Alternative alignment options are summarized below. Appendix 3.8-A provides tables that illustrate the amount of potential impacts associated with each HST alignment option by region.

A. BAY AREA TO MERCED

This region has the second highest concentration of farmland of the regions being studied. The HST Alternative (LPI and GPI) would have potentially higher impacts in all FMMP categories than the Modal Alternative. The total FMMP category acreage potentially impacted in this region would be 262 ac (106 ha) for the Modal Alternative, 549 ac (222 ha) for the HST Alternative LPI, and 770 ac (312 ha) for the HST Alternative GPI, thus indicating that the HST Alternative (LPI and GPI) would exceed the potential impact of the Modal Alternative by 287 ac and 508 ac (116 ac and 206 ha), respectively. This would be added to impacts that may result from the No Project Alternative by 2020. Figures 3.8-6 and 3.8-7 show the locations of the Modal Alternative improvements and HST Alternative in the region.

Modal Alternative

Nearly all of the improvements under the Modal Alternative would be in areas containing existing roadway rights-of-way and runways. The agricultural impacts analysis included a review of existing roadways that could accommodate the development of one lane each way in the center median. The ability to add lanes to the center median reduces the requirement to acquire farmland for outside lane expansion, and thus reduces potential farmland impacts. The Modal Alternative improvements would be implemented on existing roadways in this region; no farmland parcels would be severed.

The roadways relevant to the Modal Alternative in this region are I-80, I-580, I-880, US-101, and SR-152. Considering the location of FMMP-listed farmland in this region and the ability to develop lanes in the center medians of the above-mentioned roadways, the areas of greatest potential impact would be primarily along SR-152 east of I-5, and secondarily along US-101 in the Santa Clara Valley. Possible roadway improvements in these areas could result in farmland impacts because they would require the acquisition of farmland adjacent to the roadway due to their apparent inability to accommodate the development of inside lanes.

The amount of farmland potentially impacted in the Bay Area to Merced region for the Modal Alternative would be 168 ac (68 ha) of prime farmland, 31 ac (13 ha) of unique farmland, 56 ac (23 ha) of farmland of statewide importance, and 7 ac (3 ha) of farmland of local importance. The Modal Alternative would potentially impact a total of 262 ac (106 ha) of farmland in this region.

High-Speed Train Alternative

This region includes potential alignment options that could extend southward from either San Francisco or Oakland to San Jose or Gilroy, and on to Merced. Farmland in this region is primarily in the east along the west margin of the Central Valley, and secondarily between San Jose and Gilroy. Farmlands are sparsely located in the San Francisco and Oakland urban areas.

The HST Alternative may benefit from being able to use existing rail rights-of-way. Configuration options of the HST Alternative, as indicated in the methodology subsection, include developing the HST alignment options within or adjacent to existing rail rights-of-way, or on new alignments. The development of the HST alignment options within or adjacent to existing rail rights-of-way would reduce the potential for farmland impacts from conversion, and significantly reduce severance-related farmland impacts. Both the Modal and HST Alternatives have this potential to reduce impacts on farmland.

**Figure 3.8-6**
**Modal Alternative Improvement Locations**
**Bay Area to Merced**

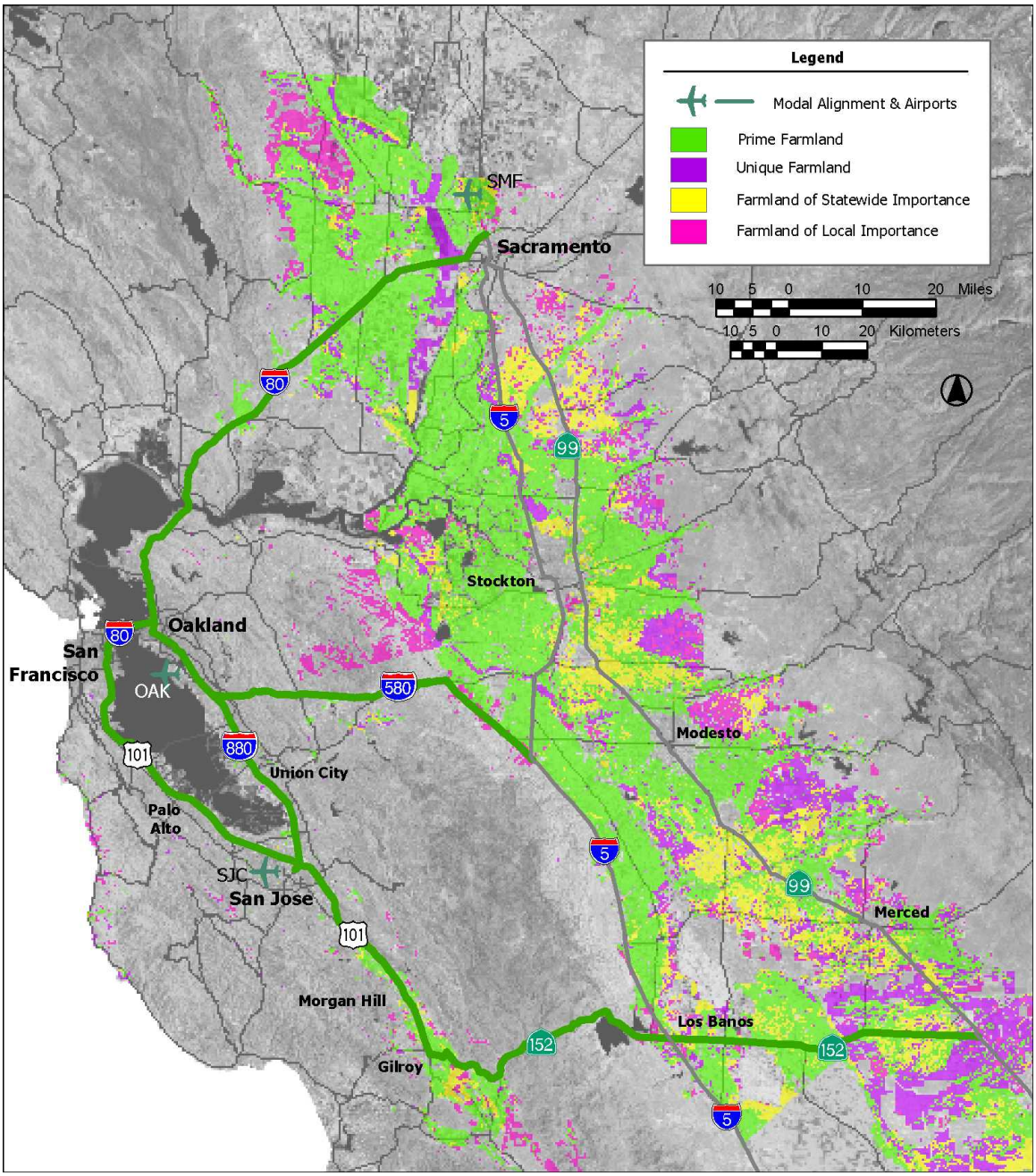
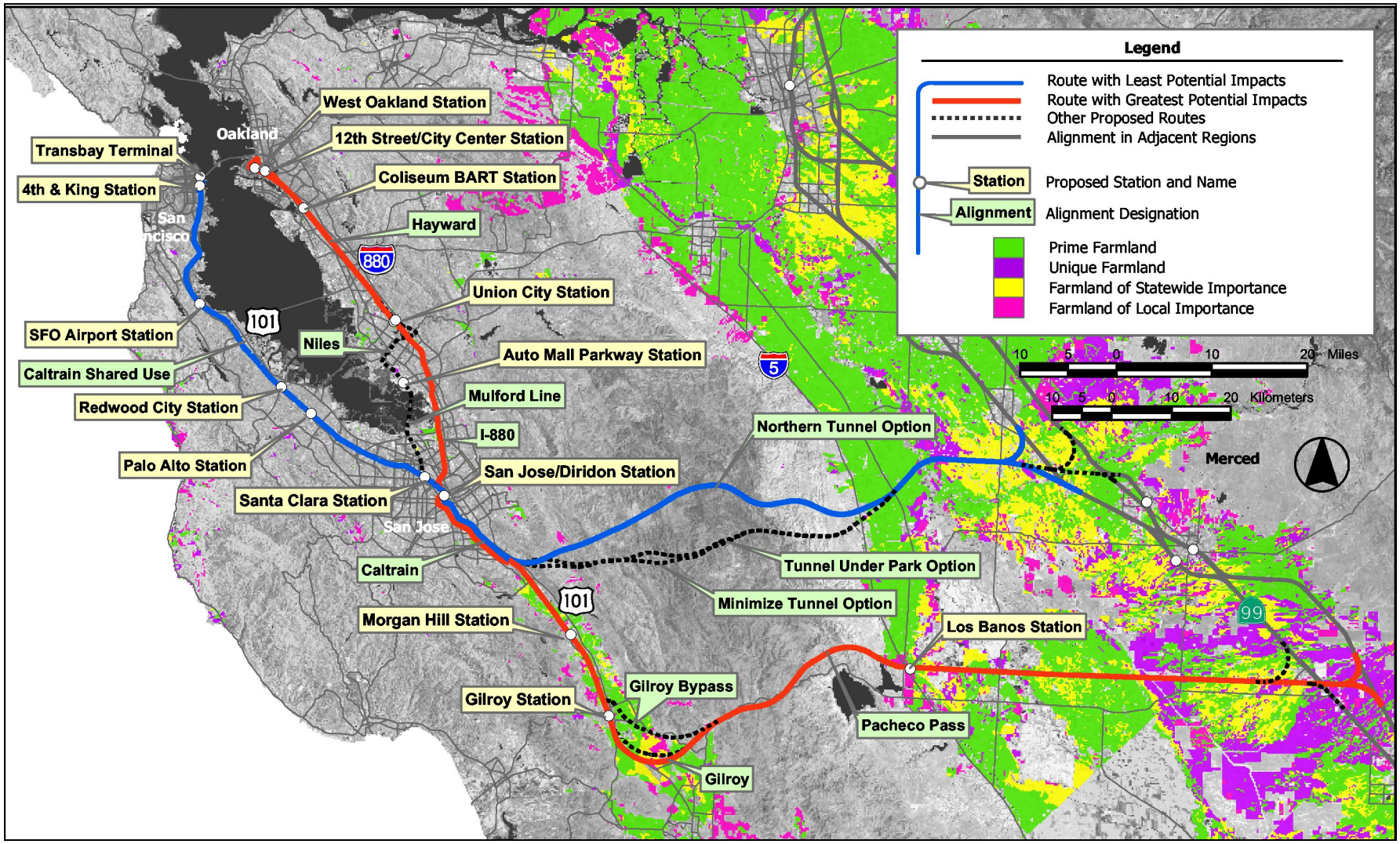


**Figure 3.8-7**
**Alignments with Least Potential Impacts and Greatest Potential Impacts**
**Bay Area to Merced**



High-Speed Train Alignment Option Comparison

Very little farmland is found in the San Francisco and Oakland urban areas. The Diablo Range direct and Pacheco Pass alignment options would connect the Bay Area to the Merced area. The Diablo Range direct alignment option would result in less potential for farmland impacts because it would travel through urban and mountainous areas and would not extend as far east into the Central Valley farmland areas as the Pacheco Pass.

There are two options for the potential Pacheco Pass alignment through the Gilroy area: through downtown Gilroy (Caltrain/Gilroy/Pacheco Pass) and bypassing Gilroy to the north (Morgan Hill/Caltrain/Pacheco Pass). The Morgan Hill/Caltrain/Pacheco Pass alignment option would result in potential impacts on 26 ac (11 ha) of farmland more than the Gilroy/Caltrain/Pacheco Pass alignment option. This greater impact would be due primarily to the Gilroy/Caltrain/Pacheco Pass option being closer to suburban areas with fewer adjacent agricultural uses than the more agricultural areas of the Morgan Hill/Caltrain/Pacheco Pass. The LPI alignment combination in this region would use the Caltrain alignment from San Francisco to San Jose and the Diablo Range direct Northern Tunnel option from San Jose to Merced, potentially impacting a total of 549 ac (222 ha) of farmland. All of the 549 ac (222 ha) impacted would be located in the western part of the Central Valley at the east end of this alignment.

The GPI alignment combination in this region would use the Hayward/I-880 alignment from Oakland to San Jose and the Morgan Hill/Caltrain/Pacheco Pass alignment from San Jose to Merced. This alignment combination would potentially result in impacts on 770 ac (312 ha) of total farmland, which is approximately 221 ac (89 ha) more than the LPI alignment combination. Approximately 629 of the 770 ac (255 of the 312 ha) would be attributable to the farmland located in the western part of the Central Valley at the east end of this alignment which is mostly an agricultural area. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

## B. SACRAMENTO TO BAKERSFIELD

The Central Valley represents the most active agricultural region in California. Potential improvements to highways and airports, as well as new HST alignments and stations in the Sacramento to Bakersfield region, would generate the greatest potential for impacts on farmland of the regions analyzed. The HST Alternative (LPI and GPI) would have higher impacts in all FMMP categories than the Modal Alternative. The total FMMP category acreage potentially impacted in this region would be 609 ac (246 ha) for the Modal Alternative, 1,872 ac (758 ha) for the HST Alternative LPI, and 3,002 ac (1,215 ha) for the HST Alternative GPI, thus indicating that the HST Alternative LPI and GPI would exceed the potential impact of the Modal Alternative by 1,263 ac and 2,393 ac (511 ha and 968 ha), respectively. Figures 3.8-8A and 3.8-8B and 3.8-9A and 3.8-9B show the locations of the Modal Alternative and HST Alternative improvements in the region.

Modal Alternative

As with the Bay Area to Merced region, areas along existing roadways in the Sacramento to Bakersfield region that can accommodate an additional lane in each direction within the center median were assumed not to generate farmland impacts because acquisition and conversion of adjacent agricultural lands would not be required. Under this assumption, the number of acres of farmland impacted by roadway right-of-way acquisition for the Modal Alternative would be 287 ac (116 ha) of prime farmland, 43 ac (17 ha) of unique farmland, 124 ac (50 ha) of farmland of statewide importance, and 48 ac (19 ha) of farmland of local importance. Total roadway-related impacts on farmland under the Modal Alternative would be 502 ac (203 ha).

Airport-related improvements under this alternative would include the lengthening of Runways 1 and 2 at the Sacramento International Airport. These improvements would potentially impact

**Figure 3.8-8A**
**Modal Alternative Improvement Locations**
**Sacrament to Bakersfield, North Portion**

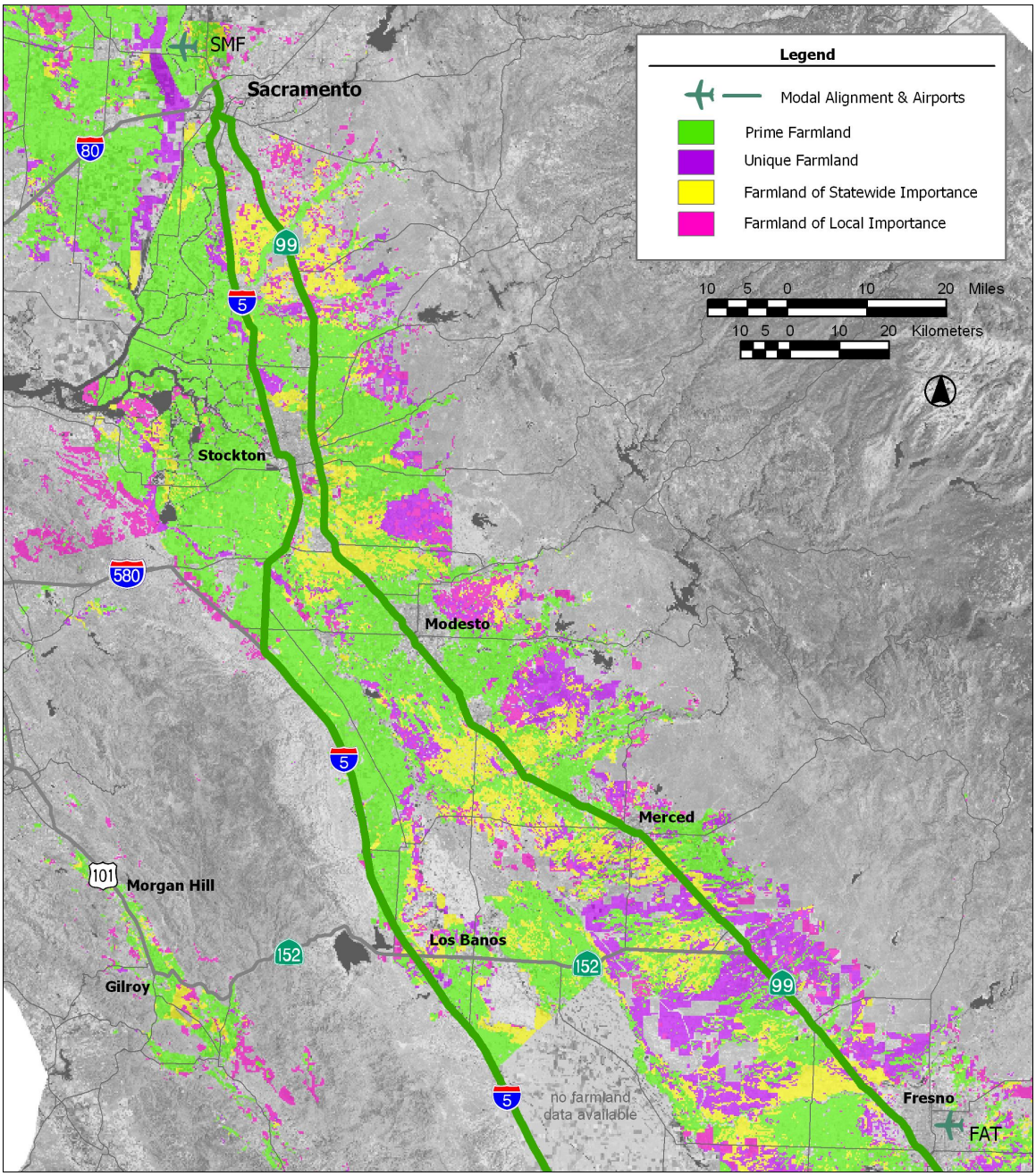


**Figure 3.8-8B**
**Modal Alternative Improvement Locations**
**Sacramento to Bakersfield, South Portion**

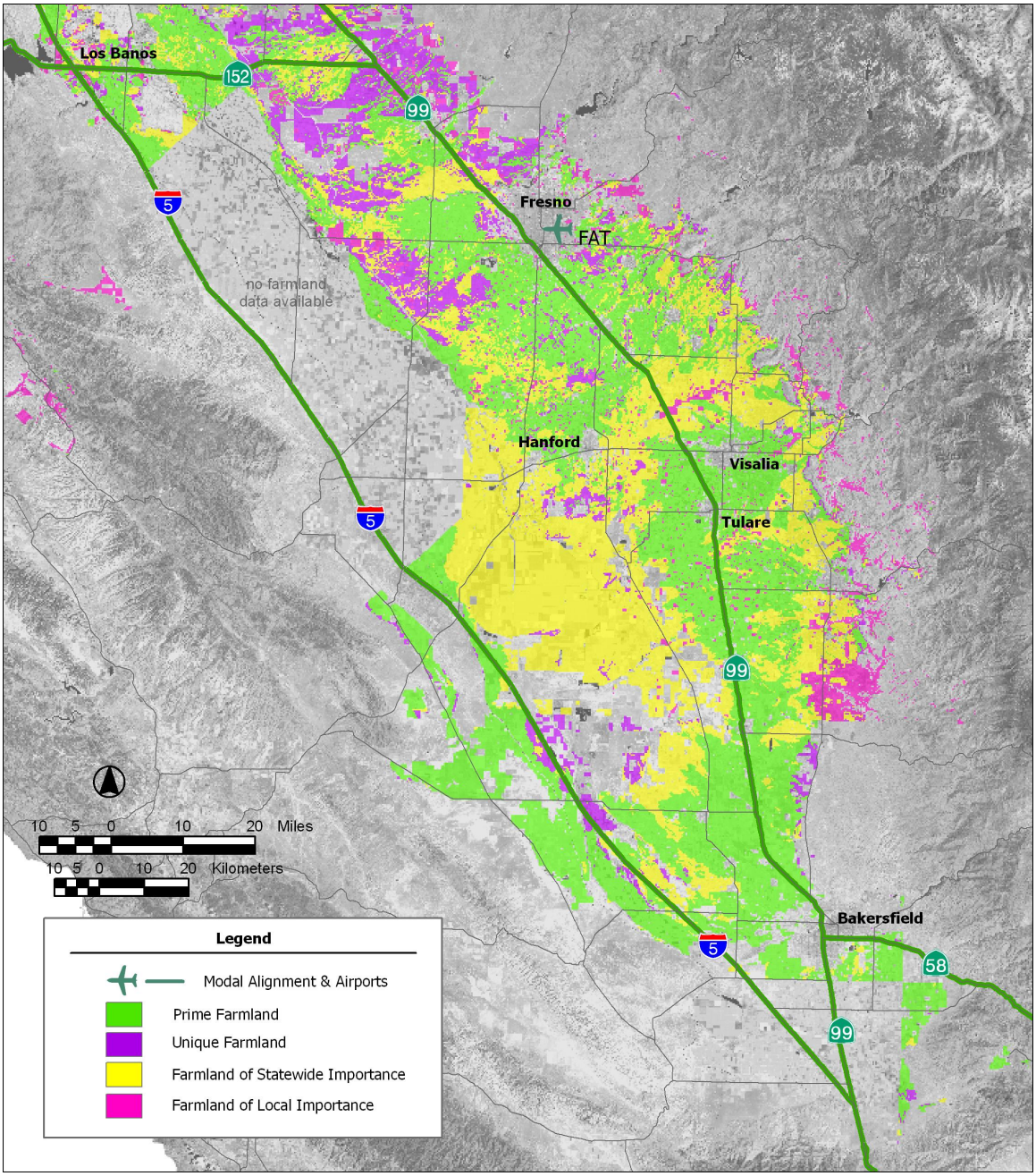


**Figure 3.8-9A**
**Alignments with Least Potential Impacts and Greatest Potential Impacts**
**Sacramento to Bakersfield**
**North Portion**

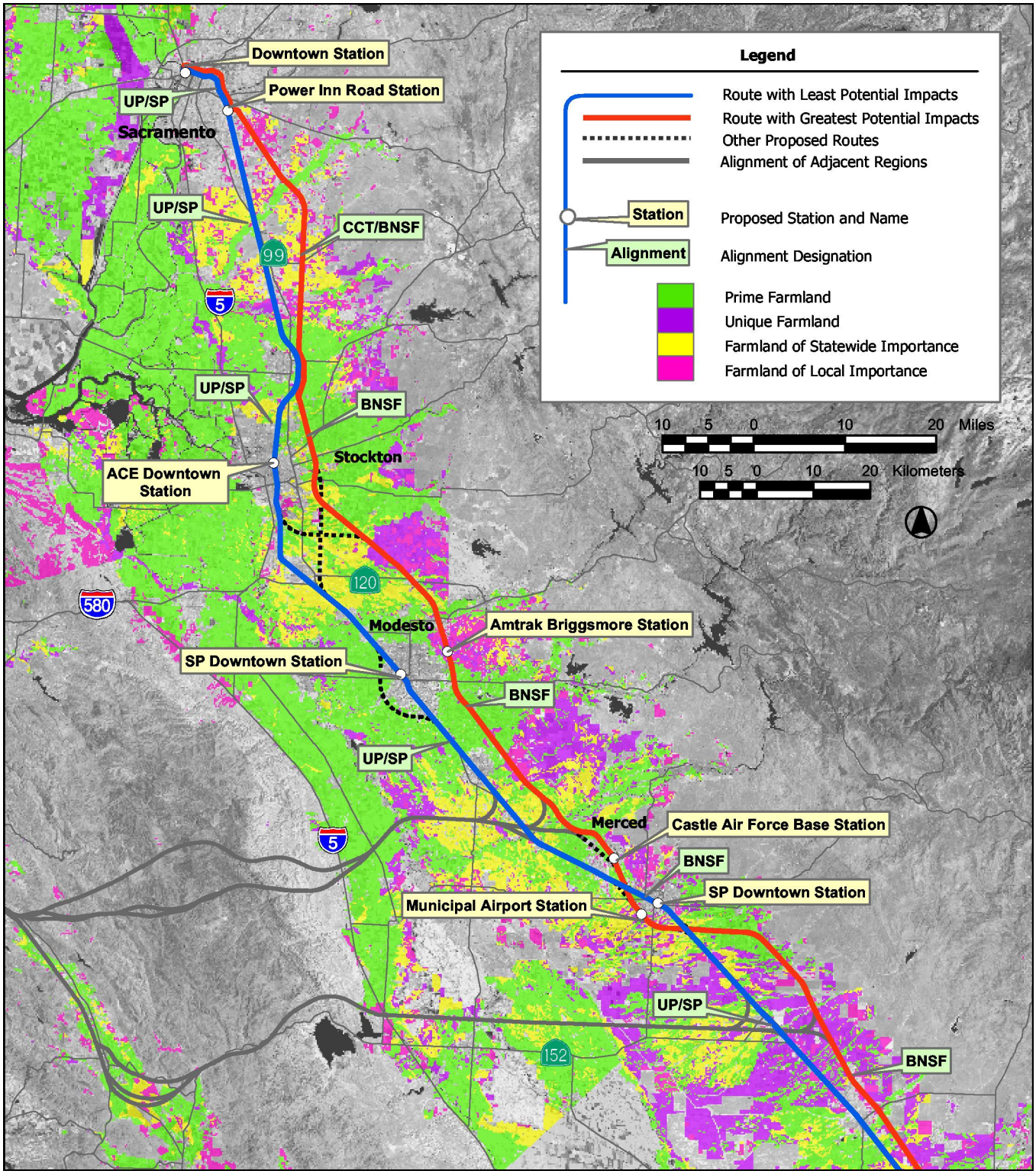
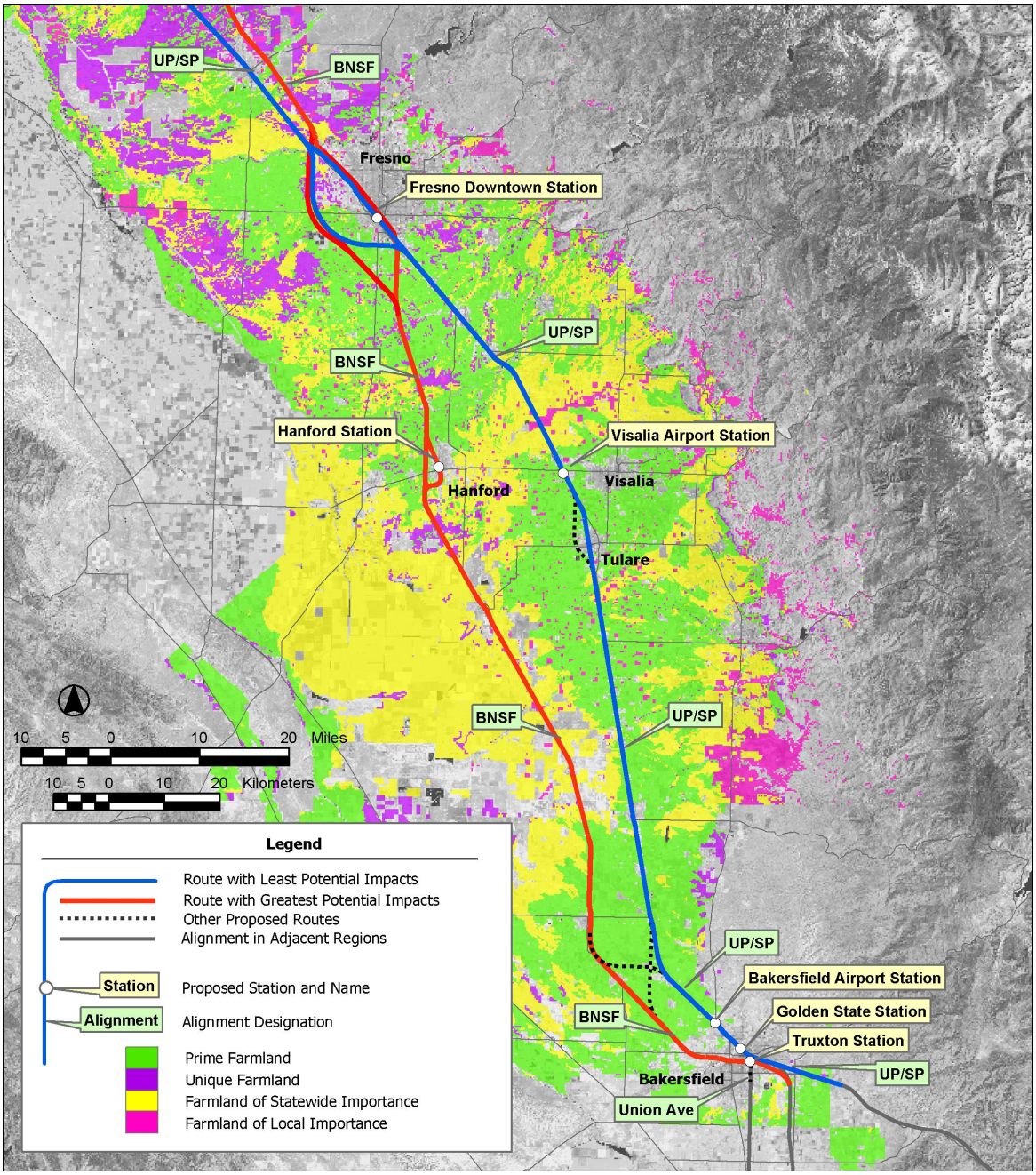


**Figure 3.8-9B**
**Alignments with Least Potential Impacts and Greatest Potential Impacts**
**Sacramento to Bakersfield Region**
**South Portion**



36 ac (15 ha) of prime farmland, 11 ac (4 ha) of unique farmland, 57 ac (23 ha) of farmland of statewide importance, and 3 ac (1 ha) of farmland of local importance. Total potential airport-related impacts on farmland under the Modal Alternative would be 107 ac (43 ha).

Collectively, the Modal Alternative improvements, roadway and airport, would potentially impact 323 ac (131 ha) of prime farmland, 54 ac (22 ha) of unique farmland, 181 ac (73 ha) of farmland of statewide importance, and 51 ac (21 ha) of farmland of local importance. The Modal Alternative would potentially impact a total of 609 ac (246 ha) of farmland in this region.

High-Speed Train Alternative

It is generally assumed that potential HST alignments in the Sacramento to Bakersfield region would be developed adjacent to existing UPRR or BNSF rail rights-of-way. In some segments, however, the alignment options are assumed to be within existing rights-of-way (e.g., CCT from Sacramento to Stockton). The GIS analyses accounted for these alignment areas. Some alignment options within the Sacramento to Bakersfield region, particularly the express loops/bypasses and connections between existing corridors would require new alignments separate from existing rail corridors.

Farmland severance impacts (i.e., impacts from dividing parcels currently in agricultural use) would potentially result, in addition to farmland conversion. While the precise amount of farmland potentially severed by the HST alignment options cannot be ascertained at this level of study, the HST alignment options on new alignments traversing farmland areas would have the potential to sever the vast majority of parcels traversed due to the curving nature of the alignments.[2]

High-Speed Train Alternative Alignment Option Comparison

The area of highest potential impact in this region would be Stockton, followed by Fresno and the north portion of Bakersfield. Although there could potentially be alignments on new corridors in the Merced area, these alignments would not occur in farmland areas. The Sacramento to Bakersfield region also has several potential express loops/bypasses under consideration that are intended to circumvent the more congested urban areas, reduce costs, and reduce potential urban impacts such as noise. They are generally routed through the agricultural areas surrounding the urban areas, resulting in greater farmland conversion and severance-related impacts.

As shown below in Table 3.8-2, seven of the eight potential express loops in the region would have higher potential farmland impacts than the mainline alignments that they would bypass. Although express loops are shown separately, some areas may require the development of an express loop and mainline alignment. Such instances have been accounted for in this report's LPI and GPI alignment combinations analysis.

[2] Severance issues may arise in the Sacramento to Bakersfield region where the HST alignment options would bypass urban areas on new corridors traveling primarily north-northwest to south-southeast, and result in diagonally dividing a number of north-south oriented farmland parcels.

**Table 3.8-2**
**Potential Farmland Impacts: Express Loops Compared to Mainlines**

| Alignment | Express Loop | Prime Farmland in ac (ha) | Unique Farmland in ac (ha) | Statewide Importance in ac (ha) | Local Importance in ac (ha) | Total Farmland in ac (ha) |
|---|---|---|---|---|---|---|
| Stockton to Modesto | Modesto loop | 141 (57) | 0 | 0 | 0 | 141 (57) |
| | Mainline | 49 (20) | 0 | 0 | 0 | 49 (20) |
| Modesto to Merced | Atwater Station loop | 79 (32) | 0 | 2 (0.8) | 3 (1) | 84 (34) |
| | Mainline | 52 (21) | 0 | 2 (0.8) | 23 (9) | 77 (31) |
| | Merced loop (BNSF) | 45 (18) | 9 (4) | 72 (29) | 5 (2) | 131 (53) |
| | Mainline | 35 (14) | 1 (0.4) | 23 (9) | 7 (3) | 66 (27) |
| | Merced loop (UPRR) | 40 (16) | 10 (4) | 72 (29) | 5 (2) | 127 (51) |
| | Mainline | 48 (19) | 3 (1) | 20 (8) | 6 (2) | 77 (31) |
| Merced to Fresno | Fresno loop (BNSF) | 149 (60) | 76 (31) | 63 (26) | 5 (2) | 293 (119) |
| | Mainline | 70 (28) | 23 (9) | 32 (13) | 9 (4) | 134 (54) |
| | Fresno loop (UPRR) | 131 (53) | 44 (18) | 42 (17) | 7 (3) | 224 (91) |
| | Mainline | 3 (1) | 0 | 11 (5) | 1 (0.4) | 15 (6) |
| Fresno to Tulare | Hanford Station loop | 46 (19) | 0 | 15 (6) | 0 | 61 (25) |
| | Mainline | 74 (30) | 0 | 13 (5) | 0 | 87 (35) |
| Tulare to Bakersfield | Tulare loop | 103 (42) | 3 (1) | 12 (5) | 1 (0.4) | 119 (48) |
| | Mainline | 60 (24) | 2 (1) | 13 (5) | 0 | 75 (30) |

Although more potential farmland conversion-related impacts would occur along the alignments of the proposed express loops than along the urban areas they would bypass, there would be the potential for severance-related impacts. These impacts are likely to occur as a result of the curvilinear nature and diagonal directions of travel of the express loops as compared to the more north-south orientation of the farmland parcels. For instance, a curved alignment through farmland has more potential to sever farmland than a straight alignment located along a road section or other linear feature.

Based on GIS analysis included in the related *System-Wide Agricultural Resources and Farmlands Report* (Parsons Brinkerhoff 2003), there would be consistently less agricultural land potentially impacted by the alignment options adjacent to the UPRR corridor than the BNSF corridor. Map observations and review of aerial photography reveal that the UPRR corridor runs parallel to SR-99. Much of the urban growth in the last 50 years in the Central Valley appears to have been around SR-99 (California Department of Transportation 2003). The nearby UPRR corridor would be in urban areas with correspondingly fewer agricultural severances or conversions. Potential HST alignment options adjacent to these corridors or sharing them would generate similar impacts on farmland. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

C. BAKERSFIELD TO LOS ANGELES

The Bakersfield to Los Angeles region represents the transition from agricultural areas in the Central Valley to urbanized areas of Los Angeles. For the HST Alternative, the HST Alternative GPI would

have the highest potential impacts in all FMMP categories (63 ac [25 ha]); the Modal Alternative and the HST Alternative LPI would have similar levels of impact, 2 ac (0.8) and 0 ac, respectively. Figures 3.8-10 and 3.8-11 show the locations of the Modal Alternative and HST Alternative improvements for the region.

Modal Alternative

Little farmland would be traversed by the potential Modal Alternative improvements in this region. The portions of the existing roadways that are able to accommodate an additional lane in each direction in the center median were assumed not to generate additional/new farmland impacts. The amount of farmland potentially impacted by the Modal Alternative in the region would be 1 ac (0.4 ha) of prime farmland and 1 ac (0.4 ha) of farmland of statewide importance. Based on these assumptions, the Modal Alternative would potentially impact a total of 2 ac (1 ha) of farmland in this region.

High-Speed Train Alternative

The FMMP database indicates that land uses along the Sylmar to Los Angeles alignment are all considered urban. Most of the farmland and agricultural resources in the region are south and east of the outskirts of Bakersfield. Little farmland would be traversed by the proposed HST Alternative alignment options in this region; there is virtually no farmland in the FMMP categories in the region.

High-Speed Train Alternative Alignment Option Comparison

The I-5 Union Avenue and Wheeler Ridge Road alignment options would traverse more farmland and thus would have the greatest potential impacts (63 ac [25 ha]) among the proposed HST alignment options. The LPI alignment combination would be the SR-58/Soledad Canyon alignment along the Bakersfield to Sylmar segment, and either the MTA/Metrolink or combined I-5/Metrolink portion along the Sylmar to Los Angeles segment. With implementation of this alignment combination, no farmland impacts would occur. The GPI alignment combination would be the Wheeler Ridge to I-5 alignment along the Bakersfield to Sylmar segment, and either the MTA/Metrolink or combined I-5/Metroliink portions along the Sylmar to Los Angeles segment. With implementation of this alignment combination, impacts on 63 ac (25 ha) of farmland would occur. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

## D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

The Los Angeles to San Diego via Inland Empire region includes farmland areas located mainly along I-15 between Riverside and south of Escondido. The Modal Alternative would have more potential impacts in all FMMP categories than the HST Alternative LPI and GPI. The total FMMP category acreage potentially impacted in this region would be 217 ac (88 ha) for the Modal Alternative, 24 ac (10 ha) for the HST Alternative LPI, and 25 ac (10 ha) for the HST Alternative GPI, thus indicating that the Modal Alternative would exceed the potential impact of the HST Alternative LPI and GPI by 193 ac and 192 ac (78 ha), respectively. Figures 3.8-12 and 3.8-13 show the potential impacts of the Modal Alternative and HST Alternative in this region.

Modal Alternative

There is not space available to add lanes to the center medians of I-15 and I-215; thus additional right-of-way would be required in this region. The amount of farmland impacted by possible Modal Alternative roadway right-of-way acquisition would be 25 ac (10 ha) of prime farmland, 1 ac (0.4 ha) of unique farmland, 3 ac (1 ha) of farmland of statewide importance, and 107 ac (43 ha) of farmland of local importance. Total potential roadway-related impacts on farmland under the Modal Alternative would be 136 ac (55 ha).

**Figure 3.8-10**
**Modal Alternative Improvement Locations**
**Bakersfield to Los Angeles**

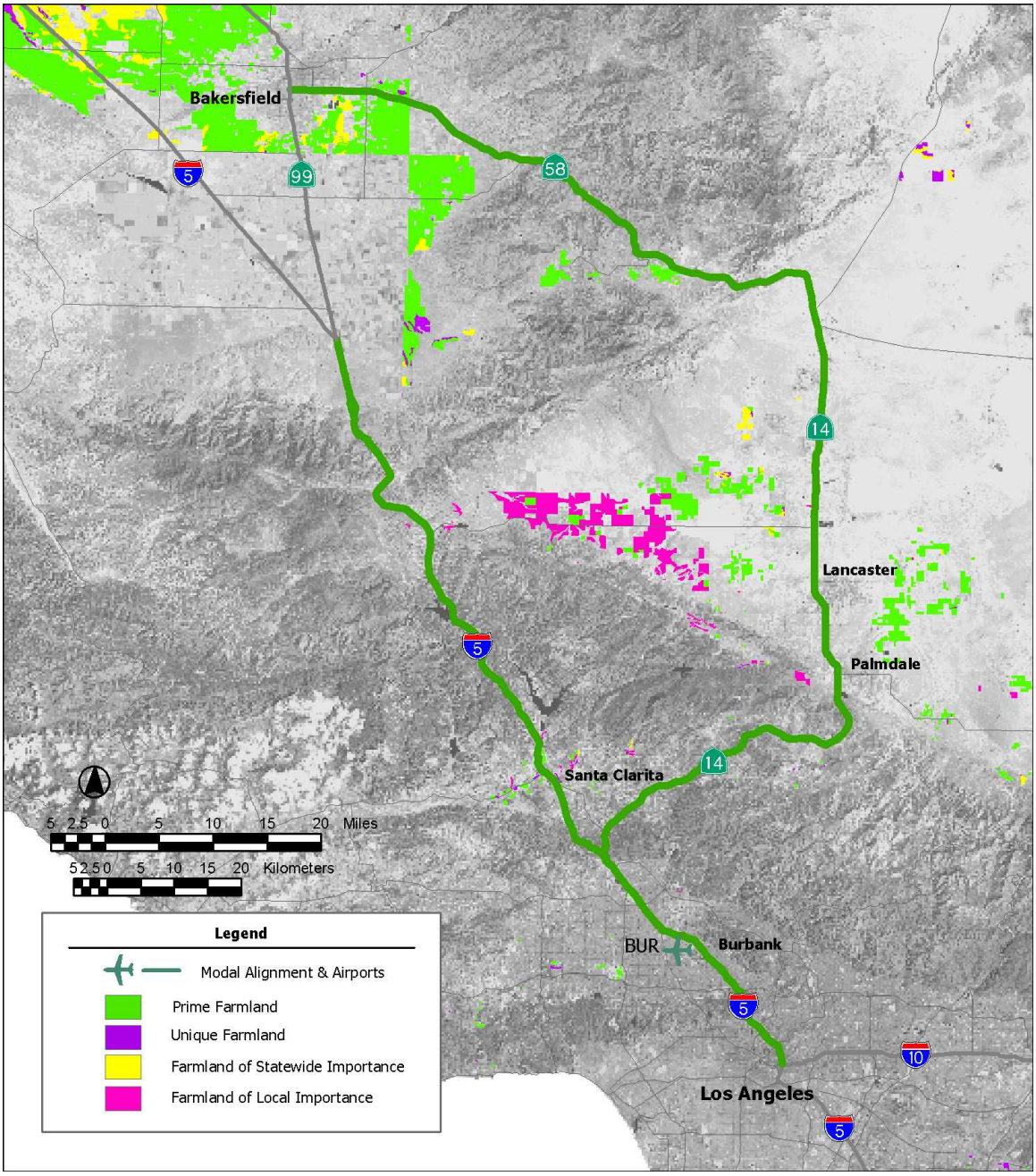


**Figure 3.8-11**
**Alignments with Least Potential Impacts and Greatest Potential Impacts**
**Bakersfield to Los Angeles**

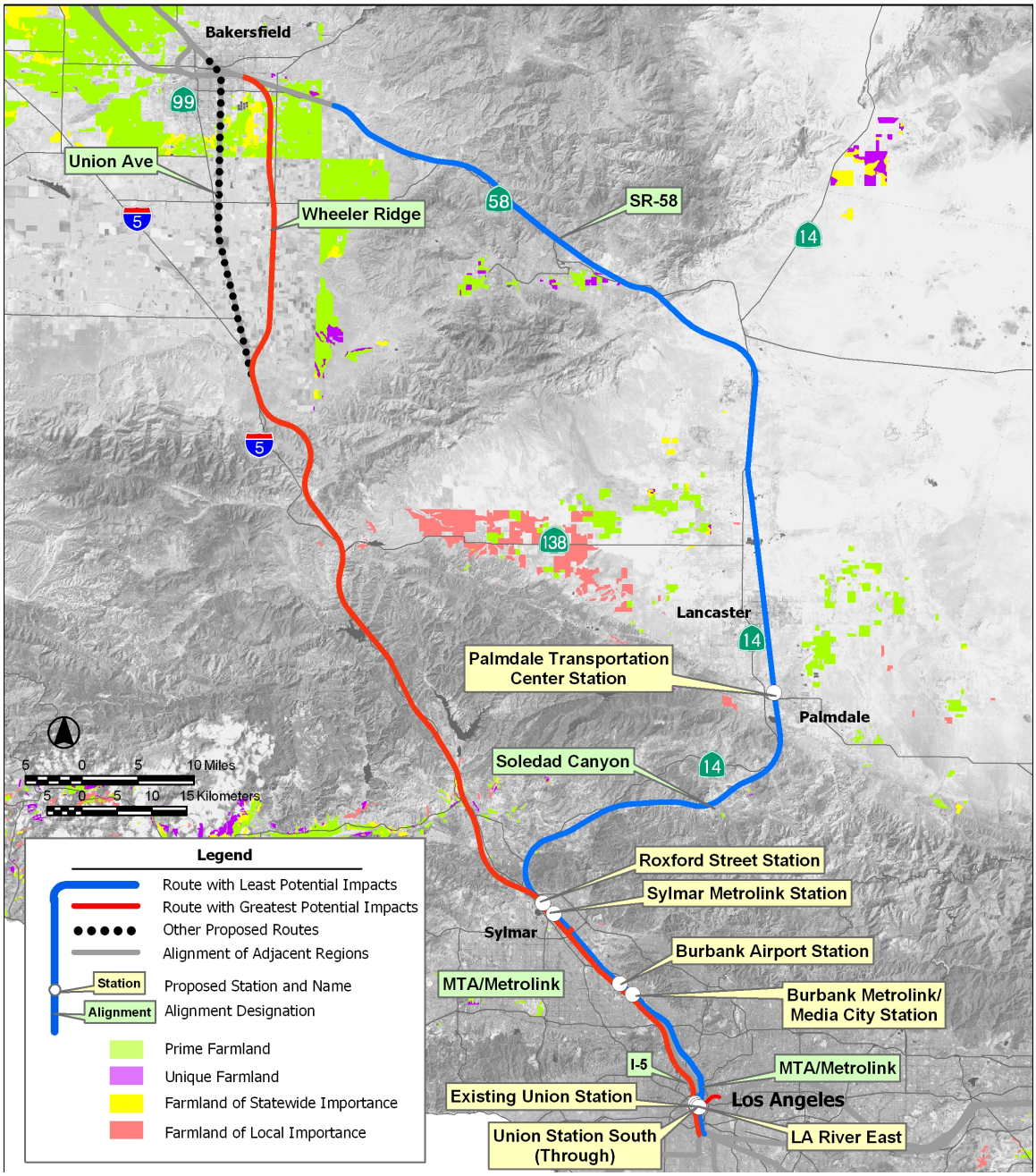


**Figure 3.8-12**
**Modal Alternative Improvement Locations**
**Los Angeles to San Diego via Inland Empire**

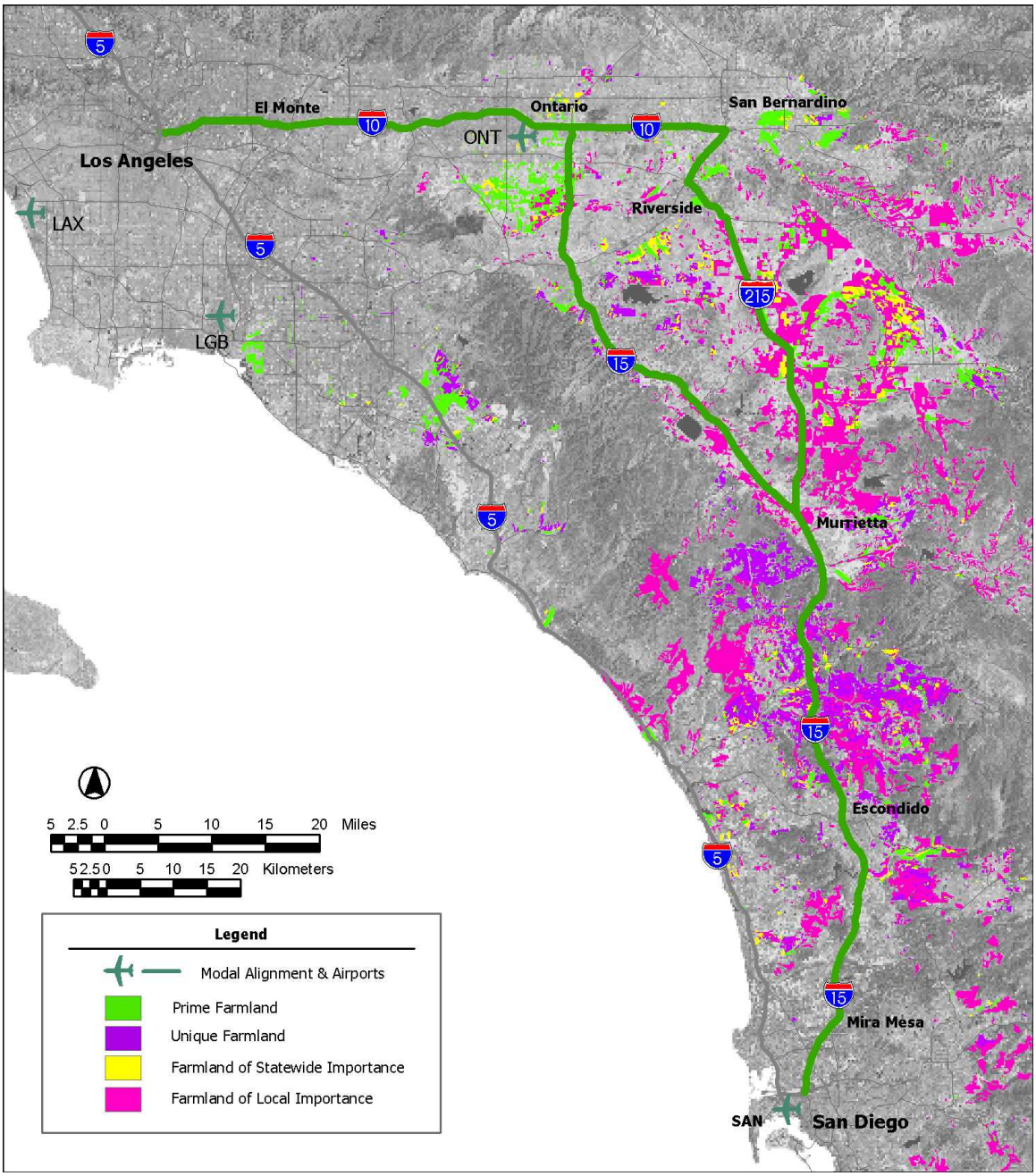
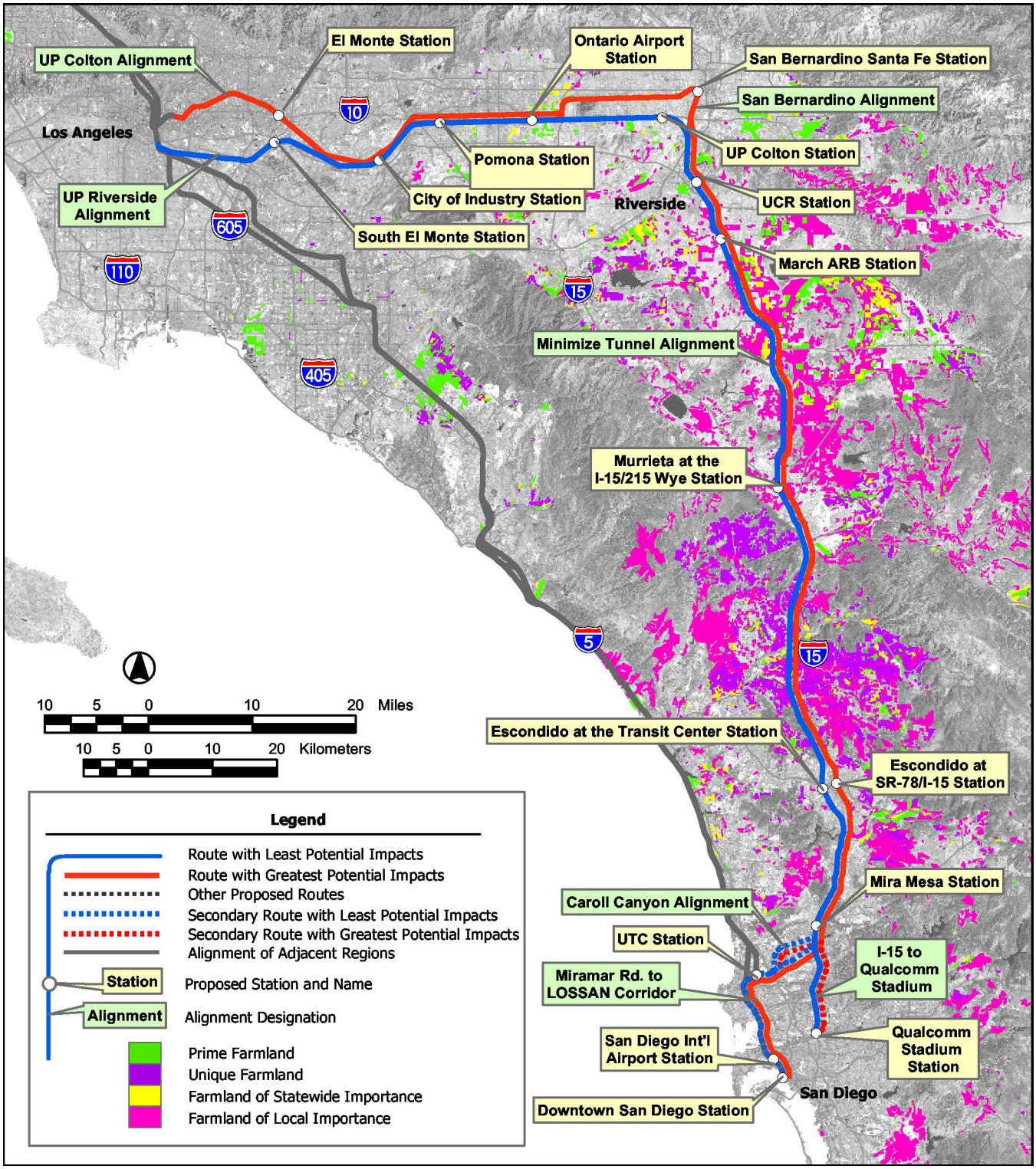


**Figure 3.8-13**
**Alignments with the Least Potential Impacts and Greatest Potential Impacts**
**Los Angeles to San Diego via Inland Empire**



Airport-related improvements under this alternative would include the addition of a third runway at the Ontario International Airport. Total potential airport-related impacts on farmland under the Modal Alternative would be 81 ac (33 ha), all of which would be prime farmland.

Collectively, the Modal Alternative improvements would potentially impact 106 ac (43 ha) of prime farmland, 1 ac (0.4 ha) of unique farmland, 3 ac (1 ha) of farmland of statewide importance, and 107 ac (43 ha) of farmland of local importance. The Modal Alternative would potentially impact a total of 217 ac (88 ha) of farmland in this region.

High-Speed Train Alternative

The Los Angeles to San Diego via Inland Empire region would travel eastward out of Los Angeles to San Bernardino and would then continue south from San Bernardino to San Diego. Most of the region's farmland and agricultural resource areas are located between Lake Elsinore and Escondido, and portions of the farmland would potentially be impacted by the HST alignment options.

The LPI alignment combination would be the UPRR Colton Line alignment or UPRR Riverside/UPRR Colton Line alignment from the Los Angeles to March Air Reserve Base (ARB) segment to the San Jacinto to I-15 alignment, from the March ARB to Mira Mesa segment to any of the alignments in the Mira Mesa to San Diego segment. With implementation of this alignment combination, impacts on 24 ac (10 ha) of farmland would occur.

The GPI alignment combination would be the UPRR Colton Line to San Bernardino alignment from the Los Angeles to March ARB segment to the San Jacinto to I-15 Alignment, from the March Air Force Base to Mira Mesa segment to any of the alignments in the Mira Mesa to San Diego segment. With implementation of this alignment combination, impacts on 25 ac (10 ha) of farmland would occur. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

## E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

The Los Angeles to San Diego via Orange County region includes only limited farmland areas located between Santa Ana and Irvine and near Oceanside for the Modal Alternative. The Modal Alternative would have greater potential impacts in all FMMP categories than the HST Alternative LPI and GPI in this region. The total FMMP category acreage potentially impacted in this region would be 28 ac (11 ha) for the Modal Alternative, 0 ac for the HST Alternative LPI, and 0 ac for the HST Alternative GPI. Thus, the Modal Alternative would exceed the potential impact of the HST Alternative LPI and GPI by 28 ac (11 ha). Figures 3.8-14 and 3.8-15 show the locations of the Modal Alternative and HST Alternative improvements for the region.

Modal Alternative

FMMP-listed agricultural land in the coastal region, located between Santa Ana and Irvine and around Oceanside, is sparse. The farmland between Santa Ana and Irvine is mostly prime farmland, with a smaller area of unique farmland. The farmland around Oceanside is entirely farmland of local importance. Under the Modal Alternative, one northbound and one southbound lane would be added to I-5. However, I-5 in this region lacks sufficient width for additional lanes in the center median. Right-of-way would need to be acquired to develop added outside lanes. The amount of farmland the Modal Alternative would potentially impact in the LOSSAN region would be 15 ac (6 ha) of prime farmland, 4 ac (2 ha) of unique farmland, 1 ac (0.4 ha) of farmland of statewide importance, and 8 ac (3 ha) of farmland of local importance. The Modal Alternative would impact a total of 28 ac (11 ha) of farmland in this region.

**Figure 3.8-14**
**Modal Alternative Improvement Locations**
**Los Angeles to San Diego via Orange County**

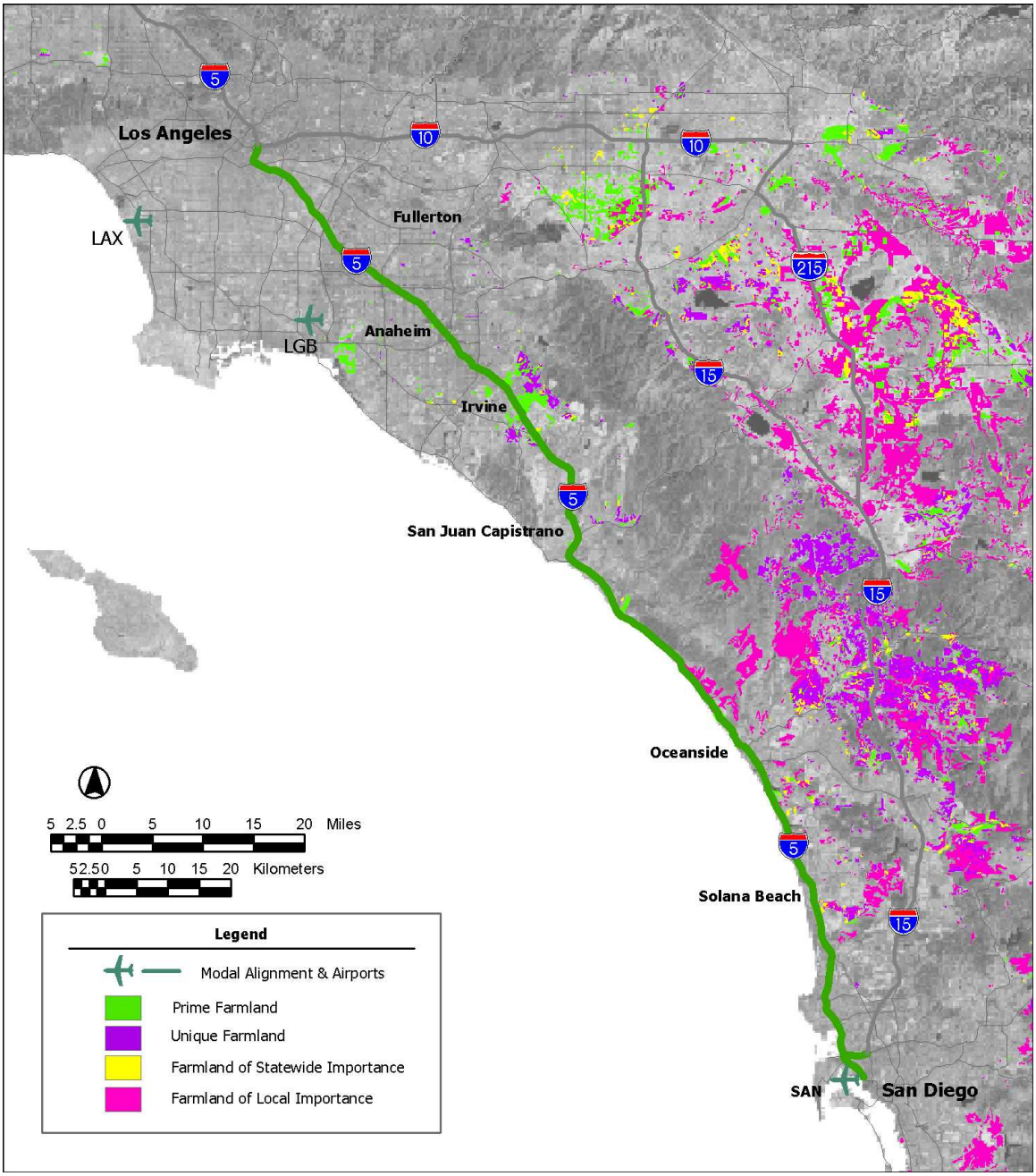
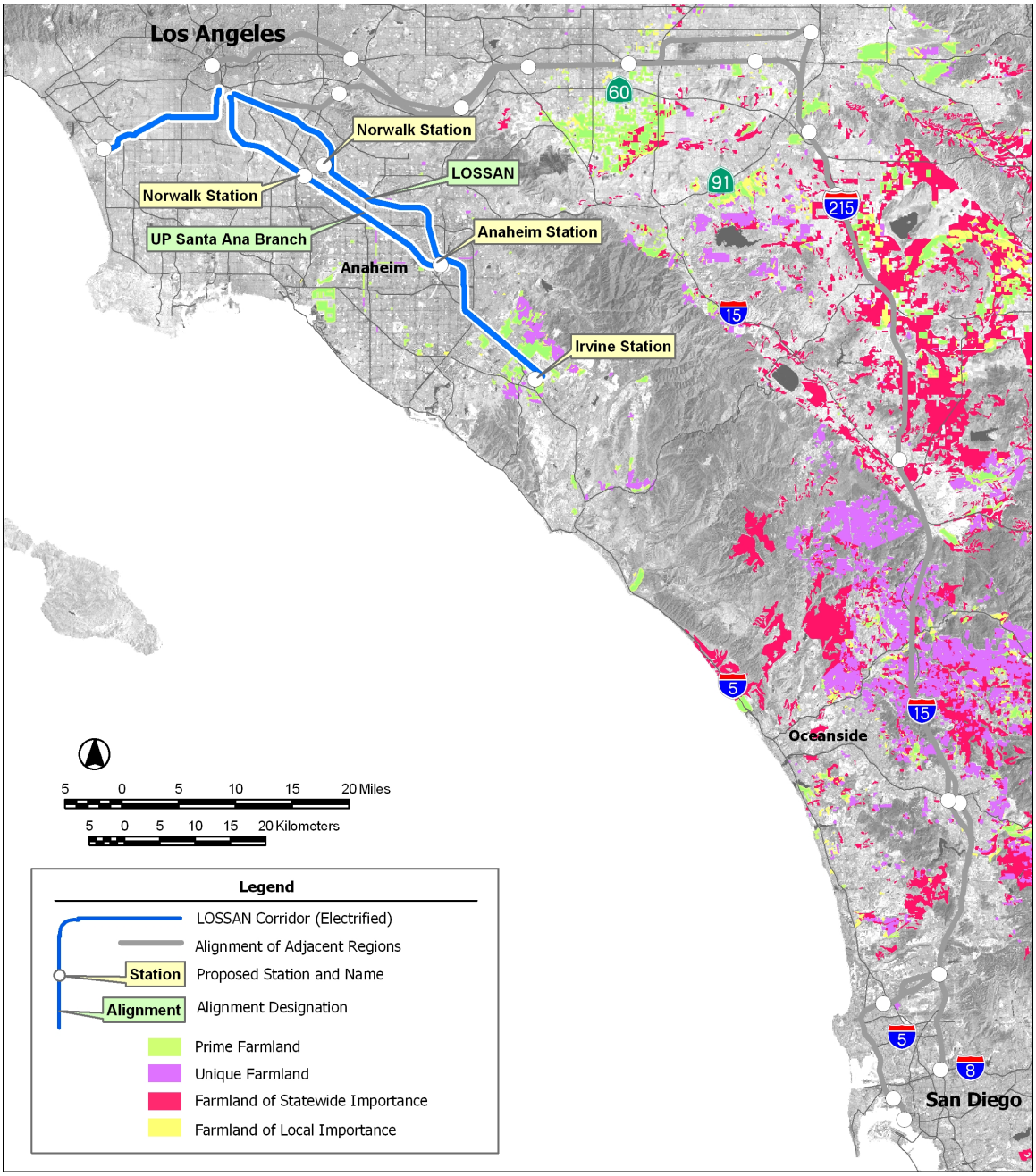


**Figure 3.8-15**
**Alignment Options**
**Los Angeles to San Diego via Orange County (LOSSAN)**



High-Speed Train Alternative

The Los Angeles to Orange County coastal region runs primarily along the southern California coastal areas through Los Angeles and Orange County. This region includes alignment options from central Los Angeles to LAX, and from the central Los Angeles area to Irvine. The existing UPRR Santa Ana Branch would be an HST alignment option. The existing LOSSAN alignment from Los Angeles to Irvine is being considered for shared HST and conventional passenger train service. The HST alignment options that would be developed primarily within the existing LOSSAN corridor right-of-way and no farmland resources would be impacted.

High-Speed Train Alternative Alignment Option Comparison

The HST alignment options that would be developed in the existing LOSSAN corridor right-of-way would only require development of bypasses; no farmland resources would be impacted. See Appendix 3.8-A for potential impacts associated with each HST alignment option in all regions.

### 3.8.5 Design Practices

The Authority is committed to utilizing existing transportation corridors and rail lines in the proposed high-speed rail system in order to minimize the need to encroach onto additional agricultural lands. Nearly 70% percent of the preferred HST Alternative is either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way). These existing transportation corridors, along which the HST system would be placed, have already divided properties and agricultural lands. Moreover, portions of the alignment would be on aerial structure or in tunnel, allowing for vehicular or pedestrian access across the alignment. Only 24% percent of the preferred HST overall preferred alignment would be in new at-grade rail corridors (not on aerial structure and not in tunnel) and not within or adjacent to an existing transportation right-of way), where there would be the potential to divide or sever properties. For the HST system, underpasses or overpasses would be constructed at reasonable intervals to provide property access, and/or appropriate severance payments would be made to the property owners whose land is severed. The Authority would work directly with land owners during the final design of the system regarding the location(s) for access passages (overpasses or underpasses) to enable adequate property access.

To minimize the potential impact to agricultural lands, the HST right-of-way width could potentially be reduced to 50 ft (15 m) in constrained areas. In addition, the Authority is committed to pursuing agreements with existing owners/rail operators to place the HST alignment within existing rail rights-of-way, which would avoid and /or minimize potential impacts to agricultural resources.

### 3.8.6 CEQA Significance Conclusions and Mitigation Strategies

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for agricultural lands, the HST alternative would have a significant impact to agricultural lands when viewed on a system-wide basis. Some direct conversion of agricultural lands to other non-agricultural uses would be expected. The HST alternative may also result in changes such as the severance of agricultural parcels that could indirectly contribute to agricultural land conversion. At this programmatic level of analysis it is not possible to know precisely the location, extent, and particular characteristics of agricultural lands that would be involved, or the precise impacts on those lands. The impact is therefore considered significant. Mitigation strategies, as well as the design practices discussed in section 3.8.5, will be applied to reduce this impact.

Mitigation of potentially major impacts on farmland (i.e., by conversion to other uses) would be based first on avoidance. The strategy followed beginning early in the conceptual design stage of the project was to avoid farmland wherever feasible. Throughout the initial screening of alternatives, a number of potential alignment options were eliminated due to the high potential for farmland impacts as well as other impacts (i.e., potential new alignments in the foothills of the Central Valley). Where potential

impacts on farmland would occur, the effort would focus on reducing the potential impact. Potential system-wide impacts have been reduced by sharing existing rail rights-of-way wherever feasible or by alignment immediately adjacent to them.

Site-specific impacts would need to be assessed and evaluated in project-level environmental review, and specific farmland mitigation measures would be considered, such as access modifications. Potential mitigation strategies would focus on securing easements, participation in mitigation banks, and local planning measures to increase the permanent protection of farmlands, open space and habitat lands.

The Authority would coordinate these efforts with other mitigation initiatives such as the California Farmland Conservancy Program (California Public Resources Code section 10222 et seq.), which is managed by the California Department of Conservation. This program provides grant funding for the purchase of agricultural easements and grants for farmland policy and planning projects. The Authority would review what this program is doing and the areas in which it has identified needs for farmland preservation. During project-level review where the co-lead agencies determine that farmland mitigation is required to address site-specific impacts from the HST system, one strategy may be to support easements that further this existing conservation program.

The Authority would coordinate with private agricultural land trusts, local programs, mitigation banks, and other agricultural stewardship programs to help identify needs for farmland protection.

The Authority would also coordinate with Resource Conservation Districts to identify additional measures to limit impacts to or otherwise to protect farmlands.

The feasibility of any mitigation strategy would have to be evaluated at the project-specific level and would depend on such factors as an assessment of the land under the state LESA model or other significance criteria, the number of voluntary participants in local or regional programs, and the cost of acquiring easements. Possible mitigation strategies for severance impacts could include alternative access, HST realignment, or over-crossings at select locations.

The Authority has established policies regarding the use of smart growth and transit oriented development strategies for station areas (see Chapter 6B), which will help to avoid secondary growth impacts on agricultural lands.

The above mitigation strategies are expected to substantially lessen or avoid impacts to agricultural lands in many circumstances. Sufficient information is not available at this programmatic level, however, to conclude with certainty that the above mitigation strategies will reduce impacts to agricultural lands to a less than significant level in all circumstances. This document therefore concludes that impacts to agricultural lands would remain significant, even with the application of mitigation strategies. Additional environmental assessment will allow a more precise evaluation in the second-tier project-level analysis.

### 3.8.7 Subsequent Analysis

As indicated earlier, the above analysis does not provide a parcel-specific potential impact analysis for farmland. Subsequent project-level analysis would address local issues once the potential alignments are defined in more detail, assuming a decision is made to proceed with the HST Alternative. Subsequent project-level environmental documentation would include more detailed information on potential severance impacts insofar as it potentially impacts a working landscape, and on potential impacts on FMMP-listed farmland, farmland under Williamson Act contracts, and farmland easements.

# 3.9 AESTHETICS AND VISUAL RESOURCES

*Visual resources* are the natural and human-made features of a landscape that characterize its form, line, texture, and color. This section describes the existing landscape in the five regions and identifies potential impacts on visual resources for each alternative related to the proposed addition of infrastructure in, or removal of infrastructure from, the existing landscape. Infrastructure may include roadway expansion, airport improvements, high-speed train (HST) improvements/construction, tunnels, fences, noise walls, elevated guideways, catenaries,[1] and stations. This assessment evaluates the potential changes to existing scenic landscapes for each alternative and HST alignment station option during construction (addition of construction staging areas, site work, construction equipment, temporary barriers, fences, and temporary power poles) and operation.

## 3.9.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY PROVISIONS

There are no specific regulatory requirements or federal or state standards for aesthetics and visual resources. However, there is a requirement in both federal and state environmental guidelines to address topics related to the visual environment. The most explicit guidance is in CEQA environmental checklist, which requires that a project proponent identify whether a project would have a substantial adverse effect on a scenic vista; substantially damage scenic resources, including trees, rock outcroppings, and historical buildings within a state scenic highway; substantially degrade the existing visual character or quality of the site and its surroundings; or create a new source of substantial light or glare that would adversely affect day or nighttime views in the area (CEQA Appendix G Environmental Checklist Form 2001). The Federal Rail Authority (FRA) Procedures for Considering Environmental Impacts (FRA Docket No EP-1, Notice 5, May 26, 1999), under the topic of aesthetic environmental and scenic resources, states: "The EIS should identify any significant changes likely to occur in the natural landscape and in the developed environment. The EIS should also discuss the consideration given to design quality, art, and architecture in project planning and development as required by DOT Order 5610.4." Consideration of local community design guidelines would be part of a subsequent phase of analysis for project-specific environmental review when more detailed engineering and architectural information would be developed for proposed alternatives. California Department of Transportation (Caltrans) design standards would apply to state highway improvements under the No Project and Modal Alternatives.

B. METHOD OF EVALUATION OF IMPACTS

The analysis of aesthetic and visual resources for this Program EIR/EIS focuses on a broad comparison of potential impacts on visual resources (particularly scenic resources, areas of historic interest, and natural open space areas and significant ecological areas [SEAs]) along proposed Modal and HST Alternative corridors and around HST stations. The potential impacts for each of these alternatives are evaluated against the existing conditions, as described in Section 3.9.2, *Affected Environment.*

Photo simulations have been prepared to illustrate the conceptual design of the facilities associated with the Modal and HST Alternatives for a set of typologies (or general descriptions) selected from each of the regions and representative of highly scenic landscapes most subject to potential significant visual impacts. These simulations have been used to evaluate how the distinguishable (dominant) visual features (color, line, texture, form) that characterize the existing landscape would change if the alternative were implemented. Of particular interest are locations where plans and profiles show elevated structures (guideways or overpasses), and tunnel portals or extensive cut or

[1] *Catenaries* are the wires and support-pole system that deliver the power supply to the proposed HST system.

fill. Also addressed in the evaluation is the potential shadow effect of elevated structures and the light and glare effects of the proposed alternatives. For the HST Alternative, the linear feature of the overhead electric wires and poles to supply power to the train, and the fenced track and potential noise barriers are considered in the evaluation.

Potential changes to the dominant landscape features, or potential visual impacts, are described and ranked as high, medium, or low according to the potential extent of change to existing visual resources. Visual contrast rankings, or impact rankings, are defined as follows.

- *High visual impacts* would be sustained if features of the alternative were obvious and began to dominate the landscape and detract from the existing landscape characteristics or scenic qualities.
- *Medium visual impacts* would be sustained if features of the alternative were readily discernable but did not dominate the landscape or detract from existing dominant features.
- *Low visual impacts* would be sustained if features of the alternative were consistent with the existing line, form, texture, and color of other elements in the landscape and did not stand out.
- *Shadow impact ranking* would be high if the new (not existing) elevated structure were within 75 feet (ft) (23 meters [m]) of residential or open space, natural areas, or parkland.
- *Beneficial visual impact* would result if the alternative eliminated a dominant feature in the landscape that currently detracts from scenic qualities or blocks vistas.

### 3.9.2 Affected Environment

A. STUDY AREA DEFINED

The study area for aesthetics and visual resources is defined as 0.25 mi (0.40 km) from the centerline of proposed alternative corridors and around stations and airports. However, where there are scenic viewing points or overlooks within 1 mi (2 km) of the alternative, these scenic viewing points have been included in the study area. The distance range of up to 0.25 mi (0.40 km) from proposed corridors and stations and up to 1 mi (2 km) from proposed alternative corridors and facilities for scenic viewing points is considered the area where a change in landscape features would be most noticeable to viewers, and where newly introduced features could begin to dominate the visual character of the landscape.

B. GENERAL DISCUSSION OF AESTHETICS AND VISUAL RESOURCES

Each of the five regions includes a number of distinct types of landscapes spread over a large geographic area, many of which are common among the regions. A typology of typical landscapes is used to describe the aesthetic and visual resources in the study area. The typologies provide the baseline or existing conditions against which the analysis of potential change or visual impact for each of the proposed alternatives is evaluated. Photographs of highly scenic and typical landscapes within each of the five regions are provided to illustrate the dominant line, form, color, and texture for that landscape typology.

The landscape typologies discussed are urban mixed use, urban suburban, traditional small urban community, industrial use, rural agriculture, rural desert, and natural open space and parks.

<u>Urban Mixed Use</u>
High-density urban mixed-use landscapes consist of multifamily housing, high-rise office buildings, at-grade and elevated transportation systems (Caltrain, BART, Metrolink, San Diego Trolley), street grids, and limited vegetation. This landscape characterizes the major

metropolitan areas in the study area: San Francisco, Los Angeles, Sacramento, San Jose, and San Diego.

Urban Suburban
This typology consists of suburban areas of low-density development—modern single-family houses, yards set back, trees and ornamental landscaping—located around more densely developed metropolitan areas. This typology also includes commercial, retail, office structures, and infrastructure such as roads, highways, overpasses, underpasses, rail lines, and utilities. Examples include South San Jose, Irvine to Oceanside, San Bernardino, Riverside, and Merced.

Traditional Small Urban Community
This typology is characterized by long-established rural communities—older buildings and historic architecture two to three stories high, with mature street trees—along existing highways or rail corridors. This typology comprises historic or early post-World War II residential neighborhoods characterized by small- to mid-size houses on small lots with narrow streets, and retail, commercial, and institutional mixed uses along arterial streets. Examples include Morgan Hill, Gilroy, Visalia, Tulare, and Santa Clarita.

Industrial Use
This landscape typology features industrial complexes with structures and warehouses of widely varied areas, sizes, and scales, and includes freight tracks and rail yards, transmission towers, substations, and utility lines. This typology typically is found along existing rail corridors or major highways.

Rural Agricultural
Broad, open agricultural fields with or without fences, along with barns, silos, and other farm structures, farm equipment, isolated farm houses, and low-density rural commercial strips typify this typology. The horizontal topography is characterized by crop fields, farm roads, fence and pole lines, and wind breaks, punctuated by barns, houses, sheds, water towers, and other agriculture-related structures. This landscape is typical of the Central Valley region.

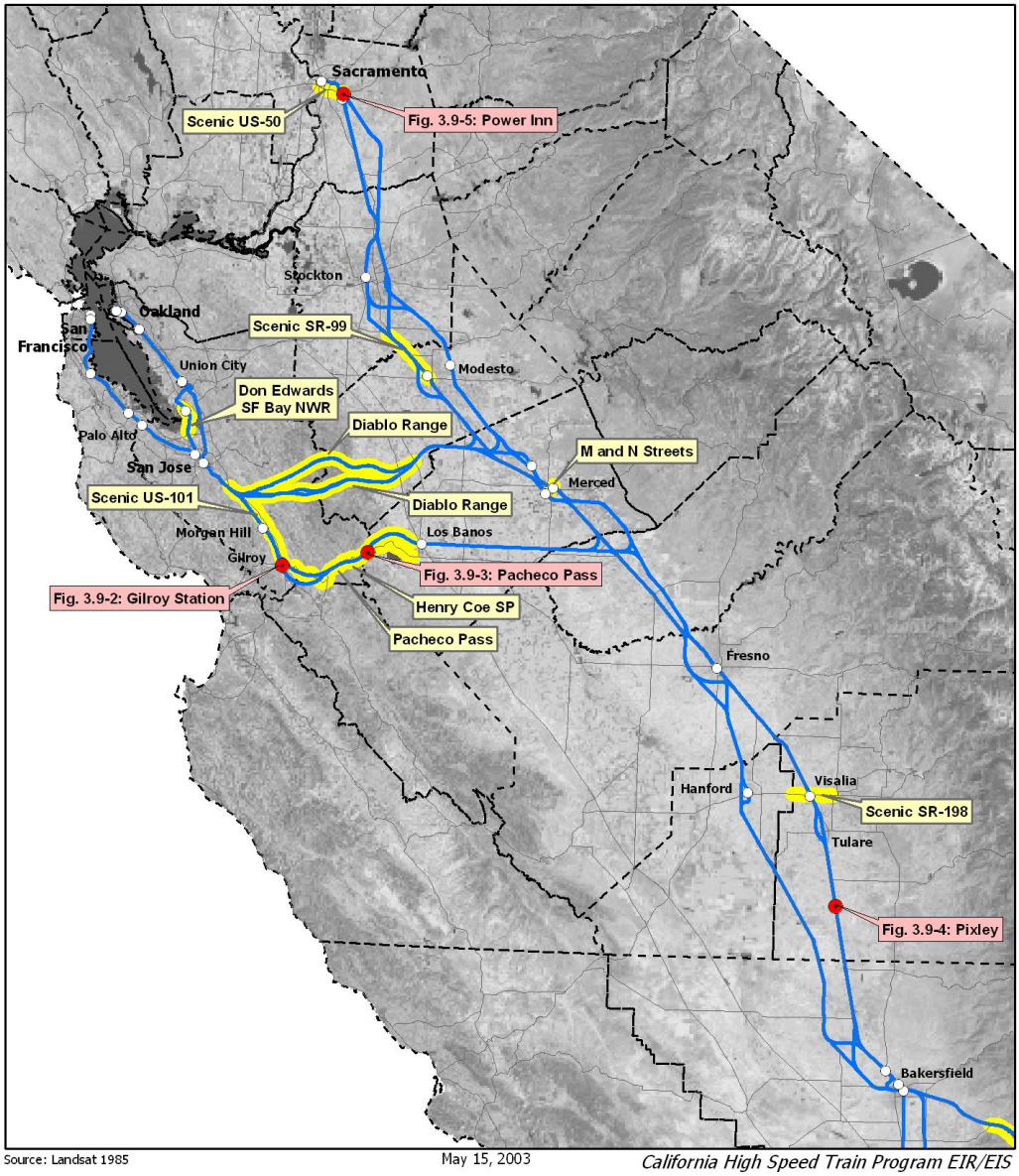
Rural Desert
In this typology, open, flat, barren land is dotted with desert plants and shrubs, and residential and commercial structures. This landscape typology is found south of Bakersfield in the Bakersfield to Los Angeles region, and in the Inland Empire region.

Natural Open Space and Parks
Undeveloped natural areas such as coastal lagoons, forested mountains, mountain lakes and streams, rolling hills with woodlands and grasslands, or forested ridges and valleys with lush vegetation form the dominant visual features of these landscapes. These landscapes are typically scenic with high aesthetic qualities. Examples include the Pacheco Pass/Diablo Range, Tehachapi Mountains, and coastal area from San Clemente to San Diego.

## C. AESTHETICS AND VISUAL RESOURCES BY REGION

A geographic information systems (GIS) map showing the location of the scenic corridors (identified in regional and local planning documents as "corridors with landscapes of high scenic qualities and scenic vistas") and scenic or sensitive landscapes in the northern region is shown in Figure 3.9-1A and in Figure 3.9-1B for the southern region. For both the No Project and Modal Alternatives, the affected environment is divided into typologies along both sides of existing highway and rail corridors. Several of the HST alignment options being evaluated are either within or adjacent to

**Figure 3.9-1A**
**Northern Region**
**GIS Visually Sensitive Landscapes with Modal Alternative and HST Alignments**




Source: Landsat 1985

May 15, 2003

*California High Speed Train Program EIR/EIS*

10 5 0 10 20 30 40 Miles

10 5 0 10 20 30 40 Kilometers

CALIFORNIA HIGH SPEED RAIL AUTHORITY

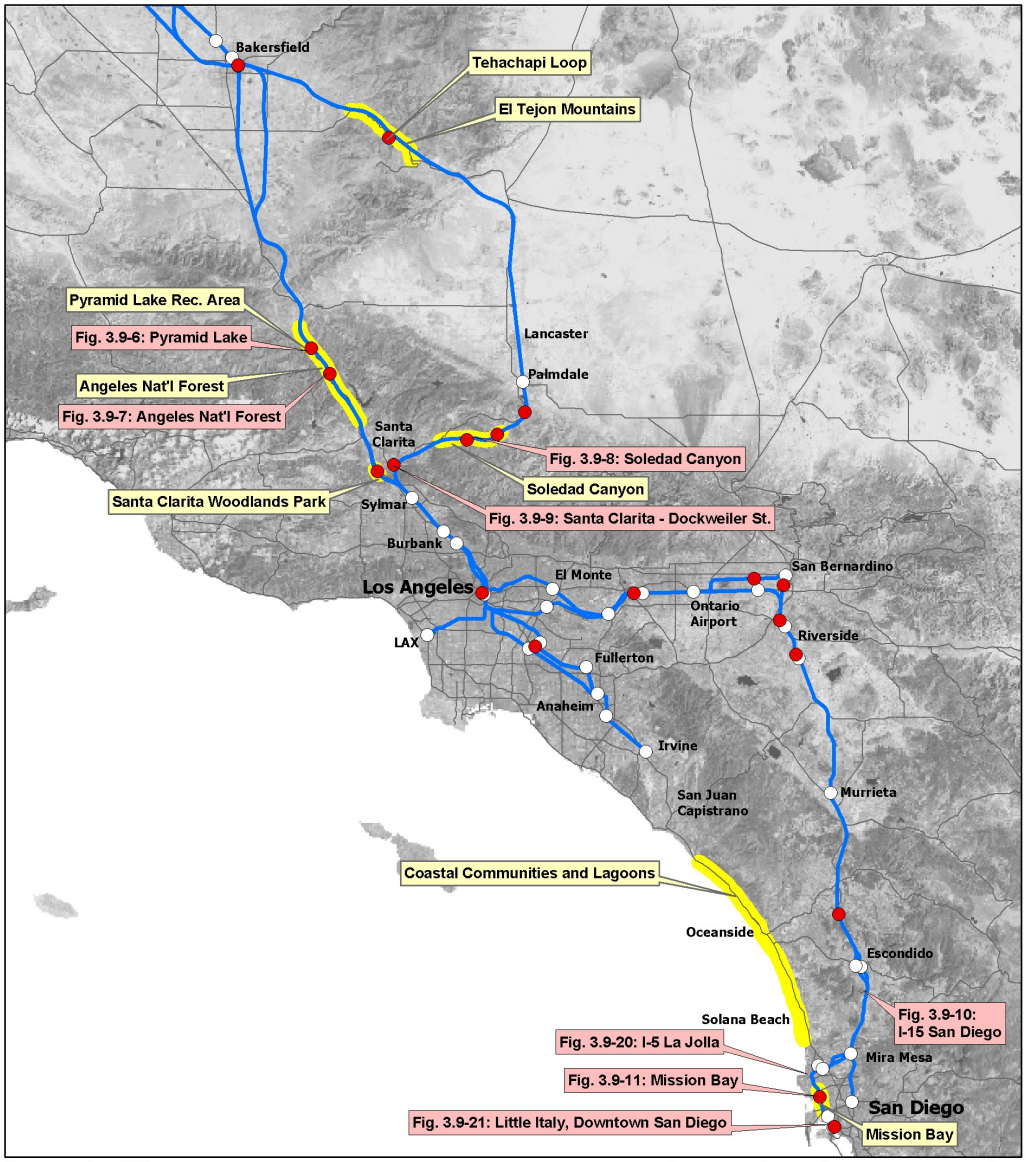
**Legend**

- High Speed Train Alignment and Proposed Stations
- Scenic Area
- Figure Reference and Photo Location
- County Boundaries

**Scenic Areas and Photo Locations Northern Region**

Figure 1A

**Figure 3.9-1B**
**Southern Region**
**GIS Visually Sensitive Landscapes with Modal Alternative and HST Alignments**




Source: Landsat 1985

May 15, 2003

*California High Speed Train Program EIR/EIS*

10 5 0 10 20 30 Miles

10 5 0 10 20 30 Kilometers

CALIFORNIA HIGH SPEED RAIL AUTHORITY

**Legend**

High Speed Train Alignment and Proposed Stations

Scenic Area

Figure Reference and Photo Location

County Boundaries

**Scenic Areas and Photo Locations Southern Region**

Figure 1B

these existing highway or rail corridors and therefore would potentially affect many of the same landscapes.

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. Landscape types vary substantially in this region, from primarily urban mixed use or urban industrial in the northern part of the Bay Area, to more rural and natural open space landscape in the southern part of the region. From San Jose to Gilroy, the study area includes about 20 mi (32 km) of scenic corridor along US-101. From Gilroy through the Diablo Mountain Range or through the Pacheco Pass (along SR-152) for about 35 mi (56 km), the study area consists of a mix of highly scenic agricultural, wetland, and natural open space landscapes, and the Henry W. Coe State Park backed by mountains (Mount Hamilton) and rolling hills with mixed oak woodlands and grasslands.

Starting from the northern part of the region, the landscapes along the Caltrain corridor and US-101 and I-880 between San Francisco and San Jose and along the Union Pacific Railroad (UPRR) corridor between Oakland and San Jose are typically urban mixed use or industrial, with stretches of urban suburban residential and commercial landscapes between the metropolitan destinations of San Francisco, Oakland, and San Jose. On the Oakland side of the Bay, the existing UPRR Line splits off to the Hayward Line and the Mulford Line. The Mulford Line traverses the eastern edge of the Don Edwards San Francisco Bay National Wildlife Refuge and transitions to the Niles Line that goes through the historic town of Niles near the mouth of the scenic Niles Canyon. The existing non-electric rail tracks and stations along the Caltrain corridor on the west side of the Bay and the UPRR tracks and elevated BART guideway on the east side of the Bay are dominant linear features in the landscape between Oakland/San Francisco and San Jose. Views of the Bay are part of the aesthetic landscape experience along the UPRR in the East Bay and also along some segments of Caltrain near the San Francisco International Airport (SFO). Views of the skyline of San Francisco are visible from the Caltrain alignment approaching the city. Views of the Caltrain tracks are visible from several local parks and from San Bruno Mountain hiking trails; however, the tracks are not a dominant visual feature in these landscapes (the multiple-lane freeways and bridges are dominant). The San Jose Diridon Station is a designated historic property listed on the National Register of Historic Places. The station dates to 1935, with architectural features characteristic of that period.

The traditional small urban community landscapes south of the highly urbanized San Jose area and through the small rural towns of Morgan Hill and Gilroy are characterized by mixed residential, commercial, and institutional uses in early to mid-20$^{th}$-century contiguous buildings, average heights of two to three stories, minimal setbacks from streets, mature landscaping, and pedestrian-oriented streetscapes. Dominant visual features are historic architecture, mature street trees, and the surrounding distant mountainous ridgelines. Figure 3.9-2, *Gilroy Station*, shows traditional small urban community typology with historic rural community character.

The natural open space landscapes along SR-152 in Pacheco Creek Valley east of Gilroy are characterized by coastal mountains and mountain valley topography typified by rolling to steep-sloped grassland with shrubs, clusters of oaks and other native tree species, and wooded bottomland. Much of this area is part of the Henry Coe State Park and Mount Hamilton Project Area of The Nature Conservancy (described in Section 3.15, *Biological Resources and Wetlands*) that is designed to preserve the rich natural habitats in a 780-sq-mi (1255-sq-km) area of the Diablo Range. Small farms or ranches (in bottomlands), isolated roadside businesses, and widely dispersed small communities (e.g., Casa de Fruta) characterize the landscape. Figure 3.9-3, *Pacheco Pass*, illustrates a rural agricultural and natural open space landscape typology.

**Figure 3.9-2**
**Gilroy Station**

**Figure 3.9-3**
**Pacheco Pass**

The coastal valley landscape consists of flat or rolling landscapes ringed with low hills and mountains in the background. Dominant visual elements are vistas of agricultural bottomland and wetlands framed by background views of green hills, ridges, and mountains. East of the community of San Felipe, the coastal valley landscape transitions into the rural agricultural landscape typical of the Central Valley.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. At the northern end of the region in the Sacramento area, the typology is urban mixed-use landscape. The Central Valley from Sacramento to Bakersfield consists primarily of rural agricultural landscapes and traditional small urban community landscapes. Agriculture dominates the majority of the region with uniform topography of tilled fields, orchards, or undeveloped land. Agricultural areas also include highly visible utility poles and lines arranged along the major roadways (e.g., SR-99 and I-5) that form a dominant linear visual element in the landscape.

Locally designated scenic routes in the study area in this region include US-50 in Sacramento, Austin Road and East River Road in San Joaquin County, M and N Streets in Merced, and SR-198 in Visalia. Much of the proposed HST Alternative in this region would be adjacent to existing rail or highway corridors and thus would share the same affected environment.

The traditional small urban communities in the region range from clustered residential subdivisions outside Pixley (Figure 3.9-4) to the mixed commercial and residential uses of towns and cities like Visalia and Madera. For the Sacramento to Bakersfield region, urban settings are exemplified by the traditional downtown areas of Sacramento, Stockton, Modesto, Merced, Hanford, Fresno, and Bakersfield. Views of the Sacramento River are intermittently part of the landscape from along the I-5 corridor south of Sacramento.

Along each alignment option for the proposed alternative corridors in the region, views are generally sweeping vistas of rural agricultural landscapes and small urban communities. The proposed HST Alternative station sites range from undeveloped or agricultural sites (e.g., the Power Inn Road station site in Sacramento), to older station sites that are either in active use (e.g., Hanford) or underutilized (e.g., Fresno), to new or refurbished station sites that are pedestrian-scale (e.g., Truxtun Amtrak) or grand (e.g., downtown Sacramento Valley station).

For the Sacramento to Bakersfield region, the industrial settings include existing station sites as well as groupings of industrial buildings along the existing rail corridors. Figure 3.9-5, *Sacramento Power Inn Road,* looks south from Polk Street (and Power Inn Road) in Sacramento, illustrating a rural landscape with light industrial uses.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. Landscapes in this region transition from rural agricultural and traditional small urban communities south of Bakersfield, to highly scenic mountain range (natural open space) through the Tehachapi Mountains and Angeles National Forest, and finally into highly urban mixed-use landscapes in northern Los Angeles County.

State- and locally designated scenic routes in the region include 2.5 mi (4.0 km) along I-5, 2.2 mi (3.5 km) along Riverside Drive near Burbank, and 1.1 mi (1.8 km) along the Sierra Highway in Palmdale. Other scenic overlooks or viewing points along the I-5 Tehachapi corridor in the

**Figure 3.9-4**
**Pixley**

**Figure 3.9-5**
**Sacramento Power Inn**

region include those in the Pyramid Lake Recreational Area in the Angeles National Forest north of the Santa Clarita Valley; views from the Golden State Highway, also in the Angeles National Forest south of Pyramid Lake; trails in the Towsley Canyon part of the Santa Clarita Woodlands Park, which is managed by the Santa Monica Mountains Conservancy; and trails near the Pacific Crest Trail south of Soledad Canyon Road in the Angeles National Forest.

Rural agricultural landscape characterizes the north part of the study area in the Central Valley between Bakersfield and the edge of the Tehachapi Mountains to the south. Urban/suburban landscapes characterize the greater Los Angeles metropolitan area, generally from the City of Santa Clarita south through the study area in the City of Los Angeles, with development density generally increasing from north to south. Rural desert landscape characterizes the Antelope Valley from the base of the Tehachapi Mountains to the town of Rosamond.

The area from Bakersfield to Sylmar includes the highly scenic natural open space landscapes described below along both the Tehachapi and Antelope Valley corridors.

- Pyramid Lake Recreation Area is in the Angeles National Forest north of the Santa Clarita Valley. Pyramid Lake, owned and operated by the California Department of Water Resources (DWR), is a reservoir of the State Water Project that provides boating, fishing, and swimming opportunities for visitors. The Vista Del Lago Visitors Center operated by DWR provides interactive exhibits on California's water and has balconies with telescopes for viewing the lake, as illustrated in Figure 3.9-6. I-5 is visible on the left of the view in the middle ground.
- The Angeles National Forest is considered a visually scenic resource because of the camping and other recreation opportunities it provides, and the largely undeveloped views it affords to visitors, as illustrated in Figure 3.9-7. The landscape shown in the figure is typical of similar mountain landscape views from within the Angeles National Forest from viewing points near I-5. Vehicles are visible on I-5, and high-voltage electrical towers are visible on the hills in the background.
- The Santa Clarita Woodlands Park, which is managed by the Santa Monica Mountains Conservancy, provides picnic facilities and trails for hiking, mountain biking, and equestrian uses. This park is considered a scenic resource because it is available to recreation users to enjoy a predominantly undeveloped setting that includes a variety of native plants and animals.
- The Tehachapi Pass south of SR-58 and east of the town of Keene includes scenic viewing points and landscapes considered scenic. The Tehachapi Pass Railroad Line, of which this loop along SR-58 is a part, is a national Historic Civil Engineering Landmark. This rail line, constructed between 1874 and 1876, averages a gradient of 2.2% along its 28-mi (45-km) length. The line is in constant use today, essentially unchanged 126 years after its completion.
- The Sierra Highway-Antelope Valley area is considered a scenic resource because Sierra Highway from Avenue S south to the City of Palmdale boundary is designated in the City of Palmdale general plan as a scenic highway. Una Lake can be seen from Sierra Highway. The Lake Palmdale dam is also visible.
- The Santa Clarita Floodplain portion of the Santa Clarita River floodplain is considered a scenic resource because it is designated an SEA by the County of Los Angeles. The primary purpose of SEAs, as described in Section 3.15, *Biological Resources and Wetlands,* is to preserve biological diversity in Los Angeles County. The county recognizes, however, that the natural open space in SEAs functions also as a visual amenity.
- The north wall of Soledad Canyon, illustrated in Figure 3.9-8, is considered a scenic resource because it is largely undeveloped and is visible to hikers on the Pacific Crest Trail and other

**Figure 3.9-6**
**Pyramid Lake**

**Figure 3.9-7**
**Angeles National Forest**

**Figure 3.9-8**
**Soledad Canyon**

**Figure 3.9-9**
**Santa Clarita from Dockweiler Drive**

trails, as well as to motorists using unpaved roads in this area of the forest. This figure shows a landscape that is typical of views from the forest looking north in Soledad Canyon.

- Figure 3.9-9 illustrates Santa Clarita from Dockweiler Drive. The area south of SR-14 is considered a scenic resource because the predominantly undeveloped area beyond SR-14 is Los Angeles County-designated SEA. The undeveloped area beyond SR-14 comprises green curvilinear hills, ridges, and mountains covered with predominantly evergreen shrubs and trees with scattered grassland areas.
- Views of the Los Angeles Union Station (LAUS) area are considered scenic because LAUS is an important historic building listed in the National Register of Historic Places, as discussed in Section 3.12, *Cultural and Paleontolgical Resources*.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 highway corridors. The region extends approximately 150 mi (241 km) through a series of diverse, and in some cases, highly developed and populated landscapes. From LAUS east and south to March Air Reserve Base (ARB), the I-10 and I-215 highway and the HST study area travel through several large, intensively urbanized, interior valleys (urban mixed-use and urban suburban landscape typologies). From the area south of March ARB through the northern reaches of San Diego County, I-15 and the HST study area pass through valley and upland areas that are under active development pressure but that presently retain a relatively undeveloped and, in places, more rural appearance than the more developed urban areas of San Diego. From Escondido south to Mira Mesa, the upland areas through which the study area passes have a generally suburban appearance. South of Mira Mesa, the various alternative options would pass through a series of coastal valleys and then along the coastal plain.

In the areas along and in the immediate vicinity of the highway and HST corridors being considered in this analysis, there are no roadways officially designated state scenic routes. None of the alternatives in the region would pass within 0.25 mi (0.40 km) of a designated scenic corridor.

For much of the distance between LAUS and the northern fringes of Riverside, the HST alignment options being considered consist of existing rail corridors, along which the adjoining areas have been developed with industrial uses. To the east south of LAUS, the long-established industrial areas are characterized by a dense pattern of development. In the area around LAUS and around the historic centers of communities in the San Gabriel Valley and in Pomona, Ontario, and San Bernardino, the rail corridors pass through or adjacent to areas of urban mixed use that extend up to the railroad right-of-way with little or no buffer of industrial development.

The central area of Escondido and the southern end of the San Diego central business district have a traditional urban character, with a regular block and lot pattern, creating a grid of urban streets. These streets are lined with buildings of varying ages housing a variety of commercial, governmental, and institutional uses. In many cases, such areas include the long-established community centers and therefore contain older structures. Often these buildings have some architectural merit or symbolic importance. Although these areas are generally highly developed, there is often vegetation consisting of street trees, and in some cases small landscaped areas on lawns or in public open spaces. In some landscapes, there are historically and architecturally important structures and/or distant views of significant natural features. Pomona is one example. At several points along the rail corridor—particularly in Los Angeles, the older portions of the San Gabriel Valley, and central San Diego—there are areas of high-density urban mixed-use landscapes with housing close to the railroad rights-of-way.

For many miles along the alternative corridors in this region, the study area passes through or is adjacent to lower-density suburban neighborhoods of single-family homes. The residential scale of the structures and the presence of landscaping, fences, and other small-scale features characterize the landscape.

Approaching San Diego, several of the HST alignment options are located either immediately adjacent to or down the middle of existing freeways, (I-215, I-15, and I-5) as illustrated in Figure 3.9-10, *I-15 in San Diego*. The freeway landscape has a highly developed, large-scale, and highly linear appearance. Figure 3.9-11 illustrates a view from the eastern edge of Mission Bay Park.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX), and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. The existing local visual setting in the region ranges from highly urbanized landscapes to undeveloped areas. Much of the existing highway system in the southern part of the region parallels the coastline of the Pacific Ocean. I-5 (evaluated in this study under the Modal Alternative) provides only one or two isolated views of the ocean.

There are no local- or state-designated scenic corridors in the study area for visual resources in this region, though some highways (e.g., SR-1 along the coast) are considered eligible for designation as California State Scenic Routes and are located near the existing rail corridor. These routes do not offer continuous views of the ocean within the study area.

Landscapes and visual settings in the region include urban mixed-use and industrial landscapes. The majority of the existing rail corridor currently traverses dense development that includes warehouses, commercial and industrial buildings, and residential housing (areas in Los Angeles County and northern/central Orange County, for example). Limited landscaping and native vegetation exist in these industrial areas that are dominated by typically large, box buildings. There are areas of high-density housing (multifamily and single-family dwelling units) along the railroad right-of-way. Residential, commercial, and industrial building structures blend with the surrounding environment with neutral colors, tones, and textures. The historic areas typically include older structures, often with architectural importance, that vary in texture, size, and color. The area of a proposed rail station along the existing UPRR Santa Ana Line in Norwalk is highly developed with a mixture of commercial and industrial uses along with surrounding residential areas.

There are a number of suburban and traditional small urban community landscapes in the region that are located close to commuter and transportation hubs and surrounded by retail, business, and residential land uses. The city center and neighborhoods in these communities, such as Santa Ana, are separated by transportation corridors and/or undeveloped land.

The region is characterized by coastal towns and urban areas, historic districts, parks, and wildlife preserves. Calafia Park in San Clemente, Camp Pendleton, area beaches, and a number of lagoons are examples of parks and open space areas along the existing I-5 highway corridor. The Camp Pendleton area is undeveloped land with some large overhead transmission lines, industrial facilities (e.g., San Onofre Power Plant), and the I-5 corridor. .

**Figure 3.9-10**
**I-15 in San Diego**

**Figure 3.9-11**
**Mission Bay**

### 3.9.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing conditions in 2003, or existing landscapes, are used as the baseline and are assumed to be representative for the analysis of potential visual impacts for the Modal Alternative and the HST Alternative. Though it is likely that the existing landscape character will change in each of the regions by the year 2020 due to development and urban growth, these changes are not possible to characterize at this time with precision. To base comparisons of alternatives on current conditions is to take a conservative approach. The extent of change to some of the landscapes (particularly the rural and open space landscapes) reported in this section may not be as pronounced as they appear in this impact evaluation.

The highway projects approved and funded for construction by 2020 and included in the No Project Alternative are described in Chapter 2, *Alternatives*. In most of the regions, these improvements or changes to the existing highways and airports are generally expansions or reconfigurations of existing facilities that would not result in substantial visual contrasts or changes to the dominant line, form, color, or texture characterizing the existing landscape condition. No significant visual impacts, shadow, or glare impacts have been identified for the changes between the existing conditions and No Project Alternative for this program-level analysis. As these projects advance, the project sponsors (not the California High Speed Rail Authority [Authority]) may identify and address some localized visual impacts in separate environmental documentation.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

The comparison of potential aesthetic and visual resource impacts for the Modal and HST alternatives is a broad overview of potential differences between alternatives for the construction (short-term) and operation (long-term), direct and indirect, and cumulative impacts.

<u>Modal Alternative</u>

Under this alternative, the potentially feasible highway improvements would represent about 2,970 lane mi (4,345 lane km) of new highway construction. Several intercity highways would be widened to a total of 12 lanes. Adding outside lanes to existing highways would involve vegetation clearing, cut and fill in areas where the topography is uneven, relocation of existing noise walls or construction of new noise barriers, reconstruction of existing ramps and bridges, and property acquisition along some constrained corridors. Construction-related activities and changes (equipment operation and movement of materials in adjacent staging areas, construction signage, jersey barriers [concrete bars about 3 ft high], temporary lane closures, and night lighting) would be highly visible to motorists and adjacent residents and businesses over a period of about 2 to 5 years in any one location and up to 17 years across the state, detracting from scenic landscape features along the highway corridors. The Modal Alternative would potentially contribute to temporary cumulative visual impacts during the construction period when added to the existing No Project Alternative.

The Modal Alternative would also result in potential long-term visual impacts from additional pavement, wider highway structures (interchanges, ramps, bridges), noise barriers, retaining walls, and open cuts in steep terrain, thus changing the dominant landscape characteristics in the study area along vast stretches of highway that traverse a variety of landscape types. Lanes added to bridges and elevated portions of the highway (two lanes would add approximately 24 ft [7 m]), and new stretches of noise barrier walls would cast additional shadows on landscapes below the structure and adjacent to the structure. Widened highways would also result in light and glare being closer to adjacent properties.

Though individually these landscape changes may not be considered significant because they would consist of additions to existing infrastructure, this alternative could contribute to substantial cumulative visual impacts during the next 17 years. Expanded paved surface would result in potential impacts on visual resources. Widening a two-lane or four-lane highway through the natural open space and rural landscapes of the state would result in both direct and cumulative visual impacts because the line, form, texture, and color of the highway would begin to dominate the landscape. Widening highways in suburban and urban areas of the state would contribute to cumulative visual impacts and shadow effects from elevated portions of highway and additional noise walls. The width of 12-lane highways would be approximately 185 ft (56 m), the width of eight lanes would be approximately 125 ft (38 m), and the width of six lanes would be approximately 100 ft (31 m). These pavement widths, together with the need for cut and fill to conform to grade changes and the elevated portions of bridges and ramps required by the Modal Alternative, would result in visual impacts similar to or greater than the HST Alternative along scenic corridors and through natural open space areas. Examples of such areas include the mountain passes (e.g., Diablo Mountain Range, Pacheco Pass, Tehachapi Mountains, Angeles Forest, and Soledad Canyon) and open rural agricultural lands south of San Jose and in the Central Valley. Figures 3.9-14 and 3.9-15 illustrate the potential impacts on SR-152 (Pacheco Pass) of the Modal and HST Alternatives.

In the Los Angeles to San Diego region, the difference between the No Project and Modal Alternatives would be substantial. The Modal Alternative would require the acquisition of approximately 1,100 ac (445 ha) of new right-of-way between Los Angeles and San Diego, 370 ac (150 ha) of which would be paved, to accommodate the highway and interchange widening proposed under this alternative.[2] The additional right-of-way would displace residential, commercial, and industrial land uses that have been established adjacent to the existing highway, as well as some areas of natural vegetation and rock slopes. Bridges and overpasses would be widened in urban, suburban, coastal, and open space environments, increasing the footprint of the highway as well as the width or extent of the shadow effects beneath the infrastructure.

The airport improvements would add runways and gates to existing airports, and these features would blend with existing landscape features. Therefore, no visual impacts have been identified for the airport part of the Modal Alternative.

High-Speed Train Alternative

A typical double-track HST, at grade, would have a 50- to 100-ft (15- to 31-m) fenced right-of-way, and an elevated guideway would have a 50-ft (15-m) right-of-way. The 100-ft width would be comparable to a six-lane highway. Catenary supports 26 ft (8 m) in height would be located every 30 ft (9 m) along both sides of the track to support the electric wires that supply power to the trains. The proposed HST alternative would include using existing rail tracks or parallel tracks or highways where feasible, and tunneling through the scenic mountainous area. (See Chapter 2, *Alternatives*, for full description of proposed HST alignment options.). About 194 mi (312 km) of tunnel has been identified for this conceptual stage of design.

The proposed HST Alternative would be built in phases. Construction of the system would have short-term impacts on visual resources similar to those described for highway construction above in the discussion of the Modal Alternative. Construction equipment, staging areas with construction materials, signage, and night lighting would be visible from adjacent properties and roadways during the construction period.

[2] Acres of right-of-way for the Modal Alternative are estimated based on the need for a minimum of 25 ft (8 m) of additional pavement width, and 50 ft (16 m) of unpaved width for drainage, cut and fill, and other unpaved area, for the length of I-5 between Los Angeles and San Diego.

**Figure 3.9-14**

**Photo simulation of Modal Alternative SR-152 (Pacheco Pass) with two added lanes**

**Figure 3.9-15**

**Photo simulation HST Alternative SR-152 (Pacheco Pass)**

Long-term visual changes would result from the introduction of a new transportation system that would be visible along many major highways and rail corridors connecting the metropolitan areas of the state. The track, catenary, fencing, 12-ft (4-m) to 16-ft- (5-m) high soundwalls (where proposed), approximately 220 mi (354 km) of elevated guideway (where proposed), and the trains themselves would introduce a linear element into the landscape that would have potential cumulative visual impacts when considered with the strong linear element of the existing highway and rail facilities that the HST would parallel. The significance of the visual change would depend on the sensitivity of the landscape and the compatibility with existing landscape features of the typologies along each of the alignment options described in the affected environment section. The landscape typologies considered scenic and therefore most subject to high-contrast visual changes—where the HST would begin to dominate the landscape and detract from the existing features—are the natural open space and park typology and the traditional small urban community typology.

At this program level of analysis, there are no potentially high aesthetic or visual impacts that could not be reduced or mitigated through design treatments (e.g., architectural treatment at historic stations, tunneling, or minimizing the cut and fill through mountainous terrain and in natural areas). Similar construction-related and long-term visual changes would occur under both the Modal and HST Alternatives, particularly in highly scenic areas of the state. Both alternatives would contribute to cumulative visual impacts from construction and shadow effects of elevated structures.

### 3.9.4 Comparison of Alternatives by Region

Table 3.9-1 summarizes the key findings for each of the alternatives by region. The table identifies the highways in the proposed Modal Alternative and the proposed HST alignment options and stations in each of the five regions that would have potential significant visual impacts (high visual contrasts).

**Table 3.9-1**
**Potential Visual Impacts by Region**

| Alignment and Station Options | Scenic Highway | Scenic Viewing Point/Landscape | High Contrast/Impact | Shadow Impact | Light/Glare |
|---|---|---|---|---|---|
| **Bay Area to Merced** | | | | | |
| **Modal Alternative** | | | | | |
| SR-152/US-101 to I-5 | 35 mi (56 km) designated scenic highway | 10–20 viewing points<br>Pacheco Creek Valley,<br>scenic natural open space | High contrast in color, line, and form from enlarged cut/fill, expanded two lanes of pavement, removal of vegetation | High—widened bridges, ramps | Lights from increased auto use at night |
| **High-Speed Train Alternative** | | | | | |
| Hayward/Niles/ Mulford alignment | 6 mi (10 km) (Niles Creek) | 4 viewing points<br>historic town of Niles | High contrast of elevated guideway with historic town and scenic canyon | Moderate | Low |
| Pacheco Pass options | 30 mi (48 km) | 10-20 viewing points<br>Pacheco Creek Valley,<br>scenic natural open space | High contrast in line and color from elevated guideway over hwy. and catenary and tunnel portal | Moderate—elevated guideway | Low—glare from locomotive lights |
| Diablo Range Direct options | | Natural open space, Henry Coe State Park<br>Orestimba Valley, I-5 | Aerial guideway, cut/fill, catenary, tunnel portal | Moderate—elevated guideway | Locomotive lights |
| **Sacramento to Bakersfield** | | | | | |
| **Modal Alternative** | | | Low visual contrasts | | |
| **High-Speed Train Alternative** | | | | | |
| UPRR options | 0–6.3 mi<br>(0–10.1 km) | 0 viewing points | Low visual contrasts | Low—at grade | Low |
| BNSF options | 0.8–6.7 mi<br>(1.28–10.8 km) | 0 viewing points | Low visual contrasts | Low—at grade | Low |
| Stations at Power Inn Road, Stockton ACE, Modesto, Merced, Castle Air Force Base, Visalia, Bakersfield Airport | None | None | Moderate to high visual contrasts with traditional rural community historic architecture in highly visible landscapes | None | Low to moderate light and glare around stations |

| Alignment and Station Options | Scenic Highway | Scenic Viewing Point/Landscape | High Contrast/Impact | Shadow Impact | Light/Glare |
|---|---|---|---|---|---|
| **Bakersfield to Los Angeles** | | | | | |
| **Modal Alternative** | | | | | |
| I-5: SR-99 to SR-14; and<br>SR-14: Palmdale to I-5 | | Pyramid Lake scenic viewing from Visitors Center and Castic Lake Viewing Point from visitor rest area | Moderate contrasts from cut required along hillside, removal of vegetation | No shadow impacts | Increased lights from auto use |
| I-5: SR-14 to I-405 | 2.5 mi (4 km) of scenic corridor along I-5 | | Moderate contrast from double-decking of four lanes for about 4 mi (6 km) over I-5, contrast with scale of urban features | No shadow impacts, existing double-deck sections | Increased lights from auto use |
| **High-Speed Train Alternative** | | | | | |
| I-5: Tehachapi corridor | None | 2 viewing points: Pyramid Lake scenic viewing point (412 ft [126 m]) and Castic Lake scenic viewing points 0.4 mi (0.6 km) and 0.7 mi (1.1 km) | High-contrast impacts from elevated structure and catenary at edge of Pyramid Lake adjacent to I-5; and cut/fill and tunnel portals in hillside of Santa Clarita Woodlands Park. Moderate contrast from cut and fill for 7.5 mi (12 km) where alignment is close to I-5. Moderate contrast across valley in front of Castic Lake. | Shadow impacts on Pyramid Lake and recreational users within 75 ft (23 m) of elevated structure | |
| SR-58 corridor | None | Tehachapi Loop Marker 0.7 mi (1 km) from alignment | Contrast with historic Tehachapi Pass Rail, and moderate contrast from cut/fill in hillside for about 12 mi (19 km) | None | |
| Soledad Canyon corridor | Sierra Highway in City of Palmdale | None within 0.25 mi (0.40 km) of alignment | The elevated guideway and catenary across the scenic Sierra Hwy. and adjacent to Santa Clarita River SEA would contrast with the existing landscape features. Cut/fill, tunnel portals would be visible against natural open space hillsides, and ridges in Angeles National Forest. | Shadow impacts of elevated guideway | |

| Alignment and Station Options | Scenic Highway | Scenic Viewing Point/Landscape | High Contrast/Impact | Shadow Impact | Light/Glare |
|---|---|---|---|---|---|
| **Los Angeles to San Diego via Inland Empire** | | | | | |
| **Modal Alternative** | | | Low visual contrasts for all Modal (highway and airport improvements) in landscapes previously modified | Low | Light and glare from increased traffic |
| **High-Speed Train Alternative** | | | | | |
| UPRR Colton Line to March ARB | None | Viewing points are from residential streets. | High visual contrast in urban suburban landscape where alignment is in center of arterial street through residential neighborhood east of the UC Riverside campus | High shadow impacts | |
| UPRR Colton Line to San Bernardino | None | Viewing points are from residential streets. | High visual contrast in urban suburban landscape where alignment is through established residential neighborhood in Rialto and San Bernardino | High shadow impacts | Low to moderate light and glare at station |
| San Jacinto to I-5 | None | Viewing points are from residential streets. | High visual contrast from long segments of elevated structures in median of highway | High shadow impacts | |
| Downtown San Diego | None | | Elevated guideway in urban mixed use landscape would block views of Bay | High shadow impacts | |
| **Los Angeles to San Diego via Orange County** | | | | | |
| **Modal Alternative** | | | | | |
| I-5 San Juan Capistrano to Del Mar | None | Coastal communities with high aesthetic qualities, limited views of the ocean | Moderate visual contrasts from extensive cut and fill of natural hillsides (removal of vegetation) and rock slopes, and widened sections of elevated highway and bridges; medium impacts in scenic lagoon areas | Shadow impacts of elevated sections of widened highway, medium impacts at lagoons and open space areas | Light and glare from increased auto use |
| **High-Speed Train Alternative** | | | | | |
| Los Angeles to Irvine | None | | Low visual contrasts | Low at-grade | Low to moderate light and glare at stations |

As shown in the above table, potential high-contrast visual impacts on the highly scenic mountain passes and open space landscapes have been identified for both the Modal and HST Alternatives in the Bay Area region (Pacheco Pass and Diablo Mountain Range), and in the Bakersfield to Los Angeles region (Pyramid Lake and Soledad Canyon). For the proposed HST Alternative, about 95 mi (153 km) of potential alignments through the scenic natural areas shown on conceptual design maps are proposed to be placed in tunnel through the Pacheco Pass and Diablo Range. For the Los Angeles to Bakersfield region, about 38 mi (62 km) of the potential HST corridor are proposed to be in tunnel in the mountainous area, and about 5 mi (8 km) would be in trench. The plan and profile of the alignments would be decided in the subsequent phase of the project development.

Shadow impacts would result from expanded highway bridges (Modal Alternative), from elevated guideways (HST Alternative), and from noise barriers for both alternatives. For all five regions, the potential visual impacts from the HST Alternative would generally be greater than visual impacts described for the Modal Alternative, primarily because the proposed HST system would introduce a new design feature to the landscapes, and the Modal Alternative would be an expansion of existing facilities. None of these potential impacts are unavoidable at this stage of review. Subsequent analysis and engineering design for the proposed HST Alternative would address feasible alignment options to further reduce visual impacts for areas identified as potential high visual contrasts with existing landscape features.

Following is a summary of the key differences among alternatives and potential HST alignment options for each of the five regions. The bulleted text in the HST discussion briefly summarizes the key differences among HST alignment options for each region.

A. BAY AREA TO MERCED

Modal Alternative

As part of the Modal Alternative, the expansion of SR-152 from four lanes to six lanes from US-101 in the Gilroy area to the junction with SR-156 north of Hollister would be most sensitive to potential visual impacts. This winding two-lane highway traverses agricultural and mountainous landscapes, passing through scenic rural, village, and wetland settings. Widening and straightening the highway through this scenic area would involve removal of vegetation and expanded cut and fill that would add to the dominant line and color of the existing highway and detract from the natural landscape features.

High-Speed Train Alternative

- The UPRR main line north of Hayward would have less potential visual impact than the Burlington Northern Santa Fe (BNSF) Niles Branch that would impact the historic town of Niles near the mouth of the scenic Niles Canyon.
- The I-880 option would have less potential visual impact than the Mulford Line option that crosses the Don Edwards San Francisco Bay National Wildlife Refuge.
- The northern tunnel option would "fly" over a residential neighborhood and result in shadow impacts before entering a highly visible tunnel portal to cross through the Diablo Mountain Range. This option would pass north of Henry Coe State Park and would cross the Diablo Range in a series of tunnels; the tunnel under the park option would cross under Henry Coe State Park. These options would have less potential visual impact than the at-grade option across Henry Coe State Park.
- The Pacheco Pass crossing would potentially impact visual resources less than the more northern Diablo Range options because it would parallel the existing linear feature of SR-152 before going in tunnel to cross the natural area of Pacheco Pass.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative
No potential visual impacts were identified for the highway improvements included in the Modal Alternative or airport improvements in this region.

High-Speed Train Alternative
All potential HST alignment options in this region were ranked as having low potential for visual impacts; only stations would have potential visual impacts because of the proximity to historic structures and architecture. The loops around the center of towns would have less visual impact than the alignment options going through town centers; however, they would be visible from long distances as new alignments in the less-developed bypass areas.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative
There are two scenic corridors adjacent to two of the segments of the Modal Alternative in this region. The I-5: SR-14 to I-405 segment is adjacent to 2.5 mi (4 km) of a designated scenic route along I-5 between SR-14 and I-405. There would be moderate visual contrasts on this corridor from the double-decking of four lanes over I-5. The I-5: SR-99 to SR-14 segment of highway would be widened by two additional lanes, and this segment would be visible from the Pyramid Lake Visitor Center, and from the Castic Lake Viewing rest area where views of a wider roadway and expanded cut of the hillside would contrast with the natural landscape.

High-Speed Train Alternative
The following HST alignment options would result in the lowest impacts on aesthetics and visual quality in this region.

- The I-5 corridor with the Wheeler Ridge alignment option to Bakersfield would result in the lowest aesthetics/visual quality impacts of the alignments between Bakersfield and Sylmar. Moderate contrast impacts associated with cut and fill would occur along approximately 7.5 mi (12 km) where the alignment would be close to I-5 and/or adjacent to existing roads that parallel I-5. Contrast impacts would be lower in these areas because the landform has previously been graded and altered for these existing roads. Visual impacts would therefore be minimized by locating the alignment in the area of the existing transportation corridor. In comparison, the SR-58/Soledad Canyon corridor would result in approximately 6.2 mi (10 km) of high-contrast cut-and-fill impacts in Soledad Canyon and 11.8 mi (19 km) of high-contrast cut-and-fill impacts in the mountainous area of SR-58. The landform in the mountainous areas on the Antelope Valley corridor would be largely unaltered. Visual contrast related to cut and fill in these areas would therefore be greater than along the I-5 corridor. Both the I-5 corridor and the SR-58/Soledad Canyon corridor would have high-contrast impacts and high potential shadow impacts related to aerial structure.
- Both the Wheeler Ridge and the Union Avenue alignment options of the I-5 alignment would have high-contrast impacts related to aerial structure. The Wheeler Ridge alignment option would have low potential shadow impacts on residential areas, however, while the Union Avenue alignment option would have moderate potential shadow impacts on residential areas.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

The highway and airport expansions described for this region would not have potentially high visual contrasts because the changes to these facilities would be in landscapes that have been substantially modified already.

High-Speed Train Alternative

- In the LAUS to March ARB segment, the additional potential high-contrast impacts and shadow impacts of the San Bernardino loop would expose the two alignment options that would include this loop to more high visual impacts than the two alignment options that would not include this loop.
- In the March ARB to Mira Mesa segment, the alignment option that would serve the proposed Escondido Transit Center station site would have slightly more high visual potential impacts than the other alignment option. This difference is due to the relatively greater potential for high-contrast and shadow impacts in the subsegment associated with the transit center station.
- In the Mira Mesa to San Diego segment, the two alignment options that would join the coast and serve downtown San Diego would have more potential high visual impacts than the alignment option that would serve the Qualcomm Stadium station. This outcome is due to the relatively greater potential for high-contrast and shadow impacts expected in this segment. A scenic viewing point included in the two alignment options serving downtown San Diego also would not occur in the other alignment option.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

The Modal Alternative would potentially increase the visual mass of the existing I-5 freeway, interchanges, bridges, and overpasses throughout its length from Los Angeles to San Diego. The existing right-of-way would need to be widened in most areas, resulting in displacement of uses built up to the right-of-way and reduction of undeveloped or landscaped areas along the freeway. In the northern and southern stretches of the freeway corridor (Los Angeles to San Juan Capistrano, and south of Del Mar to downtown San Diego), these changes to the landscape would result in overall low visual impacts. In areas between San Juan Capistrano and Del Mar, visual impacts would generally be higher (medium) due to more alteration of adjacent uses and the need for some extensive cut-and-fill activities in areas of natural hillsides and rock slopes. All elevated portions of the freeway and interchanges would be widened, increasing the shadow impacts on uses underneath the elevated infrastructure and expanding the dominance of the line and form of the existing infrastructure from viewing points along SR-1 (Pacific Coast Highway) and coastal trails. Shadow impacts would be noticeable in the residential and natural open space areas, such as crossing of lagoons in San Diego County.

High-Speed Train Alternative

In some locations along the LOSSAN corridor, the HST Alternative presents opportunities to improve the existing visual environment with alignment and/or construction options that would place existing and new rail infrastructure in a covered trench. The covered trench option in Orange and Santa Ana Counties (LAUS to Irvine segment) would place the existing at-grade rail tracks in a covered trench. This option would have a beneficial impact in the urban/suburban environment, while the option of constructing a second track at grade would have a low impact.

The implementation of some or all of the beneficial options above would improve the scenic quality along the existing LOSSAN corridor in residential areas along the corridor. Neither the No

Project nor the Modal Alternative would provide these opportunities for improving the aesthetic environment.

### 3.9.5 Photo Simulations of Alternatives in Selected Scenic Areas

Figures 3.9-16 to 3.9-21 are photo simulations that illustrate what the Modal or HST Alternatives (expanded highways or HST) may look like in typical landscapes described for each of the regions, using existing conditions as the baseline. These simulations do not include potential changes to the existing landscapes that could occur between the time of this analysis and the year 2020 from other projects and urban development. These simulations are meant to illustrate how the existing dominant landscape features would be potentially changed with the implementation of the proposed alternatives. Below is a brief description of the photo simulations.

- Figure 3.9-16A and 3.9-16B: Historic Gilroy station with and without HST station. These figures illustrate how the proposed HST station could be integrated with an existing historic structure. The Gilroy station is representative of historic stations, predominantly of those in the Central Valley areas (Bay Area to Merced and Sacramento to Bakersfield).
- Figures 3.9-17A and 3.9-17B: Pixley with and without HST alignment. These figures illustrate how the proposed HST alignment could potentially impact a traditional small urban community. It should be noted, however, that this particular area is already impacted by US-99, which is located adjacent to the proposed HST alignment, the viewpoint from which the picture without HST was taken. Under the Modal Alternative, the visual impact would be a widening of US-99 into the area where the proposed HST alignment is pictured and on the other side of the highway.
- Figures 3.9-18A and 3.9-18B: Soledad Canyon with and without the proposed HST alignment in cut configuration. These figures illustrate how a scenic resource could potentially be impacted by HST alignment in a cut configuration. It should be noted that this impact could potentially be avoided or mitigated by placing the HST alignment in tunnel or by using other construction and landscaping techniques to reduce visual impact.
- Figures 3.9-19A and 3.9-19B: I-15 corridor in San Diego with and without the proposed HST alignment. These figures illustrate how the proposed HST alignment could be integrated alongside an existing highway alignment. It should be noted that along this alignment, the HST alignment in some portions would be in tunnel and would not be visible from the highway or the surrounding area. Under the Modal Alternative, the visual impact would be a widening of I-15 into the area where the HST alignment is pictured and on the other side of the highway (Figure 3.19-C).
- Figures 3.9-20A and 3.9-20B: I-5 corridor in La Jolla with and without the highway widening improvements proposed under the Modal Alternative. These figures illustrate how the addition of one through lane in each direction affects the ramps (moving them into the hillsides) and overcrossing structure (reconstructing the abutments). The improvements would be visible from the highway, and in the case of the ramps visible from the surrounding hillsides as well.
- Figures 3.9-21A and 3.9-21B: Little Italy, downtown San Diego, water view with and without HST alignment. These figures illustrate how the HST system could be integrated into a developed urban region. The potential impact of the HST alignment would be relative to the position of the viewer. For instance, in this case the potential impact would be greatest closest to the alignment, while from the location where the picture was taken, the proposed HST alignment blends into the built area.

### 3.9.6 Design Practices

It would be speculative to address specific aesthetic treatments at the conceptual level of design of this program level study. However, the Authority is committed to working with local agencies and communities during subsequent project level environmental review to develop context sensitive aesthetic

**Figure 3.9-16A**
**Gilroy Station**

**Figure 3.9-16B**
**Photo Simulation of HST Alternative at Gilroy**

**Figure 3.9-17A**
**Pixley**

**Figure 3.9-17B**
**Photo Simulation of HST Alternative at Pixley**

**Figure 3.9-18A**
**Soledad Canyon**

**Figure 3.9-18B**
**Photo simulation of HST Alternative at Soledad Canyon (Cut)**

**Figure 3.9-19A**
**I-15 Corridor in San Diego**

**Figure 3.9-19B**
**Photo Simulation of HST in I-15 Corridor in San Diego**

**Figure 3.9-19C**
**Photo Simulation of Highway Improvement (Modal) in I-15 Corridor in San Diego**

**Figure 3.9-20A**
**I-5 Corridor in La Jolla**

**Figure 3.9-20B**
**Photo simulation of Modal Alternative I-5 Corridor in La Jolla**

**Figure 3.9-21A**
**Little Italy, Downtown San Diego Water View**

**Figure 3.9-21B**
**Photo simulation of HST Alternative at Little Italy, Downtown San Diego Water View**

designs and treatments for HST infrastructure (bridges, tunnel portals, overhead catenary systems, stations, etc.).

### 3.9.7 CEQA Significance Conclusions and Mitigation Strategies

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for aesthetics, the HST alternative would have a potentially significant impact on aesthetics when viewed on a system-wide basis. The HST alternative would create construction-related short-term visual changes. The HST alternative would also create long-term visual changes from introduction of a new transportation system. While the significance of the changes is dependent on the sensitivity of the landscape and compatibility with existing landscape features, at least some changes would occur in highly scenic areas of the state and are expected to be significant. Mitigation strategies, as well as the design practices discussed in Section 3.9.5, will be applied to reduce this impact. See also Section 3.7.6, Part B, mitigation for communities and neighborhoods.

General mitigation strategies would include the design of proposed facilities that are attractive in their own right and that would integrate well into landscape contexts, so as to reduce potential view blockage, contrast with existing landscape settings, light and shadow effects, and other potential visual impacts. Further consultation with local and regional agencies and with the public would help the Authority and the FRA refine these general mitigation strategies during the following stage of environmental review. The following measures could be considered during subsequent review and design development to enhance project appearance and minimize project visual impacts.

In the development of the final design for the project, there is a need to generate design solutions that lead to development of project facilities that are attractive in their own right and that integrate into landscape contexts in a way that minimizes view blockage, contrast with settings, light and shadow effects, and other visual impacts. Some of the potential mitigation strategies that could enhance project appearance and minimize project visual impacts include:

- Bridges and elevated guideways could be designed with graceful lines and with minimal apparent bulk and potential shading effects. Features that could be considered include use of contoured, rounded edges for columns and other structural elements.
- Elevated guideway, station, and parking structures could be designed with sensitivity to the context. Exterior materials, colors, textures, and design details could be used that are compatible with patterns in the surrounding natural and built environments and that minimize the contrast of the structures with their surroundings.
- Exterior finishes for catenary support structures could be chosen that have neutral colors, are context-appropriate, and have dulled finishes that minimize reflectivity.
- Aesthetically appropriate fencing could be installed along rights-of-way. In residential and city center areas, decorative fencing may be appropriate. In all contexts, the fencing could be dark and non-reflective to reduce its visual contrast.
- Where at-grade or depressed route segments pass through or along the edge of residential areas or heavily traveled roadways, landscape treatments could be installed along the edge of the right-of-way such as trees, shrubs, and groundcover to provide partial screening and to visually integrate the right-of-way into the residential context.
- Night lighting at stations should be the minimum required for operations and safety. All lights should be hooded and directed to the area where the lighting is required. For lights that are not required to be on all the time, sensors and timers should be specified.
- In the project-level review of proposed stations, the potential shadow impacts on adjacent pedestrian areas, parks, and residential areas should be taken into account.

- Areas outside of the operating rail trackbed that are disturbed by cut, fill or grading will be seeded or planted, as feasible, such that these areas will blend with the surrounding vegetated areas. Native vegetation will be placed in appropriate locations and densities to fit adjacent natural settings. Appropriate native or ornamental species will be used adjacent to developed and landscaped areas. Steep areas of cut in rock may not be able to support plants.
- In areas where elevated guideways are close to residential areas, parks, and public open spaces, use of strategic plantings of fast-growing trees to provide partial or full screening of the structures.
- Where at-grade or depressed route segments pass through or along the edge of residential areas or heavily traveled roadways, landscape the edge of the right-of-way with trees, shrubs, and groundcovers to provide partial screening and to visually integrate the right-of-way into the residential context.
- Where elevated guideways are located down the median strips or along the edge of freeways or other major roadways, use appropriate landscaping of the area under the guideway. The landscaping should make use of attractive shrubs and groundcovers that provide a high level of visual interest. The emphasis should be on the use of low-growing species to minimize any additional shadow effects or blockage of views.
- In the development of the final site plans for stations, shadow impacts on adjacent pedestrian areas, parks, and residential areas should be taken into account, and all structures should be sited in a way that minimizes shadow effects on sensitive portions of the surrounding areas.
- New outdoor lighting associated with the project can be shielded to minimize both the glare from any new light source and the spillover of light onto developed and undeveloped areas outside of the right-of-way.

The above mitigation strategies are expected to substantially lessen or avoid impacts to aesthetics in many circumstances. Sufficient information is not available at this programmatic level, however, to conclude with certainty that the above mitigation strategies will reduce impacts to aesthetics to a less than significant level in all circumstances. This document therefore concludes that impacts to aesthetics could remain significant, even with the application of mitigation strategies. Additional environmental assessment will allow a more precise evaluation in the second tier project-level environmental analyses.

### 3.9.8 Subsequent Analysis

Specific analyses that would be appropriate for project-specific environmental evaluation are discussed below.

- Detailed analyses should be performed along each corridor, particularly in areas with elevated structures, to identify potential visual intrusions into residential and park and open space areas. These analyses should focus on identifying the potential for blockage of valued views; the areas where shadows would be cast on residential and open space lands; and the areas where the scale, form, line, and color of project facilities would substantially alter the existing character and quality of the setting. In addition to producing a detailed inventory of area-specific impacts, this analysis would serve as the basis for identifying areas where project siting adjustments and design modifications, landscaping, and other mitigation measures may be incorporated to reduce potentially considerable impacts to a low level.
- Review of local urban design plans and policies should be conducted to take into account local design objectives. The analyses would provide a basis for considering specific design measures that would modify the impacts of the project in ways that would make the project design more consistent with local urban design goals.
- An analysis should focus on the segments of alignment that would be located adjacent to and down the median strip of freeways.

- For each of the proposed station sites, further analyses should be conducted in consultation with local agencies to develop an understanding of the relationship of the proposed station architecture, parking lots, lighting systems, and other features to the surrounding natural and built setting and historic context of the surrounding landscape setting. The analyses should identify the potential for blockage of valued views; the areas where shadows would be cast; and the areas where the scale, form, line, and color of project facilities could be designed to blend with the surrounding landscape. The analyses would be used to provide a basis for considering specific measures that could be integrated into the final station designs to reduce the visual impacts of the stations on their surroundings.

# 3.10 PUBLIC UTILITIES

This section describes the existing public utilities within the five project regions and identifies the potential for impacts on utility systems for the No Project, Modal, and High-Speed Train (HST) Alternatives. The public utilities evaluated in this section include electrical transmission lines, natural gas facilities, and wastewater treatment facilities. A *potential utility impact* is any potential conflict between an alignment, station, or airport facility, and a utility, including crossings regardless of depth or height.

## 3.10.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

California Public Utilities Commission

The California Public Utilities Commission (CPUC) primarily regulates the provision of privately owned utilities in California. These utilities include privately owned telecommunications, electric, natural gas, water, railroad, rail transit, and passenger transportation companies. The CPUC is responsible for assuring that California utility customers have safe, reliable utility services at reasonable rates; protecting utility customers from fraud; and promoting the health of California's economy. The CPUC does not issue permits for proposed projects that would cross utility lines. The CPUC does, however, regulate at-grade rail crossings.

Office of the State Fire Marshall

The Office of the State Fire Marshall, Pipeline Safety Division, regulates the safety of approximately 5,500 mi (8,851 km) of intrastate hazardous liquid (e.g., oil, gas) transportation pipelines and acts as an agent of the Federal Office of Pipeline Safety concerning the inspection of more than 2,000 mi (3,219 km) of interstate pipelines. Pipeline safety staff inspects, tests, and investigates to ensure compliance with all federal and state pipeline safety laws and regulations. All spills, ruptures, fires, or similar incidents are responded to immediately; all such accidents are investigated for cause.

Research and Special Programs Administration, U.S. Department of Transportation

The Research and Special Programs Administration, U.S. Department of Transportation, is responsible for carrying out the duties regarding pipeline safety set forth in 49 U.S.C. § 60101 *et seq.* and 49 C.F.R. § 190.1. The regulations apply to the owners and operators of the facilities and cover the design, installation, inspection, emergency plans and procedures, testing, construction, extension, operation, replacement, and maintenance of pipeline facilities transporting oil, gas, and hazardous liquid. The regulations require operators of gas pipelines to participate in a public safety program, such as a one-call system that would notify the operator of any proposed demolition, excavation, tunneling, or construction that would take place near or affect the facility.

Wastewater Regulatory Setting

Many regulatory agencies are involved in wastewater treatment oversight. These agencies include the U.S. Environmental Protection Agency, the California Water Resources Control Board, and nine California Regional Water Quality Control Boards (RWQCBs). Primary wastewater regulation occurs via the issuance of wastewater discharge standards that are implemented through National Pollutant Discharge Elimination System permits and waste discharge requirements issued by the various RWQCBs.

Wastewater conveyance and treatment facilities in the study area are owned and/or operated by different agencies and entities. Any potential conflict with such facilities would be addressed in consultation with the respective agency. If a proposed alternative would potentially include use

of wastewater facility properties, during the project-level review the need for easements, agreements, or other arrangements with the agency and/or local jurisdiction would be considered and addressed.

## B. METHOD OF EVALUATION OF IMPACTS

Various methods, including the following, were used to gather the appropriate information for each of the regions.

- Review of the project geographic information systems (GIS) to identify cities and counties in the study area.
- Review of the general plans for potentially affected communities within each of the five regions in which proposed alternatives are being studied, as well as maps from the Thomas Bros. *California Atlas* and from the California State Automobile Association.
- Review of project alignments/proposed improvements against GIS information of electrical transmission lines, and gas and oil pipelines compiled by MapSearch.
- Exploration of Web sites of the GIS-identified cities and counties in the study area to gather appropriate setting information.
- Examination of applicable utility system maps and Web sites to gain a better understanding of facility distribution.
- Contact with public utility providers via mail to obtain or confirm the locations of their current and planned services and facilities in the study area.

Public utilities can generally include a range of services such as water, power, sewage, communications, and other systems. For the purposes of this analysis, three of the most common major facilities that may pose construction challenges were identified to best represent potential utility impacts. These facilities not only provide critical services, they are likely to create a hazard if damaged during construction operations.

- Electrical facilities are defined as major transmission lines and substations that meet or exceed a power rating of 230 kilovolts (kV).
- Natural gas facilities are defined as high-pressure gas pipelines and facilities of various sizes.
- Wastewater treatment facilities are defined as wastewater pipelines with a minimum 36-in (91-centimeter [cm]) diameter, and any treatment facilities located in the project corridor.

The methodology used to assess potential conflicts (any crossing or longitudinal encroachment of an existing utility by the defined improvement) included overlaying the available utility maps with the alternative alignments and identifying facilities within 100 ft (30 m) of the centerline and the proposed alignment alternatives. Because public utilities are so prevalent throughout the study area, it was not practical to assess each potential conflict. Rather, the relative impact between alternatives was determined by quantifying the number and type of potential conflicts for each alternative. In addition, a qualitative ranking of high, medium, or low was assigned to describe the potential severity of the conflict, as described below and summarized in Table 3.10-1.

Electric transmission lines, telecommunications lines, natural gas pipelines, and wastewater pipelines would be less likely to be affected by an alternative because with relatively minimal disruption or construction impacts, they could be avoided, minimized, or mitigated by routing either the public utility or the transportation improvement around, over, or under the facility. Where unavoidable, relocations of the utilities would not pose adverse environmental risks, based on current construction practices. However, they do represent additional project-related costs.

- Fixed facilities, such as electrical substations or power stations and wastewater treatment plants, would be more likely to be affected by an alternative, because they could require more considerable engineering, design, and construction to avoid, minimize, or mitigate potential conflicts. These types of fixed facilities have more significant constraints regarding any potential conflict, such as routing the transportation improvement around, over, or under the facility, or relocating the fixed facility to another location.

**Table 3.10-1**
**Rankings for Potential Public Utilities Impacts/Conflicts**

| | Electrical Facilities | Natural Gas Lines | Waste Treatment Facilities |
|---|---|---|---|
| Low | No 230-kV or greater facility within study area | 1 to 15 gas lines within study area | No wastewater pipelines of 36-in (91-cm) diameter or greater or treatment facilities within study area. |
| Medium | N/A* | 16 to 30 gas lines within study area | N/A* |
| High | One or more 230-kV substation, power station, or greater facility within study area | 31 or more gas lines within study area | Wastewater pipelines of 36-in (91-cm) diameter or greater or treatment facilities within study area. |
| * N/A = not available. There is no medium rating for this category; impacts are either low (no facilities in the segment) or high (one facility or more in the segment). | | | |

The analysis indicated that with regard to potential conflicts with utilities, there was little difference among the proposed alternatives. This is because utilities generally do not present significant potential impacts that cannot be avoided, minimized, or mitigated through conventional design and construction processes. For instance, most potential conflicts typically would be identified during the design or construction stage of a project, and standard measures would be taken to minimize costs and disruption of service.

### 3.10.2 Affected Environment

A. STUDY AREA DEFINED

The study area for public utilities encompasses the area within 100 ft (30 m) of the centerline of each alignment, and 100 ft (30 m) around stations and airports. The study area is generally located within developed and urbanized areas throughout the five study regions. These areas typically include various underground, at-grade, and elevated utilities that provide water, power, communications, and sewage service to residential, business and manufacturing, and agricultural practices. The following section provides additional information on utility resources.

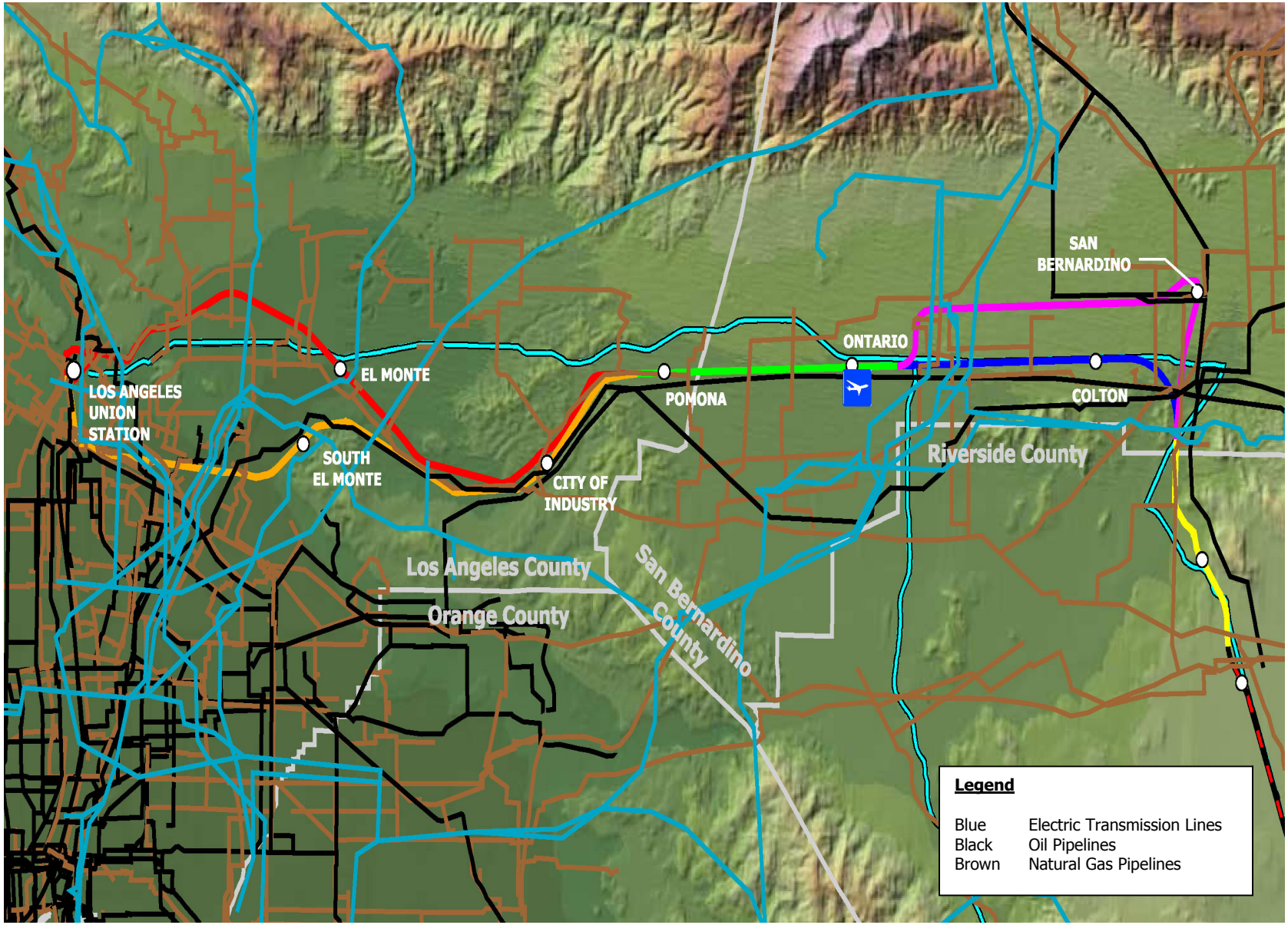
B. GENERAL DISCUSSION OF PUBLIC UTILITIES

As shown in Figure 3.10-1, a representative segment of the proposed HST Alternative in the Los Angeles to San Diego via Inland Empire region illustrates the difficulty in avoiding conflicts with utilities that are present in virtually every segment in the study area. This condition is common across all regions and alignment and design options under consideration.

C. PUBLIC UTILITIES BY REGION

The key service providers and resources in each of the five regions are summarized below. A complete description of these providers and resources is provided in Appendix 3.10-A.

**Figure 3.10-1. Major Utility Lines—Los Angeles to San Diego via Inland Empire Region**



Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley.

- Electrical Facilities—Providers include the Pacific Gas and Electric Company (PG&E), Silicon Valley Power, and City of Palo Alto Utilities (CPAU). There are two power-generating facilities within the region (Santa Clara power plant and Gilroy Cogeneration Plant LP).
- Natural Gas Facilities—Provided by PG&E with the exception of the City of Palo Alto. In the City of Palo Alto, CPAU gas is purchased from commodity suppliers and transported via PG&E's system to CPAU's distribution system.
- Wastewater Treatment and Water—Provided by more than 50 cities and other special districts within the region.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield.

- Electrical Facilities—Provided by PG&E, Sacramento Municipal Utility District (SMUD), and Southern California Edison.
- Natural Gas Facilities—Provided by PG&E.
- Wastewater Treatment—There are three wastewater treatment facilities: Atwater Wastewater Treatment Plant (adjacent to SR-99), Ceres Water Reclamation Facility, and Cross Valley Canal Treatment Plant. Wastewater service is generally provided by each city or other special district within the region.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles.

- Electrical Facilities—Providers include Los Angeles Department of Water and Power (LADWP), City of Burbank, Southern California Edison (SCE), and PG&E. The MacNeil Substation and a 42-megawatt (MW) natural gas/fuel-to-oil electricity power plant are located in the Burbank area.
- Natural Gas Facilities—Providers include Southern California Gas (SCG) and PG&E. Natural gas facilities are provided by pipeline by PG&E.
- Wastewater Treatment—The region is predominantly served by Los Angeles County Sanitation District, Los Angeles City, Rosemund Community Services District, City of Tehachapi Public Works, Mojave Public Utilities Districts, and City of Bakersfield Wastewater Division. Areas not served by these providers are generally served by septic tanks or wastewater plants well beyond proposed alignments.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors.

- Electrical Facilities—Providers include LADWP, SCE, and San Diego Gas and Electric Company (SDG&E).
- Natural Gas Facilities—Provided by Sempra Energy Company through its subsidiaries of SCG and SDG&E.

- Wastewater Treatment and Water—Provided by more than 13 cities and special districts.

Los Angeles to San Diego via Orange County
This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County (LOSSAN) rail corridor.

- Electrical Facilities—Providers include LADWP, SCE, and Sempra Energy Company/SDG&E.
- Natural Gas Facilities—Provided by SCG and three wholesale utility customers, including SDG&E, Southwest Gas Corporation, and City of Long Beach Energy Department.
- Wastewater Treatment—Provided primarily by San Diego Metropolitan Wastewater District, Encina Wastewater Authority, San Elijo Joint Powers Authority, U.S. Marine Corps, and South Orange Wastewater Authority.

### 3.10.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing conditions assume the continued operation of the transportation and public utilities infrastructure described above. The No Project Alternative assumes that, in addition to existing conditions, additional transportation and utility improvements will be developed and operational by 2020. The transportation improvements include projects that are programmed or funded to 2020 (as described in Chapter 2).

It was not possible as part of this study to identify or quantify the utility improvements expected to occur by 2020. Rather, it is assumed that utility development will occur to meet projected demand and growth characteristics near the alignments of the proposed alternatives. For existing transportation facilities, conflicts with electrical transmission lines, natural gas pipelines, oil pipelines, wastewater and water utilities, and other utilities have previously been addressed and few additional or increased impacts are expected from the future transportation improvement included in the No Project Alternative. In addition, it is assumed that measures would be taken to avoid these potential conflicts to the extent feasible and practical, as well as to greatly limit any potential additional costs or disruption of service. It is common practice to coordinate onsite with utility representatives during construction in the vicinity of critical infrastructure such as high-voltage overhead/underground transmission lines, high-pressure gas pipelines, or aqueduct canals. Also, future transportation or utility improvements would be expected to be analyzed in a project-level environmental document, which would incorporate feasible measures to mitigate potentially significant adverse environmental impacts.

Based on the above assumptions, the existing conditions of the No Project Alternative are used to provide the baseline for analysis of potential conflicts with utilities.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

Existing conditions from the No Project Alternative provide the baseline condition. Improvements associated with the proposed Modal and HST Alternatives would result in potential impacts in addition to those resulting from the No Project Alternative. With respect to public utilities, the analysis did not show significant differences when comparing the No Project Alternative to the Modal and HST Alternatives, or comparing the Modal and HST Alternatives. As described above, the number of potential utility conflicts under the No Project Alternative was not identified, and existing conditions were used as the baseline for analysis. For the purposes of this analysis, the existing conditions are treated as representative of the No Project Alternative, and the analysis summarizes the relative

differences between the existing conditions and Modal and HST Alternatives. Because there are several alignment and station options for the HST Alternative, a range of potential utility conflicts was developed that represents the design options with the least to the greatest number of potential conflicts within a region, as summarized below and in Table 3.10-2.

The most significant difference between the alternatives is the lower number of potential high-impact conflicts (conflicts with fixed facilities such as electrical substations, power plants, and wastewater treatment facilities) under the Modal Alternative. For instance, the HST Alternative would result in up to 20 potential fixed-facility conflicts, compared to 10 under the Modal Alternative. This significant difference is because the Modal Alternative generally is an expansion of an existing facility (i.e., highway widening or airport expansion) where high-impact facilities are not likely to be located. In contrast, greater portions of the HST Alternative would be located in undeveloped corridors where high-impact facilities are more likely to be located; however, the undeveloped corridors offer greater potential for avoidance through alignment changes. Another significant finding is the relatively high number of total potential conflicts for both the Modal (up to 384) and HST (as many as 323) Alternatives in the Sacramento to Bakersfield region compared to other regions. This is a result of two major factors.

- The region includes the longest Modal and HST alignments compared to the other regions.
- The Modal and HST alignments pass through developed urban and agricultural areas where there are heavy concentrations of utilities, compared to other more remote regions, such as mountain crossings, where utilities are limited.

**Table 3.10-2**
**Summary of Potential Public Utilities Conflicts for Alternatives[a]**

| Region | Electrical Transmission Lines | Electrical Sub- or Power Stations | Natural Gas Pipelines | Wastewater Treatment Pipelines[b] | Wastewater Treatment Plants | Regional Totals |
|---|---|---|---|---|---|---|
| **Modal Alternative** | | | | | | |
| Bay Area to Merced | 8 | 3 | 80 | N/A | 0 | 91 |
| Sacramento to Bakersfield | 252 | 3 | 128 | N/A | 1 | 384 |
| Bakersfield to Los Angeles | 57 | 2 | 128 | 2 | 0 | 189 |
| Los Angeles to San Diego via Inland Empire | 33 | 1 | 70 | 21 | 0 | 125 |
| Los Angeles to San Diego via Orange County (HST corridor equivalent) | 14 | 0 | 30 | 0 | 0 | 44 |
| Los Angeles to San Diego via Orange County (conventional rail corridor equivalent) | 26 | 0 | 45 | 4 | 0 | 75 |
| **Modal System-wide Totals[c]** | **364** | **9** | **436** | **23** | **1** | **833** |
| **High-Speed Train Alternative[c]** | | | | | | |
| Bay Area to Merced | 3–4 | 1–2 | 51–67 | N/A | 0–0 | 55–73 |
| Sacramento to Bakersfield | 105–227 | 1–5 | 45–89 | N/A | 0–2 | 151–323 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Bakersfield to Los Angeles | 22–47 | 1–1 | 57–138 | 0–3 | 0–1 | 80–190 |
| Los Angeles to San Diego via Inland Empire | 29–29 | 2–9 | 61–64 | 37–51 | 0–0 | 129–153 |
| Los Angeles to Orange County | 22–25 | 1–1 | 73–77 | 0–0 | 0–0 | 96–103 |
| **HST System-wide Totals** | **181–332** | **6–18** | **287–435** | **37–54** | **0–3** | **511–842** |

[a] It is not possible to quantify the utility impacts associated with the No Project Alternative. The existing conditions are assumed to be representative of the future No Project Alternative.

[b] For Bay Area to Merced and Sacramento to Bakersfield regions, the total number of potential wastewater pipeline conflicts was not provided.

[c] The number of potential conflicts associated with the HST Alternative is provided as a range of potential conflicts. For each region, the HST Alternative generally includes various design options within each segment of the region. These routes serve only to provide a reasonable range of impacts for comparative purposes and do not represent any selection of a preferred option.

### 3.10.4 Comparison of Alternatives by Region

The key findings of the utilities analysis by region and alignment options are summarized below. For a complete summary of all utility conflicts by region see Table 3.10-B-1 in Appendix 3.10-B.

A. BAY AREA TO MERCED

Modal Alternative

Within the five segments of the region there would be a total of 11 potential conflicts with electrical utility facilities, of which three are fixed facilities. The Merced to San Jose segment includes two electrical power facilities within the study area: PG&E's Evergreen Substation and Calpine's Gilroy power plant. In addition, the study area for the San Jose to San Francisco segment includes PG&E's San Jose B Substation. There are potential conflicts with natural gas pipelines for a total of 80 potential conflicts in all segments; the San Jose to Oakland segment would have the highest number of potential conflicts (22). No potential conflicts with wastewater treatment plants were identified. There is a potential for conflicts with wastewater pipelines, although no quantifiable data about the total number of potential conflicts were available.

High-Speed Train Alternative

Within the San Jose to Oakland segment, there are two potential high-impact conflicts: the PG&E San Jose B Substation and Santa Clara Power Plant. The San Jose B Substation would potentially conflict with the I-880 alignment option, while the Santa Clara Power Plant would potentially conflict with the Mulford alignment option. The largest number of potential conflicts associated with the HST Alternative would be with natural gas pipelines. There are no potential conflicts with wastewater treatment plants.

High-Speed Train Alignment Option Comparison

The two alignment options for the segment between Oakland and San Jose each would potentially impact an electrical substation and have a similar number of conflicts with natural pipelines, 20 for the Hayward Alignment/I-880 option and 18 for the Hayward/Niles/Mulford option. No other alignment options within the region would result in potential impacts on a fixed facility. From San Jose to Merced, the Pacheco Pass options would each result in more natural gas pipeline conflicts (23) than the three Diablo Range direct tunnel options (9). Each alignment option would potentially conflict with three electrical transmission lines. Along the existing Caltrain corridor between San Francisco and San Jose, the only potential for conflict would be with the 24 natural gas pipelines within the study area.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

Of the 384 total potential conflicts, 255 (66%) are electrical facilities, three of which are high-impact substations. The proposed widening of SR-99 would potentially conflict with two electrical substations in the Sacramento to Stockton segment and one in the Modesto to Merced segment. There are a total of 128 potential conflicts with natural gas pipelines. There is the potential for impacts on the Atwater Wastewater Treatment Plant, which lies adjacent to SR-99 in the Modesto to Merced segment and could be affected by the widening of the highway. There is a potential for conflicts with wastewater pipelines, although data about the total number of potential conflicts have not been gathered.

High-Speed Train Alternative

Within three of the six segments, there is a potential for conflict with either an electrical substation or power station, or a wastewater treatment plant. All the alignment options within the Sacramento to Stockton segment would potentially conflict with electrical substations. Within the Modesto to Merced segment, only one Union Pacific Railroad (UPRR) alignment option would potentially conflict with the Ceres Water Reclamation Facility. All but two alignment options in the Tulare to Bakersfield segment would potentially conflict with either an electrical substation or the Cross Valley Canal Wastewater Treatment Plant.

High-Speed Train Alignment Option Comparison

Within the Sacramento to Stockton segment, the number of potential impacts on fixed facilities is equal for the UPRR and Central California Traction (CCT) alignment options. Depending on the option, the potential fixed-facility conflicts associated with the UPRR and CCT alignment options ranges from one to three. The difference between the alignment options is the addition of another potential electrical substation conflict associated with the UPRR option maintenance facility.

There are no impacts with fixed facilities within the Stockton to Modesto segment. In this segment the UPRR alignment option has more total potential conflicts with electrical transmission lines and natural gas pipelines than the Burlington Northern Santa Fe (BNSF) alignment option.

From Modesto to Merced, one of the connectors to the UPRR alignment option would potentially conflict with a wastewater treatment plant, but the BNSF alignment option would have no major conflicts.

From Merced to Tulare there would be no impacts on fixed facilities for any of the UPRR or BNSF alignment options, and total potential conflicts would be similar for all alignment options.

In the Tulare to Bakersfield segment, each UPRR alignment option would potentially impact an electrical substation, and the majority would also potentially impact a wastewater treatment plant. The BNSF alignment option would not impact an electrical substation, but would potentially impact a wastewater treatment plant.

In general, the alignment option with the greatest number of potential high-impact conflicts and total utility conflicts follows the UPRR alignment. The difference between the alignment options with the greatest potential conflicts and the least potential conflicts is six fixed facilities, and 100 transmission line and natural gas pipeline conflicts. This represents a substantial difference and should be considered a primary discriminator between the alignment options.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

There are 57 potential conflicts with electrical facilities within the study area. This includes potential conflicts in all project segments, with the exception of SR-58/14 from SR-99 to Palmdale (because there is no highway widening in that area). Within the I-5: Burbank to Los Angeles Union Station (LAUS) segment, there is the potential for conflict with the McNeil Substation and a 42-MW electrical power plant in the City of Burbank. Of the total 128 potential conflicts with natural gas pipelines, the I-5 between SR-14 and SR-99 segment has the greatest number (88). There are limited potential conflicts with wastewater facilities, with the exception of I-5: SR-99 to SR-14 segment where there are two potential conflicts with a major sewage pipeline.

High-Speed Train Alternative

In the Bakersfield to Los Angeles region, there is the potential for two high-impact conflicts. The SR-58 corridor alignment option in the Bakersfield to Sylmar segment would traverse a portion of the Lancaster Water Reclamation Plant, while the Burbank Metrolink/Media City in the Sylmar to downtown Burbank segment would potentially conflict with the McNeil Substation. All alignment options would potentially conflict with the McNeil Substation since it is part of the only option through the Sylmar to downtown Burbank segment.

High-Speed Train Alignment Option Comparison

From Bakersfield to Sylmar, only the SR-58 corridor alignment option would potentially impact a fixed facility, the Lancaster Water Reclamation Plant. Among the alignment options in the segment there is a wide range of total potential conflicts with utility infrastructure. The SR-58/Soledad Canyon corridor option would have the fewest overall utility conflicts, while the I-5 Tehachapi corridor option would have the most conflicts.

Within the Sylmar to downtown Burbank segment, the majority of potential conflicts are associated with the station options, including one potential impact on an electrical substation as part of the Burbank Metrolink/Media City. The MTA/Metrolink alignment option has two potential conflicts with natural gas lines, while the Combined I-5/Metrolink option has one potential conflict with natural gas lines.

There are no impacts on fixed facilities in the downtown Burbank to Los Angeles segment. There are no substantial differences in the total number of potential conflicts among the various alignment options.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

Under the Modal Alternative, the segment with greatest number of potential impacts is the LAUS to March Air Reserve Base. This segment traverses the most developed area of the region and contains the most utility infrastructure. There are a total of 25 potential conflicts with electrical facilities within the segment, including one potential conflict with SCE's Vista Substation. There are 70 potential conflicts with natural gas lines, with equal distribution among all segments. There are 21 potential conflicts with wastewater treatment facilities, of which 18 are located in the Los Angeles to March ARB segment. Utility conflicts are not anticipated at either the Orange or San Diego airport.

High-Speed Train Alternative

Within each segment of the Los Angeles to San Diego via Inland Empire region there would be a potential conflict with an electrical substation or power plant. All alignment options in the Los Angeles to March ARB segment and March ARB to Mira Mesa segment would potentially conflict

with one or more electrical power stations. In the Mira Mesa to San Diego segment, two of the three alignment options (both I-15 to the coast alignment options) would potentially conflict with a power station. There would be no potential conflicts with any wastewater treatment plants.

High-Speed Train Alignment Option Comparison

Each alignment option in the Los Angeles to San Diego via Inland Empire region, except the I-15 to Qualcomm Stadium option, would potentially impact fixed electrical facilities. The UPRR Riverside Line to San Bernardino option has the greatest potential for impacts, with seven conflicts with electrical substations. Both the UPRR Colton Line to San Bernardino and UPRR Riverside/UPRR Colton Line options would potentially impact four electrical substations.

The fourth alignment option in the Los Angeles to March ARB segment is the UPRR Colton Line, which would potentially impact one electrical substation. Additionally, each of the alignment options in this segment would result in similar numbers of conflicts with electrical transmission lines, natural gas pipelines, and wastewater pipelines.

Each alignment option in the March ARB to Mira Mesa segment would potentially impact one fixed electrical facility and have similar numbers of conflicts with other public utilities infrastructure.

From Mira Mesa to San Diego, each I-15 to the coast alignment option would potentially impact one fixed electrical facility, while the I-15 to Qualcomm Stadium would not impact any fixed facilities and have relatively few potential conflicts with other public utility infrastructure (four natural gas pipelines and one wastewater treatment pipeline).

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

There are 26 locations in which the corridor is crossed by 230-kV transmission lines. No electrical substations or power plants were identified within the 100-ft (30-m) study area of I-5. High-pressure natural gas pipelines cross the I-5 corridor in 45 locations. Water treatment facilities crossing the I-5 corridor include two treated wastewater ocean outfalls in the Camp Pendleton segment and two major sewer trunk lines, one in the I-5/805 to SR-52 segment and another in the SR-52 to Santa Fe Depot segment.

High-Speed Train Alternative

There would be no impacts on fixed facilities in the LAUS to LAX alignment option. The potential conflicts for this option include six electrical transmission lines and 41 natural gas pipelines. Each alignment option from LAUS to Irvine would potentially impact an electrical substation. The LOSSAN option would result in slightly more potential conflicts with other utility infrastructure (49 conflicts) than the UPRR Santa Ana Branch option (44 conflicts). There are no impacts on wastewater facilities within the HSR corridor.

### 3.10.5 Design Practices

The public utilities impact analysis is programmatic and addresses only representative utilities; it does not address all utilities and does not address local details. Project-level analysis would address all utilities and local issues once the alignments are more defined. The Authority plans to avoid these potential conflicts to the extent feasible and practical, as well as to greatly limit any potential additional costs or disruption. It is common practice to coordinate onsite with utility representatives during construction in the vicinity of critical infrastructure such as high-voltage overhead/underground transmission lines, high-pressure gas pipelines, or aqueduct canals. Also, future transportation or utility improvements would be

analyzed at the project-level environmental review along with feasible measures to mitigate potentially significant adverse environmental impacts.

### 3.10.6 Mitigation Strategies and CEQA Significance Conclusions

Proposed general mitigation strategies for potential utility conflicts should first focus on avoidance of the potential conflicts. If such conflicts are unavoidable, the next strategy should focus on reducing and minimizing the potential impact. The mitigation strategies are similar for all regions and would be refined during subsequent project-specific review.

For large utilities, such as wastewater treatment facilities, electrical substations, and pipelines, the strategy would be first to avoid crossing or using any of the utility right-of-way or facility footprint as the project-specific review proceeds and as engineering designs are refined. Avoidance opportunities should include consideration of modifying both the horizontal and vertical profiles of the proposed transportation improvements.

If avoidance is not feasible, and adjustment of alignments has not removed potential conflict, then in close consultation and coordination with the utility owner, relocation/reconstruction/restoration of the utility should be considered as a second mitigation strategy. This type of mitigation could include combining several utilities into a single utility corridor, or relocation or reconstruction. Where feasible and cost-effective, consolidating several utilities, primarily underground electrical and communications utilities, into one conduit should be considered during utility relocation planning.

Potential strategies to avoid and/or mitigate potential utility conflicts associated with the HST Alternative include but are not limited to the following:

- Make adjustments to the HST alignments and profiles to avoid major utility lines or facilities.
- Relocate transmission lines or substations.
- The co-lead agencies would comply with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 in the acquisition of all property necessary for the proposed HST system.
- During final design, the Authority would consult with each utility provider/owner to avoid or reduce potential impacts on existing and planned utilities through design refinements. Should impacts be unavoidable, all affected facilities would be relocated or protected in place prior to, during or after construction, as appropriate, and in accordance with the methods and designs approved by the affected utility provider/owner.

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for public utilities and service systems, the HST system alternative would not be expected to result in a significant effect on utilities and utility services when viewed on a system-wide basis. The proposed location of the HST system largely within existing transportation corridors reduces the systemwide potential to affect utility operations. In locations where a proposed HST alignment would intersect or be in close proximity to existing utility pipelines or facilities, design modifications and avoidance strategies would be applied to avoid and to limit impacts to utilities. Opportunities for utility relocation and coordination would also help avoid utility impacts. Design practices and mitigation strategies would be applied also to avoid even temporary curtailment of services during construction. Because the proposed HST system, as analyzed in Chapter 5, would not contribute significantly to statewide population growth, it is not expected to result in a significant increase in demand for public utility services, and thus, viewed on a system-wide basis it would have a less-than-significant effect on these services.

The above mitigation strategies are expected to reduce impacts of the HST system alternative to utilities to a less-than-significant level. Additional environmental assessment will allow a more precise evaluation in the second-tier of environmental analyses.

### 3.10.7 Subsequent Analysis

As previously mentioned, the public utilities impact analysis is programmatic and addresses only representative utilities; it does not address all utilities and does not address local details. Project-level analysis would address all utilities and local issues once the alignments are more defined. Project-level environmental documentation and subsequent planning documents should include more detailed information on the following utilities.

- Water supply lines.
- Wastewater conveyance lines.
- Wastewater and water pump stations.
- Storm drains.
- Fiber-optic lines.
- Telecommunication lines.
- Other utilities, and pipelines likely to be crossed or conflict with the various alternative alignments, including liquid petroleum, crude oil, etc.

# 3.11 HAZARDOUS MATERIALS AND WASTES

This section identifies the potential for impacts on areas that may be contaminated with hazardous materials and/or wastes for the No Project, Modal, and High-Speed Train (HST) Alternatives within the five project regions. According to Title 22 C.C.R. § 66261, waste is considered *hazardous* if it exhibits at least one of the four characteristics of ignitability, corrosivity, reactivity, or toxicity, or if it is a "listed waste." Waste can be liquid, semi-solid, or gaseous. A potential hazardous waste impact is any potential conflict between an alignment, station, or airport facility and a known contaminated site, including crossings of a known contaminated site regardless of depth or height. The section focuses on contamination at sites on the National Priorities List (NPL)/Superfund, California's high-priority Annual Work Plan (AWP) sites, and solid waste landfill (SWLF) sites.

## 3.11.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Hazardous materials and waste sites, including their use and remediation, are regulated by a number of federal laws, including the Resource Conservation and Recovery Act and the Comprehensive Environmental Response and Liability Act (CERCLA).

California's hazardous materials regulations for the discovery of hazardous substances in the subsurface during construction, and the disposal of hazardous materials and cleanup of the hazards area incorporate most federal hazardous materials regulations. California's statutes and regulations on hazardous materials are contained in Health and Safety Code Section 25130 *et seq*. and Title 22 C.C.R., which contains regulations adopted and administered by the California Department of Toxic Substances Control (DTSC). California regulations require that hazardous waste be managed according to applicable regulations that include worker operational safety procedures as identified in Title 8 C.C.R.; handling, storage, and exposure requirements; transportation and disposal requirements under a uniform hazardous waste manifest; and documentation procedures. In California, waste disposal facilities are classified in three categories: Class I, Class II, and Class III. A Class I disposal facility may accept federal and California hazardous waste. Class II and Class III facilities are only permitted to accept non-hazardous waste at facility specific acceptance threshold levels established by the Regional Water Quality Control Board (RWQCB), the permitting agency.

Additional federal and state regulations address worker exposure to safety and health hazards. The federal regulations are identified in Title 29 C.F.R., and the state regulations are in Title 8 C.C.R. The federal and California Occupational Safety and Health Administrations are the primary agencies responsible for enforcing these regulations.

B. METHOD OF EVALUATION OF IMPACTS

Identification of Hazardous Sites

Impacts on hazardous waste and/or material sites are an important consideration in the development of any major transportation improvement project. Remediation of such sites can dramatically increase the overall cost of a project. It is important to know early in the environmental analysis process where potential conflicts with these sites may occur, so that proper planning can be done to avoid these locations where possible. At this program level of analysis, available databases and information regarding the extent and nature of known hazardous materials/hazardous waste sites were reviewed. The following databases were consulted for information on potential hazardous materials risks.

- Federal National Priorities List/Superfund: This U.S. Environmental Protection Agency-developed database lists sites that pose an immediate public health hazard, and where an immediate response to the hazard is necessary. These listings are also found in the CERCLA database, also known as CERCLIS (Title 42 U.S.C. Chapter 103).
- State Priority List: Sites listed in this DTSC and RWQCB database are priority sites that were compiled from AWP and CAL-SITE databases, and sites where Preliminary Endangerment Assessments were conducted by the California Environmental Protection Agency (CEPA). The AWP database lists contaminated sites authorized for cleanup under the Bond Expenditure Plan developed by the California Department of Health Services as a site-specific expenditure plan to support appropriation of Hazardous Substance Cleanup Bond Act funds.
- State of California Solid Waste Landfills: The landfill sites listed in this database generally have been identified by the state as accepting solid wastes. This database includes open, closed, and inactive solid waste disposal facilities and transfer stations pursuant to the Solid Waste Management and Resource Recovery Act of 1972 and is maintained by the California Integrated Waste Management Board. The locations of the disposal facilities are primarily identified through permit applications and local enforcement agencies.

Methods of Analysis

The hazardous materials and wastes analysis for this Program EIR/EIS entailed a qualitative comparison of potential impacts on humans and the natural environment from exposure to hazardous materials or wastes that could result from proximity to or potential disturbance of sites containing these materials due to the No Project Alternative, the Modal Alternative, or the proposed HST Alternative. As described above, the analysis was based on the results of a database search (Environmental Data Resources 2003) for a study area that included the potential HST and Modal alignment corridors as well as proposed station locations and existing airports, as described below in Section 3.11.2. For this program-level broad analysis of potential impacts related to known priority hazards sites, the analysis was limited to hazardous materials sites and hazardous waste sites listed on the NPL, SPL, and SWLF databases. Other types of sites, such as sites with leaking underground storage tanks (LUSTs), would be considered in a subsequent phase of analysis, when site-specific analysis could be tied to more detailed alignment plans and profiles. No site-specific investigations were conducted for this analysis. Because of the large area covered, such analyses would not be cost-effective at this program-level analysis.

Potential impacts of the Modal and HST Alternatives were compared to conditions under the No Project Alternative. This assessment assumed that impacts related to hazardous materials/hazardous waste exposure could occur both during project construction and during project operation. It was based on the anticipated difference between No Project conditions and conditions under the Modal and HST Alternatives, in terms of the estimated area of the proposed improvements described in Chapter 2, *Alternatives*, which guided the identification of study area boundaries. Particular attention was paid to the extent of improvements that would occur outside existing rights-of-way. This analysis focused on the number of identified NPL, SPL, and SWLF sites within the study area. The program-level comparison of alternatives in this section assesses the relative degree to which known hazardous material and waste sites could constrain the alternatives by requiring costly disposal conditions and site cleanup and remediation. The number of sites gives some indication of an overall level of potential impact; more sites generally imply more potential impact. In this comparative analysis, each type of listing (NPL, SPL, and SWLF) was given equal weight. The program-level analysis does not include a detailed assessment of the nature or extent of any hazardous materials or wastes that may be present at identified sites, or the degree or specific nature of potential impacts under the various alternatives. The analysis and identification of potential hazards within the study area of

alternative corridors and alignments is useful in comparing alternatives and in identifying areas where avoidance may be possible in subsequent project-level review.

### 3.11.2 Affected Environment

A. STUDY AREA DEFINED

The Modal and HST Alternatives would result in substantial improvements to existing highway, aviation, and rail infrastructure within or adjacent to existing rights-of-way, in addition to the No Project transportation improvements. Therefore, the study area for the presence of hazardous materials and wastes includes existing transportation corridors, new HST corridors, and areas where passenger stations, airport expansions, and HST storage and maintenance facilities are being considered. The study area consisted of a 500 ft-wide (152 mm-wide) (250 ft [76 m] on either side of the centerline or the facility) corridor along each rail and highway alignment identified for the Modal and HST Alternatives, and a 250-ft (76-m) radius around each airport and station facility. The study area boundaries were based on the distance within which a hazardous material or waste site could impact the possible location of a transportation improvement under the Modal or HST Alternative.

B. HAZARDOUS MATERIALS AND WASTE SITES BY REGION

Most of the hazardous materials and hazardous waste sites in the study area are relatively minor in extent and could be effectively mitigated through typical design and construction practices. Fewer major sites are known to be located in the vicinity of the proposed HST system alignment options than near existing highway alignments. Figure 3.11-1 shows the general locations of hazardous materials and hazardous waste sites identified through the database search. Additional information on the results of the database search is presented in Appendix 3.11-A and in the hazardous materials and hazardous wastes technical evaluation documents prepared for each region (Environmental Data Resources 2003).

### 3.11.3 Environmental Consequences and Comparison of Alternatives by Region

The potential severity of impacts from hazardous material or waste releases on the construction, operations, and maintenance of the proposed alternatives would depend on two factors: the nature and severity of contamination, and the construction and operations/maintenance activities that are likely to occur near the sites. The sites that pose the greatest concern are those with soil or groundwater contamination within or adjacent to the right-of-way, and those with groundwater contamination near areas where excavation down to groundwater would be necessary. For example, dewatering during excavation, trenching, or tunneling could alter local subsurface hydraulic gradients and draw groundwater contamination into excavated areas, trenches, or tunnels. In addition, fuel or chemical vapors could move through the vadose zone[1] to excavated areas (during construction), or to underground structures associated with the rail line such as vaults and manholes (during project operation).

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The description of existing conditions in the study area was based on the known hazardous materials sites in the vicinity of the transportation infrastructure that exists in 2003. The No Project Alternative would incorporate local, state, and interstate transportation system improvements designated in existing plans and programs. This analysis assumed that no additional hazardous material or waste impacts would occur beyond those already addressed or those that would be addressed in the environmental documents for those improvement projects, and that any such impacts would largely

[1] The *vadose zone* comprises the region between the land surface and underlying groundwater aquifers and is the geologic zone through which pollutants and contaminants travel prior to entering groundwater (INEEL National Vadose Zone Project 2002).

**FIGURE 3.11-1. Hazardous Material and Waste Locations in the Study Area**

be mitigated as part of those projects. For the purpose of this analysis, existing hazardous materials sites and hazardous waste sites identified in the available databases were treated as the baseline for comparison. While the future conditions for the No Project Alternative may result in some additional hazardous materials or waste impacts, they cannot be predicted or estimated for purposes of this program-level analysis. Similarly, it can be presumed that during the next 17 years some of the existing hazardous waste sites would be cleaned up or remediated as part of CEPA and RWQCB efforts.

Projects included under the No Project Alternative would be completed before construction of the Modal or HST Alternative. Construction associated with the No Project Alternative, compared to existing conditions, would vary depending on the region being analyzed. As identified in the hazardous materials and hazardous wastes technical evaluation documents prepared for each region (Environmental Data Resources 2003), in the Bay Area to Merced and the Los Angeles to San Diego via Inland Empire regions, the difference between existing conditions and the No Project Alternative would likely be greater than that between the No Project Alternative and the Modal or HST Alternative. The opposite is expected to be the case in the Sacramento to Bakersfield, Bakersfield to Los Angeles, and Los Angeles to San Diego via Orange County (LOSSAN) regions. This assumption and assessment of potential impacts is based on the estimated land area of the anticipated improvements and particularly on the amount of improvements that would likely occur outside of existing right-of-way. This assumption does not take into account the dollar value or complexity of the anticipated improvements.

### B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

As described above, the No Project Alternative was used as a proxy for the baseline 2020 condition; the impact from any improvements associated with the Modal or HST Alternatives would be in addition to the impacts from the 2020 No Project Alternative. Table 3.11.3-1 compares the number of potential hazardous material and waste sites identified under the Modal and HST Alternatives, based on more detailed information presented in Appendix 3.11-A.[2]

As shown in Table 3.11.3-1, the number of sites identified for the HST Alternative varies widely depending on which alignment and station options are selected, ranging from 31 (less than under the Modal Alternative) to 75 (more than twice the number of sites identified under the Modal Alternative). The numbers of sites identified for the HST Alternative in the Bakersfield to Los Angeles; Los Angeles to San Diego via Inland Empire; and LOSSAN, including Los Angeles Union Station to Los Angeles International Airport segments are greater for any alignment option than those identified for the Modal Alternative. The Bay Area to Merced and Sacramento to Bakersfield segments are the only regions in which fewer sites were identified for at least one HST Alternative alignment than for the Modal Alternative, probably because the HST Alternative alignment, depending on alignment option, would follow a route with fewer SWLFs than the Modal Alternative.

Assuming that a larger number of identified hazardous materials and hazardous waste sites increases the potential for hazardous materials and hazardous waste impacts, under the HST Alternative the extent of cleanup or remediation required depends on the alignment and station options selected—and, depending on the route and station locations, the HST Alternative could have either a greater or a lesser potential for such impacts than the Modal Alternative. The extent of cleanup or remediation would translate into additional costs for construction, which could make a major difference in practicality or feasibility of an alternative. As described above, this analysis was limited to searches

[2] Appendix 3.11-A shows the number of identified NPL, SPL, and SWLF sites associated with the HST and Modal Alternatives. For the Modal Alternative, the number of sites includes those identified along the roadway alignments and around airport improvements. For the HST Alternative, the number of sites includes those identified along the alignment options, stations, and storage and maintenance facilities.

of standard databases listing known sites and did not incorporate information on other smaller sites that could contribute to risk on a local basis and would be studied at the project-specific level, if the proposed HST system is pursued. In addition, because neither site-specific investigations nor onsite fieldwork was performed, little or no information is available about the nature and severity of contamination at the sites identified, or the schedule or program for cleanup, if any, so the comparison above represents a "site-count" approximation and may not fully divulge potential risk levels. Finally, much of both the Modal and HST Alternative alignments would be within existing right-of-way, and these alignments have a land-use history under which additional unknown contamination (e.g., spills or accidental releases) would be a possibility. Consequently, although no unavoidable hazardous materials and hazardous waste impacts are expected under either the Modal Alternative or HST Alternative, hazardous materials and hazardous waste information available at the program level is not sufficient to distinguish the two alternatives.

**Table 3.11.3-1**
**Potential Hazardous Material and Waste Sites Comparison Modal and High-Speed Train Alternatives**

| Region | Modal Alternative | HST Alternative | |
|---|---|---|---|
| | | Fewest Identified Sites | Most Identified Sites |
| Bay Area to Merced | 5 | 3 | 11 |
| Sacramento to Bakersfield | 16 | 8 | 24 |
| Bakersfield to Los Angeles | 8 | 13 | 23 |
| Los Angeles to San Diego via Inland Empire | 4 | 7 | 14 |
| Los Angeles to San Diego via Orange County | 2 | 5 | 5 |
| Total Sites* | 33 | 31 | 72 |

* Totals presented do not include the identified LOSSAN sites because this segment is not a part of the HST Alternative defined for the representative demand.

Source: Environmental Data Resources 2003.

### 3.11.4 Design Practices

At this programmatic level of study it is not possible to identify specific hazardous material impacts, determine the nature and severity of contamination, or the construction and operations/maintenance activities that are likely to occur near specific sites. However, the Authority is committed to avoiding and minimizing potential impacts through design refinement at the project level as well as the use of best practices to avoid potential impacts during construction.

### 3.11.5 Mitigation Strategies and CEQA Significance Conclusions

Mitigation for impacts related to hazardous materials and/or hazardous wastes depends on detailed site-specific investigations (environmental site assessments) that have not been performed at this programmatic level of analysis. More detailed analysis and specific mitigation measures would be included in subsequent project-level analysis. Mitigation strategies could include realignment of the HST corridor or relocation of associated features such as stations to avoid an identified site, and remediation of identified hazardous material/waste contamination.

In addition, potential mitigation strategies would include, but are not limited to, the following:

- Investigate soils for contamination and prepare environmental site assessments (ESA) when necessary.

- Prior to demolition of buildings for project construction, survey for lead-based paint and asbestos-containing materials.
- Acquire necessary permits if ground dewatering is required
- When indicated by project level ESA's, perform a Phase II ESA (e.g., hydrogeologic investigation) to identify specific mitigation measures. Perform Phase II ESA's in conformance with the ASTM Standards Related to the Phase II Environmental Site Assessment Process (E1903-01)
- Prepare a Site Management Program/Contingency Plan (SMP/CP) prior to construction to address known and potential hazardous material issues SMP/CP including:
  - Measures to address management of contaminated soil and groundwater
  - Site-specific Health and Safety Plan (HASP) including measures to protect construction workers and general public
  - Procedures to protect workers and the general public in the event that unknown contamination or buried hazards are encountered

Based on the analysis above, and considering CEQA Appendix G thresholds of significance and the standards described in paragraph 3.11 for hazardous materials and hazardous wastes, the proposed HST alternative would have a potentially less than significant effect on hazardous materials and hazardous waste when viewed on a systemwide basis. At this programmatic level of review, it is not possible to identify specific hazardous material impacts, or the nature and severity of contamination at specific sites. However, the Co-lead agencies' commitment of using design practices to minimize impacts, and the use of best practices and mitigation strategies for remediation of hazardous sites, are expected to substantially lessen or avoid impacts to hazardous materials and wastes. With the second-tier, project-level review, specific impacts to sites with hazardous materials will be identified, and mitigation measures based on these mitigation strategies will be applied on a site-specific basis. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses.

### 3.11.6 Subsequent Analysis

Specific studies that would be required for project-level environmental documentation include environmental site assessments, which would study the identified hazardous materials and hazardous waste sites in more detail to evaluate the nature and level of contamination and allow thorough analysis of potential impacts in accordance with applicable regulatory requirements. Tasks to be performed as part of the project-level environmental site assessment would be expected to include the following.

- Environmental database search. This would include additional databases (e.g., Cortese list, LUST list, other sites, etc.).
- Review of historical land use for all alignment options or corridor alternatives carried forward for detailed analysis.
- Site reconnaissance.
- Review of agency records and agency consultation.
- Data analysis and report preparation.

# 3.12 CULTURAL AND PALEONTOLOGICAL RESOURCES

*Cultural resources* include prehistoric archaeological sites, historic archaeological sites, traditional cultural properties, and historic structures. *Paleontological resources* are resources in the fossil record, such as prehistoric remains and other evidence of past life. This section discusses the applicable federal and state laws and regulations that protect cultural and paleontological resources, including Section 106 of the National Historic Preservation Act (NHPA) and California Public Resources Code Sections 5024.1 and 21084.1, and assesses the potential for the proposed high-speed train (HST) system and alternatives to have impacts on these resources.

## 3.12.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Cultural Resources

The NHPA (16 U.S.C. § 470 *et seq.*) established a national program to preserve the country's historical and cultural resources. Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties and provide the President's Advisory Council on Historic Preservation an opportunity to comment on a proposed action before it is implemented. Guidelines for implementing the Section 106 process are provided in 36 C.F.R. § 800. Both state and federal guidelines for cultural resources recognize that buildings, structures, objects, districts, and cultural landscapes can be historically significant. The NHPA refers to these significant resources as "historic properties," while under CEQA, such highly sensitive resources are referred to as "historical resources." Adverse changes to historic properties and historical resources caused by an undertaking are described as "adverse effects" under Section 106, and as "adverse changes" or "adverse impacts" under CEQA. Under state law, projects that would cause a substantial adverse change in the historical significance of a historical resource are considered projects that may have a significant impact on the environment for CEQA purposes (see below for NHPA and CEQA discussion. Under NHPA Section 106 (36 C.F.R. § 800.16), an historic property is "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" (NRHP). Districts include the property types known as cultural landscapes (historic, rural, designed, etc.). To be eligible for the NRHP these property types must meet at least one of the NRHP significance evaluation criteria (36 C.F.R. § 60.4) to be considered an historic property, and the property must also possess integrity. NRHP historic properties meet one or more of the following evaluation criteria:

- The property is associated with events that have made a significant contribution to the broad patterns of our history (Criterion A).
- The property is associated with the lives of persons significant in our past (Criterion B).
- The property embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction (Criterion C).
- The property has yielded, or may be likely to yield, information important to prehistory or history (Criterion D).

Under CEQA, significant cultural resources are called "historical resources" whether they are of historic or prehistoric age. *Historical resources* are resources that are listed, or eligible for listing, in the California Register of Historical Resources (CRHR), or which are listed in the historical register of a local jurisdiction (county or city). NRHP historic properties located in California are considered to be historical resources for the purposes of CEQA and are also listed in the CRHR (P.R.C. § 5024.1). Generally, a resource should be considered an historical resource for the

purposes of CEQA if it has integrity and meets one or more of the criteria for listing in the CRHR (CEQA Guidelines § 15064.5[a][3]). These state criteria are based upon, and are very similar to, federal significance criteria:

- The resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (Criterion 1); or
- The resource is associated with the lives of persons important in California's past (Criterion 2); or
- The resource embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of an important creative individual; or possesses high artistic values (Criterion 3); or
- The resource has yielded, or may be likely to yield, information important in prehistory or history (Criterion 4).

The NRHP and CRHR criteria are almost identical. Any resource determined eligible for NRHP is also automatically eligible for CRHR. However, the term "historical resources" under CEQA and CRHR is more inclusive since resources listed in local historical surveys that meet Office of Historic Preservation standards are encompassed.

The definition of effect for the purposes of Section 106 of NHPA is contained within 36 CFR § 800: "*Effect* means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." An adverse effect occurs "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association… Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative."[1] Examples of adverse effects may include, but are not limited to: destruction, damage, alteration, or relocation of a historic property, as well as the introduction of elements that diminish the property's integrity, cause neglect of a property, or its transfer out of federal ownership.[2]

Impacts on historical resources listed in or eligible for the CRHR constitute a significant effect on the environment (significant impacts that must be disclosed in a CEQA environmental document) if the impact constitutes a substantial adverse change in the significance of a historical resource (P.R.C. § 21084.1). Similar to the federal definition of adverse effect, a *"substantial adverse change"* to a historical resource under CEQA includes "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines § 15064.5[b][1]). *Material impairment* includes changes to the physical characteristics that make a historical resource eligible for listing in the CRHR such that the resource would no longer be eligible for the CRHR or a local historical register (CEQA Guidelines § 15064.5[b][2]).

Paleontological Resources

The following United States statutes incorporate provisions for the protection of paleontological resources.

[1] 36 CFR 800.5(a)(1).

[2] 36 CFR 800.5(a)(2)(i through vii).

- Federal Antiquities Act of 1906 (16 U.S.C. § 431 *et seq.*): Establishes national monuments and reservation of lands that have historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federal lands. Section 433 prohibits appropriation, excavation, injury, or destruction of any historic or prehistoric ruin or monument, or any object of antiquity on Federal lands only.
- National Environmental Policy Act of 1969 (P.L. 91–190, 83 Stat. 852, 42 U.S.C. §§ 4321–4327): Mandates policies to "preserve important historic, cultural, and natural aspects of our national heritage" (§ 101.b4).

In California, fossil resources are considered a limited, nonrenewable, highly sensitive scientific resource. The following state statutes incorporate provisions for the protection of paleontological resources.

- CEQA (P.R.C. § 21000 *et seq.*): Requires public agencies and private interests to identify the potential adverse impacts and/or environmental consequences of their proposed project(s) to any object or site that is historically or archaeologically significant or significant in the cultural or scientific annals of California (P.R.C. § 5020.1). Under CEQA, archaeological resources are presumed nonunique unless they meet the definition of "unique archaeological resources" (P.R.C. § 21083.2[g]). Under CEQA, an impact on a nonunique archaeological resource is not considered a significant environmental impact. An EIR need not discuss nonunique archaeological resources.
- CEQA Guidelines (14 C.C.R. § 15064.5 [a][3]): Provides that a lead agency may find that "any object, building, structure, site, area, place, record, or manuscript" is historically significant or significant in the "cultural annals of California." The section also provides that, generally, a resource may be considered historically significant if it has yielded or may be likely to yield information important in prehistory. Paleontological resources fall within this broad category and are included in the CEQA checklist under *Cultural Resources*.
- Public Resources Code Section 5097.5: Prohibits excavation or removal of any "vertebrate paleontological site ... or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands." *Public lands* include lands owned by or under the jurisdiction of the State of California or any city, county, district, authority, or public corporation, or any agency thereof. This section provides that any unauthorized disturbance or removal of paleontologic, archaeologic, and/or historic materials or sites located on public lands, which violates the section, is a misdemeanor.
- Public Resources Code Section 30244: Requires reasonable mitigation of adverse impacts on paleontological resources resulting from development on public land in the Coastal Zone, as defined in Public Resources Code Section 30103.

## B. METHOD OF EVALUATION OF IMPACTS

Archaeological Sites and Traditional Cultural Properties

The FRA initiated consultation with the State Historic Preservation Office (SHPO) under Section 106 of the NHPA in November 2002 with a letter (Appendix 3.12-A) that proposed a phased identification effort for historic properties as provided for in 36 C.F.R. § 800.4 (b)(2). The SHPO concurred with the phased identification and evaluation for compliance with Section 106 in November 2002 (Appendix 3.12-A). The study area for cultural resources is the Area of Potential Effect (APE), which was defined by the FRA in consultation with the SHPO, who concurred by email in January 2003 (Appendix 3.12-A). The SHPO was also consulted about the method of evaluation for this Program EIR/EIS.

Cultural resources studies began with records searches obtained from the appropriate California Historical Resources Information System (CHRIS) Information Centers. The records searches identified the general locations of previously recorded archaeological sites in the APE. The number of known archaeological sites within the APE for each alternative was tabulated and used as an indicator of potential sensitivity for the comparison of the relative degree of potential impacts or effects for each alternative. For this program-level analysis, individual archaeological sites were not evaluated for eligibility. Instead, the archaeological sites identified as a result of the records searches were considered potentially eligible for listing in the CRHR or the NRHP, and the number of archaeological sites per linear mile identified in the APE for each alternative was used as one indicator of the relative degree of potential impacts on cultural resources from construction or operation of that alternative. Impacts on NRHP-eligible archaeological resources include physical destruction or damage. The total number of archaeological sites in the APE for the corridor was divided by the total length of the corridor being evaluated to arrive at an average number of sites (or proportion of sites) per mile. That average was then translated to a qualitative rating of *low*, *medium*, and *high* impacts as follows.

- Low: 0.00–0.25 site per mile for the corridor.
- Medium: 0.26–0.75 site per mile.
- High: 0.76–more than one site per mile.

The cultural resource specialist's knowledge and background of regional prehistory supplemented the records search results. For example, if the cultural resource specialist has previous experience that several sites have been identified along a particular river drainage in the region, but the records search did not yield formally recorded sites in CHRIS within the APE for a particular alternative route, the cultural resource specialist documented the additional information and, based on it, increased the rating for that corridor.

Certain kinds of prehistoric sites and certain kinds of material sites are often regarded by contemporary Native Americans as especially sensitive. These include habitation sites, shell mounds, and burials. If sites with these characteristics were present along the route for an alternative, that route was automatically ranked high for archaeological resources, indicating that the potential sensitivity to impacts from construction disturbance would be greater in that corridor than in a corridor ranked as low or medium.

Historic-era Properties and Historical Resources

The method used in this Program EIR/EIS for evaluating potential effects and impacts to historic-era properties and historical resources began with the same consultation as used for prehistoric resources. The FRA initiated consultation with SHPO under Section106 of the NHPA in November 2002 with a letter (Appendix 3.12-A) that proposed a phased identification effort for historic properties as provided for in 36 C.F.R. § 800.4 (b)(2), and requested the SHPO to comment on the proposed Area of Potential Effect (APE) for cultural resources (prehistoric and historic) for this Program EIR/EIS. The SHPO concurred with the phased identification and evaluation for compliance with Section 106 in November 2002 and the APE by email in January 2003 (Appendix 3.12-A). The SHPO was also consulted about the method used to predict potential effects and impacts for this Program EIR/EIS.

The method used to predict potential effects and impacts of the HST program on historic properties and historical resources is based upon estimating the amount of historic development that occurred along each proposed segment/alignment. These estimates were based upon review of existing documentation, including historical maps, aerial photographs, and local inventories, and the preparers' knowledge of the history of the region. New surveys of historic-period properties/resources were not conducted for this program-level analysis. Instead, the

likelihood that a proposed HST route would affect or impact historic properties or historical resources was determined by estimating the linear miles of each alternative that pass through historic development, i.e., buildings, structures, objects, sites, district, and/or landscapes that developed during specific historical time periods (before 1900, 1900 to 1929, and 1930 to 1958). This likelihood, or sensitivity, was calculated by measuring the linear miles of development that occurred during each historic period, so that the various program alternatives could be compared based on the percentage of each route that passed through historic development. The more area along each HST route alternative that developed historically, the more likely it is that there would be historic-era properties/historical resources along the route that could be affected or impacted by the HST program. The percentage of historic development was ultimately expressed as a ranking of *low*, *medium*, or *high* probability of affecting or impacting historic-era properties/resources.

- Low: 0%–25% of the corridor passes through areas of historic development.
- Medium: 26%–75% of the corridor passes through areas of historic development.
- High: 76%–100% of the corridor passes through areas of historic development.

Traditional Cultural Properties and Native American Consultations

The FRA and the Authority initiated consultation with the California Native American Heritage Commission (NAHC) requesting a search of their Sacred Lands file to identify any traditional cultural properties that could be potentially impacted or affected by the project, and requesting lists of Native Americans to contact for the areas that could be affected by the project, as required by 36 C.F.R. § 800.4(1)(4).

Letters were sent to Native Americans on the contact lists provided by the NAHC. The letters provided information about the proposed project alternatives and requested information about any traditional cultural properties that could be affected by the project.

Authority staff met with tribal representatives in a series of three Workshops held during the fall of 2003. The workshops were held on September 9, 2003, at Frazier Park in the Tehachapi Mountains; on September 10, 2003, at the San Luis Recreation Area in Gustine; and on October 9, 2003, at the Temecula Community Center. HST alignment options and potential station locations, potential impacts on cultural resources, the level of detail of the Program EIR/EIS studies, and need for potential subsequent project-specific studies were discussed at each of the workshops.

Native American concerns have also been conveyed to the FRA and the Authority at public hearings or as comments submitted on the EIR/EIS.

Paleontological Resources

*Paleontological resources* determined to be significant are fossils or assemblages of fossils that are unique, unusual, rare, uncommon, and diagnostically or stratigraphically (layers of the earth's surface) important, and/or those that add to an existing body of knowledge in specific areas—stratigraphically, taxonomically, and/or regionally.

Literature research and institutional records searches or geologic maps and geographic data from the University of California Museum of Paleontology in Berkeley have resulted in the designation of areas within the APE as having *high*, *low*, or *undetermined* paleontologic sensitivity, as follows.

- High: Sedimentary units with a high potential for containing significant nonrenewable paleontological resources. In these cases the sedimentary rock unit contains a high density

of recorded vertebrate fossil sites, has produced vertebrate fossil remains within the study area and/or vicinity, and is likely to yield additional remains within the study area.

- Low: The rock unit contains no or very low density of recorded resource localities, has produced little or no fossil remains within the study area and/or vicinity, and is not likely to yield any remains within the study area.
- Undetermined: The rock unit has had limited exposure(s) in the study area and has been little studied, and there are no known recorded paleontological resource localities. However, in other areas, the same or a similar rock unit contains sufficient paleontological resource localities to suggest that exposures to disturbance of the unit within the right-of-way have potential to yield fossil remains.

The number of rock units (formations) having high paleontologic sensitivity and the number of paleontological resource localities recorded within each study area were assessed to provide an accurate interpretation of the overall ranking of high, low, or undetermined potential to impact significant nonrenewable paleontological resources. This evaluation was reached using both the numbers of formations and localities and incorporating professional assessments regarding the significance of recovered resources from exposed rock units and the likelihood of these rock units to contain additional paleontological resources.

### 3.12.2 Affected Environment

A. STUDY AREA DEFINED: AREA OF POTENTIAL EFFECT

The study area for cultural resources is the APE that was defined in consultation with the SHPO, as noted above in Section 3.21.1.B. The APE for cultural resources at this program level of analysis was developed based on review of the records searches from the CHRIS Information Centers, as well as the cultural resource specialists' knowledge and experience in regional history and prehistory. It is important to note that the APE was specifically designed to aid in the program level analysis, which provides a general comparison of the alternatives without new identification surveys. The size and width of the APE was selected to predict the existence and relative sensitivity of cultural resources in and near the proposed program route alternatives, including prehistoric archaeological sites, historic archaeological sites, traditional cultural properties, and historic buildings, structures, objects, districts, and cultural landscapes. The APE for cultural resources for the proposed HST Alternative is as follows:

- 500 ft (152 m) on each side of the centerline of proposed new rail routes where additional right-of-way could be needed.
- 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads where very little additional right-of-way would be needed.
- 100 ft (30 m) around station locations.

Locations of easements and construction-related facilities, such as equipment staging areas, borrow and disposal areas, access roads, and utilities, have not yet been identified. Locations for these will be identified as part of the construction design program for the alternatives selected for more detailed analysis in the next phase of the project. Thus, these items are not considered in the program Level Tier 1 analysis, but this information will be available for Tier 2 site-specific EIR/EIS's. The APE will be modified to include these items as part of the Tier 2 analysis.

Under the Modal Alternative, the APE for freeway routes and around airports is 100 ft (30 m) beyond the existing freeway right-of-way and 100 ft (30 m) beyond the existing airport property boundary.

The study area for paleontological resources under the HSR Alternative is 100 ft (30 m) on each side of the centerline of proposed rail routes (including station locations), in both nonurban and urban areas. The paleontological APE under the Modal Alternative for freeway routes and around airports is 100 ft (30 m) beyond the existing freeway right-of-way and 100 ft (30 m) beyond the existing airport property boundary. The study area for paleontological resources is limited to the area that would potentially be disturbed by earthwork construction activities.

## B. CULTURAL RESOURCE CATEGORIES

The following topics are covered in this section.

- Prehistoric archaeological sites.
- Historic archaeological sites.
- Historic-era properties and historical resources.
- Traditional cultural properties.
- Paleontological resources.

Following are brief descriptions of each cultural resource category.

### Prehistoric Archaeological Sites

*Prehistoric archaeological sites* in California are places where Native Americans lived or carried out activities during the prehistoric period before 1769 AD. Prehistoric sites contain artifacts and subsistence remains, and they may contain human burials. Artifacts are objects made by people and include tools (projectile points, scrapers, and grinding implements, for example), waste products from making flaked stone tools (debitage), and nonutilitarian artifacts (beads, ornaments, ceremonial items, and rock art). Subsistence remains include the inedible portions of foods, such as animal bone and shell, and edible parts that were lost and not consumed, such as charred seeds.

### Historic Archaeological Sites

*Historic archaeological sites* in California are places where human activities were carried out during the historic period between 1769 AD and 50 years ago. Some of these sites may be the result of Native American activities during the historic period, but most are the result of Spanish, Mexican, Asian, African-American or Anglo-American activities. Most historic archaeological sites are places where houses formerly existed and contain ceramic, metal, and glass refuse resulting from the transport, preparation, and consumption of food. Such sites can also contain house foundations and structural remnants, such as windowpane glass, lumber, and nails. Historical archaeological sites can also be nonresidential, resulting from ranching, farming, industrial, and other activities.

### Historic-era Properties / Historical Resources

*Historic-era properties* (NRHP) and *historical resources* (CRHR) are historically significant elements of the built environment that are listed in, or eligible for the NRHP and/or the CRHR. These elements reflect important aspects of local, state, and/or national history and can be buildings, structures, objects, sites, districts, and/or historic cultural landscapes. Examples of the types of historic-era properties or historical resources that are located in and near the APE for the HST program include dwellings, industrial buildings, commercial buildings, downtown districts, farms, canals, rural landscapes, dams, bridges, roads, and other facilities that were built, operated, and previously gained historical significance.

Traditional Cultural Properties

*Traditional cultural properties* are places associated with the cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community. Examples include locations "associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world" and locations "where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice" (Parker and King 1990). Traditional cultural properties are identified by consulting with Native American groups that have a history of using an area, as well as the Native American Heritage Commission, the Sacred Lands File, and tribal representatives.

Paleontological Resources

*Paleontological resources* are the fossilized remains of animals and plants. They are typically found in sedimentary rock units, and they provide information about the evolution of life on earth over the past 500 million years or more.

## C. CULTURAL RESOURCES BY REGION

Archaeological Resources by Region

As described above, information on the numbers, kinds, and locations of archaeological sites for this Program EIR/EIS was obtained from CHRIS Information Centers. For the most part, the data from CHRIS Information Centers provide archaeological site information only for areas that have been previously surveyed by archaeologists. No archaeological field surveys were conducted for this Program EIR/EIS. However, surveys would be a part of the next stage of environmental review in the project-level EIR/EIS (see Section 3.12-6).

Bay Area to Merced: This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. Archaeological evidence places prehistoric people in California as early as 8,000 to 12,000 years ago; however, in the Bay Area to Merced region, the last 2,000 to 4,000 years are best documented. The regional chronological sequence of time periods (PaleoIndian; Early, Middle, and Late Archaic; and Protohistoric) reflects changes in land use that were influenced by population growth (e.g., shift from small camps to village sites), technological innovation (e.g., shift from use of the spear to bow and arrow), and resource intensification (e.g., the intensive use of mortars and pestles and bedrock milling features for acorn processing). Change also resulted from population movements and displacements, and from outside influences such as climate change and rise in sea level.

The records search for the project APE in the Bay Area to Merced region identified 109 archaeological sites: 95 prehistoric sites, 13 historic sites, and one site with both prehistoric and historic archaeological components. Half of the prehistoric sites are habitation sites, variously referred to as shell mounds, shell middens, and large flaked and ground stone scatters[3] with midden[4] accumulations, but also including sites where house pits were noted. Many of these habitation sites (the shell mounds around San Francisco Bay in particular) contain Native American burials. Burials are noted on the site records for more than 15% of the sites within the APE. Other types of sites identified in the APE include bedrock mortars, lithic scatters,[5] ground

[3] *Ground stone scatter* refers to a site containing milling equipment, including handstones, mortars, and pestles.

[4] *Midden* refers to a mound or deposit containing shells, animal bones, and other refuse that indicates the site of a human settlement.

[5] *Lithic scatter* refers to a site containing general utility implements such as projectile points, bifaces, expedient flake tools, and debitage.

stone scatters, and fire-affected rock scatters.[6] The 13 historic archaeological sites identified within the APE include debris and features associated with nineteenth and early twentieth-century housing developments, farm complexes, and post–World War II trash dumps. The third location of Mission Santa Clara de Asís, near the Santa Clara train station, is the site identified above where both prehistoric and historic components are present.

Sacramento to Bakersfield: This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. Archaeological investigations conducted in the southern San Joaquin Valley generally document human occupation of the region since about 12,000 years ago. Population density was low at that time, with the few settlements concentrated around the shores of ancient water sources such as Tulare and Buena Vista Lakes. Because of the rapid accumulation of sediment on the valley floor, older archaeological material tends to be deeply buried. Material from a site near Buena Vista Lake is estimated to be 7,500 to 11,500 years old. Most other archaeological material found in the southern valley appears to be a result of the presence of the Yokuts in the San Joaquin Valley throughout the last 2,000 years.

The Sacramento to Bakersfield portion of the project APE passes through the traditional lands of four Native American groups: the Nissenan, Plains Miwok, Northern Valley Yokuts, and Southern Valley Yokuts. However, the northern San Joaquin Valley is one large area in California for which very little ethnographic information is available. The dearth of information about the early inhabitants of the region is thought to be due in part to their rapid depopulation as a result of European diseases in the early nineteenth century and invasion of their territory by gold miners and others in the mid-nineteenth century. Most of what is known about the early inhabitants comes from the writings of explorers and other early travelers in the region. By piecing together these scraps of information, it has been determined that by the time of the first European visitors, the primary inhabitants of the area were the Northern Valley Yokuts.

Prehistoric archaeological sites in the region consist of habitation sites, many of which represent village locations, and lithic scatters, which may represent camps and activity areas away from villages. Cemeteries and isolated burials are also present. Most prehistoric sites in this region are found between Sacramento and Stockton, where many rivers and streams that originate in the Sierras to the east cross the Modal Alternative and the HST Alternative routes, and between Tulare and Bakersfield near Tulare and Buena Vista Lakes. (See Section 3.14, *Hydrology and Water Resources*, for maps of rivers and streams). Proximity to water was common for habitation sites because the rivers and streams were a source of food and water.

San Joaquin Valley archaeological sites containing material from the historic period include sites with structural remains (usually foundations) and associated refuse, and sites consisting only of refuse.

Bakersfield to Los Angeles: This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. The prehistory of the Mojave Desert has been divided into several periods spanning the time from 10,000 BC (approximately 12,000 years ago) to the time of Euro-American contact in the early nineteenth century. Each period has characteristic artifacts and subsistence systems. The earliest occupation of the Mojave Desert for which widely accepted data are available began about 10,000 BC, or 12,000 years ago. The period from 10,000 BC to 5,000 BC (12,000 years ago to 7,000 years ago) is known as the Lake Mojave Period. This period was followed by the Pinto Period (5000 to 2000 BC, or 7,000 to 4,000 years ago); the

[6] *Rock scatter* refers to dispersed pieces of rock.

Gypsum Period (2000 BC to 500 AD, or 4,000 years ago to 1,500 years ago); the Saratoga Springs Period (500 AD to 1200); and the Shoshonean Period (began 1200 AD).

The Milling Stone Period along the southern California coast (about 5000 BC to 1000 BC, or from 7,000 to 3,000 years ago) was characterized by smaller, more mobile groups compared to later periods. The period from 1000 BC to 750 AD (3,000 years ago to 1,350 years ago) is known archaeologically as the Intermediate Period. More specifically, in the Los Angeles basin, perhaps the earliest evidence of human occupation was recovered from the tar pits of Rancho La Brea. In 1914, the partial skeleton of a young woman was discovered in association with a stone used for grinding by hand, called a *mano*. In the 1970s, a collagen sample from the skeleton was dated at circa 9,000 years old. In addition, projectile points similar to those found in the desert dating from 7,000 to 10,000 years ago, as well as crescent-shaped flaked tools, called *crescentics*, have been recovered from bluffs near Ballona Lagoon. The presence of these point types along the coast suggests connections between what is now the Los Angeles area and the cultures of the southeastern California desert regions present during this early period.

A different nomenclature is used to organize the prehistoric record in southern California coastal contexts. The Milling Stone Period manifest primarily along the coast (about 5000 BC to 1000 BC, or from 7,000 to 3,000 years ago) was characterized by smaller, more mobile groups compared to later periods. The period from 1000 BC to AD 750 (3,000 years ago to 1,350 years ago) is known archaeologically as the Intermediate Period. More specifically, in the Los Angeles basin, perhaps the earliest evidence of human occupation was recovered from the tar pits of Rancho La Brea. In 1914, the partial skeleton of a young woman was discovered in association with a stone used for grinding by hand, called a *mano*. In the 1970s, a collagen sample from the skeleton was dated at circa 9,000 years old. In addition, projectile points similar to those found in the desert dating from 7,000 to 10,000 years ago, as well as crescent-shaped flaked tools, called *crescentics*, have been recovered from bluffs near Ballona Lagoon. The presence of these point types along the coast suggests connections between what is now the Los Angeles area and the cultures of the southeastern California desert regions present during this early period.

The Los Angeles basin was part of territory occupied by the Tongva Native American groups (renamed Gabrieliños by early explorers, missionaries, and settlers) when the Spanish arrived in 1769 AD. Tongva settlement and subsistence systems may extend back in time to the beginning of the Late Prehistoric Period, about 750 AD.

Prehistoric archaeological sites types commonly found along the APE for the HST and Modal Alternative alignments in the Bakersfield to Los Angeles region include lithic scatters, milling stations, and quarries. Less common are habitation sites, which can include midden, rock features and, in some cases, human burials. One rock art site, a petroglyph, is also known to exist within the APE.

<u>Los Angeles to San Diego via Inland Empire</u>: This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors. This region includes a portion of the Los Angeles basin. The prehistory and ethnography of this area were discussed above in the *Bakersfield to Los Angeles* section. The rest of the region consists of the area east of the Santa Ana Mountains in Riverside County and east of the coastal hills in San Diego County.

The 241 known archeological sites within the study area for this region reflect the full range of cultures and periods, from chronologically ancient prehistoric Native American, to historic European (Spanish/Mexican) settlements, to historic Euro-American settlements and more recent periods through World War II urban and industrial growth. There are 130 prehistoric sites and

101 sites from the historic period. The majority of the prehistoric sites (80) are in San Diego County, and 48 of the 101 historic sites are in San Bernardino County.

The San Dieguito Complex[7] was originally thought to represent big-game hunters who moved to the San Diego County coastal area from the Great Basin during Early Holocene time (8,000 to 10,000 years before present [BP], or 10,000–5,000 BC). This movement occurred when warmer, drier conditions resulted in desiccation of the pluvial lakes in the Great Basin. Although it was thought that big-game hunting continued after these people arrived on the coast during Early Holocene time, more recent investigations at Early Holocene sites closer to the coast have shown that a wide range of plant foods, along with small- and medium- sized terrestrial mammals, fish, and shellfish, were also being exploited in these sites. Population size was likely low, with relatively little competition for resources. Therefore, small groups probably migrated throughout the coastal area and the area inland of the coastal hills and mountains to wherever the best resources were available at the time.

The Pauma Complex characterized inland San Diego County and southwestern Riverside County during the period from 3,000 to 8,000 years ago. However, there are few sites that date to the period from 1,300 to 3,000 BP in northern San Diego County and western Riverside County.

A larger population, a more sedentary settlement system, and a more intensive use of available resources characterize the Late Period (100 to 1,300 BP in this area). The large villages, occupied almost year-round, that were present when the Spanish explored this area in 1769 AD developed during this period.

Los Angeles to San Diego via Orange County: This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County (LOSSAN) rail corridor. The prehistory and ethnography of the Los Angeles basin portion of the region was discussed above in the *Bakersfield to Los Angeles* section.

The prehistory of coastal San Diego County begins with the San Dieguito Complex, as discussed above in the *Los Angeles to San Diego via Inland Empire* section. Archaeological sites occupied between 3,000 and 8,000 years ago on the San Diego County coast belong to the La Jolla Complex. Most La Jolla Complex sites are located around the coastal lagoons, which began filling with seawater at the beginning of this period because of a rise in the sea level, as the ice caps melted at the end of the last ice age. Most sites around lagoons on the San Diego County coast were abandoned about 3,000 years ago. However, sites around Peñasquitos Lagoon and San Diego Bay continued to be occupied because these two southern bay/estuary systems did not fill with sediment. Still, in general, there are few sites in the coastal region that date to the period between 1,300 and 3,000 BP. Little is known about settlement and subsistence during this period of San Diego County prehistory.

The Late Period (200 to 1,300 BP in this area) is characterized by a more sedentary settlement system and a more intensive use of available resources. The large villages, occupied almost year-round, that were observed by the Spanish in 1769 AD developed during this period.

Historic-era Properties and Historical Resources by Region

Historic buildings, structures, objects, sites, districts and cultural landscapes in and near the program route alternatives date from the eighteenth century to the mid-1900s, although the vast

[7] *Complex* refers to a group or association of artifacts and subsistence remains that are characteristic of a specific period of time and geographic area.

majority date to the twentieth century. These properties/resources were constructed during the major historic periods of California history, including the exploration and settlement of the Spanish and Mexican eras; the US-Mexican War, the Gold Rush, and statehood in the mid nineteenth century; and subsequent settlement and development of California through the mid twentieth century. The property types also vary widely, but most are dwellings, commercial buildings, or industrial facilities that date to the 1890s and after. Properties/resources dating to before 1890 largely consist of a few remaining adobe structures and sites dating to the Mexican period prior to 1848, and wood-frame dwellings and commercial buildings from the period between 1849 and 1890.

The oldest standing elements of the built environment in California date to the eighteenth century, during the period when California was a Spanish colony. Spanish exploration and settlement began in 1769 with the Portola Expedition and continued with the establishment of 21 missions and several presidios (forts) and pueblos (towns) near the coast between San Diego and Sonoma. Three of the missions, San Gabriel, San Juan Capistrano, and Santa Clara, are located near proposed project alignments. The San Gabriel Mission is located along the proposed HST Alternative alignment in the Los Angeles to San Diego via Inland Empire region. The San Juan Capistrano Mission is located near all of the proposed HST and Modal Alternative routes through San Juan Capistrano in the LOSSAN region. The third location of Mission Santa Clara de Asís, near the extant, historic Santa Clara train station is an archaeological site with both prehistoric and historic components. It lies within the HST alignment in the Bay Area to Merced region. (See Chapter 2, *Alternatives*, for maps of the routes).

The Spanish made land grants to retired soldiers and other Spanish citizens interested in settling the area. The Mexican government continued the land grant system after gaining independence from Spain in 1821 and dissolving the mission system in 1834. The presidios and pueblos founded during the Spanish/Mexican period, including San Francisco, San Jose, Los Angeles, and San Diego, grew slowly during the 1830s and 1840s and relatively few properties/resources are predicted for the HST and modal routes that pass through these cities.

The United States acquired California upon the ratification of the Treaty of Guadalupe-Hidalgo at the close of the Mexican War in 1848. The subsequent gold rush of 1849 lured immigrants to the west coast from across the United States and around the world. California became a state in 1850 and it continued to grow in population as completion of the transcontinental railroad in 1869 brought more settlers. Southern California remained a sparsely settled cattle ranching area until the arrival of the Southern Pacific Railroad in the 1870s and the Atchison, Topeka, and Santa Fe Railroad in the 1880s. New towns developed across the state in the nineteenth century, but were especially clustered along the state's railroad routes. Some of these properties / historical resources (such as dwellings, businesses, factories and other buildings and structures from the Victorian era) remain along the various segments of the proposed HSR routes and modal alternatives.

The early twentieth century saw continued urban expansion in both northern and southern California, especially in conjunction with the first widespread use of automobiles. Popular residential architectural styles during this period included the Craftsman bungalow, as well as the Spanish Colonial Revival and other revival styles. Increasing use of automobiles also led to construction of linear commercial strips and other roadside development along arterials, although industry and major shipping facilities largely remained clustered along rail lines and maritime ports. By the late 1930s and during World War II, dwellings, commercial, industrial, and public buildings were often designed in the Art Deco Style (or the related Art, Zigzag, or Streamline Moderne styles). The construction boom of the post-war period brought residences in the Ranch style with an open plan and attached garage, often laid out in expansive suburbs of builders' tract homes. Regional malls and shopping centers developed on the outskirts of communities,

while the industrial and shipping facilities of the post-war period became more inter-modal as trucking competed with rail and sea transportation. The areas along the HST routes and modal alternatives contain properties/resources of each of these types and from each decade of the twentieth century.

Bay Area to Merced: By far the largest concentrations of historic buildings, structures, objects, sties, districts, and cultural landscapes (or potential historic properties/historical resources) in this region are in the urban centers of San Jose, San Francisco, and Oakland, but resources of all types appear throughout the Bay Area to Merced region. A certain number of properties/resources appear in other towns, and to a lesser extent, in the rural countryside of the Santa Clara and Central valleys. Towns that were important local trade centers in the late nineteenth century, like Morgan Hill and Gilroy, exhibit concentrations of historical resources along the project corridors. Diridon (Cahill) Station and Santa Clara Station in San Jose are listed on the National Register of Historic Places (NRHP) and California Register of Historical Resources (CRHR). Diridon Station is a NRHP historic district, and the Santa Clara Station is a multi-component listed historic property and is a historical resource for the purposes of CEQA.

Other historic districts in the region include the Redwood City Historic District along the Caltrain alignment, the Downtown Oakland Historic District, the Oakland Waterfront Warehouse District along the Oakland to San Jose via I-880 route, and the Alviso Historic District and Agnews Insane Asylum Historic District along the Oakland to San Jose via Milford route. There is also one historic district, the U.S. Naval Air Station Sunnyvale Historic District, in the San Francisco to San Jose segment, as well as two bridges listed in the NRHP, Carquinez Bridge and the Oakland–San Francisco Bay Bridge, on the Modal Alternative alignment. Rural historic properties and historical resources that appear long the HST routes include farm and ranch complexes, as well as infrastructure elements (such as water conveyance systems, bridges, industrial complexes, and rail stations).

Sacramento to Bakersfield: Buildings from the historic period along the alternative corridors in the Sacramento to Bakersfield region consist of residential and commercial structures located mostly in the towns and cities that developed along the Southern Pacific Railroad (now the Union Pacific Railroad [UPRR]) and Central Pacific Railroad routes in the 1870s.[8] Some of the region's railroad bridges and stations are also historic, along with some roads, highway bridges, and cemeteries. Construction of agricultural irrigation projects in the San Joaquin Valley began in the late 19th century and continued into the 20th century. There are many canal and levee systems in this region, some of which may be historic.

Because the UPRR tracks were initially constructed in the Central Valley in the mid- to late nineteenth century, the towns along the HST alignments that use the UPRR corridor have a high potential to contain nineteenth-century buildings. For example, one of the towns that developed during the nineteenth century along the UPRR corridor between Sacramento and Stockton is Elk Grove, a part of which is now a National Register Historic District. Alignments that use the Burlington Northern Santa Fe (BNSF) corridors established in the early twentieth century avoid many of the smaller towns and pass through far fewer historically sensitive areas.

Bakersfield to Los Angeles: Historic structures along the project corridors in the Bakersfield to Los Angeles region are primarily twentieth-century residential, commercial, and industrial structures located within cities. Large tracts of residential houses are most common, with industrial and commercial structures largely confined to existing railroad rights-of-way and station areas in Los Angeles.

[8] The Central Pacific was later purchased by the AT&SF Railroad (now the BNSF Railroad).

Structures dating to before 1900 are rare. In many parts of the region, such as the Antelope Valley, structures from this time period were sparse and were built in perishable vernacular styles (e.g., wooden barns and other structures). In the largest cities of the region, Los Angeles and Bakersfield, large sections of houses and commercial structures built originally before 1900 have been replaced by subsequent development.

Los Angeles to San Diego via Inland Empire: Before 1900, the region's small towns had developed small-scale residential neighborhoods surrounding their central blocks. In the region's rural areas, the pre-1900 built environment consisted mostly of farm/ranch homes and related outbuildings, small bridges, dirt roads, and railroads and railroad-related terminals and warehouses. The small towns consisted mostly of residential and commercial buildings and offered better-established roads. Railroad stations in these smaller towns often served as the commercial hub for the surrounding areas.

By 1900, Los Angeles, Riverside, San Diego, and the central blocks of the smaller outlying towns had developed commercial/industrial buildings and were surrounded by more residential land uses. Between 1900 and 1929, the built environment changed markedly, with the advent of the automobile age. Not only did the region experience population growth, but major improved road networks were also constructed to accommodate increased numbers of automobiles and trucks. During this timeframe, new types of specialized structures appeared in the built environment, including gas stations, parking garages, and auto/truck sales and repair/maintenance facilities. Urbanized areas continued to grow, and use of streetcars and interurban passenger rail services peaked at this time. In the years following World War I, Southern California experienced growth in military bases and training facilities. Important industrial facilities expanded in the Riverside and San Bernardino vicinities with Kaiser steelworks in Fontana being a notable example.

Very few pre-1900 structures remain near the proposed project alignments. A notable exception is the San Gabriel Mission (founded in 1771), located immediately adjacent to the former Southern Pacific Railroad (now UPRR) route through San Gabriel. There is the potential for a few pre-1900 buildings, including rail stations, along this railroad route in Pomona, Ontario, Guasti, San Bernardino, and Temecula. Los Angeles Union Station (LAUS) passenger terminal is listed in the NRHP.

Los Angeles to San Diego via Orange County: Historic structures in the LOSSAN region are primarily twentieth-century (1900 to 1929 and 1930 to 1958) residential, commercial, and industrial structures located within cities. Large tracts of residential houses are most common, with industrial and commercial structures largely confined to existing railroad rights-of-way in the Los Angeles and San Diego areas. However, many of the medium-sized cities of the region, such as Anaheim, Fullerton, and San Clemente, began as small towns in the late nineteenth or early twentieth century. The historic core areas of cities in this region commonly preserve some buildings from this time period.

Structures dating to the period before 1900 are rare. As in other parts of southern California, structures from this time period were sparse in much of this region and were built in perishable vernacular (wood frame) styles. However, there are notable exceptions, especially the Spanish and Mexican Period development in downtown San Juan Capistrano (1769 to 1848) around Mission San Juan Capistrano (founded in 1776) and the Hispanic to American Transition Period (1848 to 1870) development along the waterfront of San Diego, and Old Town San Diego. In the largest cities of the region, Los Angeles and San Diego, large sections of houses and commercial structures built before 1900 have been replaced by subsequent development.

Traditional Cultural Properties

Information regarding traditional cultural properties was derived from the NAHC's review of the Sacred Land files, the Native American Outreach Workshops, from presentations at public hearings, and in formal comments received on the draft EIR/EIS.

Based on their review of the Sacred Lands file, the NAHC identified one traditional cultural property near the project's APE. Within the Bakersfield to Los Angeles region, the property is described as a sacred power area and a worship and ritual site. It is, however, located well north of SR 58 and the High-Speed Train Alignment, and so lies outside of the project APE. The NAHC did not identify any other traditional cultural property within the APE of the other four regions (Bay Area to Merced; Sacramento to Bakersfield; Los Angeles to San Diego via Inland Empire; Los Angeles to San Diego via Orange County).

Letters were distributed to Native American potential contacts provided by the NAHC. No direct reply to the contact letters was received from Native Americans, that identified traditional cultural properties that could be affected by the project.

At each of the three Native American Outreach Workshops, attendees provided information concerning potentially sensitive resources and concerns. At the Frazier Park workshop, concerns were raised about potential impacts on sensitive cultural resources along the HST alignment options through the I-5 corridor between Bakersfield and Los Angeles, in particular for the northern portion of the Tehachapi range area between Grapevine and Frazier Park. At the San Luis Recreation Area workshop, concerns were raised about potential impacts on sensitive cultural resources along the HST Pacheco Pass alignment options, both through the mountains and in the Santa Clara Valley between Gilroy and Morgan Hill. During this meeting it was also noted by those attending that the Altamont Pass corridor, would have considerably more potential impacts on Native American traditional cultural properties than either the Diablo Range direct or Pacheco Pass corridors that are being considered for further HST evaluation. At the Temecula workshop, concerns were raised about potential impacts on sensitive cultural resources along the HST alignment options through the Soledad Canyon between Antelope Valley and Los Angeles, and in regards to potential alignment and tunneling impacts through the mountain range just south of Temecula along the I-215/I-15 HST alignment.

At public hearings, two individuals representing two different tribes presented statements. Two statements have also been submitted as written comments representing tribal concerns. At the April 28, 2004 hearing in Fresno, Mr. Val Lopez, Chair of the Amah Mutsun Tribal Band, spoke in general support of the HST project, requesting continued involvement and consultation on subsequent planning and construction of the project, and provided perspective on traditional tribal territories for the Amah Mutsun and Yokuts. In the spring of 2004, the Authority received public comments from Robert Gomez, Tubatulabal, concerning continued consultation with Native Americans, natural and cultural resources preservation, and disposition of archaeological collections. On June 23, 2004, representatives of the Pechanga Band of Luiseno Indians in Temecula requested continued involvement and consultation throughout subsequent phases of the project, including government-to-government consultation, and inclusion in the development of agreement documents concerning cultural resources. Subsequent to that public statement, the Pechanga Band submitted written comments stating their concerns with potential project impacts on significant cultural resources, sacred sites, and Native American human remains. Among their specific requests, the Pechanga Band asks that the Authority meet with tribal representatives in-person regarding confidential information concerning sensitive locations, in the interest of avoiding impacting such locations.

Paleontological Resources By Region

California's rich geologic record and complex geologic history has resulted in exposure of many rock units with high paleontologic sensitivity at the surface. The fossil record in California is exceptionally prolific; abundant fossils representing a diverse range of organisms have been recovered from rocks as old as 1 billion years to as recent as 11,000 years. These fossils have provided key data for charting the course of the evolution and extinction of various types of life on the planet, both locally and globally, as well as for determining paleoenvironmental conditions, sequences and timing of sedimentary deposition, and other details of geologic history.

The following paragraphs summarize key paleontological resources by region. More detailed information is given in the regional technical reports on cultural and paleontological resources.

Bay Area to Merced: The major fossil-bearing units in the Bay Area to Merced region include the Irvington Gravels, Livermore Gravels, Merced Formation, Santa Clara Formation, Tulare Formation, Tehama Formation, Pinole Tuff, San Pablo Formation, Orinda Formation and Siesta Formation (Contra Costa Group), Briones Formation (San Pablo Group), Markley Sandstone, Nortonville Shale, Martinez Formation, Panoche Formation, Quinto Formation, Chico Formation, and Franciscan Formation. Pleistocene alluvial units also contain important paleontological resources.

Of the 237 vertebrate fossil localities identified within the study area, 93 (nearly 40%) are in materials of Pleistocene age, including the Los Banos alluvium, Riverbank Formation, Irvington Gravels, and Tulare Formation. Other units with a high sensitivity include the Pinole Tuff, the Contra Costa Group, and the San Pablo Group, all of which are of Miocene age. The Pleistocene and Miocene age geologic units are units with a high potential for containing vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.

Sacramento to Bakersfield: The most important paleontological resources in the Sacramento to Bakersfield region are contained in the Modesto-Riverbank Formations, the Turlock Lake-Laguna Formations, and the Franciscan Formation.

The Modesto-Riverbank Formations are largely unconsolidated Middle to Late Pleistocene units composed of interbedded poorly sorted brownish sandstone and siltstone with lesser amounts of pebble to cobble conglomerate. They are primarily fluvial (stream) deposits, and have yielded a wide range of fossils including clams, fish, turtles, frogs, snakes, birds, bison, mammoths, mastodons, ground sloths, camels, horses, deer, dire wolves, coyotes, rabbits, rodents, and land plant remains, including wood, leaves, and seeds.

The Turlock Lake-Laguna Formations are Pliocene in age and are composed of interbedded poorly sorted, reddish-brown siltstone and sandstone with lenses of pebble to cobble conglomerate. They are primarily fluvial deposits, but lacustrine (lake) beds are not uncommon. The Turlock Lake-Laguna Formations have yielded fossil remains at many sites, including petrified wood and the bones and teeth of a diversity of extinct land mammals.

The Franciscan Formation ranges in age from Jurassic through Cretaceous. The formation consists mainly of sandstone and shale or mudstone, but contains lesser amounts of chert, serpentinite, and greenstone. Coherent sedimentary units in the Franciscan primarily record deep marine deposition. Fossil vertebrates are rare; molluscan fossils and freshwater gastropods and pelecypods have been reported.

The Modesto-Riverbank and Turlock Lake-Laguna Formations occur in all segments of the Modal Alternative alignment except between Sacramento and Stockton. Along the HST Alternative route, they occur between Sacramento and Stockton in the Central California Traction (CCT)

alignments and in all the alignments between Modesto and Merced. The Franciscan Formation occurs only on the Modal Alternative route between Merced and Fresno.

Bakersfield to Los Angeles: Sixteen different formations occur along both the Modal and HST Alternative corridors in this region. In the Bakersfield to Los Angeles region, the following formations have the potential to yield fossils.

- The Tecuya Formation along I-5 from SR-99 to SR-14 and the I-5 Tehachapi crossing, with oreodont artiodactyl and amphicyonid carnivore fossils.
- The Tick Canyon Formation along the SR-14 corridor, with horse, camel, carnivore, and oreodont artiodactyl fossils.
- The Kinnock Formation along the SR-58 corridor, with canid fossils.
- The Monterey Formation along I-405 between LAUS and Burbank, with fish and marine mammal fossils.
- The Towsley Formation along I-405 to Burbank, and along I-5 from SR-99 to SR-14 and in the Soledad Canyon and Tehachapi crossing, with whale fossils.
- The Castaic Formation along SR-14 and I-5 in Soledad Canyon and the Tehachapi crossing, with fish, mollusk, sea cow, sea turtle, and tapir fossils.
- The Mint Canyon Formation along SR-14 and in Soledad Canyon, with horse, camel, peccary, and rodent fossils.
- The Peace Valley Formation along I-5 between SR-99 and SR-14 and in the Tehachapi crossing, with cypriniodont, plant, and killifish fossils.
- The Ridge Route Formation along I-5 from SR-99 to SR-14 and in the Tehachapi crossing, with rhinoceros, horse, ground sloth, mollusk, lizard, snake, gopher, bony fish, and plant fossils.
- The Horned Toad Formation along SR-58, with gomphothere fossils.
- The Walker Formation along SR-58, with shark, ray, bony fish, whale, and marine bird fossils.
- The Pico Formation along SR-14 and I-5 and in Soledad Canyon, with shark, whale, and clam fossils.
- The Harold Formation along SR-14 and in the Antelope Valley area, with mammals and birds fossils.
- The Saugus Formation along SR-14 and I-5 between SR-99 and SR-14, and in Soledad Canyon and the Tehachapi crossing, with camel, horse, tapir, deer, lizard, gopher, canid, shark, ray, and bony fish fossil.
- The Kern River Formation along SR-58, with mustelid carnivore, peccary, mouse, and vulture fossils.
- Older Quaternary alluvium along I-405 to Burbank; along SR-14, SR-58, and I-5 between SR-99 and SR-14; and in Soledad Canyon, Antelope Valley, and the Tehachapi crossing, with large mammal and small nonmammalian vertebrate fossils.

Los Angeles to San Diego via Inland Empire: The following formations that occur along proposed alignments of the Modal and HST Alternatives in the Los Angeles to San Diego via Inland Empire region have the potential to yield fossils.

- The Silverado Formation from March Air Reserve Base (ARB) to Mira Mesa, with mollusk fossils.

- The Ardath Shale from Mira Mesa to downtown San Diego, with shark, ray, bony fish, and marine microorganism and macroinvertebrate fossils.
- The Scripps Formation from Mira Mesa to downtown San Diego, with shark, ray, bony fish, marine invertebrate, rhinoceros, artiodactyl, brontothere, uintathere, crocodile, turtle, as well as wood fossils.
- The Friars Formation between Escondido and San Diego, with artiodactyl, perissodactyl, primate, opossum, insectivore, and rodent fossils.
- The Stadium Conglomerate Formation from Mira Mesa to San Diego and Mira Mesa to Qualcomm Stadium, with artiodactyl, perissodactyl, primate, opossum, insectivore, rodent, carnivore, and rhinoceros fossils.
- The Mission Valley Formation between Mira Mesa and San Diego, with shark, ray, bony fish, marine microorganism and macroinvertebrate, artiodactyl, perissodactyl, primate, opossum, insectivore, and rodent fossils.
- The Puente Formation from Los Angeles to March ARB and Mira Mesa, and from LAUS to Pomona via El Monte and South El Monte, with marine and terrestrial vertebrate, invertebrate, and plant fossils.
- The Sespe Formation from March ARB to Mira Mesa, with camel, rhinoceros, oreodont, carnivore, insectivore, primate, and rodent fossils.
- The Vaqueros Formation from March ARB to Mira Mesa, with shark, ray, crab, and clam fossils.
- The Fernando Formation from Los Angeles to March ARB and from LAUS to Pomona via El Monte, with shark, ray, bony fish, bivalve, snail, whale, bird, camel, and tapir fossils.
- An unnamed sandstone unit from March ARB to Escondido, with large mammal, small vertebrate and invertebrate, and giant teratorn fossils.
- The Lindavista Formation from Mira Mesa to San Diego and Escondido to Mira Mesa and Qualcomm Stadium, with shark, whale, and marine invertebrate fossils.
- The Pauba Formation from March ARB to Mira Mesa, with large and small vertebrate fossils.
- The Bay Point Formation from Mira Mesa to San Diego, with shark, ray, bony fish, and mollusk fossils.
- Quaternary terrace deposits from Mira Mesa to the Transit Center, with small and large mammal and bird fossils.
- Older Quaternary alluvium from March ARB to San Diego, with large mammal and plant fossils.

Los Angeles to San Diego via Orange County: The following formations in the LOSSAN region have the potential to yield fossils.

- The Ardath Shale and Scripps Formation along SR-52 to San Diego, with shark, ray, bony fish, marine microorganism and macroinvertebrate, rhinoceros, artiodactyl, brontothere, uintathere, crocodile, turtle, as well as wood fossils.
- The Delmar Formation in Del Mar and along I-5/I-805 at the SR-52 split, with estuarine vertebrate and invertebrate, aquatic reptile, and rhinoceros fossils.
- The Torrey Sandstone from Encinitas to Solana Beach and Del Mar, with plant and marine invertebrate fossils.

- The San Mateo Formation at Camp Pendleton, with horse, camel, peccary, llama, sea cow, fur seal, walrus, sea otter, sea bird, whale, dolphin, shark, ray, bony fish, and marine invertebrate fossils.
- The Capistrano Formation from Irvine to San Juan Capistrano, Dana Point, San Clemente, Camp Pendleton, Oceanside, and Carlsbad, with whale, walrus, sea cow, fur seal, sea bird, shark, ray, bony fish, and kelp fossils.
- The Niguel Formation from Irvine to San Juan Capistrano, with marine mollusk and marine vertebrate fossils.
- The San Diego Formation along SR-52 to San Diego, with shark, ray, bony fish, marine invertebrate, sea bird, walrus, fur seal, cow, whale, dolphin, terrestrial mammal, wood, and leaf fossils.
- The Lindavista Formation along I-5/I-805, with marine invertebrate, shark, and whale fossils.
- The Bay Point Formation along SR-52 to San Diego, with shark, ray, bony fish, and mollusk fossils.
- Unnamed marine terrace deposits from Camp Pendleton through Encinitas and Solana Beach to the Santa Fe Depot in San Diego, with marine invertebrate, shark, ray, bony fish, and terrestrial mammal fossils.

### 3.12.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The No Project Alternative is composed of transportation projects other than the proposed HST system that are projected to be completed between the time of this Program EIR/EIS and 2020, including local, state, and interstate transportation system improvements designated in existing plans and programs. No additional impacts on cultural resources would occur under No Project beyond those addressed in environmental documents for those projects.

Because it was not realistically feasible for this Program EIR/EIS to identify or quantify all the statewide impacts on or mitigation activities for cultural resources associated with all of the projects considered as part of the No Project Alternative, it is assumed that the existing condition is representative of No Project conditions. It is possible that other transportation projects (not including the Modal or HST Alternatives) may impact some existing cultural resources by 2020, and that these changes to the baseline would be described and quantified in subsequent environmental analysis and reflected in future database information. This Program EIR/EIS addresses the general potential for the proposed project to affect or impact cultural resources as they exist at present and uses this information to compare the potential for impacts from the alternatives evaluated.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

This section compares the predicted sensitivity or potential for the alternatives to cause adverse effects or impacts to archaeological, historic, and/or paleontological properties/resources, and which would require mitigation. No new inventory or evaluation surveys of properties/resources were conducted for this Program EIR/EIS because that identification and evaluation work would be conducted as part of the next stage of environmental review in the project-level EIR/EIS (see Section 3.12.6).

The Modal Alternative would potentially affect or impact cultural resources (archaeological and historic properties/resources) as a result of expanding freeway rights-of-way to add lanes and as a result of airport expansion (new runways). Systemwide, the Modal Alternative is ranked as medium in terms of its potential impact on cultural resources Cumulative effects and impacts are likely

because the combined effects and impacts from the Modal Alternative, No Project, and other community residential and commercial development projects would be greater than from the Modal Alternative alone. The Modal Alternative is ranked as high in terms of its potential effect or impact on paleontological resources from expansion of highways and airports. This ranking is a result of the estimated 2,970 lane mi (4,780 km) of expansion statewide and the number of formations identified as sensitive for paleontological resources that would be crossed by highways.

The HST Alternative would potentially affect or impact cultural resources as a result of its construction, including grading, cutting, tunneling, and erecting pylons for elevated track, as well as station construction. Systemwide, the HST Alternative is ranked as medium to high in terms of its potential effect or impact on archaeological, historic, and or paleontological properties/resources. The HST Alternative's potential effect or impact on historic properties/resources is generally higher on a systemwide basis compared to No Project or the Modal Alternative because the HST Alternative would use existing rail corridors at many locations. These existing rail corridors developed during the historic period and therefore the rail lines tend run through the oldest parts of cities and towns and are surrounded by historic properties/resources. Cumulative effects or impacts are likely because the combined effects and impacts from the HST Alternative, projects anticipated or planned for under No Project, and other residential and commercial development projects in the study area can be expected to be greater than from the HST Alternative alone. Potential effects or impacts on historic properties during operation of the HST Alternative related to noise or visual impacts are discussed in Sections 3.4 and 3.9, respectively, of this Program EIR/EIS.

The Modal and HST Alternatives would have greater potential effect and impact on cultural resources than No Project. Although many of the potential effects or impacts could be avoided or minimized through design refinements or alignment changes in a linear facility such as a highway or rail corridor, it is not always feasible to avoid effects or impacts to cultural resources, and mitigation measures would need to be identified and evaluated to address these situations for specific projects.

Table 3.12-1 summarizes the comparison of potential effects and impacts on cultural and paleontological resources for each of the alternatives. The table depicts relative sensitivity, or the potential for the alternatives to cause adverse effects or impacts to cultural resources. This table does not identify specific adverse effects or impacts at this programmatic level of review.

**Table 3.12-1**
**Summary Rating Table—Potential Impacts on Cultural and Paleontological Resources**

| | Archaeological Resources | Historic Structures | Paleontological Resources |
|---|---|---|---|
| **Bay Area to Merced** | | | |
| No Project | Medium | Medium | Low |
| Modal | Medium | Medium | High |
| HST | Medium | High | Medium |
| **Sacramento to Bakersfield** | | | |
| No Project | Low | Low | Low |
| Modal | Medium | Medium | High |
| HST | Medium | High | Medium |

| | Archaeological Resources | Historic Structures | Paleontological Resources |
|---|---|---|---|
| **Bakersfield to Los Angeles** | | | |
| No Project | Low | Low | Low |
| Modal | Medium | Medium | High |
| HST | High | High | Medium |
| **Los Angeles to San Diego via Inland Empire** | | | |
| No Project | Low | Low | Low |
| Modal | Medium | Medium | High |
| HST | Medium | Medium | High |
| **Los Angeles to San Diego via Orange County** | | | |
| No Project | Low | Low | Low |
| Modal | Medium | Medium | High |
| HST | High | High | High |

### 3.12.4 Comparison of Alternatives by Region

This section compares the potential effects or impacts to cultural and paleontological resources predicted for the program alternative options in each of the five regions, based on available information. At this level of analysis, the extent and types of effects or impacts on specific cultural and paleontological resources are not known, instead this comparison presents the likelihood for these alternatives to cause effects or impacts that would meet criteria for significance under NEPA/NHPA and CEQA.

A. BAY AREA TO MERCED

Modal Alternative

The total number of archaeological sites that could be potentially impacted by the Modal Alternative in this region is 47. The northern portion of the Modal Alternative route from San Francisco/Oakland to San Jose has a medium ranking for archaeological sensitivity, while the southern portion from San Jose to Merced is ranked as low.

Sixty percent of the areas along the Modal Alternative route in this region developed during the historic period are within the potentially affected area resulting in an overall rank of medium sensitivity for historic properties/resources. The greatest number of historic buildings in or near the APE for the Modal Alternative is found between San Francisco/Oakland and San Jose, where 100% of this area was developed during the historic period, however, the ranking for the Modal Alternative in the entire Bay Area to Merced region is medium.

The Modal Alternative has the potential to affect an estimated 81 to 93 mi (130 to 150 km) of highly sensitive geologic units within the study area. As such, this receives a high sensitivity rank concerning paleontological resources.

High-Speed Train Alternative

The total number of archaeological sites for the HST Alternative ranges from 16 (for the Oakland to San Jose via Hayward Line and the Diablo Range Direct corridors) to 35 (for the San Francisco to San Jose and Diablo Range Direct corridors). For archaeological resources, the No Project, Modal, and HST Alternatives are all ranked as medium, although the HST Alternative has a somewhat greater potential for impacts.

One hundred percent of both the Oakland to San Jose study area and the San Francisco to San Jose study area developed during the historic period and these segments of the HST alternative in the Bay Area to Merced region have a high ranking for adverse effects or impacts. This high potential for adverse effect or impact could be reduced to medium if HST construction could be confined to the existing rail corridor and grade-separation impacts were minimized, particularly in the areas of the downtown Oakland Historic District, the Oakland Waterfront Warehouse District, the Redwood City Historic District, the Agnews Insane Asylum Historic District, the Santa Clara Station Historic District, and the Cahill (Diridon) Station Historic District in San Jose. The outlying segments of the HST alternatives in the Bay Area to Merced region are ranked medium for historic properties/resources, as are the No Project and Modal Alternatives.

An estimated 28 mi (45 km) of geologic units identified as highly sensitive for paleontological resources have been identified for the HST Alternative. For opaleontological resources, this correlates to a medium sensitivity.

High-Speed Train Alignment Options Comparison

All segments of the HST Alternative in this region, except the two Pacheco Pass alignment options, have a medium sensitivity for archaeological resources. The two Pacheco Pass options are ranked as low. For the San Jose to Merced portion of the study area, there is a slight difference between the Pacheco Pass routes (14%) and the Diablo Range direct routes (9%). The greatest numbers of archaeological sites occur along the two Diablo Range tunnel alignments (more than 20 each).

Both alignment options from San Jose to Merced via Pacheco Pass are ranked high for potential impacts on historic structures, whereas the alignment options using the three Diablo Range direct alignments area ranked low. Selection of the Diablo Range direct options would reduce potential impacts on historic structures.

For the HST alignment options, the key differences for paleontological resources are between the Pacheco Pass options, which would cross about 11 mi (18 km) of high-sensitivity rock units and 13 mi (21 km) of moderate-sensitivity units, compared to the Diablo Range Direct options, which would cross about 2 mi (3 km) of high-sensitivity rock units and 14 mi (23 km) of moderate-sensitivity units.

## B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

There are 85 archaeological sites in the study area for the Modal Alternative (50 prehistoric sites and 31 historic sites). Most sites are in the Sacramento to Stockton corridor (27) and the Tulare to Bakersfield corridor (30). Under the Modal Alternative, most sites are along SR-99, with relatively few sites along I-5. The SR-99 alignment under the Modal Alternative has the highest potential to impact archaeological resources, while the I-5 corridor is ranked low, with the lowest number of sites. The overall archaeological sensitivity ranking for the Modal Alternative is medium.

More than 50% of the length of the SR-99 Sacramento to Stockton, Modesto to Merced, and Merced to Madera segments was developed during the historic period. As a result, the Modal Alternative has a medium potential to impact historic structures.

The Modal Alternative has a high potential to impact paleontological resources.

High-Speed Train Alternative

The number of archaeological sites potentially affected by the HST Alternative varies greatly, ranging from 55 to 225, depending on which alignments are chosen. In general, the HST alignments that have fewer archaeological sites are those that bypass the urban cores to the extent possible and follow the BNSF corridor. The APEs for the UPRR alignments that go through the urban cores have the most archaeological sites. For example, between Modesto and Merced, the alignments that follow the UPRR corridor and go to the Merced Downtown Station each have the potential to affect more than 100 sites. The alignments that follow the BNSF corridor to the Merced Municipal Airport each have the potential to affect only one site. The minimum and maximum number of sites for the other corridors are not as high or low; they range from 17 to 32 for Sacramento to Stockton, 18 to 19 for Stockton to Modesto, three to 14 for Merced to Fresno, and 12 to 40 for Tulare to Bakersfield. Overall, the HST has a medium potential to impact archaeological resources.

Though the degree to which the areas along the HST alignment options developed during historic periods varies greatly, the HST Alternative has a high potential to effect or impact historic properties/resources because all routes pass through station locations in historic urban cores, although there are lower-ranked alternatives for most of the alignments between stations. Examples include historic properties/resources in the area of the downtown Sacramento Valley Station, which is the oldest area of the city, and the segment from Sacramento to Stockton with five known historic sites, two preservation areas, and one State Historic Landmark. The percentage of the route length with the potential to contain historic structures ranges from 20% to 37%. In urban cores, however, the route percentages of historic properties/resources would be nearly 100%. Thus, the UPRR alignments that traverse the urban cores would potentially cause the greatest number of impacts to historic properties/resources. For example, the area around the following stations are almost entirely of historic age: the Downtown Sacramento Valley Station, Stockton ACE Downtown Station, Modesto Downtown Station, Fresno Downtown Station, Hanford Station, and Truxtun Station in Bakersfield. The UPRR route would go through Elk Grove and Galt, two towns established in the mid-1800s.

The HST Alternative has a medium potential to impact paleontological resources.

High-Speed Train Alignment Options Comparison

The potential impact of the HST Alternative on archaeological resources varies greatly, depending on the alignments chosen. The segments between Modesto and Merced have a high potential to affect archaeological resources, with about two-thirds of the more than 150 recorded historical sites that lie along the corridor concentrated in two areas: along a portion of the UPRR Line between Keyes and Atwater, and at the former Castle Air Force Base. The potential for effects or impacts to historic properties is somewhat greater along the UPRR route because of the towns dating to the 1870s. Similarly, from Fresno to Tulare, the UPRR corridor would have the greatest number of historic structures per mile, over the BNSF alignment options. In general, the alignments that would have fewer historic structures are those that follow the BNSF corridor and bypass urban cores.

## C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

Overall, the Modal Alternative for this region has a medium potential for impacting archaeological sites, with 49 archaeological sites recorded along this alignment. Most sites are in the I-5 corridor between SR-99 and SR-14 (18 sites) and in the SR-14 corridor between Palmdale and I-5 (30 sites). There is a high potential for as-yet-unidentified buried sites from the historic period (which may also be of concern to Native Americans) in the Tejon area south of the Grapevine along I-5 between SR-99 and SR-14. In this area, the Sebastian (Tejon) Indian Reservation is

California Historical Landmark #133 and the Rose Stage Station is California Historical Landmark #300. In addition, Fort Tejon State Historic Park and the Tejon Ranch headquarters are located in this area.

For the Modal Alternative, the route following I-5 between Bakersfield and Santa Clarita has a medium potential to impact archaeological sites, while the route through the Antelope Valley (SR-58/SR-14) has a low potential impact on archaeological sites. The remainder of the I-5 corridor from Santa Clarita to LAUS has a high potential for impacts on archaeological sites.

Half of the Modal Alternative segments are in areas that developed in the historic period, (prior to 1958). These include I-5 from I-405 to Burbank, I-5 from Burbank to LAUS, and SR-58 and SR-14 between Bakersfield and Palmdale. The area around Burbank Airport was almost completely developed during the historic period. The Modal Alternative has a low to medium ranking for potential to effect or impact historic properties/resources in this region. Though sensitivity varies greatly within this study area, the overall level of potential impacts is considered medium.

The Modal Alternative would also impact paleontological resources because existing highways traverse 30 formations with high paleontologic sensitivity, resulting in an overall high-sensitivity ranking.

High-Speed Train Alternative

The HST Alternative for this region receives a high-sensitivity rank for potential effects to archaeological resources and historic-era structures (Table 3.12.1). The sensitivity of subsegments, however, differs considerably. For the HST Alternative, there are two corridors under consideration between Bakersfield and Sylmar in the northern San Fernando Valley: the I-5 corridor and the SR-58–Antelope Valley–Soledad Canyon corridor. There are 17 recorded archaeological sites in the study area for the I-5 corridor using the Union Avenue corridor from Bakersfield to I-5 and 16 sites using the Wheeler Ridge corridor from Bakersfield to I-5. One prehistoric site reported to contain human burials is recorded within the Union Avenue study area. The Tehachapi Crossing portion of the I-5 corridor passes through the Tejon area discussed under the Modal Alternative.

The HST corridor that passes through the Antelope Valley has the potential to affect 68 recorded archaeological sites. The majority of the sites in the SR-58 corridor and the Soledad Canyon corridor are prehistoric. A burial was reported at one of the sites in the Soledad Canyon corridor. Most sites in the Antelope Valley corridor are historic trash scatters along the railroad.

The HST alignments between Sylmar and LAUS have no known archaeological sites because most of this area was not surveyed prior to development. The area developed prior to 1971 before systematic archaeological surveys began to be required. However, impacts are likely. There is a high potential for buried prehistoric sites in this area, especially along the Los Angeles River. There is also a high potential for buried historic sites in the vicinity of LAUS, located in the historic core of Los Angeles, because archaeological material from the nineteenth-century occupation of the area by Hispanic Americans, Chinese Americans, and Anglo Americans has been recovered.

More than 70% of the following HST Alternative alignments had begun development by 1958: Burbank Airport to downtown Burbank, the Burbank Airport Station and Downtown Burbank Station, the MTA/Metrolink route from downtown Burbank to LAUS, and the I-5 route from downtown Burbank to LAUS (cut and cover at Silverlake option). LAUS is listed in the NRHP.

High-Speed Train Alignment Options Comparison

The HST alignment from Bakersfield to Sylmar via the I-5/Grapevine has a low potential to impact archaeological sites, while the Antelope Valley alignment option has a high potential to impact archaeological sites, including recorded trash scatters from historic period along rail corridors.

For the HST Alternative, the alignment options from Bakersfield to Sylmar via the Grapevine have a medium to high potential for effects or impacts on historic properties/resources, whereas the Antelope Valley alignment option has a low to medium potential for such impacts. Both alignment options leading into the LAUS have a high potential to affect or impact historic properties/resources because of the historic area surrounding the station.

The HST alignment options with the lowest potential impact on paleontological resources would be the I-5/Grapevine south of Bakersfield, using the Union Avenue corridor, and the Metrolink/I-5 aerial alignment option into LAUS. The I-5/Grapevine south of Bakersfield, using the Wheeler Ridge alignment and or the SR-58 and SR-14 corridors through the Antelope Valley with an at-grade cut would have greater potential impacts on paleontological resources.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

The Modal Alternative has the potential to affect 85 recorded sites in this region; 44 of these are in the March ARB to Mira Mesa corridor. From March ARB to Mira Mesa, all alignments and corridors are ranked as having high potential impacts. From Mira Mesa to San Diego, the Modal Alternative is ranked as having medium potential impacts.

There are many commercial and residential properties/resources that date to the periods between1900 to 1929 and 1930 to 1958 along the rail routes between Los Angeles and Ontario. There are relatively few historic properties/resources along the rest of the Modal Alternative alignment; only 16% of the study area developed during the historic period. The overall potential impact ranking concerning historic structures for this region is medium.

The mountainous terrain just south of Temecula is considered to contain important traditional tribal cultural areas. The Pechanga Band of Luiseno Indians has expressed particular concern that the project not effect traditional cultural properties in the vicinity of Temecula.

For peleontological resources within this region, the potential level of effects is high for the Modal Alternative.

High-Speed Train Alternative

The HST Alternative for this region receives a medium rank for potential effects to archaeological resources, having the potential to affect between 125 and 136 recorded archaeological sites, depending on the alignments used and excluding the spur from Mira Mesa to Qualcomm Stadium. For the corridor from LAUS to March ARB, there are between 18 and 25 recorded sites. For the corridor from March ARB to Mira Mesa, there are either 60 or 62 recorded sites, depending on which route through Escondido is used. From Mira Mesa to San Diego, there are 47 or 49 recorded sites, depending on which alignment between Mira Mesa and the Transit Center is used. There are five recorded sites in the corridor from Mira Mesa to Qualcomm Stadium.

The average historically developed area along the HST alignments between LAUS and March ARB is 27.5%, with the highest being the UPRR Colton Line via San Bernardino (33%), and the lowest the UPRR Riverside Line–UPRR Colton Line (21%). The average historically developed area along

the HST alignments between March ARB and Mira Mesa is 0.3% due to the rural characteristics of this area. For Mira Mesa to San Diego, the two alignments each average about 21% of the study area built during the historic period. None of the spur from I-15 to Qualcomm Stadium developed during the historic period. Over 95% of the area around the San Diego Station at the Santa Fe Depot was developed during the historic period, and the station structure is listed in the NRHP. The overall potential impact to historic structures for this region is considered medium-ranked.

The mountainous terrain just south of Temecula is considered to contain important traditional tribal cultural areas. The Pechanga Band of Luiseno Indians has expressed particular concern that the project not affect traditional cultural properties in the vicinity of Temecula.

While both the Modal and HST Alternatives potential impacts on historic structures is calculated as medium, the HST alignment is nearly twice the length as the Modal Alternative.

For paleontological resources in this region, the HST Alternative, like the Modal Alternative, would have similar potential impacts on Pliocene-Pleistocene nonmarine sedimentary rock units and Quatenary Dune Sand.

High-Speed Train Alignment Options Comparison

The segment between March ARB and Mira Mesa has the highest potential to impact archaeological resources. The segment from LAUS to El Monte passes directly adjacent to San Gabriel Mission, where there are recorded archaeological sites dating to the late eitheenth and nineteenth centuries and high potential for encountering additional buried archaeological material from the historic period. The two HST alignment options (I-15 to Coast via Miramar Road and I-15 to Coast via Carroll Canyon) are ranked as having high potential impacts.

For this region, the UPRR Colton Line via San Bernardino would have the highest potential to impact historic properties.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

The Modal Alternative would have potential impacts on 108 recorded archaeological sites in this region, resulting in a medium sensitivity ranking. However, all of the recorded sites are south of Irvine Station. This is due to lack of archaeological surveys north of Irvine Station prior to development of the area; as mentioned above, there were few systematic archaeological surveys until the passage of CEQA in 1971. More than 70% of the portion of the Modal Alternative between LAUS and Irvine and between SR-52 and Santa Fe Depot developed during the historic period, prior to 1958.More than 70% of the portion of the Modal Alternative between LAUS and Irvine and between SR-52 and Santa Fe Depot developed during the historic period. This Alternative, therefore, has a high ranking for potential to effect or impact historic properties/resources and known historic properties/resources are located within the APE.

High-Speed Train Alternative

There are three recorded archaeological sites between LAUS and Anaheim (UPRR corridor) and 21 sites between LAUS and Irvine following the LOSSAN (BNSF) corridor. The spur from LAUS to LAX has seven recorded sites.

The HST alignment option from LAUS to Anaheim via the UPRR ranks low for recorded archaeological sites.

For the HST alignments, 52% of the area between LAUS and Anaheim (UPRR corridor) and 78% of the area between LAUS and Irvine following the LOSSAN (BNSF) corridor developed during the historic period. Fifty-eight percent of the area along the spur from LAUS to LAX developed historically. The HST Alternative between LAUS and Irvine has a high potential to result in effects and impacts on historic properties/resources because much of the area developed during the historic period and historic properties/resources remain along the corridor.

Over 95% of the area around the San Diego Station at the Santa Fe Depot was developed during the historic period, and the building is listed in the NRHP.

### 3.12.5 Design Practices

The Authority and FRA are committed to avoiding potential impacts to cultural resources through careful alignment design and selection. The Authority is committed to avoiding impacts to Native American resources to the extent feasible and practical.

The Authority will develop procedures for fieldwork, identification, evaluation, and determination of potential effects to cultural resources in consultation with SHP and Native American Tribes. On-site monitoring is often incorporated in the fieldwork when sites are known or suspected of containing native American human remains. The procedures need to comply with federal and state statutes concerning burials.

### 3.12.6 Mitigation Strategies and CEQA Significance Conclusions

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for cultural and historic resources, the proposed HST system alternative would have a potentially significant effect on cultural and historic resources when viewed on a systemwide basis. Although placing the conceptual corridors for the HST system alternative within or along existing transportation corridors reduces the potential for adverse effects to many resources, providing HST service to and locating potential stations sites in metropolitan centers increases the potential for adverse impacts to cultural and historic resources. Additional avoidance and mitigation strategies will be applied in the second-tier, project-level analyses. However, some cultural and historic resources will be adversely affected should a decision be made to proceed with the development of the HST system. At the programmatic level of analysis, it is not possible to know precisely the location, extent and particular characteristics of impacts to these resources. Because of this uncertainty, at the programmatic level of analysis the impact is considered significant. Mitigation strategies, as well as the design practices discussed in section 3.12.7, will be applied to reduce these impacts.

General mitigation strategies are discussed in this section as part of this programmatic evaluation. Should the HST Alternative be carried forward, the Authority and FRA would consult with SHPO to define and describe general procedures to be applied in the future for fieldwork, methods of analysis, and the development of specific mitigation measures to address effect and impacts on cultural resources, which could be reflected in a programmatic agreement between the Authority, FRA and SHPO. The Authority and FRA would also continue to consult with Native American tribes concerning the proposed undertaking, as required by federal and state laws concerning the management of historic properties (federal)/historical resources (state). Mitigation measures would be required for adverse effects (significant under CEQA) on cultural resources that are listed, determined eligible for, or that appear to be eligible for listing in the NRHP or CRHR. The mitigation measures ultimately selected for this undertaking will meet the Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44740), as well as standards and guidelines for historic preservation activities established by the California SHPO.

At the conclusion of the programmatic environmental review process, the Authority and the FRA, in consultation with the SHPO, would develop a programmatic memorandum of agreement (PA) to describe

expectations for the next phase of fieldwork, eligibility determination, and documentation under Section 106 of NHPA and pursuant to CEQA. The PA may specify procedures for the identification and evaluation of impacts for future projects and the site-specific work that would be required during project-level environmental review.

These potential measures provide two levels of mitigation and are organized by resource type. One level of mitigation are those that, when implemented as conditions of project approval, would enable the project to avoid an adverse effect or impact. The other level of mitigation includes measures that would lessen the degree of adverse effect/impact. No one measure presented in this section would mitigate all adverse effects or impacts, however, some combination of these measures and others negotiated during the project phases of the program will emerge as the agreed upon mitigation for this project.

In general, there is a wide range of actions that can qualify as mitigation, depending on the type of project, the type of property, and impacts the project may have on cultural resources. The following list presents some of the principles that generally guide mitigation development in historic preservation practice.[9]

- Mitigation measures should correspond or be related directly with the resource being affected, rather than in a compensatory fashion that does not relate to the affected resource;
- Mitigation should be consistent with the significance of the historic property and correspond to the severity of project effects on the historic property;
- Mitigation must be relevant to the goals of historic preservation, rather than as an enhancement of the project to which it is related or as enhancement to amenities unrelated to the affected properties;
- Mitigation measures that are chosen should be a worthwhile use of public funds and provide a high degree of public benefit relative to the cost;
- Mitigation measures should benefit the greatest number of people, particularly those members of the interested public rather than only those of a specialized audience or particular group;
- Historic properties that will be demolished or greatly altered should be documented in permanent forms.

A. ARCHAEOLOGICAL RESOURCES

The following are potential mitigation measures for eligible or listed archaeological sites:

- Consider avoidance of impact, and when avoidance cannot be accommodated, consider minimizing the scale of impact..
- Incorporate the site into parks or open space (P.R.C. § 21083.2).
- Cap or cover the site before construction.
- Provide data recovery.
- Develop procedures for fieldwork, identification, evaluation, and determination of potential effects to cultural resources in consultation with SHPO and Native American tribes. On-site monitoring is often incorporated in the fieldwork when sites are known or suspected of containing Native American human remains. The procedures need to comply with federal and state statutes concerning burials.

[9] These factors are based on those presented in: Caltrans, "San Francisco-Oakland Bay Bridge East Span Seismic Safety Project, Consideration of Proposed Mitigation Measures," September 1999.

Avoidance is preferred, but if adjustments to the alignment plan or profile are not feasible, data recovery may be provided. When impacts will destroy or affect the data potential of a property (NRHP Criterion D/CRHR Criterion 4), data recovery may consist of archaeological excavation of an adequate sample of site contents so that the research questions applicable to the site can be addressed. Recovery of important information from the site mitigates the information loss that would result from site destruction. If only part of a site were impacted by the project, data recovery would only be necessary for that portion of the site. Data recovery would not be required if the agency determines prior testing and studies had adequately recovered the scientifically consequential information from the resources (CEQA Guidelines, 14 C.C.R. § 15126.4[b]).

When other NRHP or CRHR criteria are relevant (e.g., Criterion A/1; Criterion B/2; Criterion C/3) or when a Traditional Cultural Property is involved, it is often necessary to consider more diverse mitigation measures.

B. HISTORIC PROPERTIES/RESOURCES

Measures to avoid adverse effects would include steps taken in both the design and construction phases of the project. Avoidance has occurred and would occur during the design phase by not including components that could possibly effect or impact historic properties/resources. Avoidance would also occur by conducting construction activities to actively evade historic properties/resources.

The following are potential mitigation measures for historic properties/resources Measures to avoid Adverse Effects:

Stabilization/Monitoring During Construction. The lead agency would prepare a treatment plan that would present a detailed methodology for the protection of historic properties/resources, such as buildings, structures, objects, and sites, and cultural landscape elements that are in close proximity to construction activities. This treatment plan would describe methods for the preservation, stabilization, shoring / underpinning, and monitoring of buildings, structures, and objects. The treatment plan would also include provisions that high vibration construction techniques would be avoided in sensitive areas. Underpinning and/or other stabilization methods could be used at buildings located near project construction areas and that may be susceptible to damage or inadvertent destruction.

Measures to Lessen Adverse Effects. Measures to minimize project impacts to historic properties/resources would occur in pre-construction, construction, and post-construction phases. Many of these mitigation measures would require careful agency review and may require stipulations in the contracts of the construction contractors to ensure appropriate preservation of cultural resources.

Recordation. The lead agency would ensure that cultural resources adversely affected by the project would be recorded and documented to the standards of the Historic American Building Survey (HABS) or Historic American Engineering Record (HAER). This would require coordination with the NPS HABS / HAER program to determine the appropriate level of recordation. This coordination would also address the adequacy of recordation previously conducted for historic properties/resources that may be adversely affected.

Design Guidelines. The lead agency would ensure that design guidelines would be developed to ensure sympathetic, compatible, and appropriate designs for new construction. Aesthetic details can be considered mitigation, but there may be a limit to the amount of change possible in the design once important engineering and environmental considerations have been taken into account. It is most likely that the design guidelines mitigation would apply to the visual appearance of the project, rather than specifics of alignment, overall depth / width, or placement of supports. Design guidelines

could be informed by the documentation prepared under HABS/HAER standards. It would be necessary for an architectural historian or a historical architect to advise the structural designers on appropriate architectural treatments that could serve as mitigation. SHPO and other agencies would review draft design guidelines and provide comment on the guidelines as well as on proposed design changes.

Interpretive / Educational Materials and Popular Report. The lead agency could prepare interpretive and/or educational materials and programs regarding the affected historic properties/resources. The focus of this mitigation would be the historic themes related to these resources. Such materials and/or programs could include: a popular report; documentary videos, booklets, interpretive signage, additional interpretive information made available to state and local agencies. These materials could also include salvage items, historic drawings, interpretive drawings, current and historic photographs, models, and oral histories. Assistance could also be provided for archiving or digitizing the documentation of cultural resources affected, as well as for the dissemination of the material to appropriate repositories.

Relocation. Historic properties/resources that would be otherwise demolished because of the project could be relocated and rehabilitated. The lead agency would ensure that these buildings or structures were recorded to HABS standards prior to their removal and in consultation with NPS. The lead agency / project proponent would prepare a removal plan, including site plans for the new locations and placing them on new foundations and to conditions consistent with those that existed prior to the move.

Monitoring (Architectural / Cultural Landscape). The project construction documents and new construction would be monitored to ensure they conform to the design guidelines and any other treatment procedures agreed to by the consulting parties. A professional architectural historian and a professional historical landscape architect, who meet the Secretary of the Interior's *Professional Qualifications Standards* (48 FR 44738-9), would monitor construction to identify conditions that could conflict with the mitigation measures. The lead agency would take steps to correct these conflicts.

Minor Repairs and Reconstruction. The lead agency would ensure that inadvertent damage to historic properties/resources would be repaired in accordance with the Secretary of the Interior's *Standards for Treatment of Historic Properties*.

Salvage. The lead agency would ensure that selected decorative or architectural elements of the adversely affect historic properties/resources would be reviewed for feasibility of salvage in order to mitigate their loss or destruction. Where possible, these elements would be retained and incorporated into the new construction. Where re-use was not possible, selected salvaged elements could be made available for use in interpretive displays either near the affected resources or at an appropriate museum, for example.

## C. PALEONTOLOGICAL RESOURCES

Mitigation measures for paleontological resources would be developed and implemented at the project level. The following measures may be included.

- Educate workers.
- Recover fossils identified during the field reconnaissance.
- Monitor construction.
- Develop protocols for handling fossils discovered during construction, likely including temporary diversion of construction equipment so that the fossils could be recovered; identified; and

prepared for dating, interpreting, and preserving at an established, permanent, accredited research facility.

The above mitigation strategies, including implementation of a programmatic agreement addressing historic resources and continued consultation and coordination with tribal representatives, are expected to substantially lessen or avoid impacts to cultural and historic resources in most circumstances. At the second-tier, project-level review it is expected that for proposed HST alignments which would result in impacts to cultural and historic resources, most of the impacts will be mitigated to a less-than-significant level, but it is possible that for some impacts will be significant. Sufficient information is not available at the program level to conclude with certainty that the above mitigation strategies will reduce impacts to affected resources to a less than significant effect in all circumstances. Therefore, potential impacts to cultural and historic resources are considered significant at the program level even with the application of mitigation strategies. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses.

### 3.12.7 Subsequent Analysis

The following paragraphs describe the procedures that would be necessary at the next stage of environmental review (a Tier-2 study) to determine appropriate and feasible mitigation measures in consultation with the SHPO, if a decision is ultimately made to go forward with the proposed HST system. These procedures would satisfy the NHPA and also satisfy CEQA requirements.

As allowed under 36 C.F.R. § 800.4(b)(2), a phased approach to identification of historic properties can be used when the proposed undertaking involves corridors. As indicated by the results of this study, FRA and the Authority have determined that historic properties likely exist in various corridor segments, through background research, consultation, and abbreviated field reconnaissance. Once alternatives have been refined, full identification efforts may proceed. Under NHPA Section 106 and implementing regulations (36 C.F.R. § 800), the procedures would include identifying resources with the potential to be affected; evaluating their significance under NRHP and CEQA; and identifying any substantial adverse effects, and then evaluating potential mitigation.

In the interest of identifying archaeological sites within the APE, a field survey of the APE should be completed which will identify those sites evident on the surface, geomorphological maps and studies should be reviewed to assess the potential for corridor segments to contain significant buried sites, and historic maps and an historic overview or context should be developed in the interest of identifying potential historical archaeology sites within the APE.

Additional efforts must also be made to consult with appropriate Tribes and individuals knowledgeable about the nature and locations of potential traditional cultural properties.

Identifying potentially affected archaeological and historical properties/resources would require identification and evaluation within a more specifically defined APE that would include the area where direct and indirect impacts from construction could occur (including locations of easements and construction-related facilities, such as equipment staging areas, borrow and disposal areas, access roads, and utilities) and the area(s) where the settings of any eligible historic buildings and structures, or the buildings and structures themselves, could be materially or significantly altered.

All identified resources would then be evaluated using NRHP and CRHR eligibility criteria. Evaluating archaeological sites may require preparing test plans for archaeological resources that contain regionally relevant research questions. The Authority and the FRA would consult with the SHPO on any test plans and determinations of eligibility for evaluated resources. The impacts of a proposed specific project on resources determined eligible would be analyzed. An impact analysis report may then be reviewed with the SHPO. Mitigation measures needed to address impacts on specific resources could then be

developed and incorporated in an MOA between the SHPO, the Advisory Council on Historic Preservation, the FRA, and the Authority during the preparation of project-specific environmental evaluation. The mitigation measures in the MOA would then be incorporated into project-specific environmental documentation and project approvals.

A paleontological resource assessment program would also be completed as part of the subsequent analysis for a project-level EIR/EIS. The assessment program would include field reconnaissance to identify exposed paleontological resources and more precisely determine potential paleontologic sensitivity for the project. A paleontological resources treatment plan would be prepared by a qualified paleontologist. The plan would be included in project approval and would address the treatment of paleontological resources discovered prior to and during construction.

Further consultation would also occur at the project level with the Native American Heritage Commission as necessary, and with Native American groups when traditional territories may be close to APEs for the project. Additionally, more specific information related to traditional cultural sites of concern would be obtained as necessary.

# 3.13 GEOLOGY AND SOILS

This section describes existing geologic conditions in the five study regions and analyzes the potential geological impacts of each alternative and proposed HST alignment option. This analysis focused on potential impacts related to seismic hazards; landslide hazards; locations of oil and gas fields, geothermal fields, and mineral resource sites, and on bedrock and other conditions that could affect excavation.

## 3.13.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

A number of state regulations apply to geologic hazards and engineering geologic practice. The following paragraphs summarize key regulatory provisions; more detailed discussion is deferred to project-level environmental documentation because these regulations, if applicable, relate to site-specific conditions and thus would be applied as appropriate at the project level rather than the program level.

Principal state guidance relating to geologic hazards is contained in the Alquist-Priolo Act (P.R.C. § 2621 *et seq.*), and in the Seismic Hazards Mapping Act of 1990 (P.R.C. § 2690–2699.6). The Alquist-Priolo Act prohibits the location of most types of structures for human occupancy across the active traces of faults in earthquake fault zones shown on maps prepared by the state geologist, and regulates construction in the corridors along active faults (earthquake fault zones). The Seismic Hazards Mapping Act of 1990 focuses on hazards related to strong ground shaking, liquefaction, and seismically induced landslides. Under its provisions, the state is charged with identifying and mapping areas at risk of strong ground shaking, liquefaction, landslides, and other corollary hazards, and the maps are to be used by cities and counties in preparing their general plans and adopting land use policies in order to reduce and mitigate potential hazards to public health and safety.

Site-specific geotechnical investigations may be prepared to provide a geologic basis for the development of appropriate construction design for proposed projects, including mitigation/ remediation of geologic hazards where this is possible. Geotechnical investigations typically assess the bedrock and Quaternary geology, the geologic structure, the soils, and the previous history of excavation and fill placement on and in the vicinity of the site for a proposed project. They may also address the requirements of the Alquist-Priolo Act and the Seismic Hazards Mapping Act.

Pursuant to the Surface Mining and Reclamation Act (P.R.C. § 2710 *et seq.*), the State Mining and Geology Board identifies in adopted regulations areas of regional significance that are known to contain mineral deposits judged to be important in meeting the future needs of the area. (See P.R.C. § 2726 and 2790; Title 14 C.C.R. 3550, *et seq.*) The State Mining and Geology Board also adopts state policy for the reclamation of mined lands and certifies local ordinances for the approval of reclamation plans as being consistent with state policies (P.R.C. § 2755–2764, 2774 *et seq.*).

B. METHOD OF EVALUATION OF IMPACTS

To evaluate potential impacts related to geology and soils, each alternative was ranked for potential seismic hazards (ground shaking and ground failure potential), surface rupture hazard (number of active fault crossings), slope instability, areas of difficult excavation, presence of oil/gas/geothermal fields (presence of the resource and/or production facilities), and presence of economic mineral resources. The analysis was performed generally on the basis of existing data available in geographic information systems (GIS) format as opposed to detailed site investigations. The geologic data provided in this section are intended for planning purposes and are not intended to be definitive for specific sites. Alignments were evaluated by the regional team technical leads as having high, medium, or low potential for geologic impacts based on the number of geologic constraints identified.

Airports, stations, and other facilities were evaluated as having high or low potential for geologic impacts, based on the number of geologic constraints identified. These rankings made it possible to provide a rough comparison of the potential geologic constraints affecting each alternative and each alignment.

The following paragraphs describe the ranking process. Table 3.13-1 summarizes the ranking criteria for potential geologic and soils impacts.

**Table 3.13-1**
**Ranking System for Comparing Impacts Related to Geology/Soils/Seismicity**

| Impact Ranking | Seismic Hazards (% of Length) | Active Fault Crossings (Number of Crossings) | Slope Instability (% of Length) | Difficult Excavation (% of Length) | Oil and Gas Fields (% of Length) | Mineral Resources (Present or Not Present) |
|---|---|---|---|---|---|---|
| **Alignments** | | | | | | |
| High | >50 | 2+ | >10 | >25 | >20 | >20 |
| Medium | 10–50 | 1 | 5–10 | 10–25 | 10–20 | 10–20 |
| Low | <10 | 0 | <5 | <10 | <10 | <10 |
| **Airports/Stations/Facilities** | | | | | | |
| High | Present | Present | Present | Present | Present | Present |
| Low | Not Present | Not Present | Not Present | Not Present | Not Present | Not Present |

Seismic Hazards

Seismic hazards that could potentially constrain the design of proposed facilities were evaluated on the basis of potential for strong ground motion and potential for liquefaction. Areas potentially subject to strong ground motion were defined for this program-level study as areas where peak horizontal ground accelerations in an earthquake may exceed 0.50g (i.e., areas where peak horizontal ground acceleration may exceed 50% of the acceleration due to gravity) as mapped by the California Geological Survey (formerly the California Division of Mines and Geology) (State of California 1999). This acceleration is used to calculate the horizontal force a structure may be subjected to during and earthquake. For this analysis, liquefaction was conservatively assumed to be possible in all areas where peak ground accelerations could exceed 0.30g, except for areas mapped as underlain by bedrock. Where groundwater levels were not known from existing literature, they were conservatively assumed to be high, contributing to increased potential for liquefaction.

The ranking system for impacts related to seismic hazards used the percentage of each potential alignment within strong ground motion zones and/or potentially liquefiable zones. Station and airport sites were compared by determining whether any portion of the proposed station site would be within a strong ground motion zone or potentially liquefiable zone.

- Alignments: High, medium, or low, based on percentage of alignment length in strong ground motion zones plus the percentage of length in potentially liquefiable zones.
- Stations/airports: High if any part of the site is within a strong ground motion zone or potentially liquefiable zone; otherwise, low.

Potential for Surface Rupture (Active Fault Crossings)

Surface rupture hazard was evaluated based on whether any portion of a project alignment or facility would be located within 200 ft (62 m) of the mapped trace of any fault with known or

inferred movement during Quaternary time (the past 1.6 million years). If any portion of a proposed alignment or potential facilities site was within 200 ft (62 m) of a Quaternary fault, it was identified as crossing an active fault trace. As described below, the State of California defines active faults as those that show evidence for movement in the last 11,000 years. Because of the extreme disruption of transit facilities that can result from surface fault rupture, this analysis deliberately adopted a conservative criterion for the assessment of surface rupture hazard and included potentially active faults, those with known or inferred movement over Quaternary time.

The ranking system for impacts related to surface rupture hazard was based on the number of active fault crossings identified.

- Alignments: High, medium, or low, based on number of active (recent or Quaternary) fault crossings.
- Stations/airports: High if any part of the site is within 200 ft (60 m) of an active (recent or Quaternary) fault; otherwise, low.

Slope Instability

Slope stability was evaluated based on the geologic formations or units present along each alignment and at each facilities site, as shown in statewide mapping compiled by Jennings (1977, 1991). Each of the mapped geologic units was assigned a rating for inferred slope stability, based primarily on lithology (physical characteristics of the rock formation) and age. This approach allowed the identification of areas at risk for slope instability. A conservative 200-ft (60-m) buffer was included around each identified area of instability.

The ranking system for impacts related to slope instability was based on the percentage of each alignment within potentially unstable zones. Station and airport sites were compared by determining whether any portion of the site is within an area of potential slope instability.

- Alignments: High, medium, or low, based on percentage of alignment length in potentially unstable zone.
- Stations/airports: High if any part of the site is within a potentially unstable zone; otherwise, low.

Difficult Excavation

Areas of potentially difficult excavation were identified based on bedrock geologic characteristics in combination with the presence of faults of any age, based on statewide mapping compiled by Jennings (1977, 1991) and information from selected 1:250,000-scale geologic map sheets for the study regions published by the California Geological Survey. Each fault crossing was conservatively assumed to be approximately 600 ft (185 m) wide. Geologic cross-sections were prepared to assess subsurface tunneling conditions along proposed HST tunnel segments.

The ranking system for impacts related to difficulty of excavation was based on the percentage of each alignment where excavation would be required within identified areas of difficult excavation. Stations and airport sites were compared by determining whether any portion of the site is within an identified area of difficult excavation.

- Alignments: High, medium, or low, based on percentage of surface segments in hard rock plus percentage of tunnel segments within fault zones.
- Stations/airports: High if any part of the site is within a hard rock zone or fault zone; otherwise, low.

Oil, Gas, and Geothermal Fields
Areas where the presence of oil, gas, and geothermal resources could constrain project construction or operation were identified on the basis of published resource maps produced by the California Department of Conservation's Division of Oil, Gas, and Geothermal Resources (California Department of Conservation 2001a, 2001b).

The ranking system for impacts related to oil, gas, and geothermal fields was based on the percentage of each proposed alignment within identified oil and gas or geothermal field areas. Station and airport sites were compared by determining whether any portion of the proposed site is within a mapped oil, gas, or geothermal field areas.

- Alignment: High, medium, or low, based on percentage of alignment length within mapped oil and gas plus geothermal fields.
- Stations/airports: High if any part of the site is within a mapped oil, gas, or geothermal field; otherwise, low.

Mineral Resources
Areas where the project could affect mineral resource extraction (primarily sand and gravel deposits) were identified on the basis of reports and published maps by the United States Geologic Survey, and California Geologic Survey.

The ranking system for mineral resources impacts was based on the number of mineral resources sites intersected by each alignment. Station and airport sites were compared by determining whether any portion of the site is within a mineral resource area. The potential value of mineral resources varies with time with demand for the resource. Thus, evaluation of specific sites for relative importance was not considered for this program-level study.

- Alignments: High, medium, or low, based on number of mapped resources within 200 ft (60 m) of a mineral resource area.
- Stations/airports: High if any part of the site is within 200 ft (60 m) of a mineral resource area; otherwise, low.

### 3.13.2 Affected Environment

A. STUDY AREA DEFINED

The study area for geology and soils is defined as the corridor extending 200 ft (60 m) on each side of the alignment centerlines, and a 200-ft (60-m) radius around each station or airport site. This distance incorporates all cross-sections with the exception of deep cuts and fills. As described in *Method of Evaluation of Impacts* above, alternatives were compared based on the number of sites with potential geologic or soils impacts per alternative, which depends on the length and location of the alignment; broadening the study area to include the entire width of deep cut-and-fill sections would not change the results of the comparison.

B. GENERAL DISCUSSION OF GEOLOGY AND SOILS

The following sections describe key project constraints related to geology and soils.

Seismic Hazards
Seismic hazards are generally classified in two categories: *primary seismic hazards* (surface fault rupture and ground shaking) and *secondary seismic hazards* (liquefaction and other types of seismically induced ground failure, along with seismically induced landslides).

Primary: *Surface fault rupture*, or ground rupture, occurs when an active fault ruptures at depth to produce an earthquake, and the rupture propagates to the ground surface. Surface rupture can also occur as a result of slow, gradual motion referred to as *fault creep*. An area's potential for ground rupture is assessed based on the displacement history of the area's faults. Two categories of faults have been defined by the State of California in Special Publication 42 (Hart and Bryant 1997). *Active faults* are those that are known or inferred to have experienced movement in the past 11,000 years and are considered to have a high potential for future ground rupture. *Potentially active*[1] faults are those that are not known to have experienced movement in the past 11,000 years but have moved during Quaternary time (the past 1.6 million years). These faults may also pose a surface rupture hazard, but the hazard is more difficult to evaluate. For the purpose of this study, both active and potentially active faults were evaluated, and considered active faults in subsequent sections.

*Ground shaking* occurs in response to the release of energy during an earthquake. The energy released travels through subsurface rock, sediment, and soil materials as seismic waves, which result in motion experienced at the ground surface.

Secondary: *Liquefaction* and other types of seismically induced ground failure reflect loss of strength and/or cohesion when earth materials are subjected to strong seismic ground shaking. Earthquakes can also trigger landslides where slopes are prone to failure because of geologic conditions or because of modifications during construction.

Surface fault rupture, ground shaking, and seismically induced ground failure all can result in substantial damage to structures. Thorough assessment of the existing hazard combined with appropriate design and construction can reduce the potential for damage substantially.

Unstable Slopes

Slopes are considered unstable (prone to failure or landslides) when soil or rock strength is insufficient to resist gravitational forces or other loads. Slope instability can occur naturally due to factors such as fracture patterns, soil saturation, or steep slopes. Slope failure can also be triggered by seismic activity or by improperly designed construction.

If slope instability is not adequately characterized and mitigated during design and construction, it can cause severe damage to surface and near-surface improvements as well as risks to public safety. However, slope instability can generally be addressed with planning and design.

Areas of Difficult Excavation

Subsurface geologic conditions will largely determine the ease or difficulty of excavation, which will in turn indicate the appropriate excavation technique for use in various areas. For instance, hard unfractured bedrock may be difficult to excavate using bulldozers and other earthmoving equipment, or too resistant to tunneling using a tunnel boring machine; in these areas, blasting may be required. On the other hand, fractured rock that contains groundwater can also be difficult to excavate using tunneling methods. Faulted material can pose an additional challenge by contributing to instability at the tunnel face.

Geological Resources

Geological resources in California include oil and gas fields, geothermal fields, and a wide range of mineral resources. The principal constraint associated with oil, gas, geothermal, and mineral resources is the need for planning to ensure that construction of new facilities would not conflict with the removal of economically important resources and would avoid known problem areas to

[1] The term "potentially active" is under review for alternative nomenclature by California Geologic Survey.

the extent feasible. In addition, the presence of even small (noneconomic) quantities of oil or gas in the subsurface can pose toxic or explosive hazards during construction, requiring specific precautions, and may also necessitate special designs and monitoring during the operation of subsurface structures such as subway tunnels. Similarly, certain mineral resources, such as serpentine (the source of natural asbestos) can result in hazardous working conditions if not properly managed.

## C. GEOLOGY AND GEOMORPHOLOGY BY REGION

Appendix 3.13-A contains tables summarizing the geologic constraints in each of the five study regions. The following paragraphs provide an overview of key geomorphologic features in each region, based on Norris and Webb's (1990) overview of California's geomorphic provinces and information from topographic maps published by the U.S. Geological Survey.

### Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. The Bay Area to Merced region spans two of California's geomorphic provinces: the Coast Ranges province and the Great Valley province.

The Coast Ranges uplift consists of generally northwest-trending ridges that form a rugged barrier between the Pacific Coast and inland California. The valley occupied by San Francisco Bay, bordered by the Diablo Range and East Bay Hills on the east and the Santa Cruz Mountains on the west, is one of several fault-bounded valleys within the Coast Ranges; other important regions of low elevation near the study area include the Salinas, Napa, and Sonoma Valleys.

The Great Valley province comprises a large, elongated north-trending valley situated between the Coast Ranges on the west and the Sierra Nevada on the east. Much of the Great Valley is at elevations near sea level (Norris and Webb 1990). The valley is structurally controlled, with faults occurring at the boundaries between valley and mountain range.

### Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. Relatively uniform, gentle terrain that typifies the interior of California's Great Valley geomorphic province characterizes this region. As described above, the Great Valley province consists of an elongate north-trending valley bordered by the Sierra Nevada and the Coast Ranges (Norris and Webb 1990).

### Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. The Bakersfield to Los Angeles region includes portions of three major geomorphic provinces: Great Valley, Mojave, and Transverse Ranges. Consequently, terrain in this region is highly variable. From the southern end of the San Joaquin Valley, the proposed alignments would climb several thousand feet to cross the rugged Tehachapi Mountains. They would descend across the westernmost portion of the Mojave province, and would climb again to cross the San Gabriel Mountains before descending into the Los Angeles basin. The Los Angeles basin is a fault-bounded depression within the Transverse Ranges province, which was named for its westerly structural and geomorphic grain, transverse to the dominant northerly-northwesterly fabric of California landscapes (Norris and Webb 1990).

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin (Transverse Ranges) from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors. This region is located in the Los Angeles basin and the Peninsular Ranges province. The Los Angeles basin is bounded by several westerly-trending ranges, including the Elysian, Repetto, Puente, and San Joaquin Hills and the Santa Ana Mountains. The Peninsular Ranges province is characterized by a series of northwest- to west-northwest-trending fault-bounded mountain ranges.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. The route follows a coastal corridor that traverses parts of two geomorphic provinces: the Transverse Ranges and Peninsular Ranges. Key features of this southern region include spectacular coastal cliffs.

### 3.13.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

Existing conditions describes transportation conditions as of 2003. The No Project Alternative includes existing transportation infrastructure plus all planned, approved, and funded projects that can reasonably be expected to be in operation by 2020. This analysis assumed that existing major infrastructure (bridges, for example) was designed, has been retrofitted, or is currently scheduled to be retrofitted to meet current design standards for seismic safety and other geologic constraints, and that future projects included in the No Project Alternative would incorporate similar safeguards as part of the development, design, and construction process. However, it is not possible to eliminate or mitigate all geologic hazards through design and construction. Some types of geologic hazards (seismic hazards in particular) are also unpredictable. While it is difficult to evaluate the change in hazards (potential for geologic impacts) between existing conditions and No Project conditions, it can be assumed that some improvements in technology and materials as well as more stringent design codes will be implemented in the next 20 years to address seismic design of new structures. Thus the No Project Alternative would be somewhat improved from the existing conditions, but existing geologic risks were assumed to be representative of geologic risks under the No Project Alternative.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

This analysis focused on comparing the difference in impacts anticipated with the proposed Modal and HST Alternatives, using 2020 No Project conditions as a baseline.

As shown in Table 3.13-2, geologic constraints would be similar for the proposed Modal and HST Alternatives. They include the following.

- Active fault crossings.
- Potential for strong seismic ground shaking.
- Unstable slopes.
- Difficult excavation of tunnels and deep cuts.
- At-grade construction over problem soils.

Active seismicity represents a key constraint on design and construction for both the Modal and HST Alternatives. Portions of both the Modal and HST Alternatives would require special design, including

additional structural ductility and redundancy to withstand severe ground shaking as well as the potential for liquefaction and/or other types of seismically induced ground failure. Conceptual alignments have been laid out so that the proposed HST Alternative would cross major faults at grade; nonetheless, active fault crossings would require special designs to minimize potential damage to the rail lines and other infrastructure as a result of surface fault rupture and surface disruption associated with fault creep. Modal Alternative designs would be subject to similar requirements.

Construction of mountain crossings for both the Modal and HST Alternatives would be constrained by existing unstable slopes and areas of difficult excavation. The tunnels proposed under the HST Alternative would pose additional design and construction issues because of difficult excavation conditions. The Modal Alternative would not require tunnel construction, so impacts related to difficulty of excavation would be less under the Modal Alternative. In the LOSSAN segment, however, tunnel construction under the HST would result in lower impacts on coastal geology because impacts on the stability of coastal bluffs would be reduced.

Potential geologic impacts that are categorized as high should not be regarded as precluding construction of an alternative or an alignment option, or as necessarily indicating that these would be potentially significant impacts. Rather, they identify aspects of project design where additional study would be needed and where engineering and design effort would be required to avoid or mitigate the impacts.

**Table 3.13-2**
**Summary of Geology Potential Impact Rankings by Alternative and Segment**

| | | Bay Area to Merced | | Sacramento to Bakersfield | | Bakersfield to Los Angeles | | Los Angeles to San Diego (via Inland Empire) | | Los Angeles to San Diego (via Orange County) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Category** | **Impact** | **Modal** | **HST** | **Modal** | **HST** | **Modal** | **HST** | **Modal** | **HST** | **Modal** | **HST** |
| Seismic hazards | Potential risk to worker and public safety due to collapse or toppling of partially constructed or completed facilities during strong earthquakes. Potential risk to public safety due to automobile accidents/interruption of service due to derailment caused by ground motion during strong earthquakes. Damage to facilities due to secondary hazards over soft or filled ground. | H | M | L | L | H | H | H | H | H | H |
| Active fault crossings | Potential risk to worker or public safety due to ground rupture along active faults. Potential risk to public safety due to damage to highway or airport/interruption of service due to derailment by ground rupture along active faults. | M–H | H | H | L | H | M–H | H | H | M | M |
| Slope stability | Potential risk to worker or public safety due to failure of natural and/or construction cut slopes or retention structures. | L–H | L–M | L | L | L | L | L | L | L | M |
| Difficult excavation | Potential cost and duration of surface or tunnel excavations during construction. | L–M | M | L | L | L | M | H | M–H | L | L–M |
| Oil and gas fields | Potential migration of potentially explosive and/or toxic gases into subsurface facilities. | L | L | L | L | L | M | L | M | L | L |
| Mineral resources | Potential project costs and delays due to potential impacts on existing mineral resource areas and facilities, including potential remediation. | L–M | L–M | L | M | L | L | H | M | L | L |

H = High impact.
M = Medium impact.
L = Low impact.

### 3.13.4 Comparison of Alternatives by Region

A. BAY AREA TO MERCED

Modal Alternative
In the Bay Area to Merced region, the majority of the Modal Alternative alignments are located in areas of potentially strong ground shaking and, to a lesser extent, areas potentially subject to liquefaction and/or other types of seismically induced ground failure. Active fault crossings would be a concern along I-80 from I-880 to I-5, along I-580 from I-880 to I-5, and along SR-152 from US-101 to I-5. Overall, the Modal Alternative ranked high with respect to seismic hazards, with the exception of the segment along SR-152 from SR-99 to I-5.

Slope stability would be a major consideration where the alignment would require widening of existing highway cuts along SR-152 through the Diablo Ranges. However, the potential for slope stability impacts is low along the remainder of the Bay Area to Merced modal alignments.

Areas where hard rock may be difficult to excavate occur in mountain crossings along SR-15, I-80, and I-580.

High-Speed Train Alternative
In the Bay Area to Merced region, the majority of the HST alignments are located in areas of potentially strong ground motion, and to a lesser extent, areas potentially subject to liquefaction and/or other types of seismically induced ground failure (Figure 3.13-1). Active fault crossings would also be a concern along I-580 from I-880 to I-5 and along SR-152 from US-101 to I-5. Overall, the HST Alternative ranked medium in this region with respect to seismic hazards.

All of the proposed HST alignment alternatives that cross the Diablo Range traverse steep and potentially unstable slopes where the proposed alignment would be at grade or in cuts into slopes. There would be little to no concern about slope stability where the alignments cross the nearly flat topography of the San Francisco Bay margin, the Santa Clara Valley, and the Central Valley. In addition, considering the lengths of the alignments, the potential for slope stability impacts is low through the Diablo Range.

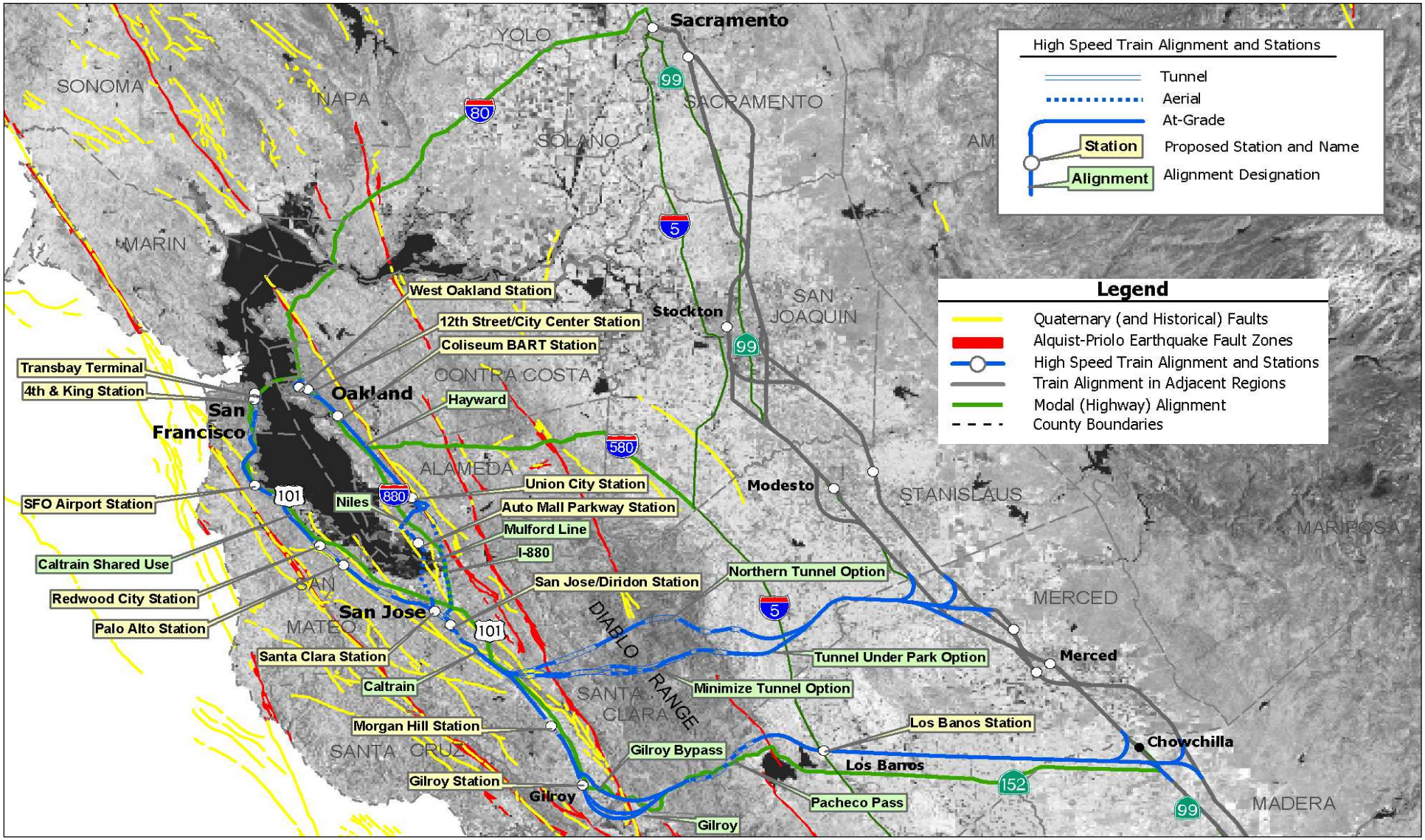
High-Speed Train Alignment Options Comparison
The most likely areas of difficult underground excavation would be the Diablo Range crossings where rocks of the Franciscan Complex are highly variable and include some rock units that are typically hard and fracture zones are common. The proposed tunnel options are all through Franciscan rock.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative
In the Sacramento to Bakersfield region, the Modal Alternative alignments are ranked medium and high for seismic hazards. Along the western edge of the Central Valley, portions of the I-5 alignment between I-5/I-580 near Tracy in the north and Kettleman City in the south (Stockton to Modesto, Modesto to Merced, and Merced to Fresno corridors) are subject to strong ground shaking (0.7g), as they are along the west side of the Central Valley, near the coastal ranges and in closer proximity to active faults than the HST alternative.

High-Speed Train Alternative
Seismic hazards, including ground motion, liquefaction, and other seismically induced ground movement, are considered relatively minor for the HST Alternative alignments in the Central Valley. All of the alignments are located in regions ranked low for seismic ground shaking, with

**Figure 3.13-1: HST Design Options—Major Fault Crossings—San Francisco Bay Area**



the exception of the southern end of the corridor (Bakersfield area), where predicted ground motion is slightly higher but is not expected to exceed 0.5g.

High-Speed Train Alignment Options Comparison
Oil and gas fields would potentially affect all of the following proposed HST alignment segments, as they would the Stockton Downtown Station, Bakersfield Airport Station, and Bakersfield Golden State Station sites. Because the length of the alignment through the oil and gas fields would be relatively short, the overall rankings were all low for impacts due to oil and gas.

Mineral resources provide a potential means to distinguish proposed alignments in parts of the Central Valley. The following alignments and sites ranked high for potential impacts related to mineral resources: Sacramento Downtown Valley station site, Sacramento Power Inn Road station site, and all Sacramento to Stockton alignment options. The presence of mineral resources (typically sand and gravel deposits) is most significant in the Sacramento area but would potentially impact all HST alignment options in the Sacramento to Stockton corridor to some extent.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative
In the Bakersfield to Los Angeles region, the Modal Alternative is considered to have high potential for impacts related to seismic hazards and fault crossings. With the exception of I-5 from Burbank to Los Angeles Union Station (LAUS), all Modal Alignment segments cross at least one Quaternary fault. Approximately seven active faults, including the Garlock and San Andreas, cross the segment of I-5 that extends between SR-99 and SR-14. The segment of SR-14 between Palmdale and I-5 has approximately five fault active crossings, including the San Andreas.

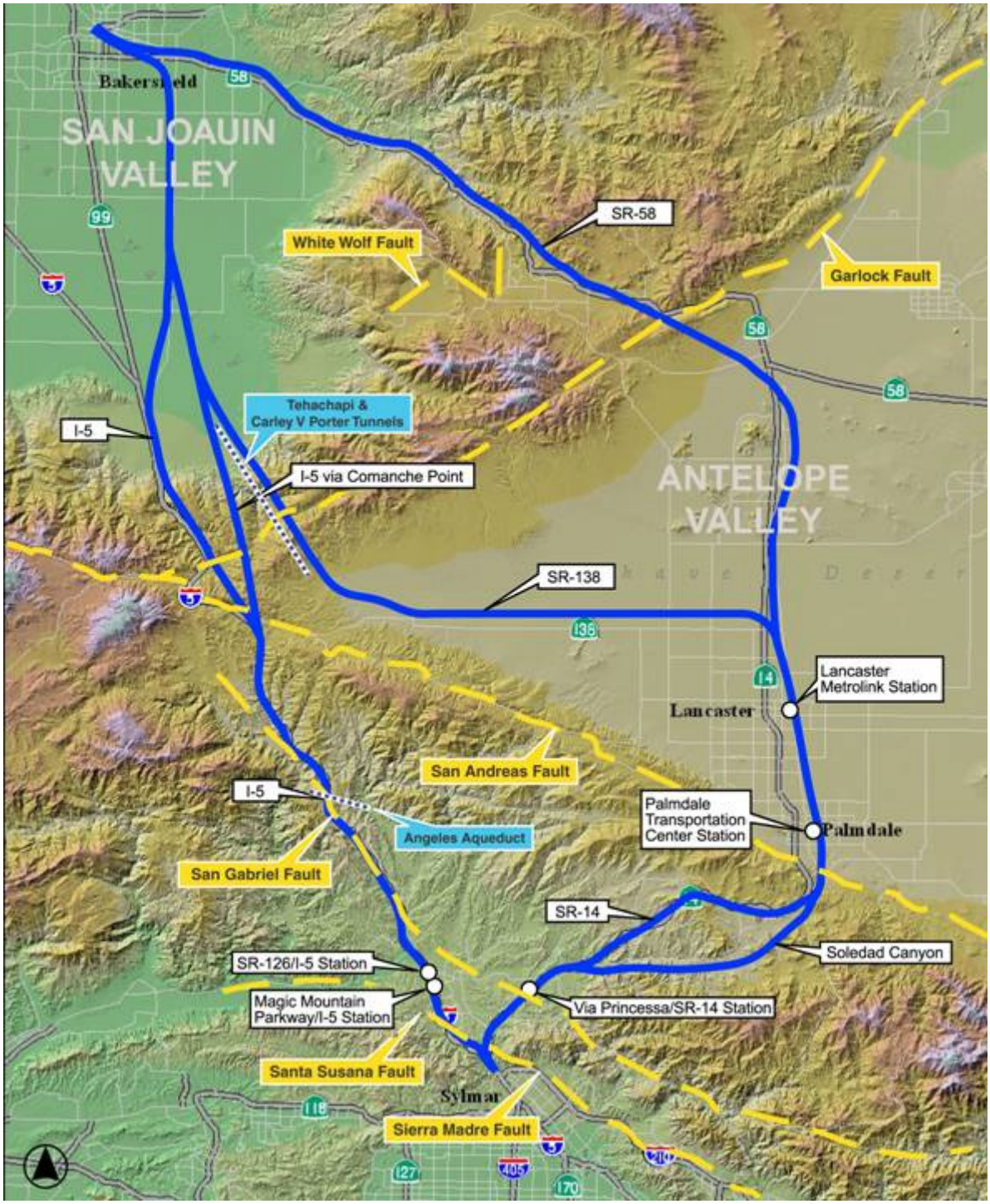
High-Speed Train Alternative
The HST Alternative alignment options in the Bakersfield to Los Angeles region are considered to have high potential for impacts related to seismic hazards (Figure 3.13-2). In addition, tunneling proposed with the HST Alternative would result in higher design, construction, and operational costs than at-grade construction. Six faults intersect the I-5 Tehachapi corridor, which extends from Wheeler Ridge to San Fernando, and seven faults cross the Soledad Canyon corridor. In addition, the I-5 Tehachapi alignment option would run parallel to an active fault (San Gabriel Fault) for over 20 miles. With regard to active fault crossings, the HST Alternative is ranked low to medium.

High-Speed Train Alignment Options Comparison
All proposed HST alignments through the Tehachapi Mountains would encounter at least four major fault crossings. The most significant crossings would include the San Andreas and the Garlock faults, which are capable of generating large earthquakes (over magnitude 7). The alignment would be designed to cross these faults at grade. The I-5 alignment options would have considerably higher seismic hazards and constructability issues than the Antelope Valley option since it would run parallel to the San Gabriel fault Los Angeles to San Diego via Inland Empire

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative
The Modal Alternative is considered to have high potential for impacts related to relatively frequent earthquake activity and the presence of the following faults: the San Jose fault at I-10 in Pomona, the southern San Bernardino fault at I-10 in San Bernardino, and the Temecula fault at I-15 in Temecula. Difficult excavation for cut slopes in hard rock formations would also be a concern in this region.

**Figure 3.13-2. HST Design Options—Major Fault Crossings**
**Tehachapi Mountains—Bakersfield to Los Angeles**



High-Speed Train Alternative
Several active faults are located in the immediate vicinity of the proposed HST segments and the HST stations; consequently, this alternative ranked high for seismic hazards. The significant faults include the Elysian Park, Rialto-Colton-Claremont, San Jacinto, Murrieta Hot Springs, Whittier-Elsinore, and Newport-Inglewood-Rose Canyon faults. In addition, three active faults cross the proposed HST segments in this region, including the southern San Bernardino, the Temecula, and, in San Diego, the La Jolla. This alternative would also encounter areas of difficult excavation in tunneled sections due to fractured rock.

High-Speed Train Alignment Options Comparison
There is not a significant difference among the proposed HST Alternative alignment options in this region based on geology.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative
In the LOSSAN region, the Modal Alternative ranked high for impacts related to seismic hazards between LAUS and Irvine, San Juan Capistrano and Camp Pendleton, and SR-52 and Santa Fe Depot in San Diego.[2] Overall, about half of the Modal Alternative would traverse areas of high seismic hazard. Additionally, the Modal alignment crosses three active faults in the southern portion of the region.

High-Speed Train Alternative
In the LOSSAN region, the HST Alternative ranked high for potential impacts related to seismic hazards along the route between LAX and LAUS. It also crosses two active faults in this area. The HST Alternative also ranked high for potential impacts related to seismic hazards between LAUS and Irvine) and proposed station sites except the Irvine station site.

### 3.13.5 Design Practices

The Authority has specifically avoided or minimized potential effects related to major geologic hazards such as major fault crossings, oil fields, and landslide areas throughout extensive alignment studies completed prior to and as part of the program EIR/EIS process. The Authority's objective is to avoid fault crossings in tunnel or aerial sections, and this has been carried through the development of the alternatives. Any impacts that remain at the conclusion of project level environmental review would be mitigated through specific design and construction practices described in the following mitigation section.

### 3.13.6 CEQA Significance Conclusions and Mitigation Strategies

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for geology and soils, the HST alternative would have potentially significant impacts when viewed on a system-wide basis. In some alignment segments there would be potential for increased soil disturbance due to slope instability. The HST alternative would involve some seismic hazards along alignment segments being susceptible to ground motion. The proposed HST system would reduce exposure to seismic risk by crossing any known active faults at grade. Mitigation strategies, as well as the design practices discussed in section 3.13.5, will be applied to reduce these impacts.

This document contains a broad program analysis that generally identifies the locations of potential geologic impact areas for the proposed alternatives. These are areas that would need further study in environmental documentation at the project level.

[2] No Modal Alternative improvement is proposed between LAX and LAUS.

Mitigation for potential impacts related to geologic and soils conditions must be developed on a site-specific basis, based on the results of more detailed (design-level) engineering geologic and geotechnical studies. Consequently, geologic and geotechnical mitigation would be identified in subsequent, project-level analysis rather than at the program level. Following is an overview of general approaches to possible geologic and geotechnical mitigation.

A. GROUND SHAKING

The potential for traffic safety issues related to ground shaking during a large earthquake cannot be mitigated completely; this holds true for most vehicle transportation systems throughout California. However, some strategies are available to reduce hazards, including the following.

- The potential for collapse or toppling of superstructures such as bridges or retaining structures due to strong ground motion can be routinely mitigated by designing structures to withstand the estimated anticipated ground motions. Designs typically include additional redundancy and ductility in the structure. The design needed to withstand a certain magnitude of earthquake would be determined during subsequent stages of design and development of proposed facilities. Temporary facilities, such as shoring, would be designed considering a lower probability of seismic events.
- The potential for structural damage and resulting traffic hazard as a result of liquefaction can be mitigated through site-specific methods such as ground modification methods (soil densification) to prevent liquefaction, or structural design (e.g., deep foundations) to accommodate/resist the liquefiable zones.
- It is unlikely that the potential for HST derailment during a peak event could be mitigated by designing a track-wheel system capable of withstanding the potential ground motions in most of the project area. Existing train systems throughout California face the same challenge. However, a network of strong motion instruments has been installed throughout California and additional monitoring stations are proposed. These stations provide ground motion data that could be used with the HST instrumentation and controls system to temporarily shut down the HST operations during or after an earthquake. The system would then be inspected for damage due to ground motion and/or ground deformation and then returned to service when appropriate. This type of seismic protection is already used for many rapid transit systems in seismically active areas and has been proven effective.

B. FAULT CROSSINGS

The potential for ground rupture along active faults is one of the few geologic hazards that can rarely be fully mitigated. However, known active faults are typically monitored, and in some cases fault creep is mitigated with routine maintenance, which could include repaving or minor track re-alignment. Project design could provide for the installation of early warning systems triggered by strong ground motion associated with ground rupture. Linear monitoring systems such as time domain reflectometers (TDRs) could be installed along major highways and rail lines within the zone of potential ground rupture. These devices emit electronic information that is processed in a centralized location and could be used to temporarily control traffic and trains, thus reducing accidents. In addition, the HST Alternative has been modified in mountain crossing areas where tunnels are proposed to avoid crossing known or mapped active faults within the tunnel.

C. SLOPE STABILITY/LANDSLIDES

The potential for failure of natural and/or temporary construction slopes and retention structures can be mitigated through geotechnical investigation and review of proposed earthwork and foundation excavation plans and profiles. Based on investigation and review, recommendations would be provided for temporary and permanent slope reinforcement and protection, as needed. These

recommendations would be incorporated into the construction plans. Additionally, during construction, geotechnical inspections would be performed to verify that no new, unanticipated conditions are encountered, and to verify the proper incorporation of recommendations. Slope monitoring may also be incorporated in final design where warranted.

D. AREAS OF DIFFICULT EXCAVATION

The potential for difficult excavation in areas of hard rock and faults cannot be fully mitigated, but it can be anticipated so that safety is assured, potential environmental impacts are addressed, and project schedule problems are avoided to the extent possible. This includes focusing future geotechnical engineering and geologic investigations in these areas and incorporating the findings into project construction documents, communicating with the contractors during the bid process, and monitoring actual conditions during and after construction.

E. HAZARDS RELATED TO OIL AND GAS FIELDS

Hazards related to potential migration of hazardous gases due to the presence of oil fields, gas fields, or other subsurface sources can be mitigated by following strict federal and state Occupational Safety & Health Administration (OSHA/CalOSHA) regulatory requirements for excavations, and consulting with other agencies as appropriate, such as the Department of Conservation (Division of Oil and Gas) and the Department of Toxic and Substances Control regarding known areas of concern. Mitigation measures would include using safe and explosion-proof equipment during construction and testing for gases regularly. Active monitoring systems and alarms would be required in underground construction areas and facilities where subsurface gases are present. Gas barrier systems have also been used effectively for subways in the Los Angeles area. Installing gas detection systems can monitor the effectiveness of these systems.

F. MINERAL RESOURCES

In some cases, mineral resources sites may represent valuable sources of materials that should either be completely developed prior to use for another purpose or should be avoided by proposed facilities to the extent feasible. This practice could result in realignment of proposed alignments and/or proposed relocation or modification of other proposed facilities. To mitigate the potential for significant project redesign, important mineral sites should be identified as early as possible.

Mitigation strategies to address seismic hazards such as liquefaction, seismically induced settlement and landslides as well as long-term settlement along oil fields may include, but would not be limited to:

- Design and engineer all structures for earthquake activity - Seismic design for the structures would be based on the Caltrans Seismic Design Criteria
- Design and install foundations resistant to soil liquefaction and settlement.
- Identify potential serpentinite bedrock disturbance areas and implement a safety plan
- Apply the requirements of Section 19 (Earthwork) of the most current Caltrans Standard Specifications to ensure geotechnically stable slopes are planned and created.
- Subsurface gases: Install passive or active gas venting systems and gas collection systems in areas where subsurface gases are identified.
- Remove corrosive soil and use corrosion protected materials in infrastructure.
- Address erosive soils through soil removal and replacement, geosynthetics, vegetation, and/or rip rap, where warranted.

- Remove or moisture condition shrink-swell soils, where necessary.
- Utilize stone columns, grouting, and deep dynamic compaction in areas of potential liquefaction
- Utilize buttress berms, flattened slopes, drains, and/or tie-backs in areas of slope instability.
- Avoid settlement through preloading, use of stone columns, deep dynamic compaction, grouting, and/or special foundation designs.

The above mitigation strategies are expected to reduce the geologic and soils impacts of the HST alternative to a less-than-significant level. Additional environmental assessment will allow a more precise evaluation in the second-tier, project-level of environmental analyses.

### 3.13.7 Subsequent Analysis

As described in *Method of Evaluation of Impacts* above, this analysis was performed generally on the basis of existing data available in GIS format. The data provided in this section are intended for planning purposes, are not meant to be definitive for specific sites, and have not been independently confirmed. More detailed geological studies would be required at the project level, and would likely include subsurface exploration, laboratory testing, and engineering analyses to support detailed alignment design and mitigation of potential impacts associated with geologic and soils conditions, including seismic hazards.