Appendix L

Transportation Technical Study

TEXAS–OKLAHOMA PASSENGER RAIL STUDY

Transportation

Technical Study

Prepared by

Texas Department of Transportation

U.S. Department of Transportation Federal Railroad Administration

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Abbreviations and Acronyms

APE	Area of Potential Effect
AUS	Austin-Bergstrom International Airport
BRO	Brownsville/South Padre Island International Airport
CFR	Code of Federal Regulations
CONV	conventional rail
COTPA	Central Oklahoma Transportation & Parking Authority
CRP	Corpus Christi International Airport
DAL	Dallas Love Field Airport
DART	Dallas Area Rapid Transit
DCTA	Denton County Transportation Authority
DFW	Dallas/Fort Worth International Airport
EIS	environmental impact statement
FR	Federal Register
FRA	Federal Railroad Administration
GRK	Killeen/Fort Hood Regional Airport
HRL	Valley International Airport
HOU	Houston Hobby Airport
HrSR	higher-speed rail
HSR	high-speed rail
IAH	Houston George Bush Intercontinental Airport
IH-30	Interstate Highway 30
IH-35	Interstate Highway 35
ITC	Intermodal Transportation Center
KCI	Kansas City International Airport
KCS	Kansas City Southern
LRD	Laredo International Airport
METRO	Capital Metropolitan Transportation Authority
MFE	McAllen Miller International Airport
mph	miles per hour
MPO	Metropolitan Planning Organization
NEPA	National Environmental Policy Act
ODOT	Oklahoma Department of Transportation

OKC	Will Rogers Worlds Airport
Program	Texas-Oklahoma Passenger Rail Program
PWG	Waco Regional Airport/McGregor Executive Airport
SAN	San Antonio International Airport
Study	Texas-Oklahoma Passenger Rail Study
T&P	Texas and Pacific station
The T	Fort Worth Transportation Authority
TMP	Transportation Management Plan
TTI	Texas A&M Transportation Institute
TRE	Trinity Railway Express
TxDOT	Texas Department of Transportation
U.S.C.	United States Code
UPRR	Union Pacific Railroad
VIA	VIA Metropolitan Transit
VMT	Vehicle Miles Traveled

1.0 Introduction

The Texas Department of Transportation (TxDOT), along with the Federal Railroad Administration (FRA), is preparing a service-level environmental impact statement (EIS) to evaluate intercity passenger rail service alternatives for the Texas-Oklahoma Passenger Rail Program (Program). The purpose of the Program is to enhance intercity mobility by providing enhanced passenger rail service as a transportation alternative that is competitive with automobile, bus, and air travel. Preparation of the service-level EIS, in support of which this technical study has been prepared, is one of two primary objectives of the Texas-Oklahoma Passenger Rail Study (Study). In addition to the service-level EIS, TxDOT and FRA are preparing a service development plan for the corridor to guide further development and capital investment in passenger rail improvements identified in the EIS Record of Decision. The Oklahoma Department of Transportation (ODOT) is a partnering state agency for the Study and the EIS.

The 850-mile corridor analyzed for the Study runs north-south and roughly parallels Interstate Highway (IH)-35, with the northern point in Edmond, Oklahoma (i.e., northern end of the Oklahoma City portion of the corridor), and the southern end in south Texas, potentially in Corpus Christi, Brownsville, Laredo, or the Rio Grande Valley, as shown on Figure 1-1. For this service-level analysis, a preliminary alignment was developed to represent each EIS alternative based on conceptual engineering that considered and avoided obvious physical or environmental constraints. These alignments were not refined to optimize performance, reduce cost, avoid specific properties or individual environmental resources, or for any other such considerations. If an alternative is selected at the service level for further development, the above considerations would be assessed at the project level. A broad corridor of study with a width of 500 feet has been identified along each route. This EIS Study Area provides an envelope that could accommodate areas for associated effects, including necessary roadway shifts, grade separations, construction activities, and affiliated features such as stations and parking, traction-power substations, power lines, and maintenance-of-way facilities.

The build alternatives are divided into the following three geographic sections based on the key regional markets that could be served by passenger rail improvements:

- 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

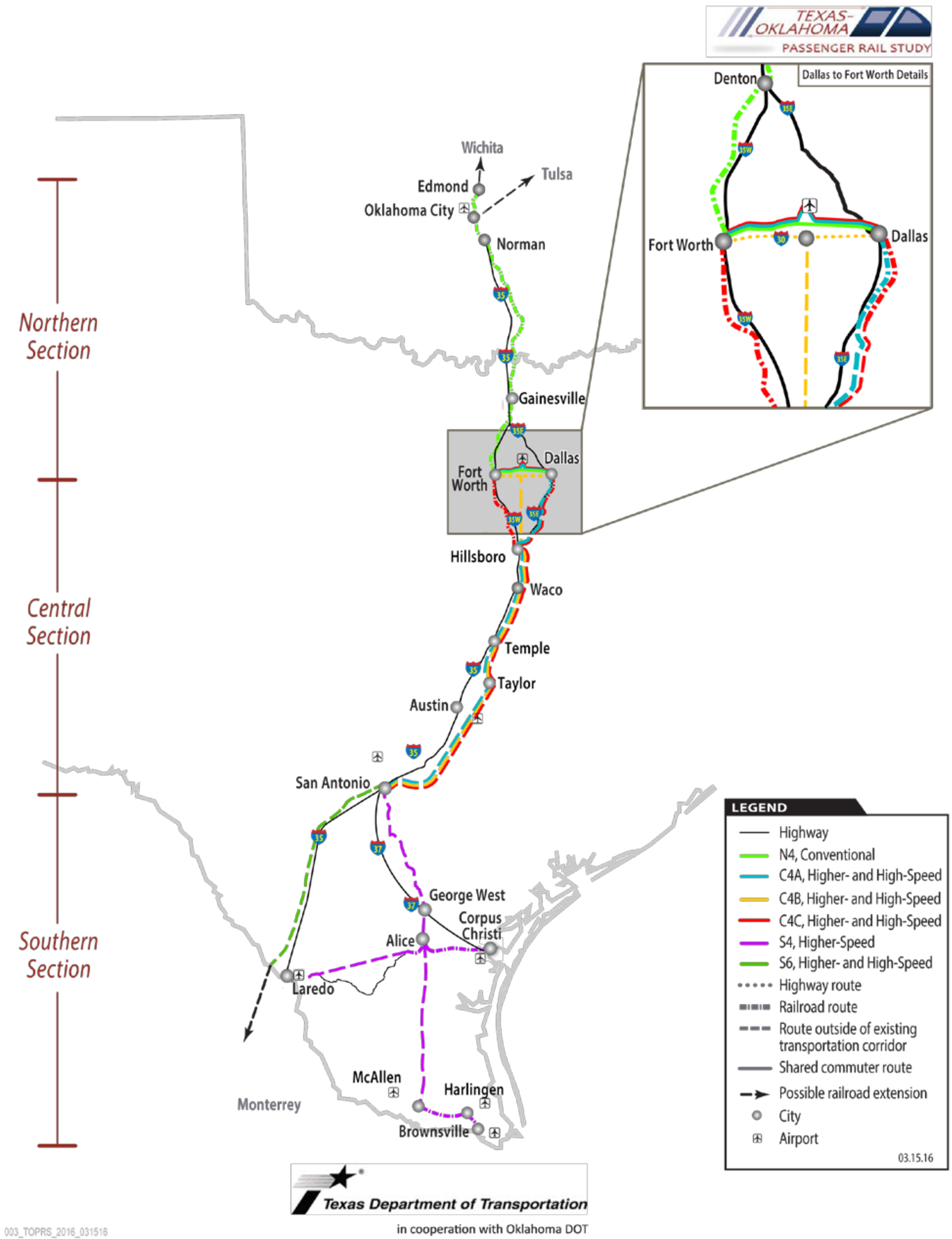


Figure 1-1: Build Alternatives

In addition, the alternatives consist of both a "route," which refers to the specific corridor that a potential alignment follows, and a "service type," which refers to the speed or category of rail transportation (conventional rail, higher-speed rail, or high-speed rail). The alternatives that have been carried forward for analysis in the EIS, including their geographic sections, routes, and service types, are listed in Table 1-1.

Table 1-1: Alternatives Carried Forward for Further Evaluation

Route	Service Type[a]
Northern Section	
N4A	CONV
Central Section	
C4A	HrSR
	HSR
C4B	HrSR
	HSR
C4C	HrSR
	HSR
Southern Section	
S4	HrSR
S6	HrSR
	HSR

[a] CONV = conventional rail; HrSR = higher-speed rail; HSR = high-speed rail

1.1 Service Type Descriptions

The three service types (conventional rail, higher-speed rail, and high-speed rail) considered in this EIS are described below.

1.1.1 Conventional Rail

Conventional rail typically includes diesel-powered, steel-wheeled trains operating on steel tracks. Roadway crossings may be grade-separated depending on the type of roadway and amount of traffic, and rail rights-of-way may be fenced. Conventional rail would be operated at speeds up to 79 to 90 miles per hour (mph) and would mostly use existing railroad rights-of-way. For the conventional rail alternative, existing railroad track may be used, or in some cases, modifications such as double-tracking could be constructed within the existing right-of-way to accommodate additional trains. Conventional rail is only being considered for the Northern Section.

1.1.2 Higher-Speed Rail

Higher-speed rail is similar to conventional rail in several respects. In many cases, higher-speed rail trains can run on the same steel tracks that support conventional rail, but higher speeds can require improvements such as upgrading wooden ties with concrete ties, improving signaling, and upgrading roadway crossings. In this case, higher-speed rail trains are assumed to be diesel-powered. Higher-speed rail would be operated at speeds up to 110 to 125 mph. Where proposed within an existing railroad right-of-way, a shared right-of-way with separate tracks for freight and passenger services would be constructed. Because of its maximum speed and because train frequency would be similar to conventional rail, higher-speed rail could operate on a single track with passing locations and would not require double-tracking. Where higher-speed rail is proposed outside an existing transportation corridor, the new alignment would be designed with curves and other features that could accommodate high-speed rail service if warranted by ridership and if economically feasible in the future. However, unlike high-speed rail, the design would not include electrification or a full double track, and some grade crossings would remain.

1.1.3 High-Speed Rail

High-speed rail includes electric trains powered by an overhead power supply system. Train sets are steel wheel on steel rail, but are designed to operate at high speeds with an aerodynamic shape, and suspension and braking systems are designed for high-speed travel. High-speed rail would be operated at speeds up to 220 to 250 mph. The entire right-of-way would be fenced and fully grade-separated. The alignment would be electrified and double-tracked. This service type could only reach its maximum speeds outside existing transportation corridors because existing railroad alignments are not compatible with the speeds required and they do not have the required space for separation of freight and high-speed rail. In areas where this service type is within existing transportation corridors, it would operate at lower speeds.

1.2 Alternative Descriptions

For this service-level analysis, a preliminary alignment was developed to represent each route alternative based on conceptual engineering that considered obvious physical or environmental constraints. They are not detailed alignments that have been refined to optimize performance, reduce cost, avoid specific properties or individual environmental resources, or similar considerations, which would be assessed at the project-level phase for alternatives carried forward for further analysis.

The alternatives evaluated in the service-level EIS, shown on Figure 1-1, have been developed to a level of detail appropriate for a service-level analysis: the route alternatives represent a potential corridor where rail improvements could be implemented but do not specify the precise location of the track alignment. When a route alternative is refined to include a service type (conventional, higher-speed, or high-speed rail), it is then referred to as an alternative. Alternatives in the Northern, Central, and Southern sections could be built as individual, stand-alone projects or in combination with alternatives in another section. In addition, more than one alternative in the Central Section and Southern Section could be built in the future because the alternatives provide different service types for independent destinations. Details on connecting the alternatives would be determined during project-level studies.

Potential alignments are described below in terms of nearby transportation corridors and cities. For example, potential alignments are described as “following” railway corridors, which could mean that they are sharing existing tracks, within an existing right-of-way or generally adjacent to existing tracks depending on the service type.

The Southern Section alternatives include a potential extension to Monterrey, Mexico. The EIS evaluates alignment corridors only within the United States; however, the potential extension to Monterrey has been included for ridership analysis purposes, and FRA and TxDOT have initiated coordination with the Mexican government about the potential extension.

1.2.1 No Build Alternative

The No Build Alternative is carried forward as a baseline alternative and provides an alternative for comparative evaluation of the advantages and disadvantages of the build alternatives. The No Build Alternative would not fulfill the Program’s purpose and need and is a result of choosing not to build the project. The context of the No Build Alternative is the 2035 horizon year in which the project is projected to occur. The No Build Alternative consists of the existing transportation network, including roadway, passenger rail, and air, in the EIS Study Area and committed improvements to these systems. It includes:

- Major highways and arterials that make up the roadway network (for auto and bus travel)
- Existing and currently planned conventional passenger rail service
- Intercity bus service
- Local public transit services
- Freight railroad services and planned and committed improvements
- Air travel
- Projects of all modes that are included in the regional Metropolitan Planning Organization’s (MPO’s) constrained Long-Range Transportation Plans

1.2.2 Northern Section: Oklahoma City to Dallas and Fort Worth

Due to feasibility based on initial ridership and cost information, only one route alternative with one service type was considered feasible in the Northern Section: Alternative N4A with conventional rail.

1.2.2.1 Alternative N4A Conventional

Alternative N4A would begin in Edmond, Oklahoma, and follow the BNSF rail alignment south to Oklahoma City. The alternative

would continue south along the BNSF rail alignment to Norman, Oklahoma; through Metro Junction, near Denton, Texas; and on to Fort Worth. From Fort Worth, the alternative would continue east to Dallas following the Trinity Railway Express (TRE) tracks. From Edmond to Dallas, the route would be approximately 260 miles long. Because existing freight traffic would not preclude passenger service along this section of track, the route would provide passenger rail service on the existing BNSF track, with potential improvements within the existing BNSF right-of-way.

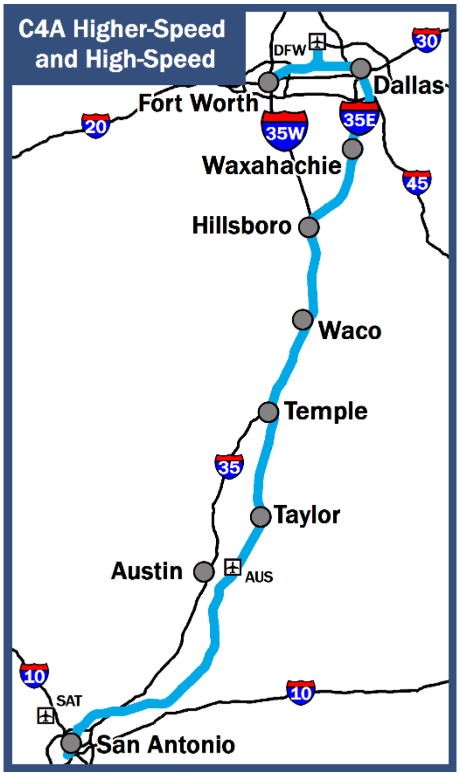
Alternative N4A would provide several improvements over the existing Heartland Flyer service. Alternative N4A would increase the number of daily round trips along this route (the Heartland Flyer currently offers one round trip per day), and the N4A route would extend from Fort Worth to Dallas without requiring a transfer (the Heartland Flyer service currently terminates in Fort Worth). In addition, Alternative N4A would provide improvements to existing station facilities, and new train equipment with more onboard amenities, including business class available for a premium price.

Alternative N4A assumes diesel-locomotive hauled equipment running three to six daily round trips. Two or three of the round trips would operate on an accelerated schedule, making roughly seven stops, with remaining "local" trains making as many as 12 stops.

1.2.3 Central Section: Dallas and Fort Worth to San Antonio

Three route alternatives, each with higher-speed and high-speed rail options, were evaluated in the Central Section: Alternatives C4A (Higher-Speed Rail and High-Speed Rail), C4B (Higher-Speed Rail and High-Speed Rail), and C4C (Higher-Speed Rail and High-Speed Rail).

The Central Section alternatives would provide several improvements over the existing Texas Eagle service in this corridor. All of the alternatives would increase the number of daily round trips along this route (the Texas Eagle currently offers one round trip per day). The high-speed rail alternatives would provide much faster service between Dallas and Fort Worth and Antonio — 2 hours versus 8 hours for the Texas Eagle Service. In addition, the Central Section alternatives would provide improvements to existing station facilities and new train equipment.

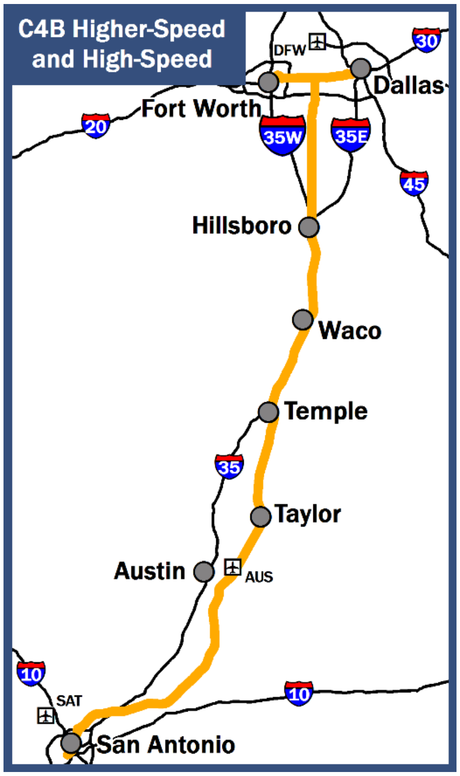


1.2.3.1 Alternative C4A Higher-Speed and High-Speed Rail

Alternative C4A would begin in Fort Worth and follow the TRE tracks east to Dallas. From Dallas, it would follow the BNSF alignment south toward Waxahachie where it would enter a new alignment outside existing highway and rail corridors to accommodate maximum operating speeds. Though outside existing transportation corridors, the southern portion of Alternative C4A would generally follow the BNSF alignment for about 250 miles, traveling south from Waxahachie through Hillsboro, Waco, Temple, Taylor, and Austin to San Antonio.

Alternative C4A Higher-Speed Rail assumes new “high-performance” diesel-locomotive hauled equipment running six to 12 daily round trips. Express trains would likely make seven stops with local trains making 12 stops.

Alternative C4A High-Speed Rail assumes true electric-powered, high-speed service running 12 to 20 daily round trips. Express trains would likely make six stops, while local trains would make up to nine stops.

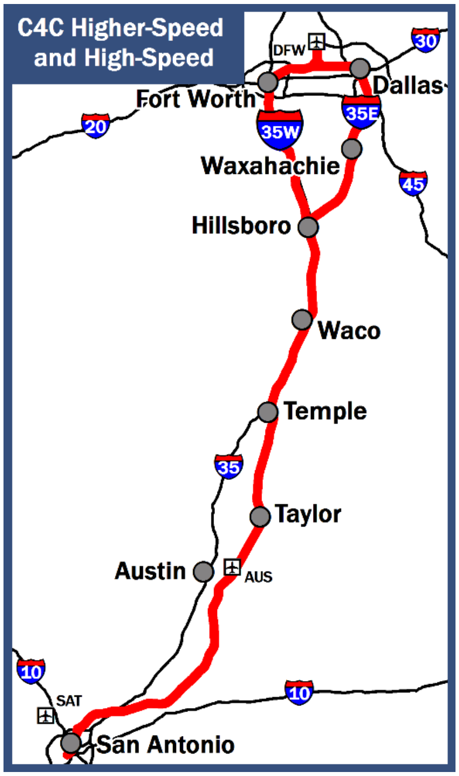


1.2.3.2 Alternative C4B Higher-Speed and High-Speed Rail

Alternative C4B would serve both Fort Worth and Dallas, with trains following a new elevated high-speed rail alignment over IH-30. In Arlington (between Dallas and Fort Worth), the alternative would turn south to Hillsboro on an alignment outside existing transportation corridors. The alternative would then follow the same high-speed rail alignment as Alternative C4A from Hillsboro to San Antonio.

Alternative C4B Higher-Speed Rail assumes new “high-performance” diesel-locomotive hauled equipment running six to 12 daily round trips. Express trains would likely make seven stops, and local trains would make up to 12 stops.

Alternative C4B High-Speed Rail assumes true electric-powered, high-speed service running 12 to 20 daily round trips. Express trains would likely make six stops, and local trains would make up to eight stops.



1.2.3.3 Alternative C4C Higher-Speed and High-Speed Rail

Alternative C4C would follow the same potential alignment as Alternative C4A from Fort Worth east to Dallas and south to San Antonio, but would include a link from Hillsboro directly to Fort Worth parallel to the UPRR alignment. Service on the Alternative C4C route would operate in a clockwise direction, running from Hillsboro to Fort Worth, to Dallas, back to Hillsboro, and south to San Antonio in order to serve Fort Worth directly (while also being compatible with the general service for C4A alternatives).

Alternative C4C Higher-Speed Rail assumes new "high-performance" diesel-locomotive hauled equipment running six to 12 daily round trips. Express trains would likely make seven stops, and local trains would make up to 12 stops.

Alternative C4C High-Speed Rail assumes true electric-powered high-speed service running 12 to 20 daily round trips. Express trains would likely make six stops, while local trains would make up to nine stops.

1.2.4 Southern Section: San Antonio to South Texas

Two route alternatives were evaluated in the Southern Section: Alternative S4 Higher-Speed Rail, and Alternative S6, with Higher-Speed Rail and High-Speed Rail options.

1.2.4.1 Alternative S4 Higher-Speed Rail

Alternative S4 would begin in San Antonio and travel southeast along the UPRR alignment to George West, where it would continue outside existing transportation corridors to Alice. At Alice, the alternative would divide into three legs at a stop. The first leg would travel west along the Kansas City Southern (KCS) Railway to San Diego, Texas; it would then travel outside existing transportation corridors to east of Laredo in an alignment that would allow higher speeds and rejoin the KCS Railway to enter the highly developed Laredo area. The second leg would travel south along abandoned railroad tracks to McAllen and east to Harlingen and Brownsville. The third leg would travel east along the KCS Railway to Corpus Christi.

Alternative S4 Higher-Speed Rail assumes new "high-performance" diesel-locomotive hauled equipment running four to six daily round trips. Depending on corridor demand model forecasts, the primary service may be designated as Laredo-Alice-San Antonio and Corpus Christie-Alice-San Antonio, with a connecting feeder from Brownsville, Harlingen, and McAllen.

1.2.4.2 Alternative S6 Higher-Speed and High-Speed Rail

Alternative S6 would begin in San Antonio and travel south on a new alignment outside existing transportation corridors to a station near the Laredo-Columbia Solidarity Bridge, which crosses the Rio Grande north of Laredo. The alternative would then cross on a new railway bridge to join a new rail line being constructed in Mexico, which would continue to Monterrey. This study only examines the physical effects of the U.S. component of this new line, but it does consider the ridership impact of such a connection.

Alternative S6 Higher-Speed Rail assumes new “high-performance” diesel-locomotive hauled equipment running four to six daily round trips between San Antonio and Laredo, which would be the only U.S. stops for the alternative. If an extension from Laredo to Monterrey were added, the frequency of trips to Monterrey is assumed to be the same as those from San Antonio to Laredo.

Alternative S6 High-Speed Rail assumes true electric-powered, high-speed service running eight to 12 daily round trips between San Antonio and Laredo. If an extension from Laredo to Monterrey were added, the frequency of trips to Monterrey is assumed to be the same as those from San Antonio to Laredo.

1.2.5 Station Cities

The Study does not evaluate specific station locations, and no conclusion about the exact location of stations will be made as part of the service-level EIS process. However, based on ridership data and transit connectivity information developed as part of the alternatives analysis (see Appendix C; TxDOT 2014), and based on stakeholder input, the cities in which stations would most likely be located have been assumed. The size and design of stations would be appropriate for the service type and the route of the alternative. Cities that could have stations are listed in Table 1-2.

Table 1-2: Cities with Potential Stations

Oklahoma	
Edmond	Pauls Valley
Oklahoma City	Ardmore
Norman	
Texas	
Gainesville	Austin
Fort Worth	San Antonio
Arlington	Alice
Dallas	Corpus Christi
Waxahachie	Harlingen
Waco	McAllen
Temple (also serving Killeen)	Brownsville
Taylor	Laredo

2.0 Regulatory Context and Purpose

Applicable legislation, regulations and orders pertaining to transportation are described below. Additional local and regional laws, regulations, and orders may be applicable and will be addressed in project-level analysis.

2.1 Federal

2.1.1 Federal Railroad Administration

Section 14(n)(13) of the Federal Railroad Administration (FRA)'s *Procedures for Considering Environmental Impacts* states: "The EIS should assess the impacts on both passenger and freight transportation, by all modes, from local, regional, national and international perspectives. The EIS should include a discussion of both construction period and long-term impacts on vehicular traffic congestion."

2.1.2 Passenger Rail Investment and Improvement Act (PRIIA) (49 USC 22705).

In 2008, state rail plans took on an increased importance when Congress passed the Passenger Rail Investment and Improvement Act (PRIIA) (49 United States Code [U.S.C.] 22705). It laid the foundation for an expanded focus on rail planning. PRIIA requires each state to have an approved state rail plan as a condition of receiving rail funding in the future for either passenger or freight improvements. PRIIA requires each state rail plan to include the following:

- Inventory of the existing rail transportation network
- Review of proposed high-speed rail corridors in the state
- Statement of the state's objectives related to rail transportation
- General analysis of rail's economic, transportation, and environmental impacts
- Long-range investment program for current and future rail freight and passenger services
- Discussion of public financing issues for rail projects and listing of current and potential rail-related funding sources
- Discussion of stakeholder-identified rail infrastructure issues
- Review of freight and passenger multimodal rail connections and facilities
- Review of publicly funded rail projects that enhance rail-related safety
- Performance evaluation of passenger rail services
- Compilation of previous high-speed rail reports and studies
- Statement that the state's rail plan complies with PRIIA

2.1.3 State

To improve the coordination of the planning, construction, operation and maintenance of a statewide passenger rail system in the State of Texas, S.B. 1382 (Section 201.6012-6013, Transportation Code), an act passed by the 81st Texas Legislature and approved by the governor on June 19, 2009, requires TxDOT to prepare and update annually a long-term plan for a statewide passenger rail system. The plan must include the following information useful for the development of the vision, goals, and objectives for the passenger rail system for Texas:

- A description of existing and proposed passenger rail systems
- Information regarding the status of passenger rail systems under construction
- An analysis of potential interconnectivity difficulties
- Ridership projections for proposed passenger rail projects
- Ridership statistics for existing passenger systems

3.0 Evaluation Methods

This study used a broad approach to determine the potential effects on travel demand and transportation at the corridor level. To evaluate the potential effects of the demand for the new rail system, a travel demand model was developed to forecast existing and future conditions (Year 2035) by mode (auto, passenger rail, intercity bus, and air travel) within the EIS Study Area for each alternative. For the purpose of this transportation analysis, the EIS Study Area includes the primary routes of travel (e.g., major highway corridors) and sets of modeled city pairs within each geographic section. The model outputs were then used to compare the No Build Alternative against the rail alternatives. A general description of the travel demand model outputs is provided in Table 3-1.

Table 3-1: Travel Demand Model Outputs

Context	Description	Potential Effect Compared to the No Build Alternative	Evaluation of Intensity of Effects
Travel Demand/Mode Share	Number and percentage of intercity trips taken by mode.	A shift in mode share could be a beneficial or negative effect depending on the mode (e.g., a decrease in bus ridership could have a negative effect on transit service providers).	Negligible: <3% Moderate: 3%-20% Substantial: > 20%
Travel Time Savings	Travel times by mode between city pairs. For rail, bus, and air, travel time includes on-train/on-plane, or on-bus time and transfer time between city pairs.	Savings in travel time is a beneficial effect of the project.	Negligible: <30 mins. Moderate: 30 mins-60 mins. Substantial: > 60 mins.
Travel Time Reliability	Average variance in travel times between city pairs.	Travel time reliability is a beneficial effect of the project. Trains operate on a scheduled service within a dedicated right-of-way.	Negligible: <30 mins. Moderate: 30 mins-60 mins. Substantial: >60 mins.
Vehicle Miles Traveled (VMT)	Average annual VMT on the highways between city pairs (for auto travel only).	A reduction in VMT is a beneficial effect of the project.	Negligible: <2% Moderate: 2%-5% Substantial: > 5%
Level of Service (trains, buses, and air travel)	Daily number of trains, buses, or flights between city pairs.	Increased (or new) rail service is a beneficial effect of the project.	The intensity of the effect was not evaluated, because the analysis assumes no change in level of service for the other modes.
Ridership	Ridership (passengers per year) by mode between city pairs.	Passenger rail travel demand is a beneficial effect of the project.	The intensity of the effect was not evaluated, because it is captured in other measures (Travel Demand Mode Share).

Potential effects, including beneficial effects, were characterized using ratings of negligible, moderate, or substantial. The Study also identifies design and mitigation strategies to reduce potentially substantial effects.

These levels of effect determinations are further defined as follows:

- Negligible intensity effects from construction and operation of an alternative are those effects that result in minor changes to travel demand, mode share, travel time, and VMT.
- Moderate intensity effects from construction and operation of an alternative are those effects that result in noticeable changes to travel demand, mode share, travel time, and VMT.
- Substantial intensity effects from construction and operation of an alternative are those effects that result in significant changes to travel demand, mode share, travel time, and VMT, with a probability of a residual effect.

For this service-level analysis, each alternative was evaluated as an independent alternative—even when overlapping with other alternatives. Each alternative has termini within large cities and each alternative could be constructed alone or in combination with other alternatives. In addition, multiple alternatives could be constructed within each region because each alternative provides separate service-type options.

3.1 Data Sources

Transportation-related information and data were obtained from the travel demand model developed for the project and a literature review of available information. In general, the sources include:

- Texas-Oklahoma Passenger Rail Travel demand model outputs (per the Service Development Plan: Initial Service Schedule and Operating Assumptions, Texas-Oklahoma Passenger Rail Study – Service-Level EIS Phase)
- TxDOT and ODOT traffic count data
- TxDOT Research Project 0-5930, Potential for Development of an Intercity Passenger Transit System in Texas
- Adopted state, regional, and local transportation plans

Specific sources used in the preparation of this technical study are listed in Section 8.0, References.

3.2 Travel Demand

Ridership travel demand measures the potential attractiveness of new passenger rail service investments to the traveling public. Travel demand includes the existing intercity travel demand for the EIS Study Area, by mode, and how this travel demand is expected to change due to the infrastructure and service improvements of each alternative.

The service-level analysis included the following tasks:

- Conducted existing and future-year intercity travel demand forecasts for the EIS Study Area, by mode and level of service.
- Compared the alternatives on their ability to meet the projected intercity travel demand.
- Assessed the impacts on intercity travel times, by mode, between key destinations, for each alternative.

The travel demand model rail forecasting methodology is based on an inter-urban travel mode choice model to predict what percentage of current travelers will divert to the proposed new or improved rail service for their trips. The mode choice models place sensitivities on key elements of travel, such as time and cost, based on survey respondents' answers to hypothetical scenarios about available travel choices. For this study, a new data collection effort to gather such data was undertaken and mode choice model(s) specific to the TOPRS corridors were estimated.

To assess the attractiveness of proposed improvements in the rail mode relative to other existing modes, data about traveler responses to these improvements are needed. These data are often obtained from surveys called Stated Preference (SP) surveys. SP surveys are used to elicit traveler preferences and tradeoffs involving different modal attributes. Survey data can then be used to develop choice models involving the improved mode.

The survey response data were used to develop mode choice models that calculate traveler diversions from existing modes to the rail service with the proposed services. Model development also incorporated relevant information from other sources (e.g., U.S. Department of Transportation [USDOT] guidance on values of time for intercity travel), and professional judgment based on forecasting best practices.

3.3 Transportation Conditions

The evaluation also describes the current and projected traffic conditions in the study area, including average annual VMT, travel times, level of service, and mode share. Changes to traffic conditions due to the infrastructure and service changes proposed by each alternative were assessed, based on the projected travel demand (developed from the model). However, this service-level analysis does not include a detailed evaluation of potential impacts to specific roadways, intersections, or specific transportation service providers (bus or air).

The service-level analysis included:

- Documented existing traffic conditions within the EIS Study Area, including a general analysis of existing primary travel routes and travel times by mode.
- Documented the anticipated changes to traffic conditions within the EIS Study Area as a result of each alternative. Potential effects include changes to travel modes, average speeds, travel time, and travel time reliability for both passenger rail and autos.

- Broadly assessed existing and future freight use of the existing routes and impacts on freight travel times, reliability, and areas of conflict.
- Broadly assessed effects on air carriers.
- Broadly assessed effects on intercity transit service providers.
- Identified the likely short-term effects of construction activities on vehicular traffic congestion.

With the exception of Table 3.21-35: Summary of Travel Demand and Transportation Effects by Alternative, which summarizes the potential intensity of effects, the information reported in all of the tables and figures is based on the travel demand model outputs developed as part of the *Service Development Plan: Initial Service Schedule and Operating Assumptions Texas-Oklahoma Passenger Rail Study – Service-Level EIS Phase* (TxDOT 2016). The model outputs are presented at either the corridor level or the city pair level depending on the context (e.g., travel time versus mode share). The results at the city level are specific to the pair of cities that are modelled, and may not reflect the travel demand and transportation conditions occurring at the corridor level. Therefore, a comparison between the modeled results at the corridor level versus the city level should not be made. Furthermore, because each alternative was evaluated as an independent alternative, the travel demand model accounts for the individual market segment identified for each alternative. For example, the No Build Alternative would have a different number of total trips (for all modes) compared to the total number of trips for Alternative N4A because each alternative is drawing from a different market segment. Another example is the model results shown for VMT. For instance, Alternative C4A Higher-Speed Rail serves both Austin Downtown and Austin Airport while Alternative C4A High-Speed Rail only serves Austin Airport. As a result, when computing existing VMTs, the Austin Downtown market is included for Alternative C4A Higher-Speed Rail, but not included for Alternative C4A High-Speed Rail, thus resulting in different VMTs overall. Therefore, due to the nuances in the model outputs, a direct comparison between every alternative is not always possible. Instead, the model provides a reasonable measure of future changes in travel demand, mode share, etc., based on the specific alternative being evaluated.

4.0 Baseline/Affected Environment

4.1 EIS Study Area

The following section provides a general description of the existing transportation facilities (highway corridors, passenger rail, intercity bus, and airports) and existing transportation conditions (travel demand, mode share, travel times, level of service, and VMT) for each geographic section analyzed. This information is provided as background data only and as a context for the alternatives analyses. The No Build Alternative and build alternatives have been analyzed for the 2035 conditions only. The information within each geographic section is generally described from north to south.

4.1.1 Northern Section: Oklahoma City to Dallas and Fort Worth

The Northern Section extends approximately 220 miles, beginning in the north in Edmond, Oklahoma, and ending in the south in Dallas. From north to south, the route passes through the cities of Edmond, Oklahoma City, Moore, Norman, Purcell, Pauls Valley, Ardmore, and Marietta, Oklahoma; and Gainesville, Sanger, Denton, Fort Worth and Dallas, Texas. The section is served primarily by passenger rail and freight rail, highway, intercity bus, and air travel. The existing transportation modes and facilities are discussed below.

4.1.1.1 General Description of Transportation Facilities

4.1.1.1.1 Passenger and Freight Rail

Passenger rail service in Oklahoma and north Texas plays a limited role in its transportation system. There is one active passenger rail in the Northern Section. The Heartland Flyer, operated by Amtrak, provides intercity passenger rail service between Oklahoma City and Fort Worth and is a 418-mile round trip route. Amtrak operates one train per day in each direction, with station stops in Norman, Purcell, Pauls Valley, Ardmore, and Gainesville, in addition to Oklahoma City and Fort Worth. The train departs Oklahoma City in the morning, arrives in Fort Worth mid-day, and returns to Oklahoma City in the evening. The Heartland Flyer operates on tracks owned by BNSF railway (Amtrak 2016).

At the Fort Worth end of the Heartland Flyer route, connections can be made in Fort Worth to Amtrak's Texas Eagle, which operates between Chicago and Los Angeles via San Antonio. Connections can also be made to the TRE, a commuter rail line (described in the following paragraphs), which provides a connection to Dallas and its public transportation network.

The TRE is a 35-mile regional commuter train service that operates between downtown Fort Worth and downtown Dallas. There are 10 stations between the cities, including the Texas and Pacific (T&P) station in downtown Fort Worth, the Fort Worth Intermodal Transportation Center (ITC), Richland Hills, Bell, CentrePort/Dallas/Fort Worth International Airport (DFW), Downtown Irving Crossing, Medical Market Center, Victory Station, and Dallas Union Station. There are 17 weekday departures from Fort Worth. Reduced service is offered on Saturday and there is no service on Sunday. Connections between the Heartland Flyer and TRE are not coordinated at Fort Worth, resulting in significant time delays between these services.

Within the Northern Section, BNSF and UPRR operate north-south routes with significant freight traffic through central Oklahoma and Texas. The MidCon route, operated by BNSF, operates between Canada and the Gulf Coast and generally parallels the IH-35 corridor. This north-south route is vital in connecting ports on the Gulf Coast and markets in Mexico with the central United States (ODOT 2012). The number of freight trains per day varies significantly depending on the route and segment and ranges from approximately 15 to 100 trains per day (Texas A&M Transportation Institute [TTI] 2010).

4.1.1.1.2 Regional Highway System

The highway system constitutes the foundation of the region's overall transportation infrastructure. Within the Northern Section, the primary highways, along the corridor, are IH-35, IH-235, and U.S. Highway (US)-77.

IH-35 begins at the border with Mexico at Laredo, Texas and terminates at Duluth, Minnesota, approximately 200 miles southwest of the Canadian border. Within the EIS Study Area, IH-35 runs north-south through central Texas and central Oklahoma. Within Oklahoma, IH-35 connects the cities of Blackwell, Perry, Guthrie, Oklahoma City, Moore, Norman, Purcell, Pauls Valley, Ardmore, and Thackerville. Within central Texas, IH-35 connects the cities of Denton, Argyle, Corral City, and the Fort Worth metropolitan area.

IH-235 is a north-south spur of IH-35 that connects IH-35 and IH-40 in downtown Oklahoma City to IH-44 north of downtown. It is also called the Centennial Expressway.

US-77 is a north-south highway that connects Brownsville, Texas in the south with Sioux City, Iowa in the north. Within the Northern Section, US-77 connects Edmond to Oklahoma City and generally parallels IH-35 to the east, connecting all of the major cities in the Northern Section.

4.1.1.1.3 Intercity Bus

The Northern Section is served by two traditional intercity motorcoach operators—Jefferson Lines and Greyhound. Jefferson Lines provides a route that crosses Oklahoma diagonally from the northeast, originating in Kansas City, with stops in Bartlesville, Stillwater, Tulsa, Oklahoma City, Chickasha, Lawton, and terminating in Wichita Falls, Texas (Jefferson Lines 2016). Greyhound provides direct service from Oklahoma City to Dallas and from Norman to Dallas. Indirect service (i.e., transfers are required) is provided by Greyhound to all major cities in the area (Greyhound 2016).

The Central Oklahoma Transportation & Parking Authority (COTPA) operates Metro Transit, a public transit service concentrated into a service area of Oklahoma City and Midwest City with express bus service to Norman. The Oklahoma City system has fixed routes that originate from the Downtown Transit Center with generally 15-minute headways throughout the day. There are approximately 30 routes that serve all areas of the city. Included in these routes are four express routes to suburban areas (COTPA 2016).

4.1.1.1.4 Air Service

The Northern Section is served by three commercial service airports: Will Rogers Worlds Airport (OKC), DFW, and Dallas Love Field Airport (DAL).

OKC is located approximately 6 miles from downtown Oklahoma City, near the junctions of IH-35, IH-40, and IH-44. OKC handles an average of 150 commercial flights each day, carrying over 3.5 million passengers annually. Five commercial carriers operate at OKC with service to 21 nonstop destinations. Regionally, direct service is provided to Dallas (DAL and DFW) and Houston George Bush Intercontinental Airport (IAH) and Houston Hobby Airport (HOU) (Will Rogers World Airport, 2016) (Oklahoma City Department of Airports 2016).

DFW is located within the cities of Irving, Euless, Grapevine, and Coppell, between the major cities of Dallas and Fort Worth. DFW is the primary international airport serving the Dallas and Fort Worth metropolitan area. DFW is ranked fourth in the world for operations (aircraft movements) and tenth in the world for number of passengers served. DFW has 24 passenger airlines and serves over 60.4 million passengers annually. Within the EIS Study Area, DFW provides direct service to Wichita, Tulsa, Oklahoma City, Waco, Killeen, Austin, San Antonio, Houston (IAH and HOU), Corpus Christi, and Laredo (DFW 2016).

DAL is located 7 miles northwest of the downtown central business district. DAL serves an average of over 7 million passengers annually. Within the EIS Study Area, DAL provides direct service to Kansas City, Tulsa, Oklahoma City, Austin, Houston (IAH and HOU), and San Antonio (Dallas Love Field 2016).

4.1.1.2 Baseline Conditions

This section presents the existing baseline travel demand and transportation conditions for the Northern Section. In most cases, the data are presented at the corridor level. Where appropriate, the data are presented at the city pair level to assess differences in the urban markets.

4.1.1.2.1 Travel Demand, Mode Share, and Travel Times

Table 4-1 presents the existing travel demand (passengers per year) by mode for the Northern Section. The mode share, which is the percentage of travelers using a particular type of transportation, is also presented.

Table 4-1: Existing Travel Demand and Mode Share

Mode	Travel Demand (Trips per Year)	Mode Share (Percentage by Mode)
Oklahoma City – Dallas – Fort Worth		
Auto	22,920,866	98.8%
Passenger Rail	73,731	0.3%
Intercity Bus	108,912	0.5%
Air	95,569	0.4%

Table 4-2 presents the travel time (in minutes) between city pairs by mode. The travel time is presented at the city level to show the differences between travel times from Oklahoma City to Dallas and from Oklahoma City to Fort Worth.

Table 4-2: Existing Travel Times by Mode

Mode	Travel Time (minutes)		
	Oklahoma City – Dallas	Oklahoma City – Fort Worth	Dallas – Fort Worth
Auto	209	200	36
Passenger Rail[a]	418[b]	238	60
Intercity Bus[a]	391	473	72
Air[a]	52	59	-

[a] Total travel time includes on-train, on-plane, or on-bus time and transfer time between city pairs.

[b] There is no direct service between Oklahoma City and Dallas. The Heartland Flyer operates between Oklahoma City and Forth Worth. Travel to Dallas could be made through connections on the Texas Eagle or TRE.

As shown in Tables 4-1 and 4-2, highway travel represents the majority of the mode share and is the second fastest form of travel for the Northern Section, when compared with other modes. Key characteristics associated with highway travel as the preferred mode are travel time and cost, with travel time a product of congestion and distance between origin and destination and an assumed average speed. Other than air, auto travel has an advantage in travel time over bus and rail service. Users are able to leave their origin and arrive at their destination without the transfer of modes required of public transit users who must select a secondary transport mode before arrival to and departure from origin and destination transit facilities. While air travel is significantly faster than driving, the cost of flying makes this option prohibitive to some users.

The Heartland Flyer provides a convenient alternative to highway travel for travel between Oklahoma City and Fort Worth. However, because of the lack of coordinated connections on either end, the service is limited outside of this corridor.

4.1.1.2.2 Existing Level of Service

Table 4-3 presents the level of service by mode (e.g., daily number of flights, buses, and trains between city pairs). In the Northern Section, service is generally limited at the corridor level.

Table 4-3: Existing Levels of Service

Mode	Existing Levels of Service (Daily number of trains, buses or direct flights)		
	Oklahoma City – Dallas	Oklahoma City – Fort Worth	Dallas – Fort Worth
Passenger Rail	1 train	1 train	1 train
Intercity Bus	4 buses	4 buses	13 buses
Air	4 flights[a]	10 flights[b]	0 flights

[a] Flights to/from Dallas Love Field Airport (DAL).

[b] Flights to/from Dallas Fort Worth Airport (DFW).

4.1.1.2.3 Existing Vehicle Miles Traveled

VMT is an indicator of highway travel throughout the EIS Study Area. It is the cumulative number of average annual VMT by automobiles along the corridor and is useful as a large scale measure of change in travel demand over time. As shown in Table 4-4, existing VMT within the Northern Section is over 1.3 billion VMT per year.

Table 4-4: Existing Vehicle Miles Traveled

Vehicle Miles Traveled (per Year)	
Oklahoma City – Fort Worth – Dallas	1,303,329,271

4.1.2 Central Section: Dallas and Fort Worth to San Antonio

The Central Section extends approximately 260 miles, beginning in the north in Dallas and Fort Worth and ending in the south in San Antonio. From north to south, the route passes through the cities of Fort Worth, Dallas, Arlington, Waxahachie, Hillsboro, Waco, Temple, Taylor, Austin, San Marcos, New Braunfels, Schertz, and San Antonio, Texas.

The Central Section EIS Study Area differs by alternative north of Hillsboro but is the same for all alternatives south of Hillsboro. The following section provides a general description of the primary transportation facilities/services in the Central Section. The section is served primarily by passenger and freight rail, highway, intercity bus, and air travel. Because the alternatives could be built as individual, stand-alone projects, there is some overlap in facilities/services between the Northern and Central sections.

4.1.2.1 General Description of Transportation Facilities

4.1.2.1.1 Passenger and Freight Rail

As previously described, Amtrak currently operates the Heartland Flyer and the Texas Eagle. The Texas Eagle operates between Chicago and San Antonio daily and between Chicago and Los Angeles three days per week. Within the Central Section, the Texas Eagle stops in Fort Worth, Dallas, Cleburne, McGregor, Temple, Taylor, Austin, San Marcos, and San Antonio. Thruway Amtrak Motorcoach connections are provided to Shreveport and Houston via Longview; Fort Hood and Killeen via Temple; Brownsville and Laredo via San Antonio; and Albuquerque via El Paso.

Regional/commuter rail service is provided on the TRE (Dallas to Fort Worth), previously described, and Capital MetroRail in Austin. Capital MetroRail offers service Monday through Friday between Leander and downtown Austin, and from Lakeline to downtown on Saturday (Capital MetroRail 2016).

TEX Rail is a 27-mile commuter rail project being constructed by the Fort Worth Transportation Authority (The T). The line begins in downtown Fort Worth at the existing T&P Station (currently served by TRE commuter service) and travels through the ITC station, continuing across northeast

Tarrant County to the cities of North Richland Hills and Grapevine and into DFW. At full build-out, the service is projected to have more than 13,600 daily riders using nine rail stations.

As previously described, BNSF and UPRR operate north-south routes with significant freight traffic through central Oklahoma and Texas. The MidCon route, operated by BNSF, operates between Canada and the Gulf Coast and generally parallels the IH-35 corridor. This north-south route is vital in connecting ports on the Gulf Coast and markets in Mexico with the central United States (ODOT 2012). The number of freight trains per day varies significantly depending on the route and segment and ranges from approximately 15 to 100 trains per day (TTI 2010).

4.1.2.1.2 Regional Highway System

IH-35 is the primary north-south highway running through the Central Section. IH-30 is the primary east-west highway between Dallas and Fort Worth.

4.1.2.1.3 Intercity Bus

Within the Central Section, Greyhound serves the Dallas Fort Worth metroplex, with four stops in Dallas, including Dallas Union Station, and two stops in Fort Worth. Additional Greyhound stations are located in Arlington, Dublin, Garland, Lewisville, Richardson, Stephenville, Terrell, Waxahachie, Hillsboro, Waco, Killeen, Temple, Weatherford, Round Rock, Austin, Bastrop, Kerrville, San Marcos, and San Antonio. Greyhound also provides coordinated schedules and through ticketing services for passengers along routes served by All Aboard America, Kerrville Bus Company, Inc., Valley Transit Company, Inc., and T.N.M. & O Coaches, Inc. Arrow Trailways (terminal in Round Rock) and Concho Coaches provide additional routes, although they do not coordinate with Greyhound and passengers wishing to travel on these carriers must obtain schedules and purchase tickets directly from the individual bus company (TTI 2010).

In addition to the U.S.-based intercity carriers, several Mexican intercity bus companies provide service in the state, particularly along the Laredo-Dallas corridor. El Conejo, El Expreso, Tornado, Autobus Adame, and Americanos USA are some of the carriers operating in the Central and Southern Sections. However, finding route and schedule information for these carriers is more difficult than for the larger U.S.-based carriers; they advertise primarily in Spanish language newspapers and only some provide information online (TTI 2010).

Public transportation services are provided by small and large transit-focused organizations, as well as private bus companies. The three largest public agencies include Dallas Area Rapid Transit (DART), The T, and the Denton County Transportation Authority (DCTA). Other local organizations provide complementary services that coordinate transit operations in less densely populated areas in north-central Texas. There are an additional 80 known public, private, and specialized transportation service providers in north-central Texas.

DART serves the cities of Addison, Carrollton, Cockrell Hill, Dallas, Farmers Branch, Garland, Glenn Heights, Highland Park, Irving, Richardson, Rowlett, Plano, and University Park. DART's services include 45 miles of light rail and 130 bus routes. DART Light Rail connects with the TRE for service to the DFW and to Fort Worth. DART's 2030 system plan includes an additional 43 miles of light rail service, 77 miles of enhanced bus service corridors, and 20 miles of rapid bus service corridors (TTI 2010).

The T offers fixed route and express bus service within Fort Worth, plus a "Rider Request" demand-response circulator service in Richland Hills. Many of The T's bus routes connect with the TRE at either the ITC or the T&P Station.

The DCTA provides fixed-route service in the cities of Denton, Lewisville, and Highland Village. DCTA's Commuter Express bus service travels from park-and-rides in Denton and Lewisville to downtown Dallas, the DART North Carrollton Transit Center, Texas Women's University, and the University of North Texas.

The Capital Metropolitan Transportation Authority (Capital Metro) provides urban transit service in the cities of Austin, Manor, San Leanna, Leander, Jonestown, Lago Vista, Point Venture, Volente, and some of the incorporated areas of Travis and Williamson counties. A variety of bus services serve different travel markets; options include local, limited-stop and "flyer," crosstown, and express bus routes, feeder routes that connect selected neighborhoods to Capital Metro Transit Centers, airport shuttles, downtown circulators, and a dial-a-ride route serving Lago Vista, Jonestown, and Leander.

The Hill Country Transit District provides demand-response transit service to Bell, Coryell, Hamilton, Lampasas, Llano, Mason, Milam, Mills, and San Saba counties and fixed-route service in the cities of Copperas Cove, Killeen, Harker Heights, Nolanville, and Temple. Waco Transit provides fixed-route service within Waco and connects to Greyhound at the Waco Intermodal Center. The Waco Streak bus line provides three roundtrips per day from Waco to DFW. The Waco Intermodal Transit Center serves Waco Transit as well as Greyhound.

VIA Metropolitan Transit (VIA) provides public transportation services to San Antonio, 13 suburban cities, and the unincorporated areas of Bexar County. Services currently include 85 fixed routes and four downtown circulator routes. VIA also sponsors commuter vanpools in partnership with Enterprise Rent-a-Car; some of these vanpools travel between San Antonio and Austin.

VIA has opened two new major transit centers connecting the region's largest employment centers – the Westside Multimodal Transit Center and the South Texas Medical Center Transit Center, and implemented the region's first high capacity transit line, VIA Primo/BRT on the Fredericksburg Road corridor.

4.1.2.1.4 Air Service

DFW and Dallas Love Field, previously described, provide commercial air service in the Central Section.

The Austin-Bergstrom International Airport (AUS) serves the greater Austin metropolitan area, and is located approximately 5 miles southeast of downtown Austin. AUS has two runways and three helipads. It served nearly 12 million passengers in 2015 and is the 35th busiest airport for total passengers in the United States.

San Antonio International Airport (SAT) is located in northern San Antonio, approximately eight miles from downtown. The airport provides commercial airline service for the south Texas region and approximately 8.5 million passengers fly into and out of San Antonio each year.

Regional airports in the Central Section include Waco Regional Airport/McGregor Executive Airport (PWG) and Killeen/Fort Hood Regional Airport (GRK).

4.1.2.2 Baseline Conditions

This section presents the existing baseline travel demand and transportation conditions for the Central Section. In most cases, the data are presented at the corridor level; however, where appropriate, the data are presented at the city pair level to assess differences in the urban markets.

4.1.2.2.1 Existing Travel Demand, Mode Share, and Travel Times

Table 4-5 presents the existing travel demand (passengers per year) by mode and mode share for the Central Section. Highway travel accounts for the largest percentage of the mode share, followed by air and intercity bus travel. Passenger rail represents less than one percent of the mode share.

Table 4-5: Existing Travel Demand and Mode Share

Mode	Travel Demand (Trips per Year)	Mode Share (Percentage by Mode)
Dallas – Fort Worth – San Antonio		
Auto	18,155,904	89.62%
Passenger Rail	52,461	0.26%
Intercity Bus	943,219	4.66%
Air	1,107,387	5.47%

Table 4-6 presents the travel time (in minutes) between city pairs by mode. With the exception of air, highway travel generally is significantly faster than the existing passenger rail and intercity bus service. This is mainly due to the lack of direct service by these modes. Between Dallas and Austin and Austin and San Antonio, bus travel is relatively time-competitive with highway travel.

Table 4-6: Existing Travel Times by Mode

Mode	Travel Time (minutes)[a]				
	Dallas – San Antonio	Fort Worth – San Antonio	Dallas – Austin	Fort Worth – Austin	Austin – San Antonio
Auto	291	285	207	201	86
Passenger Rail	605	465	392	252	143
Intercity Bus	327	409	220	292	95
Air	62	68	55	62	-

[a] Total travel time includes on-train/on-plane, or on-bus time and transfer time between city pairs.

4.1.2.2.2 Existing Level of Service

Table 4-7 presents the level of service by mode between city pairs. With the exception of air travel, there is largely a lack of service provided between the city pairs.

Table 4-7: Existing Levels of Service

Mode	Existing Levels of Service (Daily number of trains, buses or direct flights)				
	Dallas – San Antonio[b]	Fort Worth – San Antonio	Dallas – Austin	Fort Worth – Austin	Austin – San Antonio
Passenger Rail	1 train	1 train	1 train	1 train	1 train
Intercity Bus	17 buses	17 buses	17 buses	17 buses	17 buses
Air	13 flights[a]	15 flights[b]	12 flights[a]	14 flights[b]	0 flights

[a] Flights from Dallas Love Field Airport (DAL).

[b] Flights from Dallas Fort Worth Airport (DFW).

Existing Vehicle Miles Traveled

Table 4-8 presents the existing average annual VMT for the Central Section. For the Central Section, the VMT were modeled based on the regional market segment identified for each alternative. Although the alternatives have similar (or in some cases) the same origin and destination, the stations vary slightly and there are minor differences in the modeled market segment. The existing VMT for the Central Section ranges from approximately 1.3 to 1.4 billion VMT per year depending on the market segment.

Table 4-8: Existing Vehicle Miles Traveled

Vehicle Miles Traveled (per Year)	
Dallas – Fort Worth – San Antonio[a]	1,303,329,271 to 1,415,866,197

[a] The VMT for the Central Section were modeled for each alternative based on the market segment identified for each alternative. A range in VMT is shown because the VMT vary depending on the market segment. For example, C4A HrSR serves both Austin Downtown and Austin Airport while C4A HSR only serves Austin Airport. As a result, when computing existing VMTs, the Austin Downtown market is included for C4A HrSR, but not included for C4A HSR, thus resulting in different VMTs overall.

4.1.3 Southern Section: San Antonio to South Texas

The Southern Section includes two distinct alignments, and extends approximately 120 to 145 miles, depending on the alignment. The section begins in the north in San Antonio and ends in either Brownsville (Alternative S4) or Laredo (Alternative S6), in southern Texas. With the exception of the urban areas of San Antonio, Alice, Corpus Christi, Laredo, Kingsville, Raymondville, McAllen, Harlingen, and Brownsville, Texas, the Southern Section is predominately rural.

The following section provides a general description of the primary transportation facilities/services in the Southern Section. The section is served primarily by highway and intercity bus travel, with some local air service. There is some overlap in facilities/services between the Central and Southern sections.

4.1.3.1 General Description of Transportation Facilities

4.1.3.1.1 Passenger and Freight Rail

There is currently no passenger rail service in the Southern Section.

4.1.3.1.2 Regional Highway System

IH-35 is the major north south highway between San Antonio and Laredo. To the west, IH-37 is the major north-south highway connecting San Antonio and Corpus Christi.

4.1.3.1.3 Intercity Bus

Valley Transit Company, a Greyhound affiliate company, connects the Lower Rio Grande Valley to Houston, San Antonio, and Laredo, with stops in the three primary cities (Brownsville, Harlingen, and McAllen). The Valley Transit “Main Line” through the Lower Rio Grande Valley also operates as express bus service along US-83 from Brownsville to McAllen.

The Harlingen Express, a flex-route bus service, provides local service in Harlingen. The Brownsville Urban System provides urban transit service within Brownsville and the McAllen Express Transit provides urban transit service within McAllen.

4.1.3.1.4 Air Service

As previously described, SAN provides commercial airline service for the South Texas region.

Brownsville/South Padre Island International Airport (BRO) is located approximately four miles east of downtown Brownsville. The airport is served by three commercial airlines and is a convenient airport for flying into the Rio Grande Valley and northern Mexico. The airport has scheduled nonstop passenger flights to DFW and Houston (IAH).

Corpus Christi International Airport (CRP) is approximately 5.5 miles west of downtown Corpus Christi. The airport is served by three commercial airlines, with scheduled non-stop passenger flights to DFW and Houston (IAH), and Houston Hobby (HOU).

Valley International Airport (HRL) is located 3 miles northeast of Harlingen. The airport is served by four commercial airlines, with scheduled non-stop passenger flights to Houston Hobby (HOU), Houston (IAH), and Austin. Non-stop service is also provided, seasonally, to Minneapolis/St. Paul and DFW.

Laredo International Airport (LRD) is located approximately 4 miles northeast of downtown Laredo. The airport is served by three commercial airlines, with scheduled non-stop passenger flights to Houston (IAH) and DFW.

McAllen Miller International Airport (MFE) is located approximately 2.5 miles south of downtown McAllen. The airport is served by four commercial airlines, with scheduled non-stop passenger flights to Houston (IAH) and DFW.

4.1.3.2 Baseline Conditions

This section presents the existing baseline travel demand and transportation conditions for the Southern Section. In most cases, the data are presented at the corridor level; however, where appropriate, the data are presented at the city pair level.

4.1.3.2.1 Existing Travel Demand, Mode Share, and Travel Times

Table 4-9 presents the existing travel demand (passengers per year) by mode and mode share at the corridor level. Highway travel represents the majority of the mode share.

Table 4-9: Existing Travel Demand and Mode Share

Mode	Travel Demand (Trips per Year)		Mode Share (Percentage by Mode)	
	San Antonio - Laredo	San Antonio - Brownsville	San Antonio - Laredo	San Antonio - Brownsville
Auto	7,155,070	43,320,812	97.17%	97.85%
Passenger Rail	-	-	-	-
Intercity Bus	208,442	863,321	2.83%	1.95%
Air	-	86,698	-	0.20%

Table 4-10 presents the travel time (in minutes) between city pairs by mode. Intercity bus is generally comparable to highway travel in terms of travel time.

Table 4-10: Travel Time by Mode

Mode	Travel Time (minutes)				
	San Antonio – Laredo	San Antonio – Corpus Christi	Laredo – Brownsville	Corpus Christi – Brownsville	Austin - San Antonio
Auto	149	125	235	210	86
Passenger Rail	-.	-	-	-	143
Intercity Bus	160	157	285	231	95
Air	-	-	-	-	-

4.1.3.2.2 Existing Level of Service

Table 4-11 presents the level of service by mode between city pairs.

Table 4-11: Existing Levels of Service

Mode	Existing Levels of Service (Daily number of trains, buses or direct flights)				
	San Antonio – Laredo	San Antonio – Corpus Christi	Laredo – Brownsville	Corpus Christi – Brownsville	Austin - San Antonio
Passenger Rail	-.	-	-	-	1 train
Intercity Bus	12 buses	5 buses	1 bus-	6 buses-	17 buses
Air	-	-	-	-	-

4.1.3.2.3 Existing Vehicle Miles Traveled

Table 4-12 presents the existing average annual VMT for the Southern Section.

Table 4-12: Existing Vehicle Miles Traveled

Vehicle Miles Traveled (per Year)[a]	
San Antonio – Laredo	454,243,056
San Antonio – Brownsville[a]	2,895,896,201

[a] The VMT for the Southern Section were modelled for each alternative based on the market segment identified for each alternative. VMT between San Antonio and Brownsville includes additional travel through Alice, Corpus Christi, McAllen, and Harlingen.

5.0 Travel Demand and Transportation – Environmental Consequences

This section compares the alternatives on their ability to meet the projected intercity travel demand and documents the anticipated changes to traffic patterns by alternative, including changes in mode share, travel time, travel time reliability (for passenger rail and autos), and VMT. The section also presents the projected station boardings for each alternative. A qualitative discussion of potential effects on air carriers, intercity transit service providers, and freight operations is also provided. The analysis presented is for the 2035 conditions only.

With all of the build alternatives, highway, bus, and air travel decreases as users are diverted from these modes to the new rail service. Based on the broad assessment conducted, increases in mode share to rail could provide both negative and beneficial effects across all mode choices. For highway travel, the decrease in mode share would be a beneficial effect, based on users being encouraged to use transit and reduce congestion on highways, which could also provide a secondary benefit to bus service providers. Likewise, the increase in mode share for passenger rail is considered a beneficial effect of the project.

The diversion of intercity bus and air travelers to the rail system may yield additional benefits by providing a mode choice for travelers, travel time savings, and increased schedule reliability. For air carriers, the potential benefits may include the opportunity to shift from short-haul to longer-haul flight operations, which may include more reliable scheduling and increased revenue.

There are also negative effects for bus and air travel carriers, since a reduction in their mode share would affect intercity bus service providers and air carrier operations (e.g., existing demand, schedule adjustments/reductions, and revenue). The shift in mode share and the corresponding effects are discussed further throughout the alternative sections, and the results vary from negligible to substantial, depending on the alternative.

For example, automobile drivers do not typically switch to transit without significant gains in travel time or reductions in cost. Compared with the No Build Alternative, the build alternatives save travelers time compared with highway travel in most cases (high-speed service providing the most time savings), with time savings generally increasing as the trip length increases or for urban areas where congestion levels are forecast to increase and highway travel time increases.

Travel time reliability is another beneficial effect of the project. Trains operate on a scheduled service within a dedicated right-of-way and are not subject to fluctuations in traffic congestion. Highway travel time reliability will vary from location to location, depending on future traffic conditions in the area. In general, the Build Alternatives provide travel time reliability for train travelers, compared with expected increases in highway drive times. A reduction in VMT is also a beneficial effect of the project. VMT changes vary by alternative, from negligible changes (less than 1 percent) to substantial changes (5 percent).

The potential effects, beneficial or negative, from air carrier operations, which may include shifting their existing short-haul flights to longer-haul flights, have not been assessed as part of this service-level analysis (see Draft EIS, Section 3.20.6, Subsequent Analysis).

5.1 Northern Section: Oklahoma City to Dallas and Fort Worth

In the Northern Section, only one alternative and the No Build Alternative were carried forward for further evaluation. Alternative N4A would follow the same general alignment within Dallas and Fort Worth as several of the alternatives in the Central Section.

5.1.1 No Build Alternative

A description of the No Build Alternative is provided in Section 1.2.1. A quantitative comparison of the No Build Alternative and Alternative N4A is provided in the following sections. The No Build Alternative would not implement the Program of rail improvements associated with this service-level evaluation and would not meet the purpose and need of the Program. The No Build Alternative is carried forward as a baseline alternative and provides an alternative for comparative evaluation of the advantages and disadvantages of the build alternatives. Under the No Build Alternative, it is assumed that the level of service for rail, bus, and air would remain the same. There would be no increase in rail ridership because there would be no expanded rail service and there would be no diversion of bus ridership and air travel to rail. There would be no effect on these modes and no effect on intercity transit service providers and air carriers because operations would remain the same. The benefits of fewer VMT (lower congestion, increased transit use, etc.) would not be realized with the No Build Alternative. There would be no effects on local transportation (e.g., roadway and intersection operations, parking demand) with the No Build Alternative because there would be no change in mode shift or demand.

5.1.2 Alternative N4A Conventional

Alternative N4A would increase the existing passenger rail service between Oklahoma City and Dallas and Fort Worth from one daily train to six daily trains, as well as providing an expanded route north to Edmond, Oklahoma.

5.1.2.1.1 Travel Demand and Mode Share

Table 5-1 presents the projected yearly ridership and mode share for the No Build Alternative and Alternative N4A.

Table 5-1: 2035 Travel Demand and Mode Share – Alternative N4A

Mode	Travel Demand (Trips per Year)		Mode Share (Percentage by Mode)	
	No Build	N4A	No Build	N4A
Oklahoma City – Dallas – Fort Worth				
Auto	38,115,278	37,875,193	99.0%	97.8%
Passenger Rail	109,028	702,034	0.3%	1.8%
Intercity Bus	130,272	65,711	0.3%	0.2%
Air	147,588	83,313	0.4%	0.2%

Under Alternative N4A, highway, bus, and air travel would decrease as users would be diverted from these modes to the new rail service. For highway travel, the decrease in mode share would be a beneficial effect. Users would be encouraged to use transit and reduce congestion on highways as a result of having a new mode choice. Likewise, the increase in mode share for passenger rail would be a beneficial effect for the Northern Section. For bus and air travel, a reduction in mode share would be a negative effect as this change would affect intercity bus service providers and air carriers' operations (e.g., demand, schedule, and revenue).

Under Alternative N4A, the reduction in mode share for highway travel would be less than 2 percent, which would be a negligible change. The increase in mode share for passenger rail would be substantial. Passenger rail ridership is forecast to increase to over 700,000 passengers per year, a 500 percent increase in mode share over the 2035 No Build Alternative. For bus and air, the shift in mode share would be substantial. The mode share for bus would decrease by 33 percent and the mode share for air would decrease by 50 percent. The ridership data (including diverted trips and induced demand) are described in further detail in the Passenger Rail Ridership section.

5.1.2.1.2 Travel Time Savings

Table 5-2 provides a comparison of the projected travel time for the different modes.

Table 5-2: 2035 Travel Time Comparison by Mode – Alternative N4A

Mode	Travel Time (minutes)[a]		
	Oklahoma City – Dallas	Oklahoma City – Fort Worth	Dallas – Fort Worth
Highways	225	219	40
Passenger Rail	418	238	60
With N4A[b]	266	217	41
Intercity Bus	391	473	72
Air	52	59	-

[a] Except for passenger rail, travel time is assumed to be the same for the No Build Alternative and Alternative N4A.

[b] Estimated passenger rail time with Alternative N4A.

It is assumed that there would be no significant difference in travel time between the No Build Alternative and Alternative N4A for autos, bus, and air because these modes would not see a significant change in their travel times after the rail service is introduced. While there would be travel times saved for those who elect to use the new passenger rail system, there would be no significant travel time savings for those users who continue to use their existing modes. For example, the removal of a few thousands cars per day on roads with 100,000 cars or more per day, such as IH-35, would not affect the congestion significantly enough to improve travel times on the road. Similarly, the few hundreds of air and bus travelers removed from the existing planes and buses would not affect plane frequency and bus frequency or their travel times, so the remaining air and bus travelers (who continue to use air or bus travel) will not see any reduction in their travel times.

Therefore, this analysis focuses on the travel time savings for rail users compared to the other modes. Under Alternative N4A, rail and highway travel times would be similar; therefore, Alternative N4A would have a negligible effect on travel time compared with highway travel. There would be improvements in passenger rail travel time under Alternative N4A. The travel time improvements are due to increases in rail frequency, as well as better rail connections between the cities in the Northern Section. Passenger rail service between Oklahoma City and Dallas would take approximately 2.5 hours less than the No Build Alternative, approximately 20 minutes less between Oklahoma City and Fort Worth, and approximately 20 minutes less between Fort Worth and Dallas. Alternative N4A would have a beneficial effect on passenger rail travel time savings.

Alternative N4A would also provide significant travel time savings compared to intercity bus travel. Under Alternative N4A conventional, passenger rail service would take approximately 3.5 to 4 hours (217 to 266 minutes) between Oklahoma City and the Dallas and Fort Worth area. However, it is predicted that future bus travel would take up to 8 hours (473 minutes).

5.1.2.1.3 Travel Time Reliability

Highway travel time is projected to increase over the next 20 years as a result of general increases in VMT and future highway congestion. By 2035, highway travel time between Oklahoma City and Dallas is projected to increase by 16 minutes, travel time between Oklahoma City and Fort Worth is projected to increase by 19 minutes, and travel time between Fort Worth and Dallas is projected to increase by 4 minutes. These increases in future highway travel time would be minor, so reliability for highway travel is expected to remain relatively good. Under Alternative N4A, there would be a negligible difference in travel time reliability for train travelers, compared with highway travel.

5.1.2.1.4 Passenger Rail Ridership

Table 5-3 provides a summary of the projected rail ridership with Alternative N4A at the corridor level, as well as for the Oklahoma City and Dallas urban markets. Figure 5-1 illustrates the projected rail ridership composition for Alternative N4A.

It is assumed that the rail ridership will be a combination of trips that are diverted from other modes to rail and induced demand for the new service.

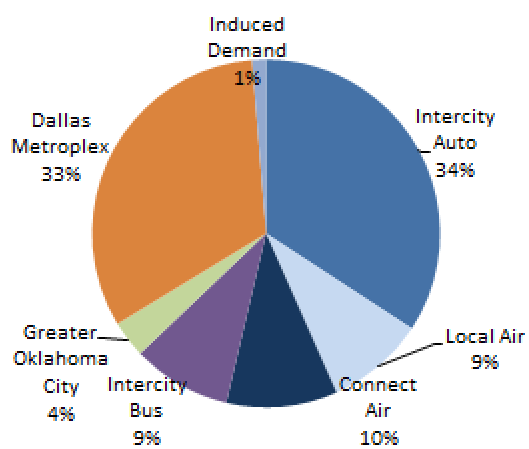


Figure 5-1: Alternative N4A Ridership Composition

The table presents the number of trips and the percentage of trips that would be diverted from other modes to rail. It also shows the composition of the total rail trips by mode. For example, there are 38,115,278 potential auto trips that could be diverted to rail. It is projected that 240,085 of these auto trips (approximately 1 percent) would be diverted to rail. In total, 702,033 new rail trips are projected. Of these new rail trips, 240,085 trips, or 34 percent, are trips that are diverted from auto trips or other modes.

For the new rail trips (over 700,000 riders), the highest percentage would be shifts from auto trips (34 percent), followed by connect air (10 percent), and local air and bus trips (9 percent). Intercity bus would have the highest percentage of its trips diverted to rail (50 percent), followed by local air (44 percent), connect air (3 percent), and auto trips (1 percent).

Table 5-3: 2035 Intercity Rail Ridership – Alternative N4A

Ridership Composition by Mode	Divertible Market	N4A Rail Riders	Diversion Percentage	N4A Rail Ridership Composition
(Passengers per Year)				
Total Intercity Ridership	40,770,643	**441,407**	1%	
Auto	38,115,278	240,085	1%	34%
Local Air[a]	147,588	64,276	44%	9%
Connect Air[b]	2,377,505	72,485	3%	10%
Bus	130,272	64,561	50%	9%
Total Urban Ridership		**251,550**		
Greater Oklahoma City[c]		24,047		4%
Dallas Metroplex[d]		227,503		33%
Induced Demand[e]		**9,076**		1%
Total Intercity and Urban Ridership[f]		**702,033**		

[a] Air travelers whose entire trip is within the corridor area.
[b] Air travelers for whom only one end of their trip falls within the corridor area.
[c] Trips that begin and end within the larger Oklahoma City area.
[d] Trips that begin and end within the Dallas Metroplex.
[e] HSR riders who would not have made the trip by another mode.
[f] The sum of diverted and induced demand for HSR.

5.1.2.1.5 Station Boardings

The total boardings at each station are presented in Table 5-4. The top three station boardings are anticipated to occur in the Dallas and Fort Worth area.

Table 5-4: 2035 Rail Station Boardings – Alternative N4A

Station	Boardings (Passengers per Year)	Station Rank
Edmond	29,270	8
Oklahoma City	106,740	4
Norman	36,902	7
Purcell	6,370	10

Station	Boardings (Passengers per Year)	Station Rank
Pauls Valley	11,462	9
Ardmore	38,925	6
Gainesville	58,361	5
Fort Worth/ITC	134,746	2
Centreport	133,792	3
Dallas/DUS	136,391	1
Total	**692,958**	

5.1.2.1.6 Vehicle Miles Traveled

Regional and corridor effects on highway congestion can be measured through changes in VMT. The ability of the rail alternatives to alter travel patterns on a regional basis can also be evaluated through the number of auto trips taken and corresponding changes in VMT. Table 5-5 presents the estimated changes in annual VMT with the No Build Alternative and Alternative N4A.

Table 5-5: 2035 Vehicle Miles Traveled – Alternative N4A

	Vehicle Miles Traveled (per Year)		
	No Build	N4A	Change
Oklahoma City – Dallas – Fort Worth	2,047,593,985	2,035,630,281	-11,963,704 / -0.6%

The existing VMT in the Northern Section is projected to increase from 1.3 billion annual VMT to 2 billion annual VMT by 2035 under the No Build Alternative scenario. The increase in VMT by 2035 is primarily attributed to population growth in the region. The diversion of auto trips to rail under Alternative N4A would result in a 0.6 percent reduction in VMT compared with the No Build Alternative. This equates to nearly 12 million fewer VMT each year. The decrease in VMT is a beneficial, although negligible, effect of Alternative N4A.

5.1.2.1.7 Local Effects on Transportation and Parking

Alternative N4A would primarily use the existing rail infrastructure and stations. It would not likely result in permanent grade crossing closures that could impact local circulation. Local traffic volumes and parking demand would increase around and at the stations due to increases in ridership and longer wait times would occur at grade crossings. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.1.2.1.8 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

Under Alternative N4A, approximately 50 percent of existing bus riders and 44 percent of air passengers would be diverted to rail. While the new rail service would yield benefits for travelers by providing an alternative transportation option, transit operators and airlines themselves could be negatively affected by a reduction in passengers. This diversion could result in substantial effects on service provider operations (e.g., demand and schedule) and lost revenue as a result of fewer customers.

Alternative N4A would provide passenger rail service on the existing BNSF track, with potential improvements within the existing BNSF right-of-way. Once operational, there would be no change to the existing freight routes. Freight operations could be affected by the increase in passing trains, from one train per day to six trains per day. However, the long-term improvements to the rail system would offset any adverse effects on freight service. Based on this assessment, the qualitative evaluation is that the local effects on freight operations are negligible.

5.2 Central Section: Dallas and Fort Worth to San Antonio

In the Central Section, six alternatives and the No Build Alternative were carried forward for further evaluation. All of the alternatives in the Central Section (Alternative C4A [both service types] and Alternative C4B [both service types]) and Alternative C4C [both service types]) follow the same alignment from Hillsboro to San Antonio (see Figure 1-1).

5.2.1 No Build Alternative

A description of the No Build Alternative is provided in Section 1.2.1. The potential effects of not building the project in the Central Section would be similar to those described for the Northern Section. A quantitative comparison of the No Build Alternative and the build alternatives for the Central Section is provided in the following sections.

5.2.2 Alternative C4A High-Speed Rail

5.2.2.1.1 Travel Demand and Mode Share

Table 5-6 presents the projected travel demand and mode share for the No Build Alternative and Alternative C4A High-Speed Rail.

Table 5-6: 2035 Travel Demand and Mode Share – Alternative C4 HSR

Mode	Travel Demand (Trips per Year)		Mode Share (Percentage by Mode)	
	No Build	C4A HSR	No Build	C4A HSR
Dallas – Fort Worth – San Antonio				
Auto	34,453,728	31,668,952	91.74%	76.52%
Passenger Rail	77,575	8,193,483	0.21%	19.80%
Intercity Bus	1,218,438	949,310	3.24%	2.29%
Air	1,806,931	575,327	4.81%	1.39%

Under Alternative C4A High-Speed Rail, highway, bus, and air travel would decrease as users are diverted from these modes to the new rail service. Under Alternative C4A High-Speed Rail, the reduction in mode share for highway travel would 16 percent, which represents a moderate effect. The increase in mode share for passenger rail represents a substantial effect, with passenger rail ridership is forecast to increase to over 8 million passengers per year, a 9,000 percent increase. For bus and air, the shift in mode share would also represent a substantial effect. The mode share for bus would decrease by 29 percent and the mode share for air would decrease by 71 percent. The ridership data (including diverted trips and induced demand) are described in further detail in the Passenger Rail Ridership section.

5.2.2.1.2 Travel Time Savings

Table 5-7 provides a comparison of the projected travel time between modes. It is assumed that there would be no difference in travel time between the No Build Alternative and Alternative C4A High-Speed Rail for autos, bus, and air.

With the exception of air, Alternative C4A High-Speed Rail would provide significant travel time savings across all modes. For example, the new passenger rail service would take approximately 2 hours (115 minutes) between Dallas and San Antonio, compared to over 5.5 hours (338 minutes) by car. The time savings associated with Alternative C4A High-Speed Rail would be a substantial beneficial effect compared with the No Build Alternative.

Table 5-7: 2035 Travel Time Comparison by Mode – Alternative C4A High-Speed Rail

Mode	Travel Time (minutes)[a]				
	Dallas – San Antonio	Fort Worth – San Antonio	Dallas – Austin	Fort Worth – Austin	Austin – San Antonio
Auto	338	332	238	232	103
Passenger Rail	605	465	392	252	143
With C4A HSR[b]	115	163	74	122	39
Intercity Bus	327	409	220	292	95
Air	62	68	55	62	-

[a] Except for passenger rail, travel time is assumed to be the same for the No Build and C4A HSR alternatives.

[b] Estimated passenger rail time with Alternative C4A HSR.

5.2.2.1.3 Travel Time Reliability

The Central Section will generally experience moderate increases in highway travel time by 2035, particularly between the larger metropolitan areas. For instance, by 2035, highway travel time between Dallas and San Antonio and Fort Worth and San Antonio is projected to increase by approximately 50 minutes as a result of general increases in congestion. Alternative C4A High-Speed Rail would provide travel time reliability between these areas for train travelers, compared to the expected increases in highway drive times and potential unexpected delays. Under Alternative C4A High-Speed Rail there would be a substantial difference and beneficial effect in travel time reliability compared to highway travel.

5.2.2.1.4 Passenger Rail Ridership

Table 5-8 provides a summary of the projected rail ridership under Alternative C4A High-Speed Rail at both the corridor level, as well as for the Dallas and Austin/San Antonio urban markets. Figure 5-2 illustrates the projected ridership composition for Alternative C4A High-Speed Rail.

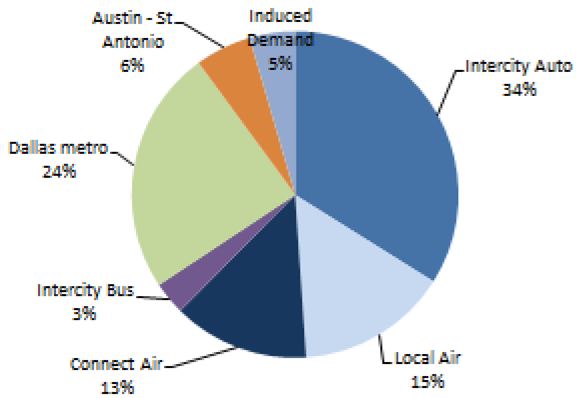


Figure 5-2: Alternative C4A HSR Ridership Composition

For the new rail trips (over 8 million riders), the highest percentage would be shifts from auto trips (34 percent), followed by local air (15 percent), connect air (13 percent) and bus trips (3 percent). Local air would have the highest percentage of its trips diverted to rail (68 percent), followed by bus (22 percent), auto trips (8 percent), and connect air (7 percent).

Table 5-8: 2035 Intercity Rail Ridership – Alternative C4A High-Speed Rail

Ridership Composition by Mode	Divertible Market	C4A HSR Riders	Diversion Percentage	C4A HSR Ridership Composition
(Passengers per Year)				
Total Intercity Ridership	53,076,654	**5,391,666**	10%	
Auto	34,453,728	2,784,776	8%	34%
Local Air[a]	1,806,931	1,231,604	68%	15%
Connect Air[b]	15,597,557	1,106,158	7%	13%
Bus	1,218,438	269,128	22%	3%
Total Urban Ridership		**2,449,206**		
Dallas Metroplex[c]		1,991,898		24%
Austin - San Antonio Area[d]		457,308		6%
Induced Demand[e]		**352,611**		5%
Total Intercity and Urban Ridership[f]		**8,193,484**		

[a] Air travelers whose entire trip is within the corridor area.

[b] Air travelers for whom only one end of their trip falls within the corridor area.

[c] Trips that begin and end within the Dallas Metroplex.

[d] Trips that begin and end within the Austin – San Antonio area.

[d] HSR riders who would not have made the trip by another mode.

[f] The sum of diverted and induced demand for HSR.

5.2.2.1.5 Station Boardings

Table 5-9 presents the station boardings for Alternative C4A High-Speed Rail. Dallas would have the highest number of station boardings, followed by Austin and DFW.

Table 5-9: 2035 Station Boardings – Alternative C4A High-Speed Rail

Station	Boardings (Passengers per Year)	Station Rank
Fort Worth/ITC	437,890	6
DFW	1,333,814	3
Dallas/DUS	1,891,246	1
Waxahachie	534,323	5
Waco	386,128	8
Temple	437,355	7
Austin Airport	1,484,705	2
SAT Airport	1,003,250	4
San Antonio/VIA	332,161	9
Total	**7,840,872**	

5.2.2.1.6 Vehicle Miles Traveled

Table 5-10 summarizes the projected 2035 VMT under the No Build Alternative and Alternative C4A High-Speed Rail. Implementation of Alternative C4A High-Speed Rail would result in an 8.6 percent decrease in VMT in the Central Section, compared to the No Build Alternative. This would be a substantial beneficial effect on VMT.

Table 5-10: 2035 Vehicle Miles Traveled – Alternative C4A High-Speed Rail

	Vehicle Miles Traveled (per Year)		
	No Build	C4A HSR	Change
Dallas – Fort Worth – San Antonio	2,742,367,985	2,507,423,895	-234,944,090/ -8.57%

5.2.2.1.7 Local Effects on Transportation and Parking

Alternative C4A High-Speed Rail would begin in Fort Worth and follow the TRE tracks east to Dallas. From Dallas, it would follow the BNSF alignment south toward Waxahachie where it would enter a new alignment outside existing highway and rail corridors. The entire right-of-way would be fenced and fully grade-separated. Once constructed, there would be no effect on local traffic circulation because of the grade separated tracks. Local traffic volumes and parking demand would increase around and at the stations due to both increases and new demand in rail ridership and longer wait times would occur at grade crossings. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.2.2.1.8 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

Under Alternative C4A High-Speed Rail, approximately 20 percent of existing bus riders and 70 percent of air passengers would be diverted to rail. While the diversion of intercity bus and air travelers to the rail system will yield benefits for travelers by providing an alternative transportation option, transit operators and airlines themselves could be negatively affected by a reduction in passengers. The new rail service could result in moderate (for transit) to substantial (for air) effects on service provider operations (e.g., demand, schedule) and lost revenue as a result of fewer customers.

Within existing transportation corridors, the high-speed rail alternative would not have the required space for separation of freight and passenger rail and freight operations could be affected by an increase in the number of passing trains. The long-term improvements to the rail system would offset any adverse effects on freight service. Based on this assessment, the qualitative evaluation is that the local effects on freight operations are negligible. Within proposed new transportation corridors, passenger rail tracks would be constructed within a separate right-of-way and there would be no effect on freight operations.

5.2.3 Alternative C4A Higher-Speed Rail

5.2.3.1 Travel Demand and Mode Share

Table 5-11 presents the projected travel demand and mode share for the No Build Alternative and Alternative C4A Higher-Speed Rail.

Table 5-11: 2035 Travel Demand and Mode Share – Alternative C4A Higher-Speed Rail

Mode	Travel Demand (Trips per Year)		Mode Share (Percentage by Mode)	
	No Build	C4A HrSR	No Build	C4A HrSR
Dallas – Fort Worth – San Antonio				
Auto	36,912,196	35,679,819	92.18%	82.71%
Passenger Rail	77,575	5,271,829	0.19%	12.22%
Intercity Bus	1,238,394	1,061,409	3.09%	2.46%
Air	1,815,699	1,125,615	4.53%	2.61%

Under Alternative C4A Higher-Speed Rail, the reduction in mode share for highway travel would be 10 percent, which represents a moderate effect. The increase in mode share for passenger rail represents a substantial effect. Passenger rail ridership is forecast to increase to over 5 million passengers per year, an increase of more than over 6,000 percent. The shift in mode share represents a moderate effect for bus and a substantial effect for air. The mode share for bus would decrease by 20 percent and the mode share for air would decrease by 42 percent. The ridership data (including diverted trips and induced demand) are described in further detail in the Passenger Rail Ridership section.

5.2.3.1.1 Travel Time Savings

Table 5-12 provides a comparison of the projected travel time between modes. It is assumed that there would be no difference in travel time between the No Build Alternative and Alternative C4A Higher-Speed Rail for autos, bus, and air.

With the exception of air, Alternative C4A Higher-Speed Rail would provide significant travel time savings across all modes, although to a lesser extent than Alternative C4A High-Speed Rail. For example, the new passenger rail service would take approximately 3 hours (190 minutes) between Dallas and San Antonio, compared to over 5.5 hours (338 minutes) by car. The time savings under Alternative C4A Higher-Speed Rail would be a substantial beneficial effect compared with the No Build Alternative.

Table 5-12: 2035 Travel Time Comparison by Mode – Alternative C4A Higher-Speed Rail

Mode	Travel Time (minutes)[a]				
	Dallas – San Antonio	Fort Worth – San Antonio	Dallas – Austin	Fort Worth – Austin	Austin – San Antonio
Auto	338	332	238	232	103
Passenger Rail	605	465	392	252	143
With C4A HrSR[b]	190	238	131	179	57
Intercity Bus	327	409	220	292	95
Air	62	68	55.	62	-

[a] Except for passenger rail, travel time is assumed to be the same for the No Build and C4A HrSR alternatives.

[b] Estimated passenger rail time with Alternative C4A HrSR.

5.2.3.1.2 Travel Time Reliability

As previously discussed, the Central Section will generally experience moderate increases in highway travel time by 2035, particularly between the larger metropolitan areas. By 2035, highway travel time between Dallas and San Antonio and Fort Worth and San Antonio is projected to increase by approximately 50 minutes. Alternative C4A Higher-Speed Rail would provide travel time reliability between these areas for train travelers, compared to the expected increases in highway drive times and potential unexpected delays. Under Alternative C4A Higher-Speed Rail there would be a substantial difference and corresponding effect in travel time reliability compared to highway travel.

5.2.3.1.3 Passenger Rail Ridership

Table 5-13 provides a summary of the projected rail ridership under Alternative C4A Higher-Speed Rail at both the corridor level, as well as for the Dallas and Austin/San Antonio urban markets. Figure 5-3 illustrates the projected ridership composition for this alternative.

For the new rail trips (approximately 5.3 million riders), the highest percentage would be shifts from auto trips (23 percent), followed by connect air (15 percent), local air (13 percent) and bus trips (3 percent). Local air would have the highest percentage of its trips diverted to rail (38 percent), followed by bus (14 percent), connect air (5 percent), and auto trips (3 percent).

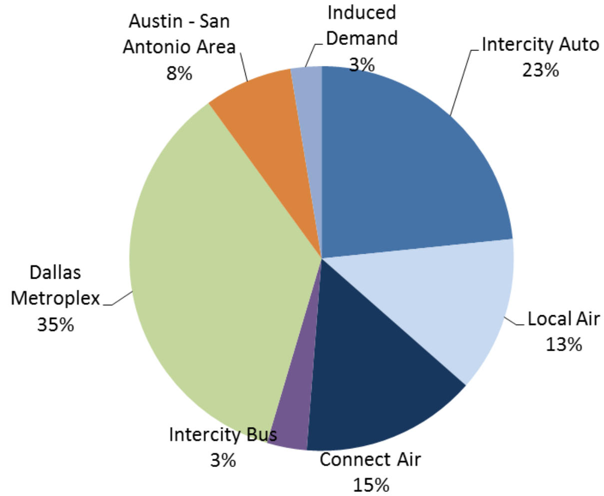


Figure 5-3: Alternative C4A HrSR Ridership Composition

Table 5-13: 2035 Intercity Rail Ridership – Alternative C4A Higher-Speed Rail

Ridership Composition by Mode	Divertible Market	C4A HrSR Riders	Diversion Percentage	C4A HrSR Ridership Composition
(Passengers per Year)				
Total Intercity Ridership	55,568,425	**2,877,995**	5%	
Auto	36,912,196	1,232,377	3%	23%
Local Air[a]	1,815,945	690,084	38%	13%
Connect Air[b]	15,601,890	778,549	5%	15%
Bus	1,238,394	176,985	14%	3%
Total Urban Ridership		**2,256,911**		
Dallas Metroplex[c]		1,865,274		35%
Austin - San Antonio Area[d]		391,637		8%
Induced Demand[e]		**136,923**		3%
Total Intercity and Urban Ridership[f]		**5,271,829**		

[a] Air travelers whose entire trip is within the corridor area.

[b] Air travelers for whom only one end of their trip falls within the corridor area.

[c] Trips that begin and end within the Dallas Metroplex.

[d] Trips that begin and end within the Austin – San Antonio area.

[e] HSR riders who would not have made the trip by another mode.

[f] The sum of diverted and induced demand for HSR.

5.2.3.1.4 Station Boardings

Table 5-14 presents the station boardings for Alternative C4A Higher-Speed Rail. Dallas would have the highest number of station boardings, followed by DFW and the Austin airport.

Table 5-14: Station Boardings – Alternative C4A Higher-Speed Rail

Station	Boardings (Passengers per Year)	Station Rank
Fort Worth/ITC	285,041	7
DFW	1,056,400	2
Dallas/DUS	1,275,484	1
Waxahachie	389,194	5
Waco	259,800	8
Temple	335,832	6
Austin CBD	53,622	10
Austin Airport	756,168	3
SAT Airport	553,748	4
San Antonio/VIA	169,616	9
Total	**5,134,905**	

5.2.3.1.5 Vehicle Miles Traveled

Table 5-15 summarizes the projected 2035 VMT under the No Build Alternative and Alternative C4A Higher-Speed Rail. Implementation of Alternative C4A Higher-Speed Rail would result in a 3.1 percent decrease in annual VMT in the Central Section, compared with the No Build Alternative. This would be a moderate beneficial effect on VMT.

Table 5-15: 2035 Vehicle Miles Traveled – Alternative C4A Higher-Speed Rail

	Vehicle Miles Traveled (per Year)		
	No Build	C4A HrSR	Change
Dallas – Fort Worth – San Antonio	2,811,060,425	2,722,809,840	-88,250,585/ -3.14%

5.2.3.1.6 Local Effects on Transportation and Parking

Alternative C4A Higher-Speed Rail would have similar effects on transportation and parking as those described for Alternative C4A High-Speed Rail. However, unlike high-speed rail, the higher-speed rail design would include some grade crossings, which would affect local traffic circulation. Local traffic volumes and parking demand would increase around and at the stations due to both increases and new demand in rail ridership and longer wait times would occur at grade crossings. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.2.3.1.7 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

Alternative C4A Higher-Speed Rail would have similar effects on intercity transit providers and air carriers as those described for Alternative C4A High-Speed Rail, but at a lesser intensity. Under Alternative C4A Higher-Speed Rail, approximately 14 percent of existing bus riders and 38 percent of air passengers would be diverted to rail. The new rail service could result in moderate (for transit) to substantial (for air) effects on service provider operations (e.g., demand, schedule) and lost revenue as a result of fewer customers.

The design of the higher-speed rail alternative, within existing railroad rights-of-way, would allow for a shared right-of-way with separate tracks for freight and passenger services. The long-term improvements to the rail system would offset any adverse effects on freight service. Based on this assessment, the qualitative evaluation is that the local effects on freight operations are negligible.

5.2.4 Alternative C4B High-Speed Rail

5.2.4.1 Travel Demand and Mode Share

Table 5-16 presents the projected travel demand and mode share for the No Build Alternative and Alternative C4B High-Speed Rail.

Table 5-16: 2035 Travel Demand and Mode Share – Alternative C4B High-Speed Rail

Mode	Travel Demand (Trips per Year)		Mode Share (Percentage by Mode)	
	No Build	C4B HSR	No Build	C4B HSR
	Dallas – Fort Worth – San Antonio			
Auto	34,486,594	31,528,524	91.75%	78.74%
Passenger Rail	77,575	7,039,557	0.21%	17.58%
Intercity Bus	1,218,248	932,764	3.24%	2.33%
Air	1,805,925	538,644	4.80%	1.35%

Under Alternative C4B High-Speed Rail, the reduction in mode share for highway travel would be 14 percent, which represents a moderate effect. The increase in mode share for passenger rail would be substantial. Passenger rail ridership is forecast to increase to over 7 million passengers per year, an over 8,000 percent increase. For bus and air, the shift in mode share would be substantial. The mode share for bus would decrease by 28 percent and the mode share for air would decrease by 72 percent. The ridership data (including diverted trips and induced demand) are described in further detail in the Passenger Rail Ridership section.

5.2.4.1.1 Travel Time Savings

Table 5-17 provides a comparison of the projected travel time between modes. It is assumed that there would be no difference in travel time between the No Build Alternative and Alternative C4B High-Speed Rail for auto, bus, and air.

With the exception of air, Alternative C4B High-Speed Rail would provide significant travel time savings across all modes. For example, the new passenger rail service would take approximately 2 hours (127 minutes) between Dallas and San Antonio, compared with over 5.5 hours (338 minutes) by car. The time savings associated with Alternative C4B High-Speed Rail would be a substantial beneficial effect compared with the No Build Alternative.

Table 5-17: 2035 Travel Time Comparison by Mode – Alternative C4B High-Speed Rail

Mode	Travel Time (minutes)[a]				
	Dallas – San Antonio	Fort Worth – San Antonio	Dallas – Austin	Fort Worth – Austin	Austin – San Antonio
Auto	338	332	238	232	103
Passenger Rail	605	465	392	252	143
With C4B HSR[b]	127	134	86	93	39
Intercity Bus	327	409	220	292	95
Air	62	68	55	62	-

[a] Except for passenger rail, travel time is assumed to be the same for the No Build and C4B HSR alternatives.

[b] Estimated Passenger rail time with Alternative C4B HSR.

5.2.4.1.2 Travel Time Reliability

As previously discussed, the Central Section will generally experience moderate increases in highway travel time by 2035, particularly between the larger metropolitan areas. By 2035, highway travel time between Dallas and San Antonio and Fort Worth and San Antonio is projected to increase by approximately 50 minutes. Alternative C4B High-Speed Rail would provide travel time reliability between these areas for train travelers, compared with the expected increases in highway drive times and potential unexpected delays. Under Alternative C4B High-Speed Rail there would be a substantial difference and corresponding effect in travel time reliability compared to highway travel.

5.2.4.1.3 Passenger Rail Ridership

Table 5-18 provides a summary of the projected rail ridership with Alternative C4B High-Speed Rail at the corridor level, as well as for the Dallas and San Antonio urban markets. Figure 5-4 illustrates the projected rail ridership composition for this alternative.

For the new rail trips (over 7 million riders), the highest percentage would be shifts from auto trips (42 percent),

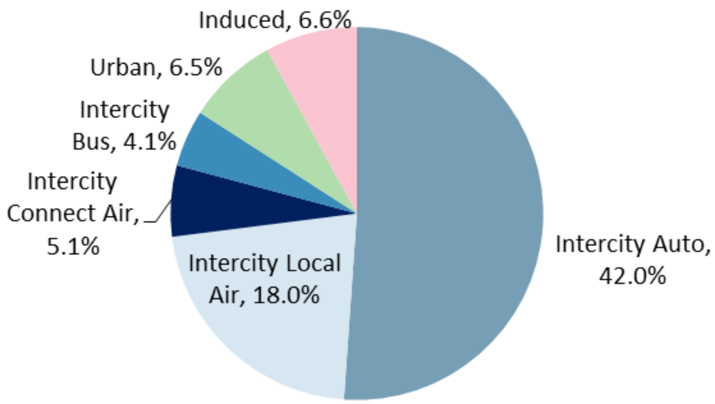


Figure 5-4: Alternative C4B HSR Ridership Composition

followed by local air (18 percent), connect air (5 percent) and bus trips (4 percent). Local air would have the highest percentage of its trips diverted to rail (70 percent), followed by bus (23 percent), auto trips (9 percent), and connect air (2 percent).

Table 5-18: 2035 Intercity Rail Ridership – Alternative C4B High-Speed Rail

Ridership Composition by Mode	Divertible Market	C4B HSR Riders	Diversion Percentage	C4B HSR Ridership Composition
(Passengers per Year)				
Total Intercity Ridership	53,116,035	**4,867,251**	9%	
Auto	34,486,594	2,958,069	9%	42%
Local Air[a]	1,805,925	1,267,281	70%	18%
Connect Air[b]	15,605,268	356,415	2%	5%
Bus	1,218,248	285,484	23%	4%
Total Urban Ridership		**1,709,043**		
Dallas Metroplex[c]		1,251,735		18%
Austin - San Antonio Area[d]		457,308		6%
Induced Demand[e]		463,263		7%
Total Intercity and Urban Ridership[f]		**7,039,557**		

[a] Air travelers whose entire trip is within the corridor area.

[b] Air travelers for whom only one end of their trip falls within the corridor area.

[c] Trips that begin and end within the Dallas Metroplex.

[d] Trips that begin and end within the Austin – San Antonio area.

[e] HSR riders who would not have made the trip by another mode.

[f] The sum of diverted and induced demand for HSR.

5.2.4.1.4 Station Boardings

The total boardings at each station are presented in Table 5-19. Dallas is anticipated to have the highest number of station boardings, with over 1.5 million boardings.

Table 5-19: Station Boardings – Alternative C4B High-Speed Rail

Station	Boardings (Passengers per Year)	Station Rank
Fort Worth/ITC	367,014	6
Dallas/DUS	1,561,524	1
Arlington	1,242,363	3
Waco	363,667	7
Temple	445,286	5
Austin Airport	1,378,145	2
SAT Airport	871,740	4
San Antonio/VIA	346,554	8
Total	**6,576,294**	

5.2.4.1.5 Vehicle Miles Traveled

Table 5-20 summarizes the projected 2035 VMT under the No Build Alternative and Alternative C4B High-Speed Rail. Implementation of Alternative C4B High-Speed Rail would result in a 9 percent decrease in VMT in the Central Section, compared with the No Build Alternative. This would be a substantial beneficial effect on VMT.

Table 5-20: 2035 Vehicle Miles Traveled – Alternative C4B High-Speed Rail

	Vehicle Miles Traveled (per Year)		
	No Build	C4B HSR	Change
Dallas – Fort Worth – San Antonio	2,748,517,876	2,496,018,505	-252,499,371/ -9.19%

5.2.4.1.6 Local Effects on Transportation and Parking

Alternative C4B High-Speed Rail would have similar effects on transportation and parking as those described for Alternative C4A High-Speed Rail. As a high-speed rail alternative, the entire right-of-way would be fenced and fully grade-separated. Once constructed, there would be no effect on local traffic circulation because of the grade separated tracks. Local traffic volumes and parking demand would increase around and at the stations due to both increases and new demand in rail ridership and longer wait times would occur at grade crossings. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.2.4.1.7 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

Under Alternative C4B High-Speed Rail, approximately 23 percent of existing bus riders and 70 percent of air passengers would be diverted to rail. The new rail service could result in moderate (for transit) to substantial (for air) effects on service provider operations (e.g., demand, schedule) and lost revenue as a result of fewer customers.

Within existing transportation corridors, the high-speed rail alternative would not have the required space for separation of freight and passenger rail and freight operations could be affected by an increase in the number of passing trains. The long-term improvements to the rail system would offset any adverse effects on freight service. Based on this assessment, the qualitative evaluation is that the local effects on freight operations are negligible. Within proposed new transportation corridors, passenger rail tracks would be constructed within a separate right-of-way and there would be no effect on freight operations.

5.2.5 Alternative C4B Higher-Speed Rail

For this service-level analysis the travel demand modeling for Alternative C4B Higher-Speed Rail was not conducted to the same level of detail, but instead relied upon a proportional relationship based on full travel demand modeling conducted for the C4A High-Speed and C4A Higher-Speed Rail alternatives. This appropriate level of detail applied for Alternative C4B Higher-Speed Rail is supported by a linear proportional adjustment in ridership and demand, which is based on the relationship between C4A High-Speed Rail and C4A Higher-Speed Rail alternatives, thereby producing reasonably accurate estimates for Alternative C4B Higher-Speed Rail. Further, the observed relationship between C4A Higher-Speed Rail and C4A High-Speed Rail was used to produce a forecast of Alternative C4B Higher-Speed Rail based on Alternative C4B High-Speed Rail. An identical methodology was utilized for the observed relationship between Alternative C4C Higher-Speed Rail based on Alternative C4C High-Speed Rail.

5.2.5.1 Travel Demand and Mode Share

The C4B Higher-Speed Rail alternative would see decreases in ridership demand proportionally similar to the decrease in ridership demand between the C4A High-Speed Rail and the C4A Higher-Speed Rail alternatives. The shift in mode share would also be proportionally similar. For example, the ridership demand would be approximately 36 percent less for the C4A Higher-Speed Rail alternative than the C4A High-Speed Rail alternative. Alternative C4B would see a similar difference between ridership demand between the high-speed rail alternative and higher-speed rail alternative.

5.2.5.1.1 Travel Time Savings

Travel time information was prepared for Alternative C4B Higher-Speed Rail and is summarized in Table 5-21. Alternative C4B Higher-Speed Rail would result in similar changes to travel time savings as Alternative C4A Higher-Speed Rail. Both alternatives would provide significant travel time savings across all modes, although to a lesser extent than the high-speed rail alternatives. The new passenger rail service would take approximately 3 hours (195 minutes) between Dallas and San Antonio, compared to over 5.5 hours (338 minutes) by car. The time savings associated with Alternative C4B Higher-Speed Rail would be a substantial beneficial effect compared with the No Build Alternative.

Table 5-21: 2035 Travel Time Comparison by Mode – Alternative C4B Higher-Speed Rail

Mode	Travel Time (minutes)[a]				
	Dallas – San Antonio	Fort Worth – San Antonio	Dallas – Austin	Fort Worth – Austin	Austin – San Antonio
Auto	338	332	238	232	103
Passenger Rail	605	465	392	252	143
With C4B HrSR[b]	195	202	136	143	57
Intercity Bus	327	409	220	292	95
Air	62	68	55	62	-

[a] Except for passenger rail, travel time is assumed to be the same for the No Build and C4B HrSR alternatives.

[b] Estimated passenger rail time with Alternative C4B HrSR.

5.2.5.1.2 Travel Time Reliability

As previously discussed, the Central Section will generally experience moderate increases in highway travel time by 2035, particularly between the larger metropolitan areas. By 2035, highway travel time between Dallas and San Antonio and Fort Worth and San Antonio is projected to increase by approximately 50 minutes. Alternative C4B Higher-Speed Rail would provide travel time reliability between these areas for train travelers, compared to the expected increases in highway drive times and potential unexpected delays. Under Alternative C4B Higher-Speed Rail there would be a substantial difference and corresponding effect in travel time reliability compared with highway travel.

5.2.5.1.3 Vehicle Miles Traveled

The C4B Higher-Speed Rail alternative would see a reduction in VMT proportionally similar to the reduction in VMT between the C4A High-Speed Rail and the C4A Higher-Speed Rail alternatives. The reduction in VMT would be approximately 64 percent less for the C4A Higher-Speed Rail alternative than the C4A High-Speed Rail alternative. Alternative C4B would see a similar difference between VMT changes between the high-speed rail alternative and higher-speed rail alternative.

5.2.5.1.4 Local Effects on Transportation and Parking

Alternative C4B Higher-Speed Rail would have similar effects on transportation and parking as those described for Alternative C4A High-Speed Rail. However, unlike high-speed rail, the higher-speed rail design would include some grade crossings, which would affect local traffic circulation. Local traffic volumes and parking demand would increase around and at the stations due to both increases and new demand in rail ridership and longer wait times would occur at grade-crossings. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.2.5.1.5 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

Alternative C4B Higher-Speed Rail would have similar effects on intercity transit providers and air carriers as those described for Alternative C4B High-Speed Rail, but at a lesser intensity. Under Alternative C4B Higher-Speed Rail, existing bus riders and air passengers would be diverted to rail. However, the percentage of diverted trips would be less with C4B Higher-Speed Rail than Alternative C4B High-Speed Rail.

The design of the higher-speed rail alternative, within existing railroad rights-of-way, would allow for a shared right-of-way with separate tracks for freight and passenger services. The long-term improvements to the rail system would offset any adverse effects on freight service. Based on this assessment, the qualitative evaluation is that the local effects on freight operations are negligible.

5.2.6 Alternative C4C High-Speed Rail

5.2.6.1 Travel Demand and Mode Share

Table 5-22 presents the projected travel demand and mode share for the No Build Alternative and Alternative C4C High-Speed Rail.

Table 5-22: 2035 Travel Demand and Mode Share – Alternative C4C High-Speed Rail

Mode	Travel Demand (Trips per Year)		Mode Share (Percentage by Mode)	
	No Build	C4C HSR	No Build	C4C HSR
Dallas – Fort Worth – San Antonio				
Auto	34,355,278	31,986,136	91.72%	81.17%
Passenger Rail	77,575	5,754,286	0.21%	14.60%
Intercity Bus	1,218,378	980,645	3.25%	2.49%
Air	1,804,336	684,830	4.82%	1.74%

Under Alternative C4C High-Speed Rail, the reduction in mode share for highway travel would be 11 percent, which represents a moderate effect. The increase in mode share for passenger rail would be substantial. Passenger rail ridership is forecast to increase to over 5 million passengers per year, a nearly 7,000 percent increase. For bus the shift in mode share would be moderate and for air the shift in mode share would be substantial. The mode share for bus would decrease by 23 percent and the mode share for air would decrease by 64 percent. The ridership data (including diverted trips and induced demand) are described in further detail in the Passenger Rail Ridership section.

5.2.6.1.1 Travel Time Savings

Table 5-23 provides a comparison of the projected travel time between modes. It is assumed that there will no difference in travel time between the No Build Alternative and Alternative C4C High-Speed Rail for auto, bus, and air.

With the exception of air, Alternative C4C High-Speed Rail would provide significant travel time savings across all modes. Under this alternative, the new passenger rail service would take less than 2.5 hours (140 minutes) between Dallas and San Antonio, compared with over 5.5 hours (338 minutes) by car. The time savings associated with Alternative C4C High-Speed Rail would be a substantial beneficial effect compared with the No Build Alternative.

Table 5-23: 2035 Travel Time Comparison by Mode – Alternative C4C High-Speed Rail

Mode	Travel Time (minutes)[a]				
	Dallas – San Antonio	Fort Worth – San Antonio	Dallas – Austin	Fort Worth – Austin	Austin – San Antonio
Auto	338	332	238	232	103
Passenger Rail	605	465	392	252	143
With C4C HSR[b]	140	140	99	99	39
Intercity Bus	327	409	220	292	95
Air	62	68	55	62	-

[a] Except for passenger rail, travel time is assumed to be the same for the No Build and C4C HSR alternatives.

[b] Estimated Passenger rail time with Alternative C4C HSR.

5.2.6.1.2 Travel Time Reliability

As previously discussed, the Central Section will generally experience moderate increases in highway travel time by 2035, particularly between the larger metropolitan areas, as a result of general increases in congestion. By 2035, highway travel time between Dallas and San Antonio and Fort Worth and San Antonio is projected to increase by approximately 50 minutes. Alternative C4C High-Speed Rail would provide travel time reliability between these areas for train travelers, compared to the expected increases in highway drive times and potential unexpected delays. Under Alternative C4C High-Speed Rail there would be a substantial difference and corresponding effect in travel time reliability compared to highway travel.

5.2.6.1.3 Passenger Rail Ridership

Table 5-24 provides a summary of the projected rail ridership under Alternative C4C High-Speed Rail at the corridor level, as well as for the Dallas and San Antonio urban markets. Figure 5-5 illustrates the projected rail ridership composition for this alternative.

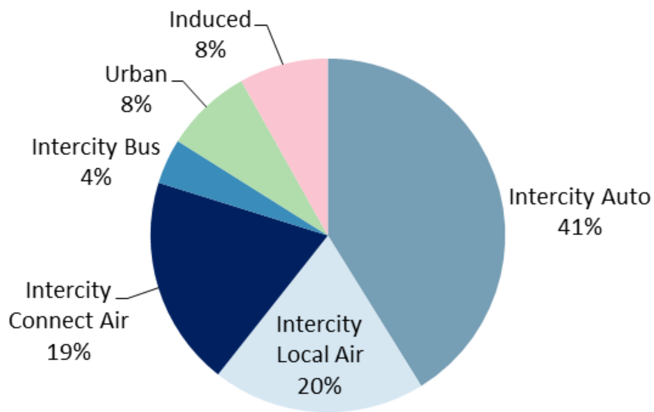


Figure 5-5: Alternative C4C HSR Ridership Composition

For the new rail trips (approximately 5.8 million riders), the highest percentage would be shifts from auto trips (41 percent), followed by local and connect air (20 and 19 percent, respectively), and bus trips (4 percent). Local air would have the highest percentage of its trips diverted to rail (62 percent), followed by bus (21 percent), connect air (7 percent), and auto trips (6 percent).

Table 5-24: 2035 Intercity Rail Ridership – Alternative C4C High-Speed Rail

Ridership Composition by Mode	Divertible Market	C4B HSR Riders	Diversion Percentage	C4B HSR Ridership Composition
(Passengers per Year)				
Total Intercity Ridership	52,980,507	**4,830,777**	9%	
Auto	34,355,278	2,369,141	6%	41%
Local Air[a]	1,804,336	1,119,506	62%	20%
Connect Air[b]	15,602,515	1,104,397	7%	19%
Bus	1,218,378	237,733	21%	4%
Total Urban Ridership		**457,308**		
Dallas Metroplex[c]				0%
Austin - San Antonio Area[d]		457,308		8%
Induced Demand[e]		**466,202**		8%
Total Intercity and Urban Ridership[f]		**5,754,286**		

[a] Air travelers whose entire trip is within the corridor area.

[b] Air travelers for whom only one end of their trip falls within the corridor area.

[c] Trips that begin and end within the Dallas Metroplex.

[d] Trips that begin and end within the Austin – San Antonio area.

[e] HSR riders who would not have made the trip by another mode.

[f] The sum of diverted and induced demand for HSR.

5.2.6.1.4 Station Boardings

The total boardings at each station are presented in Table 5-25. The Austin airport is anticipated to have the highest number of station boardings, with nearly 1.4 million boardings.

Table 5-25: Station Boardings – Alternative C4C High-Speed Rail

Station	Boardings (Passengers per Year)	Station Rank
Fort Worth/ITC	173,481	8
DFW	724,837	4
Dallas/DUS	1,007,955	2
Waco	354,073	6
Temple	402,985	5
Austin Airport	1,389,212	1
SAT Airport	933,081	3
San Antonio/VIA	302,461	7
Total	**5,288,085**	

5.2.6.1.5 Vehicle Miles Traveled

Table 5-26 summarizes the projected 2035 VMT under the No Build Alternative and Alternative C4C High-Speed Rail. Implementation of Alternative C4C High-Speed Rail would result in a 7.2 percent decrease in annual VMT in the Central Section, compared with the No Build Alternative. This would be a substantial beneficial effect on VMT.

Table 5-26: 2035 Vehicle Miles Traveled – Alternative C4C High-Speed Rail

	Vehicle Miles Traveled (per Year)		
	No Build	C4C HSR	Change
Dallas – Fort Worth – San Antonio	2,731,030,269	2,533,463,242	197,567,027/ -7.23%

5.2.6.1.6 Local Effects on Transportation and Parking

Alternative C4C High-Speed Rail would have similar effects on transportation and parking as those described for Alternative C4A High-Speed Rail. As a high-speed rail alternative, the entire right-of-way would be fenced and fully grade-separated. Once constructed, there would be no effect on local traffic circulation because of the grade-separated tracks. Local traffic volumes and parking demand would increase around and at the stations due to both increases and new demand in rail ridership and longer wait times would occur at grade crossings. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.2.6.1.7 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

Under Alternative C4C High-Speed Rail, approximately 21 percent of existing bus riders and 62 percent of air passengers would be diverted to rail. The new rail service could result in moderate (for transit) to substantial (for air) effects on service provider operations (e.g., demand, schedule) and lost revenue as a result of fewer customers.

Within existing transportation corridors, the high-speed rail alternative would not have the required space for separation of freight and passenger rail and freight operations could be affected by an increase in the number of passing trains. The long-term improvements to the rail system would offset any adverse effects on freight service. Based on this assessment, the qualitative evaluation is that the local effects on freight operations are negligible. Within proposed new transportation corridors, passenger rail tracks would be constructed within a separate right-of-way and there would be no effect on freight operations.

5.2.7 Alternative C4C Higher-Speed Rail

For this service-level analysis the travel demand modeling for Alternatives C4C Higher-Speed Rail was not conducted to the same level of detail, but instead relied upon a proportional relationship based on full travel demand modeling conducted for the C4A High-Speed Rail and C4A Higher-Speed Rail alternatives. This appropriate level of detail applied for Alternative C4C Higher-Speed

Rail is supported by a linear proportional adjustment in ridership and demand, which is based on the relationship between C4A High-Speed Rail and C4A Higher-Speed Rail, thereby producing reasonably accurate estimates for Alternative C4C Higher-Speed Rail. Further, the observed relationship between C4A Higher-Speed Rail and C4A High-Speed Rail was used to produce a forecast of Alternative C4C Higher-Speed Rai based on C4C High-Speed Rail. As described above this same methodology was used for Alternative C4B Higher-Speed Rail.

5.2.7.1 Travel Demand and Mode Share

The C4C Higher-Speed Rail alternative would see decreases in ridership demand proportionally similar to the decrease in ridership demand between the C4A High-Speed Rail and the C4A Higher-Speed Rail alternatives. The shift in mode share would also be proportionally similar. For example, the ridership demand would be approximately 36 percent less for the C4A Higher-Speed Rail alternative than the C4A High-Speed Rail alternative. Alternative C4B would see a similar difference between ridership demand between the high-speed rail alternative and higher-speed rail alternative.

5.2.7.1.1 Travel Time Savings

Travel time information was not prepared for Alternative C4C Higher-Speed Rail; however, this alternative would result in similar changes to travel time savings as Alternative C4C High-Speed Rail. The travel time savings would be to a lesser extent, however, because the higher-speed rail alternative would be operated at speeds of up to 110 to 125 mph, compared to the faster high-speed rail alternatives, which would be operated at speeds of up to 220 to 250 mph. Both alternatives are expected to provide substantial travel time savings across all modes.

5.2.7.1.2 Travel Time Reliability

As previously discussed, the Central Section will generally experience moderate increases in highway travel time by 2035, particularly between the larger metropolitan areas. By 2035, highway travel time between Dallas and San Antonio and Fort Worth and San Antonio is projected to increase by approximately 50 minutes. Alternative C4C Higher-Speed Rail would provide travel time reliability between these areas for train travelers, compared to the expected increases in highway drive times and potential unexpected delays. Under Alternative C4C Higher-Speed Rail there would be a substantial difference in travel time reliability compared to highway travel.

5.2.7.1.3 Vehicle Miles Traveled

The C4C Higher-Speed Rail alternative would see a reduction in VMT proportionally similar to the reduction in VMT between the C4A High-Speed Rail and the C4A Higher-Speed Rail alternatives. The reduction in VMT would be approximately 64 percent less for the C4A Higher-Speed Rail alternative than the C4A High-Speed Rail alternative. Alternative C4C would see a similar difference between VMT changes between the high-speed rail alternative and higher-speed rail alternative.

5.2.7.1.4 Local Effects on Transportation and Parking

Alternative C4C Higher-Speed Rail would have similar effects on transportation and parking as those described for Alternative C4A High-Speed Rail. However, unlike high-speed rail, the higher-speed rail design would include some grade crossings, which would affect local traffic circulation. Local traffic volumes and parking demand would increase around and at the stations due to both increases and new demand in rail ridership and longer wait times would occur at grade crossings. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.2.7.1.5 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

Alternative C4C Higher-Speed Rail would have similar effects on intercity transit providers and air carriers as those described for Alternative C4C High-Speed Rail, but at a lesser intensity. Under Alternative C4C Higher-Speed Rail, existing bus riders and air passengers would be diverted to rail. However, the percentage of diverted trips would be less with C4C Higher-Speed Rail than Alternative C4C High-Speed Rail.

The design of the higher-speed rail alternative, within existing railroad rights-of-way, would allow for a shared right-of-way with separate tracks for freight and passenger services. The long-term improvements to the rail system would offset any adverse effects on freight service. Based on this assessment, the qualitative evaluation is that the local effects on freight operations are negligible.

5.3 Southern Section: San Antonio to South Texas

In the Southern Section, three alternatives and the No Build Alternative were carried forward for further evaluation. Alternative S4 Higher-Speed Rail serves different destinations than Alternative S6 (both service types). Alternative S6 (both service types) would follow an alignment that does not follow existing transportation corridors and is considerably shorter than Alternative S4 Higher-Speed Rail.

5.3.1 No Build Alternative

A description of the No Build Alternative is provided in Section 1.2.1. The potential effects of not building the project in the Southern Section would be similar to those described for the Northern Section. A quantitative comparison of the No Build Alternative and build alternatives for the Southern Section follows.

5.3.2 Alternative S4 Higher-Speed Rail

Alternative S4 Higher-Speed Rail would introduce a new passenger rail service between San Antonio and south Texas. It is assumed that there would be no changes in the level of service for all other modes.

5.3.2.1 Travel Demand and Mode Share

Table 5-27 presents the projected travel demand and mode share for the No Build Alternative and Alternative S4 Higher-Speed Rail.

Table 5-27: 2035 Travel Demand and Mode Share – Alternative S4 Higher-Speed Rail

Mode	Travel Demand (Trips per Year)		Mode Share (Percentage by Mode)	
	No Build	S4 HrSR	No Build	S4 HrSR
San Antonio – Brownsville				
Auto	139,815,235	139,560,919	99.25%	99.03%
Passenger Rail	0	611,106	0.00%	0.43%
Intercity Bus	920,291	713,133	0.65%	0.51%
Air	129,309	46,568	0.09%	0.03%

Under Alternative S4 Higher-Speed Rail, the reduction in mode share for highway travel would be less than 1 percent, which represents a negligible effect. Passenger rail service does not currently exist in the Southern Section and there would be a substantial demand for this new service. Passenger rail ridership is forecast at 611,100 passengers per year. For bus the shift in mode share would be moderate and for air the shift in mode would be substantial. The mode share for bus would decrease by 22 percent and the mode share for air would decrease by 67 percent. The ridership data (including diverted trips and induced demand) are described in further detail in the Passenger Rail Ridership section.

5.3.2.1.1 Travel Time Savings

Table 5-28 provides a comparison of the projected travel time between modes. It is assumed that there would be no difference in travel time between the No Build and Alternative S4 Higher-Speed Rail for auto and bus (direct air service between the modeled city pairs does not exist).

Table 5-28: 2035 Travel Time Comparison by Mode – Alternative S4 Higher-Speed Rail

Mode	Travel Time (minutes)[a]				
	San Antonio – Laredo	San Antonio – Corpus Christi	Laredo – Brownsville	Corpus Christi – Brownsville	Austin - San Antonio
Auto	157	151	320	211	103
Passenger Rail[b]	151	113	213	175	-
Intercity Bus	160	157	285	231	95
Air[c]	-	-	-	-	-

[a] Except for passenger rail, travel time is assumed to be the same for the No Build and S4 HrSR Alternatives.

[b] Passenger rail times shown for the build alternative only. Except for Austin to San Antonio, rail service does not currently exist. No new service is proposed between Austin and San Antonio.

[c] There is no direct air (non-stop) service between these city pairs.

For most of the city pairs, Alternative S4 Higher-Speed Rail would provide substantial travel time savings compared to highway and intercity bus travel. For example, between Laredo and Brownsville, Alternative S4 Higher-Speed Rail would be nearly 2 hours faster than driving, compared with the No Build Alternative.

5.3.2.1.2 Travel Time Reliability

The Southern Section will generally experience moderate increases in highway travel time by 2035, particularly between the larger cities. For instance, by 2035, highway travel time between Brownsville and Laredo is projected to increase by approximately 1 hour and 25 minutes. Alternative S4 Higher-Speed Rail would provide travel time reliability between these areas for train travelers, compared to the expected increases in highway drive times and potential unexpected delays. Under Alternative S4 Higher-Speed Rail there would be a substantial difference and corresponding effect in travel time reliability compared to highway travel.

5.3.2.1.3 Passenger Rail Ridership

Table 5-29 provides a summary of the projected rail ridership with Alternative S4 Higher-Speed Rail at the corridor level and for the urban market (McAllen – Brownsville area). Figure 5-6 illustrates the projected ridership composition for the S4 Higher-Speed Rail Alternative.

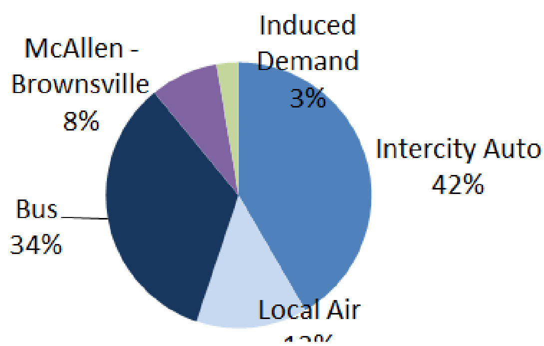


Figure 5-6: Alternative S4 HrSR Ridership Composition

For the new rail trips (approximately 611,000 riders), the highest percentage would be shifted from auto trips (42 percent), followed by bus (34 percent), and local air (13 percent). Local air would have the highest percentage of its trips diverted to rail (64 percent), followed by bus (23 percent). Less than 1 percent of auto trips would be diverted to rail.

Table 5-29: 2035 Intercity Ridership – Alternative S4 Higher-Speed Rail

Ridership Composition by Mode	Divertible Market	S4 HrSR Rail Riders	Diversion Percentage	S4HrSR Rail Ridership Composition
(Passengers per Year)				
Total Intercity Ridership	140,864,835	**544,215**	<1%	
Auto	139,815,235	254,316	<1%	42%
Local Air[a]	129,309	82,741	64%	13%
Connect Air	-	-	-	-
Bus	920,291	207,159	23%	34%
Total Urban Ridership		**50,514**		
McAllen – Brownsville[b]		50,514		8%

Ridership Composition by Mode	Divertible Market	S4 HrSR Rail Riders	Diversion Percentage	S4HrSR Rail Ridership Composition
(Passengers per Year)				
Induced Demand[c]		**16,377**		3%
Total Intercity and Urban Ridership[d]		**611,106**		

[a] Air travelers whose entire trip is within the corridor area.

[b] Trips that begin and end within the McAllen Weslaco Harlingen Brownsville triangle.

[c] HSR riders who would not have made the trip by another mode.

[d] The sum of diverted and induced demand for HSR.

5.3.2.1.4 Station Boardings

The total boardings at each station are presented in Table 5-30. San Antonio is anticipated to have the highest number of station boardings, with 185,535 boardings.

Table 5-30: Rail Station Boardings – Alternative S4 Higher-Speed Rail

Station	Boardings (Passengers per Year)	Station Rank
San Antonio/VIA	185,535	1
Alice	51,269	5
Corpus Christi	72,345	3
Laredo	67,544	4
McAllen	96,734	2
Weslaco	35,440	7
Harlingen	35,375	8
Brownsville	50,487	6
Total	**594,729**	

5.3.2.1.5 Vehicle Miles Traveled

Table 5-31 presents the estimated changes in VMT under the No Build Alternative and Alternative S4 Higher-Speed Rail. The existing VMT in the Southern Section is projected to increase from 2.9 billion annual VMT to 9.3 billion annual VMT by 2035, under the No Build Alternative. The increase in VMT by 2035 is primarily attributed to population growth in the region. Implementation of Alternative S4 Higher-Speed Rail would result in a 0.2 percent decrease in VMT compared with the No Build Alternative. This equates to nearly 18.5 million fewer miles traveled each year. The decrease in VMT would be a beneficial, although negligible, effect of the project, compared with the No Build Alternative.

Table 5-31: 2035 Vehicle Miles Traveled – Alternative S4 Higher-Speed Rail

	Vehicle Miles Traveled (per Year)		
	No Build	S4 HrSR	Change
San Antonio – Brownsville	9,364,781,443	9,346,313,854	-18,467,589/ -0.2%

5.3.2.1.6 Local Effects on Transportation and Parking

Alternative S4 Higher-Speed Rail would have similar effects on local transportation and parking as previously described for the build alternatives in the Central Section. This alternative generally traverses through less developed areas and as a higher-speed rail option would be designed with some at grade crossings, which would affect local traffic circulation. New stations would be constructed in some locations and would alter traffic patterns in these locations. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.3.2.1.7 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

Under Alternative S4 Higher-Speed Rail, approximately 23 percent of existing bus riders and 64 percent of air passengers would be diverted to rail. This diversion could result in moderate (for transit) to substantial (for air) effects on service provider operations (e.g., demand, schedule) and lost revenue as a result of fewer customers.

The design of the higher-speed rail alternative, within existing railroad rights-of-way, would allow for a shared right-of-way with separate tracks for freight and passenger services. The long-term improvements to the rail system would offset any adverse effects on freight service. Based on this assessment, the qualitative evaluation is that the local effects on freight operations are negligible.

5.3.3 Alternative S6 High-Speed Rail

5.3.3.1 Travel Demand and Mode Share

Table 5-32 presents the projected travel demand and mode share for the No Build Alternative and Alternative S6 High-Speed Rail.

Table 5-32: 2035 Travel Demand and Mode Share – Alternative S6 High-Speed Rail

Mode	Travel Demand (Trips per Year)		Mode Share (Percentage by Mode)	
	No Build	S6 HSR	No Build	S6 HSR
San Antonio - Laredo				
Auto	11,745,072	11,638,144	98.88%	97.88%
Passenger Rail	0	138,500	0.00%	1.17%
Intercity Bus	132,860	113,302	1.12%	0.95%
Air	0	0	0.00%	0.00%

Under Alternative S6 High-Speed Rail, the reduction in mode share for highway travel would be 1 percent, which represents a negligible effect. Passenger rail service does not currently exist in the Southern Section and there would be a substantial demand for this new service. Passenger rail ridership is forecast at 138,500 passengers per year. For bus, the shift in mode share would be moderate. The mode share for bus would decrease by 15 percent. Direct air service does not exist and there would be no effect on this mode. The ridership data (including diverted trips and induced demand) are described in further detail in the Passenger Rail Ridership section.

5.3.3.1.1 Travel Time Savings

Table 5-33 provides a comparison of the projected travel time between modes. It is assumed that there would be no difference in travel time between the No Build Alternative and Alternative S6 High-Speed Rail for autos and bus (direct air service does not exist).

Alternative S6 High-Speed Rail would provide service between San Antonio and Laredo. This alternative would provide significant travel time savings compared to highway and intercity bus travel between these city pairs. Alternative S6 High-Speed Rail would save travelers one hour and 40 minutes compared to driving or intercity bus travel, between San Antonio and Laredo. This is a substantial beneficial effect of the project.

Table 5-33: 2035 Travel Time Comparison by Mode – Alternative S6 High-Speed Rail

Mode	Travel Time (minutes)[a]				
	San Antonio – Laredo	San Antonio – Corpus Christi	Laredo – Brownsville	Corpus Christi – Brownsville	Austin - San Antonio
Auto	157	151	320	211	103
Passenger Rail[b]	56	-	-	-	-
Intercity Bus	160	157	285	231	95
Air	-	-	-	-	-

[a] Except for passenger rail, travel time is assumed to be the same for the No Build and S6 HSR alternatives.

[b] Passenger rail is for the build alternative only. Rail service does not currently exist. Service is only proposed between San Antonio and Laredo.

5.3.3.1.2 Travel Time Reliability

By 2035, highway travel time between San Antonio and Laredo is projected to increase by approximately 8 minutes. These increases in future highway travel time would be minor, so reliability for highway travel is expected to remain relatively good. With Alternative S6 High-Speed Rail, there would be a negligible difference and corresponding effect in travel time reliability for train travelers, compared with highway travel.

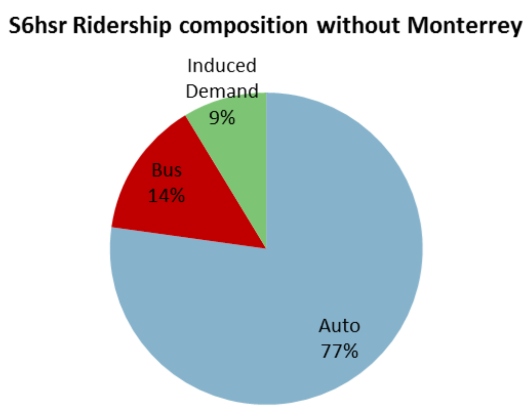


Figure 5-7: Alternative S6 HSR Ridership Composition

5.3.3.1.3 Passenger Rail Ridership

Table 5-34 provides a summary of the projected rail ridership under Alternative S6 High-Speed Rail and Figure 5-7 illustrates the anticipated ridership composition.

For the new rail trips (approximately 138,500 riders), the highest percentage would be shifts from auto trips (77 percent), followed by bus (14 percent). Bus travel would have the highest percentage of its trips diverted to rail (15 percent).

Table 5-34: 2035 Intercity Rail Ridership – Alternative S6 High-Speed Rail

Ridership Composition by Mode	Divertible Market	S6 HSR Rail Riders	Diversion Percentage	S6 HSR Rail Ridership Composition
(Passengers per Year)				
Total Intercity Ridership	11,877,933	**126,487**	1%	
Auto	11,745,073	106,928	1%	77%
Local Air[a]	< 40,000	< 10,000		
Connect Air	-	-		
Bus	132,860	19,559	15%	14%
Induced Demand[b]		**12,013**		9%
Total Ridership[c]		**138,500**		

[a] Air travelers whose entire trip is within the corridor area.

[b] HSR riders who would not have made the trip by another mode.

[c] The sum of diverted and induced demand for HSR.

5.3.3.1.4 Station Boardings

The total boardings at each station are presented in Table 5-35. Monterrey is anticipated to have the highest number of station boardings, with 370,086 boardings.

Table 5-35: Station Boardings – Alternative S6 High-Speed Rail

Station	Boardings (Passengers per Year)	Station Rank
San Antonio/VIA	188,741	3
Laredo Columbia Crossing	307,832	2
Monterrey[a]	370,086	1
Total	**866,660**	

[a] Alternative S6 is proposed to cross a new railway bridge to join a new rail line being constructed in Mexico, which would continue to Monterrey. While this study only examines the physical impacts of the U.S. component of this new line, it does consider the ridership impact of such a connection.

5.3.3.1.5 Vehicle Miles Traveled

Table 5-36 presents the estimated changes in VMT under the No Build Alternative and Alternative S6 High-Speed Rail. Implementation of Alternative S6 High-Speed Rail would result in a 0.9 percent decrease in VMT compared with the No Build Alternative. This equates to nearly 7 million fewer miles traveled each year. The decrease in VMT would be a beneficial, although negligible, effect of the project, compared with the No Build Alternative.

Table 5-36: 2035 Vehicle Miles Traveled – Alternative S6 High-Speed Rail

	Vehicle Miles Traveled (per Year)		
	No Build	S6 HSR	Change
San Antonio – Laredo	745,641,562	738,853,164	-6,788,398/ -0.9%

5.3.3.1.6 Local Effects on Transportation and Parking

Alternative S6 High-Speed Rail would have similar effects on local transportation and parking as described for the build alternatives in the Central Section. This alternative generally traverses through less developed areas and as a high-speed rail option, the entire right-of-way would be fenced and fully grade-separated. Once constructed, there would be no effect on local traffic circulation because of the grade separation. Two existing stations would be used and one new station would be constructed. Local traffic volumes and parking demand would increase around and at the stations due to new demand in rail ridership, particularly at the new station, where no demand currently exists. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.3.3.1.7 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

With Alternative S6 High-Speed Rail, approximately 15 percent of existing bus riders would be diverted to rail. The new rail service could result in moderate effects on transit service provider operations (e.g., demand, schedule) and lost revenue as a result of fewer customers. There would be no effect on air carriers because there would be no diverted passenger air trips.

Within proposed new transportation corridors, passenger rail tracks would be constructed within a separate right-of-way and there would be no effect on freight operations.

5.3.4 Alternative S6 Higher-Speed Rail

5.3.4.1 Travel Demand and Mode Share

Table 5-37 presents the projected travel demand and mode share for the No Build Alternative and Alternative S6 Higher-Speed Rail.

Table 5-37: 2035 Travel Demand and Mode Share – Alternative S6 Higher-Speed Rail

Mode	Travel Demand (Trips per Year)		Mode Share (Percentage by Mode)	
	No Build	S6 HrSR	No Build	S6 HrSR
San Antonio - Laredo				
Auto	11,745,072	11,700,826	98.88%	98.48%
Passenger Rail	0	59,440	0.00%	0.50%
Intercity Bus	132,860	120,956	1.12%	1.02%
Air	0	0	0.00%	0.0%

With Alternative S6 Higher-Speed Rail, the reduction in mode share for highway travel would be less than 1 percent, which represents a negligible effect. Passenger rail service does not currently exist in the Southern Section and there would be a substantial demand for this new service. Passenger rail ridership is forecast at 59,440 passengers per year. For bus, the shift in mode share would be moderate. The mode share for bus would decrease by nine percent. Direct air service does not exist and there would be no effect on this mode. The ridership data (including diverted trips and induced demand) are described in further detail in the Passenger Rail Ridership section.

5.3.4.1.1 Travel Time Savings

Table 5-38 provides a comparison of the projected travel time between modes. Alternative S6 Higher-Speed Rail would provide service between San Antonio and Laredo. This alternative would save travelers approximately 1 hour compared to driving or intercity bus travel. This would be a moderate beneficial effect of the project.

Table 5-38: 2035 Travel Time Comparison by Mode – Alternative S6 Higher-Speed Rail

Mode	Travel Time (minutes)[a]				
	San Antonio – Laredo	San Antonio – Corpus Christi	Laredo – Brownsville	Corpus Christi – Brownsville	Austin – San Antonio
Auto	157	151	320	211	103
Passenger Rail[b]	101	-	-	-	-
Intercity Bus	160	157	285	231	95
Air	-	-	-	-	-

[a] Except for passenger rail, travel time is assumed to be the same for the No Build and S6 HrSR alternatives.

[b] Passenger rail is for the build alternative only. This service does not currently exist. Service is only proposed between San Antonio and Laredo.

5.3.4.1.2 Travel Time Reliability

By 2035, highway travel time between San Antonio and Laredo is projected to increase by approximately 8 minutes. These increases in future highway travel time are minor, so reliability for highway travel is expected to remain relatively good. With Alternative S6 High-Speed Rail, there would be a negligible difference and corresponding effect in travel time reliability for train travelers, compared with highway travel.

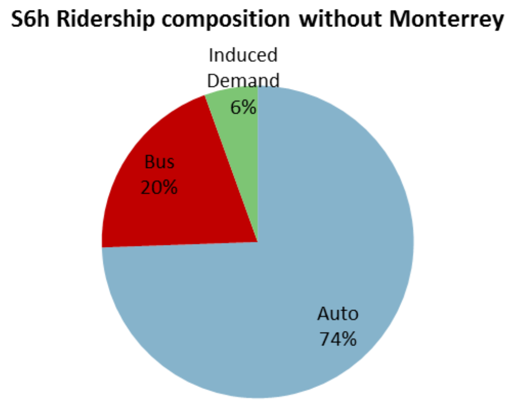


Figure 5-8: Alternative S6 HrSR Ridership Composition

5.3.4.1.3 Passenger Rail Ridership

Table 5-39 provides a summary of the projected rail ridership with Alternative S6 Higher-Speed Rail and Figure 5-8 illustrates the projected rail ridership composition.

For the new rail trips (approximately 59,440 riders), the highest percentage would be from auto trips (74 percent), followed by bus trips (20 percent). Bus would have the highest percentage of its trips diverted to rail (9 percent).

Table 5-39: 2035 Intercity Rail Ridership – Alternative S6 Higher-Speed Rail

Ridership Composition by Mode	Divertible Market	S6 HrSR Rail Riders	Diversion Percentage	S6 HrSR Rail Ridership Composition
(Passengers per Year)				
Total Intercity Ridership	11,877,933	**56,150**	0%	
Auto	11,745,073	44,246	0%	74%
Local Air[a]	< 40,000	< 10,000		
Connect Air	-	-	-	
Bus	132,860	11,909	9%	20%
Induced Demand[b]		**3,289**		6%
Total Ridership[c]		**59,439**		

[a] Air travelers whose entire trip is within the corridor area.

[b] HSR riders who would not have made the trip by another mode.

[c] The sum of diverted and induced demand for HSR.

5.3.4.1.4 Station Boardings

The total station boardings are presented in Table 5-40. Monterrey is anticipated to have the highest number of station boardings, with 269,232 boardings.

Table 5-40: Rail Station Boardings – Alternative S6 Higher-Speed Rail

Station	Boardings (Passengers per Year)	Station Rank
San Antonio/VIA	125,097	3
Laredo Columbia Crossing	200,285	2
Monterrey[a]	269,232	1
Total	**594,615**	

[a] Alternative S6 is proposed to cross a new railway bridge to join a new rail line being constructed in Mexico, which would continue to Monterrey. While this study only examines the physical impacts of the U.S. component of this new line, it does consider the ridership impact of such a connection.

5.3.4.1.5 Vehicle Miles Traveled

Table 5-41 presents the estimated changes in VMT with the No Build Alternative and Alternative S6 Higher-Speed Rail. Implementation of Alternative S6 Higher-Speed Rail would result in a 0.4

percent reduction in VMT compared with the No Build Alternative. This equates to nearly 3 million fewer miles traveled each year. The decrease in VMT would be a beneficial, although negligible, effect of the project, compared with the No Build Alternative.

Table 5-41: 2035 Changes in Vehicle Miles Traveled – Alternative S6 Higher-Speed Rail

	Vehicle Miles Traveled (per Year)		
	No Build	S6 HrSR	Change
San Antonio – Laredo	745,641,562	742,832,570	-2,808,992/ -0.4%

5.3.4.1.6 Local Effects on Transportation and Parking

Alternative S6 Higher-Speed Rail would have similar effects on local transportation and parking as previously described for the build alternatives in the Central Section. This alternative generally traverses through less developed areas and as a higher-speed rail option would be designed with some at grade crossings, which would affect local traffic circulation. New stations would be constructed in some locations and would alter traffic patterns in these locations. Based on this assessment, the qualitative evaluation is that the local effects on transportation and parking are moderate.

5.3.4.1.7 Effects on Intercity Transit Providers, Air Carriers, and Freight Operations

With Alternative S6 Higher-Speed Rail, approximately 9 percent of existing bus riders would be diverted to rail. This diversion could result in moderate effects on transit service provider operations (e.g., demand, schedule) and lost revenue as a result of fewer customers.

The design of the higher-speed rail alternative would allow for a shared right-of-way with separate tracks for freight and passenger services. The long-term improvements to the rail system would offset any adverse effects on freight service. Based on this assessment, the qualitative evaluation is that the local effects on freight operations are negligible.

5.4 Construction Effects

This section provides a qualitative discussion of the likely temporary effects of construction activities, for all build alternatives, on rail operations and vehicular traffic.

5.4.1 No Build Alternative

Under the No Build Alternative, there would be no construction activity associated with a passenger rail system. Construction would be limited to regular maintenance activities on the existing rail corridor. Because there would be no construction, there would be no effect on vehicular traffic, existing passenger rail service, or freight operations. There would also be no effect on local transit service providers and air carriers.

5.4.2 Build Alternatives

5.4.2.1 Potential effects from construction added traffic

Construction of any of the build alternatives would generate additional vehicle trips on the regional and local road network, resulting in potential increases in traffic congestion. This is a result of equipment and materials hauling and construction work force travel to and from work sites. Potential increases in vehicle trip generation would vary based on the project type, location, schedule, size of workforce, equipment needs, and other factors and the distribution of construction trips on the road network will also depend on the location of individual projects and the project staging areas. While construction activities would be temporary, they would be cumulatively long-term given that construction would be ongoing for many years.

Construction-generated traffic could result in substantial traffic effects if traffic management during construction is not appropriately planned. However, these potential effects would be addressed at the project-level and would likely include implementation of project-specific transportation management plans (TMPs). A TMP identifies measures, such as scheduling deliveries of heavy equipment and construction materials outside of peak hours, identifying detour routes, maintaining local access, etc.

5.4.2.2 Potential effects on existing rail operations

In general, construction activities that would take place near or within existing railroad right-of-way would affect existing rail traffic by reducing operating train speeds through the construction zones, adding to rail travel time and, in turn, cost. This would occur when adding new siding tracks, double-tracks, and connection tracks, upgrading signals, and modifying grade crossings. Another potential effect would be schedule modifications to accommodate the temporary shutdown of rail operations on selected track sections or when there is a potential safety risk. During construction, there may be track outages that would interrupt intercity passenger rail service. As necessary, bus service could be provided along the corridor to replace intercity passenger rail service lost during construction.

5.4.2.3 Potential effects on existing vehicular traffic circulation

Vehicular traffic would be temporarily affected at locations where grade crossings will be separated, modified, or improved and at or near existing and proposed stations. While the exact construction areas are not known at this time, temporary lane closures or roadway closures will be required to construct some of the proposed improvements. The grade crossing improvements would, at a minimum, require slower traffic speeds through the construction areas while improvements are installed. In some cases, temporary diversion of traffic to adjacent crossings could be required. Construction of grade separations should be staged to minimize street closures. Emergency services, schools, businesses, and other activities requiring vehicular access would be affected by potential delays or detours. Implementation of a TMP would minimize these potential effects. The TMP would include procedures for notifying and coordinating with all affected agencies, in advance of construction activities.

6.0 Avoidance, Minimization, and Mitigation Strategies

Avoidance, minimization, and mitigation strategies for adverse environmental impacts will be further developed in consultation with affected agencies. At the project level, measures to minimize transportation effects may include, but would not be limited to, preparation and implementation of a TMP during construction. Implementation of any of the build alternatives should include a Traffic Management Plan that would minimize effects on existing local traffic as a result of construction activities. The TMP would be prepared in accordance with the *Manual on Uniform Traffic Control Devices* (Federal Highway Administration 2009) and all applicable requirements of the local reviewing agency, as appropriate. The TMP could include but not be limited to the following measures:

- Prepare temporary traffic control plans for each construction area. The temporary traffic control plans will identify the need for full or partial lane closures, detours, flaggers for directing traffic, temporary signage, lighting, traffic control devices, and other measures, if required.
- Identify oversize and overweight load haul routes. Transporters will comply with state and county regulations for transportation of oversized and overweight loads on all state, county, and city roads. Such regulations typically include provisions for time of day, pilot cars, law enforcement escorts, speed limits, flaggers, and warning lights. All material hauling activities shall comply with applicable state and local regulations.
- Schedule deliveries of heavy equipment and construction materials during periods of minimum traffic flow and determine the need for construction work hours and arrival and departure times outside peak traffic periods.
- Post the approved hours of construction activity at the construction site in a place and manner that can be easily viewed by any interested member of the public.
- Identify vehicle safety procedures for entering and exiting site access roads.
- Notify and coordinate with emergency responders regarding potential road closures prior to construction.
- Provide access for emergency vehicles to and around the project sites.
- Maintain access to adjacent properties, transit, bicycle, and pedestrian facilities along project routes.
- Notify residential and commercial occupants of property adjacent to the construction sites of the hours of construction activity which may impact the area.
- Notify and coordinate with transit operators regarding potential road closures prior to construction. Notify and coordinate with mail service and waste haulers regarding potential road closures prior to construction.
- Provide a construction-parking plan that minimizes the effect of construction worker parking in the area. Include an estimate of the number of workers that will be present on the site during

the various phases of construction, indicate where sufficient off-street parking will be used, and identify all locations for offsite material deliveries.

- Distribute public information using local news television and radio broadcasts, informational flyers and mailers, Web sites, and other outreach options. Signs should be installed and public notices should be distributed regarding construction work before disruptions occur; the notifications would identify detours to maintain access.

7.0 Summary of Potential Effects

Table 7-1 provides a summary of the conclusions for each of the alternatives.

Table 7-1: Summary of Travel Demand and Transportation Effects by Alternative

Context	Potential Intensity of Effects					
	Northern	Central		Southern		
	N4A CONV	C4A/B/C SR	C4A HrSR	S4 HrSR	S6 HSR	S6 HrSR
Travel Demand and Mode Share[a]						
Auto	Negligible (positive)	Moderate (positive)	Moderate (positive)	Negligible (positive)	Negligible (positive)	Negligible (positive)
Transit	Substantial (negative)	Substantial (negative)	Moderate (negative)	Moderate (negative)	Moderate (negative)	Moderate (negative)
Air	Substantial (negative)	Substantial (negative)	Substantial (negative)	Substantial (negative)	No effect	No effect
Travel Time Savings[b]						
Auto	Negligible (positive)	Substantial (positive)	Substantial (positive)	Substantial (positive)	Substantial (positive)	Moderate (positive)
Transit	Substantial (positive)	Substantial (positive)	Substantial (positive)	Substantial (positive)	Substantial (positive)	Moderate (positive)
Air	Negligible (positive)	Negligible (positive)	Negligible (positive)	No effect	No effect	No effect
Travel Time Reliability[c]						
Auto	Negligible (positive)	Substantial (positive)	Substantial (positive)	Substantial (positive)	Negligible (positive)	Negligible (positive)
Change in VMT[d]						
Auto	Negligible (positive)	Substantial (positive)	Moderate (positive)	Negligible (positive)	Negligible (positive)	Negligible (positive)
Local Transportation[e]						
Transportation/Parking	Moderate (negative)	Moderate (negative)	Moderate (negative)	Moderate (negative)	Moderate (negative)	Moderate (negative)
Service Providers[f] and Freight Operations[g]						
Transit	Substantial (negative)	Moderate (negative)	Moderate (negative)	Moderate (negative)	Moderate (negative)	Moderate (negative)
Air	Substantial (negative)	Substantial (negative)	Substantial (negative)	Substantial (negative)	No effect	No effect
Freight	Negligible (negative)	Negligible (negative)	Negligible (negative)	Negligible (negative)	Negligible (negative)	No effect

[a] Shift in mode share as a result of the project. This could be a beneficial or negative effect depending on mode.
[b] Travel time savings compared to all modes. Savings in travel time is a beneficial effect of the project.
[c] Travel time reliability compared to highway travel. This is a beneficial effect of the project (e.g., as highway travel speeds slow, highway travel time reliability decreases).
[d] A reduction in VMT is a beneficial effect of the project.
[e] Potential effects on local traffic circulation and parking were assessed qualitatively.
[f] Potential effects on transit providers and air carriers.
[g] Effects on freight operations were assessed qualitatively.

7.1.1 Subsequent Analysis

Future studies conducted at the project level would likely define a specific Area of Potential Effect (APE) through the development of a Programmatic Agreement among FRA, TxDOT, and ODOT. Project-specific data, including specific roadways and intersections affected in areas of the APE, would be conducted for individual projects when they are proposed. At the local level, the project-level analysis will include identifying local effects on circulation (roadway and intersection level of service), access (vehicular, transit, pedestrian, and bicycle access), and parking demand in the vicinity of station locations and grade crossings. During construction, transportation effects will also be analyzed in the vicinity of new station locations, and where new rail infrastructure is proposed.

Updated travel market data, demographic data, and forecasts should be included in the travel demand model. The update should include the latest metropolitan planning organization (MPO) base year and future year highway networks; the latest MPO, and statewide socioeconomic data and forecasts; and the latest rail, intercity bus, and air travel market data. Subsequent analysis related to the travel demand model could also include refined intercity travel demand forecasts by section or subsequent project and detailed assessment of potential frequency, costs, travel market data, using project-level demographic data and forecasts, and more detailed information on future/planned regional and local transportation systems.

Detailed information about how the alternatives could connect would be analyzed at the project-level EIS phase. Due to the degree of variability in possibilities and the lack of detail, the Study does not provide a summary of effects for the entire route traveling between Oklahoma to South Texas. Rather, this analysis provides information about each individual alternative compared against the No Build Alternative and in some instances compared with another alternative for that same section.

Review of potential site-specific indirect and cumulative effects would be included during the project-level analysis. These actions are not covered in this analysis and therefore are not discussed further.

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