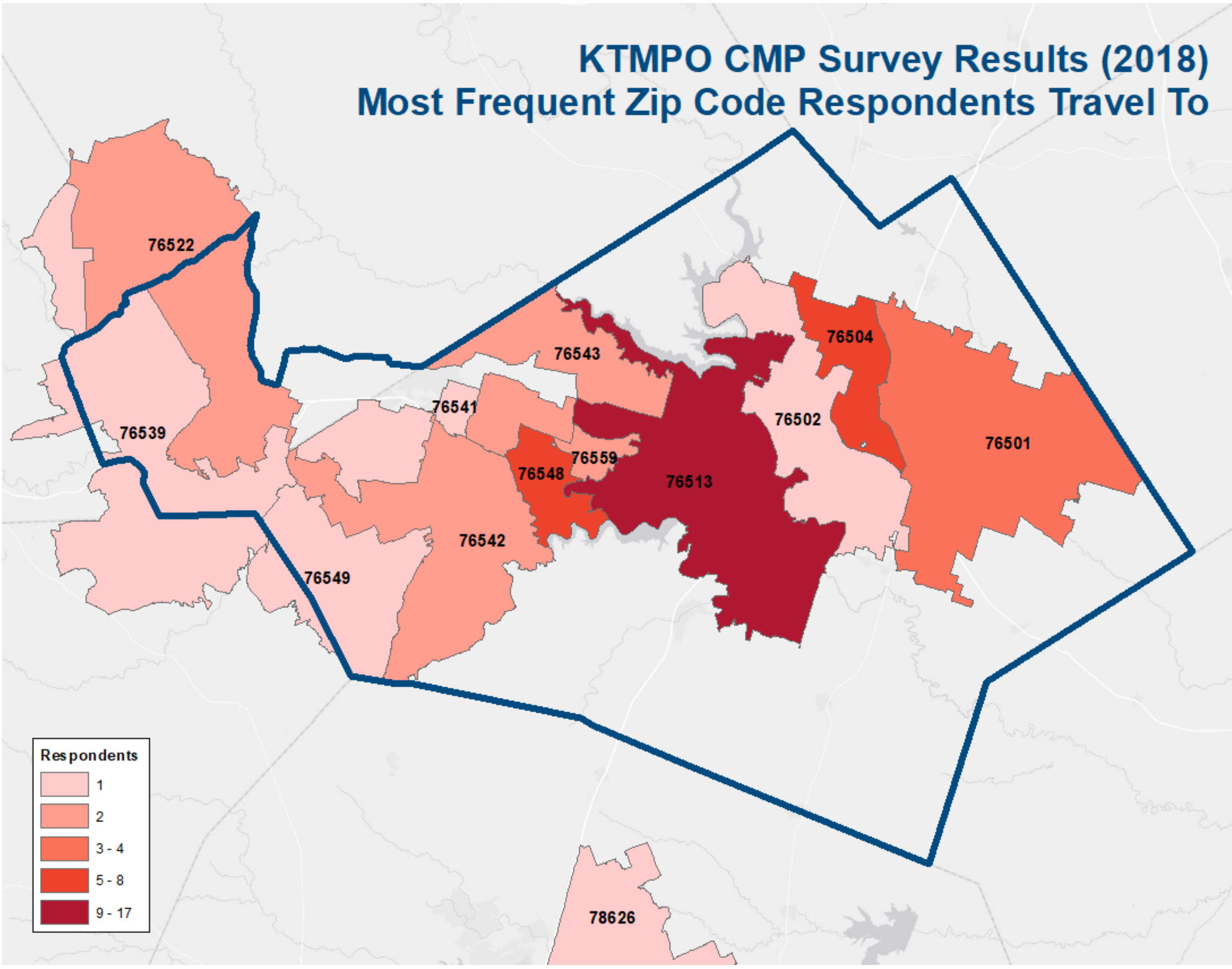
Question 5. What mode of transportation do you use most often?

	2016	2018
Personal Car	98%	96%
Carpool/Rideshare	0%	2%
Walking	0%	2%
Biking	0%	0%
Public Transportation	0%	0%
Other/No Response	2%	0%

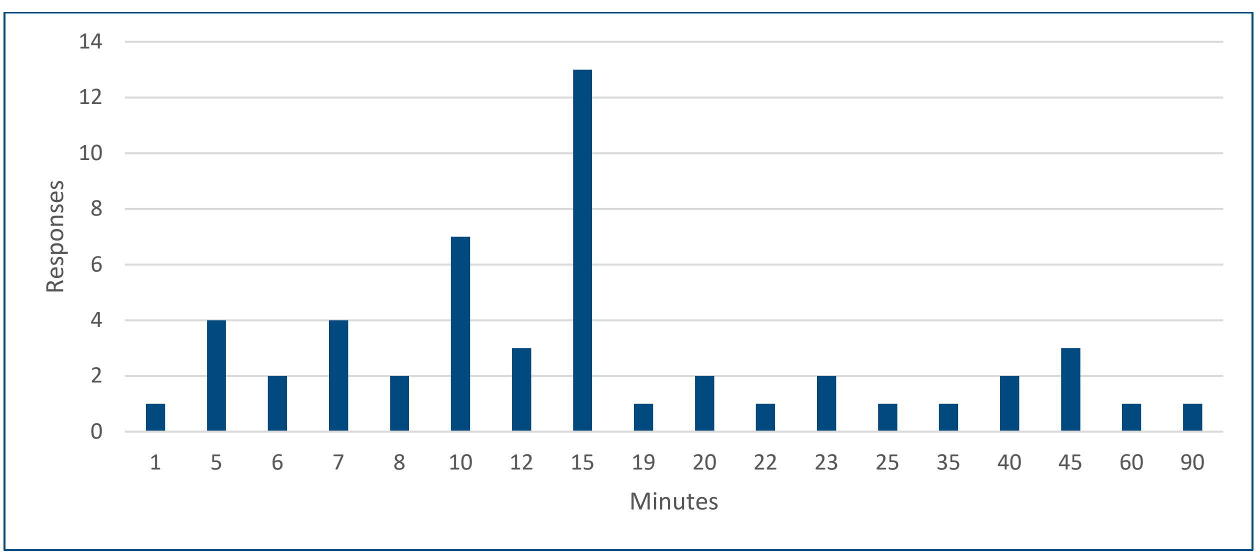
Question 6. In which zip code do you live?



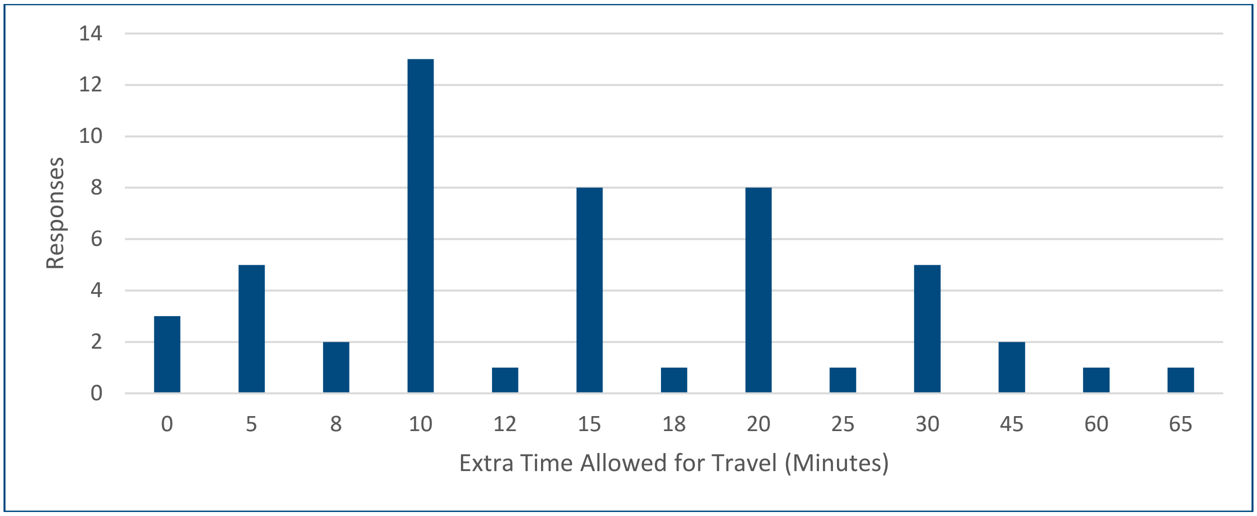
Question 7. To which zip code do you travel to the most (for work, school, etc.)?



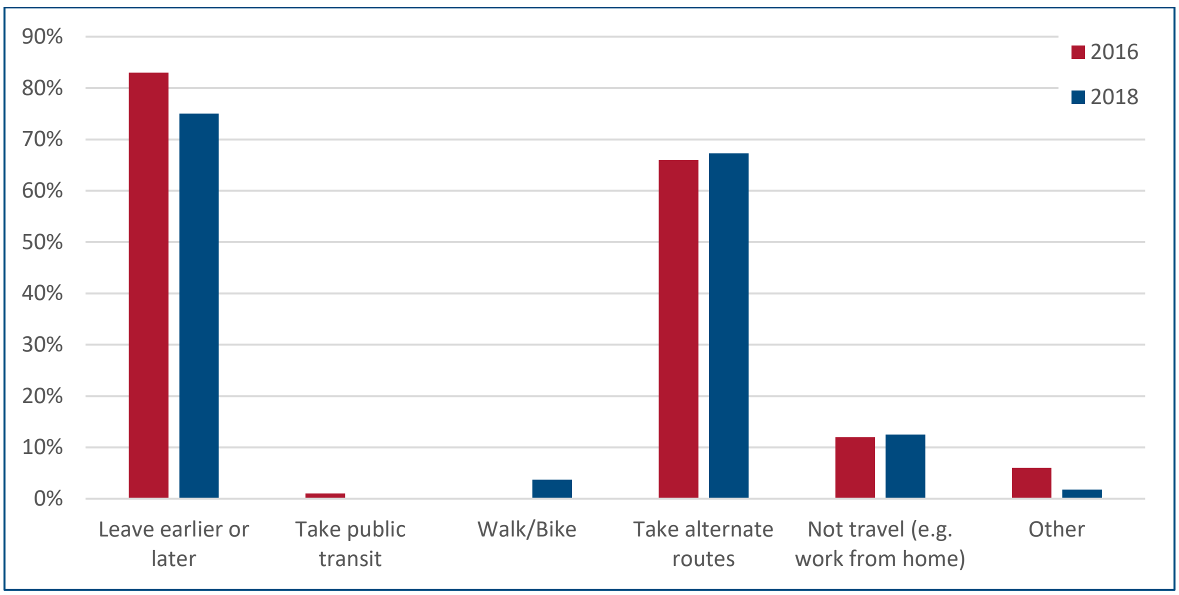
Question 8. How long would it take (in minutes) to get to your most frequent destination (e.g. work) from home with no traffic congestion?



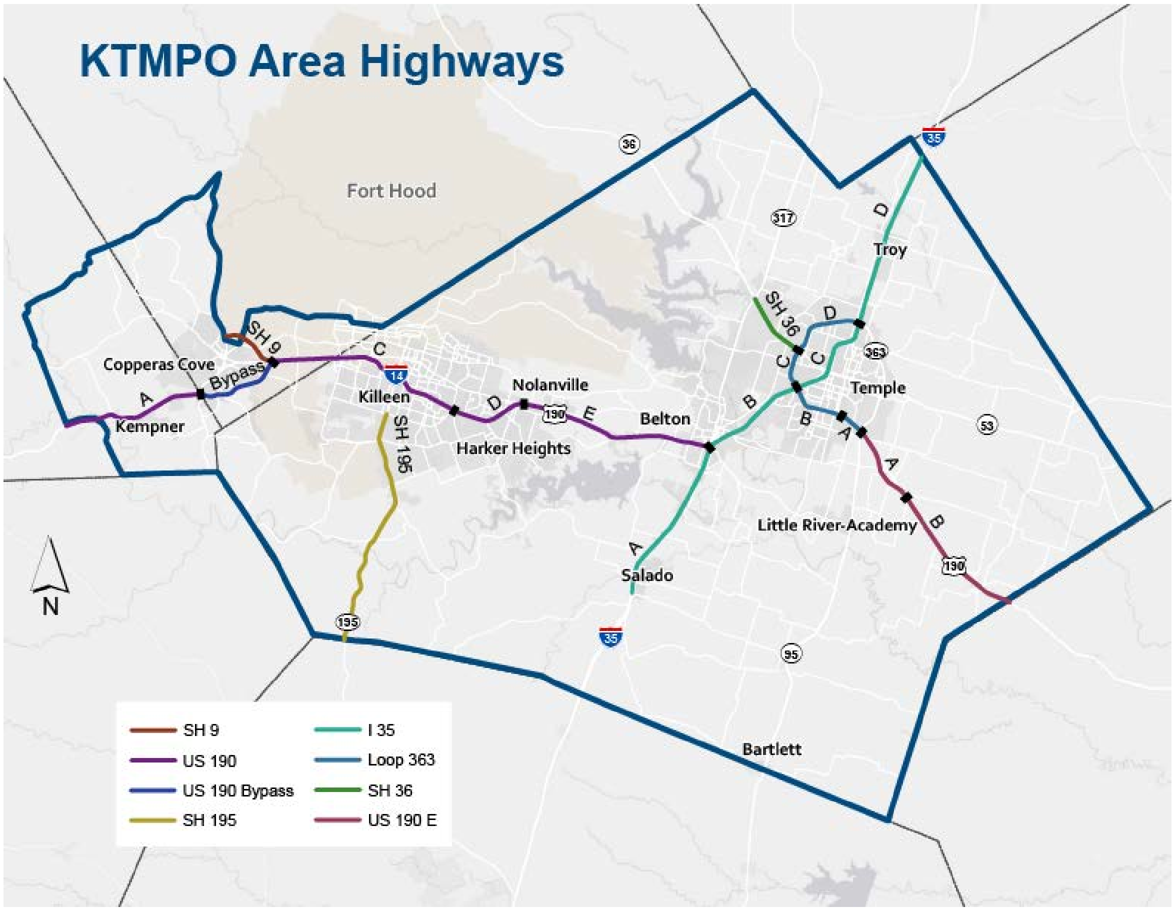
Question 9. How much extra time do you allow yourself (in minutes) to get to your destination on time to account for traffic congestion along your route?

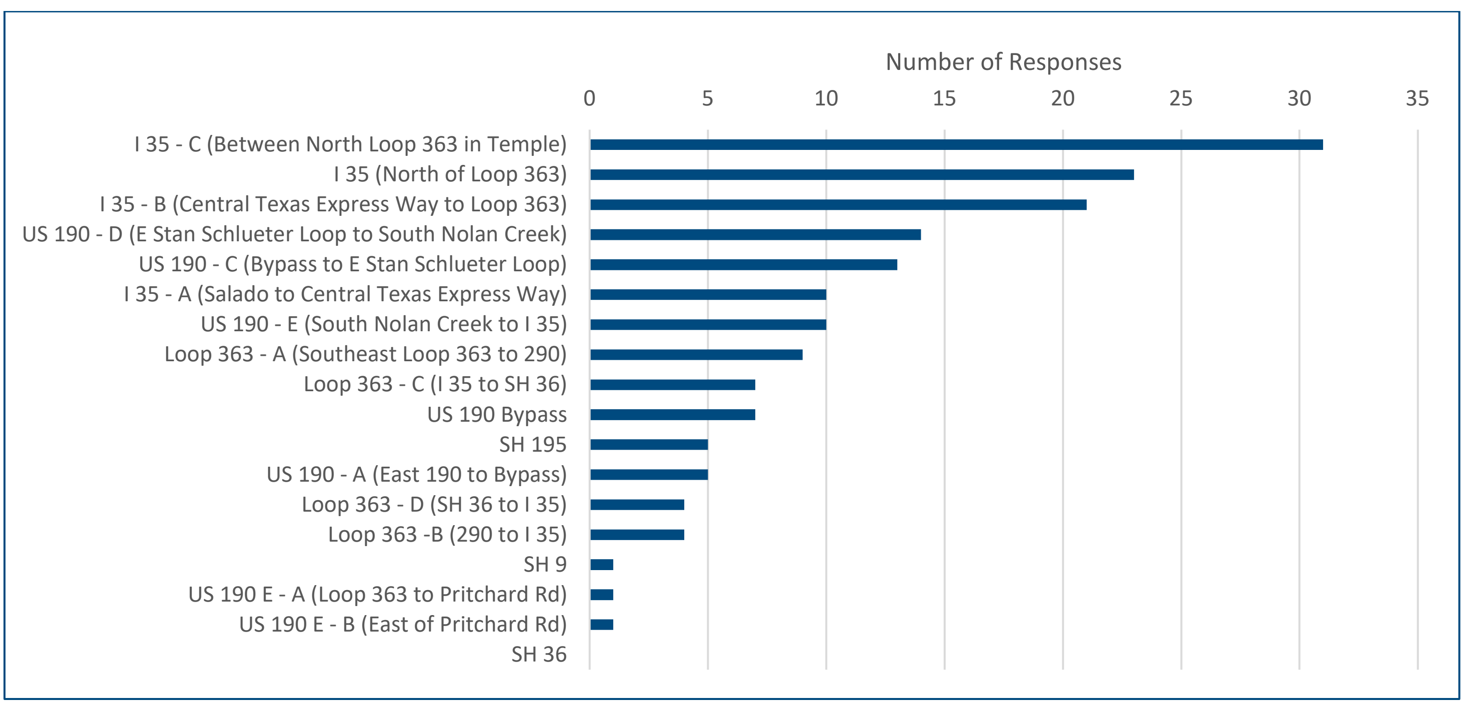


Question 10. What actions do you take to avoid traffic congestion?

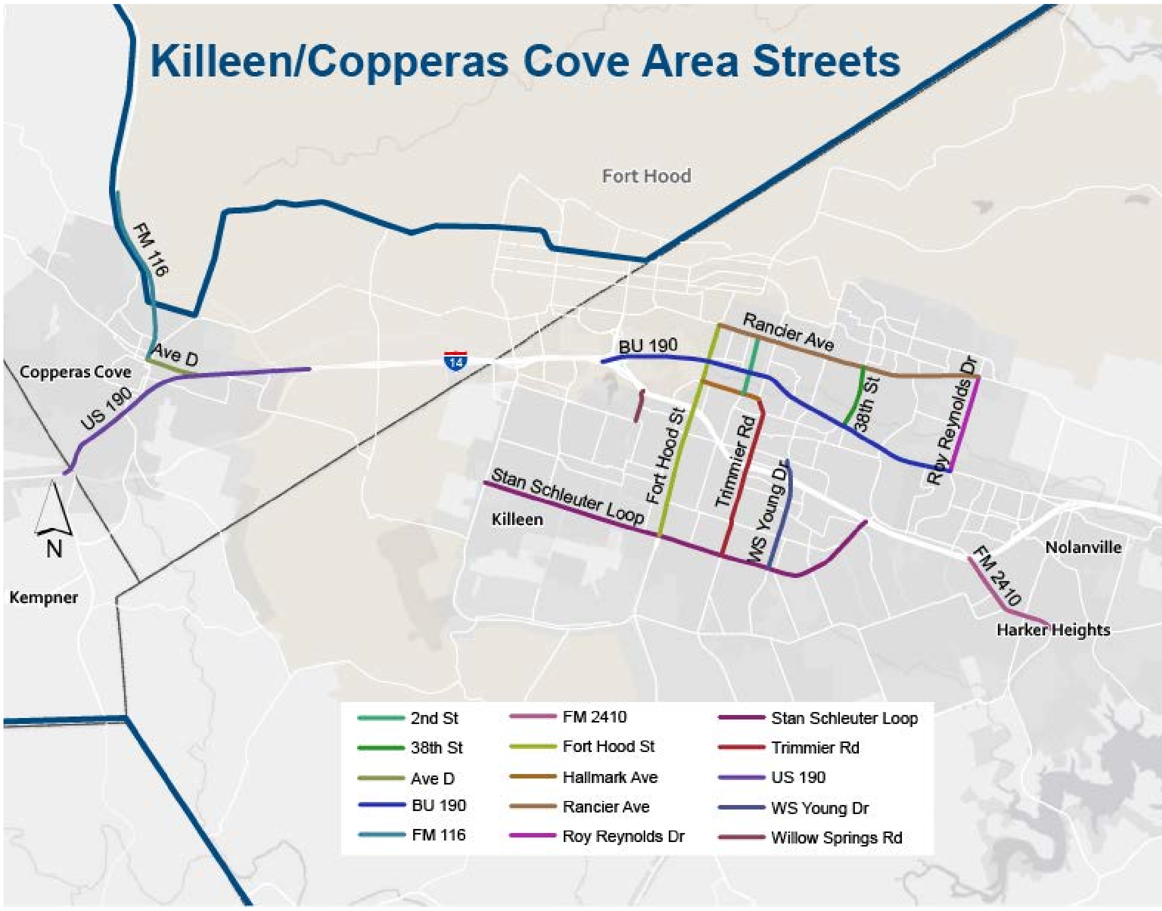


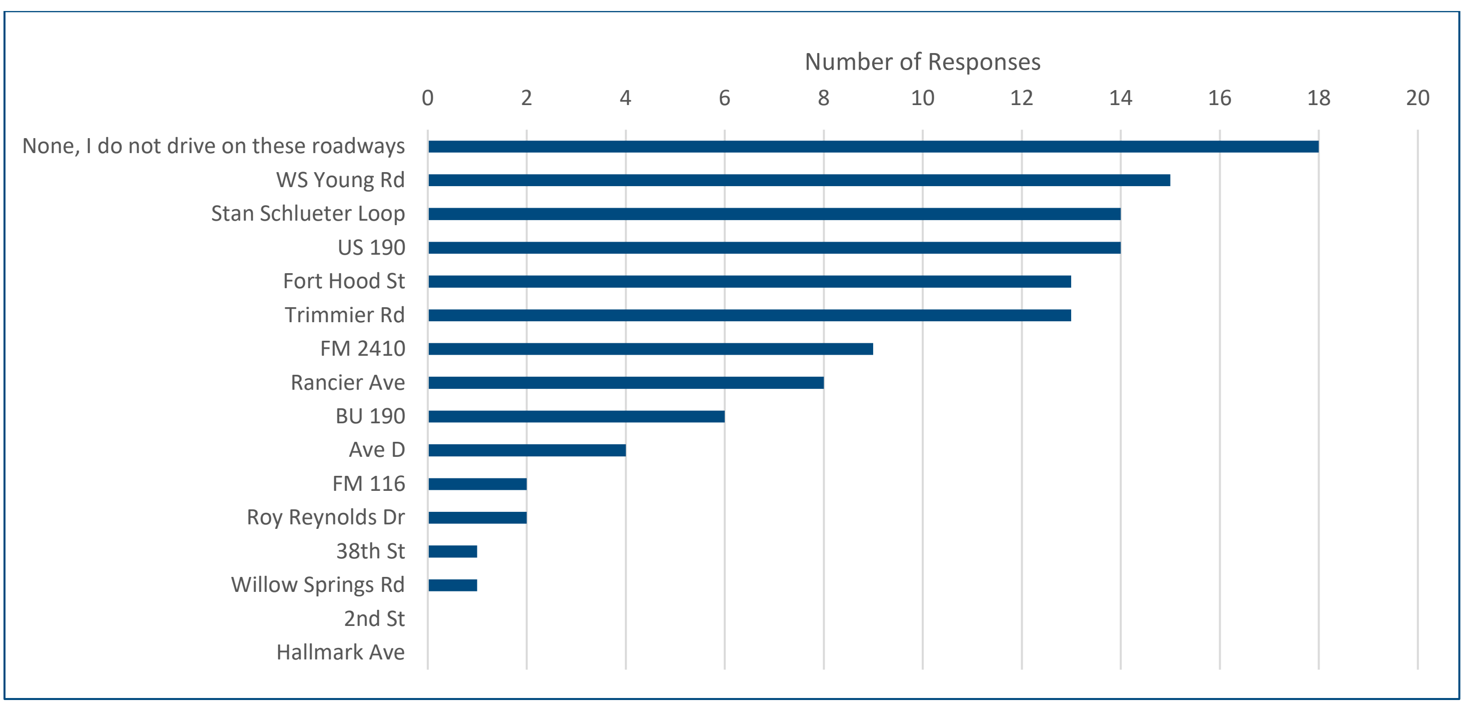
Question 11. In 2016, KTMPO established a Congestion Monitoring Network based on data availability and public feedback. The map below shows the highway segments of the monitoring network. From the list below, please select the segments where you experience the most traffic congestion.



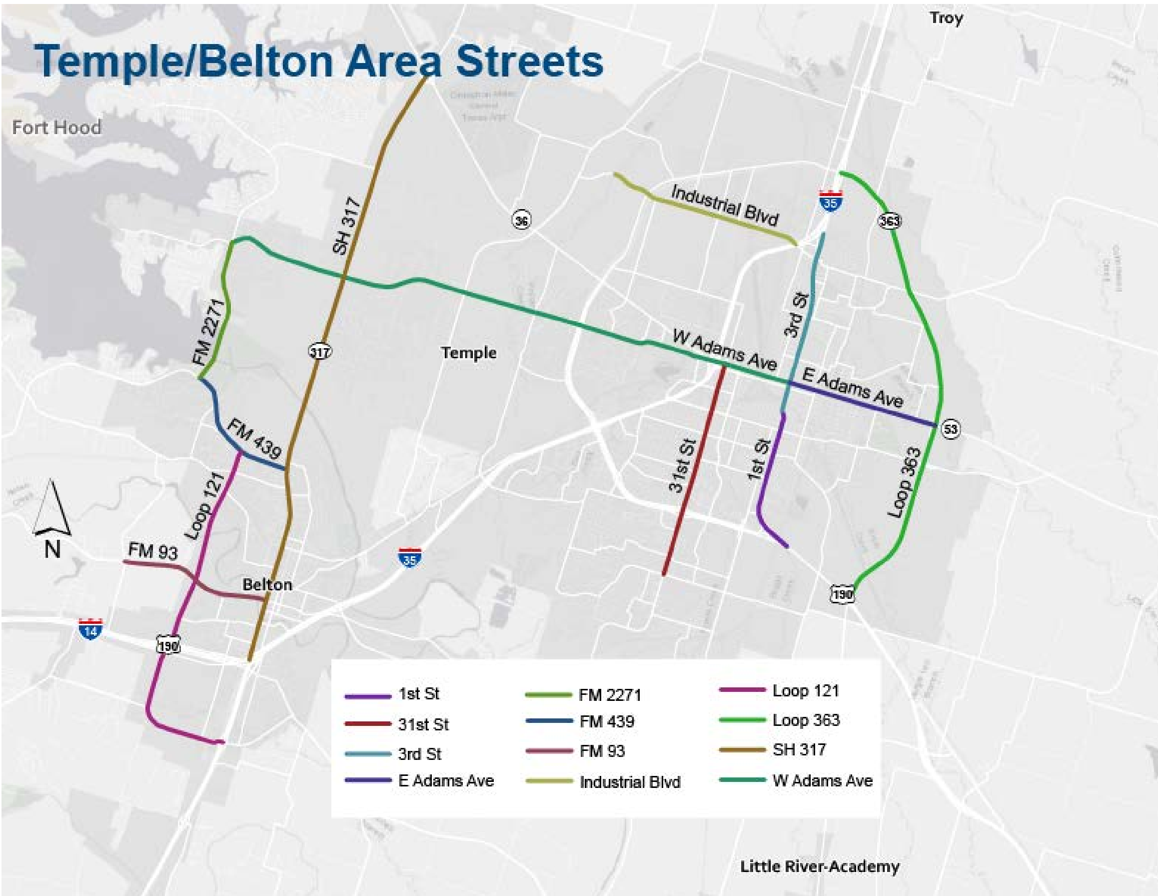


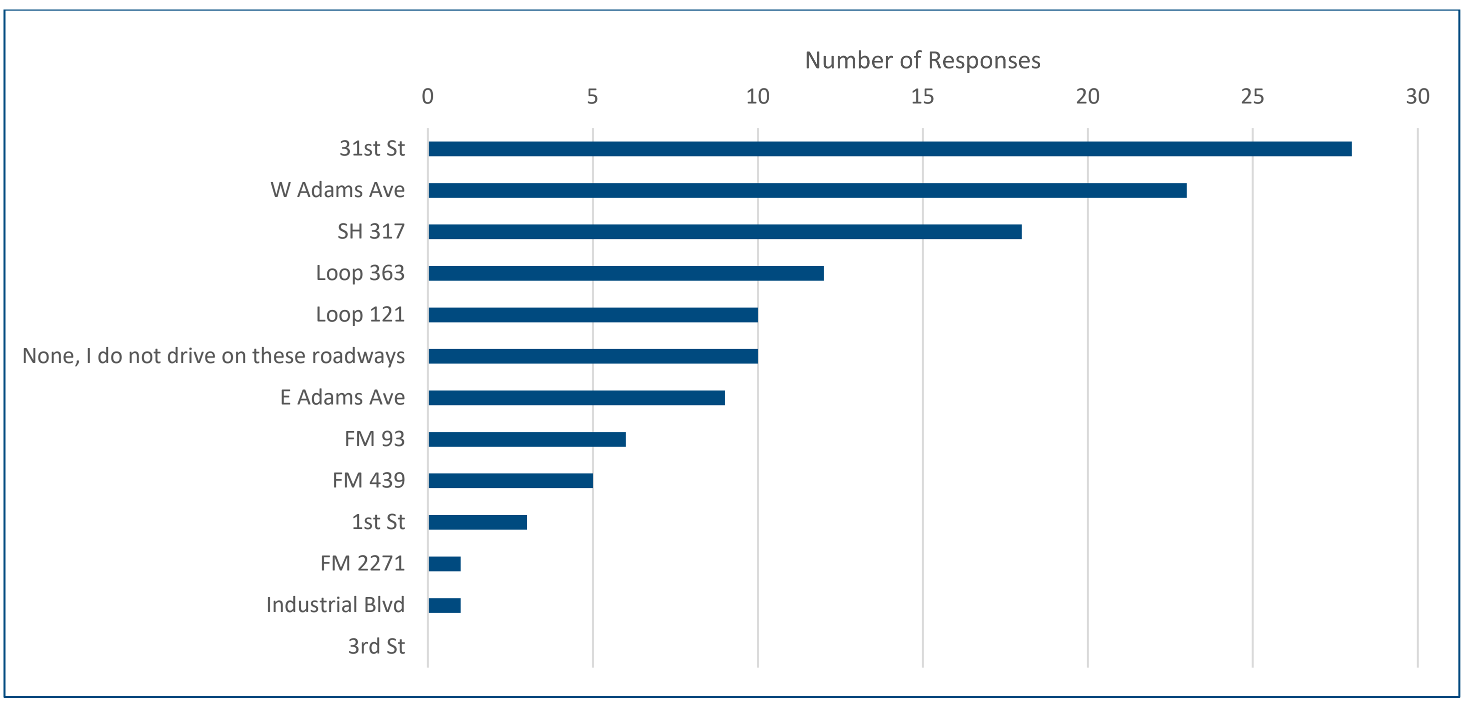
Question 12. The 2016 Congestion Monitoring Network also included segments along major arterial streets. The map below shows the arterial segments within the Killeen/Copperas Cove area. From the list below, please select the segments where you experience the most traffic congestion.



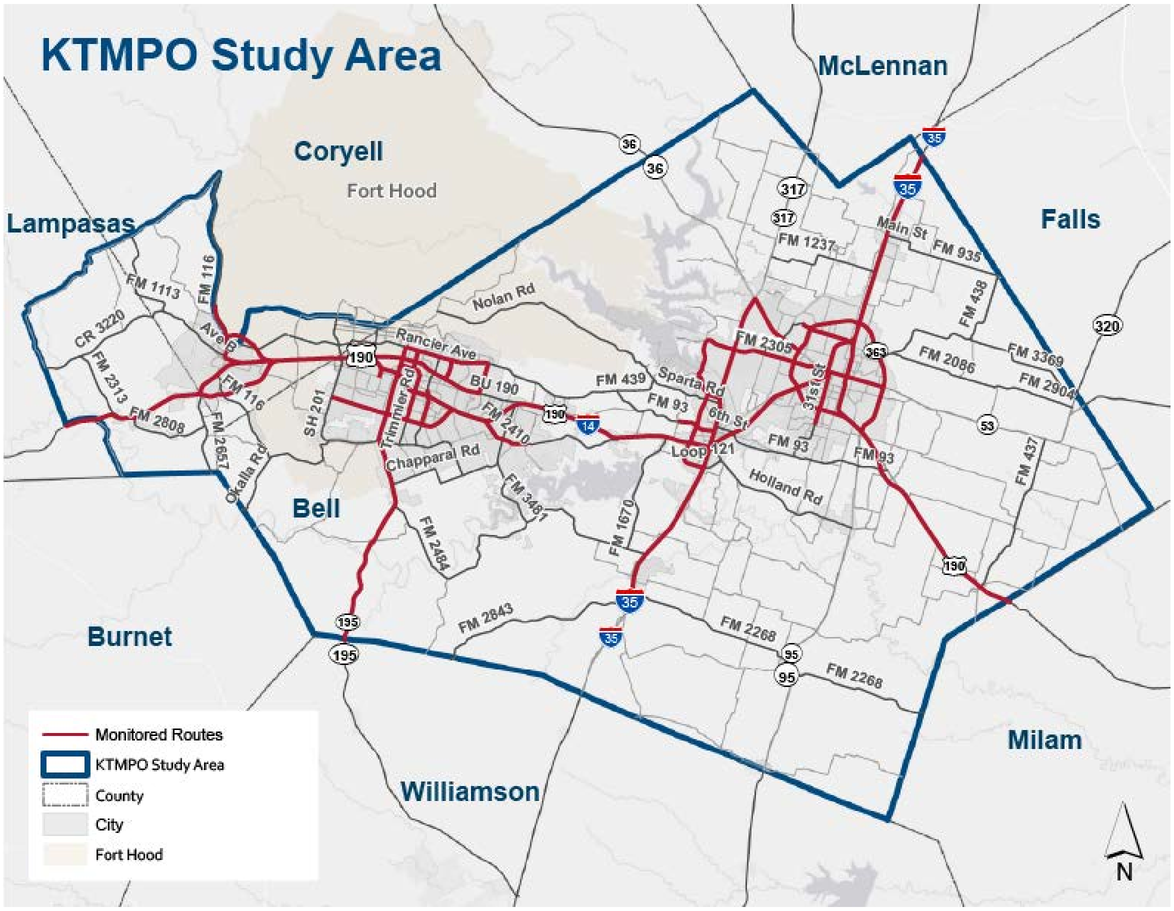


Question 13. The map below shows the arterial segments within the Temple/Belton area. From the list below, please select the segments where you experience the most traffic congestion.





Question 14. The map below shows the entire 2016 Congestion Monitoring Network (in red) in the Killeen/Temple metro area.



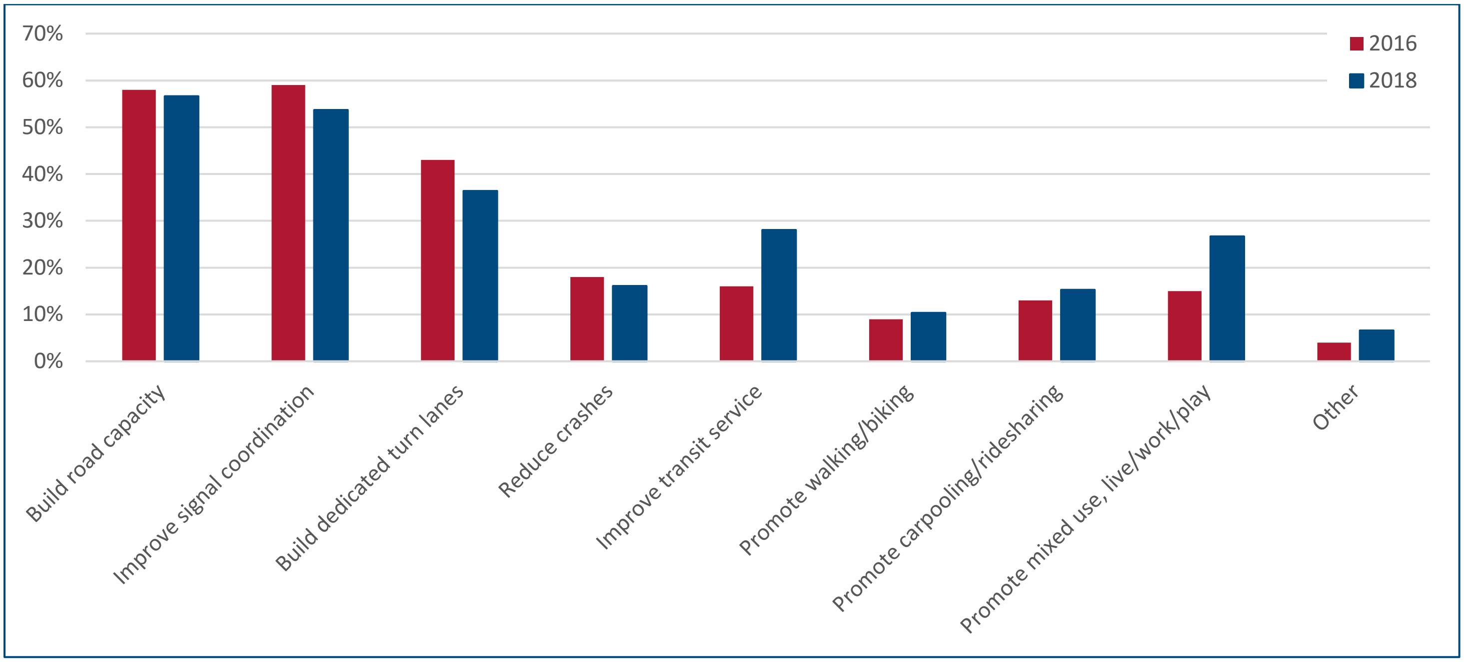
Question 14a. Are there any streets or highways in the region that are not included on the Congestion Monitoring Network (see above map) that you believe experience significant congestion?

Roadway	Mentions
Ave B from FM 116 to Summers Rd	1
Indian Trail	2
FM 3481 from FM 2484 to FM 2410	1
Veterans Memorial Blvd in Killeen	1
10th St in Killeen from Rancier to Hallmark	1
Trimmier Rd from Hallmark to IH 14	1
FM 93/IH 35 Intersection	1
W. Adams Ave from Kegley to Hwy 317	1
FM 93 from S. 31st St to IH 35	1
Clear Creek Rd from US 190 to Stan Schleuter Loop	2
Kegley Rd from IH 35 to W. Adams Ave	1
Lake Rd from FM 2410 and Chaparral Rd	1
6th St in Belton	1
Old Waco Rd and W. Adams Ave	1
Old Waco Rd and Poison Oak	1
Charter Oaks Dr and S. Pea Ridge	1
Main Street in Belton	2
Kegley Rd and W. Adams Ave.	1
FM 93 from Belton to Temple	1
FM 93 from 31st St heading west	1
CR 3220 from FM 2313 to FM 1113	1

Question 14b. Are there any streets or highways in the region that are not included on the Congestion Monitoring Network (see above map) that you believe will experience significant congestion in 10 years?

Roadway	Mentions
Summers Rd	1
Luther Church Rd from Ave Bto FM 116	1
Constitution Ave from BUS 190 to Old Copperas Cove	1
FM 93	4
FM 436	1
SH 95	2
FM 439	3
FM 3481 from FM 2410 to Chaparral Rd	1
Knights Way	1
Elms Rd	1
10th St in Killeen	1
Chaparral Rd from SH 195 to FM 3481	1
Indian Trail from US 190 to Veterans Memorial Blvd	1
Lake Rd from FM 2410 to Chaparral Rd	1
Old Waco Rd	3
Charter Oaks Dr	2
Airport Rd	1
Research Blvd	1
Kegley Rd	1
Scott Blvd	1
Chaparral Rd	1
Stagecoach Rd	1
Main St	1
Warriors Path	1
Loop 121 in Belton	1
US 190 Bypass in Copperas Cove	1

Question 15. What do you believe are the most effective strategies for addressing traffic congestion in the Killeen/Temple metro area?



Acknowledgments

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Texas Department of Transportation

KILLEEN-TEMPLE metropolitan planning organization

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Belton, TX 76513

Appendix H:

Air Quality

MOBILITY 2040

Killeen-Temple Metropolitan Planning Organization

Appendix H: Air Quality

Killeen-Temple KTMPO METROPOLITAN PLANNING ORGANIZATION

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Appendix H-1: Air Quality Next Steps Guide

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Killeen-Temple
KTMPO
METROPOLITAN PLANNING ORGANIZATION

Air Quality

Next Steps Guide

July 2012

Kimley-Horn
and Associates, Inc.

KTMPO Air Quality Next Steps Guide

A number of factors have contributed to the need for the Killeen-Temple MPO (KTMPO) to proceed with proactive air quality planning within the region. These factors include the region's proximity to one of the country's busiest Interstate Highway corridors, a recently introduced air quality monitoring station at Skylark Field, and potential changes in EPA ozone standards that may affect the KTMPO.

Kimley-Horn and Associates (KHA) was retained to assist them in an information gathering effort relating to their regional air quality. Through this effort, KHA met with local and regional stakeholders on May 16th, 2012 to discuss the current and future air quality conditions in the area. As a follow up to that effort, we have prepared this Next Steps Guide. The Guide's purpose is to document the steps KTMPO will have to take and potential issues that may be encountered as air quality becomes a high priority for the region.

This guide is composed of the following sections:

- **Introduction to air quality** – summary of overarching topics and terminology
- **Impacts for KTMPO** – potential actions and timelines involved with air quality nonattainment
- **Preparing for air quality nonattainment** – summary of Ozone Advance program and next steps for MTP, TIP, and travel demand model
- **Transportation conformity** – overview of conformity process for KTMPO
- **The MOVES model** – summary of data needs and integration of the travel demand model
- **Potential staffing needs** – description of options for staffing to facilitate air quality modeling
- **Interagency consultation** – discussion of participants in air quality consultation process

This guide is meant to serve as a companion to the Air Quality Work Session presentation, now available on the KTMPO website. For more information on these topics, please reference that document.

Introduction to Air Quality

KTMPO has been very proactive in seeking ways to prepare for future air quality issues. As stated above, the Air Quality Work Session presentation along with KTMPO's previously prepared air quality presentation provide much of the background information on this topic.

To help with the ease of use of this document, applicable terms and standards are defined here. Other terms may be introduced and described in detail elsewhere in the document.

- **National Ambient Air Quality Standards (NAAQS)** – Standards implemented by EPA to assign limits to the amount of pollution that can be present in the atmosphere. The NAAQS seek to regulate carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution, and sulfur dioxide.
- **Nonattainment** – Based on monitoring data, the EPA will determine if a region has air quality pollution levels that are under the NAAQS thresholds. If the region exceeds any of these thresholds, it is considered to be in nonattainment. For ozone, there have been different levels of nonattainment designations created based on the severity of the violation.
- **Transportation Conformity** – Transportation conformity is a process required by EPA for any nonattainment area. Conformity requires the analysis of proposed projects for air quality impacts within the MTP and TIP.
- **MOVES** – MOVES is the EPA's adopted air quality modeling software.
- **Travel Demand Model** – The travel demand model monitors the region's transportation network. This tool is relied upon during the MTP and TIP development, as well as the transportation conformity process.

Impacts for KTMPO

KTMPO is currently in attainment for all criteria air pollutants. The recent implementation of ozone monitoring in the Killeen area means that this region will become more highly scrutinized for its conformance to that standard. To determine if KTMPO is still attaining the standard, the EPA will look at the three-year average of monitoring data for this location. While it is unlikely that KTMPO will be designated nonattainment for the 2008 ozone standard, they may face this issue when the ozone standard is revised. The EPA is currently in progress with updating this standard. The current schedule for this is as follows:

- Standard proposed by end of 2013
- Finalized by end of 2014
- State recommendations for nonattainment areas by end of 2015
- EPA's final nonattainment designations by end of 2016

Once the final nonattainment designations are made, KTMPO would have one year to adopt a conforming MTP and TIP.

Preparing for Air Quality Nonattainment

This section details action KTMPO can take to make air quality a higher priority within its planning and projects.

Ozone Advance

KTMPO's future of being an air quality nonattainment area is far from a foregone conclusion. There are steps that the region can take now to avoid or minimize their air quality problems in the future. To assist interested states, local governments, MPOs, and COGs work towards this goal, the EPA created the Ozone Advance program. This program was created to accompany the 2008 ozone standards that are currently being implemented. The goals of the Ozone Advance program are as follows:

1. Help attainment areas take action in order to keep ozone levels below the level of the standard to ensure continued health protection
2. Better position areas to remain in attainment
3. Efficiently direct available resources toward actions to address ozone problems quickly

During the KTMPO Air Quality meeting on May 16, 2012 and subsequent discussions with staff, there was strong interest expressed in participating in this program. The actions needed to initiate participation in this program are as follows:

- Notify agency partners such as TxDOT, EPA, TCEQ, and FHWA of interest in participating. Agency support through this process will be critical, so they need to be on board from the beginning.
- Coordinate with Fort Hood. KTMPO's proximity to and close relationship with Fort Hood makes the installation an invaluable partner. Representatives from Fort Hood should be invited to participate in the development of KTMPO's strategies.
- Identify types of measures that can be considered. In order to achieve maximum impact with minimal expense, KTMPO should place initial emphasis on transportation demand management programs. Examples of TDM programs include ridesharing and carpooling, telecommuting, and increased bicycle and pedestrian travel.
- Within a year, develop a plan framework. This can consist of general descriptions of the measures being considered, and does not have to include quantitative analysis.
- Annual follow-up meetings with EPA. These meetings are required, but ideally coordination should be more frequent.

Carrie Paige serves as the Ozone Advance coordinator for EPA Region 6. During the preparation of this material, Carrie expressed her interest in helping KTMPO to move this along. Carrie's contact information is included at the end of this document.

Incorporating Air Quality into Planning Tools

Air quality needs can be a consideration in the long-range planning process even if an area is in attainment for all standards. There are actions that can be taken with the MTP, TIP, and travel demand model (TDM) to help streamline future air quality considerations.

- **MTP** – The biggest change that can be made to consider air quality in the MTP comes through the project prioritization criteria. As the evaluation process for ranking or grouping projects is established, air quality should be included as one of the criteria. Air quality benefits can be reasonably expected through most bicycle, pedestrian, and transit projects (reducing vehicle miles traveled), intersection improvement projects focused on congestion relief (reducing idling vehicles), ITS projects (reducing delay), and even some major congestion relief projects. However, some new location projects or widening projects will increase demand or VMT such that air quality impacts increase. As a result, these types of projects would not receive ranking points in this category. Consideration of air quality's importance may also influence the type of projects and programs that are recommended.
- **TIP** – Most of the changes to the TIP will come as a result of the modifications to the project ranking criteria done in the MTP.
- **TDM** – The full range of data needs for air quality modeling that can be obtained from the TDM are detailed in a subsequent section. Addressing these potential data needs in a timely fashion will allow for new data to be collected or analyzed (if needed) prior to the region moving into air quality nonattainment.

Transportation Conformity

If the KTMPO area is designated as an air quality nonattainment area, the transportation conformity process will have to be introduced into MTP and TIP development. Any time an update or modification is made to either of these documents, a conformity analysis will be performed. The financially constrained project list must be subjected to a conformity test to ensure those projects will not result in excessive negative air quality impacts for the region. Air quality conformity will be documented in its own chapter of the MTP, and also in the TIP documentation.

The concepts of regional significance and transportation control measures are important to this process.

Regional Significance

The transportation conformity process is geared towards addressing air quality issues associated with regionally significant projects. Regional significance is a concept that has been introduced at the federal level. However, it has been left to the regional and state level to define regional significance for their areas.

KTMPO can begin this process by coordinating with TxDOT. Since TxDOT oversees all the MPOs in the state, they have an active role in vetting the regionally significant project definitions. To help this process move forward, KTMPO should reference the regional significance definitions being used by other MPOs. It would be advisable to reference nearby MPOs as well as MPOs of similar size or makeup as KTMPO. KTMPO may begin the process of defining regional significance at any time

Skylark Field Air Quality Monitoring Station

Transportation Control Measures

If during the conformity process the region has difficulty staying under their budget, KTMPO may want to consider implementing transportation control measures (TCMs). TCMs provide additional enhancement to the area's air quality by promoting activities or projects that reduce vehicle miles traveled or vehicle delay. Many of these measures are similar to those that could be considered in the Ozone Advance program. TCMs can be implemented directly into the region's conformity analysis at any time. However, if TCMs are incorporated as a part of the demonstration of conformity, KTMPO will have to quantify the benefits that can be received from each of them. Proactively implementing some of these solutions is usually the preferred course of action, rather than having to rely on them to reach conformity.

The MOVES Model

The EPA introduced the MOVES model in 2009. MOVES serves as a new way to look at mobile source emissions, replacing EPA's old MOBILE6 software. In the years following its release, MOVES has been gradually rolling out for both regional and project-level air quality modeling. The most recent federal guidance indicates that all regional conformity air quality modeling must use the MOVES software after March 2013.

MOVES is a data-hungry software, relying on database iterations as the backbone of its analysis process. If KTMPO becomes an air quality non-attainment area, they will have to collect the appropriate data for this analysis as a part of the air quality modeling process. Data can be pulled from many sources. The major data needs for this program are listed below, along with potential sources of this information. The source used for this data can vary based on the capabilities of the travel demand model and the availability of local, regional, or state information.

Integrating the Travel Demand Model

The KTMPO travel demand model is in the process of being revised. This model is based upon the standard TxDOT modeling structure. The MPO has contracted with CDM Smith to update the base year data. However, the updating and maintenance of this model is typically done at the state level through the TxDOT Transportation Planning and Programming Division (TPP).

The travel demand model and its capabilities are an integral part of the MOVES air quality analysis process. If KTMPO does become a nonattainment area for air quality, significant coordination will be needed between the MPO and TxDOT. During this coordination process, TxDOT will be able to provide guidance about what types of air quality modeling information can be obtained from the model. If the model does not have the capability to provide all the potential data sources, they will have to be obtained from existing state or federal data. While this is often an acceptable alternative, having the information in the regional travel demand model helps to ensure the air quality modeling information being used is reflective of the local conditions. We encourage TxDOT to discuss the options for air quality modeling integration within the travel demand model with KTMPO and other potentially affected MPOs in advance of any air quality rulings. Advance preparation will help ensure desired model data is available in time for future air quality analyses.

Data Need	Travel Demand Model	TxDOT	TCEQ	FHWA/ EPA	Regional Transit Agencies	Notes
Vehicle Source Type		x	x			Likely references DMV records
Vehicle Age Distribution		x	x			Likely references DMV records
Alternative Vehicle Fuel Types					x	If applicable
I/M Program Data			x			If applicable
Meteorology			x			May reference NOAA data for Skylark Field
Fuel Supply/Fuel Formulation		x	x			
Road Type Distribution	x	x	x			May use HPMS data
Vehicle Type VMT	x					
Monthly/Daily VMT Fractions		x		x		State or national averages
Hourly VMT Fractions	x	x				
Ramp Fraction	x					
Speed Distribution	x	x		x		

Potential Staffing Needs

If the KTMPO becomes a nonattainment area it will introduce a new element of transportation planning and modeling to the region. To prepare for this, it is important to consider the options available for addressing these concerns at an agency level.

Two primary staffing options present themselves for consideration. The first option would involve all air quality modeling being conducted in-house by KTMPO. Alternately, KTMPO could consider having their air quality modeling done elsewhere and then being applied into the MTP and TIP processes. Both options are discussed below, along with the skill sets and efforts involved.

Option 1 – AQ modeling done locally

In order for a KTMPO staff member to perform the needed air quality analysis and documentation, several issues should be considered. The staff member identified should be required to attend the FHWA/EPA MOVES Regional Conformity training. If possible, the staff member should also be involved with the development of other elements of the MTP. If KTMPO is performing portions of its travel demand modeling in-house, it is recommended that the same person manipulating the TDM also performs the air quality modeling. This staff member would also be responsible for leading the air quality interagency consultation process.

The staff member's time will be needed whenever an update is made to the region's TIP or MTP, with additional coordination on projects requiring NEPA analysis and updates to the TDM. Continuing education initiatives like air quality webinars, training courses, and conferences/workshops would also be beneficial to maintain proficiency. With all of this in mind, a full-time staff member is not needed.

To ensure smooth startup for KTMPO's air quality involvement, coordination with other involved agencies (TxDOT, TCEQ, FHWA, EPA) will be needed to clearly outline the staff member's responsibilities. Other ways to speed KTMPO's integration into the air quality modeling process would be to enlist an outside entity (e.g. public/private agency such as TTI, or private consulting firm) that could assist with the first air quality model development, analysis, and coordination and conduct supplemental training for staff.

Option 2 – AQ modeling done elsewhere, applied into MTP and TIP

If KTMPO determines that a fully in-house air quality modeling presence is not desired or practical, they can look to an outside entity for assistance. There are three potential ways the air quality effort could be completed:

- **State-led effort** – If resources exist and are available for use, KTMPO could rely on TxDOT to perform air quality analyses for MTP and TIP updates.
- **Public/private entity** – An entity such as TTI that works with TxDOT while also having the freedom to work for other clients could be hired to assist, depending on their available resources and skill sets.
- **Consulting firm** – A private consultant could be retained to perform AQ analysis. Consultant could be retained using a master agreement, thereby allowing flexibility for their involvement when AQ analysis is needed. Consultant could also be hired on an as-needed basis during MTP and TIP updates.

It is recommended that a KTMPO staff member be identified as the primary coordination point for these efforts. This staff member would still benefit from having background knowledge about the air quality modeling process. As such, the staff member may want to attend the FHWA/EPA MOVES

Regional Conformity training. Other FHWA/EPA webinars or presentations could potentially serve this purpose as well. This staff member will also head up ongoing coordination with involved agencies (TxDOT, TCEQ, FHWA, and EPA) to track timelines and needed deliverables.

Interagency Consultation

The interagency consultation process is at the heart of any air quality conformity determination. Interagency consultation is needed to establish air quality modeling parameters, to provide review and oversight on the analysis and documentation, and to ensure the regional air quality conformity process will satisfy federal and state requirements.

During the preparation of this material, we relied on the input from representatives at agencies such as FHWA, EPA, TxDOT, and TCEQ. These representatives, along with representatives from KTMPO and FTA, would form the backbone of the interagency consultation process. Depending on the interest level of local jurisdictions, counties and municipalities may also be invited to participate in the interagency coordination process. Similarly, a contact from Fort Hood could also be invited to participate in this process.

The table below shows the recommended agencies and contact points within those agencies that could serve as the core interagency consultation group.

Name	Agency	Email	Phone
Margie McAllister	TCEQ	Margie.mcallister@tceq.texas.gov	(512) 239-1967
Shelley Naik	TCEQ	Shelley.naik@tceq.texas.gov	(512) 239-1536
Barbara Maley	FHWA	Barbara.maley@dot.gov	(214) 224-2175
Jose Campos	FHWA	Jose.campos@dot.gov	(512) 536-5932
FTA Region 6	FTA		(817)978-0550
Tim Juarez	TxDOT	Tim.juarez@txdot.gov	(254) 745-2136
Tim Wood	TxDOT	Tim.wood@txdot.gov	(512) 416-2659
Greg Lancaster	TxDOT	Greg.lancaster@txdot.gov	(512) 486-5126
Carrie Paige	EPA	Paige.carrie@epamail.epa.gov	(214) 665-6521
Guy Donaldson	EPA	Donaldson.guy@epamail.epa.gov	(214) 665-7242

Transportation Control Measures

According to the U.S. Federal Highway Administration (FHWA), Transportation Contol Measures (TCMs) are strategies that:

1. are specifically identified and committed to in State Implementation Plans (SIPs); and
2. are either listed in Section 108 of the Clean Air Act (CAA) or will reduce transportation-related emissions by reducing vehicle use or improving traffic flow. (http://www.gpo.gov/fdsys/pkg/USCODE-2010-title42/html/USCODE-2010-title42-chap85-subchapI-partA-sec7408.htm)

Section 108 of the CAA provides examples of transportation control measures including, but not limited to:

- improved public transit,
- traffic flow improvements and high-occupancy vehicle lanes,
- shared ride services,
- pedestrian/bicycle facilities, and
- flexible work schedules.

Timely implementation of TCMs criterion must be satisfied before conformity determinations can be made. Consequently, TCMs receive the highest priority for funding under the Congestion Mitigation and Air Quality Improvement (CMAQ) Program.

Many other measures, similar to the TCMs listed in the CAA, are being used throughout the country to manage traffic congestion on streets and highways and to reduce vehicle emissions. Increasingly they are being recognized for their benefits toward improving an area's livability. These TCM type activities may be eligible for CMAQ funding, whether or not they are in approved SIPs, if they are documented to have emission reduction benefits in nonattainment and maintenance areas. These activities have been employed throughout the country for many years and include many travel demand management and transportation system management applications.

Examples that have been, or will be, implemented in the **Dallas–Fort Worth area** include: intersection improvements, grade seperations, signal improvements, high-occupancy-vehicle lanes, freeway-corridor management, park and ride lots, travel-demand management, ped-bike facilities, rail, and vanpool.

Currently in the State of Texas, only H-GAC and NCTCOG utilized Transportation Control Measures and CMAQ funding.

Process for Determining Regionally Significant Facilities for Purposes of Regional Emissions Analysis (Mountainland Association of Governments)

http://www.ampo.org/assets/590_regionallysignificant5106.doc

Background: 40 FR 93.101 defines "regionally significant project" and associated facilities for the purpose of transportation conformity. The federal definition does not specifically include minor arterials. The following definitions and processes will be used by the MPOs in consultation with DAQ, UDOT, UTA, FHWA, FTA, and EPA to determine which facilities shall be considered regionally significant for purposes of regional emissions analysis. It is the practice of the MPO to include minor arterials and collectors in the travel model for the purpose of accurately modeling regional VMT and associated vehicle emissions. The inclusion of minor arterials and collectors in the travel model, however, does not identify these facilities as regionally significant.

1. Any new or existing facility with a functional classification of principal arterial or higher on the latest UDOT Functional Classification Map shall be considered regionally significant.
2. Any fixed guideway transit service including light rail, commuter rail, or portions of bus rapid transit that involve exclusive right-of-way shall be considered regionally significant.
3. As traffic conditions change in the future, the MPO's - in consultation with DAQ, UDOT, FHWA, and EPA (and UTA and FTA in cases involving transit facilities) - will consider 1) the relative importance of minor arterials serving major activity centers, and 2) the absence of principal arterials in the vicinity to determine if any minor arterials in addition to those listed in Exhibit A should be considered as regionally significant for purposes of regional emissions analysis.

Appendix H-2: Killeen-Skylark and Temple-Georgia Monitoring Ozone Readings

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Killeen Skylark Ozone Readings 2015-2016

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan-15	13	10	28	32	32	38	36	30	27	28	22	18	19	20	31	36	42	45	52	54	30	37	31	37	42	44	44	53	39	30	30
Feb-15	25	34	24	31	25	30	44	40	49	67	57	35	47	53	46	28	38	47	51	40	33	24	29	26	37	34	32	25			
Mar-15	24	22	13	37	45	45	45	30	26	29	35	44	46	55	34	46	28	41	32	16	22	36	43	54	51	46	52	57	49	43	44
Apr-15	41	42	48	46	29	42	44	29	38	42	24	28	46	38	51	42	41	43	56	51	62	44	36	31	57	41	50	40	58	59	
May-15	66	70	54	59	45	41	33	26	34	30	40	26	28	31	24	32	40	35	29	31	29	32	29	35	26	33	33	35	49	49	46
Jun-15	49	58	55	58	46	53	48	43	47	50	37	30	31	22	29	21	26	35	24	20	17	22	24	29	32	35	37	47	30	27	
Jul-15		33	30	26	25	29	27	29	24	30	31	34	40	40	41	45	39	31	30	37	36	37	39	42	36	29	29	39	42	43	57
Aug-15	56	55	61	41	41	41	35	36	33	35	49	64	60	56	59	53	53	45	46	30	45	38	36	39	32	58	64	71	67	47	46
Sep-15	36	45	38	37	30	28	30	37	27	30	49	45	48	57	31	34	41	38	42	45	48	53	53	57	46	59	58	51	43	53	
Oct-15	56	53	53	48	44	49	NV	49	52	48	59	58	51	61	60	57	62	52	57	50	43	28	28	32	24	36	45	45	53	36	35
Nov-15	29	37	52	39	26	27	30	38	35	33	40	39	39	36	40	31	35	39	39	52	36	38	43	36	38	31	28	15	9	9	
Dec-15	17	36	36	37	42	34	42	46	33	35	33	36	40	36	34	33	38	32	44	31	32	45	36	38	24	21	24	30	27	24	31

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan-16	29	28	37	34	27	23	36	22	21	33	33	44	49	44	42	33	36	28	44	25	24	35	31	49	43	30	39	40	46	51	43
Feb-16	42	43	40	40	47	46	46	41	42	47	50	57	50	38	43	46	47	51	48	28	26	33	35	41	42	46	56	44	42		
Mar-16	47	51	48	52	59	45	NV	36	39	29	43	43	51	51	49	57	35	33	46	41	49	52	48	43	50	54	38	46	36	22	50
Apr-16	36	44	49	57	62	49	57	54	50	47	40	32	31	39	46	31	39	38	39	53	46	50	64	51	45	40	55	69	39	46	
May-16	45	29	47	53	NV	54	57	41	48	55	53	54	53	50	42	48	42	31	34	43	48	39	34	27	30	34	42	38	38	46	25
Jun-16	34	42	45	44	60	56	67	61	55	46	44	33	34	39	42	40	50	39	42	33	42	44	49	41	21	24	38	40	54	58	
Jul-16	57	33	31	36	43	40	38	36	35	32	32	36	38	40	37	35	37	36	NV	37	42	46	44	30	39	52	40	33	39	40	34
Aug-16	39	37	40	45	42	40	33	35	37	36	38	40	49	48	35	23	22	27	32	26	26	28	34	37	39	38	48	40	39	37	53
Sep-16	52	41	48	51	31	29	36	40	36	43	46	48	39	42	39	50	48	37	39	49	52	61	39	25	24	31	41	50	49	41	
Oct-16	47	61	66	50	39	33	26	38	52	53	70	56	31	52	39	39	37	34	36	49	44	52	51	NV	46	48	47	46	53	40	50
Nov-16	39	33	25	19	31	35	26	26	25	34	32	38	47	34	42	51	47	33	37	43	49	29	32	43	22	25	39	47	38	39	
Dec-16	42	36	32	24	18	17	24	24	27	25	31	29	23	13	21	23	26	34	33	27	42	38	19	25	28	28	35	29	39	29	35

Source: TCEQ Air Quality: Daily Maximum Eight-Hour Ozone Averages

Killeen Skylark Ozone Readings 2017-2018

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan-17	38	35	33	22	27	33	38	41	42	39	42	36	20	5	25	35	14	15	26	42	44	43	45	46	34	40	43	42	46	48	51
Feb-17	51	36	31	29	28	27	40	39	37	48	41	48	33	32	44	48	51	48	35	38	46	56	62	36	46	39	40	37			
Mar-17	51	51	54	38	34	33	50	45	NV	40	31	28	43	46	55	41	NV	46	48	50	49	48	51	51	45	50	43	47	53	46	59
Apr-17	44	44	50	65	46	57	71	54	46	34	45	47	40	45	40	35	41	42	44	43	42	38	51	68	52	43	56	55	43	52	
May-17	61	67	48	49	58	68	69	48	39	45	41	58	59	65	58	44	52	39	36	38	44	45	42	55	64	41	40	34	48	57	40
Jun-17	40	34	30	46	47	64	66	67	66	56	47	41	39	35	42	42	38	30	30	48	52	39	55	50	38	36	39	35	47	34	
Jul-17	40	34	40	31	32	32	40	38	36	45	34	37	41	41	37	49	53	35	39	40	42	43	35	39	38	43	47	42	37	51	61
Aug-17	59	44	50	66	50	34	39	44	42	47	36	42	38	40	38	37	42	33	32	31	40	45	45	57	40	29	28	39	54	50	51
Sep-17	59	57	58	57	48	56	53	50	54	57	62	61	69	64	53	48	47	45	33	37	33	35	47	44	43	31	48	30	35	62	
Oct-17	59	49	31	43	50	50	38	52	50	29	46	61	46	46	41	47	50	62	46	38	36	38	48	42	43	58	33	42	44	54	30
Nov-17	37	45	40	34	28	37	23	11	15	32	41	37	37	42	33	38	37	38	39	42	39	39	42	49	52	51	58	49	36	41	
Dec-17	51	49	33	32	32	12	33	33	40	40	40	37	37	36	37	26	22	13	18	34	45	13	27	22	31	21	18	21	18	10	26

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan-18	30	31	36	34	42	41	37	38	36	39	30	36	34	40	32	35	33	28	28	37	32	40	43	42	47	33	28	41	35	39	45
Feb-18	46	35	30	29	18	17	30	NV	18	22	29	23	13	17	25	41	29	25	28	22	21	18	10	22	42	37	19	28			
Mar-18	31	47	49	31	48	50	48	53	52	46	48	49	61	60	58	51	42	36	51	44	55	61	47	42	36	46	40	39	46	48	59
Apr-18	51	25	41	49	53	42	34	32	39	54	NV	49	46	54	56	65	61	63	56	53	36	49	59	63	44	53	62	75	67	53	
May-18	39	34	34	44	58	66	81	71	63	63	53	47	42	44	45	56	67	55	40	40	43	44	41	42	53	59	53	55	65	45	53
Jun-18	56	55	51	54	51	49	42	44	38	34	39	39	39	44	35	34	32	37	26	31	47	48	37	37	NV	NA	NV	38	38	32	
Jul-18	34	39	46	35	42	48	47	51	29	39	43	44	40	39	36	38	40	49	53	52	52	52	64	64	66	63	65	57	54	58	69
Aug-18	68	75	72	NA	NA	NA	NA	NV	43	49	35	29	35	37	46	46	42	39	37	40	61	50	64	53	45	46	42	41	38	45	46
Sep-18	48	41	36	38	38	41	40	26	25	37	30	33	NV	NV	36	37	33	50	43	33	26	24	19	27	36	36	43	41	28	34	
Oct-18	34	30	40	36	34	34	28	28	32	27	37	51	28	31	22	21	32	25	17	36	38	32	43	22	34	37	41	45	45	42	25
Nov-18	37	42	50	28	2	36	25	21	17	34	32	33	30	35	38	39	48	48	21	25	34	32	39	40	47	36	33	37	45	38	33
Dec-18	43	33	25	24	30	27	12	22	25	38	44	35	32	34	39	26	28	34	20	38	39	43	34	33	30	35	33	25	23	19	28

Source: TCEQ Air Quality: Daily Maximum Eight-Hour Ozone Averages

Skylark Field Annual Highest Values 2015-2018

1st		2nd		3rd		4th	
Date	Value	Date	Value	Date	Value	Date	Value
8/28/2015	71	5/2/2015	70	2/10/2015	67	5/1/2015	66
4/28/2016	69	6/7/2016	67	10/4/2016	66	9/22/2016	61
5/7/2017	69	4/24/2017	68	6/8/2017	67	8/4/2017	66
5/7/2018	81	4/28/2018	75	7/31/2018	69	8/1/2018	68

Source: TCEQ Air Quality: Daily Maximum Eight-Hour Ozone Averages

Temple Georgia Ozone Readings 2015-2016

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan-15	8	6	15	23	19	16	26	22	26	26	21	16	17	17	29	32	37	41	49	46	27	35	28	32	40	39	41	47	38	29	26
Feb-15	22	32	22	24	24	28	41	41	47	59	52	31	42	50	42	26	36	44	48	40	33	23	29	26	33	32	31	26			
Mar-15	20	20	9	35	44	48	47	31	28	32	36	37	42	52	35	NV	NV	44	34	14	18	33	45	48	47	45	49	60	48	44	43
Apr-15	37	40	46	46	24	37	42	28	39	37	27	27	45	36	49	44	44	44	52	52	61	47	41	31	54	42	51	38	57	64	
May-15	72	72	54	64	45	39	33	24	32	29	39	27	30	27	24	31	44	37	30	32	26	37	32	37	27	37	37	36	57	51	49
Jun-15	57	60	57	61	49	58	50	54	52	53	33	33	32	25	30	22	28	38	29	23	16	20	26	27	34	42	42	54	37	37	
Jul-15	34	32	33	27	24	27	24	29	27	29	29	35	42	35	35	41	34	31	29	33	35	37	43	39	39	31	29	32	36	45	62
Aug-15	61	62	69	39	42	49	37	38	37	44	55	69	63	60	65	60	57	49	48	29	47	40	42	47	38	67	75	80	77	56	51
Sep-15	40	49	43	35	33	31	33	38	33	36	52	49	52	62	35	39	36	38	47	51	57	58	60	61	52	65	65	56	45	58	
Oct-15	59	58	56	51	44	54	57	52	57	49	65	57	54	58	58	57	60	51	56	51	42	32	31	33	24	39	44	45	55	35	38
Nov-15	25	36	50	41	28	28	30	39	34	35	40	37	38	34	41	30	33	39	39	51	35	39	42	38	40	33	28	15	8	9	
Dec-15	17	38	36	35	38	33	40	49	32	35	33	33	39	34	34	34	38	31	43	30	31	43	35	36	26	22	23	29	25	24	30

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan-16	31	29	36	33	26	20	30	24	22	34	33	42	46	46	43	33	35	25	42	25	25	37	29	48	43	28	39	39	45	49	42
Feb-16	40	43	40	41	46	48	47	41	42	44	51	56	46	37	44	47	47	51	48	29	29	34	35	41	42	47	59	42	48		
Mar-16	46	50	49	52	58	47	NV	34	39	28	43	45	50	56	47	53	30	33	46	41	48	51	44	43	50	52	39	44	34	21	53
Apr-16	35	44	50	59	60	50	57	54	50	49	39	34	31	41	46	34	42	39	40	51	48	52	64	50	39	38	53	69	36	43	
May-16	45	31	51	54	58	56	56	41	51	55	52	56	57	50	43	49	44	32	33	46	49	39	32	26	27	35	43	37	35	45	25
Jun-16	34	42	47	45	60	60	68	62	55	45	42	29	38	33	41	29	41	43	42	36	39	40	45	36	20	23	38	40	57	59	
Jul-16	58	31	29	32	41	32	32	33	36	26	27	31	33	33	40	31	37	35	37	34	44	48	43	31	41	52	42	35	38	38	34
Aug-16	35	32	38	40	42	35	31	34	37	34	39	44	43	46	30	21	21	23	33	32	26	26	29	30	29	38	51	40	40	38	55
Sep-16	53	45	48	53	27	26	28	34	29	49	49	50	40	40	38	49	49	40	42	53	55	63	34	24	21	31	44	48	47	44	
Oct-16	47	64	65	43	37	35	29	42	55	53	61	53	34	NV	36	36	40	32	30	50	48	50	52	45	45	48	49	45	45	42	43
Nov-16	35	36	29	18	35	38	28	24	26	39	34	41	48	34	43	53	48	31	40	43	49	30	32	43	22	26	41	47	42	41	
Dec-16	44	39	34	25	19	19	26	27	28	26	30	22	21	10	22	23	26	35	33	33	38	39	18	26	29	28	32	29	38	27	34

Temple Georgia Ozone Readings 2017-2018

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan-17	40	34	34	22	28	35	39	43	42	41	43	36	16	4	26	35	15	14	23	40	45	44	46	47	37	42	44	45	46	49	53
Feb-17	51	37	34	29	28	26	40	42	37	50	45	48	35	34	45	50	53	49	34	38	46	58	61	35	47	38	41	36			
Mar-17	51	53	55	38	37	NA	NV	45	30	40	31	30	42	45	58	40	NV	42	47	53	49	46	52	47	45	50	41	47	53	46	58
Apr-17	47	46	50	62	48	58	69	55	46	37	46	47	41	44	39	34	39	42	40	39	41	40	55	62	45	41	53	52	40	53	
May-17	68	64	49	52	61	75	72	52	41	44	38	59	62	65	55	47	45	38	35	41	47	49	43	55	64	44	38	35	50	58	42
Jun-17	39	36	32	46	51	64	72	66	66	61	50	43	34	30	37	37	31	29	30	52	54	35	50	53	42	38	41	38	42	31	
Jul-17	37	34	33	28	33	36	39	35	37	45	32	32	35	42	39	53	56	34	37	43	42	42	36	39	34	49	45	47	40	54	64
Aug-17	65	46	57	70	47	36	37	47	43	56	40	39	39	42	36	35	42	39	32	31	47	47	49	58	41	30	32	41	50	55	54
Sep-17	66	60	61	58	51	62	54	51	57	60	68	58	80	58	47	45	49	43	31	28	28	39	51	48	47	36	51	40	39	68	
Oct-17	64	53	31	47	53	57	41	61	43	33	51	51	40	43	44	49	53	60	50	44	33	42	56	45	59	35	33	45	45	56	30
Nov-17	31	48	43	34	31	42	22	12	11	35	46	42	37	40	34	38	37	41	42	45	42	40	44	55	53	54	61	50	38	44	
Dec-17	52	53	35	34	34	24	33	38	42	41	41	39	36	36	NA	NA	NA	NV	10	30	38	13	26	19	30	21	19	20	19	11	24

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan-18	29	30	33	32	39	42	36	37	35	37	31	36	31	37	35	34	30	28	27	32	29	39	38	40	44	32	25	40	33	40	42
Feb-18	43	33	26	23	18	16	27	31	23	24	32	24	15	13	23	37	25	23	26	22	21	18	9	21	39	35	19	30			
Mar-18	28	44	48	33	48	49	48	50	49	46	47	47	58	57	55	47	38	34	47	42	52	56	NV	39	35	43	40	39	43	45	56
Apr-18	47	21	39	46	47	39	33	25	40	55	62	44	42	53	53	60	56	64	53	49	32	47	55	64	44	53	60	71	63	51	
May-18	39	32	32	42	58	65	75	61	57	56	46	42	37	36	40	63	61	47	69	34	39	35	38	37	49	55	49	54	57	39	41
Jun-18	43	48	52	50	48	39	38	36	31	31	32	34	33	34	31	31	29	34	24	26	40	47	32	34	31	32	38	33	32	28	
Jul-18	31	32	45	33	41	45	45	49	27	33	37	36	32	33	33	41	37	43	48	45	45	47	51	61	65	60	63	53	50	66	
Aug-18	66	70	69	40	33	38	37	41	41	47	32	26	29	29	37	36	41	36	38	37	60	53	58	45	45	42	35	32	31	44	45
Sep-18	46	39	32	35	40	36	41	25	27	37	30	30	27	25	34	36	36	NA	NA	NA	NA	NA	NA	NV	34	34	43	38	24	31	
Oct-18	32	28	30	31	30	31	26	26	29	26	33	47	27	27	19	20	28	26	18	31	42	27	38	19	32	37	37	44	42	41	24
Nov-18	37	38	48	28	34	20	20	16	32	31	35	29	34	38	35	46	44	19	25	28	33	35	36	41	33	32	33	41	35	30	
Dec-18	40	32	29	23	27	23	13	19	22	35	42	32	30	31	36	20	29	29	19	36	35	41	31	32	29	35	33	22	21	16	26

Temple Georgia Annual Highest Values 2015-2018

1st		2nd		3rd		4th	
Date	Value	Date	Value	Date	Value	Date	Value
8/2/2015	80	8/29/2015	77	8/27/2015	75	5/1/2015	72
4/28/2016	69	6/7/2016	68	10/3/2016	65	6/8/2016	62
9/13/2017	80	5/6/2017	75	6/7/2017	72	8/4/2017	70
5/7/2018	75	4/28/2018	71	8/2/2018	70	7/30/2018	66

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Appendix H-3: Waco Ozone Conceptual Model Report

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3.0 Ozone Trends

This section presents an overview of ozone concentrations measured at CAMS 1037 during 2007-2012 and CAMS 1047 during 2009-2012. Annual, seasonal, day-of-week, and time-of-day trends of high ozone concentrations are investigated.

3.1 Sensitivity to Monitoring Locations

Throughout the analyses presented in this report, the reader should recognize that data interpretations are inherently biased by the locations of the individual monitors within the Waco monitoring network. For example, CAMS 1037 is located several miles northeast of downtown Waco. As shown in subsequent data analyses, high ozone concentrations occur on days when ground-level winds are northerly clockwise through southerly. During these wind flow patterns, CAMS 1037 is not well-positioned to sample a portion of the Waco urban ozone plume. As such, the overall maximum ozone concentrations in the Waco area may not be captured and the maximum ozone concentrations at downwind locations may have been different than the CAMS 1037 data indicate.

Ozone trends are presented using measurement data collected at both CAMS 1037 (Waco) and CAMS 1047 (Killeen). Monitoring data are available at CAMS 1047 beginning on June 12, 2009 and are included to complement the CAMS 1037 results through an analysis of regional trends. It should be mentioned that three years of data may not provide a sufficiently large dataset for a robust investigation of ozone annual and seasonal trends in Killeen and that Killeen is influenced by different local emissions sources than the Waco area.

3.2 Frequency of Occurrence by Year

During 2007-2012, 17 days had maximum ozone concentrations ≥ 75 ppb at CAMS 1037. The annual numbers of high ozone days are shown in Figure 3-1 for both CAMS 1037 and CAMS 1047. At CAMS 1037, the annual number of high ozone days ranged from 1 day in 2008 and 2010 to 7 days in 2011. Both 2011 and 2012 each had 5 high ozone days at CAMS 1047.

3.3 Frequency of Occurrence by Month

The monthly numbers of high ozone days at CAMS 1037 and CAMS 1047 are shown in Figure 3-2. At CAMS 1037, the number of high ozone days ranged from 2 days during July to 7 days during August. CAMS 1047 had 0 days during July and 6 days during August. No high ozone days were measured at either monitor during April-May. Based on the frequency of occurrence of days with local meteorological conditions conducive to high ozone concentrations at CAMS 1037 (refer to Section 4.5 of this report), April-May (and October) are relatively unfavorable for high ozone concentrations.

To investigate the inter-annual variation in the seasonal occurrence of high ozone days, the ozone season was divided into early (June–July) and late (August–October) components. Figure 3-3 shows the numbers of early and late season high ozone days for each year at CAMS 1037 and CAMS 1047. At both monitors, each year had at least one high ozone day during the late ozone season. At CAMS 1037, the year 2011 had an atypically high number of late ozone season days at 6 days; otherwise, the years 2009 and 2012 each had higher number of early season days (2 days) compared to the late season (1 day). At CAMS 1047, high ozone days occurred predominantly during the late season.

Figure 3-1. Annual numbers of high ozone days at CAMS 1037 (left) during 2007-2012 and CAMS 1047 (right) during 2009-2012.

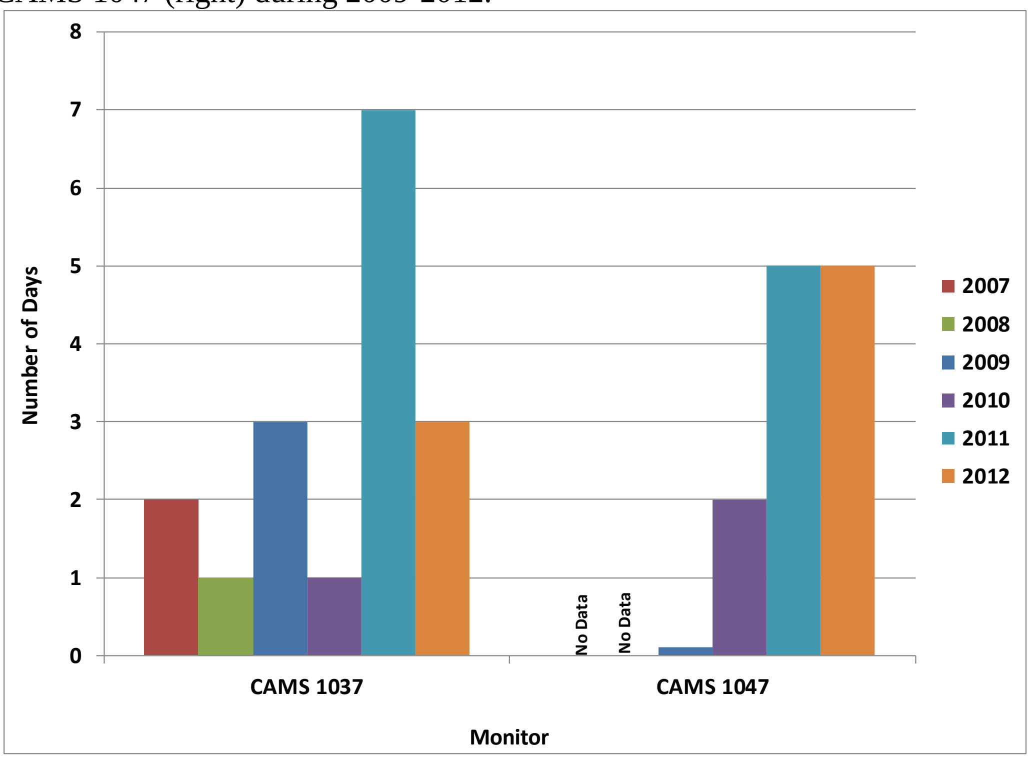


Figure 3-2. Monthly numbers of high ozone days at CAMS 1037 (left) and CAMS 1047 (right) during 2007-2012.

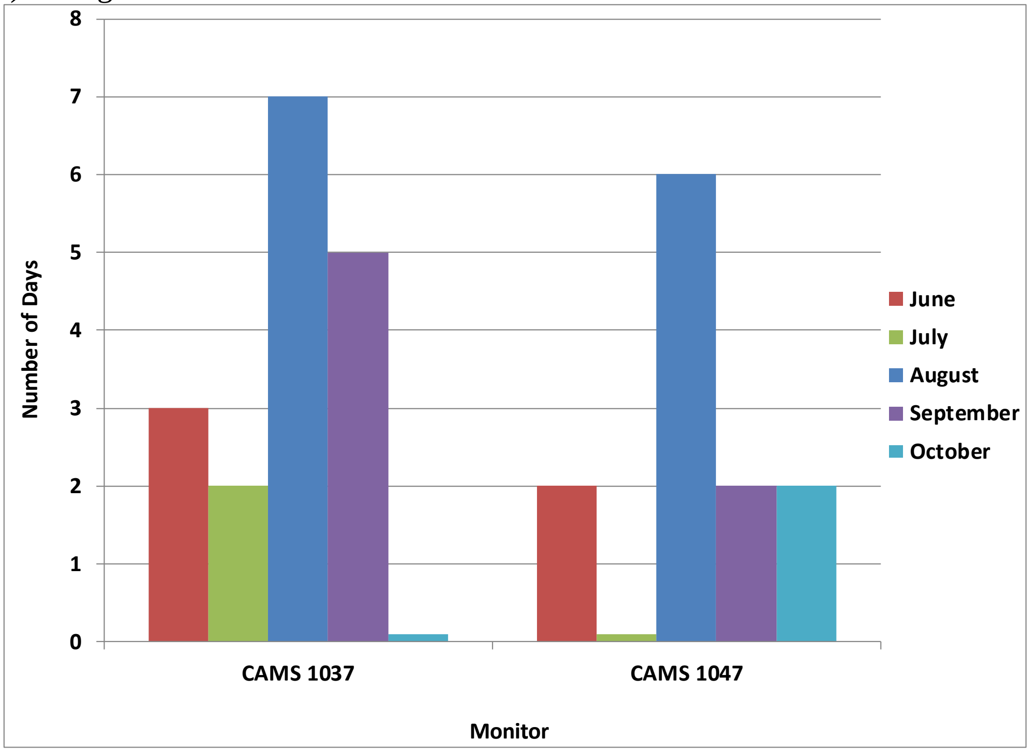
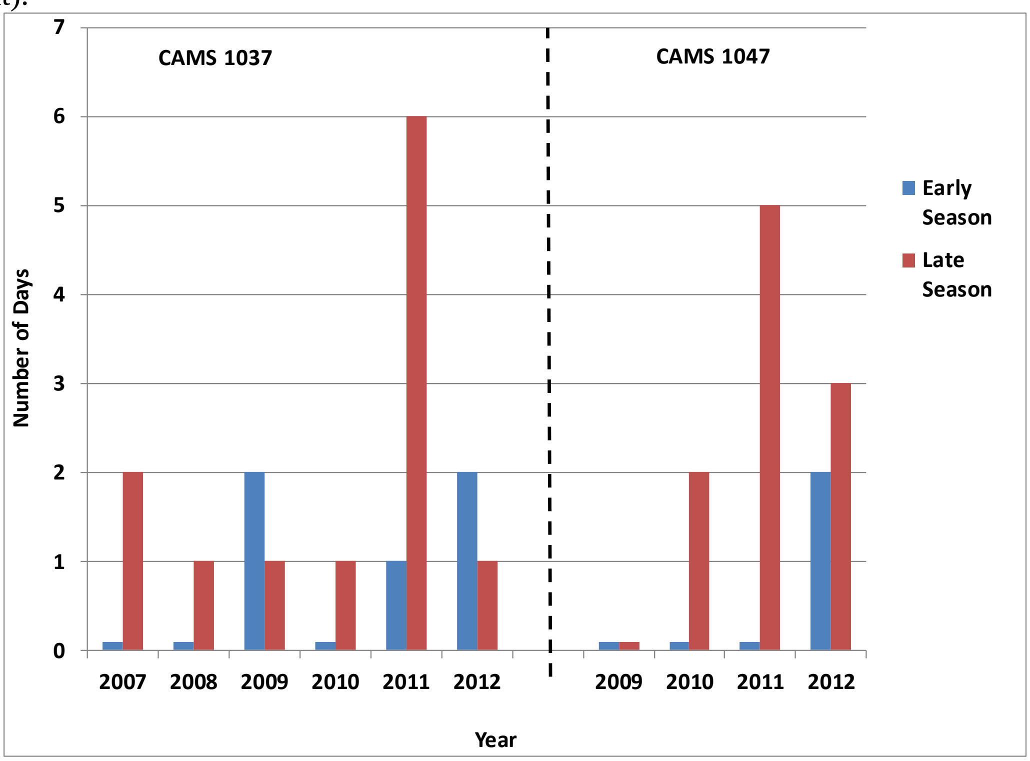


Figure 3-3. Annual numbers of early season (June–July) and late season (August–October) high ozone days during 2007-2012 at CAMS 1037 (left) and CAMS 1047 (right).



3.4 Frequency of Occurrence by Day-of-Week

The numbers of high ozone days grouped by day-of-week (Figure 3-4) show large variability that suggests the day-to-day differences are associated with weather variability due to the small sample size. For example, it is not obvious what emissions sources might be associated with relatively highest numbers of high ozone days on Wednesday at CAMS 1037 or no high ozone days on Thursday at CAMS 1047.

3.5 Frequency of Occurrence by Time of Day

The numbers of high ozone days, grouped by the starting hour of the daily maximum 8-hour average ozone concentration, is shown in Figure 3-5 for CAMS 1037 and CAMS 1047. At CAMS 1037, the starting hour across the 17 high ozone days ranged between 1000 CST and 1300 CST; the majority of days (9 days) had a starting hour of 1100 CST. Most high ozone days at CAMS 1047 had a starting hour of 1000-1100 CST.

Figure 3-4. By day-of-week numbers of high ozone days during 2007-2012 at CAMS 1037 (left) and CAMS 1047 (right).

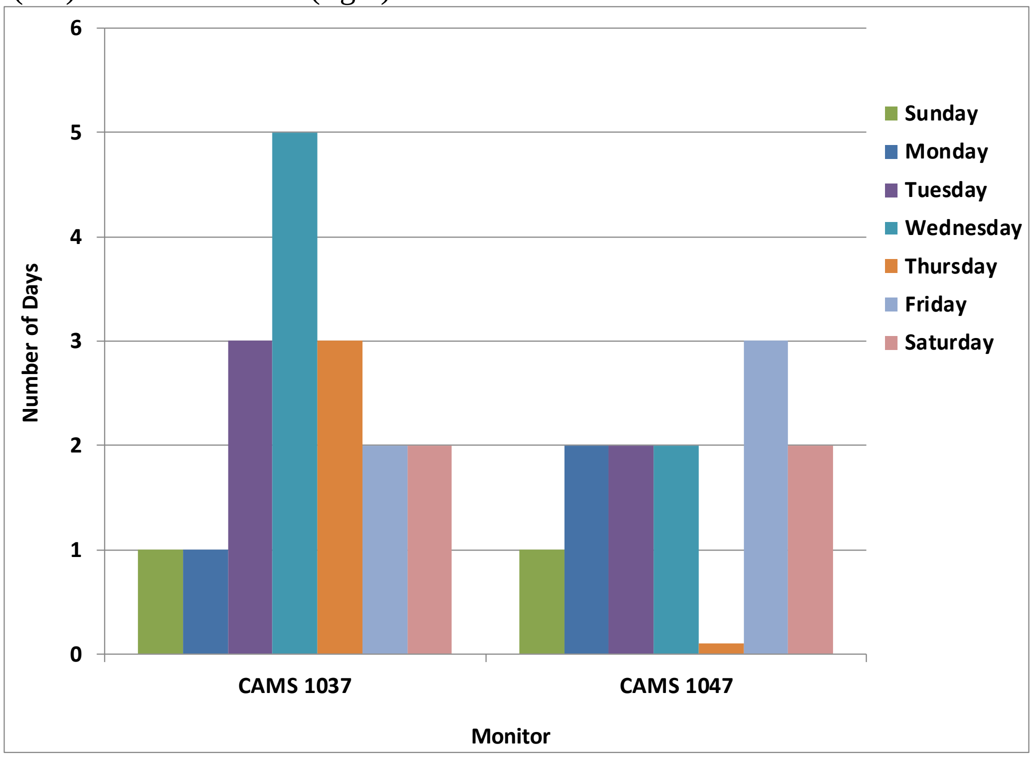
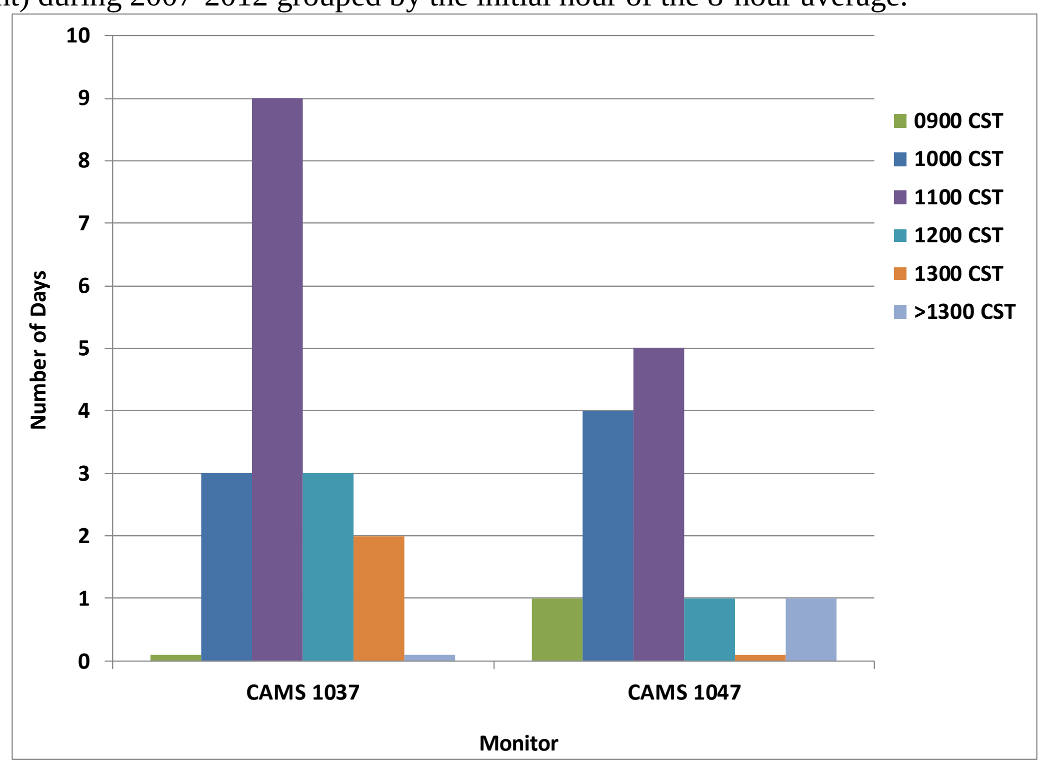


Figure 3-5. The numbers of high ozone days at CAMS 1037 (left) and CAMS 1047 (right) during 2007-2012 grouped by the initial hour of the 8-hour average.



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Appendix I:

Travel Demand Model

TRAVEL DEMAND MODELING

A Travel Demand Model (TDM) is a helpful tool in projecting future traffic demand, and current and forecasted roadway capacity. An updated KTMPO model was completed the latter part of 2014. In 2011, KTMPO hired a consultant to assist in developing demographic and network data for inclusion in the updated TDM. This work involved developing and updating the Traffic Analysis Zone (TAZ) structure, TAZ-level demographics, and the modeled roadway network for the years 2010 and 2040.

During the model development process, KTMPO sought to include the existing land use patterns as well as future trends across the region to provide better, more defined input. KTMPO made a call for future land use plans, existing zoning, local transportation plans, plat logs, established land use and locations of substantial traffic generators from member cities. Data was also collected from a variety of sources, to include school districts and local colleges, to develop growth projections and determine new generators. This data was then refined by KTMPO staff, and forwarded to consultant, CDM Smith. Simultaneously, rooftop data as well as additional generator information were being collected on the consultant side.

A public process in which to gauge future trends was carried out in the fall of 2012 in coordination with consultant, Kimley-Horn. Public meetings were held to gain input, and subsequent trend scenarios were developed from this process to incorporate into the 2040 model.

TRAFFIC ANALYSIS ZONE GEOGRAPHY

A TAZ is a unit of geography most commonly used in transportation planning models. The zones are constructed by census block information. Typically these blocks are used in transportation models by providing socio-economic data. Most often, the critical information is the number of automobiles per household, household income, and employment within these zones. This information helps to further the understanding of trips that are produced and attracted within the zone.

Because of the KTMPO boundary expansion since the last model update, new TAZs were developed to cover the recently expanded planning area. TAZs were generally constructed from 2010 census blocks; however, due to the incompatibility of some TAZs and census blocks, 30 blocks had to be split among TAZs.

2010 population and household data were derived directly from the 2010 US Census at the block level. Since some TAZs span county boundaries, there are some TAZs that extend slightly outside of the official MPO planning area. Therefore, a query of the TAZ database will show slightly higher population and household values than the official MPO planning area.

Education and employment data was identified for each zone using data provided by KTMPO staff and supplemented with additional research by the consultant. For areas outside of Fort Hood, 2010 Texas Workforce Commission (TWC) data was used for basic, retail, and service employment, supplemented by additional research by the consultant. Within Fort Hood, considerations in estimated employment included active duty military employment, active Reserves and temporary duty military, civilian contractors working for the military, traditional civilian employment, and civilian educational employment.

Special Generators are locations that generate a large volume of traffic such as a shopping mall, hospital, college, airport, etc. 2010 special generators were identified and included in the model.

ROADWAY NETWORK

The consultant updated the 2010 roadway network to include all roadways within the expanded metropolitan planning area boundary and assigned attributes for all defined links. Link attributes were defined for seven categories as shown in Exhibit 10.1. Other fields in the network such as area type, capacity, speed, and time are assigned by TxDOT during the model validation process. The 2010 network is detail coded for higher functional classed facilities as defined by TxDOT. Generally, only links with frontage roads and ramps are shown as separate road links for each direction. New links added to the delivered model include facilities that opened after the base year, such as SH 9 on the eastern side of Copperas Cove, as well as projects expected to be in operation by 2040. (See Exhibits 10.2 and 10.3.)

Exhibit 10.1: Network Attributes

Attribute	Type	Description
Street Name	Objective	Primary street name per local usage
Posted Speed	Average	Posted speed on the majority of the link
Functional Class	Subjective	Roadway type per the standard hierarchical classification system
Facility Type	Objective Referenced	Divided, undivided, or with turn bays
Lanes	Objective	Number of through lanes
Turn Penalty	Referenced	Flag on links with assigned turn penalties
Auxiliary Lane	Objective	Flag for auxiliary lane not counted as a through lane

Exhibit 10.2: Improvements to Existing Roads by 2040

Project ID	Road	Limits	Description
	IH 35	FM 2843 to FM 2484	Widen to 6 lanes
H15-01	FM 3423	BU 190 to US 190	Widen to 4 lanes w/ CTL
H15-02	FM 2410	FM 3470 to US 190	Widen to 4 lanes w/ CTL
K15-03	SH 201	Airport to SH 195	Widen to 4 lane divided, w/ overpass at SH 195
T15-06	IH 35	LP 363 N to LP 363 S	Widen to 8 lanes
T15-06	IH 35	SL 363 S to Midway	Ramp reversals and aux lanes
T15-06	IH 35	Bell/Falls C/L to SL 363	Widen to 6 lanes
T15-06m	IH 35	Loop 363 S to Midway	4 ramp reversals, 2 ramp deletions, and aux lane
T25-11	SH 317	FM 2305 to FM 439	Widen to 4 lanes w/ raised median
W25-02	SH 36	Bell/Coryell C/L to SH 317	Widen to 4-lane divided
W30-21	SL 363	IH 35 to Hopi Trail	Widen to 4 lanes divided, SH 36 & Wendland overpass
W30-23	SL 363	At Spur 290	Reconstruct Interchange
W30-27	US 190	Spur 172 to FM 2410	Widen to 6 lanes w/ FR turnarounds at FM 2410
X25-02	FM 2657	US 190 to CR 4744	Widen roadway

Exhibit 10.3: New Construction Roads by 2040

Project ID	Road	Limits	Description
	SH 201	SH 195 to IH35	Construct new 4-lane divided roadway
B15-01	W 9th Ave	SL 121 to University Dr	Construct new roadway
B15-02	FM 2271	FM 439 to US 190	Construct 2-lane roadway
C15-01&	US 190	W of FM 2657 to W of Clarke Rd	Construct 4-lane divided roadway
K30-01	CS	FM 2410 to existing Rosewood	Construct 2-lane roadway w/ overpass at US 190
W35-13	SH 9	US 190 to FM 116	Construct 2 lane roadway

FUTURE YEAR CONTROL TOTALS

Future demographic "control totals" were developed based on documented growth projections from the KTMPO member jurisdictions. Based upon the documented growth rates, 2040 regional population projections were developed, resulting in a 2040 control total population of 575,200 for the KTMPO metropolitan planning area.

Employment was split into basic, retail, service, and education sectors. Based on the 2010 base data, total employment to individual employment sector ratio was calculated for each county and the future years were projected to carry forward the same ratio. This resulted in a 2040 control total employment for the KTMPO planning area at 249,000.

The consultant team met with local representatives to collect and understand information on local growth issues and trends to develop future growth distribution. This involved a three step process as follows:

· Identifying Known Growth between 2010 to 2012

· Identifying Growth from Planned Developments

· Distributing Anticipated Growth

Since 2010 is considered as the base year, it was necessary to identify all developments that were constructed after the base year. This involved using building permit data, ortho-photography, review of approved/proposed plats from different jurisdictions, etc. This new construction and preliminary/final site development plans were used to develop population, household, and employment estimates by TAZ for the future year.

After distributing known and proposed developments, the amount of population and employment that is required to reach the previously established control totals was estimated for year 2040. To allocate where this anticipated growth will occur, a suitability analysis was performed separately for cities of Killeen, Temple, Harker Heights, and the rest of Bell County that assigns a composite "attraction" factor for each TAZ.

Suitability analysis is a technique used to categorize locations according to a set of criteria that define an area's suitability for development. For this analysis in the KTMPO region, a linear relationship was assumed between the development of land and its driving factors. Any change in these development factors will impact future development. The factors assumed to drive future developments are:

· Availability of Developable Land

· Accessibility (Proximity to Major Roads)

· Infrastructure (City Limits)

· Future Development Plans

· Anticipated Growth Areas

The probability of the occurrence of development is calculated based on these independent factors. For each TAZ, a population attraction factor was calculated for different years to distribute the anticipated future growth. In most cases, employment at each special generator site was expected to grow at a rate equivalent to the rate of population growth of the city in which the special generator is located. Basic, retail and service employment sectors were assumed to grow in and around the existing employment areas. It was assumed that if a zone has basic employment, that zone was expected to grow more basic employment. So the remaining number of basic, retail, and service employment was then distributed to each TAZ based on the number of basic, retail, and service employment by sector that TAZ had in year 2010.

Like special generators, education employment at each school was expected to grow at a rate equivalent to the rate of population growth of the city in which the special generator is located. In instances where the location of proposed schools was known, the educational employment of the TAZ was increased by the estimated employment level supported at that school.

The final step was to calculate the total growth each TAZ would experience by year 2040. The growth from planned developments and long term were added together to calculate the future growth. Exhibits 10.4 and 10.5 illustrate the future population and employment growth respectively.

Travel Demand Model Application & Benefit:

Since receiving the updated TDM model, KTMPO has used this model for the updated 2016 CMP and during the 2040 MTP Reprioritization. For the 2016 CMP, the TDM was used in evaluating the level of service for the various roadways identified in the Congestion Management Process List of Congestion Hotspots. During the 2040 MTP Reprioritization in 2016, the TDM was used to evaluate Level of Service for submitted projects. Projects were evaluated on their current LOS, forecasted LOS and the change in LOS for the build vs no build scenario.

MOVING FORWARD

In 2017, KTMPO coordinated with TxDOT and Texas A&M Transportation Institute (TTI) to refresh the model from the current 2010 base year to 2015 and the forecast year from 2040 to 2045. For this process, demographic data was updated to notify of changes in the region's population since the last demographics. A consultant was hired to assist KTMPO with the demographic data. The updated demographic data (Exhibit 10.6 and Exhibit 10.7) will be incorporated into the TDM refresh. The refreshed TDM will be converted to the TexPack standard interface and be used to evaluate projects as KTMPO develops and publishes the Mobility 2045 Metropolitan Transportation Plan (MTP) in 2019. The updated TDM will also be used to evaluate the network segments in the CMP.

KTMPO staff has attended a number of training sessions to better understand the underlying principles of traffic modeling and to become proficient with the modeling software and will continue to do so in the future. At least one staff member will be responsible for maintaining the network and TAZ files, coordinating with consultants for model runs and other analysis, and creating maps or reports to KTMPO boards or member cities. KTMPO staff is also exploring ways in which municipal planning staffs and elected officials from our member cities may utilize the model to inform their own planning purposes.

Exhibit 10.4: 2010-2040 Population Distribution

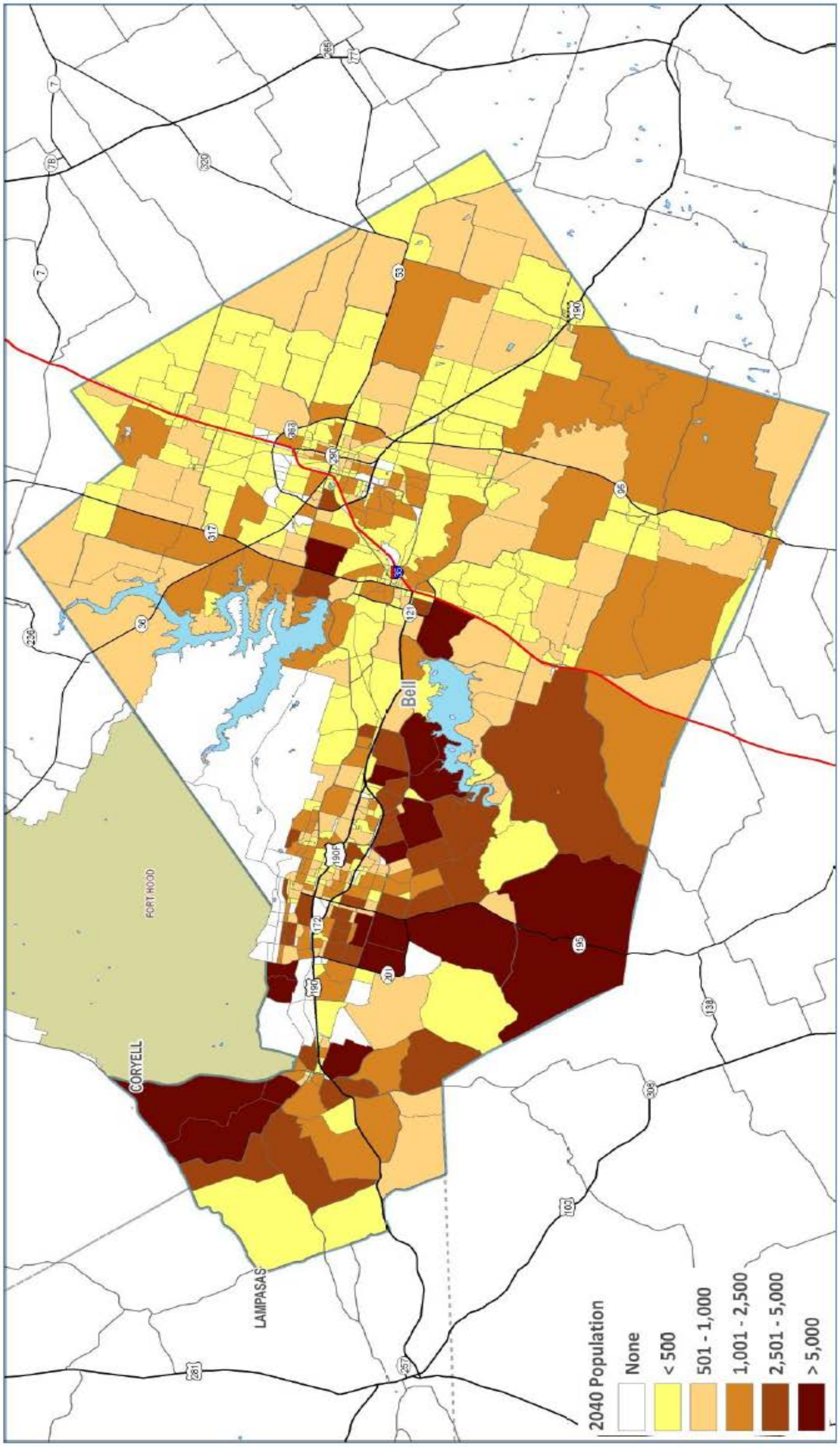


Exhibit 10.5: 2010-2040 Employment Distribution

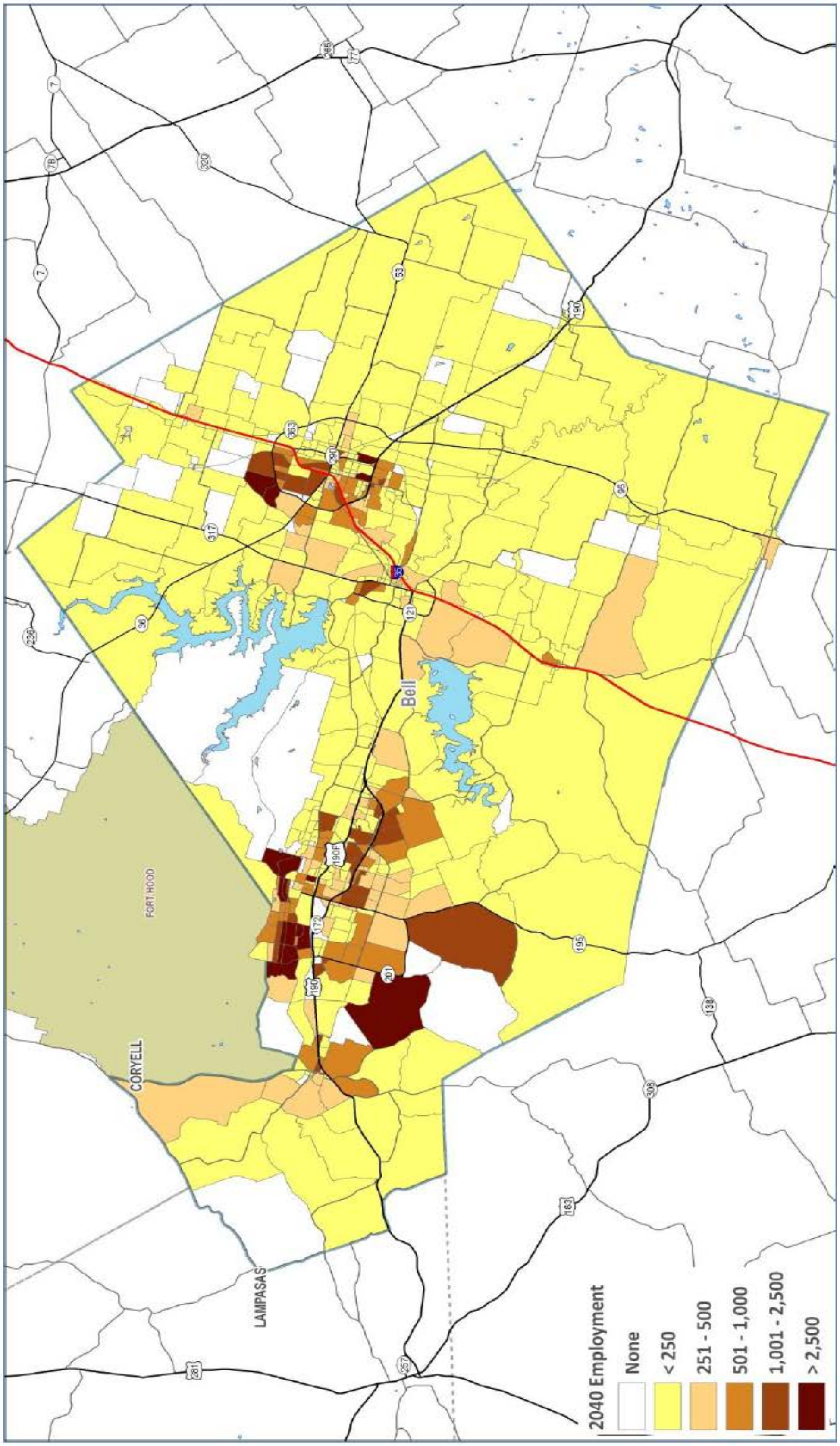


Exhibit 10.6: 2010-2015 New Households

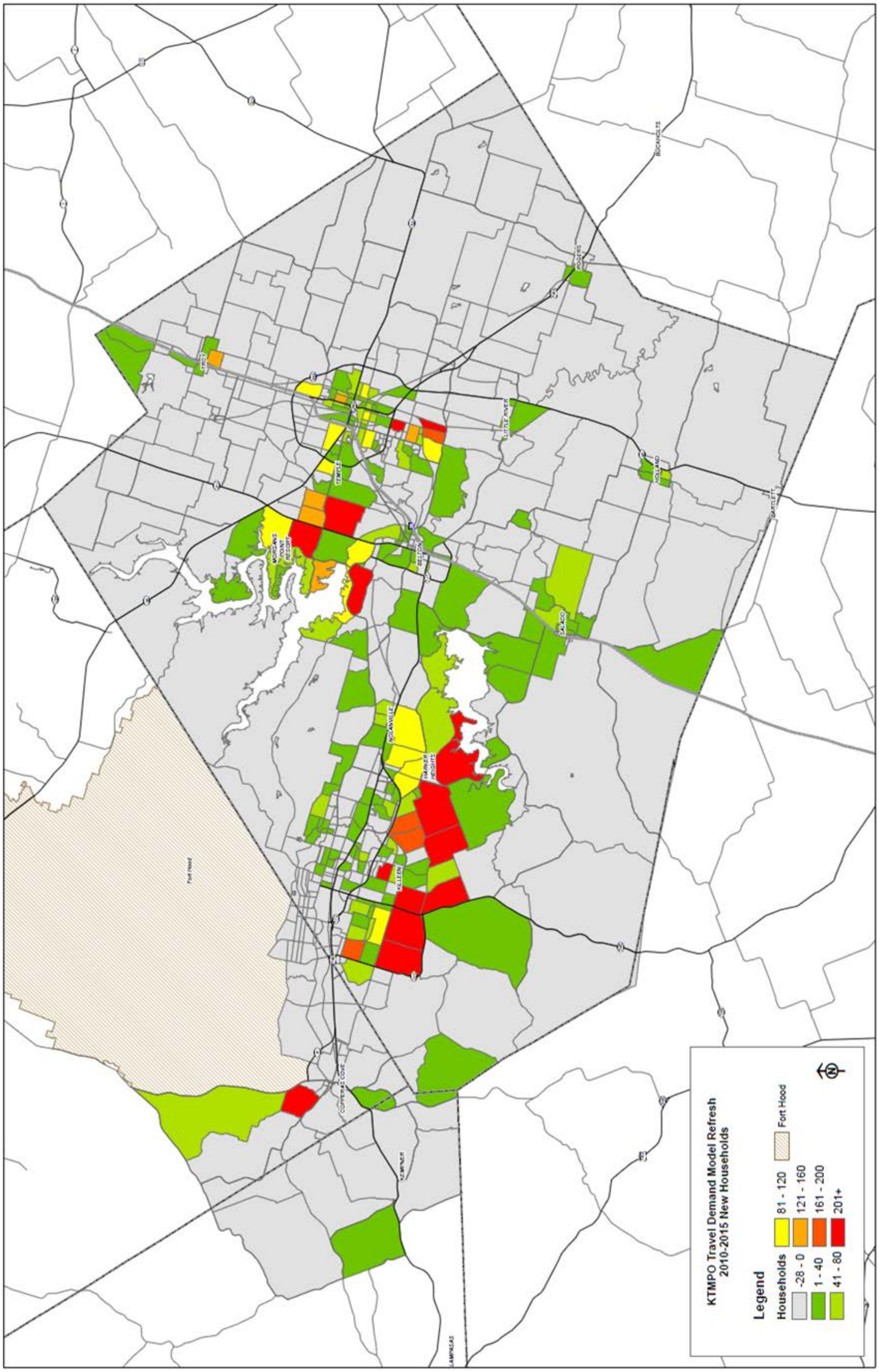
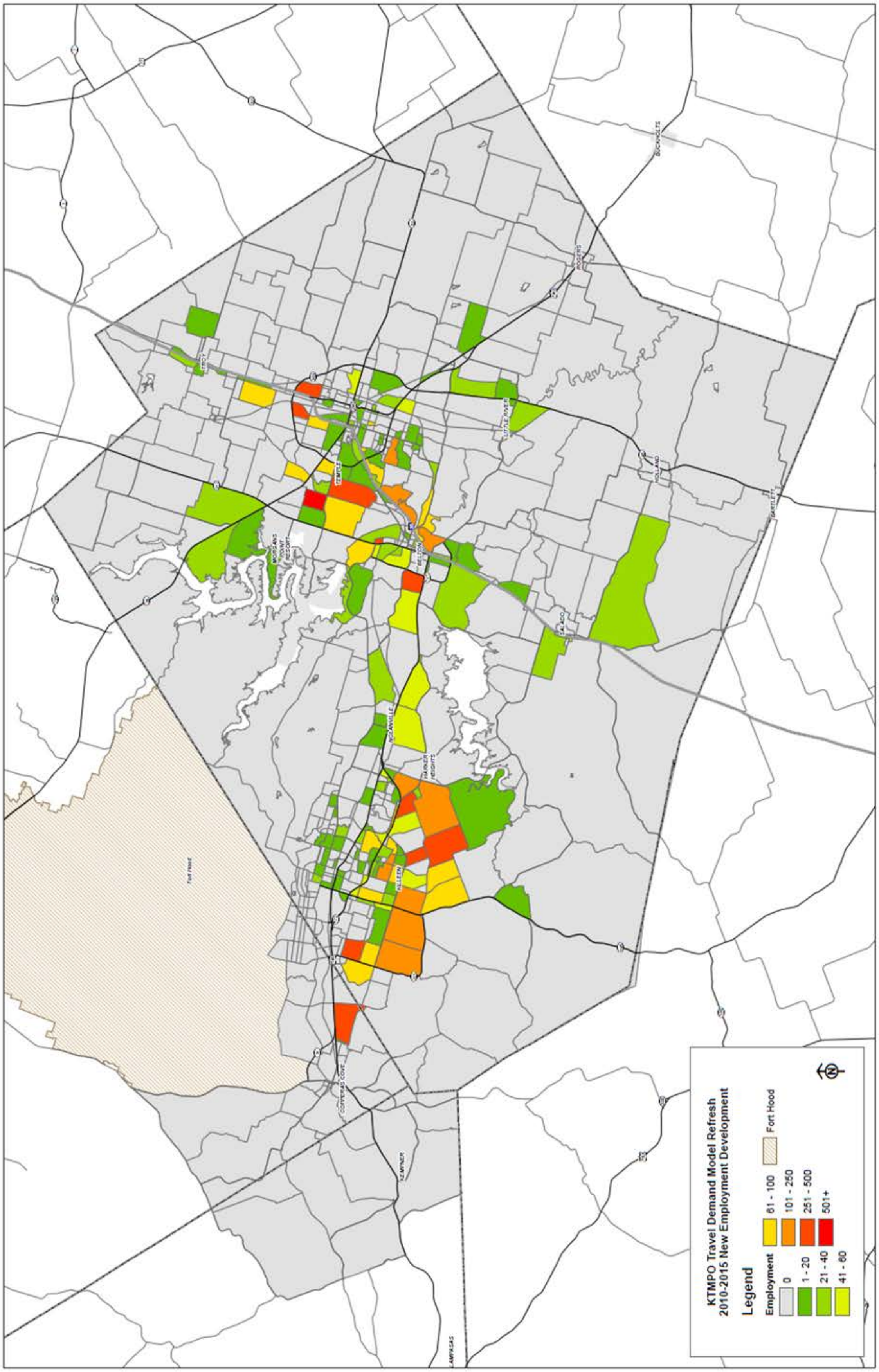


Exhibit 10.7: 2010-2015 New Employee Development



KTMPO
KILLEEN-TEMPLE
metropolitan planning organization

Appendix J:

Federal Certification Review Report

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL TRANSIT ADMINISTRATION
819 TAYLOR STREET, ROOM 14A02
FORT WORTH, TEXAS 76102-9003

FEDERAL HIGHWAY ADMINISTRATION
300 E. 8TH STREET, ROOM 826
AUSTIN, TEXAS 78701

May 1, 2019

Killeen-Temple Transportation Management Area (TMA)
2018 FHWA/FTA Transportation Planning Certification Review Action

Mayor Marion Grayson, Chair
Killeen-Temple Metropolitan Planning Organization (KTMPO)
2180 North Main Street
P.O. BOX 729
Belton, TX 76513

Dear Mayor Grayson:

The Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA) personnel have been working closely with KTMPO, Texas Department of Transportation (TxDOT), and Hill Country Transit District (HCTD) to complete the TMA certification review process required under title 23 United States Code (USC).

Based upon the review and evaluation of the KTMPO planning process, the FHWA and FTA jointly determined that the metropolitan transportation planning process is substantially consistent with the federal requirements of the 23 CFR 450 (highway) and 49 CFR Part 613 (transit) metropolitan planning regulations.

Enclosed is a copy of the 2018 Certification Review report documenting the review. The report provides an overview of the KTMPO planning process, including recommendations and commendations. We greatly appreciate all the time and effort by the MPO, the other agencies involved, and the elected officials that prepared for and participated in the review.

Representatives from our offices are available to formally present the review findings and the FHWA/FTA certification action at an agreed upon KTMPO policy board meeting. Should you have any questions about the certification review, or any other topic, please contact FHWA's Justin Morgan at 512-536-5943, or FTA's Melissa Foreman at 817-978-0554. Thank you for your attention and participation in the review of the KTMPO transportation planning process.

Sincerely yours,

Robert C. Patrick
Regional Administrator
Federal Transit Administration, Region VI

Achille Alonzi
Division Administrator
Federal Highway Administration

Enclosure

cc: Jim Reed, KTMPO
Kendra Coufal, KTMPO
Uryan Nelson, KTMPO
Carole Warlick, Hill Country Transit District
Melissa Foreman, FTA Region VI
Victor Goebel, TxDOT
Brigida Gonzalez, TxDOT
Peter Smith, TxDOT
Peggy Thurin, TxDOT

U.S. Department of Transportation

Transportation Management Area Planning Certification Review

Federal Highway Administration

Federal Transit Administration

____Killeen-Temple MPO____ Transportation Management Area

COURTESY: CITY OF TEMPLE

May 1, 2019

Summary Report

Table of Contents

1.0 EXECUTIVE SUMMARY

On May 9th, 2018, the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) conducted the certification review of the transportation planning process for the Killeen-Temple urbanized area. FHWA and FTA are required to jointly review and evaluate the transportation planning process for each urbanized area over 200,000 in population at least every four years to determine if the process meets the Federal planning requirements.

1.1 Previous Findings and Disposition

The first certification review for the Killeen-Temple urbanized area was conducted in 2015. No findings were presented.

1.2 Summary of Current Findings

The current review found that the metropolitan transportation planning process conducted in the Killeen-Temple urbanized area meets Federal planning requirements, as noted in our letter of October 4, 2018.

As a result of this review, FHWA and FTA are certifying compliance to the requirements of 23 CFR 450 of the transportation planning process conducted by Texas Department of Transportation (TxDOT), Hill Country Transit District (HCTD; also known as The HOP), and the local governments represented by the Killeen-Temple Metropolitan Planning Organization (KTMPO)There are also recommendations in this report that warrant consideration, as well as areas that MPO is performing very well in that are to be commended.

Review Area	Finding	Action	Corrective Actions/ Recommendations/ Commendations
Metropolitan Planning Area Boundaries 23 U.S.C. 134(e) 23 CFR 450.312(a)	The MPO considers the unique needs of veterans, a non-federally recognized population group that is rapidly growing in the KTMPO region.	Commendation	We commend the MPO on recognizing a demographic mix and planning ahead for the needs of those groups, especially veterans

Review Area	Finding	Action	Corrective Actions/ Recommendations/ Commendations
Metropolitan Transportation Plan 23 U.S.C. 134(c), (h) & (i) 23 CFR 450.324	There needs to be a summary in the plan that describes how much funding is available for Maintenance & Operations (M&O).	Recommendation	Recommendation that M&O be included in the plan. This should be accomplished with the new Metropolitan Transportation Plan as it is developed
	It was not clear how much revenue in total could be generated, or how much was to be expended overall	Recommendation	Recommendation of a chart or table showing revenue and expenditures totals should be included in the new Metropolitan Transportation Plan.
Transit Planning 49 U.S.C. 5303 23 U.S.C. 134 23 CFR 450.314	There was extensive coordination between Hill Country Transit District and KTMPO. Also, HCTD took the initiative to prepare for new FAST Act requirements, including a new MOU between them and KTMPO. Further, the transit provider prioritized Transit Asset Management (TAM) plan and similar, unrequired metrics.	Commendation	We commend the MPO for its coordination of transit. We also commend TxDOT and the transit agency for preparing for the new requirements. It is also commendable that the transit agency took notable efforts on performance measures outside of the TAM and regarding the TAM.
	HCTD, in coordination with the MPO, offers the general public guidance on how to best use the bus network	Commendation	We commend the transit agency for having "travel training" and related activities that that helps riders and riders using service dogs
Transportation Safety 23 U.S.C. 134(h)(1)(B) 23 CFR 450.306(a)(2) 23 CFR 450.306(d) 23 CFR 450.324(h)	The MPO staff create videos and other visuals to inform and promote safety on social media	Commendation	We commend the MPO for utilizing social media to promote safety

Review Area	Finding	Action	Corrective Actions/ Recommendations/ Commendations
Travel Demand Forecasting 23 CFR 450.324(f)(1)	The MPO has a protocol where if a board member disagrees on data used in the model, that member must provide alternate credible data	Commendation	The MPO has a policy of requesting credible data alternatives should policy board members disagree on data used in model

Details of the certification findings for each of the above items are contained in this report.

2.0 INTRODUCTION

2.1 Background

Pursuant to 23 U.S.C. 134(k) and 49 U.S.C. 5303(k), the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) must jointly certify the metropolitan transportation planning process in Transportation Management Areas (TMAs) at least every four years. A TMA is an urbanized area, as defined by the U.S. Census Bureau, with a population of over 200,000. After the 2010 Census, the Secretary of Transportation designated 183 TMAs – 179 urbanized areas over 200,000 in population plus four urbanized areas that received designation by the Secretary of Transportation. In general, the reviews consist of three primary activities: a site visit, a review of planning products (in advance of and during the site visit), and preparation of a Certification Review Report that summarizes the review and offers findings. The reviews focus on compliance with Federal regulations, challenges, successes, and experiences of the cooperative relationship between the MPO(s), the State DOT(s), and public transportation operator(s) in the conduct of the metropolitan transportation planning process. Some of the analysis of this relationship comes from interviews of the elected officials from the MPO's policy board. Joint FTA/FHWA Certification Review guidelines provide agency field reviewers with latitude and flexibility to tailor the review to reflect regional issues and needs. As a consequence, the scope and depth of the Certification Review reports will vary significantly.

The Certification Review process is only one of several methods used to assess the quality of a regional metropolitan transportation planning process, compliance with applicable statutes and regulations, and the level and type of technical assistance needed to enhance the effectiveness of the planning process. Other activities provide opportunities for this type of review and comment, including Unified Planning Work Program (UPWP) approval, the Metropolitan Transportation Plan (MTP), metropolitan Transportation Improvement Program (TIP) findings, air-quality (AQ) conformity determinations (in nonattainment and maintenance areas), as well as a range of other formal and less formal contact provide both FHWA/FTA an opportunity to comment on the planning process. The results of these other processes are considered in the Certification Review process.

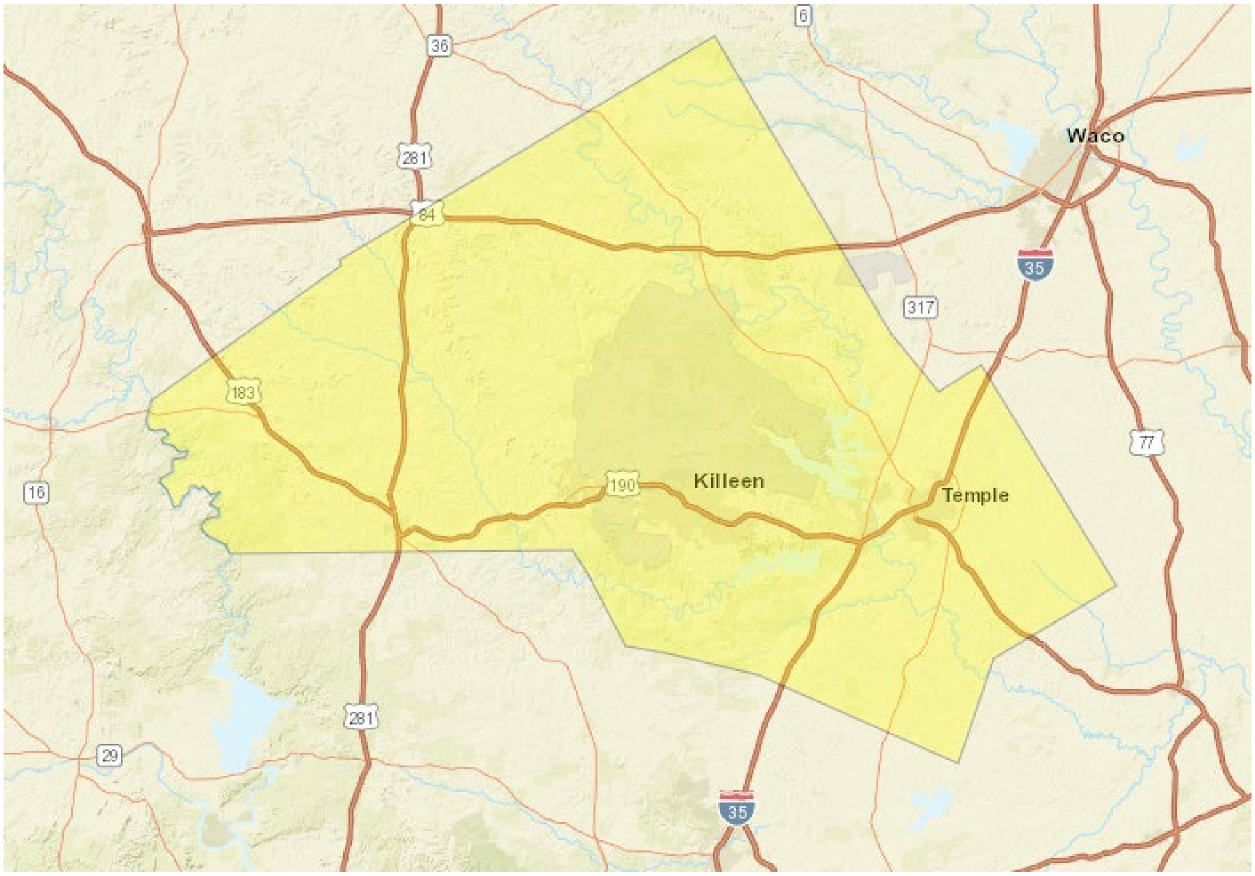
While the Certification Review report itself may not fully document those many intermediate and ongoing checkpoints, the "findings" of Certification Review are, in fact, based upon the cumulative findings of the entire review effort.

The review process is individually tailored to focus on topics of significance in each metropolitan planning area. Federal reviewers prepare Certification Reports to document the results of the review process. The reports and final actions are the joint responsibility of the appropriate FHWA and FTA field offices, and their content will vary to reflect the planning process reviewed, whether or not they relate explicitly to formal “findings” of the review.

2.2 Purpose and Objective

Since the enactment of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, the FHWA and FTA, are required to jointly review and evaluate the transportation planning process in all urbanized areas over 200,000 population to determine if the process meets the Federal planning requirements in 23 U.S.C. 134, 40 U.S.C. 5303, and 23 CFR 450. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), extended the minimum allowable frequency of certification reviews to at least every four years.

KTMPO is the designated MPO for the Killeen-Temple urbanized area. The urbanized area, which consists of the currently developed area, as well as what will likely will be built-out within the next 20 years, which included Bell County, as well as parts of Coryell and Lampasas Counties in Texas.



The Killeen-Temple-Fort Hood Metropolitan Statistical Area (Source: US Census Bureau)

TxDOT is the responsible State agency and Hill Country Transit District is the responsible public transportation operator. Current membership of KTMPO consists of elected officials and citizens from the political jurisdictions in the Killeen-Temple-Fort Hood Metropolitan Statistical Area (MSA). The study area includes the Killeen-Temple-Fort Hood MSA with the City of Killeen as the largest population center.

Certification of the planning process is a prerequisite to the approval of Federal funding for transportation projects in such areas. The certification review is also an opportunity to provide assistance on new programs and to enhance the ability of the metropolitan transportation planning process to provide decision makers with the knowledge they need to make well-informed capital and operating investment decisions.

3.0 SCOPE AND METHODOLOGY

3.1 Review Process

This report details the KTMPO 2018 Federal Certification review, which consisted of a desk audit, a formal site visit and a public involvement opportunity, conducted from May 8th through 10th, 2018.

Participants in the review included representatives of FHWA, FTA, TxDOT (staff from their Austin headquarters as well as personnel from the local Waco District office), Hill Country Transit District, and Killeen-Temple MPO staff. Locally elected officials who are members of KTMPO's policy board were interviewed as well. A full list of participants is included in Appendix A.

A desk audit of current documents and correspondence was completed prior to the site visit. In addition to the formal review, routine oversight mechanisms provide a major source of information upon which to base the certification findings.

The certification review covers the transportation planning process conducted cooperatively by the MPO, State, and public transportation operators. Background information, current status, key findings, and recommendations are summarized in the body of the report for the following subject areas selected by FHWA and FTA staff for on-site review:

- Metropolitan Planning Area Boundaries
- MPO Structure and Agreements
- Unified Planning Work Program
- Metropolitan Transportation Plan (MTP)
- Transit Planning
- Transportation Improvement Program (TIP)
- Public Participation
- Civil Rights (Title VI, EJ, LEP, ADA)
- Consultation and Coordination
- List of Obligated Projects
- Freight Planning
- Environmental Mitigation/Planning Environmental Linkage
- Transportation Safety
- Transportation Security Planning
- Nonmotorized Planning/Livability

- Integration of Land Use and Transportation
- Travel Demand Forecasting
- Congestion Management Process / Management and Operations

3.2 Documents Reviewed

The following MPO documents were evaluated as part of this planning process review:

- TxDOT Agreement with Metropolitan Planning Organization and Fiscal Agent, 2013
- FY 2018-2019 Unified Planning Work Program for the Killeen-Temple MPO
- MPO Metropolitan Transportation Plan (MTP), 2040
- MPO FY-2017-2020 TIP and Self-Certification
- https://ktmpo.org
    - MTP Amendments (https://ktmpo.org/planning/plans/)
    - MTP Appendix G—Congestion Management (https://ktmpo.org/planning/plans/#app_g_cmp)
    - MPO 2016 Congestion Management Plan (CMP)
    - Public Participation Plan
- Annual Performance and Expenditure Report (FY 2017)
- Annual Project Listing (FY 2017)

4.0 PROGRAM REVIEW

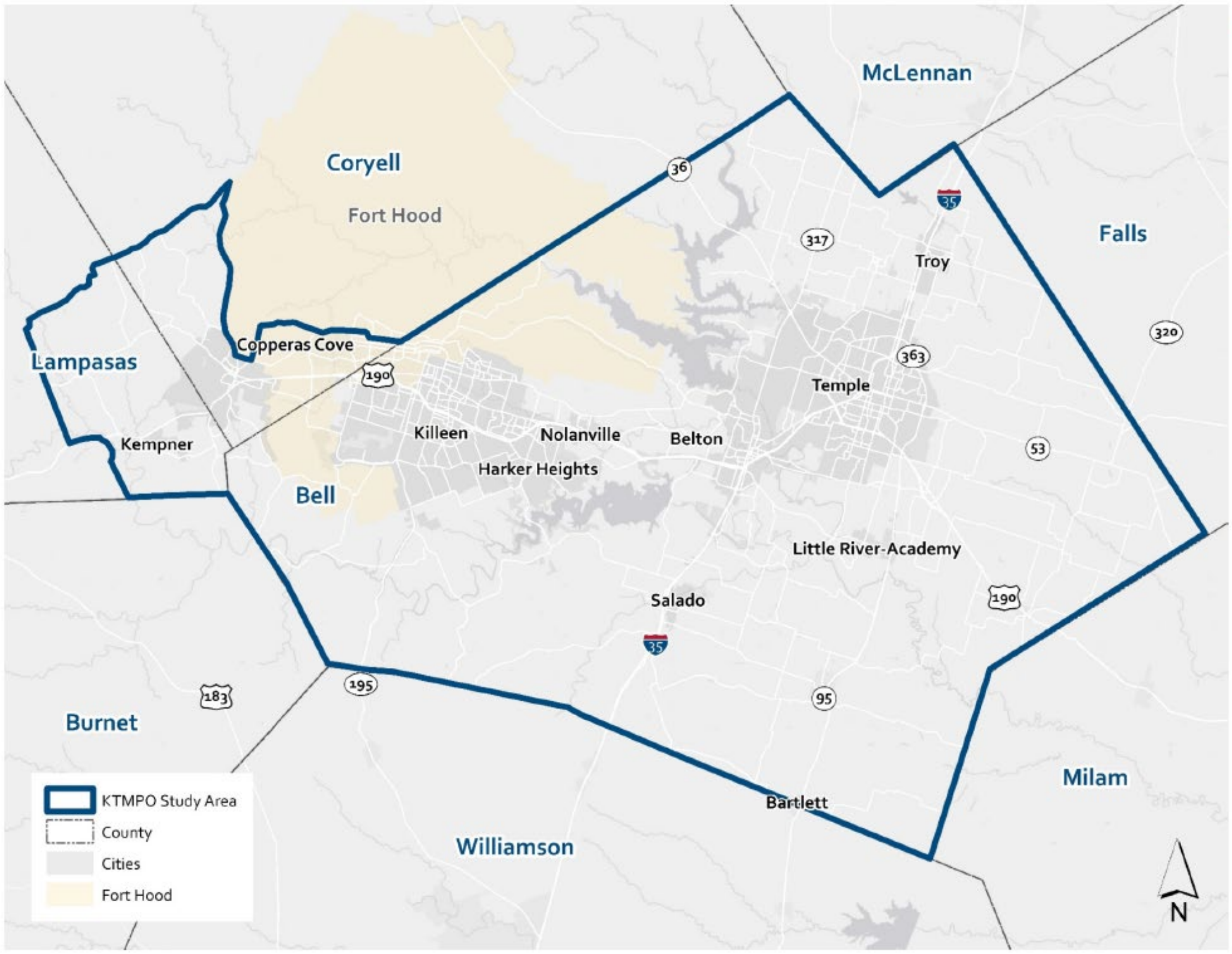
4.1 Metropolitan Planning Area Boundaries

4.1.1 Regulatory Basis

23 U.S.C. 134(e) and 23 CFR 450.312(a) state the boundaries of a Metropolitan Planning Area (MPA) shall be determined by agreement between the MPO and the Governor. At a minimum, the MPA boundaries shall encompass the entire existing urbanized area (as defined by the Bureau of the Census) plus the contiguous area expected to become urbanized within a 20-year forecast period for the MTP.

4.1.2 Current Status

- MPO Official Name--The Killeen-Temple Metropolitan Planning Organization (KTMPO since 2009)
- MPO Area Boundaries—Bell County, parts of Coryell and Lampasas counties
- Population Served—426,926 (Total Population of Killen-Temple-Fort Hood MSA, 2016 American Community Survey 5-Year Estimate)



The KTMPO Planning Area Boundaries (Source: CMP 2016)

The MPO consists of two census urbanized areas, Killeen and Temple, Texas. The MPA currently encompasses both urbanized areas, as well as any contiguous area that could be urbanized within the next two decades.

There haven't been any major changes in the developed area since the last review in 2015, although the community of Copperas Cove (which is west of Killeen) continues to grow. Suburbanization has also occurred in Harker Heights, which is Killeen's immediate neighbor to the east. The far east of the planning boundary area and its south has seen little to no growth in the past three years.

4.1.3 Findings

Observations:

The KTMPO MPA boundaries, as described above, are compliant with the requirements of 23 CFC 450.312(a).

4.2 MPO Structure and Agreements

4.2.1 Regulatory Basis

23 U.S.C. 134(d) and 23 CFR 450.314(a) state the MPO, the State, and the public transportation operator shall cooperatively determine their mutual responsibilities in carrying out the metropolitan transportation planning process. These responsibilities shall be clearly identified in written agreements among the MPO, the State, and the public transportation operator serving the MPA.

4.2.2 Current Status

- Year MPO Founded—1975, as "Killen-Temple Urban Transportation Study—K-TUTS"
- Organizational Type/Status (i.e. Council of governments, non-profit, independent)—part of the Central Texas Council of Governments (CTCOG)
- Member Jurisdictions and Number Represented—14 cities (Bartlett, Belton, Copperas Cove, Harker Heights, Holland, Kempner, Killeen, Little River-Academy, Morgan's Point Resort, Nolanville, Rogers, Salado, Temple, and Troy) and a portion of Fort Hood. 14 voting members are on the Transportation Planning Policy Board (this includes 11 elected officials from within the MPA); 23 members (voting and nonvoting) on the Technical Advisory Committee
- Major Transit Operators—Hill Country Transit District. The MPO has an Interlocal Agreement with HCTD (see 4.5 Transit Planning —*Current Status*)

KTMPO has a policy board, a technical advisory committee, and other adjunct committees, including bicycle/pedestrian and freight committees.

The MPO's most recent agreement with TxDOT was in 2013. In it, KTMPO designated CTCOG, a regional council of governments, as their fiscal agent. It also identifies the mutual responsibilities between TxDOT and KTMPO, such as TxDOT needing to provide federal metropolitan planning funds to KTMPO, and KTMPO having to provide an Annual Performance and Expenditure Report (APER) to TxDOT by the end of the calendar year.

The MPO Bylaws also state responsibilities. The bylaws, which were approved by KTMPO in September of 2013, discuss that the policy board must hold at least four public meetings a year. The bylaws also state that the policy board is comprised of a chairperson, a vice chair, and numerous members representing the local cities that are a part of KTMPO.

The MPO policy board has a tiered representation structure: a member city can have up to three representatives, depending on the city's size (as determined by the latest federal Census): one board representative for cities 10,000 to 40,000 citizens, two representatives for cities between 40,000 and 80,000 in population, and three representatives for cities beyond 80,000 citizens. Despite the differences in urban scale, all votes from the representatives, regardless of city size, have the same weight. Also, several agencies have non-voting ex-officio members on the policy board, such as Fort Hood. The policy board structure has remained the same for a number of years.

CTCOG is the fiscal agent for KTMPO. The US Department of Commerce and the Texas Workforce Commission are the current federal and state cognizant agencies, respectively, for the MPO. KTMPO's indirect cost rate, which is 44.97%, has been approved by the federal cognizant agency.

4.2.3 Findings

<u>Observations</u>:

Based on our review of KTMPO's agreement with TxDOT, its bylaws, and the other supporting information above, KTMPO has been found compliant with the requirements of 23 CFR 450.314(a).

4.3 Unified Planning Work Program

4.3.1 Regulatory Basis

23 CFR 450.308 sets the requirement that planning activities performed under Titles 23 and 49 U.S.C. be documented in a Unified Planning Work Program (UPWP). The MPO, in cooperation with the State and public transportation operator, shall develop a UPWP that includes a discussion of the planning priorities facing the MPA and the work proposed for the next one- or two-year period by major activity and task in sufficient detail to indicate the agency that will perform the work, the schedule for completing the work, the resulting products, the proposed funding, and sources of funds.

4.3.2 Current Status

- Biannual Budget--$2,068,583 (FY 18 and19)

- Vision & Mission—to comply with the FAST Act

- Major Projects/Plans—Updated the bike & pedestrian plan as part of Task 2.0.

- Major MPO Issues—New performance measures and targets. MTP update for 2045 is Task 4.2 and has a total budget of $248,013.

The MPO utilizes a two-fiscal-year Unified Planning Work Program (UPWP). The most recent UPWP was adopted by the KTMPO policy board on May 17, 2017. It was subsequently approved by FTA and FHWA on September 22, 2017.

The KTMPO UPWP follows the same five-task structure as the other Texas MPOs. They have consulted with TxDOT to get assistance on how to fulfill FAST Act and related Federal initiatives, such as Ladders of Opportunity and a sense of regional cooperation, through the UPWP. Examples of this include the US 190 Feasibility Study that was recently amended into the UPWP as task 5.6, and the US 290/IH-14 system improvements. Such projects have ramifications beyond the KTMPO MPA and therefore, with the assistance of TxDOT, require coordination with other planning and governmental entities within the region.

The UPWP also addresses planning priorities such as those required by the FAST Act. It was developed in consultation with many partner agencies, including the counties that make up the MPO, the Bureau of Land Management, Fort Hood, the US Environmental Protection Agency, and the local planning & zoning commissions within the MPO.

The UPWP includes the required “Debarment Certification”, “Lobbying Certification”, “Certification of Compliance”, and “Certification of Internal Ethics & Compliance Program”.

4.3.3 Findings

Observations:

The latest UPWP (2018-2019) was found to be developed in accordance with 23 CFR 450.308 and approved jointly by FHWA and FTA.

4.4 Metropolitan Transportation Plan

4.4.1 Regulatory Basis

23 U.S.C. 134(c), (h) & (i) and 23 CFR 450.324 set forth requirements for the development and content of the Metropolitan Transportation Plan (MTP). Among the requirements are that the MTP address at least a 20-year planning horizon and that it includes both long and short-range strategies that lead to the development of an integrated and multi-modal system to facilitate the safe and efficient movement of people and goods in addressing current and future transportation demand.

The MTP is required to provide a continuing, cooperative, and comprehensive multimodal transportation planning process. The plan needs to consider all applicable issues related to the transportation systems development, land use, employment, economic development, natural environment, and housing and community development.

23 CFR 450.324(c) requires the MPO to review and update the MTP at least every four years in air quality nonattainment and maintenance areas and at least every 5 years in attainment areas to reflect current and forecasted transportation, population, land use, employment, congestion, and economic conditions and trends.

Under 23 CFR 450.324(f), the MTP is required, at a minimum, to consider the following:

- Projected transportation demand
- Existing and proposed transportation facilities
- Operational and management strategies
- Congestion management process
- Capital investment and strategies to preserve transportation infrastructure and provide for multimodal capacity
- Design concept and design scope descriptions of proposed transportation facilities
- Potential environmental mitigation activities
- Pedestrian walkway and bicycle transportation facilities
- Transportation and transit enhancements
- A financial plan

4.4.2 Current Status

The MPO's most current plan is their 2040 MTP. It estimates an addition of over 200,000 people and 90,000 jobs by that plan's target date. The 2040 MTP identifies over 150 roadway projects, 13 transit projects, and 17 bicycle/pedestrian projects for the next quarter-century period. Each project undergoes a four-step selection project, which starts with a project's submission, followed by a review & evaluation, then a technical advisory committee recommendation, and concludes with the policy board's review and approval.

The MTP also contains such information as environmental mitigation activities, potential project designs, freight transportation considerations, and short- and long-term transportation investment strategies. KTMPO's MTP is a fiscally constrained document. Some of the funding forecasts were determined from amounts forecasted in TxDOT's 2014 Unified Transportation Program. While the anticipated funding was shown in the MTP in detail, the anticipated expenditures were not, thus making it difficult to discern fiscal constraint.

As the projected revenue over the MTP's 25-year period is estimated at $657 million, only 14 roadway projects in the plan will be fully funded.

The 2040 plan was adopted in May of 2014. It was provided to FHWA and FTA for approval on May 4th, 2015. It has been amended eleven times, the most recent of which was December 2017. Four of those were administrative amendments.

A new Mobility 2045 MTP Plan is currently in development. By September or October of 2018 all the projects will be listed, and the scoring process will begin by December. KTMPO plans to have the MTP completely updated by April of 2019. Their MTP will use a continuing, cooperative and comprehensive regional planning process that identifies needs, resources and priorities for KTMPO's region. All of the current FAST Act planning factors should be addressed in it.

4.4.3 Findings

Observations:

The current MTP from KTMPO is compliant with the requirements of 23 CFR 450.324.

Recommendations:

There is no adequate summary in the plan that addresses sufficiently how much funding is available for Maintenance & Operations (M&O) activities. It is recommended that additional documentation addressing M&O funding over the life of the MTP be included in the 2045 plan.

4.5 Transit Planning

4.5.1 Regulatory Basis

49 U.S.C. 5303 and 23 U.S.C. 134 require the transportation planning process in metropolitan areas to consider all modes of travel in the development of their plans and programs. Federal regulations cited in 23 CFR 450.314 state that the MPO in cooperation with the State and operators of publicly owned transit services shall be responsible for carrying out the transportation planning process.

4.5.2 Current Status

Hill Country Transit District (HCTD) operates The HOP which is the only regional public transit system in the KTMPO region and provides urban, paratransit and rural bus service in nine-counties. HCTD started as a volunteer public transportation service in the 1960s and currently operates a fleet of 167 buses, including 27 fixed route buses and 140 paratransit buses. In 2011, KTMPO and HCTD entered into an Interlocal Agreement for coordinated transportation planning efforts, which includes annual updates of the Regional Metropolitan Transportation Plan. In 2012, KTMPO signed a resolution designating HCTD as the Designated Recipient of FTA 5307 (capital funds) and 5310 (Senior and Individuals with Disabilities) funds for the Killeen UZA, which previously were distributed to HCTD through the KTMPO. HCTD has been on the KTMPO Policy Board as a voting member since 2013 as shown in KTMPO's By-laws.

KTMPO assists HCTD with several different transit projects in the area such as; vehicle capital investments, fixed routes, bus facilities, transit enhancements and amenities, and development of a regional multi-modal center. KTMPO also assists with transit reporting, such as transit State of Good Repair and cost efficiency by receiving quarterly reports from HCTD. KTMPO has also assisted with transit training for the public, including service dog training for transit services. HCTD and KTMPO also coordinate with local response teams for evacuations, such as with providing service to Hurricane Harvey evacuees displaced to the KTMPO region in late August 2017.

4.5.3 Findings

The MPO is compliant with 49 U.S.C. 5303 and 23 U.S.C. 134 regarding Transit Planning. As aforementioned the MPO has coordinated with the transit agency to complete transportation and transit related planning studies. Most recently, KTMPO assisted with the public comment period for a Regional Coordinated Transportation Plan published in 2017 developed by the Central Texas Council of Governments (CTCOG) and HCTD.

KTMPO coordinates with HCTD for public meetings and announcements for public outreach regarding accessible stops, and/or service changes. Additionally, it is the goal of KTMPO and other agencies in the region to hold public meetings at locations serviced by public transit when possible.

It was also observed that approximately 10% of KTMPO's STP funding goes to transit. This is noteworthy because not every MPO this size makes available so much of their STP to their transit operations on an annual basis. However, the MPO should consider the provisions of 23 CFR 450.326(m) when determining funding to the transit agency.

Also during the course of the review, it was found that HCTD was very proactive with metrics. Not only did the agency have Transit Asset Management (TAM) measures in place, they also made use of their own, unrequired metrics, such as having most passenger trips be under 30 minutes for example. Because of this, we commend HCTD for their performance measure efforts in regard to TAM, as well as the metrics HCTD measures on their own.

Commendation:

KTMPO continues to have a strong transit voice and participation on its policy board with HCTD as a voting member. KTMPO has had HCTD as a voting member on the Policy Board prior to the implementation of 23 U.S.C. 134(d)(2)(B) and 49 U.S.C. 5303(d)(2)(B), as amended by sections 1201 and 20005 of MAP-21, Public Law 112-141, which require representation by providers of public transportation in each MPO that serves an area designated as a TMA by October 1, 2014.KTMPO has coordinated with HCTD in transit training activities for the public, as well as service dog training for transit.

HCTD has performance measures for TAM, as well as their own internal metrics.

Recommendations:

KTMPO should continue to work with HCTD to review transit State of Good Repair TAM targets, set regional performance based planning targets, and utilize them to prioritize investment decisions in transit projects.

4.6 Transportation Improvement Program

4.6.1 Regulatory Basis

23 U.S.C. 134(c), (h) & (j) set forth requirements for the MPO to cooperatively develop a Transportation Improvement Program (TIP). Under 23 CFR 450.326, the TIP must meet the following requirements:

- Must cover at least a four-year horizon and be updated at least every four years.
- Surface transportation projects funded under Title 23 U.S.C. or Title 49 U.S.C., except as noted in the regulations, are required to be included in the TIP.
- List project description, cost, funding source, and identification of the agency responsible for carrying out each project.
- Projects need to be consistent with the adopted MTP.
- Must be fiscally constrained.
- The MPO must provide all interested parties with a reasonable opportunity to comment on the proposed TIP.

4.6.2 Current Status

The current TIP, for fiscal years (FY) 2017-2020, was approved by the policy board on June 22nd, 2016. It has been amended nine times since then, with the most recent amendment in March of 2018. It is a fiscally constrained document, with a basic description for the surface transportation project, total project costs broken down by project phase, and the project sponsor (usually a municipality within the MPO) is always listed.

The FY 2019-2022 TIP will be initially prepared in the spring of 2018, and would be on track to be approved as part of the 2019-2022 STIP in late 2018. KTMPO should remember that the 2019-2022 TIP should address the FAST ACT planning factors, as their plan will be initiated and compiled after the regulations and guidance regarding the act are fully available. The MAP-21 performance measure targets should also be addressed, as the FAST Act did not alter these.

Concerning project selection criteria, the MPO uses a “four-step project selection process”, as mentioned on page 4 of the most recent (2017-2020) TIP. The process begins with a call for projects from entities that make up the MPO. Once projects are submitted, there is then a period of review and evaluation in which the project submissions are vetted for consistency with MTP goals and a local funding source that can meet any match requirements. During the project scoring and selection process, projects that are on the MPO’s Congestion Management

Process (CMP) network received extra points. Also, projects that emphasize connections to facilities with regional or national transportation significance (I-14 and I-35) are given extra weight in the process.

The next step has the project proposals go before the MPO's Technical Advisory Committee (TAC). The TAC scores and prioritizes the projects. projects listed in a previously approved TIP which were not let are KTMPO's main priority, and are therefore rolled over into the new TIP. This policy helps projects move forward within the four years of the TIP. Finally, the MPO's Policy Board has an opportunity to review and formally approve the project submissions. Once adopted, the projects will be included in the next TIP.

The MPO's self-certification is included on p.58 of the most recent TIP.

4.6.3 Findings

Observations:

The KTMPO FY 2017-2020 TIP was found to have been developed in accordance with the planning requirements of 23 CFR 450.326.

Commendation:

Just as with the transit provider, KTMPO has ensured that there is extensive coordination between its other planning partners, TxDOT and FHWA, particularly with their TIP development. We commend KTMPO for this.

4.7 Public Participation

4.7.1 Regulatory Basis

Sections 134(i)(5), 134(j)(1)(B) of Title 23 and Section 5303(i)(5) and 5303(j)(1)(B) of Title 49, require a Metropolitan Planning Organization (MPO) to provide adequate opportunity for the public to participate in and comment on the products and planning processes of the MPO. The requirements for public involvement are detailed in 23 CFR 450.316(a) and (b), which require the MPO to develop and use a documented participation plan that includes explicit procedures and strategies to include the public and other interested parties in the transportation planning process.

Specific requirements include giving adequate and timely notice of opportunities to participate in or comment on transportation issues and processes, employing visualization techniques to describe metropolitan transportation plans and TIPs, making public information readily available in electronically accessible formats and means such as the world wide web, holding public meetings at convenient and accessible locations and times, demonstrating explicit consideration and response to public input, and periodically reviewing the effectiveness of the participation plan.

4.7.2 Current Status

Public participation has long been a strongpoint of the MPO. According to documents provided for the review, and documents available online, their original Public Participation Plan (PPP) by K-TUTS was drafted in 2001, and under KTMPO, a new PPP was developed and adopted in the summer of 2007. There were a number of new revisions with the last being adopted in October of 2014. Our review of the 2014 PPP compared against the requirements of 23 CFR 450.316 found the PPP to be compliant with the regulations.

Some of the innovations that came from the review included new methods of calculating demographic data to better analyze low income and minority populations. Although demographically and socially, the population of the KTMPO region is essentially the same as it was in 2015, the new analysis led to the designation of “Environmental Justice (EJ) Communities of Concern”. These EJ communities receive extra consideration and attention when they could be affected by planning processes. In the development of the TIP and MTP, effects on Census block groups with high proportions of minorities or low-income residents near projects are evaluated.

KTMPO also takes actions to support Communities of Concern. As mentioned in the MTP, one such act is that at least two of a given five 2040 MTP workshops were held in designated EJ locations. Also, the MPO analyzed the effectiveness of the PPP with a geographic analysis by requesting the nearest cross-streets of those who left comments.

In addition to the quantitative data sources used (see 4.18 Congestion Management Process / Management and Operations), qualitative data is obtained via public surveys. Congestion Management Plans utilize surveys of the general public within the KTMPO area which gather subjective observations that assist in developing a better focus regarding regional congestion. For example, based upon the 222 responses provided in one survey, the worst locations for daily traffic congestion were identified. Surveys specific to certain populations, such as transit riders, cyclists and pedestrians, are also done to better evaluate current conditions and to aid the development of other plans. The PPP also allows for additional participation from all stakeholders, in addition to other agencies for most actions.

Besides surveys, public comments are sourced both from social media (i.e.: Facebook, Twitter) and more conventional methods, like written and oral comments. MPO staff stated that they strive to give all comments from any source the same merit and attention.

The MPO strive to maximize stakeholder access to all MPO meetings. Workshops that gather the public interest regarding the transportation system are held during the evenings and within a short distance of a transit stop. Public hearings are held in locations close to the potentially affected areas of proposed TIP amendments.

The public transit agency is also proactively engaging the public. A notable example is that Hill Country Transit District (HCTD), in coordination with KTMPO, provides to the public guidance, called “Travel Training”, on how to utilize the bus network effectively, such as how to use timetables. It is of particular assistance to those who are ADA-accessibility riders.

4.7.3 Findings

Observations:

Based on our review, it was found that KTMPO’s Public Participation Plan is compliant with 23 CFR 450.316(a).

Commendation:

It was found that the MPO considers the unique needs of veterans, a non-federally recognized population group. There are many unique traits associated with this population, including but not limited to being older in age and requiring health services from Veteran’s Administration hospitals. The review team noted it commendable that KTMPO was voluntarily observing such a group, in addition to other federally recognized groups.

4.8 Civil Rights (Title VI, EJ, LEP, ADA)

4.8.1 Regulatory Basis

Title VI of the Civil Rights Act of 1964, prohibits discrimination based upon race, color, and national origin. Specifically, 42 U.S.C. 2000d states that “No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.” In addition to Title VI, there are other Nondiscrimination statutes that afford legal protection. These statutes include the following: Section 162 (a) of the Federal-Aid Highway Act of 1973 (23 U.S.C. 324), Age Discrimination Act of 1975, and Section 504 of the Rehabilitation Act of 1973/Americans with Disabilities Act (ADA) of 1990. ADA specifies that programs and activities funded with Federal dollars are prohibited from discrimination based on disability.

Executive Order #12898 (Environmental Justice) directs federal agencies to develop strategies to address disproportionately high and adverse human health or environmental effects of their programs on minority and low-income populations. In compliance with this Executive Order, USDOT and FHWA issued orders to establish policies and procedures for addressing environmental justice in minority and low-income populations. The planning regulations, at 23 CFR 450.316(a)(1)(vii), require that the needs of those “traditionally underserved” by existing transportation systems, such as low-income and/or minority households, be sought out and considered.

Executive Order # 13166 (Limited-English-Proficiency) requires agencies to ensure that limited English proficiency persons are able to meaningfully access the services provided consistent with, and without unduly burdening the fundamental mission of, each federal agency.

4.8.2 Current Status

The MPO currently utilizes HCTD’s Limited-English-Proficiency plan. KTMPO knows there are contrasts between them and HCTD’s region, but the urban area slice of the “pie” from which most HCTD’s riders travel, has little difference they believe. HCTD uses a “four-factor analysis” to analyze LEP services and polices, which includes number of LEP persons in the eligible service population, and the importance of the service provided by the program.

Regarding other aspects of Civil Rights, KTMPO uses the most recent data available for their Environmental Justice (EJ) activities, such as determining “communities of concern”, which are areas with high minority and/or low-income populations (see 4.7 Public Participation).

Concerning Title VI, KTMPO strives to be sensitive to all regulations and makes sure they are embedded within the planning process. As of the latest update of their Title VI Plan (which was approved March 14, 2018), KTMPO is using the most recent Title VI assurance language. The MPO’s self-certification, found in their 2017-2020 TIP and dated May of 2016, addresses the Title VI requirement.

If any person thinks that they received unequal benefits or discrimination on federally protected grounds, they may follow KTMPO’s Title VI complaint process. It is a process which covers all complaints filed under Title VI of the Civil Rights Act of 1964; Section 504 of the Rehabilitation Act of 1973; the Civil Rights Restoration Act of 1987; and the Americans with Disabilities Act of 1990. The discrimination can relate to any program or activity administered by the MPO.

The MPO continues to advertise and post information in ADA-accessible locations as well. Self-certification for ADA can also be found in the 2017-2020 TIP.

4.8.3 Findings

Observations:

Based upon the items reviewed, it was found that KTMPO Civil Rights-related transportation planning processes comply with 23 CFR 450.316(a)(1)(vii).

Commendation:

There was a commendation for this section. It is for KTMPO’s coordination with the transit provider concerning Americans with Disabilities Act (ADA) compliance. Hill Country Transit District (HCTD) uses a special analysis method to determine ADA areas of focus. HCTD shares this method with KTMPO for their activities.

4.9 Consultation and Coordination

4.9.1 Regulatory Basis

23 U.S.C. 134(g) & (i)(5)-(6) and 23 CFR 450.316(b-e) set forth requirements for consultation in developing the MTP and TIP. Consultation is also addressed specifically in connection with the MTP in 23 CFR 450.324(g)(1-2) and in 23 CFR 450.324(f)(10) related to environmental mitigation.

In developing the MTP and TIP, the MPO shall, to the extent practicable, develop a documented process that outlines roles, responsibilities, and key decision points for consulting with other governments and agencies as described below:

- Agencies and officials responsible for other planning activities (State, local, economic development, environmental protection, airport operations, or freight)
- Other providers of transportation services
- Indian Tribal Government(s)
- Federal land management agencies

4.9.2 Current Status

The MPO consults and coordinates with several outside entities. For example, the MPO coordinates with TxDOT on issues regarding Native American tribal lands, particularly when a location might have artifacts within it. KTMPO also consults with the Texas Historical Commission for data concerning the National Register of Historic Places. As stated in their 2018-2019 UPWP, "[t]he MPO continues to consult and cooperate with federal, state and local agencies and tribal nations…during the adoption of long and short-term plans."

There is consultation between MPOs as well. KTMPO advises other planning organizations, like Capital Area Regional Transportation Planning Organization (CARTPO), which is a rural planning organization (RPO) to the south of KTMPO in the Austin region, about projects within KTMPO's region that could impact traffic in CARTPO's area. KTMPO also works with nearby Central Texas Rural Planning Organization, another RPO, regarding the same potential impacts.

With their neighbor to the north, Waco's MPO, KTMPO does joint Travel Demand Model (TDM) modeling. KTMPO also participates in air quality planning with their southern neighbor, Austin's Capital Area Metropolitan Planning Organization (CAMPO). On that note, as the city of

Bartlett is currently split between KTMPO and CAMPO, the Killeen-Temple MPO plans to coordinate with the Austin MPO to create a formal agreement on how to share Bartlett.

4.9.3 Findings

Observations:

Based on the activities described about the MPO, it is coordinating with others on the development of the MTP and TIP as per the requirements.

4.10 List of Obligated Projects

4.10.1 Regulatory Basis

23 U.S.C. 134(j)(7) and 23 CFR 450.334 requires that the State, the MPO, and public transportation operators cooperatively develop a listing of projects for which Federal funds under 23 U.S.C. or 49 U.S. C. Chapter 53 have been obligated in the previous year. The listing must include all federally funded projects authorized or revised to increase obligations in the preceding program year and, at a minimum, the following for each project:

- The amount of funds requested in the TIP
- Federal funding obligated during the preceding year
- Federal funding remaining and available for subsequent years
- Sufficient description to identify the project
- Identification of the agencies responsible for carrying out the project

4.10.2 Current Status

The most recent Annual Project Listing (APL), drafted by the MPO on December 12th, 2017, was submitted through TxDOT to FHWA on January 31st, 2018. The APL was consistent with requirements.

4.10.3 Findings

Observations:

Based on the APL submitted to FHWA in January 2018 (as noted above), the KTMPO list of obligated projects was found to be compliant with the requirements of 23 CFR 450.334.

4.11 Freight Planning

4.11.1 Regulatory Basis

The MAP-21 established in 23 U.S.C. 167 a policy to improve the condition and performance of the national freight network and achieve goals related to economic competitiveness and efficiency; congestion; productivity; safety, security, and resilience of freight movement; infrastructure condition; use of advanced technology; performance, innovation, competition, and accountability, while reducing environmental impacts.

In addition, 23 U.S.C. 134 and 23 CFR 450.306 specifically identify the need to address freight movement as part of the metropolitan transportation planning process.

4.11.2 Current Status

The MPO has initiated the freight planning process through several actions including a Regional freight advisory committee which kicked off November 28, 2017; hosting a Freight Planning 101 Workshop, facilitated by the FHWA Resource Center, in April 2018; and participating in on several freight-related webinars. They are also working closely with the Division Office Freight Operations Manager.

It should be noted that new freight facilities will be added in both Temple and Killeen, such as the Civilian-Military Joint Use Rail/Truck Multi-Modal Facility, a venue that can be used by the army or local industry to load freight onto trains, and a second runway at the local airport is also to come. Regarding roadway infrastructure, US 190/I-14 is a major east-west freight corridor, along with I-35, which traverses the area north-south.

4.11.3 Findings

Observations:

It is apparent from the above the MPO is working to address freight movement in the transportation planning process as required by 23 CFR 450.306

An item worth noting is that KTMPO will be hosting the Freight Planning 101 Workshop on November 6th-7th of 2018, which will allow a multitude of stakeholders and representatives from fellow MPOs to attend.

4.12 Environmental Mitigation/Planning Environmental Linkage

4.12.1 Regulatory Basis

23 U.S.C. 134(i)(2)(D)23 CFR 450.324(f)(10) requires environmental mitigation be set forth in connection with the MTP. The MTP is required to include a discussion of types of potential environmental mitigation activities for the transportation improvements and potential areas to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental functions affected by the plan.

23 U.S.C. 168 and Appendix A to 23 CFR Part 450 provide for linking the transportation planning and the National Environmental Policy Act (NEPA) processes. A Planning and Environmental Linkages (PEL) study can incorporate the initial phases of NEPA through the consideration of natural, physical, and social effects, coordination with environmental resource agencies, and public involvement. This will allow the analysis in the PEL study to be referenced in the subsequent NEPA document once the project is initiated, saving time and money with project implementation.

4.12.2 Current Status

The MPO describes its efforts towards environmental mitigation and improving the quality of life of residents in the MTP. Proposed projects that will likely impact pre-designated critical environmental areas are flagged as such in the MTP listing so all parties, such as TxDOT's Environmental Coordinators and other stakeholders, are aware of the potential environmental issues as early as possible in the transportation planning process. The MPO described PEL-style linkage of environmental factors and the transportation process by KTMPO not only avoids, minimizes and mitigates environmental degradation, but can also allow for more efficiency in time and resources. The MPO also promotes sustainable practices and context sensitivity in their concepts and project solutions, as displayed in their MTP's "Environment & Quality of Life" chapter.

4.12.3 Findings

Observations:

It was determined that, based upon the sources reviewed, that KTMPO is meeting the requirements of 23 CFR 450.324 and Appendix A to 23 CFR 450.

4.13 Transportation Safety

4.13.1 Regulatory Basis

23 U.S.C. 134(h)(1)(B) requires MPOs to consider safety as one of ten planning factors. As stated in 23 CFR 450.306(a)(2), the planning process needs to consider and implement projects, strategies, and services that will increase the safety of the transportation system for motorized and non-motorized users.

In addition, SAFETEA-LU established a core safety program called the Highway Safety Improvement Program (HSIP) (23 U.S.C. 148), which introduced a mandate for states to have Strategic Highway Safety Plans (SHSPs). 23 CFR 450.306 (d) requires the metropolitan transportation planning process should be consistent with the SHSP, and other transit safety and security planning.

4.13.2 Current Status

KTMPO uses TxDOT's SHSP as a guide when analyzing the safety of their transportation infrastructure. The MPO also has adopted the TxDOT statewide safety targets; these targets are required to be adopted annually by MAP-21 and the FAST Act. The MPO considered using Crash Records Information System (CRIS) data from TxDOT to develop safety performance measures for the MPO, but decided to adopt the TxDOT targets.

KTMPO has utilized CRIS data, maintained by TxDOT, on their own to better evaluate safety conditions. The MPO has reviewed CRIS data from 2012 through 2016 (using such a period with the intention of creating five-year averages) to evaluate trends and trouble spots that are subject to high rates of crashes. This has led to recommendations that reduced crashes at high-risk locations, such as upgrades to infrastructure, the creation of alternative routes to alleviate congestion, and public campaigns to promote safety issues. In addition to a focus on locations that have a high risk of crashes, specific system users, like teen drivers, or specific user behaviors, such as speeding and distracted driving, were also extracted from the data and used as emphasis areas for future safety planning efforts, as described in the MTP. As noted in the MTP, all safety issue information is considered when developing projects and strategies to address safety issues in the Killeen-Temple region.

The MPO should contact the FHWA Division Office if any technical assistance is desired for future safety target setting, data analysis, or other deployments of infrastructure based safety countermeasures.

4.13.3 Findings

Observations:

Based upon the information acquired, KTMPO is meeting the requirements of 23 CFR 450.306.

Commendation:

We commend the MPO for utilizing social media for the promotion of safety. For example, KTMPO created a short video about how to use roundabouts properly, and posted it to Facebook. It was very popular and effective at promoting safety. Another example involves a photo posted on their Facebook page with the "turn around, don't drown" initiative.

4.14 Transportation Security Planning

4.14.1 Regulatory Basis

23 U.S.C. 134(h)(1)(C) requires MPOs to consider security as one of ten planning factors. As stated in 23 CFR 450.306(a)(3), the Metropolitan Transportation Planning process provides for consideration of security of the transportation system.

The regulations state that the degree and consideration of security should be based on the scale and complexity of many different local issues. Under 23 CFR 450.324(h), the MTP should include emergency relief and disaster preparedness plans and strategies and policies that support homeland security, as appropriate.

4.14.2 Current Status

KTMPO supports homeland security through coordination with emergency management organizations at local, state and federal levels through CTCOG's homeland security division. That division, in turn, works with all counties in the KTMPO region on things such as emergency and evacuation plans. The MPO has evacuation routes for potential hazardous material incidents based on the location of the incident and the hazard involved. An example of this in the MTP is that State Highway 95 is the designated route for an evacuation should a chemical spill occur at an industrial facility in the community of Holland.

Concerning the safety feature of evacuation routes, when KTMPO is prioritizing projects, if a proposed project is along one of the several designated evacuation routes in the region, it gets a higher score when being considered for project selection.

CTCOG's Homeland Security division also has taken part in emergency planning exercises that provide a sense of how the transportation infrastructure could be impacted should a natural or man-made disaster occur. Some of the examples mentioned in the MTP include flooding, shooting incidents and tornadoes.

KTMPO takes into consideration its own security via its emergency planning. KTMPO has a multi-layered strategy for continuous operations, from the Emergency Services division of CTCOG, which is designed to preserve data and continue operations in an alternate location. It starts with a series of hard drives that store electronic information to prevent data loss; the plan requires that the data documents be "mirrored" with two other MPO data centers elsewhere. This data access component of their strategy has been tested (they were successful in accessing archived files). The plan also allows for KTMPO staff to be temporarily housed at alternate locations if necessary.

4.14.3 Findings

Observations:

Based on the content reviewed, KTMPO meets the requirements of 23 CFR 450.324(h).

4.15 Nonmotorized Planning/Livability

4.15.1 Regulatory Basis

23 U.S.C. 217(g) states that bicyclists and pedestrians shall be given due consideration in the comprehensive transportation plans developed by each MPO under 23 U.S.C. 134. Bicycle transportation facilities and pedestrian walkways shall be considered, where appropriate, in conjunction with all new construction and reconstruction of transportation facilities.

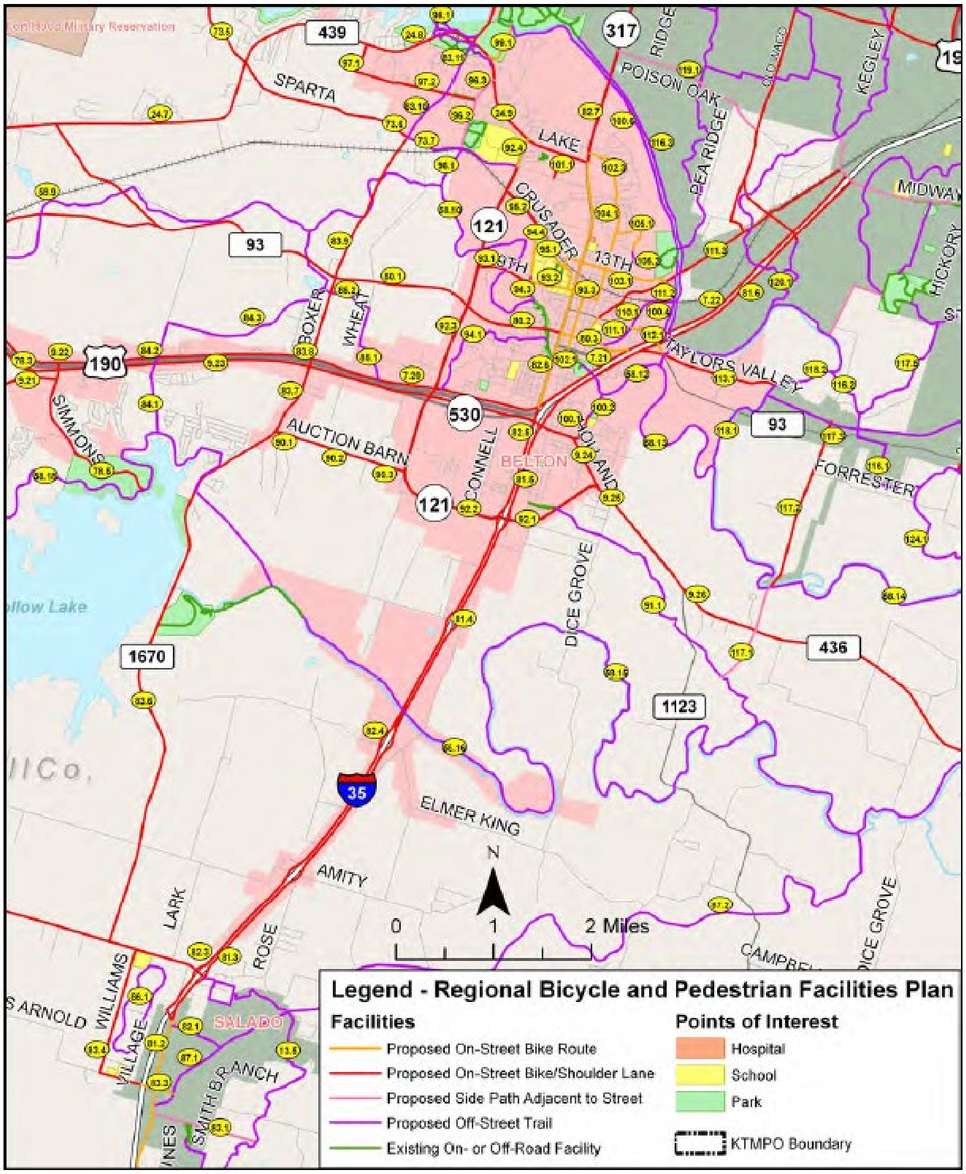
23 CFR 450.306 sets forth the requirement that the scope of the metropolitan planning process "will increase the safety for motorized and non-motorized users; increase the security of the transportation system for motorized and non-motorized users; and protect and enhance the environment, promote energy conservation, improve the quality of life.

4.15.2 Current Status

The MPO is considering livability and sustainability principles in its transportation planning process. KTMPO considers a "triple bottom line", similar to FHWA's INVEST tool, that has performance measures that assess the social, environmental and economic impacts of projects (and in turn, their sustainability).

Cultivating bicycle and pedestrian facilities in the region is a priority for KTMPO. When it comes to prioritizing projects, roadway initiatives are separated from "livability" ones, such as bike and pedestrian facilities, which have their own ranking criteria. Technically, some of the roadway projects include bike/pedestrian projects. The MPO has developed a Pedestrian/Bicycle Plan to consider the needs of nonmotorized users. The plan coordinates the MPO member jurisdictions' bike/pedestrian plans for a long-term vision for the region's mobility needs. The plan ties into the MTP's goals of accessibility, mobility, equity, and economic vitality, among others.

The plan was created with the assistance of a pedestrian/bicycle advisory committee (BPAC), comprised of representatives from the MPO member cities, HCTD and citizen stakeholders. The BPAC developed a prioritized list of proposed bicycle/pedestrian infrastructure routes, which was in turn forwarded to the MPO's Technical Advisory Committee and Policy Board for further input and possible development.



Proposed bicycle and pedestrian facilities planned for the KTMPO communities of Belton and Salado (from MTP 2040)

4.15.3 Findings

Observations:

Based upon the information collected during the course of the review, it was found that KTMPO is meeting the requirements of 23 U.S.C. 217(g).

4.16 Integration of Land Use and Transportation

4.16.1 Regulatory Basis

23 U.S.C. 134(g)(3) encourages MPOs to consult with officials responsible for other types of planning activities that are affected by transportation in the area (including State and local planned growth, economic development, environmental protection, airport operations, and freight movements) or to coordinate its planning process, to the maximum extent practicable, with such planning activities.

23 U.S.C. 134 (h)(1)(E) and 23 CFR 450.306(a)(5) set forth requirements for the MPO Plan to protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.

4.16.2 Current Status

As discussed during the on-site review, KTMPO is striving to improve land use connections between Fort Hood and the surrounding area. Land use is considered in different aspect of the planning process, such as the MPO's efforts in context sensitive solutions. Land use is also utilized in KTMPO's travel demand modeling (see 4.17 Travel Demand Forecasting).

One of the ways the MPO integrates land use into the planning process is through context sensitive solutions. Context sensitive solutions, as mentioned in the MTP, is one of several environmental concepts KTMPO utilizes that has the primary goal of avoiding or minimizing damaging effects to the environment through design features. These features promote environmental and scenic harmony, as well as improve quality of life through better community participation and project buy-in.

KTMPO takes into account land use impacts for modes besides automobiles. The 2040 MTP states that one of the action areas for their Pedestrian/Bicycle program is to promote land use patterns and zoning formats that encourage active transportation. The MTP also discusses how the master plans for the region's airports affect their plans, using their freight advisory committee as an intermediary.

4.16.3 Findings

Observations:

Based on the items reviewed, KTMPO meets the requirements of 23 U.S.C. 134(g)(3), 23 U.S.C. 134 (h)(1)(E) and 23 CFR 450.306(a)(5).

4.17 Travel Demand Forecasting

4.17.1 Regulatory Basis

23 CFR 450.324(f)(1) requires that the Metropolitan Transportation Plan include the projected transportation demand of persons and goods in the Metropolitan Planning Area over the period of the transportation plan. Travel demand forecasting models are used in the planning process to identify deficiencies in future year transportation systems and evaluate the impacts of alternative transportation investments. In air quality non-attainment and maintenance areas, they are also used to estimate regional vehicle activity for use in mobile source emission models that support air quality conformity determinations.

4.17.2 Current Status

KTMPO uses their Travel Demand Model (TDM) to evaluate the Level-of-Service (LOS) for roads, as well as to assess projected demand. The base year of the TDM was recently updated to 2015, from a previous base of 2010. Other data, like demographic data, was updated by a consultant. Control totals, which are future demographic conditions based on growth projections, come from The Texas State Data Center. TxDOT provides InfoUSA data for the employment part of the model, and the consultant Kimberly-Horn provided updated data (from the TransCAD data set) to compliment that. Schools and universities also provided data which was used to determine growth projections and trip generators for the model.

As there was no formal agreement in place for the development of the TDM. KTMPO held a kickoff meeting to determine responsibilities and mutually agree on things such as delivery dates. The model had at an all-time high 147 Transportation Analysis Zones (TAZs). These units of geography are based on Census block information, and include automobiles per household, household income and employment within the zone. When the KTMPO planning area boundaries were expanded, new TAZs were created. While freight is not exclusively addressed in the model, it is considered through truck factors. Transit is not modeled via the TDM, but it is considered in the trip generation model.

The “TexPack” standard for the model was used to evaluate projects. TexPack is the TxDOT “Package” Suite of Travel Demand Modeling Software which integrates travel demand modeling platforms and utilizes GIS capabilities[1]. A review of land uses is done as well through a suitability analysis. This finds how likely new growth will occur in a given area, based on available developable land, accessibility to major roads, and infrastructure, among other factors.

We commend the MPO for its protocol in which a member of the policy board disputes data from a study or evaluation it was shown, that member must provide credible alternative information.

4.17.3 Findings

Observations:

Based on the items reviewed, KTMPO's travel demand model activities meet the requirements of 23 CFR 450.324(f)(1).

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[1] See *TEXPACK: Integrated Travel Demand Modeling Application* *(https://static.tti.tamu.edu/conferences/tpp16/presentations/breakout-12/hall.pdf);* Texas Department of Transportation, June 2016

4.18 Congestion Management Process / Management and Operations

4.18.1 Regulatory Basis

23 U.S.C. 134(k)(3) and 23 CFR 450.322 set forth requirements for the congestion management process (CMP) in TMAs. The CMP is a systematic approach for managing congestion through a process that provides for a safe and effective integrated management and operation of the multimodal transportation system. TMAs designated as non-attainment for ozone must also provide an analysis of the need for additional capacity for a proposed improvement over travel demand reduction, and operational management strategies.

23 CFR 450.324(f)(5) requires the MTP include Management and Operations (M&O) of the transportation network as an integrated, multimodal approach to optimize the performance of the existing transportation infrastructure. Effective M&O strategies include measurable regional operations goals and objectives and specific performance measures to optimize system performance.

4.18.2 Current Status

As mentioned in the KTMPO MTP, M&O is considered in the CMP via the “System Management and Operations” and “System Preservation” planning factor mentioned in the MTP document.

The first CMP that the MPO had ever done was in 2016. They reanalyze the CMP every 24 months to see congestion improvement by segment over time, and are still adapting as an organization as to how to best implement such data into their planning process.

The KTMPO travel demand model, as well as third party data such as from the National Performance Management Research Data Set (NPMRDS) and INRIX, is used to evaluate the CMP. The NPMRDS uses crowd-sourced GPS information from consumer devices to calculate monthly average travel times on major routes. It separates passenger vehicle data from freight vehicle data for a more precise analysis. INRIX is similar in that it also utilizes GPS info from personal navigation devices, but it differs from the NPMRDS in that it uses units of speed instead of travel times.

Data such as recurring congestion (such as traffic at major intersections or at a bottleneck in the road, for instance) and crash location data from TxDOT’s CRIS database to represent non-recurring congestion are also examples of specific data items that are utilized. An overlay of the various data sources led to a “composite congestion score”—in which higher scores are deemed congestion hotspots. MTP/TIP project scoring is adequately weighted to address congestion, as directed by the policy board.

The CMP is compliant with an eight-step process, which includes developing regional objectives, collecting data, and evaluating the effectiveness of strategies. The CMP network provides KTMPO a sense of overall congestion throughout the region.

4.19.3 Findings

Observations:

Based on the items reviewed, the KTMPO Congestion Management Process is compliant with 23 CFR 450.322, and the MPO provides documentation of this, as noted above.

5.0 CONCLUSION AND RECOMMENDATIONS

The FHWA and FTA review found that the metropolitan transportation planning process conducted in the Killeen-Temple urbanized area meets Federal planning requirements as follows.

5.1 Commendations

The following are noteworthy practices that the Killeen-Temple MPO is doing well in the transportation planning process:

- The MPO recognizes a demographic mix and considers the needs of these distinct groups in their planning process, The MPO coordinates with the transit provider superbly
- HCTD has extensive performance measures both for and independent of Transit Asset Management standards
- Promotion of safety via social media
- The MPO requests credible data alternatives should policy board members disagree with model data

5.2 Recommendations

The following are recommendations that would improve the transportation planning process:

- Recommend that Maintenance & Operations funding be included in MTP in a manner that displays the total M&O funding for the plan. This should be accomplished in the updated MTP
- That a table or chart displaying revenue and expenditure totals be displayed in future plans

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APPENDIX A - PARTICIPANTS

The following individuals were involved in the Killeen-Temple urbanized area on-site review:

- Justin Morgan, FHWA Texas Division
- Jose Campos, FHWA Texas Division
- Mike Leary, FHWA Texas Division
- Melissa Foreman, FTA Region VI
- Jim Reed, Metropolitan Planning Director, Killeen-Temple MPO
- John Weber, Planner, Killeen-Temple MPO
- Kendra Coufal, Planner, Killeen-Temple MPO
- Uryan Nelson, Killeen-Temple MPO
- Victor Goebel, Texas Department of Transportation
- Courtney Jones, Texas Department of Transportation
- Sara Garza, Texas Department of Transportation
- Bill Frawley, Texas Transportation Institute
- Matt Miller, Texas Transportation Institute
- Darrell Burtner, Hill Country Transit District

APPENDIX B – SUMMARY OF ELECTED OFFICIAL COMMENTS

The following is a summary of all the three elected officials interviewed. The officials were Commissioner Tim Brown, Mayor Jose Segarra, and Mayor Marion Grayson. Their comments are anonymized.

Three elected officials that compose the KTMPO transportation policy board were interviewed, two of whom were specifically mayors of communities within the MPA. They all had a favorable opinion of the MPO and its staff, as well as the transit provider HCTD. There was lots of praise for regional cooperation within KTMPO. While generally the officials had a positive opinion of TxDOT, one official believed that the Texas Transportation Commission politicized funding, as the commission is an arm of the governor. However, the same official felt there was a great rapport at the local level with the District Engineer and Area Engineer.

Most of the commissioners felt like the KTMPO leadership did an excellent job, and that there was an emphasis on bringing people together and advocating for the needs of the organization. Although KTMPO has strong leaders, it was suggested that to improve, they should be mindful of clashing personalities and how effectively they are communicating future projects and upcoming plans to the public. One way of achieving the latter that was suggested by an official was to use social media more.

All the officials felt that their role in the planning process involved working together in a cohesive effort to build consensus on actions. Many of the officials found that serving on the policy board was an educating experience where they learned more about the transportation planning process. The officials stated that KTMPO staff educated new members with briefings and documents, and provided refresher trainings as well. They all felt that they are receiving enough information (if not superfluous information) in a timely manner to make informed decisions. The officials felt that the voting process on the policy board is generally a smooth process, where projects stand on their merit after being explained thoroughly.

In their interviews, the officials decided that major infrastructure projects, particularly those on or adjacent to Interstate 35, were top priorities. Besides just keeping abreast of general growth in the region and maintaining existing facilities, US 190 and local "Loop" roads were also mentioned to be routes of precedence. Relating to this, an official suggested corridor planning could be done to make the planning process more regional.

Lastly, when asked if there were other agencies or groups in the area that they felt should be represented on the board, the officials suggested cyclists, county judges, and freight haulers, possibly via a strengthened freight committee.

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APPENDIX C – PUBLIC COMMENTS

Written Public Comments:

The one public commenter during the May 9th, 2018 public involvement had several topics he had questions about. The questions he had included the following topics: funding for projects between federal, state and county; current projects by priority; overpass from I-14 to I-35; and future plans for I-14.

APPENDIX D - LIST OF ACRONYMS

ADA: Americans with Disabilities Act
AMPO: Association of Metropolitan Planning Organizations
CAA: Clean Air Act
CFR: Code of Federal Regulations
CMP: Congestion Management Process
CO: Carbon Monoxide
DOT: Department of Transportation
EJ: Environmental Justice
FAST: Fixing America's Surface Transportation Act
FHWA: Federal Highway Administration
FTA: Federal Transit Administration
FY: Fiscal Year
HCTD: Hill Country Transit District (operates "The HOP" bus service)
HSIP: Highway Safety Improvement Program
ITS: Intelligent Transportation Systems
KTMPO: Killeen-Temple Metropolitan Planning Organization
K-TUTS: Killeen-Temple Urban Transportation Study
LEP: Limited-English-Proficiency
M&O: Management and Operations
MAP-21: Moving Ahead for Progress in the 21st Century
MPA: Metropolitan Planning Area
MPO: Metropolitan Planning Organization
MSA: Metropolitan Statistical Area
MTP: Metropolitan Transportation Plan
NAAQS: National Ambient Air Quality Standards
NO_2: Nitrogen Dioxide
NPMRDS: National Performance Management Research Data Set
O_3: Ozone
PEL: Planning and Environmental Linkage
PM_{10} and $PM_{2.5}$: Particulate Matter
SHSP: Strategic Highway Safety Plan
STIP: State Transportation Improvement Program
TAM: Transit Asset Management
TDM: Travel Demand Management
TIP: Transportation Improvement Program
TMA: Transportation Management Area
U.S.C.: United States Code

UPWP: Unified Planning Work Program
USDOT: United States Department of Transportation

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