

Fort Worth to Laredo High-Speed Transportation Study



Task 3 Previous Studies Review Memorandum

Prepared for:



North Central Texas
Council of Governments



CITY OF WACO



KILLEEN-TEMPLE
metropolitan planning organization



CAPITAL AREA METROPOLITAN
PLANNING ORGANIZATION
CENTRAL TEXAS



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Previous Studies Review Memorandum

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1. Fort Worth to Laredo High-Speed Transportation Study

1.1. Background

The purpose of the Fort Worth to Laredo High-Speed Transportation Study is to study high-speed transportation options to connect six metropolitan areas in Texas: Fort Worth, Waco, Killeen-Temple, Austin, San Antonio, and Laredo. The study evaluates a variety of transportation technology options and assesses potential corridors and station locations for a future National Environmental Policy Act (NEPA) process.

The analysis is being led by the North Central Texas Council of Governments (NCTCOG) in partnership with the Waco Metropolitan Planning Organization (MPO), Killeen-Temple MPO (KTMPO), Capital Area MPO, Alamo Area MPO, and the Laredo MPO.

1.2. Purpose of the Previous Studies Review Memorandum

This memorandum reviews previous planning efforts throughout the state that have assessed the potential and need for high-speed transportation and stations. Plans reviewed in this memorandum provide the Fort Worth to Laredo High-Speed Transportation study with a foundation of methodologies, corridors, and design and screening criteria that will be further considered in the Task 4 Alternatives Analysis to be completed as part of this study.

2. Fort Worth High-Speed Rail Station Area Planning Study (2017)

2.1. Study Overview and Purpose

The Fort Worth High-Speed Rail Station Area Planning Study analyzed feasible locations and recommended a preferred station location for high-speed rail in downtown Fort Worth. The study continued an effort that began with the Dallas-Fort Worth Core Express Service (DFWCES) study (see Section 4 of this technical memorandum), which proposed a three-station concept, including a downtown Fort Worth location.

The goals of the study were to:

- Highlight scenarios for potential stations based on technology and corridor findings identified in ongoing and previous planning efforts.
- Identify and evaluate fatal flaws for high-speed transportation operating scenarios approaching and entering downtown Fort Worth.
- Select a preferred station location and evaluate potential programming and related impacts.
- Identify the most feasible location for a Fort Worth high-speed rail station to further the DFWCES Environmental Impact Statement (EIS).

2.2. General Methodology

Project goals included two main categories for study - a rail scenario evaluation and a station analysis. Stakeholder involvement, representing Downtown Fort Worth and near-downtown organizations was essential throughout the project evaluations. A Project Review Committee was established that consisted of representatives from the City of Fort Worth, Tarrant County, the Fort Worth Transportation Authority, and NCTCOG. Stakeholder input was critical to achieving consensus and developing screening criteria to be used in the station analysis.

The rail service scenario evaluation drew on operational scenarios and potential alignments developed in the DFWCES. For the evaluation, information was gathered from both public and private sources, as the Dallas to Houston HSR route is being developed privately.

The station analysis evaluated seven potential locations, with consideration of rail service scenarios and potential impacts and opportunities to existing infrastructure, land use, and compatibility with existing transportation networks. Additionally, station programming, platform orientation, and general needs were evaluated. An economic opportunity assessment was completed for the recommended station location to evaluate and gauge the opportunities associated with the implementation of high-speed passenger rail service.

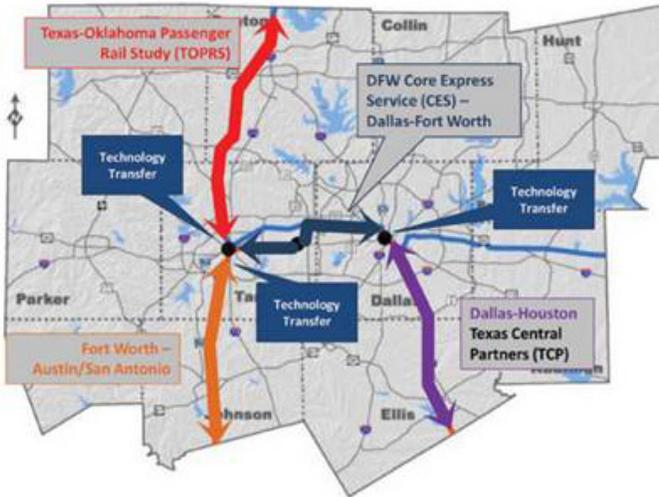
2.3. Analysis and Recommendations

The analysis reviewed possible high-speed rail routing scenarios that could impact implementation of the recommended Fort Worth Station. The review considered alignments studied in the DFWCES, Texas-Oklahoma Passenger Rail Study (TOPRS) (see Section 3 of this technical memorandum), and the Texas Central Partners project (Dallas to Houston High-Speed Rail). Each scenario was defined by high-speed rail system component interactions, related impacts on track alignment, related proposed station configuration, and additional questions that required further analysis. Figure 1 shows how each independent high-speed transportation system could interact through three different scenarios. Scenario 1 describes high-speed systems that are not integrated; Scenario 2 shows an integrated San Antonio to Dallas scenario describing the TOPRS and DFWCES studies; and Scenario 3 displays integration between the Texas Central Partners project and the DFWCES. Integrated systems would offer seamless rides for passengers to additional station locations. The Fort Worth High-Speed Rail Station Area Planning Study acknowledged unknowns related to the planning process due to varying stages of high-speed transportation development and recognized how operational differences would factor into a recommended station location.

Figure 1: DFWCES Route Scenarios

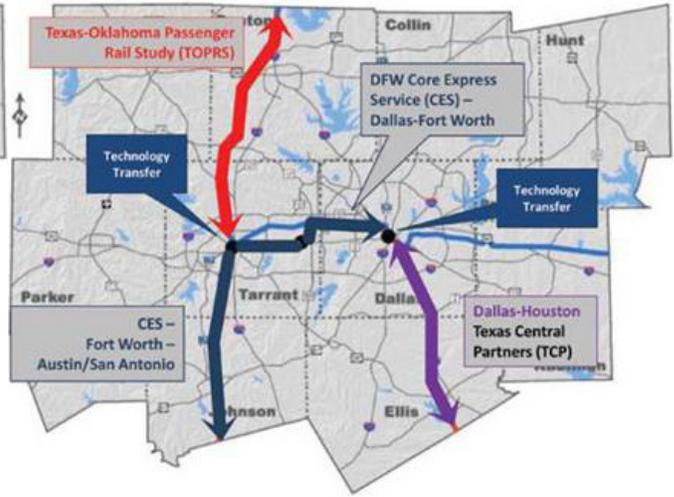
Scenario 1

DFWCES HSR from Dallas - Arlington - Fort Worth
 (No system Integration between TCP, CES, Fort Worth to Austin/San Antonio HSR or TOPRS)



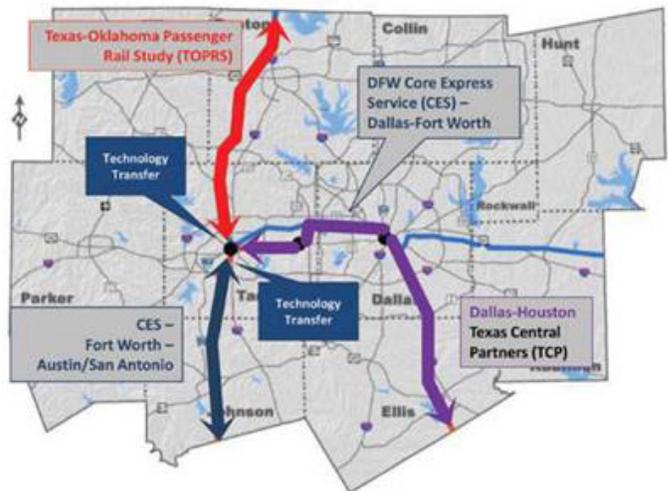
Scenario 2

DFWCES HSR from Dallas - Arlington - Fort Worth
 (System integration south from Fort Worth to Austin/San Antonio - No system integration with TCP HSR or TOPRS)



Scenario 3

TCP HSR from Houston to Dallas and on to Arlington - Fort Worth
 (No system integration with HSR south of Fort Worth to Austin/San Antonio or TOPRS)



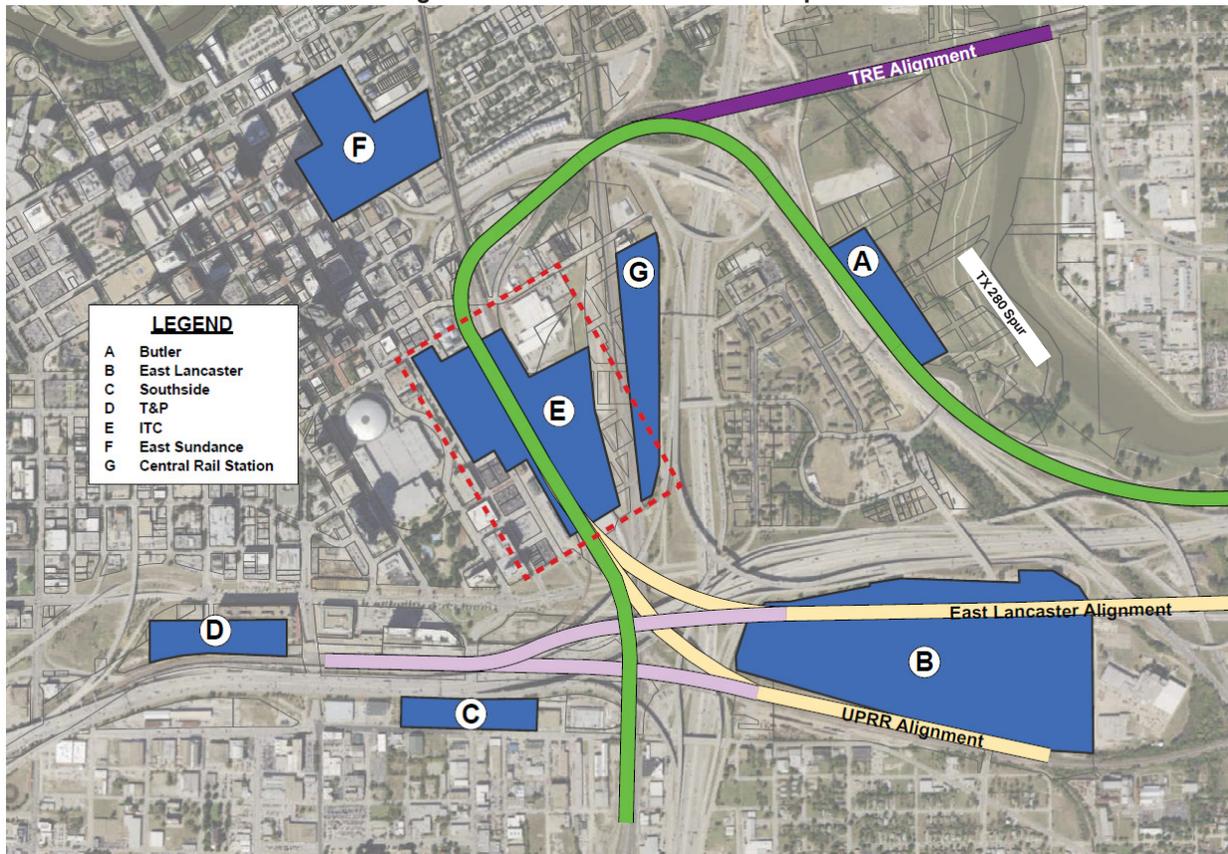
Source: Potential Rail Alignments and Operational Scenarios, Fort Worth High-Speed Rail Station Area Planning Study, September 2017

2.4. Station Analysis

Seven station options (presented in Figure 2) were evaluated based on factors developed with project team and Project Review Committee input. Station locations analyzed in this study included Butler, East Lancaster, Southside, T&P Station, Intermodal Transit Center (ITC), East Sundance, and Central Rail Station.

Station options were assessed based on the following general factors: constructability, functionality, connectivity/mobility, policy, and economics. Each option was scored and evaluated based on a sizing and orientation assumption. Station options needed to fit within an existing block, approximately 200 feet wide by 1,000 feet long, and generally be oriented north-south.

Figure 2: Fort Worth Station Area Options



Source: Fort Worth Station Area Options Map, Fort Worth High-Speed Rail Station Area Planning Study, September 2017

2.5. Recommended Station Option

The recommended station alternative was the ITC in downtown Fort Worth. Its location was the most compatible with the potential high-speed rail alignment into downtown and also scored well in additional factors considered.

An economic opportunity assessment was undertaken to determine the impacts and opportunities of progressing with the ITC station. The categories that were reviewed included redevelopment opportunities, traffic impacts, access and egress, multimodal connectivity, public-private partnership opportunities, social and environmental opportunities, regulatory and policy, and economic opportunity. The recommended ITC station location is adjacent to existing rail infrastructure served by regional, commuter, and freight rail. The ITC also serves as the main bus transfer center in downtown Fort Worth.

Surrounding land uses are generally underutilized and provide opportunity for redevelopment. Further evaluation would be necessary to fully assess parking and traffic impacts; however, access and egress to the recommended station option from I-30, I-35W, US 280, US 287, SH 121, and SH 199 are robust and efficient. The ITC provides ample opportunity from a connectivity, multimodal, and economic perspective.

2.6. Relevance to the Fort Worth to Laredo High-Speed Transportation Study

The Fort Worth High-Speed Rail Station Area Planning Study provides a foundation for a detailed station selection process involving unknown rail service operational characteristics and potentially unknown station route approaches. The study intentionally built upon planning efforts conducted as part of the DFWCES EIS. Technical information regarding station assumptions and criteria will be assessed for use in the Fort Worth to Laredo High-Speed Transportation Study and updated if necessary. Additionally, information regarding the recommended station location assists future studies in identifying fatal flaws, and complex routing issues on approach to downtown Fort Worth. The study also provides important information about station area size, configuration, operation, potential impacts, multimodal connectivity, and economic potential.

3. Texas-Oklahoma Passenger Rail Study (TOPRS) Final EIS and ROD (2017)

3.1. Study Overview and Purpose

In 2010, the Texas Department of Transportation (TxDOT) received a grant from the Federal Railroad Administration (FRA) to study passenger rail in the south-central corridor between San Antonio and Dallas/Fort Worth, generally following I-35. The FRA grant, in conjunction with a 2011 Texas A&M Transportation Institute study researching potential development of intercity rail, helped initiate the 850-mile TOPRS EIS extending from Edmond/Oklahoma City to the Texas-Mexico border. For the service-level EIS, preliminary alignments were developed at a low level of detail to avoid significant physical and environmental constraints and to represent potential corridor locations, but not precise locations of track.

The purpose of the TOPRS program was to enhance intercity mobility by providing enhanced passenger rail service as a transportation alternative that was competitive with automobile, bus, and/or air travel. Additionally, the study outlined the following goals:

- Encourage more efficient and environmentally sensitive modes of intercity travel
- Provide an equitable and affordable intercity travel alternative
- Enhance interconnectivity between intercity rail services, regional transit services, and major regional airports
- Enhance environmental sustainability by facilitating regional land use and transit-oriented development plans within the corridor
- Enhance interregional access to employment, entertainment, recreation, health, and shopping opportunities within the corridor
- Coordinate and avoid conflicts with freight rail operations and facilities
- Be a cost-efficient investment where the projected train service revenue sufficiently covers the cost of operations

The need for TOPRS arose from the inadequacies of existing passenger rail service and inability of other modes of transportation to meet current and future mobility needs throughout the I-35 corridor. Population and economic growth are expected to increase travel demand and generate additional roadway and aviation congestion thereby requiring mobility alternatives. The limited travel modes available at the time of the study contributed to reductions in air quality due to limited rail service and capacity between cities. In addition, growth in freight traffic along the I-35 corridor contributed to safety, air quality, and congestion concerns throughout the transportation network.

3.2. General Methodology

The TOPRS EIS evaluated a range of corridor alternatives and passenger rail service types. The study corridor was divided into segments with routes in northern, central, and southern locations. As part of the evaluation, the study assessed rail service types in relation to corridors that included conventional rail, higher-speed rail, and high-speed rail. The study consisted of iterative screening processes to determine preferred alternatives within each defined geography.

The alternatives development and screening process began by collecting stakeholder input, and then developing a range of initial route alternatives, performing an initial feasibility screening of the route alternatives, and finally performing a structured route alternatives analysis to identify alternatives to be evaluated further. Stakeholder input informed evaluation criteria to be used in the screening of rail service, initial routes, and potential station locations.

The initial feasibility screening identified services to be evaluated based on speed. These included:

- Conventional rail (typically under 100 mph)
- Higher-speed rail (up to 125 mph)
- High-speed rail service (up to 250 mph)

Identifying rail services types by speed informed assumptions used in assessing corridors in the next screening phase.

A structured route alternatives analysis evaluated initial routes through screening criteria and a fatal flaws analysis utilizing operational, infrastructure, and environmental criteria. This step of the process identified routes in geography and considered their general context and location with relation to the rail service types and speeds.

3.3. Analysis and Recommendations

The screening process evaluated 15 primary initial route alternatives in four geographic segments.

- Northern Section: Oklahoma City to Dallas and Fort Worth
- Central Section: Dallas and Fort Worth to San Antonio
- Southern Section: San Antonio to South Texas
- Metroplex: Fort Worth to Dallas

Each initial alternative variations included both a proposed route and two of the three possible service level operating features: Route alternatives were based on the alignments of existing transportation networks with corridors potentially suitable for passenger rail operations (i.e., the existing railroad network and/or the existing Interstate highway network or were located on new alignments outside existing transportation corridors). Stakeholder input necessitated the addition of more route alternatives, including high-speed rail options between Dallas and Fort Worth. Table 1 shows the initial route alternatives that were screened.

Initial route alternatives were screened through an iterative process that identified fatal flaws based on information from previous studies, such as the Oklahoma City to South Texas Infrastructure Analysis conducted by TxDOT in 2013, and with consideration of attributes and operational, infrastructure, and environmental criteria. Figure 3 depicts the geographic location and general routing of initial route corridors.

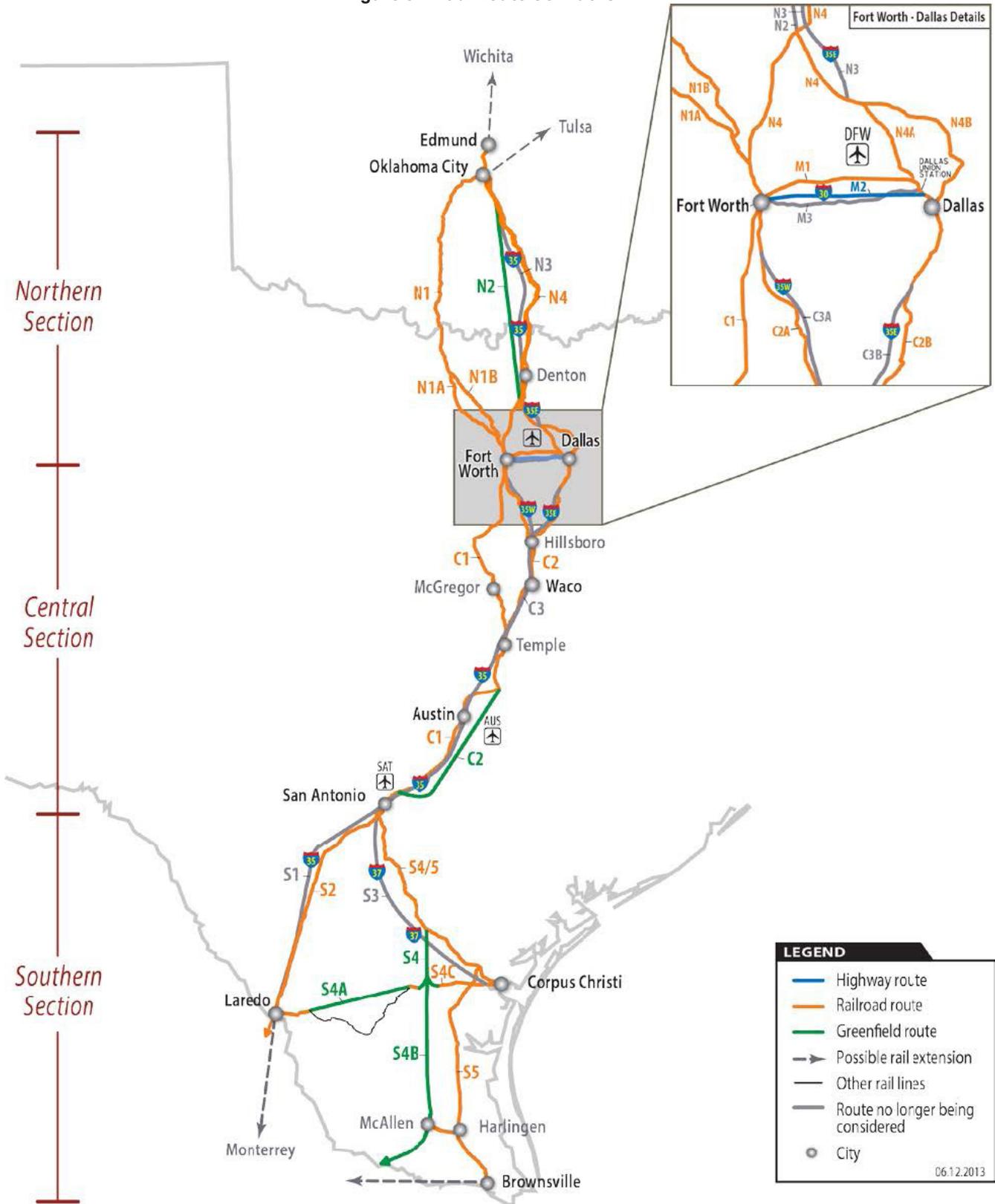
Table 1: Initial Route Alternatives with Service Type

Geographical Section	Endpoints	Initial Route Alternative	Service Types*
Northern	Oklahoma City to Dallas and Fort Worth	N1	HrSR, HSR
		N2	HrSR, HSR
		N3	CONV
		N4	CONV, HrSR
Central	Dallas and Fort Worth to San Antonio	C1	CONV, HrSR
		C2	HrSR, HSR
		C3	CONV
Southern	San Antonio to South Texas	S1	CONV
		S2	CONV, HrSR
		S3	CONV
		S4	HrSR, HSR
		S5	CONV, HrSR
Metroplex	Dallas and Fort Worth	M1	CONV, HrSR
		M2	HrSR, HSR
		M3	CONV, HrSR

*CONV = Conventional Rail (up to 100 miles per hour [mph]); HrSR = Higher-speed rail (up to 125 mph); HSR = high-speed rail (up to 250 mph).

Source: *Route Alternatives Considered in the Initial Feasibility Screening, TOPRS Service-Level Draft EIS, July 2016*

Figure 3: Initial Route Corridors



Source: Screened Initial Route Alternatives, TOPRS Service-Level Draft EIS, July 2016

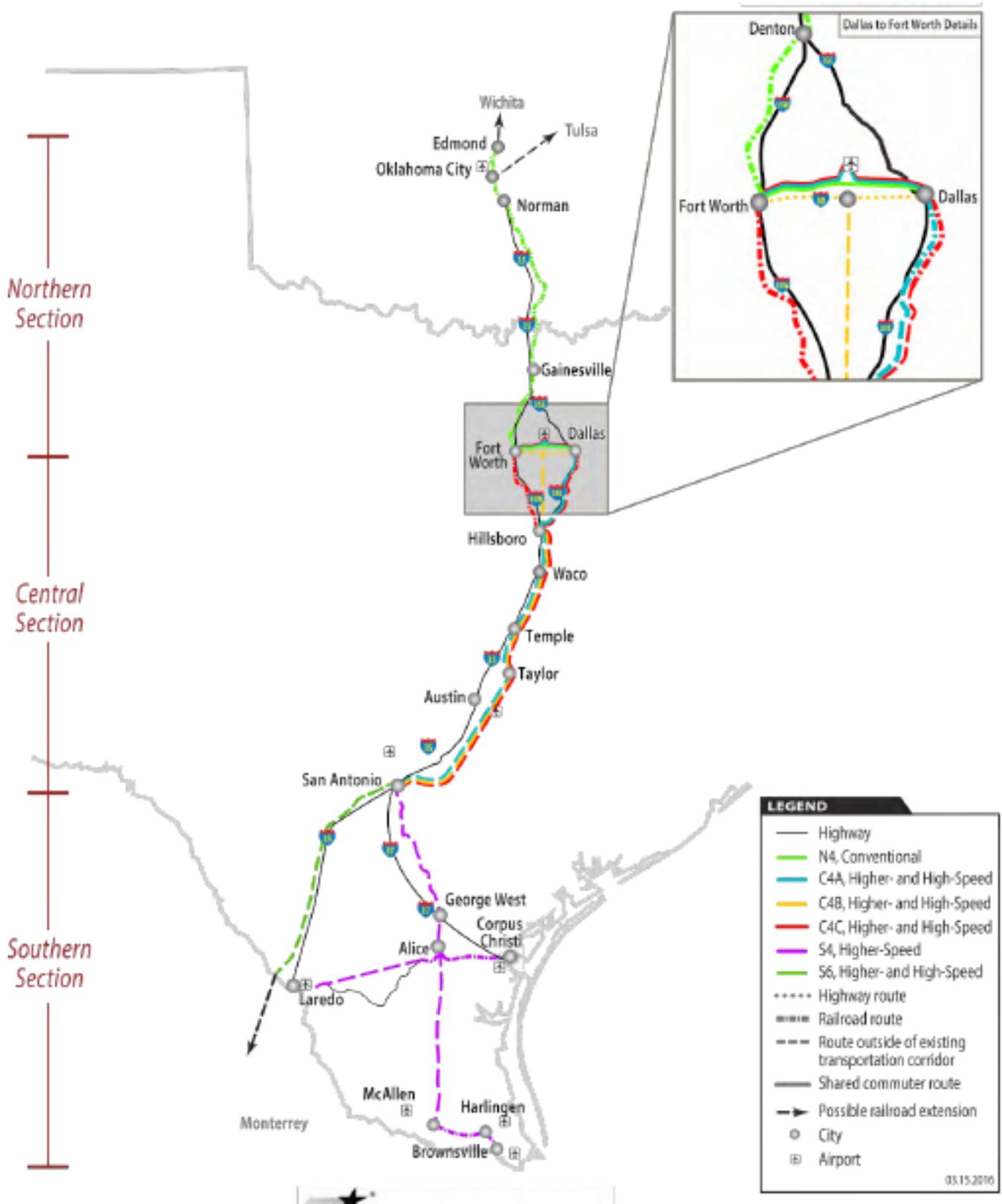
Basic assumptions identified in previous studies were used to eliminate initial routes based on incompatibility of potential speed with shared freight and or Interstate highway right-of-way. Freight traffic would pose operational issues with passenger rail service, and highway curve radii would make locating routes adjacent to highways infeasible, except for short stretches.

Alternatives that progressed beyond initial screening were screened further, including:

- Alternative Attributes: Access to stations, access to stations with endpoint cities removed, ridership for each alternative, length of route, construction cost. These were not used independently to screen alternatives, but instead to help explain differences between route alternatives.
- Operational Criteria: Revenue/operating cost ratio, reduced travel times, enhanced mode share on rail
- Infrastructure Criteria: Capital cost per passenger-mile, right-of-way/real estate impacts, and extent to which an alternative provides additional improvements to the national railroad network.
- Environmental Criteria: Impacts on natural resources (i.e., wetlands, critical habitat), minimized impacts on cultural/recreational resources (i.e., national and state historic places, river and stream crossings, parks and open space), and minimized impacts on social resources (i.e., prime farmland, sensitive receptors, environmental justice).

Figure 4 shows alternatives that underwent further screening.

Figure 4: Route Alternatives



Source: Route Alternatives Carried Forward into the Route Alternatives Analysis, TOPRS Service-Level Draft EIS, July 2016

After screening, the following alternatives were selected for each geography:

- Northern Section: Alternative N4A Conventional Rail
- Central Section: Alternatives C4A, C4B, and C4C with High-Speed Rail
- Southern Section: Alternative S4 with Higher-Speed Rail, Alternative S6 with Higher-Speed Rail, and Alternative S6 with High-Speed Rail

A note was included in the Final EIS Record of Decision clarifying that Alternative S6 with Higher-Speed Rail and Alternative S6 with High-Speed Rail are recommended as selected alternatives only if a connection to Monterrey, Mexico is established. Figure 5 shows each geography with the NEPA selected alternatives.

The following provides additional information regarding the NEPA selected alternatives:

- *N4A Conventional Rail*: This was determined to be the only feasible route in the Northern Section based on initial ridership and cost information.
- *C4A/C4B/C4C*: C4A and C4B have revenue-to-operating cost ratios that suggest profitability and the capital cost of both routes would be the lowest among the Central Section alternatives. The strong local stakeholder support for these alternatives supports the project purpose and need and was therefore recommended. Higher-speed rail was not recommended for all three options (only high-speed rail).
- *S4/S6*: For S4, higher-speed rail was preferred, as it would provide public benefits that include meeting more local transportation, which supports the purpose and need. Both higher-speed and high-speed rail were recommended for S6, but only if the routes connect Monterrey, Mexico because it is estimated that three-fourths of the regional ridership on this route would only occur with this connection

3.4. Public and Stakeholder Input

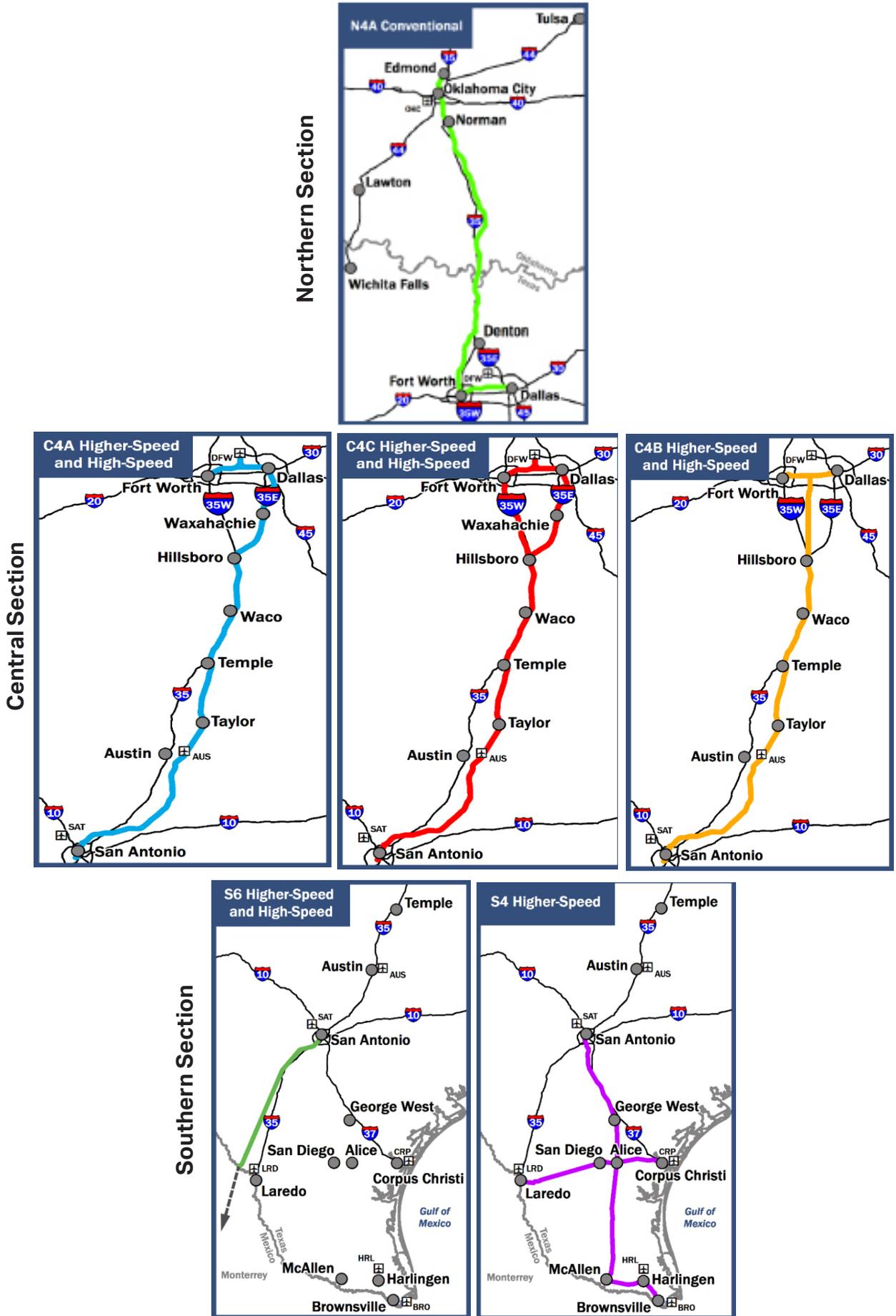
The public engagement process provided opportunities for the public to attend public events and comment on draft reports. The project also involved technical stakeholders, government officials, community leaders, and those categorized within environmental justice zones. Advertisements, notices, online comment forums, a project website, and mailing lists were used to spread word of the project/process and to increase accessibility of the report and project to the public.

Public engagement events included scoping meetings, open houses, and coordination meetings with stakeholders. Comments generally related to the following:

- Concerns over estimated capital costs
- Concerns ridership could be substantially lower than projected to justify the service
- Concerns with safety hazards occurring at local at-grade railroad crossings
- Concerns on the impact to private lands regarding aesthetics and property value

Government/agency comments were related to requests for more specific route details, station locations, and emphasis on extending the corridor south of the US-Mexico border

Figure 5: NEPA Selected Alternatives



Source: NEPA Selected Alternatives, TOPRS Service-Level FEIS and ROD, June 2017

3.5. Relevance to the Fort Worth to Laredo High-Speed Transportation Study

The TOPRS Final EIS and Record of Decision were published in June 2017. The study built upon previous infrastructure and rail planning efforts studying improvements to rail service for Texas. Likewise, the Fort Worth to Laredo High-Speed Transportation Study seeks to build upon TOPRS and further alternatives into a corridor level NEPA process.

The TOPRS study formed the basis for developing a screening methodology, gathering stakeholder input, and developing preferred technology and corridor alternatives for the Task 4 Alternatives Analysis Memorandum in this study. Alternatives, previously eliminated through TOPRS, will be reassessed with design criteria identified for superconducting maglev, guaranteed transit, and hyperloop. TOPRS assumptions and criteria will be considered and updated to evaluate these new and emerging technologies, and to reassess the rail services evaluated in TOPRS.

4. Dallas-Fort Worth Core Express Service Alternatives Analysis Final Report Study (2017)

4.1. Overview and Purpose

The DFWCES Alternative Analysis was completed by TxDOT and other stakeholders for the FRA with the purpose of enhancing intercity and intracity mobility by providing a financially viable, safe, reliable, and environmentally sustainable transportation alternative connecting the cores of Dallas and Fort Worth. This analysis served as an evaluation tool to inform decision-makers and the public on alternative costs, benefits, and impacts of express service between Dallas and Fort Worth. The DFWCES was completed in an effort to further the TOPRS program.

The report described general goals and criteria that would guide the analysis. Goals included:

- Establish the framework to evaluate alternatives to inform decision-makers of opportunities and challenges for a variety of express passenger rail service options
- Create an alternatives report to define corridors anticipated for the subsequent EIS
- Connect the Dallas and Fort Worth areas using alternatives consistent with the TOPRS report (with a No Build scenario used as a base comparison)

4.2. General Methodology

The DFWCES alternatives study began by defining alternative corridors identified in the TOPRS Final EIS and Record of Decision and then used a two-step screening process to evaluate and compare corridors, working toward defining a preferred alternative. The following steps describe the assessment process:

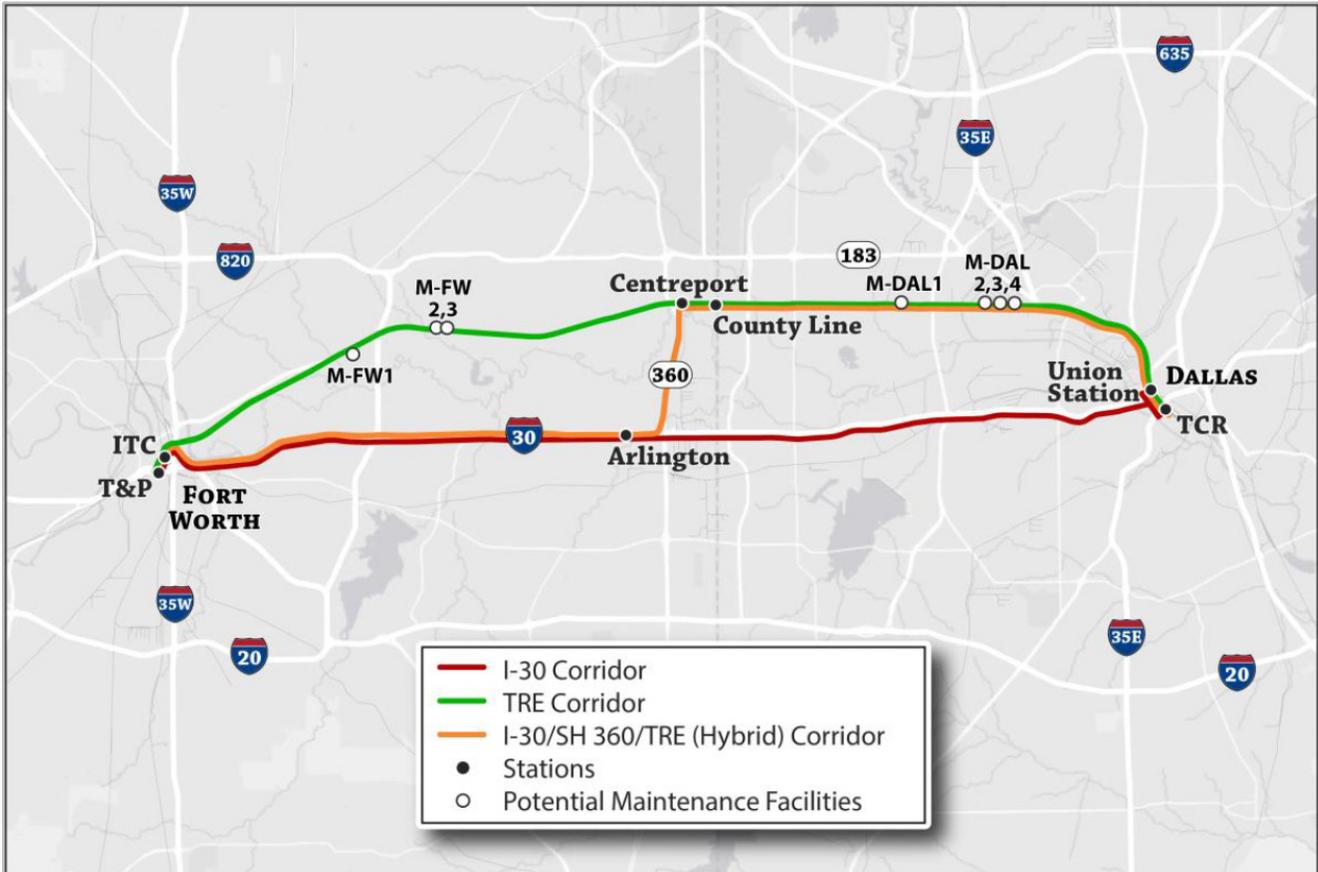
- *Definition of Alternatives:* This step further defined physical and service attributes of a potential express rail service in the study area, as well as operating plans for the alternative corridors considered in TOPRS.
- *Screening Methodology:* A two-step screening process was used to evaluate the corridor alternatives presented in the alternatives section. The process consisted of a fatal flaw analysis based on the project purpose and need, engineering feasibility, and environmental considerations. A refined screening based on quantitative and qualitative criteria was conducted on corridor alternatives carried forward from step one. Criteria generally included construction and capital cost considerations, alignment length, travel time, and speed considerations, along with a ridership demand and revenue modelling assessment.
- *Alternatives Analysis Evaluation Results:* The evaluation results provided a comparison of the alternatives express route capital and operating characteristics to help identify a preferred alternative.
- *Conclusion and Recommendations:* A summary of analysis findings and technical results led to recommendations based on the output from the two-step screening process.

4.3. Analysis and Recommendations

Three study corridors and a No Build scenario were evaluated. Each specific alignment was considered with three operating speeds associated with a level of rail service. Operating speeds considered included 90 mph, 125 mph, and 220 mph. Figure 6 shows potential alignments of the three study corridors:

- I-30 Corridor from Dallas to Fort Worth
- Trinity Railway Express Corridor
- I-30/SH 360/Trinity Railway Express (TRE) Hybrid Corridor

Figure 6: Corridors Considered in CES Alternatives Analysis



Source: *Alternatives Considered, Dallas-Fort Worth Core Express Service Alternatives Analysis Final Report, June 2017*

The TRE and Hybrid corridors were recommended to proceed to further study through an EIS process. Screening results are described in the following paragraphs.

The I-30 corridor was found to have significant design and construction feasibility issues and constraints that differentiate it from the other two corridor options. None of the speed and technology options for the I-30 corridor were able to resolve these constraints. Capital costs associated with the I-30 corridor are approximately double the other two corridors. Therefore, the I-30 corridor was eliminated from further consideration and the TRE and Hybrid corridors advanced to the next step of the screening process.

Both the TRE and Hybrid corridors were viable; however, with operational speed constraints of 90 mph and 125 mph, the evaluation determined due to a lack of safety requirements for passenger equipment (rolling stock) for operating speeds up to 220 mph, the study corridor should not be further evaluated for 220 mph.

The final results of the evaluation determined the Hybrid corridor performs slightly better than the TRE corridor, primarily in higher ridership, because of a potential Arlington station connection and lower overall environmental impacts. Comparatively, the TRE corridor offers the best financial viability with lower capital costs.

The Core Express Study recommended that both the TRE Corridor and Hybrid Corridor proceed into the EIS process for further evaluation.

4.4. Relevance to the Fort Worth to Laredo High-Speed Transportation Study

The DFWCES alternatives analysis, like TOPRS, builds upon planning efforts in developing high-speed transportation in North Texas. The fatal flaws analysis and quantifiable metrics utilized in DFWCES provide guidance for the Fort Worth to Laredo High-Speed Transportation Study, and will be utilized in the Task 4 Alternatives Analysis Memorandum. However, corridors connecting Dallas to Fort Worth, as identified in DFWCES, are outside of the study area for this evaluation and are therefore not applicable. Details regarding the potential alignment approaches into the cities of Arlington and Fort Worth will be considered to confirm and re-evaluate corridors in the Fort Worth to Laredo High-Speed Transportation Study.

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5. 2016 Texas Rail Plan Update

5.1. Overview and Purpose

The 2016 Texas Rail Plan Update expressed the vision for rail and identified opportunities for improvement. The rail network in Texas is a critical component of the economy, as it connects ports, industries, and people while at the same time alleviating congestion from roadway infrastructure. The Texas Rail Plan provides a framework for assessing rail performance and sets goals for improving freight and passenger service throughout the state.

The purpose of this statewide plan was to document existing conditions involving freight and passenger rail services, and identify potential projects and/or opportunities to enhance the rail system. Passenger rail in Texas consists of few routes with limited resources – Chapters 3 and 5 highlight existing conditions of passenger rail service and essential service, operational, and capital projects designed to improve ridership and operations, and provide a transportation alternative to vehicle and air travel.

Key topics covered within the plan include:

- Current conditions, trends and future conditions for the freight and passenger rail systems
- Long-range vision for the rail network in Texas
- Potential freight rail improvements and investments
- Potential passenger rail improvements and investments

The report included goals and objectives consistent with the Texas Transportation Plan 2040 and Texas Freight Mobility Plan, which include:

- Safety: improve multimodal transportation safety
- Asset Management: maintain and preserve existing infrastructure using cost-beneficial treatments
- Mobility and Reliability: reduce congestion and improve system efficiency/performance
- Multimodal Connectivity: provide transportation choices and improve system connectivity for all freight modes.
- Stewardship: manage resources, responsibly and be accountable in decision-making
- Customer Service: understand and incorporate citizen desires in decision-making processes and be open and forthright in all agency communications
- Sustainable Funding: identify and sustain funding sources for all rail modes
- Economic Competitiveness: improve the contribution of the Texas freight transportation system to economic competitiveness, productivity, and development
- Technology: improve the safety and efficiency of freight transportation through the development and utilization of innovative technological solutions

5.2. Recommendations

The plan mentions Texas' position of sharing rail corridors and services with other states and Mexico. Therefore, the plan evaluated other state rail plans as well as published development plans in Mexico to determine whether any plans or policies were in conflict with any Texas initiatives. The review revealed no conflicts with Texas initiatives.

- The Oklahoma Rail Plan was supportive of continued improvement of the Heartland Flyer Amtrak service and supported the concept of improving accessibility to TRE service for the purpose of connecting to the Dallas market. The plan also supported continued study of extending service south of Fort Worth.
- Louisiana and New Mexico supported improvements to the Sunset Limited Amtrak service.
- Mexico announced plans to investigate the possibility of a Mexico-USA high-speed rail line from Monterrey (in Nuevo Leon state) to San Antonio, with the potential travel time between the cities of approximately two hours. TxDOT attended meetings with officials from the U.S. Department of Transportation and Mexico to discuss the concept

The plan also lists several long-range rail passenger projects connecting many of the largest metropolitan areas in Texas. Some of the potential impacts of the long-range investments could:

- Support long-range vision for passenger service by increasing accessibility to alternatives for long-distance trips in Texas.

- Station locations could serve as economic hubs.
- New service would increase access to job markets, business services, and medical, educational, and other health and human services.
- An increased level of rail passenger service should not negatively affect, but may provide benefits, to the capacity and efficiency of rail freight services. This result could come from improved capacity and signal/communication systems would be required by the rail line owners, as well as the overseeing federal and state governments.

5.3. Relevance to the Fort Worth to Laredo High-Speed Transportation Study

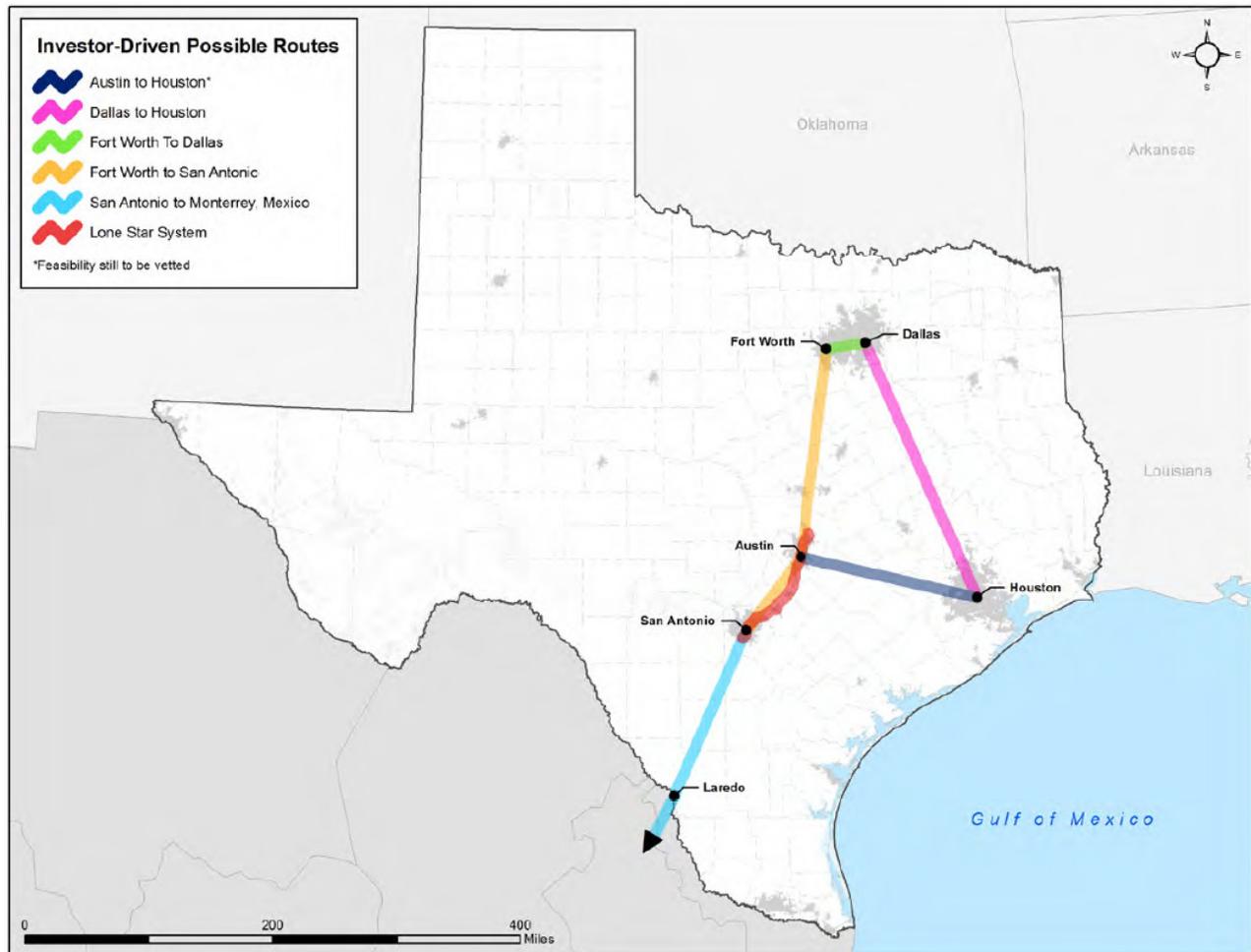
The 2016 Texas Rail Plan Update sets the vision for passenger rail service throughout the state. Overarching goals align with the foundation of the Fort Worth to Laredo High-Speed Transportation Study and previous planning high-speed transportation planning efforts. Two goals outlined in the rail plan include:

- Reducing the number of automobiles on roadways and thus improving congestion through increased passenger rail ridership
- Provide for safer and more efficient commuting through higher-capacity travel modes

The rail plan projects that constitute future passenger rail service in Texas will be primarily investor-driven, as shown in Figure 7. The Fort Worth to Laredo corridor is shown as a potential investor-driven route, indicating that investor-led or public-private partnerships would be needed to develop this corridor.

The 2016 Texas Rail Plan Update does not offer technical guidance to the Fort Worth to Laredo High-Speed Transportation Study; however, recommended service improvements, including frequency of conventional rail service and potential long-term upgrades to existing passenger rail systems, are viable options to be considered in future planning efforts.

Figure 7: Rail Passenger Vision: Investor -Driven Possible Routes



Source: Rail Passenger Vision - Investor-Driven Possible Routes, 2016 Texas Rail Plan Update, May 2016

6. Metropolitan Transportation Plans

This section summarizes current regional planning efforts adopted by NCTCOG and MPOs in the Fort Worth to Laredo study area.

6.1. NCTCOG

The NCTCOG Metropolitan Planning Area covers 9,400 square miles and includes 12 counties: Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise. Dallas and Fort Worth are the largest cities within the NCTCOG region. In 2018, population in the region was estimated at over 7.4 million people and is projected to increase to over 11.2 million by 2045. Employment in 2017 was estimated at almost 4.9 million jobs in 2017 and is projected to increase to over 7.0 million jobs by 2045.

6.1.1. Mobility 2045 (2018)

The Mobility 2045: Metropolitan Transportation Plan for the NCTCOG provided the long-range transportation system development vision for the region. The overall goals of Mobility 2045 were to:

- Improve the availability of transportation options for people and goods
- Support travel efficiency measures and system enhancements targeted at congestion reduction and management
- Ensure all communities are provided access to the regional transportation system and planning process
- Preserve and enhance the natural environment, improve air quality, and promote active lifestyles
- Encourage livable communities that support sustainability and economic vitality
- Develop cost-effective projects and programs aimed at reducing the costs associated with constructing, operating, and maintaining the regional transportation system

For public transit, the plan reviewed emerging technologies, public-private partnerships, and supported the Federal Transit Administration with a mobility-on-demand initiative to “envision a multimodal, integrated, automated, accessible, and connected transportation system in which personalized mobility is a key feature.” Transit providers in the North Central Texas region are implementing innovative transit services through partnerships with transportation network companies, to put mobility-on-demand into practice.

Mobility 2045 envisions a long-term, high-performance regional passenger rail network linking communities throughout North Central Texas. The plan identified regional passenger rail corridors existing conditions, future travel demand, interaction with freight, financial requirements, and other factors. The plan noted that due to the variety of regional passenger rail scenarios, it is important to reflect different levels of opportunities for implementation. Many passenger rail corridors in the region are proposed within existing freight corridors, and track condition in those corridors factor into potential implementation scenarios.

High-speed passenger rail service was identified in the plan as an integral component of a larger statewide and potential national rail network. Four proposed corridors would provide service between Oklahoma City and South Texas; Fort Worth and Shreveport, Louisiana; Fort Worth and Dallas; and Dallas and Houston. Depending on speed and selected technology, at-grade and fully grade-separated high-speed passenger rail services are proposed, as shown in Figure 8. Dallas-to-Houston was identified as a high-potential high-speed passenger rail service corridor. A private-sector planning effort continues to analyze the corridor for environmental impacts, alignment options, station locations, and funding options.

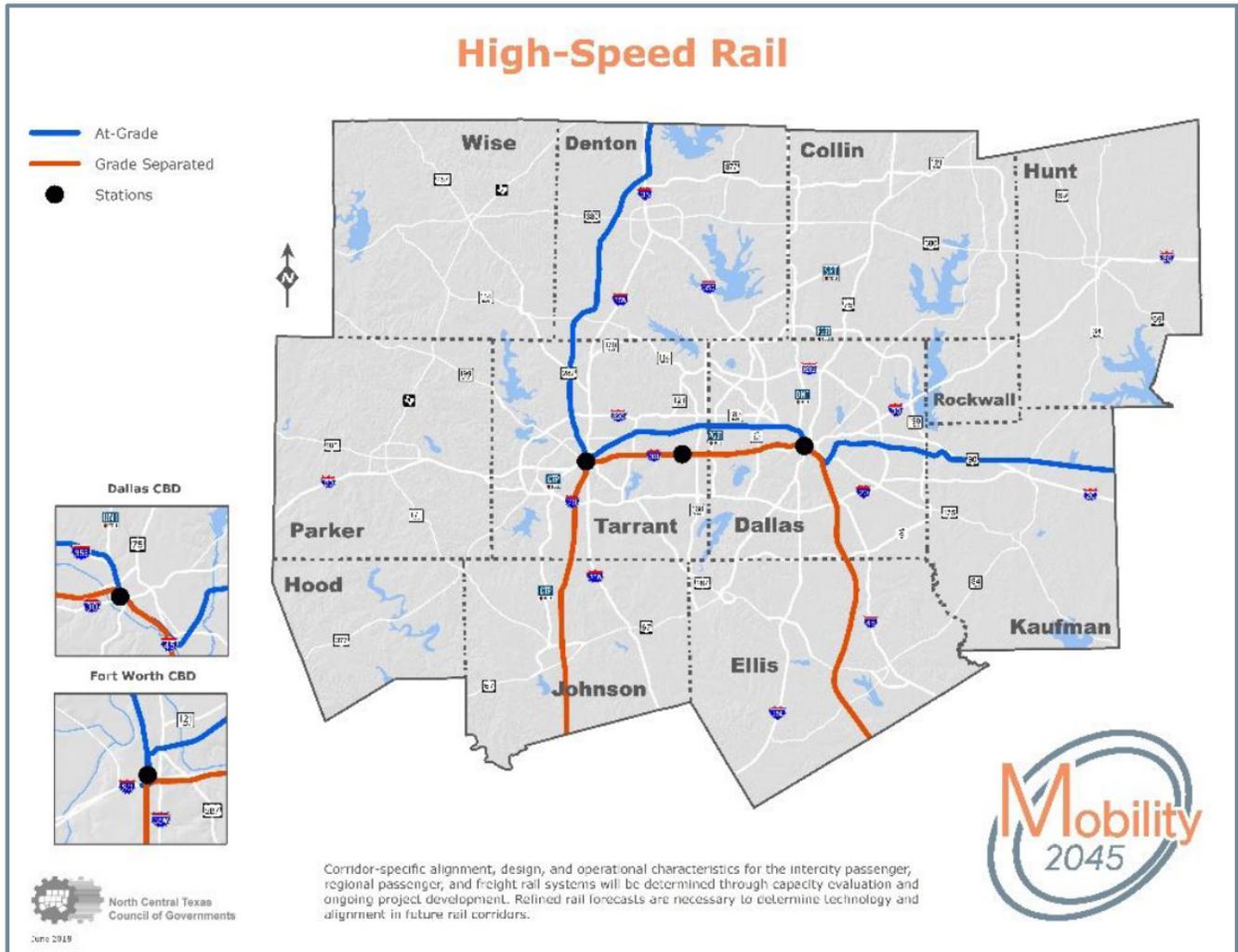
Additionally, TOPRS identified high ridership potential in segments south of Fort Worth, which should be considered for grade-separated, high-speed passenger rail service. At-grade, higher-speed passenger rail services from Fort Worth to Oklahoma City and Dallas to Shreveport were also assessed.

Within the North Central Texas region, both at-grade and grade-separated high-speed passenger rail service are recommended from Fort Worth to Dallas. The recommended grade-separated high-speed service in this corridor includes stations in downtown Fort Worth, Arlington, and downtown Dallas. A Fort Worth High-Speed Rail Station Study is reviewed in Section 2 of this memorandum. Scenarios include a “one-seat ride” high-speed rail service that could potentially connect South Texas to Houston through North Central Texas. The region supports the development of one-seat/one-ticket high-speed passenger rail connectivity between Fort Worth, Arlington, Dallas, Houston, and South Texas through the Dallas

station. Should regulatory, environmental, financial, or other challenges prohibit the timely development of a one-seat/one-ticket connection through the Dallas station, the region would support and coordinate with high-speed passenger rail system developers to implement a cross-platform transfer solution for all rail passengers that is as close to a one-seat/one-ticket connection as possible. The Fort Worth-to-Austin and Dallas-to-Houston corridors could potentially be funded by private-sector initiatives. The Fort Worth-to-Dallas project could be funded by a public-private partnership.

In Mobility 2045, NCTCOG identified alternative technologies for high-speed transportation, one being magnetic levitation, which is being explored with public and private funding.

Figure 8: NCTCOG Mobility 2045 High-Speed Rail Recommendations



Source: High-Speed Rail Recommendations, Mobility 2045, June 2018

6.1.2. Access North Texas Regional Public Transportation Plan for North Central Texas 2018 (2018)

The Access North Texas plan provided an update to the 2013 plan and documented public transit through the NCTCOG counties. The goals of the plan were to highlight trends in transit, including partnerships with traditional transit agencies and transportation network providers (e.g., Uber, Lyft), future needs of transit-dependent populations, and technology improvements for system users and fare collection. After identifying gaps in transit access across the region, the plan identified objectives with strategies designed to address issues in each area. Eight regional strategies were identified for public transit improvement throughout the NCTCOG region. Strategies range from transit service implementation in locations lacking service to technology improvements and educational campaigns.

6.1.3. Freight North Texas - The North Central Texas Regional Freight System Inventory (2013)

Freight North Texas evaluated freight movement and growth throughout the state of Texas. Plan goals included inventorying freight capacities, operations, and service levels throughout North Texas. The plan then identified recommendations to enhance the regional freight system and international connections. The I-35 corridor was emphasized in its importance to connecting and moving goods from the border to the northern extents of Texas and beyond.

As freight traffic grows within the state, particularly on the I-35 corridor, automobile and passenger rail will compete for limited space on increasingly crowded transportation networks. High-speed transportation service via train or emerging technologies is a key part of a multimodal transportation network. The Fort Worth to Laredo High-Speed Transportation Study seeks to mitigate transportation issues caused by freight growth and provide a sustainable mode of transportation that addresses congestion and air quality issues.

6.2. Waco MPO

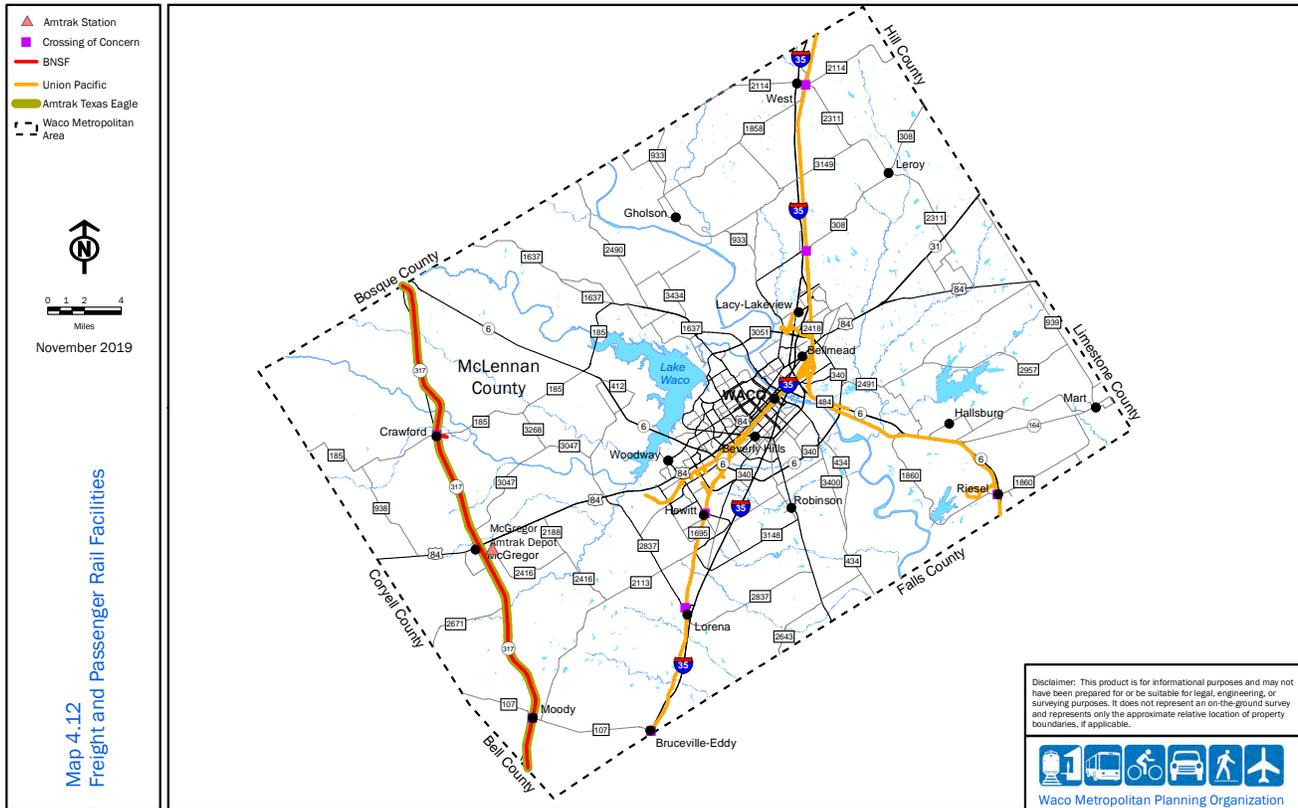
The Waco MPO is governed by a 20-member Policy Board and informed by a 36-member Technical Committee. The MPO represents all of McLennan County, an area that encompasses approximately 1,060 square miles. In 2017, the population was estimated to be over 250,000 with an anticipated 2045 population of over 306,000. In 2015, the labor force was estimated to be over 105,000, and anticipated to grow by up to 25 percent by 2045.

6.2.1. Connections 2045 (2020)

The Connections 2045 plan identified the transportation vision and priorities for the MPO over the next 25 years. The plan identified transportation needs, gaps, and priorities within the Waco area. Connections 2045 provides an overview of existing local and regional transit services, including the Waco Transit System, intercity bus, car share, and micromobility services. Service within the Fort Worth to Laredo High-Speed Transportation Study area are provided by Greyhound, Tornado, and FlixBus services with stops in Fort Worth, Dallas, Waco, Killeen, Austin, New Braunfels, San Antonio, Houston, Laredo, and Brownsville.

Passenger rail service within the MPO is provided by the Amtrak Texas Eagle, utilizing BNSF freight rail tracks. The Texas Eagle provides Waco with daily service to Dallas-Fort Worth, Austin, and San Antonio. The plan noted passenger arrivals and departures have generally remained constant, but fell by 2.8 percent between 2013 and 2018 at the Waco-area passenger rail station, the McGregor Amtrak Depot. Figure 9 displays passenger and freight rail corridors in McLennan County.

Figure 9: Freight and Passenger Rail Facilities in McLennan County



Source: Waco MPO, *Connections 2045*, January 2020

The *Connections 2045* plan also provides an overview of aviation services within the MPO area. Waco Regional Airport is the only commercial service airport in McLennan County. Passenger enplanements have fluctuated between 2010 and 2017; however, the plan notes commercial aircraft at the airport operated at an average of 70 percent capacity, 12.5 percent lower than the national average.

Connections 2045 suggests both aviation and ground transportation services would be significantly strained due to regional growth in the Dallas-Fort Worth metropolitan area, as well as growth in nearby Austin and San Antonio. Also, existing rail service utilizing freight rail lines constrains the ability of Amtrak to provide fast, frequent, and reliable service. The plan highlights the need for new, high-speed, interregional mobility options, and it provides a brief overview of TOPRS and the Fort Worth to Laredo High-Speed Transportation Study.

6.2.2. McLennan County Transit Needs Study (2018)

The McLennan County Transit Needs Study evaluated the needs of those who travel throughout the county and the Waco MPO study area. The study was conducted to improve the availability, quality, and efficiency of transportation within the study area. The study did not include any projects related to high-speed rail or interregional transit connections.

6.2.3. Waco Bus Rapid Transit Feasibility Study (2018)

The Waco Bus Rapid Transit Feasibility Study considered the types and modes of transportation available to improve existing transit services within the City of Waco. The study compared higher-capacity transit modes by average cost per mile, daily ridership, station spacing, route length, fixed guideway requirements, and frequency and number of vehicles. Ultimately, the study recommended bus rapid transit along several major corridors to serve as the “spine” of the Waco Transit System. As part of the study, the Waco MPO and Waco Transit System developed a conceptual redesign of the fixed route network to feed into the high-capacity spine.

6.3. KTMPO

KTMPO is located in Central Texas and includes Bell County, and parts of Coryell and Lampasas Counties. Total population for the MPO, according to the 2015 U.S. Census American Community Survey 5-Year Estimates, is over 380,000. By 2045, total population for the MPO is anticipated to grow to over 570,000. Employment was estimated to be over 174,000 in 2015, and anticipated to increase to 278,000 by 2045.

6.3.1. Mobility 2045 (2019)

The Mobility 2045 plan was primarily focused on local planning for regional roadway systems, public transportation, and bicycle and pedestrian facilities. The plan provides an existing conditions assessment and sets goals for the region. The multimodal chapter touches upon topics relevant to the Fort Worth to Laredo High-Speed Transportation Study. The chapter highlights freight growth throughout Texas, and particularly the role Central Texas has in facilitating the movement of goods. While not a main component of the plan, passenger rail service is discussed in a high-level review of TOPRS. The chapter also references the NCTCOG Fort Worth to Laredo High-Speed Transportation Study, noting 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.”

Lastly, the plan references a proposed freight shuttle system that has been developed by the Texas A&M Transportation Institute. The system would be an elevated transport system that utilizes current I-35 right-of-way, specifically the median. The goal would be to alleviate trucking congestion from the I-35 corridor. The Fort Worth to Laredo High-Speed Transportation Study will assess the potential for high-speed transportation to utilize corridors along the I-35 corridor. Notably, as advertised hyperloop technology could have the potential to facilitate both freight and passenger travel.

6.4. CAMPO

CAMPO is located in Central Texas and includes Bastrop, Burnet, Caldwell, Hays, Travis, and Williamson counties. The CAMPO area comprises more than 50 member governments, including counties, cities, and other transportation agencies. Austin is the largest city within the planning area boundaries. In 2018, the total MPO population was over 2.2 million and was expected to continue growing. By 2045, forecasted population and employment are anticipated to be 4.5 million and 2.25 million, respectively. The CAMPO 2045 Regional Transportation Plan was under development as of January 2020.

6.4.1. CAMPO 2040 Regional Transportation Plan (2015)

The CAMPO 2040 Regional Transportation Plan served as a guide for future regional transportation investments that balance economic opportunity, quality of life, and environmental stewardship in the Austin, Texas region. The plan established the vision for a comprehensive regional multimodal transportation system that safely and efficiently addresses mobility needs over time. It also sought to develop a transportation system that is economically viable, cost-effective, and environmentally sustainable.

The plan identified public transit as a key investment and need for the future of the regional transportation network. The 2040 Plan recognized the need for both an expanded urban and regional public transit network. Moreover, the 2040 Plan addressed the need for high-capacity transit across the region. Transit projects included in the 2040 Plan incorporate plans and projects from the Capital Metro Service Plan 2020, Project Connect, and the Lone Star Rail District.

The Capital Metro Service 2020 Plan identified the following strategies for meeting current and future transit needs:

- New and revised bus routes with potential for extended service
- New MetroExpress bus routes and park-and-ride facilities
- New frequent route network including MetroRapid

Additionally, the plan included a section on emerging transportation technologies that could impact the regional transportation network. These technologies include:

- Dynamic tolling
- Connected and autonomous vehicles
- High-speed rail
- Mobile applications
- Freight shuttle
- Transfix freight applications
- The Wire, Tri-Track, and hyperloop

6.5. AAMPO

The AAMPO is located in South Central Texas and includes Bexar, Comal, and Guadalupe Counties, as well as a portion of Kendall County. The largest city within the planning boundaries is San Antonio. Additionally, AAMPO includes more than 20 member governments and transportation agencies. In 2015, total population in the MPO was estimated to be over 2.2 million - with over 1 million in employment. Projections for 2045 anticipate population and employment numbers to rise to 3.7 million and 1.8 million, respectively. The AAMPO Mobility 2040 Metropolitan Transportation Plan and the AAMPO Regional Managed/Transit Priority Lanes Feasibility Study were reviewed in relation to planning for multimodal high-speed transportation.

6.5.1. AAMPO Mobility 2045 Metropolitan Transportation Plan (2014)

AAMPO's Metropolitan Transportation Plan provides the long-range vision for the development of the transportation system in the San Antonio area through 2045. Goals outlined in the plan focus on: opportunities to improve and enhance the regional transportation system and preserve the investment in the existing transportation system, increase efficiency and manage congestion, focus on safety, address social and environmental issues in transportation planning efforts, support economic activity, and facilitate public and stakeholder involvement.

The Mobility 2045 plan provides an overview of local public transit efforts, emerging transportation technologies, environmental considerations, and congestion management strategies. Advanced transportation systems were discussed as an aspect of congestion management. These include: bus rapid transit, light rail transit, managed lanes, passenger rail service, high-speed rail, and active parking management. The plan states, "Advanced public transit systems', though, can mitigate congestion by making public transportation more attractive to roadway users (Modal Options), decreasing the demand of roadway space by single occupancy drivers (System Demand)." Additionally, the plan highlights the TOPRS study and the need for further project-level environmental studies to refine high-speed transportation options.

6.5.2. AAMPO Regional Managed / Transit Priority Lanes Feasibility Study (2016)

The AAMPO, TxDOT, VIA, and other agencies conducted the Regional Managed/Transit Priority Lanes Feasibility Study to evaluate managed and transit priority lanes in the region. The congestion mitigation solutions were evaluated on their potential to provide reliable travel and increase people throughput. The project methodology included:

- An assessment of traffic and geometric conditions
- A review of regional corridors and their suitability for managed lane strategies
- Selection of priority corridors and identification of an optimal managed lane strategy
- Evaluation of the regional network and recommendations for network deployment of managed lane strategies

The Regional Managed/Transit Priority Lane Feasibility Study provided a review of San Antonio corridors and their ability to use specific managed lane strategies. The study identified priority corridors for implementation. The managed lane strategies included express toll lanes, high-occupancy vehicle lanes, reversible contra-flow lanes, shoulder lanes, truck and bus only lanes, and flow-controlled freeways. The bus-on-shoulder lane was the overall highest-recommended strategy. The results showed the following reasons for the high score:

- It scored well throughout the region and allowed for continuity between various segments
- It is easy to implement and can build upon other strategies
- Mixed-use shoulder running can generally follow bus-on-shoulder deployment where appropriate

6.6. Laredo MPO

The Laredo MPO is located in South Texas. The City of Laredo is located on the Rio Grande River along the border between the U.S. and Mexico. The Laredo MPO planning area includes more than 20 member governments, including Webb County, cities, and transportation agencies. Population data from the 2017 American Community Survey by the U.S. Census Bureau estimates a 2017 MPO population of approximately 275,000. Population forecasts for 2045 anticipate the MPO will be home to 450,000 residents. Similarly, 2018 employment numbers were approximately 105,000, with growth anticipated to increase employment to 180,000 by 2045.

6.6.1. 2020-2045 Laredo Metropolitan Transportation Plan (2020)

The 2020-2045 Laredo Metropolitan Transportation Plan outlined the long-range vision for transportation system development in the Laredo region through the year 2045. The plan presented an existing conditions assessment of the transportation network and regional transportation planning goals and objectives. Goals and objectives for the plan sought to increase safety of the transportation network, sustain transportation assets, maintain and improve travel times by reducing congestion, improve economic viability through an efficient freight network, and develop a transportation system that encourages vibrant and equitable communities. A financial analysis provided a list of fiscally constrained transportation projects to be implemented between 2020 and 2045.

Though the plan does not discuss high-speed rail, it provided a brief overview of a bus rapid transit feasibility study completed in 2011. The bus rapid transit study reviewed existing conditions that could impact potential bus rapid transit service and incorporated input from the community and the local transit provider to develop a series of potential bus rapid transit scenarios. After a performance screening test, a preferred scenario was selected. Implementation phases and cost estimates were also provided. If implemented, the bus rapid transit preferred scenario would provide a connection to future high-speed rail service.

6.7. Relevance to the Fort Worth to Laredo High-Speed Transportation Study

Plans reviewed for the Fort Worth to Laredo High-Speed Transportation Study provide technical guidance and regional perspectives, and identify local need for intercity mobility options throughout the study area. Information provided in the various metropolitan transportation plans show the priorities and objectives of each MPO in developing and maintaining their transportation networks. The plans highlight key stakeholders and agencies needed to implement intercity mobility solutions.

Information from the reviewed plans will be incorporated into screening criteria and corridor selections utilized in the Task 4 Alternatives Analysis Memorandum of this study

