5 ECONOMIC GROWTH AND RELATED IMPACTS

5.1 Introduction

Transportation investments can lead to reduced travel time and cost, improved accessibility to regions or parts of regions, and reduced accidents or air pollution. These effects contribute to economic growth by allowing time and money previously spent on travel to be used for other purposes, attracting businesses and residents to places with increased accessibility or improved quality of life, and reducing overall costs to society. The population and employment growth that result make up the *growth-inducing effects* of transportation investments. Growth can contribute to additional effects on human and natural resources beyond those directly attributable to the changes in the transportation system. These effects are known as *indirect impacts*.

This chapter presents an analysis of the potential growth-inducing effects and related indirect impacts of the alternatives considered in the Bay Area to Central Valley Program EIR/EIS. The intent of the analysis is to understand the extent of potential statewide, regional, and local growth effects in terms of population and employment change and land consumption associated with these changes. This section identifies and describes the following.

- Existing population and employment conditions both for the Bay Area to Central Valley study area and the entire state.
- Methodology and data sources used to assess potential growth-induced effects.
- Potential employment and population changes associated with each system alternative.
- Urban area size needed to accommodate projected population and employment growth associated with each alternative.
- Potential impacts related to growth and development, and potential strategies for managing these impacts;
- Potential for employment and population concentration in the vicinity of HST stations.
- Differences between the HST alignment and station options in the Bay Area to Central Valley study area.

5.2 Affected Environment

5.2.1 Existing Conditions

Over the last 30 years, California's population has grown from 20 million to more than 36 million people. At the same time, more than 10 million additional jobs have been created in California. Starting with the gold rush in 1849, California has been continuously experiencing rapid population and economic growth. Distance from eastern urban areas, location on the Pacific Rim, an abundance of natural resources, a desirable climate, and many other factors have contributed to California's growth into the most populous state in the nation.

California's economy is one of the most diverse in the world. Manufacturing, wholesale and retail trade, services, and government each account for more than 10% of total employment, and together have consistently made up more than three-quarters of total employment over the past 30 years. California's economy, like the nation's, has become less focused on production of goods and more focused on services, entertainment, and trade. Three service-sector industries—business, social, and legal—are among the 10 fastest-growing industries in California, with business services' contribution to gross state

product (GSP) growing by 1,400% since 1977. The overall services sector has grown by more than 800% since 1977. The finance, insurance, and real estate (FIRE) sectors and services sector have accounted for nearly one-half of the growth in GSP since 1977, with the combined contribution of these groups growing from 33% to 46% of the total economy in California.

As of 2005, California was estimated to have about 36.1 million people and 20.9 million jobs. Table 5.2-1 lists year 2005 population and employment totals, as well as an estimate of current urbanization magnitudes for select locations in 2002. Data are presented for major regions in California as well as individual counties in the Bay Area to Central Valley corridor. As expected, the inner Bay Area counties, Sacramento County, and Southern California have the highest levels of land considered to be urbanized, while less than 10% of land in most other counties is at urbanized densities.

Table 5.2-1
Existing Population, Employment, and Urbanized Densities

County	Population Year 2005	Employment Year 2005	Acreage of Land at Urbanized Densities for Employment and/or Population Year 2002	Percent of Land Area at Urbanized Densities Year 2002
Alameda County	1,451,065	953,937	141,654	30
Contra Costa County	1,017,644	508,854	142,467	31
San Francisco County	741,025	779,357	23,277	78
San Mateo County	701,175	522,830	70,869	25
Santa Clara County	1,705,158	1,323,920	184,481	22
Study Area—Bay Area	***5,616,067***	***4,088,898***	***562,748***	***29***
Fresno County	878,089	435,769	96,977	3
Madera County	142,530	56,892	23,255	2
Merced County	242,249	87,365	31,712	3
Sacramento County	1,363,423	805,978	157,101	25
San Joaquin County	664,796	274,155	74,250	8
Stanislaus County	505,492	224,491	55,426	6
Study Area—Central Valley	***3,796,579***	***1,884,650***	***438,721***	***12***
Core Study Area	***9,412,646***	***5,973,548***	***1,001,469***	***22***
Southern Sacramento Valley	658,108	456,834	116,980	4
Southern San Joaquin Valley	1,311,579	576,935	189,603	2
Southern California	16,843,742	9,290,841	1,530,221	25
San Diego County	2,936,609	1,895,002	340,837	13
Rest of California	4,991,463	2,709,974	3,105,348	6
Statewide Total	36,154,147	20,903,134	**6,284,458**	**6**

Sources: U.S. Bureau of the Census (population data); MTC/California High-Speed Rail Travel Demand Model (employment data); and *Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/Environmental Impact Statement*, California High-Speed Rail Authority, July 2003.

5.2.2 Study Area and Alternatives

For the purposes of the growth inducement analysis, California's 58 counties were grouped into seven geographic regions that would contain components of the statewide HST system[1]:

- Core Study Area—Bay Area
  - Alameda County
  - Contra Costa County
  - San Francisco County
  - San Mateo County
  - Santa Clara County
- Core Study Area—Central Valley
  - Fresno County
  - Madera County
  - Merced County
  - Stanislaus County
  - San Joaquin County
  - Sacramento County
- Southern San Joaquin Valley: Kern, Kings, and Tulare Counties
- Southern California: Los Angeles, Orange, Riverside, and San Bernardino Counties
- San Diego County
- Southern Sacramento Valley: El Dorado, Placer, Sutter, Yolo, and Yuba Counties
- Rest of California: Remaining 34 counties not included in any of the other 15 regions.

The regions reflect the economic interdependence among some counties and relate to widely recognized geographic regions in California. The five counties that compose the core study area in the Bay Area (Alameda, Contra Costa, San Francisco, San Mateo, and Santa Clara) were kept as separate economic modeling regions in order to better simulate the population and employment growth effects for each system alternative. A similar process was followed for the six counties that compose the core study area in the Central Valley. The counties grouped into Southern Sacramento Valley, Southern San Joaquin Valley, Southern California, and San Diego regions were gathered based on economic relationships between the counties; with the exception of the Southern Sacramento Valley, all of these regions were identified for direct HST service in the Final Statewide Program EIR/EIS. The counties gathered as *rest of California* would not be directly served by any of the HST Network Alternative. The county groupings that compose these regions are displayed in Figure 5.2-1.

This analysis of potential induced growth and indirect impacts considered two HST Network Alternatives as described in Chapter 2, "Alternatives." The analysis considered the No Project/No Action (No Project) Alternative, which represents the region's (and state's) transportation system (highway, air, and conventional rail) as it is today and with implementation of programs or projects that are in regional transportation plans and have identified funds for implementation by 2030, and two HST Network Alternatives (one each for Pacheco and Altamont).

[1] All counties that would have an improvement under the HST Alternative were grouped into one of the 15 core regions. *Rest of California* includes all counties without an improvement under the HST Alternative.

Quantitative analysis of induced growth and secondary impacts was performed on two specific HST Network Alternatives, one for the Altamont Pass and one for Pacheco Pass. For both HST Network Alternatives, quantitative modeling was performed using the alignments shown in Table 2.5-1 for the San Francisco and San Jose Termini because prior studies conducted by the HSRA suggested that these termini are likely to produce the highest system ridership, and hence the highest potential for induced growth and secondary impacts. Within the core study area, the following HST stations were included in the Network Alternatives used for quantitative modeling:

- Pacheco Pass: Transbay Transit Center; Millbrae-SFO; Redwood City; San Jose (Diridon Station); Morgan Hill; Gilroy; Merced (SP Downtown); and Modesto (Amtrak Briggsmore).
- Altamont Pass: Transbay Transit Center, Millbrae-SFO, Redwood City, Fremont (Warm Springs), San Jose (Diridon Station), Pleasanton (I-680/Bernal Road), Tracy (SP), Modesto (SP Downtown), and Merced (SP Downtown).

The potential induced growth effects and secondary impacts of other alignment and station options were assessed qualitatively by comparing travel demand model results, reviewing comparable results from the Final Statewide Program EIR/EIS[2], and professional experience.

5.2.3 Analysis Years

The growth-inducement analysis was conducted for the year 2030, which provides a long time horizon to consider full market response after completion of the proposed HST Network Alternatives, as well as a better basis for understanding the full range of possible secondary impacts.

The extent of potential growth-inducing effects in any given year is sensitive to the length of time over which changes in economic conditions are assumed to occur. In terms of this analysis, the number of jobs or people that would be generated in an area in 2030 is sensitive to the year in which HST service is assumed first to be available in that area. For both HST Network Alternatives, HST service along a trunk line between the Bay Area and LAUS was assumed to begin on January 1, 2016. Service to Irvine, San Diego and Sacramento was assumed to begin on January 1, 2019 for all alignment options.

5.3 Potential Growth-Inducing Effects

5.3.1 Methodology and Data Sources

The potential economic growth stimulus of a transportation investment can be measured not only in terms of its *overall magnitude* (number of new jobs and people), but also in terms of its *relative distribution* (location of new jobs and people) among different geographic areas. In economic terms, this distinction is the generative (i.e., creates growth) versus distributive (i.e., redistributes existing population and infrastructure) dimension of growth. Transportation investments, such as airports, highways, transit, and HST, compose just one of many factors that determine how much growth will occur and whether it will be generative or distributive in nature. Other major growth factors, such as education level of residents, housing affordability, and land availability, interact in complex and sometimes unpredictable ways for communities, regions, and states. Land use planning and zoning, enterprise development zones, and infrastructure funding also can influence both the magnitude and the distribution of economic growth.

[2] *Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/Environmental Impact Statement*, California High-Speed Rail Authority, July 2003.

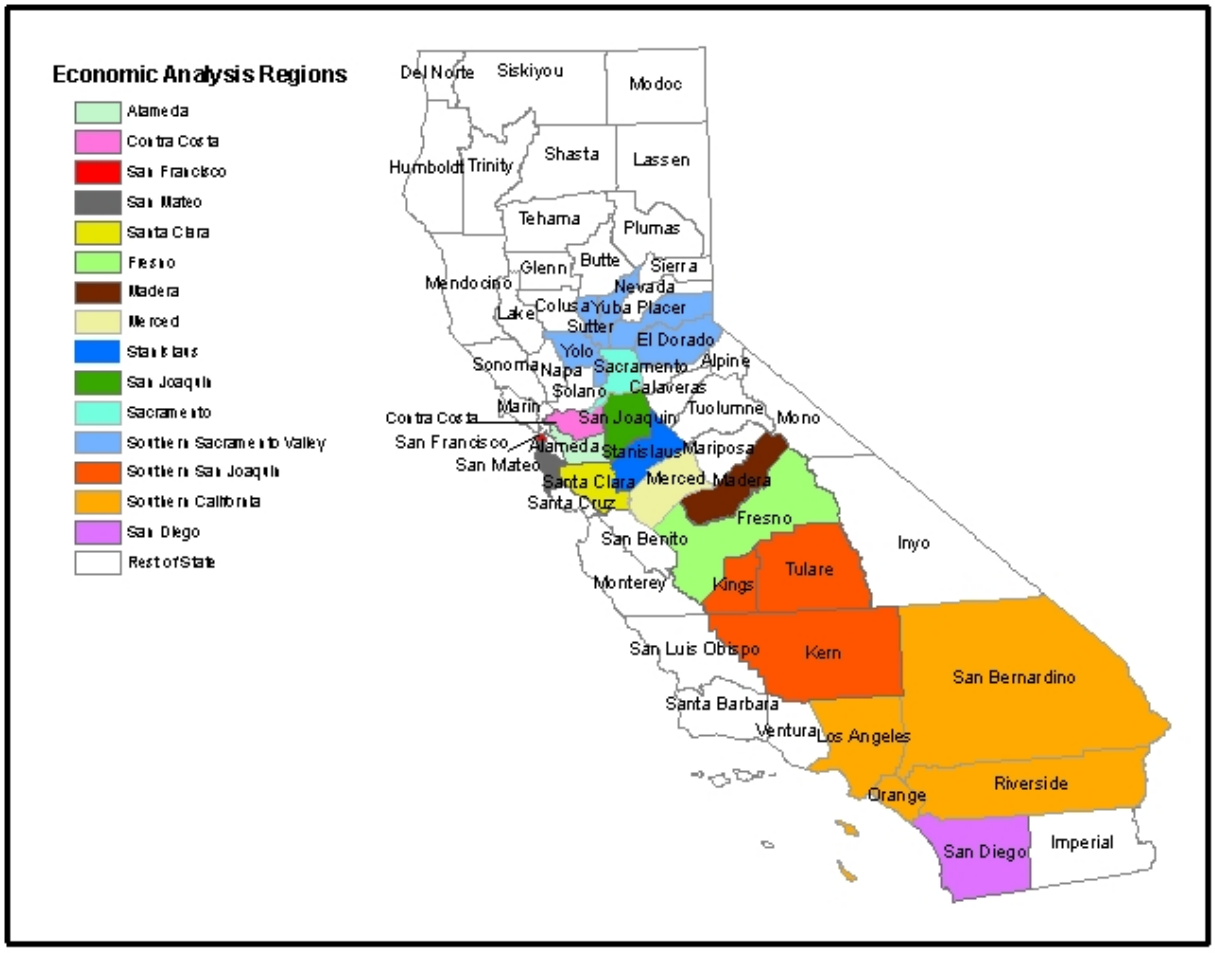


Figure 5.2-1
Regions and Counties

A. SCOPE OF ANALYSIS

The growth inducement results presented in this section were developed using the TREDIS[3] macroeconomic simulation model, which estimates the economic impact of transportation investments on business output, business attraction, employment, and population. Transportation demand, travel times and costs by mode for each system alternative were assembled by the newly developed California Statewide High-Speed Rail Travel Demand Model, with additional transportation performance information synthesized from the Final Statewide Program EIR/EIS.

The analysis process considered the potential effects that changes in transportation congestion and delay between existing conditions and future years would have on the state's economic growth. The process also modeled several dimensions of growth and spatial reallocation that could occur under any of the alignment alternatives and considered many possible impacts of the proposed HST Alignment Alternatives on jobs, population, and land development, including the following:

- Increased employment because of attraction of new businesses to California, or expansion of businesses already located in the state.
- Reallocation of employment because of changes in location of businesses already located in California.
- Population growth associated with business attraction, expansion, and spatial shift.
- Shift in residential population between counties (with fixed employment location) as a result of changed accessibility because of the Modal or HST Network Alternatives (i.e., long-distance commutes).
- Shift in employment for retail and personal service establishments that follow shifts in residential location.
- Changes in densification and development patterns both with and without the presence of a HST station.
- Allocation of population and employment between currently developed and undeveloped areas in each county.
- Consumption of currently undeveloped land to house projected population and employment growth.

B. KEY DATA SOURCES

The growth-inducement analysis required a baseline forecast of future population and employment for the 2030 year. This baseline forecast represented the No Project Alternative for the analysis year, and was also used as an economic modeling input to estimate incremental population and employment changes of the HST Network Alternatives. The analysis of potential induced growth and indirect effects necessitated that county-level population and employment forecasts be developed for 2030, with employment forecasts broken out by one-digit standard industrial classification (SIC) codes. Baseline population forecasts for each county were taken from the California Department of Finance. Baseline employment forecasts were taken from the *California Statewide High-Speed Rail Travel Demand Model* and aggregated to the county level.

[3] The Transportation Economic Development Impact System (TREDIS) model is designed specifically to evaluate the full economic development impacts of multimodal transportation investments. For this analysis, TREDIS was run in conjunction with the ReDYN economic modeling system to capture full dynamic economic feedback.

C. METHODOLOGY OVERVIEW

The analytical process to estimate the growth-inducing effects of the alternatives required significant modeling tools and data. Nonetheless, the entire process, depicted in Figure 5.3-1, can be summarized in a few key steps.

- Define transportation investments: This analysis considers the HST Network Alternatives described in Chapter 2. For this analysis, the future baseline conditions are assumed to represent the No Project Alternative, and the economic modeling process is used to forecast the incremental changes associated with the implementation of the Altamont and Pacheco network alternatives.
- Estimate transportation benefits: Using results from the California Statewide High-Speed Rail Travel Demand Model, benefits such as reduced travel times and/or costs of each alternative for air, highway, and conventional rail trips were estimated using travel demand model results. Congestion, pollution, and crash reduction benefits as well as accessibility benefits were directly estimated using travel demand model results for the two HST Network Alternatives in comparison to the No Project Alternative. Mode shift benefits arising from the introduction of HST service were estimated by scaling benefits calculated for the statewide program EIR/EIS using HST ridership and other output from the current travel demand model[4].
- Estimate direct economic impacts: Direct economic impacts, which are generated from the transportation benefits of each alternative, generally fall into one of three categories.
  - Business cost savings: Reductions in travel time and/or cost for long-distance business travelers and commuters benefiting from the transportation improvements.
  - Business attraction effects: New and relocated firms taking advantage of market accessibility improvements provided through transportation investments.
  - Amenity (quality of life) changes: Non-business travel time and/or cost benefits and other societal benefits improve the attractiveness of a region.
- Determine total regional economic impacts for regions and counties: The direct economic impacts all have the potential to create additional multiplier effects on the regional and statewide economies of California. Total regional impacts were estimated using the TREDIS-ReDyn macroeconomic simulation model. For this analysis, total economic impacts include population and industry-specific employment, with impacts forecasted for the 11 counties in the core study area and the remaining five multi-county regions.
- Forecast land consumption: County-level population and employment were allocated throughout each county to determine the infill potential and magnitude of land needed to accommodate population and employment growth for each alternative. This analysis, which was conducted for the 11 counties in the core study area, was driven by three key pieces of information.
  - Local land use, zoning, and employment data.
  - National and international experience with station-area development trends related to HST and fixed guideway transit.
  - County-level industry employment and population estimates.
- Assess Potential for Secondary Impacts: The population, employment, and land consumption forecasts for each system alternative were reviewed to characterize the nature and magnitude of potential secondary impacts on the human and natural environment. For resource topics in

[4] *Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/Environmental Impact Statement*, California High-Speed Rail Authority, Appendix F, July 2003.

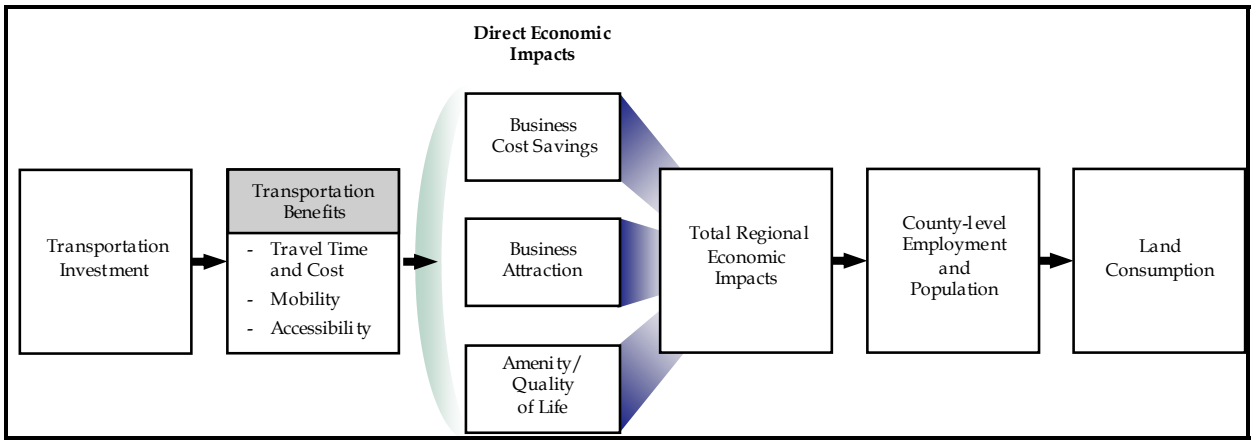


Figure 5.3-1
Methodology Overview

which specific spatial information was available, a GIS-based analysis was conducted to estimate the quantity of resources in each of the 11 core study area counties that could be affected by future urbanization patterns for each system alternative.

Essentially, this land consumption analysis provided an estimate of the population and employment growth that can fit within the currently urbanized areas of each county (i.e., infill potential), and additional acreage of currently undeveloped land that would need to be converted to urbanized densities to accommodate any remaining growth. Estimates of land needed to accommodate employment uses were developed using a statistical analysis based on current development patterns in California, adjusted to reflect expected densification trends over time.[5] The California Urbanization and Biodiversity Analysis (CURBA) model was used to allocate population growth to various locations in each county and to predict land consumption resulting from residential construction.

5.3.2 Financing of Alternatives

In any analysis of proposed public investments, it is important to consider the potential sources of public financing and how they may affect future public revenue needs (i.e., government expenditures) and consumer spending. The HST Network Alternative is projected to have significant capital costs in excess of the costs needed to fund the No Project Alternative. For the purposes of this analysis, it was assumed that the total cost of the HST Network Alternative would be funded through revenue sources that would not require direct tax increases or significant diversion of general fund revenues. Examples of these revenue sources include general obligation bonds,[6] federal grants or loans, existing airport user fees and passenger facility charges, private sector participation, local funds (from existing sources), and existing state transportation revenue sources (e.g., gas tax, sales tax on gas). The net effect of this assumption is that the induced growth and secondary impacts presented in this chapter are in no way influenced by whatever financing plan is eventually established for a potential HST system.

5.3.3 Statewide Comparison of Alternatives

A. POPULATION

Statewide population is expected to grow by about 33% between 2005 and 2030 under the No Project Alternative (Table 5.3-1). Compared to the No Project Alternative, population growth under the Pacheco and Altamont network alternatives will not have a significant difference between them, with Pacheco growing an additional 1.4% and Altamont growing an additional 1.3%. Outside the core study area, the Southern San Joaquin Valley and San Diego County exhibit noticeable increases in population growth rates between the No Project and HST Network Alternatives, with an additional 5% of growth for the HST Network Alternatives in both regions. Population growth rates are very similar between the two HST Network Alternatives outside of the core area, and are nearly indistinguishable on a statewide level.

[5] Because this analysis was conducted at the county level, it does not explicitly reflect potential land designation or policy constraints that are included in each jurisdiction's general plan. Rather, the analysis reflects market forces that currently exist and are projected to exist in the future for counties of similar location, size, development intensity, and potential HST service. The densities that are allowed under zoning and general plan designations are implicitly included in the analysis to the extent that existing development patterns and market forces have been influenced by past zoning and general plan decisions.

[6] The debt service on General Fund State Revenue bonds often is paid through a commitment of the general fund revenue with no additional tax or other revenue source. A preliminary analysis by the project team suggests that the annual debt service on a $10 billion bond may be within the range of the state's historical and future bonding patterns. While this source of funding does not directly increase taxes, it does divert state expenditures from budget items to debt service. Nevertheless, this diversion is not assumed in this analysis to result in any significant reduction in state expenditures.

Table 5.3-1
Projected Population Growth Rate by Region

Area	Year 2005 Population	Growth Rate (Year 2005 to 2030) (%)		
		No Project Alternative	HST Network Alternative	
			Pacheco	Altamont
Alameda County	1,451,065	40.5	41.4	41.6
Contra Costa County	1,017,644	51.6	52.3	51.9
San Francisco County	741,025	7.4	9.3	8.1
San Mateo County	701,175	16.1	17.1	17.9
Santa Clara County	1,705,158	26.3	28.1	28.8
Study Area—Bay Area	***5,616,067***	***30.8***	***32.0***	***32.2***
Fresno County	878,089	47.8	49.7	49.5
Madera County	142,530	54.2	61.1	61.0
Merced County	242,249	80.8	86.7	84.7
Sacramento County	1,363,423	68.2	69.1	69.8
San Joaquin County	664,796	85.0	86.7	88.7
Stanislaus County	505,492	47.3	50.0	55.1
Study Area—Central Valley	***3,796,579***	***63.9***	***66.0***	***67.1***
Core Study Area	***9,412,646***	***44.1***	***45.7***	***46.3***
Southern Sacramento Valley	658,108	65.7	66.0	66.2
Southern San Joaquin Valley	1,311,579	51.7	56.2	56.1
Southern California	16,843,742	23.8	24.6	24.4
San Diego County	2,936,609	36.4	41.2	40.7
Rest of California	4,991,463	32.5	32.6	32.5
Statewide Total	**36,154,147**	**33.1**	**34.5**	**34.4**

Sources: U.S. Bureau of the Census; California Department of Finance; Cambridge Systematics 2007.

In the core study area, population growth rates are very similar among the system alternatives for the five Bay Area counties. The HST Network Alternatives have higher population growth rates than the No Project Alternative for all five counties, and the Altamont network alternative has the highest project growth rate for three of the five counties. The six Central Valley counties in the core study area all have population growth rates that greatly exceed the statewide average under the No Project Alternative. All six counties have noticeably higher population growth rates for the HST Network Alternatives, with Merced and Madera Counties showing the largest numeric difference in growth rates between the No Project and HST Network Alternatives; this result also holds for Stanislaus County in the Altamont network alternative. As a group, the population growth rate in these Central Valley counties is highest for the Altamont network alternative, although Fresno, Madera, and Merced Counties actually have slightly higher growth rates for the Pacheco network alternative.

The greatest population increase is projected between 2005 existing conditions and the 2030 No Project Alternative, with relatively small differences in population growth occurring between the No Project and HST Network Alternatives. Compared to the No Project Alternative, the population growth rates shown in Table 5.3-1 equate to an additional 502,000 people for the Pacheco network alternative and 495,000 people for the Altamont network alternative.

B. EMPLOYMENT

Statewide and regional employment growth patterns are projected to be very similar to the population patterns. Employment growth under either the Pacheco or Altamont network alternative will be an additional 1.5% over the No Project Alternative. Outside the core study area, the Southern San Joaquin Valley exhibits noticeable increases in employment growth rates between the No Project and HST Network Alternatives, with an additional 5% of growth for the HST Network Alternatives. Employment growth rates are very similar between the two HST Network Alternatives outside the core area and are nearly indistinguishable on a statewide level.

Statewide employment is forecasted to grow by 37% under the No Project Alternative, with an additional increase of 1.53% under the Pacheco network alternative and 1.52% under the Altamont network alternative, as shown in Table 5.3.2. All five Bay Area Counties in the core study areas exhibit employment growth rates under the HST Network Alternatives that are about 1% more than under the No Project Alternative, with the Pacheco network alternative showing the highest growth rate for three of the counties.

Table 5.3-2
Projected Employment Growth Rate

Area	Year 2005 Employment	Growth Rate (Year 2005 to 2030) (%)		
		No Project Alternative	HST Network Alternative	
			Pacheco	Altamont
Alameda County	953,937	30.8	32.0	31.9
Contra Costa County	508,854	50.0	51.2	50.8
San Francisco County	779,357	25.2	26.2	25.9
San Mateo County	522,830	37.2	38.4	38.5
Santa Clara County	1,323,920	33.7	34.8	34.8
Study Area—Bay Area	***4,088,898***	***33.9***	***35.0***	***34.9***
Fresno County	435,769	35.2	38.2	38.0
Madera County	56,892	60.6	69.0	69.3
Merced County	87,365	31.7	40.1	38.5
Sacramento County	805,978	56.3	57.4	57.7
San Joaquin County	274,155	34.5	37.0	38.4
Stanislaus County	224,491	41.1	44.2	48.2
Study Area—Central Valley	***1,884,650***	***45.4***	***48.0***	***48.7***
Core Study Area	***5,973,548***	***37.4***	***39.1***	***39.2***
Southern Sacramento Valley	456,834	59.6	60.4	60.7
Southern San Joaquin Valley	576,935	40.1	44.8	44.6
Southern California	9,290,841	32.5	33.8	33.7
San Diego County	1,895,002	46.9	49.3	49.7
Rest of California	2,709,974	39.3	40.1	39.9
Statewide Total	**20,903,134**	**36.9**	**38.4**	**38.4**

Source: MTC/California High-Speed Rail Travel Demand Model; Cambridge Systematics 2007.

The six Central Valley counties in the core study area have a wide variation in employment growth rates under the No Project Alternative with values ranging between 31% and 60%. All six counties have noticeably higher employment growth rates for the HST Network Alternatives, with Merced and Madera Counties showing the largest numeric difference in growth rates between the No Project and HST Network Alternatives; this result also holds for Stanislaus County in the Altamont network alternative. The population growth rate in these Central Valley counties as a group is highest for the Altamont network alternative, with the Altamont network alternative having the highest growth rate in four of the six counties.

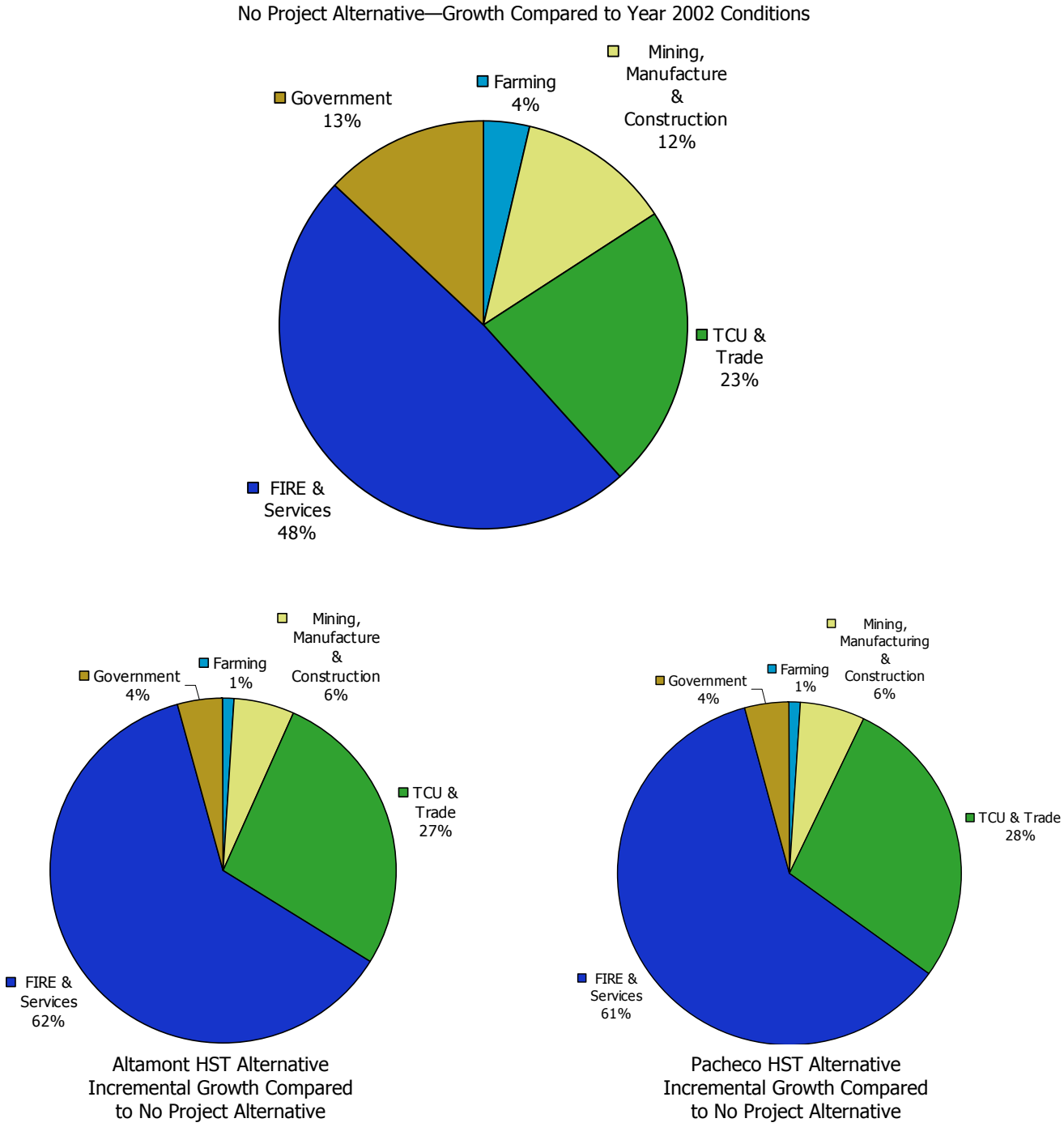
Compared to the No Project Alternative, the employment growth rates shown in Table 5.3-2 equate to an additional 320,000 jobs under the Pacheco network alternative and 316,000 jobs under the Altamont network alternative in the year 2030. As with population growth, however, this level of difference between the No Project and HST Network Alternatives is very small compared to the overall level of growth represented by the No Project Alternative relative to the 2005 conditions.

The No Project Alternative is projected to continue historical patterns of employment growth across a diverse range of industry sectors, while also following recent trends toward increases in services and trade. As shown in Figure 5.3-2, nearly one-half of the employment growth for the No Project Alternative is projected in the FIRE (Finance, Insurance and Real Estate) and services sectors, while nearly one-quarter is in TCU (transportation, communications, and utilities), retail trade, and wholesale trade. The incremental employment growth under the HST Network Alternatives does not completely follow this historical pattern. Both HST Network Alternatives show a much greater propensity to job growth in the FIRE, services, TCU, wholesale trade, and retail trade categories.

The Pacheco and Altamont network alternatives exhibit subtle differences in the types of jobs they are projected to attract to different regions. Table 5.3-3 depicts the percentage of growth by major industry group for the increment of jobs that may be "induced" by these two alternatives (i.e., job growth above and beyond that of the No Project Alternative). While the patterns are generally similar, the Altamont network alternative shows a greater propensity for generating jobs in the FIRE and Services sectors in the Central Valley and in San Diego, and in the TCU and trade sectors in the "rest of California." The Pacheco network alternative shows a greater propensity for generating jobs in the TCU and trade sectors in the Central Valley and in San Diego, and in the FIRE and services sectors in the "rest of California." The FIRE and Services sectors tend to be the most compatible for location in higher density settings, such as near potential HST sites where offices and retail development could be expected.

C. URBANIZATION

Urbanized areas in the core study area are expected to grow by about 40% between 2005 and 2030 under the No Project Alternative, as shown in Table 5.3-4. This growth would represent an increase of about 400,000 ac (162,000 ha) over today's 1.0 million ac (0.4 million ha) within the core analysis counties. Compared to urbanized area growth under the No Project Alternative, urbanized area growth is expected to be 0.9% (9,000 ac [3,650 ha]) higher under the Pacheco network alternative and 1.4% (14,000 ac [5,670 ha]) more under the Altamont network alternative. As with the population and employment growth, the level of difference between alternatives for urbanized area size is small compared to the overall level of growth represented by the No Project Alternative relative to the 2002 existing conditions. Noticeable differences in these general patterns can be seen for Madera and Merced Counties, both of which are projected to have sizable urbanization increases for the HST Network Alternatives compared to the No Project Alternative.



Source: Cambridge Systematics 2007.

Table 5.3-3
Percent of Incremental Growth by Industry

	Farming and Mining		Construction and Manufacturing		TCU and Trade		FIRE and Services		Government	
Incremental Growth Rate for Induced Employment (Year 2005 to 2030)	**Pacheco HST**	**Altamont HST**	**Pacheco HST**	**Altamont HST**	**Pacheco HST**	**Altamont HST**	**Pacheco HST**	**Altamont HST**	**Pacheco HST**	**Altamont HST**
Study Area—Bay Area	0	0	6	5	28	29	62	63	3	3
Study Area—Central Valley	2	2	6	4	25	21	63	68	5	4
Subtotal—Core Study Area	***1***	***1***	***6***	***5***	***27***	***25***	***62***	***66***	***4***	***4***
Southern Sacramento Valley	1	2	10	9	34	33	50	52	6	5
Southern San Joaquin Valley	5	5	4	4	20	19	66	67	4	4
Southern California	0	1	6	7	27	29	62	60	4	4
San Diego	0	0	4	3	32	26	59	66	4	4
Rest of California	4	4	9	10	38	45	44	36	5	6
Statewide Total	**1**	**1**	**6**	**5**	**28**	**27**	**61**	**62**	**4**	**4**

Source: Cambridge Systematics 2007.

Table 5.3-4
Increase in Urbanized Area Acreage

Area	Year 2002 Urbanized Area Acreage	Growth Rate (Year 2002 to 2030) (%)		
		No Project Alternative	HST Network Alternative	
			Pacheco	Altamont
Alameda County	141,654	31.8	32.6	32.0
Contra Costa County	142,467	29.1	29.6	29.4
San Francisco County	23,277	28.9	29.9	29.6
San Mateo County	70,869	13.3	13.4	13.7
Santa Clara County	184,481	12.7	13.5	14.6
Study Area—Bay Area	***562,748***	***22.4***	***23.0***	***23.2***
Fresno County	96,977	54.9	58.4	58.0
Madera County	23,255	56.4	62.5	62.5
Merced County	31,712	90.6	96.2	94.3
Sacramento County	157,101	51.4	51.5	52.3
San Joaquin County	74,250	96.3	95.3	96.8
Stanislaus County	55,426	34.0	33.8	38.7
Study Area—Central Valley	***438,721***	***60.7***	***62.0***	***62.9***
Core Study Area	***1,001,469***	**39.2**	**40.1**	**40.6**

Sources: *Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/Environmental Impact Statement*, California High-Speed Rail Authority, July 2003; Cambridge Systematics 2007.

5.3.4 Detail for No Project Alternative

On a statewide basis, population is projected to increase between 2005 and 2030 by about 12 million (33%), which averages to about 480,000 more people each year. The long-term growth rate averages to about 1.1% annually, which is lower than California's 1.8 % annual population growth rate between 1970 and 2005 but consistent with long-term population forecasts by California Department of Finance. Employment growth rates are similar, with jobs increasing by 8 million (37%) between 2005 and 2030; this increase equates to average annual growth of about 320,000 jobs. The long-term growth rate averages about 1.3% per year, which is one-half of the 2.6% annual employment growth rate since 1970.

For the 11 counties in the core study area, population and employment growth under the No Project Alternative are expected to require approximately an additional 400,000 ac (162,000 ha) of urbanized land in 2030 than the current estimated urbanized area of approximately 1.0 million ac (1,271,523 ha).[7] Urbanization of land in these core counties is projected to occur at slightly lower rates than overall population and employment growth, reflecting a number of factors:

- A reduction in availability of land for development in some Bay Area counties, creating higher land costs and market forces for denser development.
- Slight increases in infill and redevelopment, as seen recently in many urban communities, and blighted areas that receive new development.

[7] Estimates of current urbanized area are based on urban land cover data provided by the California Farmland Mapping and Monitoring Program (CFMMP), a division of the California Department of Conservation.

- An increase in marginal residential densities that has occurred over recent years.[8]

5.3.5 Detail for HST Network Alternatives

As noted earlier, statewide population and employment forecasts for the HST Network Alternatives are similar to those for the No Project Alternative. For Year 2030, the Pacheco network alternative is projected to add about 502,000 (1.4%) more people and 320,000 (1.5%) more jobs compared to the No Project Alternative. The Altamont network alternative is projected to add about 495,000 (1.3%) more people and 316,000 (1.5%) more jobs compared to the No Project Alternative. The incremental effect of both HST Network Alternatives is to add the equivalent of about 1 year's population and employment growth to California by year 2030.

Land consumption for both HST Network Alternatives is projected to be of the same magnitude because of the predominant effect of population growth. In the 11 core area counties, the Altamont network alternative is projected to consume an additional 5,000 ac (0.5%) of land for urbanized densities compared to the Pacheco network alternative. This increment compares to a total of 1.4 million ac of urbanized land projected for these 11 counties in the No Project Alternative. The HST Network Alternatives are able to accommodate population and employment growth at a larger rate than urbanized area growth because of stronger employment growth in the services and FIRE sectors and market forces supporting denser station-area development for office-style facilities.

5.3.6 Study Area Effects

Each of the HST Network Alternatives has varied effects on different parts of the state. Part of this difference is in terms of overall population, employment, and urbanization projections. Another part of the difference is related to the type of industries that are projected to experience employment growth under each alternative.

Table 5.3-5 presents population and employment projections for each county and region analyzed. Values are provided for Year 2005 existing conditions, and year 2030 projections are provided for the No Project Alternative and the two HST Network Alternatives. On an absolute basis, the areas currently most populous are projected to exhibit the largest increases in population and employment from 2005 to 2030. San Diego County and Southern California are together projected to add about 5 million people and 4 million jobs during this period. The five Bay Area counties in the core study area are projected to add about 1.7 million people and 1.4 million jobs during this period. The six counties in the Central Valley study area are projected to add about 2.4 million people and 0.9 million jobs.

A. POPULATION GROWTH RATES

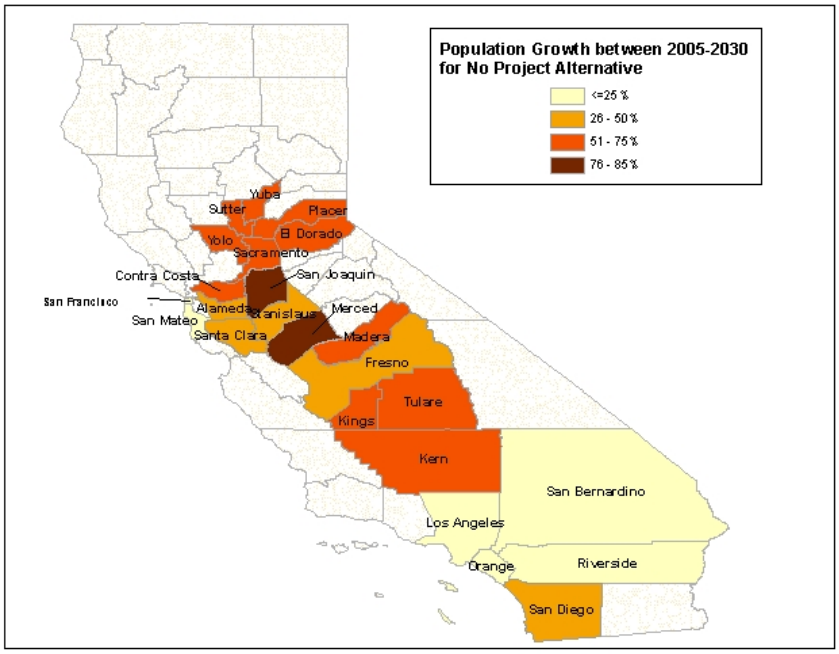
A relative comparison of county-level population growth rates is depicted graphically in Figures 5.3-3 through 5.3-5. Figure 5.3-3 displays the relative change in population for each analysis region from 2005 to 2030 under the No Project Alternative. These data illustrate that Merced and San Joaquin Counties are projected to exhibit the largest population growth rates, followed by Southern Sacramento Valley, Southern San Joaquin Valley, and Contra Costa County. The lowest relative population growth rates are projected to occur in the core areas of the Bay Area and Southern California.

[8] California's housing plan update (*Raising the Roof: California Housing Development Projections and Constraints, 1997–2020*; California Department of Housing and Community Development; May 2000; Exhibit 17) analyzed changes in gross population densities between 1984 and 1986. This analysis included data for 11 of the 21 counties in the study area (see Section 5.2). In 9 of these 11 counties, the density of new residential development that occurred between 1984 and 1996 was between 50% and 585% higher than the average residential density that existed in 1984.

Table 5.3-5
Year 2030 Employment and Population: County and Regional Totals

Region	Employment				Population			
	2005 Conditions	2030			2005 Conditions	2030		
		No Project	Pacheco Alternative	Altamont Alternative		No Project	Pacheco Alternative	Altamont Alternative
Alameda County	953,937	1,247,413	1,259,563	1,257,894	1,451,065	2,038,482	2,051,196	2,054,014
Contra Costa County	508,854	763,445	769,521	767,521	1,017,644	1,543,053	1,549,526	1,546,206
San Francisco County	779,357	975,823	983,634	981,068	741,025	796,208	809,680	801,192
San Mateo County	522,830	717,526	723,835	723,899	701,175	814,065	821,063	826,885
Santa Clara County	1,323,920	1,769,498	1,785,181	1,784,281	1,705,158	2,152,963	2,183,649	2,196,405
Study Area—Bay Area	***4,088,898***	***5,473,705***	***5,521,734***	***5,514,663***	***5,616,067***	***7,344,771***	***7,415,114***	***7,424,702***
Fresno County	435,769	589,226	602,155	601,294	878,089	1,297,476	1,314,824	1,312,891
Madera County	56,892	91,364	96,173	96,293	142,530	219,832	229,648	229,492
Merced County	87,365	115,054	122,374	121,040	242,249	437,880	452,166	447,409
Sacramento County	805,978	1,259,792	1,268,687	1,271,311	1,363,423	2,293,028	2,305,071	2,314,484
San Joaquin County	274,155	368,745	375,491	379,476	664,796	1,229,757	1,241,285	1,254,281
Stanislaus County	224,491	316,686	323,679	332,624	505,492	744,599	758,256	783,839
Study Area—Central Valley	***1,884,650***	***2,740,867***	***2,788,559***	***2,802,038***	***3,796,579***	***6,222,572***	***6,301,250***	***6,342,396***
Core Study Area	***5,973,548***	***8,214,572***	***8,310,293***	***8,316,701***	***9,412,646***	***13,567,343***	***13,716,364***	***13,767,098***
Southern Sacramento Valley	456,834	729,293	732,903	733,942	658,108	1,090,299	1,092,658	1,093,615
Southern San Joaquin Valley	576,935	808,196	835,245	833,977	1,311,579	1,989,111	2,048,889	2,047,375
Southern California	9,290,841	12,308,179	12,435,533	12,421,683	16,843,742	20,844,795	20,988,962	20,950,544
San Diego County	1,895,002	2,783,258	2,828,805	2,837,183	2,936,609	4,005,624	4,147,239	4,132,577
Rest of California	2,709,974	3,774,366	3,795,828	3,791,032	4,991,463	6,613,499	6,618,328	6,614,836
Statewide Total	**20,903,134**	**28,617,864**	**28,938,605**	**28,934,518**	**36,154,147**	**48,110,671**	**48,612,439**	**48,606,045**

Sources: U.S. Bureau of the Census; MTC/California High-Speed Rail Travel Demand Model; Cambridge Systematics 2007



Source: Cambridge Systematics 2007.

Figure 5.3-3
County-Level Population Growth under the No Project Alternative

Figures 5.3-4 and 5.3-5 display county-level population growth rates compared to the No Project Alternative for the Pacheco and Altamont network alternatives, respectively. For Pacheco, incremental population growth is highest in Madera County, followed by Merced County, San Diego County, and the Southern San Joaquin Valley; incremental growth rates are lowest in Southern California (except San Diego County) and areas from San Joaquin County northward. For Altamont, incremental population growth is highest in Madera and Stanislaus Counties, followed by Merced County, San Diego County, and the Southern San Joaquin Valley; incremental growth rates are lowest in Southern California (except San Diego County) and areas from Sacramento County northward.

B. EMPLOYMENT GROWTH RATES

Figures 5.3-6 through 5.3-8 graphically depict county-level employment growth rates. Figure 5.3-6 displays the relative change in employment for each county from Year 2005 to Year 2030 under the No Project Alternative. These data illustrate that Madera, Sacramento, Contra Costa, and San Diego Counties and the Southern Sacramento Valley are projected to exhibit the largest employment growth rates. The lowest relative employment growth rates are projected to occur in the San Francisco, Alameda, and Merced Counties and Southern California.

Figures 5.3-7 and 5.3-8 display county-level employment growth rates compared to the No Project Alternative for the Pacheco and Altamont network alternatives, respectively. For Pacheco, incremental employment growth is highest in Madera and Merced Counties, followed by Fresno and Stanislaus Counties and the Southern San Joaquin Valley; incremental growth rates are lowest in Southern California (except San Diego County), the Bay Area, and the greater Sacramento area. For Altamont, incremental employment growth is highest in Madera, Merced, and Stanislaus Counties, followed by San Joaquin County and the Southern San Joaquin Valley; incremental growth rates are lowest in Southern California (except San Diego County), the Bay Area, and the greater Sacramento area.

The Northern Central Valley region historically has exceeded statewide averages for government and farming jobs while lagging in all other industry groups. This general pattern is projected to change slightly under the No Project Alternative, with employment shifts from government into farming, and from manufacturing, trade, and TCU into FIRE and services. Incremental job growth under the HST Network Alternatives is projected to have incremental job growth that is oriented much more heavily toward FIRE and services (about 62% of total), with trade, and TCU accounting for about 27% of incremental growth. This is the largest shift in the nature of employment for any region and suggests that either HST Network Alternative could be a strong influence in attracting higher-wage jobs to the Central Valley.

Taken together, the population and employment results suggest that the additional population growth under the HST Network Alternatives is driven by internal job growth (i.e., job growth that occurs in the same county as opposed to population growth) related to initiation of HST service, rather than by potential population shifts from the Bay Area and Southern California and associated long-distance commuting. For the six Central Valley Counties in the core study area, each new job generated between 2005 and 2030 (No Project) is projected to be accompanied by about 2.8 new people. However, each job induced by one of the HST Network Alternatives is projected to be accompanied by only 1.6 new people. Hence, the HST Network Alternatives are projected to induce proportionately more jobs than people in the Central Valley.

C. URBANIZATION

Table 5.3-6 presents projections for increases in urbanized areas for the 11 counties in the core study area. While population and employment increases were projected to be concentrated in the counties that currently are most populous, urbanization patterns do not follow this trend. Although the six

Central Valley Counties are projected to account for 38% of the job growth for the No Project Alternative, they are projected to account for 68% of the urbanization increase in the core study area. Among all 11 core area counties, Sacramento, San Joaquin, and Fresno Counties are projected to experience by far the largest absolute increases in urbanized acreage for the No Project Alternative.

This pattern changes somewhat for the HST Network Alternatives. The six Central Valley Counties account for about one-half of the total incremental job growth in the core study area, but their share of the urbanization increase drops to 60% (from the 68% under the No Project Alternative). Absolute increases in urbanization for the HST Network Alternatives are largest in Santa Clara County (for Altamont), Stanislaus County (for Altamont), and Fresno County (both HST Network Alternatives).

Table 5.3-6
Year 2030 Size of Urbanized Area by Alternative

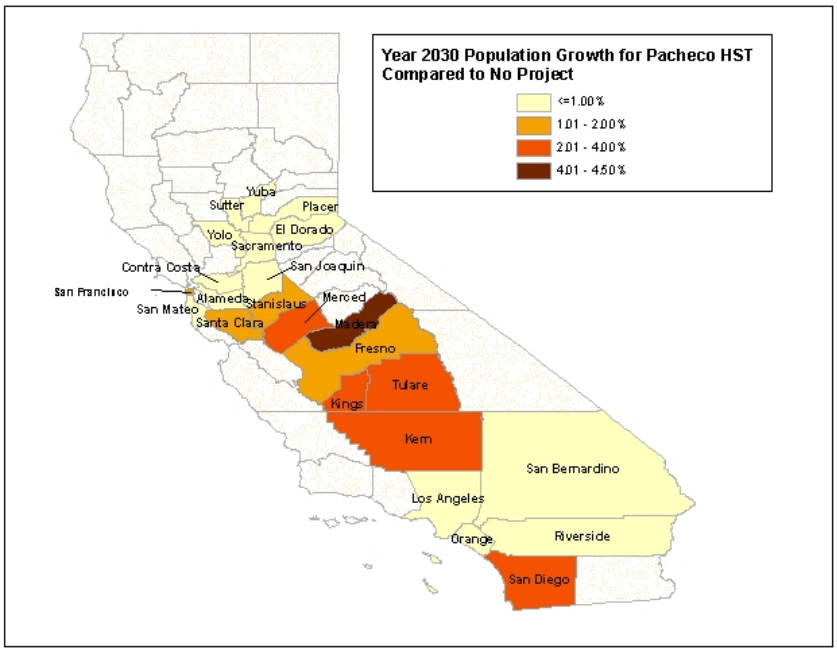
Area	Year 2002 Urbanized Area Acreage	Year 2030 Urbanized Area (Acres)		
		No Project Alternative	HST Network Alternative	
			Pacheco	Altamont
Alameda County	141,654	186,683	187,808	186,942
Contra Costa County	142,467	183,869	184,596	184,288
San Francisco County	23,277	30,013*	30,246*	30,172*
San Mateo County	70,869	80,304	80,386	80,543
Santa Clara County	184,481	207,833	209,352	211,324
Study Area—Bay Area	***562,748***	***688,702***	***692,388***	***693,269***
Fresno County	96,977	150,223	153,574	153,243
Madera County	23,255	36,366	37,793	37,778
Merced County	31,712	60,455	62,212	61,611
Sacramento County	157,101	237,818	238,066	239,245
San Joaquin County	74,250	145,776	145,046	146,104
Stanislaus County	55,426	74,267	74,179	76,886
Study Area—Central Valley	***438,721***	***704,905***	***710,870***	***714,867***
Core Study Area	**1,001,469**	**1,393,607**	**1,403,258**	**1,408,136**

*Note: Projected increases in urbanized area for San Francisco County are a function of the average densities used to calculate employment acreage. Because "greenfield" land is not available in San Francisco County, employment growth will need to be accommodated through densification and infill rather than through increases in urbanized area size implied in this table.

Source: Cambridge Systematics 2007.

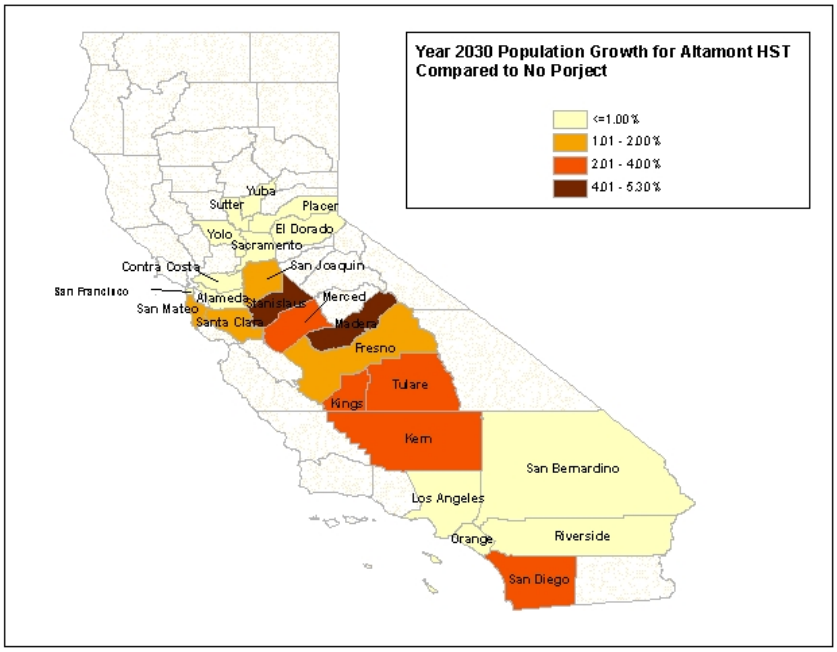
5.3.7 Summary of Effects

Overall, the system alternatives exhibit very similar levels of growth-inducing effects in terms of population, employment, and urbanization patterns. The additional effect of either HST Network Alternative relative to the No Project Alternative is small compared to the difference between the No Project Alternative and existing conditions.



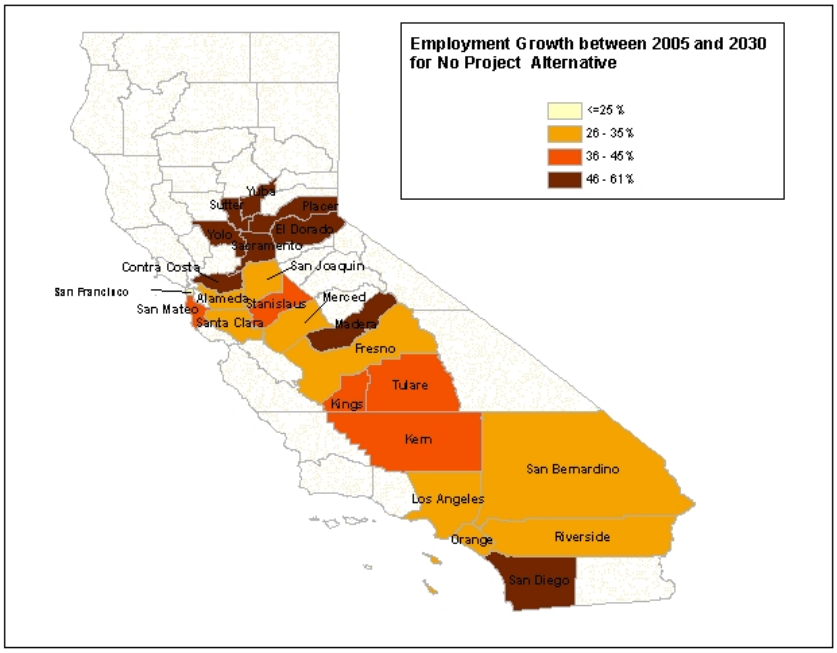
Source: Cambridge Systematics 2007.

Figure 5.3-4
County-Level Population Growth under the Pacheco Network Alternative



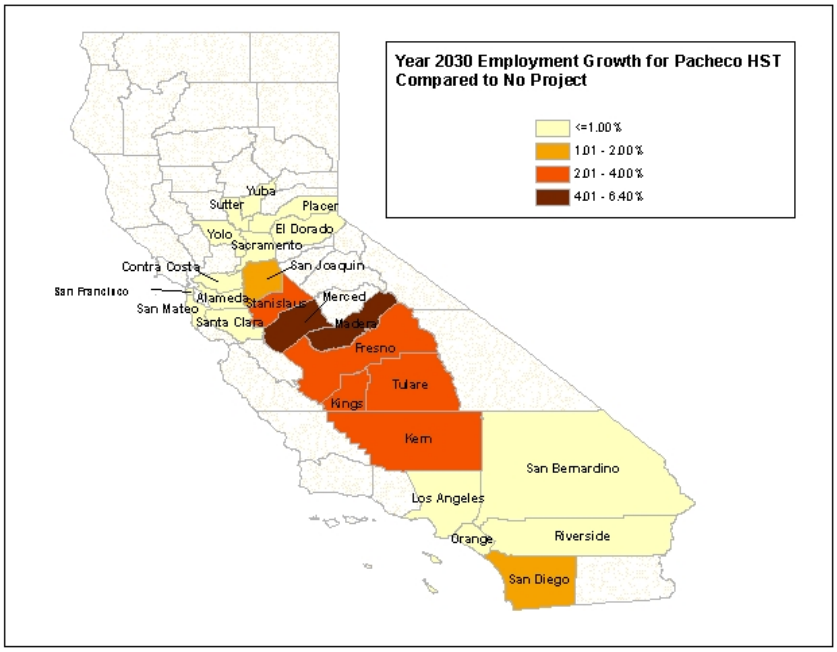
Source: Cambridge Systematics 2007.

Figure 5.3-5
County-Level Population Growth under the Altamont Network Alternative



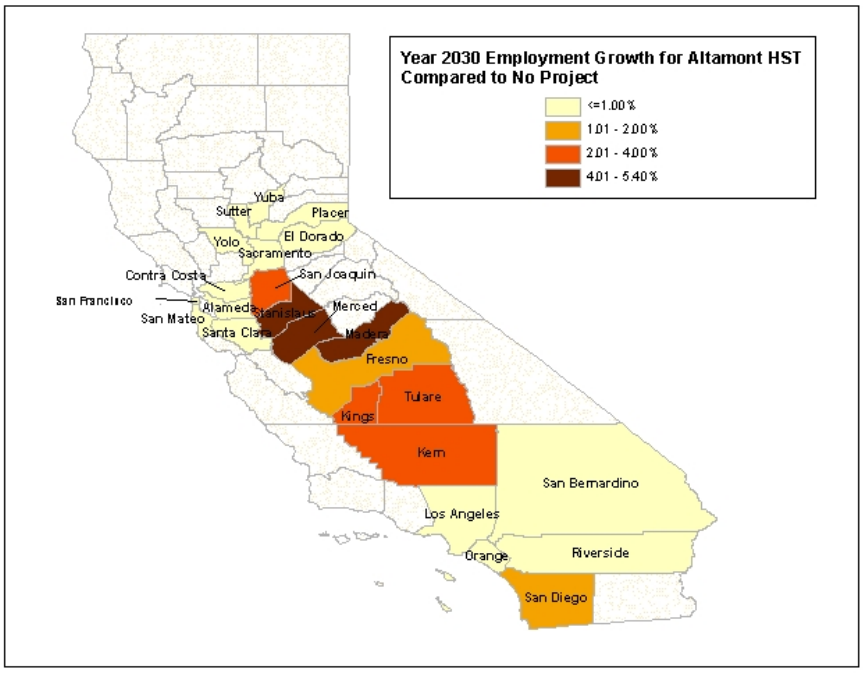
Source: Cambridge Systematics 2007.

Figure 5.3-6
County-Level Employment Growth under the No Project Alternative



Source: Cambridge Systematics 2007.

Figure 5.3-7
County-Level Employment Growth under the Pacheco Network Alternative



Source: Cambridge Systematics 2007.

Figure 5.3-8
County-Level Employment Growth under the Altamont Network Alternative

The HST Network Alternatives would stimulate additional growth relative to the No Project Alternative in many Central Valley counties between Sacramento and Fresno. The incremental employment effect is much larger than the incremental population effect in all Central Valley counties, suggesting that the HST Network Alternatives might be more effective at distributing employment throughout the state. Also, this result suggests that the HST Network Alternatives would not stimulate large shifts in residential location from the Bay Area into the Central Valley.

Experiences in other countries have shown that HST systems can provide a location advantage to those areas that are near an HST station, while at the same time facilitating broader economic expansion for a much wider geographic region. The HST Network Alternatives would contribute to a potential economic boost in two ways.

- An HST system would provide user benefits (travel-time savings, cost reductions, accident reductions) and accessibility improvements for California's citizens; in addition to HST travelers, travelers on other modes of transportation can accrue these user benefits, as trips are diverted from highways and airports, resulting in reduced congestion.
- An HST system would improve accessibility to labor and customer markets, thereby potentially improving the competitiveness of the state's industries and the overall economy. With this second effect, businesses that locate close to an HST station could operate more efficiently than businesses that locate elsewhere. Experience from overseas suggests that this competitive advantage may be quite pronounced in high-wage employment sectors that are frequently in high demand in many communities. This second effect would be much stronger under the proposed HST than under the No Project Alternative.

One of the most telling summary statistics comes from combining population and employment growth projections with land consumption forecasts, providing a measure of "land consumed per new job and resident." Essentially, this calculation tells us how efficient each network alternative is at accommodating the projected growth. Because the alternatives have similar levels of overall growth, the efficiency by which that growth would be accommodated becomes more important. Table 5.3-7 provides the relevant data for each alternative; lower values suggest greater efficiency. The results indicate that the Pacheco network alternative is the most efficient of the alternatives, providing an incremental development density that is 1.3% more efficient than the No Project Alternative, while the Altamont network alternative is 0.8% more efficient than the No Project Alternative. The efficiency gains for both HST Network Alternatives are achieved in conjunction with higher population and employment projections than under the No Project Alternative.

Table 5.3-7
Potential Land Consumption Efficiencies in the Core Study Area

	No Project Alternative	Pacheco HST Network Alternative	Altamont HST Network Alternative
Land Consumption (thousands of acres)	392.1	402	407
Job Growth (thousands of jobs)	2,241	2,337	2,343
Population Growth (thousands of people)	4,155	4,304	4,354
Acres Consumed per New Job and Resident*	***0.0613***	***0.0605***	***0.0608***
Efficiency Gain/Loss Relative to No Project Alternative	-	+1.3%	+0.8%

* Value found by dividing land consumption by the sum of job growth and population growth.
Source: Cambridge Systematics 2007.

5.4 Potential Indirect Impacts of Induced Growth

This section explores the potential indirect impacts related to incremental population and employment growth and associated changes in urbanization. Potential indirect impacts are described for the Altamont and Pacheco network alternatives, with the No Project Alternative used as the reference point.

As described above, both HST Network Alternatives may have positive, albeit relatively small, statewide effects on population and employment growth compared to the No Project Alternative. At the sub-state level, San Joaquin Valley counties are projected to experience population and employment growth rates that are noticeably higher than the statewide average, with the Altamont network alternative experiencing higher growth rates in areas north of Fresno County and the Pacheco network alternative experience higher growth rates from Fresno County southward.

Despite the relatively small magnitude of this additional population and employment growth compared to under the No Project Alternative, these changes could contribute to indirect impacts on the human or natural environment in addition to the direct impacts created by construction and operation of an HST. Many of these impacts may derive from the increased urbanization needed to accommodate the additional population and employment. In 2030, the total size of urbanized areas in the study area would be virtually the same under the proposed HST Network Alternatives as under the No Project Alternative, although the HST Network Alternatives will lead to increased urbanization in Fresno, Madera, Merced, and Santa Clara Counties.

Much of the potential incremental growth associated with each alternative is likely to focus around HST stations because these are the locations that receive the highest accessibility benefit with HST service. While county and regional effects may differ only slightly between alternatives, the localized effects could be larger near these proposed HST stations compared to under the No Project Alternative.

5.4.1 Transportation

This section discusses the potential impacts of induced growth on traffic conditions for highways, roadways, passenger transportation services (bus, rail, air, intermodal), goods movement, parking, and transit facilities in the study area.

Currently, the study area highway and roadway corridors considered in this analysis represent some of the worst traffic conditions in the nation. Traffic conditions throughout the study area are expected to worsen. Vehicle V/C ratios are projected to deteriorate between Years 2005 and 2030, and there would be more level of service F segments under the No Project Alternative compared to existing conditions. When compared to this projected degradation in traffic conditions under the No Project Alternative, the traffic conditions projected for the HST Network Alternatives would improve throughout the study area, despite the approximate 1.2% increase in study area population and employment under the proposed HST Network Alternative. The potential impacts of the induced growth, to the degree that they can be detected, would be most apparent around urban HST stations where the additional traffic generated by induced growth is expected to be concentrated.

The largest increase in population and employment would occur in Madera and Merced Counties for the Pacheco network alternative, and in Madera, Merced, and Stanislaus Counties for the Altamont network alternative. This increase has the greatest potential to generate impacts from traffic accessing the potential HST station sites. Most of these communities have considerable capacity on roadways and intersections in areas surrounding potential downtown or outlying HST station sites. The potential traffic generation impacts of the projected 4% to 6% more residents and employees, such as that projected for Madera County, would be unlikely to have measurable impacts on roadway and intersection levels of service.

As an overall conclusion, the potential transportation impacts of induced growth under the HST Network Alternatives are likely to concentrate around proposed HST station sites. Because the Altamont network alternative is projected to experience higher population and employment growth than the Pacheco network alternative for nearly all counties north of Fresno County, the secondary transportation impacts could be expected to be proportionately larger for the Altamont network alternative. Project-level environmental studies would be expected to provide the appropriate opportunity to investigate more localized impacts.

5.4.2 Air Quality

Section 3.3, "Air Quality," describes the potential impact of induced growth on air pollution. Under high-end assumptions, the HST Network Alternatives annually would accommodate an estimated 95 million travelers that would otherwise use the roadways and airports. This diversion to HST could lead to a projected 5% statewide VMT reduction on the highway system, with VMT reductions of between 7% and 12% in Bay Area and Central Valley Counties. Thus, the HST Network Alternatives are projected to decrease the amount of mobile-source air quality pollutants in the study area and the state as compared to the No Project Alternative. The additional increase in population and employment in each county from induced growth generally would be expected to increase traffic and mobile-source air pollutants by an amount proportional to that growth. Even with induced growth, mobile-source air emissions under all HST Network Alternatives would be lower than No Project emissions in all counties because the projected VMT reduction is larger than the projected population and employment growth.

At the local level, the HST Network Alternatives have somewhat more potential to affect air quality because of expected increases in local traffic near HST station locations. It is expected that the induced growth could concentrate near HST stations, and thus the direct and indirect air quality effects could be larger around the station areas. The severity of these local impacts, however, cannot be reliably quantified without local and detailed traffic modeling and impact analysis, which is outside the scope of analysis for this Program EIR/EIS. Project-level environmental studies would be expected to provide the appropriate opportunity to investigate more localized impacts.

5.4.3 Noise and Vibration

Increased population and employment related to induced growth would not increase the likelihood or levels of potential noise and vibration impacts. Therefore, no indirect impacts from induced growth are expected in the areas of noise and vibration.

5.4.4 Energy

There would not be any significant differences in potential energy use among the alignment alternatives resulting from general population and employment growth projections because the magnitude of the incremental statewide population and employment growth is expected to be similar, regardless of which alternative is chosen. However, the expected propensity of the proposed HST Network Alternatives to concentrate employment and population near HST stations, and the resulting incremental development density benefit, would tend to reduce the number and length of vehicle trips for work, leisure, and commerce compared to the No Project Alternative. Such an effect would decrease the amount of energy directly used for transportation. The potential increased density in the vicinity of proposed HST station sites also would limit the amount of energy required for construction of and access to future infrastructure projects by reducing the distance between structures and reducing the number of structures that would be required to serve new population and employment growth. In addition, higher density would reduce demand for the large-volume transportation-related infrastructure projects required for a highly automobile-oriented transportation network. Finally, if growth around HST stations occurs at higher densities than would occur with more dispersed growth under the No Project Alternative, savings in building-related energy use also could be realized because multi-unit and multi-story structures tend to require less energy per square foot for heating and cooling needs.

The projected population and employment distributive effect of the project could create the need for some change in the incremental development of overall energy and electricity generation and/or transmission capacity among regions. For example, Madera, Merced, and Stanislaus Counties would exhibit the largest relative increase in both population and employment with implementation of the HST Network Alternatives. Relatively high incremental growth is also expected in other counties in the Central Valley. The Southern San Joaquin Valley and San Diego County also would exhibit induced employment and population growth that is above the statewide average. These differences in growth rates among counties potentially would require more incremental production and/or transmission capacity to be developed in some areas with implementation of the HST Network Alternatives as compared to the No Project Alternative. Regional differences in production and transmission needs may also be seen among the HST Network Alternatives, with the Altamont network alternative exhibiting more energy use in areas north of Fresno County and the Pacheco network alternative exhibiting more energy use from Fresno County southward (including Southern California).

5.4.5 Electromagnetic Frequency and Electromagnetic Interference

Increased population or employment related to induced growth would not increase the likelihood or potential severity of EMF and EMI associated with operation of the proposed HST Network Alternatives. Therefore, no indirect impacts from induced growth are expected in the areas of EMF/EMI.

5.4.6 Land Use, Communities and Neighborhoods, Property, and Environmental Justice

This section describes the potential impacts of induced growth attributable to the HST Network Alternatives on land use compatibility, communities and neighborhoods, property, environmental justice, and socioeconomics.

A. COMPATIBILITY WITH EXISTING LAND USE AND FUTURE LAND USE PLANS

The analysis results indicate that employment is projected to increase under the HST Network Alternatives, with employment potentially available for a broad range of education or job skills. Increased employment opportunities generally lead to personal income growth. The relationship between employment, income growth, and the socioeconomic composition of a community is complex. Increases in employment and income opportunities, however, would tend to make a community more attractive to a broader range of individuals. Because induced growth under the HST Network Alternatives would be relatively small (compared to the growth under the No Project Alternative), it is expected that socioeconomic changes also would be small.

The HST Network Alternatives are projected to push employment growth in the study area 1.2% higher than under the No Project Alternative, with the Altamont network alternative experiencing higher growth in the Central Valley and the Pacheco network alternative experiencing higher growth in the Bay Area. The development pressures associated with the HST Network Alternatives would be concentrated in the service and FIRE industries, which generally occupy office developments and have been shown to have a higher propensity to locate close to transit stations. Increased residential growth might also be expected in HST station areas and adjacent communities.

The HST Network Alternatives include potential station location options that were identified through consultation with local planning agencies and selected to be compatible to the extent possible with future planned land uses. Recent trends among local jurisdictions show a growing consideration of land use policies that are intended to encourage high-density, mixed-use development in downtowns and other areas in which HST stations may be located. Section 3.7, "Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice," describes community plans in the various HST station area options and assesses the level of compatibility of an HST with these plans. Overall, most station locations for the proposed HST Network Alternatives would be highly compatible with local and regional plans, which generally support rail systems and transit-oriented

development. Potential inconsistencies were noted for a few stations, including Livermore (Greenville Road/I-580), Tracy (ACE), Union City (Shinn), Briggsmore (Amtrak), Merced (Downtown), and Castle AFB. As induced growth may lead to intensified development in HST station areas, secondary land use impacts are possible with these same potential station locations. However, it is possible that some of these inconsistencies will be addressed through further land use planning that occurs at the local level.

B. COMMUNITIES AND NEIGHBORHOODS

The induced growth associated with either HST Network Alternative would have some modest potential to increase office/commercial development densities around HST station sites and residential growth in adjacent communities. In general, this growth would not be expected to create new barriers within neighborhoods or reduce community cohesion because the growth would generally follow existing transportation corridors and rights-of-way. In some cases, growth could provide positive community and neighborhood benefits by helping to fill in vacant or underutilized areas with higher-intensity uses that generate and encourage pedestrian activity. Any induced development that does occur would be expected to be consistent with locally adopted land use plans and developed through a public process that considers both positive and negative community and neighborhood impacts.

C. PROPERTY

The induced population and employment growth that would be attributable to the HST Network Alternatives is not projected to create the need for any additional right-of-way for wider highways, new interchanges, additional runways, or other auto or air travel infrastructure.

The highest potential for secondary property impacts under the HST Network Alternatives would be expected to occur near the HST stations, where the transportation accessibility benefits of HST are expected to lead to increased land values and development pressures. Increased land values would represent a benefit to property owners near stations. As a result of the accessibility benefits of HST access, more and denser development would be expected to occur near HST stations. While some of this development might represent a net increase in development in the region (as a result of induced population and employment growth), other development simply might be shifted from an alternative location (e.g., near an outlying highway interchange). Therefore, some properties in other parts of the region, not near HST stations, might not experience the same development pressure that they would have under the No Project Alternative. These effects are likely to be very dispersed and minor from a regional perspective, and any specific locations that might be affected outside of HST station areas cannot be predicted. Furthermore, any induced development that occurs (whether inside or outside HST station areas) would be expected to be consistent with locally adopted land use plans that reflect community input into preferred development patterns. The planning policies and general plans of most jurisdictions in which potential HST station sites would be located are directing present and future development into their urban centers and to infill sites independent of possible future HST implementation.

D. ENVIRONMENTAL JUSTICE

The induced growth attributable to the HST Network Alternatives should not have disproportionate impacts on minority and low-income populations. The induced growth from the HST Network Alternatives would have the potential to offer improved employment opportunities to local communities. These opportunities may arise from more diversified regional economies and robust employment growth in regions that would not benefit in the same way under the No Project Alternative.

Section 3.7, "Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice," identifies the extent to which environmental justice populations are present in potential HST station areas. Stations with such populations identified include West Oakland/7th Street, 12th Street/City Center, Coliseum/Airport, Union City (BART), Fremont (Warm Springs), Gilroy (Caltrain), Union City (Shinn), Merced (Downtown), and Castle AFB. Impacts in specific station areas and adjacent communities could be both positive and negative—positive to property owners as a result of increased property values and to workers as a result of increased job opportunities, but potentially negative to non-property owners if rising property values reduce housing affordability. It would be speculative to attempt to further characterize potential impacts at the program level without more specific information about what development impacts might occur.

The consequence of growing employment in the service industries would be a diversification in the Central Valley away from agriculture and into more non-agricultural jobs. The impact of these new jobs (and the population growth and new development that it would stimulate) on minority and low-income populations in each county cannot be identified in this Program EIR/EIS. In general, FIRE and service job growth would tend to be attracted to station areas and adjacent communities under the HST Network Alternatives. The extent to which this development would potentially use land occupied by minority and low-income populations would deserve consideration at the project-level review of potential environmental justice issues. The growth in FIRE and service sector employment would tend to offer more jobs to high-skilled members of the work force than to low-skilled workers. Many service-sector jobs, however, would be accessible to low-skilled workers, and any increase in employment generally would have multiplier effects that tend to generate indirect and induced job growth across many occupations. Lower-skilled workers could also benefit from the additional job opportunities in building construction and related industries as a result of induced employment and population growth that occurs in the region. As with many of the resource areas, there are potential regional differences in these opportunities between the HST Network Alternatives because of differences in the pattern of induced population and employment growth. In northern San Joaquin Valley counties, more employment opportunities would be expected for environmental justice populations with the Altamont network alternative. In other San Joaquin Valley and Southern California counties, more employment opportunities would be expected with the Pacheco network alternative. Opportunities may be relatively similar between the HST Network Alternatives in the Bay Area.

5.4.7 Farmland and Agriculture

The urbanization forecasts that were developed for the analysis of potential growth inducement resulted in conceptual urbanization footprints showing the potential future locations of developed areas in the 11 core study area counties. The footprints show the areas that would be the most likely to become urbanized in the future, based on the levels of projected population and employment growth, current development patterns, land accessibility, and local regulations and policies. These urbanization footprints were combined with GIS-based information used in Chapter 3 showing the location of lands in agricultural use to produce estimates of the extent to which farmland might be converted to urbanized areas.

Table 5.4-1 provides estimates of farmland acreage that could be converted to urbanized land uses for the No Project and HST Network Alternatives. Results are presented separately for categories of prime farmland, farmland of statewide importance, unique farmland, and farmland of local importance. The difference between the No Project and HST Network Alternatives provides an estimate of the indirect impact of induced growth on farmland and agriculture.

Table 5.4-1 Farmland Resources Potentially Affected by Future Urbanization

Area	Acreage of Resource Potentially Affected by Future Urbanization* (Percent Change from No Project Alternative)		
		HST Network Alternatives	
	No Project Alternative	Pacheco	Altamont
Prime Farmland			
Alameda County	3,062	3,089 (1%)	3,062 (0%)
Contra Costa County	8,108	8,607 (6%)	8,394 (4%)
San Francisco County	0	0	0
San Mateo County	398	398 (0%)	398 (0%)
Santa Clara County	4,935	4,952 (0%)	5,113 (4%)
Study Area—Bay Area	***16,502***	***17,045 (3%)***	***16,966 (3%)***
Fresno County	29,092	31,694 (9%)	31,563 (8%)
Madera County	2,899	2,955 (2%)	2,955 (2%)
Merced County	15,073	16,035 (6%)	15,587 (3%)
Sacramento County	163	163 (0%)	163 (0%)
San Joaquin County	25,113	24,496 (-2%)	25,136 (0%)
Stanislaus County	12,420	12,333 (-1%)	13,776 (11%)
Study Area—Central Valley	***84,760***	***87,675 (3%)***	***89,180 (5%)***
Core Study Area	**101,261**	**104,721 (3%)**	**106,147 (5%)**
Farmland of Statewide Importance			
Alameda County	835	890 (7%)	835 (0%)
Contra Costa County	2,743	2,733 (0%)	2733 (0%)
San Francisco County	0	0	0
San Mateo County	0	0	0
Santa Clara County	813	815 (0%)	870 (7%)
Study Area—Bay Area	***4,391***	***4,438 (1%)***	***4,438 (1%)***
Fresno County	3,754	4,248 (13%)	4,043 (8%)
Madera County	1,497	1,527 (2%)	1,512 (1%)
Merced County	3,729	4,060 (9%)	3,912 (5%)
Sacramento County	32,746	32,793 (0%)	33,320 (2%)
San Joaquin County	23,991	23,851 (-1%)	24,164 (1%)
Stanislaus County	2,716	2713 (0%)	3,593 (32%)
Study Area—Central Valley	***68,433***	***69,192 (1%)***	***70,544 (3%)***
Core Study Area	**72,824**	**73,630 (1%)**	**74,982 (3%)**
Unique Farmland			
Alameda County	588	657 (12%)	588 (0%)
Contra Costa County	1,184	1,176 (-1%)	1,176 (-1%)
San Francisco County	0	0	0
San Mateo County	156	156 (0%)	156 (0%)
Santa Clara County	91	91 (0%)	91 (0%)
Study Area—Bay Area	***2,019***	***2,081 (3%)***	***2,011 (0%)***

Area	Acreage of Resource Potentially Affected by Future Urbanization* (Percent Change from No Project Alternative)		
		HST Network Alternatives	
	No Project Alternative	Pacheco	Altamont
Fresno County	3,818	4,038 (6%)	4,055 (6%)
Madera County	3,430	4,260 (24%)	4,260 (24%)
Merced County	3,195	3,361 (5%)	3,361 (5%)
Sacramento County	1,878	1,878 (0%)	1,900 (1%)
San Joaquin County	2,861	2,861 (0%)	2,864 (0%)
Stanislaus County	974	974 (0%)	1,100 (13%)
Study Area—Central Valley	***16,156***	***17,372 (8%)***	***17,540 (9%)***
Core Study Area	**18,175**	**19,452 (7%)**	**19,551 (8%)**
Farmland of Local Importance			
Alameda County	7	7 (0%)	7 (0%)
Contra Costa County	9,543	9,640 (1%)	9,585 (0%)
San Francisco County	0	0	0
San Mateo County	126	126 (0%)	143 (14%)
Santa Clara County	1,100	1,129 (3%)	1,161 (6%)
Study Area—Bay Area	***10,776***	***10,902 (1%)***	***10,897 (1%)***
Fresno County	3,630	3,660 (1%)	3,637 (0%)
Madera County	1,623	1,767 (9%)	1,767 (9%)
Merced County	3,884	4,013 (3%)	4,013 (3%)
Sacramento County	13,467	13,494 (0%)	13,554 (1%)
San Joaquin County	10,277	10,285 (0%)	10,336 (1%)
Stanislaus County	106	106 (0%)	168 (58%)
Study Area—Central Valley	***32,989***	***33,325 (1%)***	***33,475 (1%)***
Core Study Area	**43,765**	**44,227 (1%)**	**44,373 (1%)**
All Farmland Lost			
Alameda County	4,492	4,643 (3%)	4,492 (0%)
Contra Costa County	21,577	22,155 (3%)	21,889 (1%)
San Francisco County	0	0	0
San Mateo County	680	680 (0%)	697 (3%)
Santa Clara County	6,939	6,988 (1%)	7,235 (4%)
Study Area—Bay Area	***33,688***	***34,466 (2%)***	***34,313 (2%)***
Fresno County	40,293	43,639 (8%)	43,298 (7%)
Madera County	9,449	10,509 (11%)	10,495 (11%)
Merced County	25,882	27,468 (6%)	26,873 (4%)
Sacramento County	48,255	48,329 (0%)	48,937 (1%)
San Joaquin County	62,243	61,492 (-1%)	62,500 (0%)
Stanislaus County	16,215	16,126 (-1%)	18,637 (15%)
Study Area—Central Valley	***202,337***	***207,564 (3%)***	***210,739 (4%)***
Core Study Area	**236,025**	**242,030 (3%)**	**245,052 (4%)**

Area	Acreage of Resource Potentially Affected by Future Urbanization* (Percent Change from No Project Alternative)		
		HST Network Alternatives	
	No Project Alternative	Pacheco	Altamont

* Values in the table indicate the resource acreage that is located in areas that are projected to become urbanized between the years 2002 and 2030 under each alternative. Each alternative, including the No Project Alternative, is projected to have a unique urbanization footprint; therefore, values are presented for each alternative.

Source: Cambridge Systematics and Parsons Brinckerhoff 2007.

The potential induced growth associated with the HST Network Alternatives is projected to affect about 6,000 to 9,000 ac (2,429 to 3,652 ha) more of farmland for the core study area than the No Project Alternative, with the larger impacts being for the Altamont network alternative because of the overall higher amount of urbanization under this alternative. These impacts include an additional 3 to 5% more prime farmland, 1 to 3% farmland of statewide importance, 7 to 8% unique farmland, and 1% local farmland compared to the No Project Alternative. Fresno County is expected to experience the greatest absolute loss, about 3,000 ac (1,215 ha) under either HST Network Alternative, or one-third to one-half of the total impact. Madera and Merced Counties both will experience impacts of 1,000 ac (405 ha) or more under either HST Network Alternative, while Stanislaus County will experience impacts of 2,400 ac (972 ha) under the Altamont network alternative. On the other hand, Stanislaus and San Joaquin Counties could experience slight gains in farmland under the Pacheco network alternative. The already highly urbanized counties of the Bay Area are expected to experience minimal farmland impacts.

Projected farmland losses beyond the No Project Alternative would include 3,500 to 4,900 ac (1,417 to 1,984 ha) of prime farmland across the core study area, 800 to 2,200 ac (324 to 891 ha) of farmland of statewide interest, 1,300 to 1,400 ac (526 to 567 ha) of unique farmland, and 500 to 600 ac (202 to 243 ha) of farmland of local importance. Impacts on each category would be greater under the Altamont network alternative than the Pacheco network alternative.

5.4.8 Aesthetics and Visual Resources

Aesthetics and visual resources refer to the natural and human-made features of a landscape that characterize its form, line, texture, and color. The character of the existing landscape takes shape and would change in each region over time as a result of land uses, development, and urban growth that may occur under any of the alternatives. Increased population or employment related to induced growth could contribute to these impacts, as could the redirection of growth into HST station areas and adjacent communities. Whether these impacts are viewed as positive or negative depends on the specific nature and design of the growth that does occur as well as the subjective opinions of different viewers. In general, however, community land use plans and policies increasingly are emphasizing more compact development patterns as a preferred alternative to dispersed, low-density development. To the extent that the HST Network Alternatives encourage more compact and focused development in station areas, and support the preservation of undeveloped land elsewhere in the study area, this could represent a positive aesthetic and visual benefit. However, it would be speculative to attempt to characterize potential changes at the program level without more specific information about what might be built.

5.4.9 Utilities and Public Services

Utilities and public services include electrical transmission lines, natural gas facilities, and wastewater treatment facilities. The capacity and extent of these utilities and services would be expected to expand gradually or in increments to accommodate the growth in population, employment, and urbanized land area expected to occur in California between now and 2030. Because the additional population, employment, and land consumption related to growth potentially induced by the HST Network Alternatives are relatively small compared to the total growth from existing conditions under the No Project Alternative, no considerable impacts are expected in the areas of utilities and public services. As

with many of the resource areas, there are potential county-level differences between the HST Network Alternatives as a result of patterns of induced population and employment growth. In northern San Joaquin Valley counties, utility and public service needs may be greater under the Altamont network alternative. In other San Joaquin Valley and Southern California counties, utility and public service needs may be greater under the Pacheco network alternative. Utility and public service needs may be relatively similar for the HST Network Alternatives in the Bay Area.

To the extent that the HST Network Alternatives encourage more compact growth patterns, however, the costs of providing utilities and public services potentially could be reduced compared to the costs of serving a more dispersed pattern of development. Costs also might be reduced to the extent that specific alignments and station locations encourage development in existing, developed areas versus areas that currently are undeveloped.

5.4.10 Hazardous Materials and Wastes

Increased population or employment related to growth potentially induced by either HST Network Alternative would not be expected to increase the likelihood or potential severity of exposure to hazardous materials and wastes. No indirect impacts from induced growth are expected in the areas of hazardous materials and wastes.

5.4.11 Cultural and Paleontological Resources

Future growth is expected to result in large areas of land within and outside of cities being developed to urban density levels. However, it would be speculative to identify the likelihood or extent of potential impacts of development on prehistoric archaeological sites, historic archaeological sites, traditional cultural properties, historic structures, and paleontological resources at the program level without knowledge of the precise locations where development projects may be built. In general, both HST Network Alternatives are projected to have similar urbanization patterns as the No Project Alternative, with increased population and employment growth under the HST Network Alternatives offset by higher development density potential in the HST station areas.

Increased population or employment related to growth potentially induced by either HST Network Alternative would not increase the likelihood or extent of potential impacts on cultural or paleontological resources. No indirect impacts from induced growth are expected in the areas of cultural and paleontological resources.

5.4.12 Geology and Soils

Increased population or employment related to growth potentially induced by either HST Network Alternative would not increase the likelihood or extent of potential impacts related to geologic formations, seismic hazards, slope stability, oil and gas fields, or mineral resources. No indirect impacts from induced growth are expected in the areas of geology and soils.

5.4.13 Hydrology and Water Resources

The urbanization forecasts that were developed for the analysis of potential growth inducement resulted in conceptual urbanization footprints showing the potential future locations of developed areas in the 11 core study area counties. The footprints show the areas that would be the most likely to become urbanized in the future, based on the levels of projected population and employment growth, current development patterns, land accessibility, and local regulations and policies. These urbanization footprints were combined with GIS-based maps showing general waterway locations to identify waterways that would be located in areas of future urbanization. Table 5.4-2 provides estimates of the miles of waterways that are in future growth areas and that, in turn, could be affected by this future growth. The

difference between the No Project and the HST Network Alternatives provides an estimate of the potential indirect impact of induced growth on hydrology and water resources.

Induced growth associated with the HST Network Alternatives is projected to affect about 22 to 30 mi (35 to 48 km) more of waterways (2 to 3%) across the core study area than the No Project Alternative. Higher impacts are expected under the Altamont network alternative than the Pacheco network alternative because of the greater amount of urbanization projected under this alternative. The Bay Area would experience 9 to 10 mi (14 to 16 km) of waterway impacts, and the Central Valley would experience 13 to 20 mi (21 to 32 km) of impacts. The greatest impacts on an individual county level would be 8 mi in Santa Clara County under the Altamont network alternative, and 8 mi in Fresno County under the Pacheco network alternative.

Table 5.4-2 Hydrology and Water Resources Potentially Affected by Future Urbanization

	Waterways in Areas of Projected Urbanization*, in Miles (Percent Change from No Project Alternative)		
		HST Network Alternatives	
Area	**No Project Alternative**	**Pacheco**	**Altamont**
Prime Farmland			
Alameda County	215	218 (2%)	215 (0%)
Contra Costa County	84	86 (2%)	85 (1%)
San Francisco County	0	0	0
San Mateo County	51	51 (1%)	51 (1%)
Santa Clara County	77	80 (4%)	84 (10%)
Study Area—Bay Area	***426***	***435 (2%)***	***436 (2%)***
Fresno County	115	123 (7%)	121 (5%)
Madera County	34	35 (5%)	35 (4%)
Merced County	53	58 (9%)	56 (6%)
Sacramento County	135	135 (0%)	139 (3%)
San Joaquin County	191	190 (0%)	193 (1%)
Stanislaus County	54	54 (-1%)	60 (10%)
Study Area—Central Valley	***583***	***596 (2%)***	***603 (3%)***
Core Study Area	**1,009**	**1,031 (2%)**	**1,040 (3%)**

* Values in the table indicate the resource acreage that is located in areas that are projected to become urbanized between the years 2002 and 2030 under each alternative. Each alternative, including the No Project Alternative, is projected to have a unique urbanization footprint; therefore, values are presented for each alternative.

Source: Cambridge Systematics and Parsons Brinckerhoff 2007.

5.4.14 Biological Resources

The urbanization forecasts that were developed for the analysis of potential growth inducement resulted in conceptual urbanization footprints showing the potential future locations of developed areas in the 11 core study area counties. The footprints show the areas that would be the most likely to become urbanized in the future, based on the levels of projected population and employment growth, current development patterns, land accessibility, and local regulations and policies. These urbanization footprints were combined with GIS-based maps showing general locations of habitats in which threatened and endangered species may be found, to identify biological resources that could be affected by areas of future urbanization. Table 5.4-3 provides estimates of the acreage of potential habitat for threatened

and endangered species that could be affected by this projected future growth. The difference between the No Project and the HST Network Alternatives provides an estimate of the indirect impact of induced growth on biological resources.

Induced growth associated with the HST Network Alternatives is projected to affect about 2,600 to 3,600 ac (1,053 to 1,457 ha) more of threatened and endangered habitat (2–3%) across the core study area than the No Project Alternative. Impacts are expected to be greater under the Altamont network alternative than the Pacheco network alternative. The largest increases (1,300–1,500 ac [526–607 ha) are expected to occur in the Bay Area—particularly Alameda, Contra Costa, and Santa Clara Counties—representing an increase in affected land area of 4% across all five counties. In the Central Valley, about 650 ac (263 ha) are expected to be affected under the Altamont network alternative, with little or no net impact under the Pacheco network alternative. Fresno and Madera Counties are not expected to experience additional impacts under either HST Network Alternative.

Table 5.4-3 Biological Resources Potentially Affected by Future Urbanization

	Habitat of Threatened and Endangered Species in Areas of Projected Urbanization*, in Acres (Percent Change from No Project Alternative)		
		HST Network Alternatives	
Area	**No Project Alternative**	**Pacheco**	**Altamont**
Prime Farmland			
Alameda County	17,297	17,675 (2%)	17,557 (2%)
Contra Costa County	11,372	11,826 (4%)	11,639 (2%)
San Francisco County	0	0	0
San Mateo County	3,002	3,015 (0%)	3,022 (1%)
Santa Clara County	4,356	4,828 (11%)	5,288 (21%)
Study Area—Bay Area	***36,027***	***37,344 (4%)***	***37,506 (4%)***
Fresno County	7,225	7,225 (0%)	7,225 (0%)
Madera County	40	40 (0%)	40 (0%)
Merced County	1,290	1,334 (3%)	1,334 (3%)
Sacramento County	9,442	9,459 (0%)	9,699 (3%)
San Joaquin County	32,714	32,687 (0%)	32,848 (0%)
Stanislaus County	5,098	5,041 (-1%)	5,313 (4%)
Study Area—Central Valley	***55,809***	***55,786 (0%)***	***56,459 (1%)***
Core Study Area	**127,863**	**130,474 (2%)**	**131,471 (3%)**

* Values in the table indicate the resource acreage that is located in areas that are projected to become urbanized between the years 2002 and 2030 under each alternative. Each alternative, including the No Project Alternative, is projected to have a unique urbanization footprint; therefore, values are presented for each alternative.

Source: Cambridge Systematics and Parsons Brinckerhoff 2007.

5.4.15 Wetlands

The urbanization footprints described above in the discussion of farmland and agriculture were combined with GIS-based maps showing general wetland locations to identify wetlands that could be affected by areas of future urbanization. (See Section 3.15, Biological Resources and Wetlands.) Table 5.4-4 shows estimates of the wetland acreage that could be affected by this future growth. The difference between the No Project and the HST Network Alternatives provides an estimate of the potential indirect impact of induced growth on wetlands.

In total, induced growth associated with the HST Network Alternatives is projected to affect about 72 to 111 ac (29 to 45 ha) more of wetlands across the core study area than the No Project Alternative. This represents less than 0.5% of total study area wetlands. Under the Altamont network alternative, just over 100 ac (40 ha) are expected to be affected, primarily in Sacramento County. Under the Pacheco network alternative, the greatest impacts are expected to be in the Bay Area, particularly Alameda County (44 ac [18 ha]). Merced County is also projected to experience impacts of 15–17 ac (6– 7 ha), and Stanislaus County would see impacts of 12 ac (5 ha) under the Pacheco network alternative. Impacts in other counties would be no more than 5 ac (2 ha).

Table 5.4-4 Wetlands Potentially Affected by Future Urbanization

	Wetlands Within Areas of Projected Urbanization* (Acres) (Percent Change from No Project Alternative)		
		HST Network Alternatives	
Area	**No Project Alternative**	**Pacheco**	**Altamont**
Prime Farmland			
Alameda County	8,305	8,350 (1%)	8,305 (0%)
Contra Costa County	608	613 (1%)	608 (0%)
San Francisco County	0	0	0
San Mateo County	2,540	2,540 (0%)	2,540 (0%)
Santa Clara County	4,460	4,460 (0%)	4,465 (0%)
Study Area—Bay Area	***15,914***	***15,963 (0%)***	***15,919 (0%)***
Fresno County	1,050	1,048 (0%)	1,050 (0%)
Madera County	294	297 (1%)	297 (1%)
Merced County	418	435 (4%)	432 (4%)
Sacramento County	3,153	3,158 (0%)	3,225 (2%)
San Joaquin County	1,626	1,626 (0%)	1,631 (0%)
Stanislaus County	324	324 (0%)	336 (4%)
Study Area—Central Valley	***6,865***	***6,887 (0%)***	***6,971 (2%)***
Core Study Area	**22,778**	**22,850 (0%)**	**22,889 (0%)**

* Values in the table indicate the resource acreage that is located in areas that are projected to become urbanized between the years 2002 and 2030 under each alternative. Each alternative, including the No Project Alternative, is projected to have a unique urbanization footprint; therefore, values are presented for each alternative.

Source: Cambridge Systematics and Parsons Brinckerhoff 2007.

5.4.16 Section 4(f) and 6(f) Resources (Public Parks and Recreation)

Increased population or employment related to induced growth would not increase the likelihood or extent of potential impacts on or uses of Section 4(f) and 6(f) resources, including publicly owned land from parks, recreation lands, wildlife and waterfowl refuges, and historic sites. No indirect impacts from induced growth are expected on Section 4(f) and 6(f) resources.

5.5 Growth Inducement and Secondary Impact Differences among HST Alignment Alternatives and Station Location Options

The discussion of induced growth secondary impacts compares the general nature of impacts associated with the HST Network Alternatives to the No Project Alternative. Although quantitative employment and population impacts were not generated for every alignment and station location option, qualitative distinctions nevertheless can be made among these options.

For this discussion, the difference in impacts will be most significant between the two general choices of the Altamont and Pacheco network alternatives. In the primary study area of this environmental analysis, the Altamont network alternative would be expected to have a greater influence on all secondary impact areas than the Pacheco network alternative for two reasons. First, the Altamont network alternative is projected to induce about 6,000 more jobs and 50,000 more residents than the Pacheco network alternative in the Bay Area to Central Valley study area. Second, the Altamont network alternative is likely to have more stations in total than the Pacheco network alternative, leading to more geographic locations that could experience secondary impacts on local and regional traffic, air quality, energy, land use, and related ecological resources.

Madera and Merced Counties are likely to experience the greatest magnitude of secondary impacts among all study area counties for both HST Network Alternatives. Based on projected levels of induced growth, Stanislaus County is likely to exhibit an equally high magnitude of secondary impacts with the Altamont network alternative; under the Pacheco network alternative, Stanislaus County's secondary impacts are likely to be much lower.

All of the Altamont HST Alignment Alternatives are likely to create equal magnitudes and spatial patterns of secondary impacts because all alignments offer relatively similar travel time and station location options in the Bay Area.

The two Pacheco HST Alignment Alternatives, Henry Miller and GEA North, also are likely to produce similar patterns of induced growth and secondary impacts for all counties in the core study area. Although these two Pacheco alignment alternatives provide noticeably different HST travel times between the Bay Area and northern Central Valley, there are equally noticeable, yet opposite, travel time differences between the Bay Area and locations south of Merced County. The net effect is that the slight congestion reduction and HST ridership benefits provided by the Henry Miller alignment offset the accessibility benefits (between the Bay Area and northern Central Valley) provided by the GEA North alignment.

Adding, dropping or changing station locations will lead to changes in potential secondary impacts at the station in question as well as in the HST system as a whole. In individual counties, the most notable situation is in Merced County, where the SP Downtown station could be on either the Sacramento or Southern California HST lines depending upon the alignment followed west of Merced; the Castle AFB station, on the other hand, always would be served by HST service between the Bay Area and Sacramento. In Stanislaus County, the Amtrak Briggsmore station could lead to the urbanization of 1,000 more acres in the county than the SP Downtown station site[9], leading to additional indirect impacts; this difference between station sites accounts for about 35% of the difference in urbanized area size between the Altamont and Pacheco network alternatives noted in Table 5.3-6 for Stanislaus County. In the East Bay, HST stations that interface with the BART system may induce larger overall growth and secondary impacts attributable to improved regionwide accessibility. On the San Francisco Peninsula, all proposed HST stations offer the opportunity for intermodal transfers with Caltrain, and all proposed station sites have substantial station-area activity of one form or another. The most likely location for differences in

[9] *Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/Environmental Impact Statement*, California High-Speed Rail Authority, Section 5.2, July 2003.

areawide growth inducement and secondary impacts is with the San Francisco station location. The Transbay Transit Center offers better access than the 4th/Townsend site to the high density employment and activity center in Downtown San Francisco; this improved accessibility is likely to lead to the potential for additional growth inducement and secondary impacts.

Alternative station locations in the same general vicinity may have different localized secondary impacts, but overall impacts throughout the study area are likely to be similar. Different areawide impacts will arise from adding or dropping an HST station for a community or subarea as a whole. For example, not providing an HST station in the Tri-Valley or Tracy areas likely would lower overall growth inducement and secondary impacts because job accessibility and business attraction benefits throughout the study area would be lower. A similar situation would occur for the Pacheco network alternative if a station were not provided in Gilroy or Morgan Hill; in such a situation, access to the HST system from Monterrey, San Benito, and Santa Cruz Counties would be reduced.

The extent of secondary impacts may not be directly proportional to the amount of induced growth. It will depend in part on the specific form of induced development in the study area, which in turn will depend on local land use plans and policies. For example, alignment and station locations that serve existing urban and community centers, rather than less-developed outlying areas, would be expected to result in lower ecological and natural resource impacts, but higher community and social impacts, because development would be concentrated in existing built-up areas. The community and social effects are likely to be both positive and negative because additional growth in existing communities could bring benefits such as jobs, increased property values, and enhancements to the community environment.

5.6 Managing Growth-Inducing and Indirect Effects

In general, HST station areas would offer a more attractive market for commercial and office development than the No Project Alternative. Research and analysis conducted for the Statewide Program EIR/EIS[10] of urban rail systems in North America and high-speed rail systems in Europe and Asia support this conclusion. This research found that industries needing many highly skilled and specialized employees are the most attracted to rail-station area development, and that a noticeable densification pattern would be likely to emerge in the vicinity of potential HST stations in response to real estate and market forces.

The research and analysis further indicated that an HST station is a considerably stronger draw for business development than a conventional intercity rail station or freeway interchange. This draw can encourage more compact development patterns, which have the potential to help avoid or minimize indirect impacts. These development patterns would likely offer many businesses a competitive advantage in their industry, because of proximity to ancillary industries (i.e., industry clustering) and access to a well-educated labor force. These advantages, known as economies of agglomeration, have emerged around the French and Japanese HST stations.

The research also found that regulatory-style efforts by cities to encourage increased density and a mix of land uses near rail stations have been effective in attracting higher-density development. A Central Valley city, for example, would have an easier time redirecting new development to downtown sites adjacent to their HST station site than the outlying real estate markets created by freeway interchanges under the No Project Alternative. Furthermore, the strong real estate markets around HST stations are likely to attract development that otherwise would locate throughout a dispersed suburban region. Thus, development around HST stations potentially would consist of both consolidation of currently projected

[10] *Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/Environmental Impact Statement*, California High-Speed Rail Authority, Section 3.3, July 2003.

growth (under the No Project Alternative) and new regional employment and population associated with either HST Network Alternative.

The potential effect of regulatory style land-use strategies was tested in the Statewide Program EIR/EIS[11]. Results suggested that even a modest strategy focused on the immediate station areas could reduce the potential statewide urbanized acreage by an additional 30,000 ac (12,141 ha) (0.6% of total urbanized acreage in study area) under an HST Network Alternative. These results represent a low-end estimate of the possible densification effects of regulatory strategies in combination with the market forces likely to occur following the introduction of HST service. The research suggested that other jurisdictions have had some success in implementing more aggressive and regionwide regulatory-style strategies[12] in conjunction with high-capacity intercity and urban transit services. Experience in these areas suggests that more aggressive strategies might be more attractive to policy makers because HST could offer an economic rationale to developers to cluster new commercial, industrial, and residential development to provide easy access to the HST stations. In general, the No Project Alternative does not have the potential for such market incentive.

In short, either HST Network Alternative provides a strong incentive for directing urban growth and minimizing a variety of impacts that are frequently associated with growth. This outcome would be seen in results for resource topics such as farmland, hydrology, and wetlands, where the indirect effects of either HST Network Alternative are in some cases less than the No Project Alternative, even with more population and employment expected with the HST Network Alternative. Additional land use strategies, which would be highly compatible with either HST Network Alternative, could be considered to further reduce development impacts on sensitive natural resources; provide further concentration of employment in central areas that tend to be more readily accessible to minority and low-income populations; and provide further concentration of a wide variety of activities, making local transit options more feasible and possibly reducing local automobile travel.

[11] *Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/Environmental Impact Statement*, California High-Speed Rail Authority, Section 5.1.3, July 2003.

[12] Examples of these strategies include urban growth boundaries, maximum parking requirements, jobs-housing balance, more diversity of land uses, higher densities, and higher service levels of mass transit.