1 Introduction and Purpose, Need, and Objectives

The California High-Speed Rail Authority[1] (Authority) proposes to construct, operate, and maintain an electric-powered high-speed rail (HSR)[2] system in California. The Authority commenced its environmental planning process in coordination with the Federal Railroad Administration (FRA) with the *Final Program Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) for Proposed California High-Speed Train System* (Authority and FRA 2005), the *San Francisco Bay Area to Central Valley High-Speed Train Final Program EIR/EIS* (Authority and FRA 2008), and the *2012 Bay Area to Central Valley High-Speed Train Partially Revised Final Program EIR* (Authority 2012a). FRA and the Authority considered these three program-level documents in preparing the *Merced to Fresno Section California High-Speed Train Final Project Environmental Impact Report (EIR)/Environmental Impact Statement (EIS)* (Merced to Fresno Final EIR/EIS) (Authority and FRA 2012).

The Merced to Fresno Final EIR/EIS identified the Hybrid Alternative[3] as the preferred alternative, for the north/south alignment of the high-speed rail, and examined two design options[4] for an east-west connection to the San Jose to Merced Section, referred to as the "wye connection" (Authority and FRA 2012: pages 2-3, 2-21) but did not identify a preferred alternative for the Central Valley Wye. The Authority's Board of Directors certified the Final EIR/EIS under the California Environmental Quality Act (CEQA) on May 3, 2012 and filed a Notice of Determination on May 4, 2012, and approved the Hybrid Alternative. FRA issued a Record of Decision (ROD) under the National Environmental Policy Act (NEPA) on September 18, 2012, and the Surface Transportation Board (STB) issued a ROD on June 13, 2013. Through the ROD, FRA approved the Hybrid Alternative and Downtown Merced and Downtown Fresno Mariposa Street station locations, consistent with the Authority's decision in May.

Although the Authority and FRA approved portions of the Hybrid Alternative outside the wye for the north/south alignment of the HSR and the Downtown Merced and Downtown Fresno Mariposa

What is the HSR System?

The Authority proposes to construct, operate, and maintain an electric-powered HSR system in California. When completed, the 800-mile train system would provide new passenger rail service to more than 90 percent of the state's population. More than 200 weekday trains would serve the statewide intercity travel market. The HSR would be capable of up to 220-mile-per-hour operating speeds, with state-of-the-art safety, signaling, and automatic train control systems. The HSR system would connect and serve the major metropolitan areas of California, extending from San Francisco and Sacramento in the north to San Diego in the south.

Terms Used in this Document

The following terms are used in this document:

- **Central Valley Wye—**The portion of the Merced to Fresno Section that contains the HSR wye connection between the east-west alignment of the San Jose to Merced Section and the north-south alignment of the Merced to Fresno Section
- **Central Valley Wye alternatives—**The HSR alignment alternatives and associated electrical interconnection and network upgrade components analyzed in this Final Supplemental EIR/EIS
- **Preferred Alternative—**the Central Valley Wye preferred alternative
- **Electrical Interconnections and Network Upgrades--**New components required to interconnect to the electrical grid and upgrades to existing network components to accommodate future HSR operational load

[1] The state governing board with responsibility for planning, designing, constructing, and operating the California HSR System.

[2] The Authority used the term high-speed train (HST) in the Merced to Fresno Final EIR/EIS, but it has since changed this terminology to high-speed rail (HSR).

[3] The Hybrid Alternative consists of the north/south alignment of the high-speed rail within the Merced to Fresno Section connecting the Downtown Merced and Downtown Fresno Mariposa Street station locations. Refer to Figure 1-1.

[4] The term *design options* was used during the early stages of the alternatives screening process to refer to preliminary alternative alignments. The term is used in this chapter to be consistent with the alternatives analysis documents prepared between 2010 and 2014 and to differentiate these design options from the alternatives that were developed for this supplemental analysis.

Street station locations, these approvals deferred a decision on the area known as the "wye connection", that is, the east-west HSR connection between the San Jose to Merced Section to the west and the north-south portion of the Merced to Fresno Section to the east, for additional environmental analysis. This document, the *California High-Speed Rail Merced to Fresno Section: Central Valley Wye Final Supplemental EIR/EIS* (Final Supplemental EIR/EIS), is the next step in the environmental review process to select a wye connection.

Section 1.1, Introduction, answers the following questions:

- What is the scope of this Final Supplemental EIR/EIS?
- What is a "wye"?
- What is included in this document?

Chapter 1 also includes the approved Project Purpose, Need, and Objectives from the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: pages 1-3 through 1-21), with updates to reflect new information relevant to this Final Supplemental EIR/EIS. Cooperating and responsible agencies working with the Authority on the HSR project are listed in Section 1.5, Lead Agencies, Cooperating Agencies, Responsible Agencies.

Since publication of the Draft Supplemental EIR/EIS, in addition to the global issues described in Section S.1.2, Global Changes in the Final Supplemental EIR/EIS, of the Summary, the following substantive changes have been made to this chapter:

- A footnote has been added to the project objectives to acknowledge a change in anticipated timing of construction of the statewide HSR system compared to the objectives in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012).

1.1 Introduction

1.1.1 What is the Scope of this Final Supplemental EIR/EIS?

This Final Supplemental EIR/EIS evaluates the impacts of the Merced to Fresno Section Central Valley Wye alternatives. The Merced to Fresno Final EIR/EIS evaluated two wye design options, described as Avenue 24 and Avenue 21. However, as described previously, in 2012, the Authority and FRA deferred a decision on the wye connection for future environmental review (Figure 1-1). Since 2012, the Authority and FRA conducted additional studies of potential wye alternatives and outreach with the permitting agencies and the public, resulting in the range of four wye alternatives analyzed in this Final Supplemental EIR/EIS.

Focus of Central Valley Wye Final Supplemental EIR/EIS

This Final Supplemental EIR/EIS addresses new Central Valley Wye alternatives and associated electrical interconnections and network upgrades. It also highlights relevant information available since the Merced to Fresno Final EIR/EIS was completed in 2012.

While the Authority and FRA initially proposed to carry the wye connection forward for further study as part of the San Jose to Merced Section EIR/EIS (Authority and FRA 2012: page 7-7), they subsequently determined it should instead be evaluated as part of a supplement to the Merced to Fresno Final EIR/EIS. With FRA's July 2019 decision to delegate its responsibilities under NEPA and other federal environmental laws to the Authority (NEPA Assignment Memorandum of Understanding [MOU]) (FRA and State of California 2019), the Authority has therefore prepared this Final Supplemental EIR/EIS pursuant to 40 Code of Federal Regulations Part 1502.9 and CEQA Guidelines[5] Sections 15162 and 15163.

The environmental analysis in this Final Supplemental EIR/EIS focuses on four Central Valley Wye alternatives, each of which includes electrical interconnections (i.e., electrical infrastructure required to connect HSR to the electrical grid). Additionally, the analysis addresses upgrades to existing Pacific Gas & Electric network facilities to provide reliable electric service to meet the

[5] All citations in this document to the "CEQA Guidelines" are references to the California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000–15387.

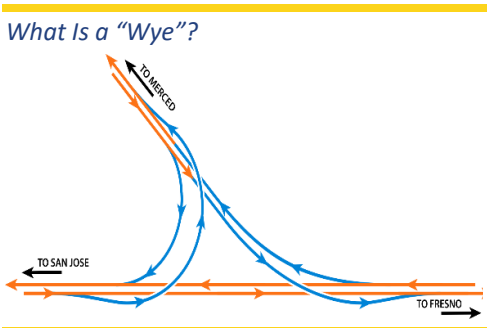
HSR system's electrical demand. This Final Supplemental EIR/EIS also addresses new information available since publication of the Draft Supplemental EIR/EIS, as well as comments received during the public reviews of the Draft Supplemental EIR/EIS.

The Central Valley Wye alternatives illustrated on Figure 1-2 differ from those of the deferred wye connection (illustrated on Figure 1-1) and include the associated electrical interconnections and network upgrades that are evaluated in this Final Supplemental EIR/EIS. Section 2.1.2, The Wye Connection, provides a history and detailed discussion of the wye alternatives.

Relevant portions of the Merced to Fresno Final EIR/EIS that remain unchanged are not repeated in this Final Supplemental EIR/EIS (unless specified), but citations are provided to help direct the reader to the relevant sections of the Merced to Fresno Final EIR/EIS (State Clearinghouse number 2009091125) (Authority and FRA 2012), which is available via the Authority's website (https://www.hsr.ca.gov/programs/environmental/eis_eir/final_merced_fresno.aspx) and the FRA's website: https://www.fra.dot.gov/Page/P0465.

1.1.2 What is a Wye?

The term *wye* refers to the Y-like formation that is created at the point where train tracks branch off the mainline to continue in different directions. The transition of mainline track to a wye requires splitting two tracks into four tracks that cross over one another before the wye *legs* can diverge in opposite directions to allow two-way travel. For the Merced to Fresno Section of the HSR system, the two tracks traveling east-west from the San Jose to Merced Section must become four tracks—a set of two tracks branching toward Merced to the north and a set of two tracks branching toward Fresno to the south.



1.1.3 What is Included in this Document?

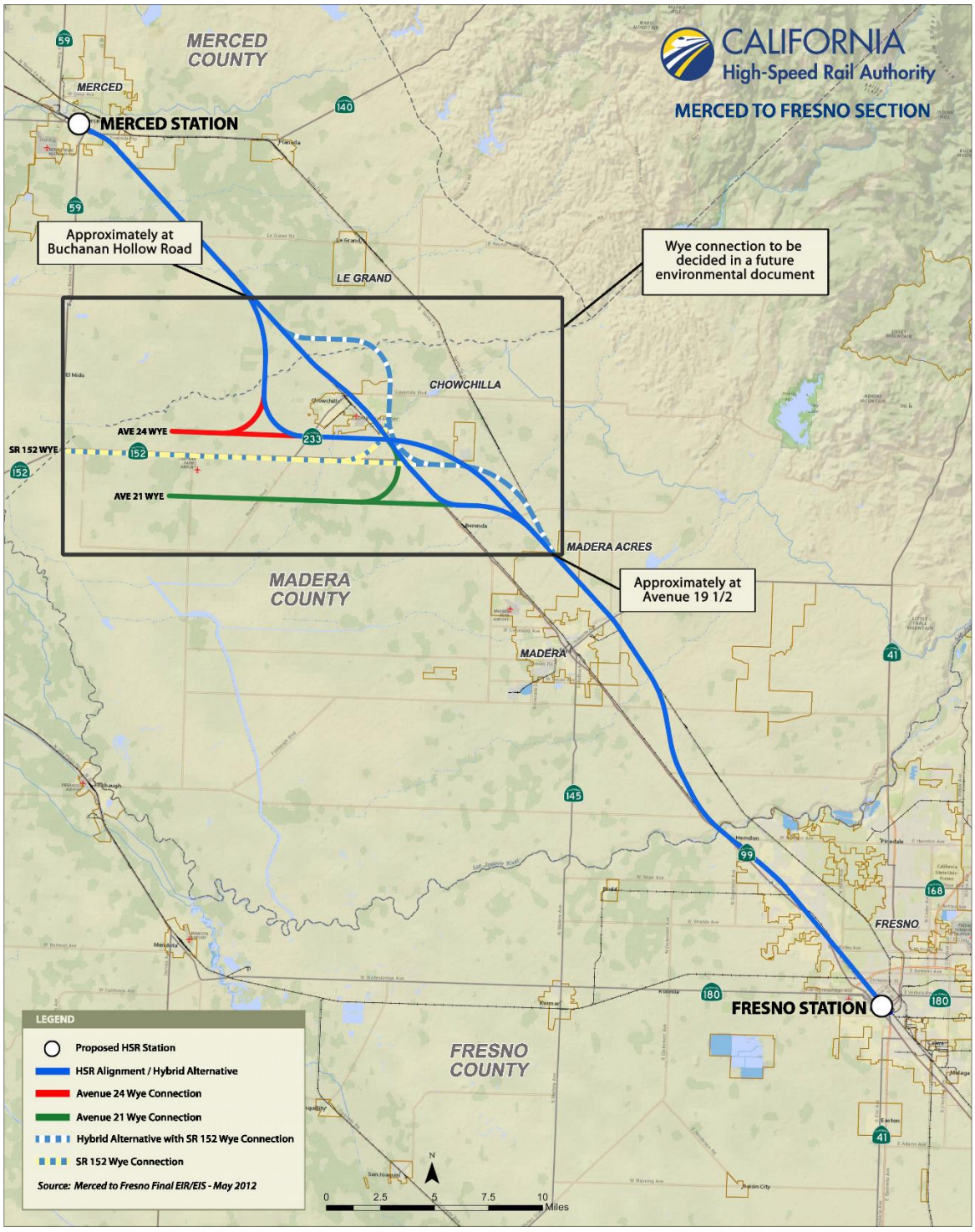
Volume I of this document follows a similar format as the Merced to Fresno Final EIR/EIS and is organized into the following chapters:

- Chapter 1, Introduction and Purpose, Need, and Objectives
- Chapter 2, Alternatives
- Chapter 3, Affected Environment, Environmental Consequences, and Mitigation Measures
- Chapter 4, Final Section 4(f) and Section 6(f) Evaluations
- Chapter 5, Environmental Justice
- Chapter 6, Project Costs and Operations
- Chapter 7, Other CEQA/NEPA Considerations
- Chapter 8, Preferred Alternative
- Chapter 9, Public and Agency Involvement
- Chapter 10, Final Supplemental EIR/EIS Distribution
- Chapter 11, List of Preparers
- Chapter 12, References
- Chapter 13, Glossary of Terms
- Chapter 14, Index
- Chapter 15, Acronyms and Abbreviations

This document also includes:

- Volume II, Technical Appendices;
- Volume III, Alignments and Other Plans
- Volume IV, Responses to Comments.

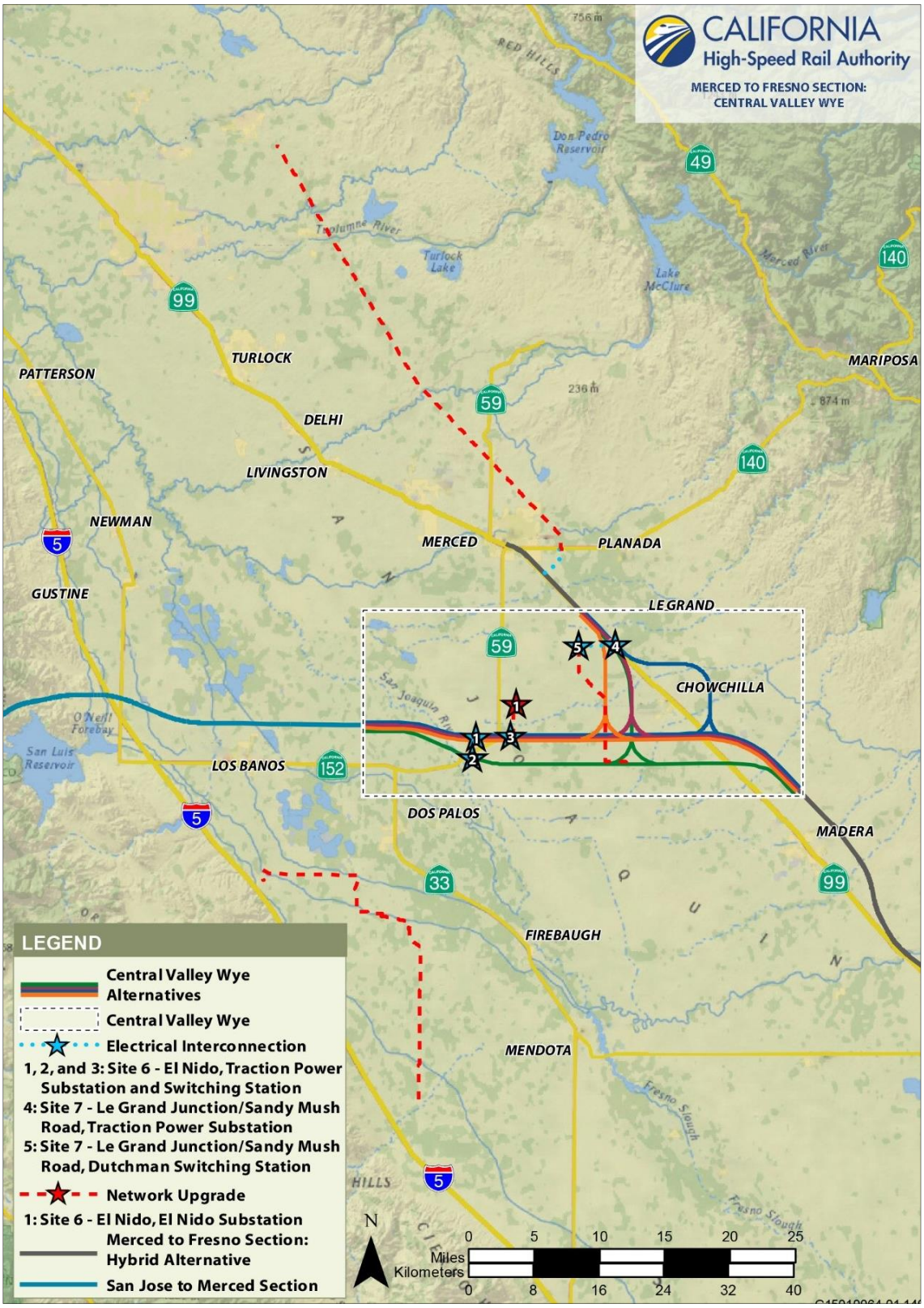
Volume II provides additional details on the Central Valley Wye alternatives and the Final Supplemental EIR/EIS process. Volume III presents the design drawings, including trackway and roadway crossing design. Volume IV contains all public comments received on the Draft Supplemental EIR/EIS and the Revised Draft Supplemental EIR/Second Draft Supplemental EIS, Biological Resources Analysis, along with the Authority's responses to all such comments. Volume IV also contains the Authority's Standard Responses to comments in both English and Spanish.



Source: Authority and FRA, 2012 MAY 2012

Note: The Merced to Fresno Final EIR/EIS identified the Hybrid Alternative as the preferred alternative, illustrated on this figure as the HSR Alignment/Hybrid Alternative.

Figure 1-1 Hybrid Alternative and Wye Area Deferred for Further Study in the 2012 Merced to Fresno Final EIR/EIS



Source: Authority, 2019

OCTOBER 30, 2019

Figure 1-2 Central Valley Wye Alternatives

1.2 Purpose of and Need for the HSR System and the Merced to Fresno HSR Section

This section presents the Purpose and Need from the Merced to Fresno Final EIR/EIS. Some subsections of the Purpose and Need have been updated to reflect relevant new information and current conditions.

1.2.1 Purpose of the HSR System

The Program EIR/EIS documents[8] identified and evaluated alternative HSR corridor alignments and stations as part of a statewide HSR system. The stated purpose of the HSR system is as follows:

> *The purpose of the statewide HSR system is to provide a reliable high-speed electric-powered train system that links the major metropolitan areas of the state, and that delivers predictable and consistent travel times. A further objective is to provide an interface with commercial airports, mass transit, and the highway network and to relieve capacity constraints of the existing transportation system as increases in intercity travel demand in California occur, in a manner sensitive to and protective of California's unique natural resources (Authority and FRA 2005).*

1.2.2 CEQA Project Objectives of the HSR System in California and in the Central Part of the San Joaquin Valley Region

The Authority's statutory mandate is to plan, build, and operate an HSR system coordinated with California's existing transportation network, particularly intercity rail and bus lines, commuter rail lines, urban rail lines, highways, and airports. The Authority has responded to this mandate by adopting the following objectives and policies for the proposed HSR system as described in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012: page 1-4) and updated to be consistent with the 2016 Business Plan:

- Provide intercity travel capacity to supplement critically overused interstate highways and commercial airports.
- Meet future intercity travel demand that will be unmet by present transportation systems and increase capacity for intercity mobility.
- Maximize intermodal transportation opportunities by locating stations to connect with local transit systems, airports, and highways.
- Improve the intercity travel experience for Californians by providing comfortable, safe, frequent, and reliable high-speed travel.
- Provide a sustainable reduction in travel time between major urban centers.
- Increase the efficiency of the intercity transportation system.
- Maximize the use of existing transportation corridors and rights-of-way, to the extent feasible.
- Develop a practical and economically viable transportation system that can be implemented in phases and that will generate revenues in excess of operations and maintenance costs.[9]
- Provide intercity travel in a manner sensitive to and protective of the region's natural and agricultural resources and reduce emissions and vehicle miles traveled for intercity trips.

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[8] The Program EIR/EIS documents are: *Final Program EIR/EIS for the Proposed California High-Speed Train System* (Authority and FRA 2005), *San Francisco Bay Area to Central Valley High-Speed Train Final Program EIR/EIS* (Authority and FRA 2008), and *2012 Bay Area to Central Valley High-Speed Train Partially Revised Final Program EIR* (Authority 2012a).

[9] The Merced to Fresno Final EIR/EIS (published in 2012) had stated this objective with a specific timeframe: "…that can be implemented in phases by 2020." At that time, it was assumed that construction on most if not all project segments would be underway by 2017 and therefore, the 2012 Merced to Fresno Final EIR/EIS included the "by 2020" language. The Draft and this Final Supplemental EIR/EIS do not include the "by 2020" language given changes in the expected construction of other segments, but the underlying objective remains in effect.

1.2.3 Purpose of the Merced to Fresno HSR Section

The purpose of the Merced to Fresno Section is to provide the public with electric-powered HSR service that provides predictable and consistent travel times between major urban centers and connectivity to airports, mass transit systems, and the highway network in the south San Joaquin Valley, and to connect the northern and southern portions of the system.

The purpose of the wye itself is to connect the Merced to Fresno Section, which runs north-south, to the San Jose to Merced Section, which runs primarily east-west. The two tracks traveling west from the San Jose to Merced Section would connect to a set of two tracks branching north toward Merced and to a set of two tracks branching south toward Fresno.

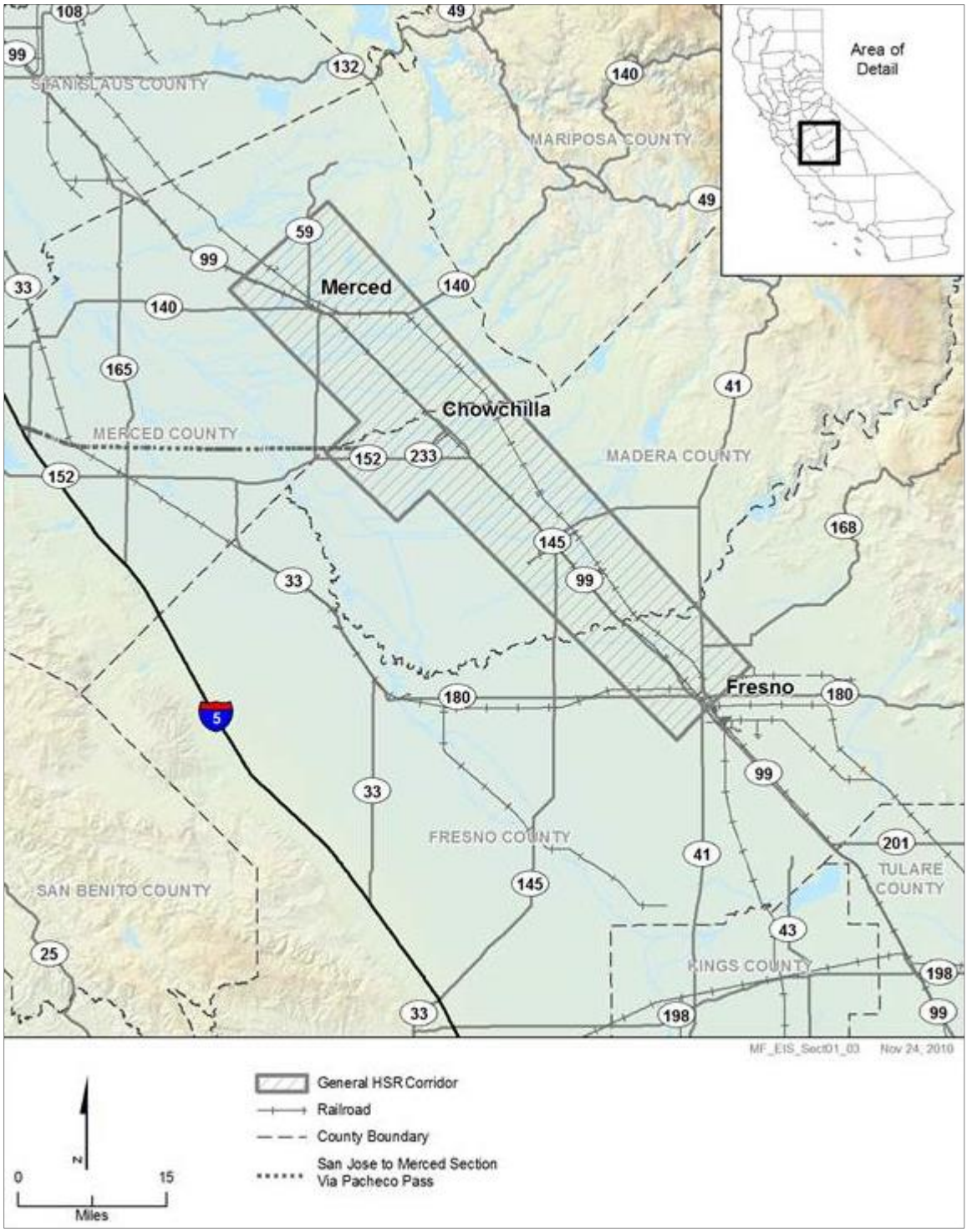
1.2.4 The Merced to Fresno Section's Contribution to Meeting the Statewide and Regional Need for the HSR System

The need for an HSR system exists statewide, with specific attributes of regional areas contributing to this need. The Merced to Fresno Section is an essential component of the statewide HSR system.

The capacity of California's intercity transportation system, including the central part of the San Joaquin Valley region, is insufficient to meet existing and future travel demand. Current and projected future system congestion will continue to result in deteriorating air quality, reduced reliability, and increased travel times. The current transportation system has not kept pace with the increase in population, economic activity, and tourism within the state, including in the central part of the San Joaquin Valley region. The interstate highway system, commercial airports, and the conventional passenger rail system serving the intercity travel market are operating at or near capacity. These transportation systems will require large public investments for maintenance and expansion to meet existing demand and future growth over the next 25 years and beyond. Moreover, the feasibility of expanding many major highways and key airports is uncertain; some needed expansions might be impractical or are constrained by physical, political, and other factors. The need for improvements to intercity travel in California, including intercity travel between the central part of the San Joaquin Valley, the San Francisco Bay Area (Bay Area), Sacramento, and Southern California relates to the following issues:

- Future growth in demand for intercity travel, including the growth in demand within the central part of the San Joaquin Valley region.
- Capacity constraints that will result in increasing congestion and travel delays, including those in the central part of the San Joaquin Valley region.
- Unreliability of travel stemming from congestion and delays, weather conditions, accidents, and other factors that affect the quality of life and economic well-being of residents, businesses, and tourism in California, including the central part of the San Joaquin Valley region.
- Reduced mobility as a result of increasing demand on limited modal connections between major airports, transit systems, and passenger rail in the state, including the central part of the San Joaquin Valley region.
- Poor and deteriorating air quality and pressure on natural resources and agricultural lands as a result of expanded highways and airports and urban development pressures, including the development pressures within the central part of the San Joaquin Valley region.

Figure 1-3 shows the central location of the Merced to Fresno Section within California. This region greatly contributes to the statewide need for a new intercity transportation service that will connect it with major population and economic centers and to other regions of the state.



Source: Authority and FRA, 2012

DECEMBER 28, 2015

Figure 1-3 Merced to Fresno Section Corridor

California's major population, economic, and political centers are located on the coasts of Northern and Southern California and in the Sacramento Valley. The following sections provide additional information about factors relevant to intercity travel between Merced, Fresno, the Sacramento Valley, the Bay Area, and Southern California that has been updated since the Merced to Fresno Final EIR/EIS.

1.2.4.1 Travel Demand and Capacity Constraints

Long-distance trips, defined as those trips greater than 50 miles, are a large and growing proportion of the total travel market in California. To accommodate this increased demand, the state's long-distance passenger transportation infrastructure—highways, railroads, and air service—will require capacity expansion. Information regarding population and economic growth, along with travel demand and capacity constraints of the transportation network, has changed since publication of the Merced to Fresno Final EIR/EIS in 2012. The following sections discuss relevant updated information.

Population and Economic Growth

The California Department of Finance projects that California's population will increase by approximately 10 million residents between 2010 and 2040. Total population is expected to grow steadily to about 50 million people by 2050 (California Department of Finance [CDOF] 2014).

The San Joaquin Valley—which is in the southern portion of the greater Central Valley and includes the two-county region of Merced and Madera Counties that encompasses the Central Valley Wye—is one of the state's fastest growing regions. As shown in Table 1-1, the California Department of Finance projects that the San Joaquin Valley will experience a population increase of approximately 51 percent between 2010 and 2040. The populations of Merced and Madera Counties are expected to increase 52 percent and 58 percent, respectively, over the same period. This growth is attributed primarily to the migration of people, both internationally and from urban coastal areas, seeking employment and affordable housing in the Central Valley.

Table 1-1 Population Growth in California, the San Joaquin Valley, and Merced and Madera Counties

Area	2010 Population	2040 Population Projection	Percent Change (%)
State of California	37,253,956	47,233,240	27
San Joaquin Valley[1]	3,971,659	5,979,559	51
Merced County	255,793	389,934	52
Madera County	150,865	238,514	58

Sources: U.S. Census Bureau, 2010; CDOF, 2014

[1] San Joaquin Valley includes San Joaquin, Stanislaus, Merced, Madera, Fresno, Tulare, Kings, and Kern Counties.

Agriculture defines the socioeconomic structure of the San Joaquin Valley. The region is one of the most agriculturally productive areas in the state. In 2014, Merced and Madera Counties ranked 5th and 9th, respectively, in total agricultural production value in California. Cumulatively, the two counties accounted for about $6.6 billion (14.5 percent) of the total agricultural revenue generated statewide in 2014 ($46.1 billion) (California Department of Food and Agriculture [CDFA] 2015). Key agricultural products and crops produced in this region include dairy products, nuts, and fruits.

As an economic driver and a factor in the socioeconomic structure of the San Joaquin Valley, agriculture will continue to play a key role in the future. However, lower land and labor costs in the valley compared to those of other regions have attracted businesses to the region over the past two decades. In 2013, the leading employment sectors in the San Joaquin Valley were agriculture (269,000 jobs), retail (135,000 jobs), education and training (134,000 jobs), and health care

services (134,000 jobs) (California Employment Development Department [CEDD] 2015). Manufacturing, especially in smaller metropolitan areas, is also important to the region's economic growth. Manufacturing is an important stage of value-added production and its continued and expanded role in the processing of agricultural products is regarded as an important source of future economic growth (Cowan 2005).

The San Joaquin Valley had substantially greater unemployment and lower per capita income than the state in 2014 and 2015 (Table 1-2). As of 2015, the valley's unemployment rate was 10.33 percent, higher than the unemployment rate for the entire state of 6.2 percent (CEDD 2017). In response to the persistent unemployment problem in the valley, local governments are making a concerted effort to help create jobs. Economic development agencies are working to create job opportunities, while workforce investment boards are providing education and training to provide individuals with the necessary skills to fulfill employment needs. Additionally, the California Partnership for the San Joaquin Valley, a public-private partnership focused on improving the region's economic vitality and quality of life, has established major initiatives in economic growth, transportation, sustainability, clean air, health and human services, and education.

Table 1-2 Unemployment and Income in California, the San Joaquin Valley, and Merced and Madera Counties

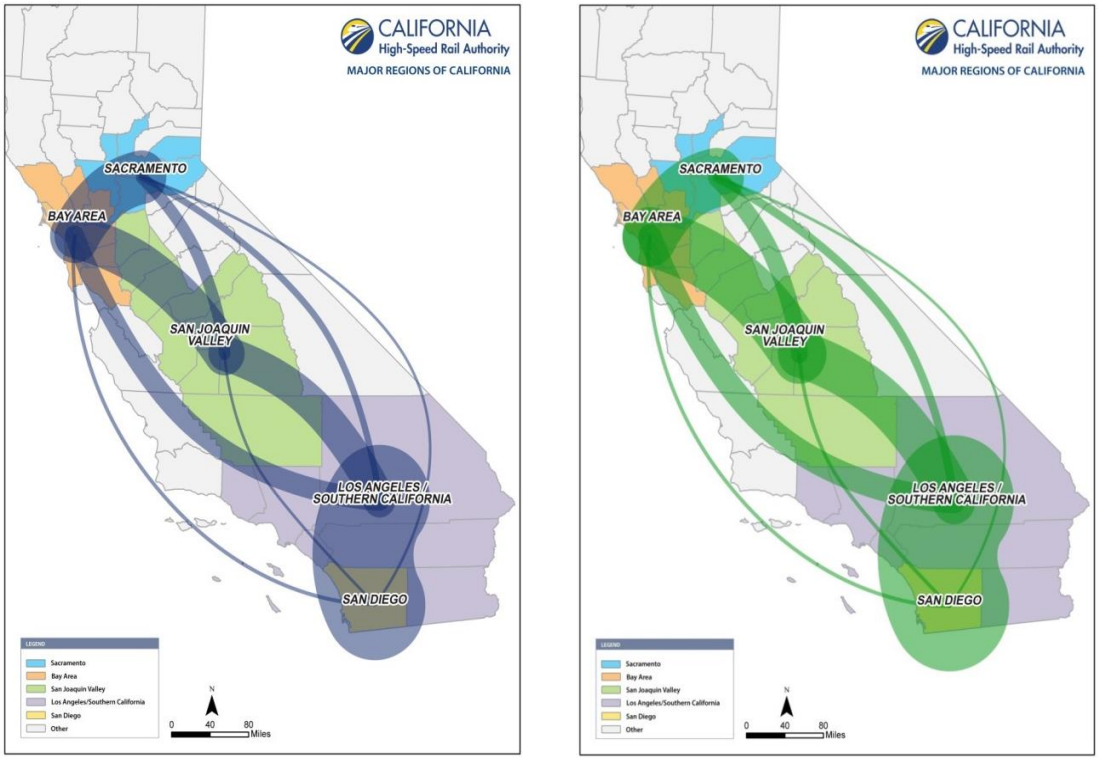
Geographic Area	Per Capita Personal Income 2014[1]	Unemployment Rate (%) 2015
State of California	$50,988	6.2
San Joaquin Valley	$36,213	10.3
Merced County	$34,567	11.3
Madera County	$34,243	10.5

Sources: CEDD, 2017; U.S. Department of Commerce, 2016

[1] At the time of writing, updated personal income estimate data were not yet available from the U.S. Department of Commerce.

Travel Demand

Intercity and interregional travel in California is expected to grow substantially into the 21st century, as depicted in Figure 1-4 and Table 1-3. These travel patterns serve as the baseline and horizon years for the 2016 Business Plan. From 2010 to 2040, the number of long-distance trips is projected to grow by at least 50 percent. By 2040, travelers will make an additional 135 million new long-distance trips in corridors that connect California's major population centers: the Bay Area, Sacramento, Los Angeles and San Diego regions, and the San Joaquin Valley. Approximately 46 million of these new long-distance trips will be made in the Bay Area-San Joaquin Valley-Los Angeles corridor that the Phase 1 HSR system would serve (see Section 1.3, 2016 Business Plan, regarding the phased approach to constructing and operating the HSR system). This growth in long-distance travel is a result of both population increase and the projection that each individual, on average, will make more long-distance trips in the future, a reflection of the state's changing physical, social, and economic landscape.



Source: Authority, 2015

Figure 1-4 Interregional Travel Patterns—2010 (left) and Projected 2040 (right)

Table 1-3 Annual Interregional and Intraregional Travel Patterns for 2010 and Projected 2040

Regional Interchanges	Average Annual Volume (2010)	Projected Average Annual Volume (2040)	Percent Increase (%)
MTC – SACOG	42,326,000	73,529,000	74
MTC – SCAG	16,475,000	23,973,000	46
MTC – SANDAG	2,714,000	4,235,000	56
MTC – San Joaquin Valley	32,895,000	56,283,000	71
SACOG – SCAG	5,433,000	9,112,000	68
SACOG – SANDAG	744,000	1,402,000	88
SACOG – San Joaquin Valley	10,452,000	19,827,000	90
SCAG – SANDAG	98,219,000	139,069,000	42
SCAG – San Joaquin Valley	28,751,000	44,348,000	54
SANDAG – San Joaquin Valley	2,718,000	4,416,000	62
Total Interregional Long-Distance Trips	**240,727,000**	**376,194,000**	**56**

Regional Interchanges	Average Annual Volume (2010)	Projected Average Annual Volume (2040)	Percent Increase (%)
MTC	28,896,000	42,806,000	48
San Joaquin Valley	19,160,000	33,046,000	72
SCAG	128,412,000	194,894,000	52
Total Intraregional Long-Distance Trips	**176,468,000**	**270,746,000**	**53**

Source: Authority, 2015
MTC = Metropolitan Transportation Commission
SACOG = Sacramento Area Council of Governments
SANDAG = San Diego Association of Governments
SCAG = Southern California Association of Governments

Freeway Congestion and Travel Delays

The San Joaquin Valley region exemplifies statewide travel demand patterns and trends. As shown in Table 1-3, intraregional long-distance travel in the San Joaquin Valley is expected to increase by 72 percent between 2010 and 2040. Correspondingly, the total vehicle miles traveled (VMT)[10] in Merced and Madera Counties is projected to double between 2012 and 2040 (Table 1-4).

Table 1-4 Current and Projected Vehicle Miles Traveled in Merced and Madera Counties

County	2012 Daily VMT	2040 Daily VMT (estimate)	Estimated Increase in VMT (% of 2012 VMT)
Merced	7,138,910	14,672,972	101
Madera	3,959,660	9,222,832	133

Source: Caltrans, 2009 and 2012
VMT = vehicle miles traveled

As shown on Figure 1-2, travel within the San Joaquin Valley in general, and in Merced and Madera Counties in particular, largely depends on State Route (SR) 99 for intercity trips. SR 99 is the principal connection between the major cities in the San Joaquin Valley region, and it currently carries from 38,000 to more than 100,000 vehicles in annual daily traffic (California Department of Transportation [Caltrans] 2013a). As part of the larger north-south freeway system that includes Interstate 5, SR 99 provides the San Francisco and Southern California regions access to and from the cities of the San Joaquin Valley.

Most of SR 99 was built in the late 1950s and early 1960s to accommodate a smaller population and correspondingly smaller transportation infrastructure demands. Not only is the population of the San Joaquin Valley increasing rapidly, but growth is also taking place in land use patterns that rely on automobiles for most trips. Caltrans has begun implementing the *Route 99 Corridor Business Plan* (Caltrans 2013a), which will remove remaining at-grade intersections and improve others to higher capacity. This work will continue over the next 10 years, depending on available funding. The plan calls for widening SR 99 between Merced and Fresno from four to six lanes to ease traffic flow between interchanges. However, the widening of SR 99 will still not create enough capacity to adequately serve future volumes projected along SR 99 through 2040. According to the *Route 99 Corridor Business Plan,* only a shift in vehicle travel to alternative modes can restore better traffic flows (Caltrans 2013a).

Caltrans' goals for state highways is level-of-service B through D on a scale of A to F, where A is unencumbered travel and F is stop-and-go traffic flow. In the *SR 99 Corridor System Management Plan,* Caltrans stated that SR 99 was operating at level-of-service C or D through most of its length

[10] The total miles traveled by all vehicles in a specified area during a specified time.

(Caltrans 2008). Caltrans estimated that by 2025, the level-of-service will likely deteriorate on all segments of SR 99 because of increased interregional and statewide travel, with operations reaching unacceptable levels of congestion (level-of-service E or F) by 2030 without system improvements. The capacity improvements planned for SR 99 often involve property acquisition, reconstruction of bridges, and other infrastructure improvements requiring an expenditure of several billion dollars. Even if Caltrans made all of the needed structural and capacity improvements, only a few segments of SR 99 would meet operating standards in 2030 because the volume of traffic would exceed practical highway capacity expansions (Caltrans 2008).

Freight Movement

Vehicle travel into, out of, and within the San Joaquin Valley region competes with freight movement along SR 99 and other local roads. Freight deliveries by truck are an important component of the regional economy, particularly for transporting agricultural goods from farm to market. In 2013, daily truck volumes on SR 99 ranged from about 8,000 to 10,000 trucks, representing 20 percent of the total traffic between Merced and Fresno (Caltrans 2013b). The region's growth, especially along the urban segments of SR 99, threatens the ability of the highway to serve future needs. Even with planned improvements, such as those discussed in the Freeway Congestion and Travel Delays subsection, heavily congested segments will remain along SR 99.

Movement of goods between the San Joaquin Valley, Southern California, and the Bay Area takes place almost entirely by truck. Trucks move approximately 92 percent of the total inbound, outbound, intraregional, and through tonnage; rail accounts for 8 percent of the total tonnage of freight movement (Cambridge Systematics, Inc. 2013).

The Union Pacific Railroad (UPRR) and BNSF Railway (BNSF) are the principal providers of freight rail service to the San Joaquin Valley. Both of these railroads offer rail-truck intermodal service from a number of locations in the valley and carry food products, general freight, grain, and lumber. UPRR and CSX Transportation offer a rail-truck service for perishable goods in the San Joaquin Valley.

Conventional Passenger Rail

Caltrans helps fund intercity passenger rail service by supplementing Amtrak's interstate service through capital and operational measures. Amtrak's San Joaquin Route, operated by Caltrans and governed by the San Joaquin Joint Powers Authority on railroad tracks owned by BNSF, currently provides intercity rail transportation in the vicinity of the Central Valley Wye. The San Joaquin route currently provides four trips daily in each direction from Oakland to Bakersfield (with a bus connection to the Los Angeles Basin), and two trips daily in each direction from Sacramento to Bakersfield, for a total of six daily roundtrips serving Merced.

The scheduled travel time between Bakersfield and Oakland averages 6 hours and 9 minutes, with an average speed of 51.3 miles per hour (the maximum speed on the route is 79 miles per hour) (Amtrak 2016, Caltrans 2013c). Travel by train can take longer than travel by car. Drivers from Bakersfield can reach Oakland in approximately 5 hours—1 hour faster than the train's average travel time, and with the convenience of direct door-to-door travel.

Utilizing tracks that also carry freight trains limits the ability to institute higher-speed service because of track conditions and freight train schedules. Despite these limitations, the San Joaquin route carried more than 1.2 million riders in fiscal year 2013, a 69 percent increase since 2000 (Amtrak 2013; San Joaquin Joint Powers Authority 2015).

In September 2018, Caltrans released the *2018 California State Rail Plan: Connecting California* (Rail Plan), a 20-year strategic plan for planning and implementing a coordinated, statewide rail system for both passenger and freight rail service (Caltrans 2018). The Rail Plan addresses expansion, upkeep and maintenance, and the addition of emerging technology (including high speed rail) to the existing rail network. The Rail Plan "*presents a future vision for statewide rail travel that builds on the State's existing conventional rail, along with opportunities provided by high-speed rail (HSR) and transit; leveraging emerging technologies such as electrification and*

advanced train control systems that help make rail travel more efficient, faster, safer, and more reliable." (Caltrans 2018, pg. 3). The role of HSR is specifically addressed in the Rail Plan as a transportation mode that is important to provide reliable and efficient passenger transportation between and within mega-regions through the integration of HSR with intercity rail and bus, regional rail, and local transit service.

Air Travel

Air travel demand has been growing steadily in California and nationwide; federal, state, and regional transportation plans (RTP) forecast continued growth in air travel over the next several decades. More than eight million passengers per year fly between the Bay Area and Los Angeles area airports (Authority 2014). There are far fewer trips to and from San Joaquin Valley airports, which do not fall within the top 100 corridors in the United States. Without HSR, air travel will account for more than 3 percent of all intercity travel statewide and approximately 10 percent of longer intercity trips (those in excess of 100 miles).

Eight airports in the Central Valley provide commercial service to the public. With the exception of Sacramento International Airport in Sacramento, Fresno-Yosemite International Airport in Fresno, and Meadow Fields Airport in Bakersfield, these airports generally offer only one to three flights daily to larger airports in Northern and Southern California. The Fresno-Yosemite International Airport is the San Joaquin Valley's major airport, while Merced Municipal/Macready Field also offers several commercial flights daily to communities in the vicinity of the Central Valley Wye.

Neither Fresno-Yosemite International Airport nor Merced Municipal/Macready Field provide substantial commercial airline service to the San Joaquin Valley population. A comparison between the populations of Sacramento, Fresno, and Merced Counties and the amount of air travel activity at Sacramento International Airport, Fresno-Yosemite International Airport, and Merced Municipal/Macready Field makes this point evident. The 2010 census data indicate that the populations of Sacramento, Fresno, and Merced Counties are approximately 1.4 million, 930,000, and 256,000 people, respectively (U.S. Census Bureau 2010). Although the population of Sacramento County is approximately 50 percent larger than the population of Fresno County, and 450 percent larger than the population of Merced County, the 2010 in-state enplanements (a visitor flying in and flying out equals one enplanement) at Sacramento International Airport are nearly 10 times higher than at Fresno-Yosemite International Airport and nearly 100 times higher than at Merced Municipal/Macready Field (Table 1-5). Sacramento International Airport also provides service to 11 cities in California, whereas Fresno-Yosemite International Airport only serves San Francisco, Los Angeles, and San Diego. Merced Municipal/Macready Field only serves Los Angeles.

Air travel to and from Fresno-Yosemite International Airport and Merced Municipal/Macready Field does not competitively serve San Joaquin Valley residents when compared with automobile travel. As shown in Table 1-5, the limited number of flights offered and origin and destination airports served constrain air travel to and from these airports. For trips within California, many San Joaquin Valley travelers choose to drive to their destinations because the travel cost is lower than airfares. For example, airfare for a one-way trip from San Francisco to Los Angeles costs approximately $105, while the same airline for the same travel date charges between $267 and $382 for a one-way flight from San Francisco to Fresno (United Airlines 2016). For trips outside California, travelers from the San Joaquin Valley frequently choose to drive to larger airports in Sacramento, San Francisco, Oakland, San Jose, or Southern California, where they can obtain more direct flights than are available from either the Fresno-Yosemite International Airport or Merced Municipal/Macready Field.

The driving time from Fresno to San Francisco is approximately 3 hours and 40 minutes, and from Fresno to Los Angeles it is approximately 4 hours. The driving time and flight costs from Fresno to San Francisco and Los Angeles can discourage residents of the San Joaquin Valley from considering trips to these metropolitan centers and in doing so can contribute to the economic and cultural isolation of the San Joaquin Valley. Fog further aggravates this isolation during winter, which causes delays in automotive and air travel. The Central Valley experiences an average of 30 days of dense fog per year; the dense fog contributes to a substantial number of accidents along SR 99 and flight delays at airports (NOAA n.d.).

Table 1-5 Commercial Air Traffic and Central Valley Airports

Airport	2015 Enplanements	2010 In-State Enplanements	Number of Carriers Providing In-State Service	Daily Departures to In-State Airports	In-State Airports Served
Sacramento International Airport	4,714,723	2,037,724	12	155	Arcata, Burbank, Los Angeles, Long Beach, Ontario, Palm Springs, San Diego, San Francisco, San Jose, Santa Barbara, Orange County (Santa Ana)
Fresno-Yosemite International Airport	694,994	199,680	8	73	San Francisco, Los Angeles, San Diego
Merced Municipal/ Macready Field	1,998	2,051	1	2	Los Angeles, Sacramento

Source: FAA, 2010, 2015, 2019

Despite the distance to the San Francisco, Oakland, and San Jose airports from Merced and Fresno Counties, many people in the San Joaquin Valley use these airports. In 2010, just over 42 million passengers moved through San Francisco International Airport, and with over 100 million passengers projected by 2035, the airport is projected to exceed capacity (Authority 2014). As early as 1998, San Francisco International Airport undertook studies to address the capacity constraints associated with its existing runway configuration. However, its location by the environmentally sensitive San Francisco Bay makes adding a new runway highly unlikely. These capacity constraints could force the airport to reduce air service in intercity travel markets with high levels of service (such as between Los Angeles and San Francisco).

The future level of travel demand is noteworthy because the demand for air travel has been growing steadily in California, and RTPs forecast continued growth in air travel over the next decades. Between November 2014 and October 2015, Los Angeles to San Francisco was the second-busiest air travel route in the U.S., with 3.68 million trips (U.S. Department of Transportation [U.S. DOT] 2017). The Bay Area's two primary medium hub airports—Oakland International Airport and San Jose International—are projected to greatly increase their annual passenger demand through 2025 and 2027, respectively (Port of Oakland 2006; City of San Jose 2015). Some projected air travel demand may be absorbed by these medium hub airports and by external airports in the larger market area, such as Sacramento International Airport, Stockton Metropolitan Airport, Fresno-Yosemite International Airport, Merced Regional/ Macready Field, and the Los Banos Municipal Airport. However, these external airports offer fewer flights and destination locations and do not provide frequent intercity commercial airline service to populations in the Central Valley.

The HSR system would provide a new intercity travel option for air passengers from the San Francisco Bay Area and Central Valley airports, serving passengers who would normally fly between the Bay Area and Los Angeles, Burbank, and Orange County. The California cities that would be served by HSR include 5 of the top 15 Bay Area domestic air passenger markets and 26 percent of all domestic passengers served from the three Bay Area airports (SH&E 2011). Because of existing constraints to expanding San Francisco International Airport and the large

hub airports in Southern California, regional sharing of air travel among local airports, market mechanisms, and high-speed ground travel modes will be needed to alleviate the demand and capacity constraints. The HSR system would help to alleviate these capacity constraints at San Francisco International Airport and Los Angeles International Airport by providing a new intercity transportation mode and improving the transportation accessibility of the San Joaquin Valley.

Travel Time

Similar to the central part of the San Joaquin Valley, with growing demand for intercity travel and growing capacity constraints, the total automobile travel time will increase statewide. Table 1-6 shows the approximate total travel time in 2010 and the projected total travel time in 2035 for automobile, air, and rail between various city pairs. These data come from the ridership analysis completed for the HSR forecasting model information from regional transportation planning agencies, Caltrans, and current air and conventional rail schedules.

While air travel time will not change, the number of desired flights to a given destination from San Joaquin Valley airports may be limited by runway capacity at major metropolitan airports, thus reducing flexibility in travel dates available. Projected increases in automobile travel time will be caused largely by growing travel demand and resulting congestion on highways used for intercity travel. Programmed and funded highway improvements will not measurably change future conditions. Some capacity improvements have been funded for the central part of the San Joaquin Valley and in Southern California, but these are basic enhancements intended to improve reliability rather than travel time. The Amtrak plan for the next 10 years includes adding one more roundtrip per day between Oakland and Bakersfield and reducing the travel time between these two cities to fewer than 6 hours (Caltrans 2013c). These improvements will provide some benefit to rail passengers, but will not provide substantial passenger rail capacity to the San Joaquin Valley.

Continuing population growth and increasing tourism in California place severe demands on the already congested transportation system serving the state's major metropolitan areas. As described in the RTPs (listed in Section 3.2, Transportation) for areas that would be served by the proposed HSR system, the highways and airports serving key cities are operating at capacity, and plans for expansion will not keep pace with projected growth over the next 20 to 40 years.

Table 1-6 Estimated Total Travel Times (Door-to-Door in Hours and Minutes) between City Pairs by Auto, Air, and Rail (Peak Conditions)

City Pair	Auto[a]		Air[b,c]		Conventional Rail[c]	
	2010	2040	2010	2040	2010[d]	2040[e]
Los Angeles downtown to San Francisco downtown	6:27	6:53	4:37	4:32	11:40	11:29
Fresno downtown to Los Angeles downtown	3:37	3:51	4:03	4:23	5:49	5:55
Los Angeles downtown to San Diego downtown	2:24	2:28	4:11	3:55	3:02	3:24
Burbank (Airport) to San Jose downtown	5:22	5:43	3:43	3:43	10:31	10:40
Sacramento downtown to San Jose downtown	2:22	2:18	4:12	4:25	4:04	3:32

Source: Authority, 2016; estimates based on Cambridge Systematics data in 2016.

[a] Travel times come from California Statewide Travel Demand Model.

[b] Main-mode level of service assumptions are the same for 2010 and 2040, and are based on 2009 level of service conditions from U.S. DOT 10% O&D Survey airline data from Bureau of Transportation Statistics. Total travel time differences based on changes in access/egress over time.

[c] Air and conventional rail times include access to main mode via transit, egress to main mode via transit, and terminal and wait time at station/airport. When transit is unavailable, auto is used for access/egress.

[d] Developed from on-line published San Joaquin schedule.

[e] Year 2040 San Joaquin operating plan developed from the 2013 State Rail Plan.

1.2.4.2 Safety and Reliability

The California Highway Patrol publishes a summary of accident data for state highways. Fatalities on state highways in the counties that encompass the Central Valley Wye are comparable to the statewide average—0.9 fatalities per 100 million VMT in Merced County and 0.8 fatalities per 100 million VMT in Madera County (California Highway Patrol 2012; Caltrans 2013b). Merced County's average daily VMT was 7.33 million in 2014. The Merced County Association of Governments forecasts a 46 percent increase in VMT between 2014 and 2040 (Madera County Association of Governments [MCAG] 2014). The Madera County Transportation Commission forecasts that VMT in Madera County will increase by 44 percent between 2010 and 2040, from 4.97 million miles per day to 7.17 million miles per day. Much of this increase will be due to longer-distance trips, especially commute trips to and from Fresno for work (MCTC 2014).

The San Joaquin Valley experiences dense fog during winter that creates a substantial safety hazard for motorists. Visibility is often less than one-eighth of a mile (approximately 600 feet); sometimes visibility can be less than 10 feet. In November 2007, fog caused a pileup that involved 108 passenger vehicles on northbound SR 99, south of Fresno. Many motorists do not travel between cities in the San Joaquin Valley, or to and from the valley, when heavy fog forms. This hazard also affects air travel and is a key factor in San Joaquin Valley airport flight delays and cancellations.

Weather conditions outside the San Joaquin Valley can also be a factor in airport flight delays and cancellations. Because the Federal Aviation Administration Ground Delay Program holds flights at their point of departure until the destination airport can accept the demand, and because short flights (e.g., Merced to Los Angeles) are more easily adjusted than longer flights (e.g., the East Coast or Midwest to the West Coast), short flights are more likely to experience holding delays. Consequently, intercity air travel within California can experience major delays because of the total airport demand at the major metropolitan airports.

The statistics for the Fresno and Merced airports reflect these delays. Approximately 18.5 percent of flights departing Fresno-Yosemite International Airport were delayed in 2014 (Bureau of Transportation Services 2015). Approximately 11 percent of flights departing Merced Municipal Airport/Macready Field were delayed in 2009.

The HSR system would not be affected by fog or weather because it would operate on a dedicated track. All intersections would be grade-separated, thereby avoiding the potential for conflicts with vehicles crossing the tracks during periods of low visibility.

1.2.4.3 Modal Connections

Currently, transportation facilities connecting communities in the valley with California's major commercial and cultural hubs underserve the San Joaquin Valley. Between San Francisco and Los Angeles, the San Joaquin Valley's major transportation facilities for passenger travel include SR 99, Amtrak California™, and the Merced and Fresno airports. Passengers prefer transportation systems with connections that perform similarly to the convenience and speed of door-to-door service by automobile. If multiple mode changes (e.g., from car to shuttle to plane to train) are needed to reach a destination, travelers might prefer to travel by car, even if travel times are comparable.

SR 99 directly connects Merced and Fresno and it is the fastest transportation route between the two cities (Figure 1-3). Because Interstate 5 is approximately 40 miles west of Merced and Fresno, it does not provide a convenient transportation route between the cities. Amtrak also directly connects Merced and Fresno; however, the train frequency between these cities (four daily roundtrips between Oakland, Merced, and Fresno and two daily roundtrips between Sacramento, Merced, and Fresno) amounts to a total of six trips per day along the Merced to Fresno corridor, a number insufficient to meet many travel needs (Amtrak 2016).

As discussed in the Air Travel subsection, commercial airports in the southern San Joaquin Valley are underutilized because flights tend to be expensive and direct flights outside of California are limited or not available. It is often less costly for San Joaquin Valley residents to

drive than to fly between locations within California, or to drive to larger airports outside the San Joaquin Valley to begin their airline journeys. Larger airports that are within driving distance of the San Joaquin Valley provide a greater variety of airline service for direct trips outside of California, often at a much lower purchase price. For these reasons, the volume of air travel from San Joaquin Valley airports is relatively constant, and correspondingly, commercial airlines have not increased service from these airports, which reduces connectivity options for the Merced to Fresno area.

The options for connecting the Central Valley to California's largest metropolitan areas include driving the full distance; driving to a regional or larger airport, flying to the metropolitan area, and renting a car; or using an intercity rail and transit bus to the final destination. The limited options of direct, fast, and safe connections to the major metropolitan areas isolate the Central Valley economically, limit the area from which Central Valley businesses draw customers and employees, and reduce the accessibility of job markets for residents. HSR service to Merced and Fresno would provide linkages to a number of bus, light rail, and airport services for intercity travelers to other areas in the state.

1.2.4.4 Air Quality and Greenhouse Gas Emissions

Under the authority of the Clean Air Act, the U.S. Environmental Protection Agency established nationwide air quality standards to protect public health and welfare with an adequate margin of safety. The federal standards (National Ambient Air Quality Standards) represent the maximum allowable atmospheric concentrations for ozone, particulate matter (particulate matter smaller than or equal to 10 microns in diameter [PM_{10}] and particulate matter smaller than or equal to 2.5 microns in diameter [$PM_{2.5}$]), carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. The Clean Air Act defines nonattainment areas as geographic regions designated as not meeting one or more of the National Ambient Air Quality Standards. The Act requires states to develop a state implementation plan for each nonattainment area, and to prepare a maintenance plan for each former nonattainment area that subsequently demonstrates compliance with the standards. A state implementation plan is a compilation of a state's air quality control plans and rules that the U.S. Environmental Protection Agency has approved.

California has multiple air basins designated as nonattainment areas ranging from severe to serious status, including the Sacramento Valley Air Basin, the San Joaquin Valley Air Basin, the South Coast Air Basin, and the Southeast Desert Air Basin (Coachella Valley) (see Section 3.3, Air Quality and Global Climate Change, for further details). Metropolitan areas will continue to experience challenges in reducing emissions to acceptable levels from a growing number of vehicles and to maintain air quality standards by encouraging more efficient use of land resources, improving mobility, and providing alternative transportation facilities and services. Policies aimed at reducing the demand for trips in single-occupant vehicles are integral to all transportation plans and help areas presently in nonattainment status to conform to National Ambient Air Quality Standards.

Emissions of criteria pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter [PM_{10} and $PM_{2.5}$], ozone, and sulfur dioxide)[11] from motor vehicles are directly proportional to the amount of fuel burned and affect air quality in the San Joaquin Valley. The San Joaquin Valley Air Basin exceeds federal and state air quality standards for ozone, $PM_{2.5}$, and the state's 24-hour

[11] The Clean Air Act, as amended in 1990, requires the U.S. Environmental Protection Agency to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment. The U.S. Environmental Protection Agency has set National Ambient Air Quality Standards for six principal pollutants, which are called "criteria" pollutants. The Clean Air Act has been amended since 1990, but with only minor changes. The last significant amendments were in 1990.

standard for PM_{10}.[12] The projected population growth in the San Joaquin Valley will result in an increase in VMT and the volume of pollutants emitted by motor vehicles. Particulate matter levels are a direct function of the amount of driving, and road dust caused by moving vehicles accounts for 60 to 80 percent of particulate emissions from mobile sources. Motor vehicle exhaust is a major source of fine particulates (i.e., $PM_{2.5}$) and the precursors to ozone. The continued increase in traffic will exacerbate existing air quality problems and impede the region's ability to attain state and federal ambient air quality standards. Because emissions are directly proportional to the amount of fuel burned, offering effective transportation choices that reduce driving will be critical for reducing these emissions.

One statewide strategy adopted in the California State Implementation Plan is the development of multiuse transportation corridors. Among these strategies, the plan includes designated lanes for high-occupancy vehicles, the addition of more transit, and the inclusion of rail modal options. Meeting federal and state air quality standards over the next 20 to 40 years will also require the following regional and local government actions:

- Reducing the VMT
- Integrating land use and transportation planning and development
- Developing transportation demand strategies
- Implementing operational improvements
- Using new technologies that improve transportation efficiencies and increase transportation alternatives to the single-occupant automobile

The automobile is expected to continue to predominate intercity travel. Without the HSR system, auto trips are expected to account for more than 95 percent of all intercity travel and close to 90 percent of long intercity trips in California by 2040.

In 2005, California's governor set statewide targets for reducing greenhouse gas (GHG) emissions. Executive Order (EO) S-3-05 requires that GHG emissions be reduced to 2000 levels by the year 2010, to 1990 levels by the year 2020, and 80 percent below 1990 levels by the year 2050. Shortly after the issuance of EO S-3-05, the California State Legislature passed Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006. AB 32 recognizes that California is the source of substantial amounts of GHG emissions. Legislative findings in the law state the following:

> *The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to the marine ecosystems and that natural environment, and an increase in the incidences of infectious diseases, asthma and other health-related problems.*

To avoid these consequences, AB 32 requires the California Air Resources Board (CARB), the state agency charged with regulating air quality, to create a plan and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases" in California. AB 32 requires CARB to design and implement emissions limits, regulations, and other measures to reduce statewide GHG emissions to 1990 levels by 2020. This requirement is the same 2020 target as in EO S-3-05. In response to this legislation, CARB developed the *Climate Change Scoping Plan: A Framework for Change* (Scoping Plan) (CARB 2008), the state's road map to reaching the GHG reduction goals required by AB 32. The Scoping Plan supports implementation of an HSR system to provide more mobility choice and reduce GHG emissions. CARB adopted the approved

[12] The federal 2015 8-hour ozone standard is exceeded when the 3-year average of the 4th-highest daily maximum 8-hour average ozone concentrations measured at each air monitor within an area over each year exceeds 0.07 parts per million. The federal 24-hour standard for $PM_{2.5}$ is exceeded when the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area exceeds 35 micrograms per cubic meter. The California standards for ozone, PM_{10}, and $PM_{2.5}$ are designated as having been exceeded for a calendar year for an area when any designated air monitor in the area exceeds the relevant state ambient air standard at any time during that year.

Scoping Plan at its December 11, 2008, meeting. The measures in the 2008 Scoping Plan were in place by 2012. CARB approved the first update of the Scoping Plan in 2014.

Governor Brown issued EO B-30-15 in April 2015, setting an interim 2030 target of 40 percent below 1990 levels for GHG reductions and, in 2018, issued EO B-55-18, which establishes a goal to achieve carbon neutrality by 2045.

In 2017, CARB completed a second update to the Scoping Plan to reflect the 2030 target. On September 8, 2016, Senate Bill (SB) 32, California Global Warming Solutions Act of 2006: emissions limit, and its companion bill AB 197, State Air Resources Board: greenhouse gases: regulations, were signed by Governor Brown. These bills gave CARB the statutory basis to include in the 2017 Scoping Plan update a 2030 GHG emissions reduction target.

SB 375 (Steinberg), the Sustainable Communities and Climate Protection Act, became law in September 2008 and established a planning process to coordinate community development and land use planning with the RTPs. SB 375 sets priorities to help California meet GHG reduction goals and requires certain RTPs prepared by metropolitan planning organizations to develop a "sustainable communities strategy" that would support the GHG emission reduction targets set by CARB.

The transportation sector is responsible for about 40 percent of California's GHG emissions (CARB 2016). GHG emissions from motor vehicles are directly proportional to the amount of fuel burned and increases in VMT. The projected continued increase in VMT will frustrate the region's ability to reduce its GHG emissions to meet the state targets established under SB 375. Because GHG emissions from automobiles and trucks are directly proportional to VMT, offering effective transportation choices that reduce driving will be critical for reducing these emissions.

An electric-powered HSR system would reduce carbon dioxide emissions in comparison to car travel, which is powered by internal combustion engines. An HSR trip from San Francisco to Los Angeles would save 324 pounds of carbon dioxide for each car making the same trip, and a trip between San Jose and Los Angeles would save 288 pounds of carbon dioxide per car (Bay Area Council Economic Institute 2008). The HSR system would provide a more energy-efficient travel mode; a trip on the HSR system would use one-third the energy of a similar trip by air, and one-fifth the energy of a trip made by car (Bay Area Council Economic Institute 2008).

1.2.4.5 Protect and Preserve Natural Resources and Agricultural Lands

California's natural resources, including wetlands and waterways, habitat areas for sensitive species of plants and animals, and wildlife migration corridors, have been subject to direct and indirect impacts as the state's population has increased and growth has occurred in the less developed areas of the state. The rapid population growth and the draw of relatively affordable housing in the San Joaquin Valley as compared with other urbanized areas of California threatens the remaining highly valued agricultural lands and the high-quality habitat areas needed to support biodiversity.

Of California's approximately 100 million total acres of land, 9 million acres are classified as Important Farmland. Of the 9 million acres, 25 percent are in Merced, Madera, and Fresno Counties. Development in California has converted approximately 40,000 acres of agricultural land per year to other uses. Since 1990, urbanization has converted 538,000 acres. Of this acreage, 30 percent were classified Important Farmlands and over half of the converted lands are in the San Joaquin Valley. Agricultural lands are a vital part of the state's environment and economy, representing over $54 billion in direct farm sales and 13 percent of the nation's total agricultural value (CDFA 2015). The high-quality agricultural lands of the Central Valley support production of a wide array of food and fiber that are exported throughout the United States and internationally. Section 3.14, Agricultural Farmland, provides more detail on San Joaquin Valley crops and value. Statewide agriculture-related jobs account for approximately 2.2 of every 100 jobs (CEDD 2015). The San Joaquin Valley accounts for over half of all direct agricultural jobs in California (CEDD 2015). These lands, which form the underpinning of the state's agricultural industries, have experienced a long-term trend of conversion to urbanized uses.

In California, new development consumed 1 acre of land for every 9.4 persons statewide, but in the San Joaquin Valley, this rate was 1 acre for every 8 persons since 1990 (Thompson 2009). Conversion of open lands has also led to inefficient urban development patterns, increasing the costs for providing public services to newly developed areas. Population growth in the Central Valley is expected to continue, generating ongoing pressure to use agricultural lands to accommodate growth.

The HSR system would ease the pressure on the state's agricultural land base and open-space areas by reducing the need to expand airports and freeways. By offering a new transportation option, the HSR system provides an opportunity to create transit centers in central business districts, where mixed land uses (residential, commercial, and business uses) and urban densities are best suited. Multimodal centers draw high volumes of people to interact for pleasure, business, and commerce. The presence of high volumes of people can induce economic investments within walkable distances of these centers. Worldwide and national examples demonstrate increased land values adjacent to large multimodal centers that develop more densely around stations. If the station cities adopt zoning around the HSR stations to take advantage of the increased land values, they can redirect development to those currently underutilized central business districts and supplant some of the development demand that has been consuming large amounts of land area through low-density development. There is an opportunity to encourage walkable, more concentrated development patterns to meet new growth demands and reduce the rate and occurrence of low-density land uses on the urban periphery, which otherwise displace valuable agricultural land resources.

1.3 2016 Business Plan

The Authority's 2016 Business Plan[13] outlines the type of HSR service that the Authority plans to develop; describes the primary benefits of the system; and forecasts patronage, project funding, construction phasing, and project risks. The purpose of the Business Plan is to comply with the requirements of California Public Utilities Code Section 185033, which requires the Authority to prepare, adopt, and submit a Business Plan to the California Legislature every two years. The Merced to Fresno Final EIR/EIS (Authority and FRA 2012: pages 1-28 through 1-30) was based on the ridership and other planning assumptions included in the Authority's 2010 Business Plan. The Merced to Fresno Final EIR/EIS Chapter 1, Project Purpose, Need, and Objectives, discussed the Authority's Revised 2012 Business Plan, and disclosed that the revised 2012 planning assumptions for the Merced to Fresno Section would not alter the construction impacts outlined in the Merced to Fresno Final EIR/EIS. It also indicated that the operations impacts of the project were expected to be lower under the Revised 2012 Business Plan than presented in the environmental document.

In May 2016, the Authority adopted the 2016 Business Plan. The plan is consistent with the routes and facilities discussed in the Merced to Fresno Final EIR/EIS (Authority and FRA 2012). Key objectives of the implementation strategy in the 2016 Business Plan include:

- Initiating high-speed rail into passenger service as soon as possible.
- Making strategic concurrent investments throughout the high-speed rail corridor that can be linked together over time.
- Positioning the Authority to advance additional sections as funding becomes available.

The Authority determined in the 2012 Business Plan that the Central Valley is the best location for the initial construction of the HSR system because it is the fastest growing part of the state and the region hardest hit by unemployment during the Great Recession (Authority 2012b). Within the Central Valley, the Authority prioritized segments of the Merced to Fresno and Fresno to

[13] The Draft and Final Supplemental EIR/EIS rely on the 2016 Business Plan's ridership forecasts because they were the best information available at the time the Draft Supplemental EIR/EIS was prepared. As explained in Section 3.1, Introduction, the differences between the 2016, 2018, and Draft 2020 Business Plan are minor, so the 2016 ridership forecasts were retained for this Final Supplemental EIR/EIS.

Bakersfield sections as the first HSR sections to be built.[14] The decision to prioritize the Merced to Fresno and Fresno to Bakersfield Sections was made in part to meet the American Recovery and Reinvestment Act funding deadline of September 30, 2017. In addition, the FRA grant agreement requires that the federal investment demonstrate "independent utility" as defined in the High Speed Intercity Passenger Rail Notice of Funding Availability and Interim Program Guidance (74 Fed. Reg. 29900, 29905, June 23, 2009). Under this program, a project is considered to have independent utility if, upon completion, it will result in the creation of new or substantially improved high-speed rail/intercity passenger rail service, and will provide tangible and measurable benefits even if no additional investments in the same high-speed rail/intercity passenger rail service are made.

In the 2016 Business Plan, the Authority described three lines for construction of the statewide HSR system (Authority 2016): the Silicon Valley to Central Valley Line, extending from San Jose to Merced and 20 miles north of Bakersfield; the Silicon Valley to Central Valley Extension, extending to San Francisco, Bakersfield, and Merced in 2025; and Phase 1, which extends from San Francisco to Los Angeles, in 2040. As shown in Figure 1-5, the Central Valley Wye is integral to the Silicon Valley to Central Valley Line. The planning horizon of 2040 is used for full operation of Phase 1, consistent with the 2016 Business Plan. Refer to Section 2.3, Updated Travel Demand and Ridership Forecasts, and Section 2.4, Updated Operations and Service Plan, for more information regarding operation of Phase 1.

The Authority subsequently adopted the 2018 Business Plan on May 15, 2018 and submitted it to the Legislature on June 1, 2018. The key objectives and principles from prior business plans remained the same:

- Initiate HSR passenger service as soon as possible.
- Make strategic, concurrent investments throughout the system that will be linked together over time.
- Position the Authority to construct additional increments of the HSR system as funding becomes available.

The 2018 Business Plan continued the vision of the 2016 Business Plan in delivering the initial Silicon Valley to Central Valley Line, which includes the Merced to Fresno Section: Central Valley Wye, and refines and updates the project delivery schedule and ridership projections provided in the 2016 Business Plan.

The Authority released a Draft 2020 Business Plan in February 2020 for public review and comment. The Draft 2020 Business Plan continues to emphasizes completion of the initial 119 miles of Central Valley construction currently underway, expanding to 171 miles of electrified HSR between Merced and Bakersfield, commencing HSR service, completing environmental evaluation of the entire Phase 1 system between San Francisco and Los Angeles/Anaheim, completing funded projects in Los Angeles and the Bay Area, and pursuing additional funding to build out the remainder of the Phase 1 system. The Authority Board is anticipated to consider and potentially adopt the Draft 2020 Business Plan in late 2020, and thereafter submit it to the Legislature.

[14] The Authority executed its first design-build contract, known as Construction Package 1, in August 2013. This 31-mile segment runs from Avenue 19 in Madera south to East American Avenue in Fresno. Construction Package 2-3 covers the next 60 miles from Fresno south to 1 mile north of the Tulare–Kern County line near Bakersfield, and was executed in June 2015. Construction Package 4 extends about 22 miles from 1 mile north of the Tulare/Kern County line to Poplar Avenue north of Bakersfield and was executed in February 2016.

Source: Authority, 2020 June 12, 2020

Figure 1-5 California HSR System Phase I Implementation

1.4 Relationship to Other Agency Plans, Policies, and Programs

The Merced to Fresno Final EIR/EIS describes plans and programs considered in the development of the Merced to Fresno Section in Section 1.3, Relationship to Other Agency Plans and Policies, and Section 1.4, Relationship to Other Transportation Projects and Plans in the Study Area (Authority and FRA 2012: pages 1-22 through 1-25). The following sections summarize RTPs relevant to the alternatives that were considered after publication of the Merced to Fresno Final EIR/EIS.

1.4.1 2014–2040 Regional Transportation Plan and Sustainable Communities Strategy for Merced County

With the passage of SB 375 in 2008, metropolitan planning organizations must develop a sustainable communities strategy for meeting GHG emissions targets as part of their RTPs or, if the target cannot be met, they must adopt an alternative planning strategy separately from the RTP. The sustainable communities strategy demonstrates an ambitious, yet achievable, approach to how land use development and transportation can work together to meet GHG emissions reduction targets for cars and light trucks. These targets, which CARB set in 2010, call for the region to reduce per capita emissions by 5 percent by 2020 and 10 percent by 2035 (CARB 2010).

On September 25, 2014, the Merced County Association of Governments adopted the *2014–2040 Regional Transportation Plan and Sustainable Communities Strategy for Merced County* (Merced County RTP) (MCAG 2014), which specifies how $892 million in anticipated federal, state, and regional transportation funds will be spent in Merced County through 2040. The Merced County RTP contains a fiscally constrained list of projects and programs that have a reasonable expectation of being funded during the life of the plan. Projects seeking state or federal funding, completing environmental clearances, or that want to begin construction must be included on the RTP list. In turn, the RTP helps inform the development of the State Transportation Improvement Program, which prioritizes the use of state transportation funds. The RTP notes that Merced County is participating in the HSR planning process.

The Merced County RTP supports growth that enhances multimodal transportation and connectivity. Other major goals include developing a safe and efficient regional road system that accommodates the demand for movement of people and goods, developing a rail system that provides safe and reliable service for passengers, and providing economical and long-term solutions to transportation problems by encouraging community designs that promote walking, transit, and bicycling (MCAG 2014). Major projects on the RTP list that would coordinate with the HSR system include widening SR 99 and other associated interchange improvements.

The 2014 Merced County RTP notes that it does not meet the GHG emissions reduction target for Merced County and therefore a separate alternative planning strategy will be adopted. The Merced County Association of Governments is presently in the process of drafting the alternative planning strategy. The transportation analysis included in this Final Supplemental EIR/EIS is based on the 2014 Merced County RTP (MCAG 2014), which is the current version available at the time of the analysis.

1.4.2 Madera County 2014 Regional Transportation Plan

On July 11, 2014, the Madera County Transportation Commission adopted the *Final 2014 Regional Transportation Plan and Sustainable Communities Strategy* (Madera County RTP) (MCTC 2014), which specifies how $1.38 billion in anticipated federal, state, and local transportation funds will be spent in Madera County through 2040. The Madera County RTP contains a fiscally constrained list of projects and programs that have a reasonable expectation of being funded during the life of the plan. Projects seeking state or federal funding, completing environmental clearances, or that want to begin construction must be included in the RTP list. In turn, the RTP helps inform the development of the State Transportation Improvement Program. The Madera County RTP notes that Madera County is participating in the HSR planning process.

The Madera County RTP envisions an integrated multimodal transportation system that considers land resource management strategies and air quality and GHG emissions reduction goals or targets to address SB 375 sustainable communities strategy requirements. The Madera County RTP notes that it does not meet the GHG emissions reduction target for Madera County and therefore an alternative planning strategy will be adopted. Major goals of the Madera County RTP include promoting fully accessible and intermodal transportation systems that encourage quality growth and development and foster economic competitiveness; identifying reliable transportation choices that support a diverse population; improving the quality of the natural and human built environment through regional cooperation of transportation systems planning activities; and protecting the environment and health of residents by improving air quality and encouraging active transportation (MCTC 2014). Major projects on the RTP list that would coordinate with the HSR system include widening SR 99 from four to six lanes through Madera County and other associated interchange improvements.

The transportation analysis included in this Final Supplemental EIR/EIS is based on the 2014 Madera County RTP (MCTC 2014). The 2014 Madera County RTP is the current version available at the time of the analysis.

1.5 Lead Agencies, Cooperating Agencies, Responsible Agencies

Pursuant to United States Code (U.S.C.) Title 23 Section 327, under the NEPA Assignment MOU between FRA and the State of California, effective July 23, 2019 (FRA and State of California 2019), the Authority is the federal lead agency for environmental reviews and approvals for all Authority Phase 1 and Phase 2 California HSR System projects. In this role, the Authority is the project sponsor and the lead federal agency for compliance with NEPA and other federal laws for the California HSR System, including the Central Valley Wye. FRA retains primary responsibility for developing and enforcing rail line safety regulations in accordance with 49 U.S.C. Subtitle V, Part A (49 U.S.C. § 20101 et seq.), conducting government-to-government tribal consultations, and making conformity determinations under the Clean Air Act.

Three cooperating agencies are part of this NEPA review process: the U.S. Army Corps of Engineers,[15] the Bureau of Reclamation,[16] and STB.[17] Other federal agencies that contribute to the environmental review of the Central Valley Wye alternatives are the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Advisory Council on Historic Preservation.

The Authority is the lead agency under CEQA. The following California agencies are responsible agencies under CEQA: the California Department of Fish and Wildlife, Caltrans, the California

[15] Construction of the Central Valley Wye alternatives would require a permit from the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (33 U.S.C. § 1251 et seq.), Section 10 of the Rivers and Harbors Act (33 U.S.C § 403), and Section 14 of the Rivers and Harbors Act (33 U.S.C. § 408). The USACE will use this Final Supplemental EIR/EIS to integrate requirements of NEPA and its permitting responsibilities (including the U.S. Environmental Protection Agency's Section 404(b)(1) Guidelines). The information contained in the Final Supplemental EIR/EIS will provide information that will facilitate USACE's consideration and issuance of any necessary permits and approvals. Further, any USACE documents produced using information from the Final Supplemental EIR/EIS can be used for alteration/modification of completed federal flood risk management facilities and any associated operation and maintenance, and real estate permissions or instruments (as applicable).

[16] The HSR alignment crosses Bureau of Reclamation lands and facilities. The Bureau of Reclamation may issue rights of entry permits for pedestrian surveys and ground-disturbing investigations, such as geotechnical investigations, or other information-gathering activities. It may grant temporary construction permits for the relocation of facilities and equipment such as pipes, canals, and pumps. If the facilities are relocated outside of the Bureau of Reclamation's ownership, the Authority will acquire any needed land rights necessary for future operations and maintenance needs and/or relocated Bureau of Reclamation features. After construction, the Authority will transfer to the Bureau of Reclamation necessary land rights. The Bureau of Reclamation will grant or transfer land rights as appropriate to the Authority.

[17] STB is a bipartisan, independent adjudicatory body. STB was established by the Interstate Commerce Commission (ICC) Termination Act of 1995 (49 U.S.C. § 10101 et seq.; PL 104-88, December 29, 1995) to assume some, but not all, functions of the ICC. STB has jurisdiction over the construction and operation of new rail lines (49 U.S.C. §§ 10901, 10502). In 2013, STB determined that it has jurisdiction over all sections of the proposed statewide HSR system, including the Merced to Fresno Section and the Central Valley Wye. The Authority has prepared this Final Supplemental EIR/EIS consistent with both NEPA and CEQA.

Public Utilities Commission, the California State Lands Commission, the Central Valley Regional Water Quality Control Board, the Central Valley Flood Protection Board, and the San Joaquin Valley Air Pollution Control District. Those agencies will use this Final Supplemental EIR/EIS to approve or permit aspects of the project for which each agency is responsible.