Appendix A	**Alignment Maps (Under Separate Cover)**
Appendix B	**Detailed Evaluation Matrices**
Appendix C	**Downtown San Jose Tunnel Alternatives Report**
Appendix D	**Alternative Alignment Development Quantm Report**
Appendix E	**Environmental Maps**
Appendix F	**Abbreviations and Acronyms**
Appendix G	**Draft Alternatives Analysis Public Participation Report**

APPENDICES

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APPENDIX A

Alignment Maps (Under Separate Cover)

Note: Alignment maps are posted at www.cahighspeedrail.ca.gov in the "library" section under the "San Jose to Merced Section."

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APPENDIX B

Detailed Evaluation Matrices

TABLE 1A -- SAN JOSE STATION APPROACH SUBSECTION EVALUATION MATRIX							
Measurement Criteria	**REFINED PROGRAM ALIGNMENT (WITHDRAWN)**	**SOUTH OF CALTRAIN TRACKS (WITHDRAWN)**	**THREE TRACK (WITHDRAWN)**	**DEEP TUNNEL (WITHDRAWN)**	**SHALLOW TUNNEL (WITHDRAWN)**	**DOWNTOWN AERIAL (WITHDRAWN)**	**SR 87 / I-280 (CARRIED FORWARD)**
Design Objectives							
Journey Time	2.09 min 1.92 miles	2.09 min 1.92 miles	2.09 min 1.92 miles	0.88 min 1.76 miles	2.22 min 2.41 miles	1.17 min 1.76 miles	2.22 min 2.41 miles
Intermodal Connections	Not Applicable						
Operating Costs (Cost Factor)	1.09	1.09	1.09	1.00	1.37	1.00	1.37
Capital Costs	1.00	1.00	1.00	7.39	5.08	1.00	1.22
Land Use							
Potential for Transit Oriented Development (TOD)	Not Applicable						
Consistency with Other Planning Efforts	Consistent with City of San Jose General Plan and Santa Clara County General Plan to: • Expand public transit and other related infrastructure to improve regional and inter-regional access; and • Provide for a safe, efficient and technologically advanced multi-modal transportation system.					Incompatible with City of San Jose's planned redevelopment of areas near Diridon Station	
Constructability							
Constructability	• Tight clearances • Local traffic impacts • Several grade separations • Caltrain operational impacts • Utility relocations (especially fiber optic cables from San Francisco to Gilroy)	• Tight clearances • Local traffic impacts • Several grade separations • Caltrain operational impacts • Utility relocations (especially fiber optic cables from San Francisco to Gilroy)	• Tight clearances • Local traffic impacts • Several grade separations • Caltrain operational impacts • Utility relocations (especially fiber optic cables from San Francisco to Gilroy)	• Potential settlement • Ground stabilization required • Unsafe mining conditions due to poor ground and high water table • Utilization of exceptional mining method • Settlement potential of foundations of SR 87/I-280 interchange. • Reconstruction of Tamien Station • Relocation and reconstruction of northbound SR 87 on-ramp • Lengthy construction schedule • Temporary business property impact: 0-1units-Industrial	• Extensive additional right-of-way required • Ground stabilization required • Utility Support Relocation • Substantial impact to Los Gatos Creek • Requires support of VTA LRT • Disruption to PCJPB operations • Reconstruction of Tamien Station • Lengthy construction schedule • Temporary property impacts: 5-10 dwelling units – SFR 0-4 units – Commercial 5-10 units – Industrial	• Impacts to traffic flow on SR 87/I-280 • High bridges over existing interchange and curved long span bridges. • Construct curved long span bridges with Straddle Bents • Significant utility relocation	• Impacts to traffic flow on SR 87/I-280 • High bridges over existing interchange and curved long span bridges. • Construct curved long span bridges with Straddle Bents • Significant utility relocation
Disruption to Existing Railroads	• Caltrain/UPRR tracks permanently shifted to accommodate HST tracks • Temporary construction impacts during construction of viaduct over Caltrain/UPRR tracks	• Temporary construction impacts during construction of viaduct over Caltrain/UPRR tracks	**Fatal Flaw/Not Ratable** • Reduction from two Caltrain/UPRR tracks to one; not consistent with Caltrain / UPRR operations	• Risk of disruption due to possible settlement from tunnel construction where tunnels cross under Caltrain/UPRR tracks.	• Risk of disruption due to possible settlement from tunnel construction where tunnels cross under Caltrain/UPRR tracks Disruption to Caltrain, Amtrak, PACE, UPRR Freight, VTA –Vasona Line during construction	Temporary construction impacts during construction of viaduct over Caltrain/UPRR tracks	Temporary construction impacts during construction of viaduct over Caltrain/UPRR tracks

TABLE 1A -- SAN JOSE STATION APPROACH SUBSECTION
EVALUATION MATRIX

Measurement Criteria	REFINED PROGRAM ALIGNMENT (WITHDRAWN)	SOUTH OF CALTRAIN TRACKS (WITHDRAWN)	THREE TRACK (WITHDRAWN)	DEEP TUNNEL (WITHDRAWN)	SHALLOW TUNNEL (WITHDRAWN)	DOWNTOWN AERIAL (WITHDRAWN)	SR 87 / I-280 (CARRIED FORWARD)
Disruption to and Relocation of Utilities	• 1 Electrical Utility (115 Kilo Volts [KV] Overhead [OH]) • 1 Fiber Optic Line (within Caltrain easement) • Potential Santa Clara Valley Water District (SCVWD) Facilities Conflict	• 1 Electrical Utility (115 KV OH) • 1 Fiber Optic Line (within Caltrain easement) • Potential SCVWD Facilities Conflict	• 1 Electrical Utility (115 KV OH) • Potential SCVWD Facilities Conflict	• 1 Electrical Utility (115 KV OH) • Potential SCVWD Facilities Conflict.	• 1 Electrical Utility (115 KV OH) • City and SCWD underground utilities • Underground communication utilities	• 1 Electrical Utility (115 KV OH) • Potential SCVWD Facilities Conflict.	• 1 Electrical Utility (115 KV OH) ▪ Potential SCVWD Facilities Conflict.
Disruption to Communities							
Displacements							
Residential Displacement	• 0-2 dwelling units - Single-Family Residential (SFR) • 0 dwelling units - Multi-Family Residential (MFR) • 0 dwelling units – Mobile Home Parks (MHP)	• 10-20 dwelling units – SFR • 0 dwelling units - MFR • 0 dwelling units – MHP	• 0 dwelling units – SFR • 0 dwelling units - MFR • 0 dwelling units – MHP	• 0 dwelling units - SFR • 0 dwelling units - MFR • 0 dwelling units – MHP	• 0 dwelling units - SFR • 0 dwelling units - MFR • 0 dwelling units – MHP	• 25-35 dwelling units - SFR • 30-40 dwelling units - MFR • 0 dwelling units – MHP	• 0-1 dwelling unit - SFR • 0 dwelling units - MFR • 0 dwelling units - MHP
Business Displacement	• 0 units - Commercial • 0 units – Industrial • 1 unit - Nonprofit	• 0-2 units - Commercial • 0 units – Industrial • 1 unit - Nonprofit	• 0 units – Commercial • 0 units - Industrial	• 0 units - Commercial • 0-1 units - Industrial	• 0-1 units - Commercial • 0-3 units - Industrial	• 10-20 units - Commercial • 0 units - Industrial	• 0-1 units - Commercial • 10-15 units - Industrial
Properties with Access Affected	• 10 parcels	• 0 parcels	• 0 parcels	• 0 parcels	• 0 parcels	• 22 parcels	• 6 parcels
Local Traffic Effects around Stations	Not Applicable						
Highway Grade Separations and Closures	• 0 grade separations • 1 road closure	• 12 grade separations • 1 road closure	• 12 grade separations • 1 road closure	• 0 grade separations • 0 road closures	• 0 grade separations • 0 road closures	• 13 grade separations • 0 road closures	• 12 grade separations • 0 road closures
Environmental Resources							
Biological Resources	• 24 ac – California Tiger Salamander (CTS) Range	• 5 ac –CTS Range	No biological resources	No biological resources	• Los Gatos Creek crossing	• 12 ac – CTS Range	• 27 ac – CTS Range
Cultural Resources	• 20 properties (with buildings over 45 years old) • Known archaeological sites • Highly sensitive for archaeological deposits	• 19 properties (with buildings over 45 years old) • Known archaeological sites • mmHighly sensitive for archaeological deposits	No cultural resources	• 1 National Register archaeological site		• 23 properties (with buildings over 45 years old) • Moderate to high sensitivity for archaeological resources • Known archaeological deposits	• 8 properties (with buildings over 45 years old) • Highly sensitive for archaeological resources • Buried archaeological deposits are known to be in general area
Parklands	• 0.8 ac of Guadalupe River Park and Gardens • 4 publicly-owned land potentially indirectly affected (Biebrach Park, Fuller Park, Cahill Park, and	• 1.3 ac of publicly-owned lands (Fuller Park) • 3 publicly-owned lands potentially indirectly affected (Biebrach Park, Gregory Plaza Tot Lot, Los Gatos	• 0 ac of publicly-owned land • 5 publicly-owned lands potentially indirectly affected (Biebrach Park, Cahill Park, Gregory Plaza Tot Lot, Los Gatos Creek, Trail,	• 0 ac of publicly-owned land • No publicly-owned land potentially indirectly affected			• 4.1 ac of Guadalupe River Park and Gardens • 2 publicly-owned lands potentially indirectly affected (Arena Green Park, and Cahill Park)

**TABLE 1A -- SAN JOSE STATION APPROACH SUBSECTION
EVALUATION MATRIX**

Measurement Criteria	REFINED PROGRAM ALIGNMENT (WITHDRAWN)	SOUTH OF CALTRAIN TRACKS (WITHDRAWN)	THREE TRACK (WITHDRAWN)	DEEP TUNNEL (WITHDRAWN)	SHALLOW TUNNEL (WITHDRAWN)	DOWNTOWN AERIAL (WITHDRAWN)	SR 87 / I-280 (CARRIED FORWARD)
	Arena Green Park).	Creek, Trail); School playfields)	J.Frey/Willow Community Garden); School playfields)				
Agricultural Land	No agricultural resources						
Natural Environment							
Noise	• 146 ac - SFR • 32 ac - MFR • 0 ac – MHP	• 146 ac – SFR • 32 ac – MFR • 0 ac – MHP	• 146 ac – SFR • 32 ac - MFR • 0 ac – MHP	• 0 ac - SFR • 0 ac – MFR • 0 ac – MHP	• 0 ac - SFR • 0 ac – MFR • 0 ac – MHP	• 103 ac - SFR • 32 ac - MFR • 0 ac – MHP	• 119 ac - SFR • 35 ac - MFR • 0 ac – MHP
Vibration	• 17 ac - SFR • 1 ac - MFR • 0 ac – MHP	• 17 ac – SFR • 1 ac – MFR • 0 ac – MHP	• 17 ac – SFR • 1 ac - MFR • 0 ac – MHP	• 11 ac - SFR • 0 ac - MFR • 0 ac – MHP	• 19 ac - SFR • 0 ac - MFR • 0 ac – MHP	• 19 ac - SFR • 8 ac - MFR • 0 ac – MHP	• 2 ac - SFR • 2ac - MFR • 0 ac – MHP
Visual/Scenic Resources	• Retaining and sound walls at edge of combined Caltrain/UPRR and HST right-of-way	• HST tracks placed in Fuller Park	• Three track configuration does not require full right-of-way width – opportunity for landscaping	• No effect on visual/scenic resources	• Demolition of structures for cut and cover portion of alignment will result in visual change to established neighborhood	• Aerial structure passes through developed neighborhoods	• Complex configuration of columns and bents above freeways
Geotechnical Constraints	• No crossings of seismic faults or fault rupture hazard zones. • 23 ac – liquefaction zones	• No crossings of seismic faults or fault rupture hazard zones. • 50 ac – liquefaction zones	• No crossings of seismic faults or fault rupture hazard zones. • 50 ac – liquefaction zones	• No crossings of seismic faults or fault rupture hazard zones • 41 ac – liquefaction zones	• No crossings of seismic faults or fault rupture hazard zones • 43 ac – liquefaction zones	• No crossings of seismic faults or fault rupture hazard zones • 49 ac – liquefaction zones	• No crossings of seismic faults or fault rupture hazard zones • 27 ac – liquefaction zones

TABLE 1A -- SAN JOSE STATION APPROACH SUBSECTION EVALUATION MATRIX							
Measurement Criteria	**REFINED PROGRAM ALIGNMENT (WITHDRAWN)**	**SOUTH OF CALTRAIN TRACKS (WITHDRAWN)**	**THREE TRACK (WITHDRAWN)**	**DEEP TUNNEL (WITHDRAWN)**	**SHALLOW TUNNEL (WITHDRAWN)**	**DOWNTOWN AERIAL (WITHDRAWN)**	**SR 87 / I-280 (CARRIED FORWARD)**
Agency and Public Input							
Agency and Public Input	Several residents and representatives of the Greater Gardner, North Willow Glen, and Gregory Plaza neighborhoods expressed concern about the proposed program alignment (along the Caltrain corridor) and its impact to the community. Concerns include the frequency of trains, the acquisition of right-of-way (e.g., portions of Fuller Park, Word of Faith Church) and the effect that an aerial alignment near the Diridon Station would have on further segmenting their community. Specific issues include additional noise, visual impacts, vibration, traffic congestion and circulation (local road closures), property value and construction impacts. There is community concern about the potential for blight from aerial structures, which could invite graffiti and degradation of neighborhoods. Grade crossings at West Virginia and Auzerais are also a safety concern to the community. During the scoping process and at subsequent community meetings, several residents and property owners requested that a tunnel option be evaluated for the San Jose Station Approach.	Although specific comments on this alignment were limited, community members' concerns were similar to those voiced about the Refined Program Alignment. Concerned neighborhoods and organizations included Pinehurst, Greater Gardner, Willow Glen and Voices of San Jose. Additional right-of-way impacts were noted, as well as concerns about impacts to the Willow Glen Spur Trail and grade crossings at West Virginia and Auzerais. Evaluation of a tunnel alternative was requested as a way to offset impacts.	The City of San Jose requested the analysis of a three-track system as a way to lessen or avoid physical impacts in the Gardner and North Willow Glen neighborhoods. Although specific comments on this alignment were limited, community members' concerns were similar to those voiced about the Refined Program Alignment. Members of the public requested an explanation of the difference of impacts between a four-track and three-track system. Some also requested a trench alignment along Caltrain and UPRR tracks under Curtner Avenue, the Guadalupe River and Los Gatos Creek before arriving at Diridon Station.	City of San Jose staff and members of the public requested the study of a tunnel alignment in the south of Diridon Station area as a way to potentially avoid adverse impacts to surrounding neighborhoods, minimize noise and vibration, and allow trains to achieve maximum speed. Some questioned why a BART tunnel/station was feasible given the area's soil conditions, but not a deep HST tunnel/station. Some members of the public expressed interest and support for any tunnel alignment, shallow or deep. After receiving more information about a deep tunnel/station, many community members agreed the risk and challenges associated with a deep tunnel are significant and a less risky underground alternative should be studied. The City of San Jose acknowledged that any benefits achieved with a deep tunnel option are outweighed by the risks and constructability issues, and requested a shallow tunnel option be evaluated. To date, several members of the public have indicated a desire to see a shallow tunnel option be evaluated in lieu of a deep tunnel despite potential impacts associate with a shallow tunnel. Some residents noted concern for surface impacts at the portals, which would be similar in the Tamien area for both Tunnel alignments.	This alignment was developed following the City of San Jose's request to study a shallow tunnel and in response to identification of significant challenges associated with a deep tunnel/station. Members of the public noted that this alignment would have faster travel times and fewer impacts to the Greater Gardner neighborhood than other alignment options. Some noted that the shallow tunnel was superior to the deep tunnel. Many still questioned the risks and anticipated surface impacts, including impacts at the portal from construction and equipment staging areas, of any tunnel given the soils and surface conditions in the area. The City of San Jose expressed concerns about impacts and limits to future development above the shallow tunnel/station. In addition, it was noted by some that in order to study the shallow tunnel alignment, VTA will also need to study the implications of a deep BART tunnel/station.	Members of the public expressed concern that an aerial structure in this area may be divisive to the community (particularly the Gardner and Willow Glen neighborhoods) and cause blight in and around the structures. Instead, it was suggested that a tunnel would preserve quality of life and community character. Besides dividing the neighborhood, concern was expressed about the visual impacts of a structure of this magnitude.	Study of this alignment was recommended by the City of San Jose to reduce neighborhood impacts by following existing transportation corridors through the community. Members of the public have acknowledged that this alignment could avoid impacts to the Gardner and North Willow Glen neighborhoods and take advantage of existing transportation corridors. Some specifically indicated that it be carried forward for further evaluation. Community concerns about this alignment option included potential visual impacts, noise, and construction impacts to freeway operations (SR 87 and I-280). Some commenters specifically indicated that this option was superior to following the Refined Program Alignment (Caltrain/UPRR corridor).

TABLE 1B – SAN JOSE STATION APPROACH SUBSECTION (STATION OPTIONS ONLY)
EVALUATION MATRIX

Measurement Criteria	San Jose HST Station: Over Diridon Platforms (CARRIED FORWARD)	San Jose HST Station: Aerial Station East of Existing Diridon Station (WITHDRAWN)	San Jose HST Station: Underground Station East of Existing Diridon Station (WITHDRAWN)
Design Objectives			
Journey Time	Included within alignment data		
Intermodal Connections	• Currently served by VTA buses, VTA light rail, DASH Shuttle, Caltrain, ACE, Capitol Corridor, Amtrak thruway buses, Amtrak Coast Starlight, Highway 17 Express, Monterey-Salinas Transit. • Future services would include BART, Amtrak Coast Daylight, and Monterey County Rail Service (TAMC).		
Operating Costs (Cost Factor)	Included within alignment data		
Capital Costs	Included within alignment data		
Land Use			
Potential for Transit Oriented Development (TOD)	• City of San Jose evaluating TOD opportunities near existing Diridon Caltrain station site. City has assumed this station location and configuration in related planning studies • Compatible with adjacent land uses • Publically-owned parking lots land-banked for TOD	• City of San Jose evaluating TOD opportunities near existing Diridon Caltrain station site • Compatible with adjacent land uses • Aerial station could form focus of development • Aerial station mass would be dominant structure in area • Commercial and retail development could be layered beneath and/or adjacent to aerial structure • Station and alignment would pass through redevelopment area in diagonal configuration potentially reducing redevelopment opportunities	• City of San Jose evaluating TOD opportunities near existing Diridon Caltrain station site. • Compatible with adjacent land uses • Compatible with City's related planning studies • Publically-owned parking lots land-banked for TOD • Building foundations would need to be coordinated with underground station and tunnels
Consistency with Other Planning Efforts	• See Above	• See Above	• See Above
Constructability			
Constructability	Included within alignment data		
Disruption to Existing Railroads	• Major construction impacts to existing railroad operations	• Minimal construction impacts to existing railroad operations	• Minimal construction impacts to existing railroad operations
Disruption to and Relocation of Utilities	Included within alignment data		
Disruption to Communities			
Displacements*			
Residential Displacement	• 0 dwelling units – SFR • 0 dwelling units – MFR	• 0-1 dwelling unit – SFR • 0-1 dwelling unit – MFR	• 0 dwelling units – SFR • 0 dwelling units – MFR
Business Displacement	• 0 units – Commercial • 0 units – Industrial	• 0-4 units – Commercial • 0-5 units – Industrial	• 0 units – Commercial • 0 units – Industrial
Properties with Access Affected	Included within alignment data		
Local Traffic Effects around Stations	• Increase in traffic congestion on local streets	• Increase in traffic congestion on local streets	• Increase in traffic congestion on local streets
Highway Grade Separations and Closures	Included within alignment data		

TABLE 1B – SAN JOSE STATION APPROACH SUBSECTION (STATION OPTIONS ONLY) EVALUATION MATRIX			
Measurement Criteria	**San Jose HST Station: Over Diridon Platforms (CARRIED FORWARD)**	**San Jose HST Station: Aerial Station East of Existing Diridon Station (WITHDRAWN)**	**San Jose HST Station: Underground Station East of Existing Diridon Station (WITHDRAWN)**
Environmental Resources			
Biological Resources*	• California Tiger Salamander (CTS) Range • 2.2 ac – Grasslands • 0.2 ac – Open waters • 1 Special status plant • 1 Wildlife species • 0 ac – Wetland Habitat • < 0.1 mi – Streams, creeks and (or) canals.	• 20 ac – CTS Range • 120 feet of Streams/Rivers	No Biological Resources
Cultural Resources*	• No known properties • Moderate sensitivity for cultural resources • No known prehistoric archaeological resources	• 9 individual properties • 1 National Register property - Diridon Station • No landmarks • No known prehistoric archaeological resources	No Cultural r\Resources
Parklands	Included within alignment data	• 10 ac – potential temporary use ,indirect impact to Guadalupe River Park	No Parklands
Agricultural Land	No Agricultural Resources		
Natural Environment			
Noise	Included within alignment data		
Vibration	Included within alignment data		
Visual/Scenic Resources	• HST Aerial platforms overshadow historic depot	• Aerial station blocks views of historic depot from east.	• No visual scenic resources
Geotechnical Constraints	Included within alignment data		
Agency and Public Input			
Agency and Public Input	Some members of the public noted that Diridon Station is an historic landmark that should not be negatively impacted by new structures for high-speed trains. While some people support the use of at-grade tracks south of Diridon station, others would prefer tunnels to avoid visual impacts and altering the existing structure and surroundings.	Of the few comments on this option, community members expressed both support for and opposition to aerial structures in this area.	Some members of the public expressed support for an underground station and tunnel because it would avoid negative impacts associated with an aerial station and structures. A few suggested that a San Jose station should be built near the HP Pavilion. After receiving more information about a deep station, including construction impacts, fire life safety measures and difficulty in connecting to different modes of transportation, many community members agreed the risk and challenges associated with a deep station are significant and a less risky underground alternative should be studied.

TABLE 2 – MONTEREY HIGHWAY SUBSECTION EVALUATION MATRIX

Measurement Criteria	REFINED PROGRAM ALIGNMENT (CARRIED FORWARD)	EAST OF CALTRAIN/UPRR (WITHDRAWN)
	East of Caltrain/UPRR Alignment Alternative	**East of Caltrain/UPRR Alignment Alternative**
Design Objectives		
Journey Time and Route Length	• 4.33 min • 7.93 miles	• 4.76 min • 7.94 miles
Intermodal Connections	Not Applicable	
Operating Costs	• 1.00	• 1.00
Capital Costs	**1.43**	**1.00**
Land Use		
Potential for TOD	Not Applicable	
Consistency with Other Planning Efforts	• Consistent with City of San Jose and Santa Clara County general plans to: - Expand public transit and other related infrastructure to improve regional and inter-regional access; and - Provide for a safe, efficient and technologically advanced multi-modal transportation system • Inconsistent with VTA's proposal to implement BRT project along this stretch of highway	• Consistent with City of San Jose and Santa Clara County general plans to: -Expand public transit and other related infrastructure to improve regional and inter-regional access; and -Provide for a safe, efficient and technologically advanced multi-modal transportation system • Inconsistent with VTA's proposal to implement BRT project along this stretch of highway
Constructability		
Constructability	• Work may disrupt Caltrain operations • Tight clearances to railroad tracks along Monterey Highway • Increased railroad relocation • Squeezed between SR 87 and Caltrain Railroad Corridor.	• Work may disrupt Caltrain operation • Tight clearances to railroad tracks along Monterey Highway • Impacts to existing Tamien Station • Impacts to Luther Industrial Spur • Reconstruction of SR 87 Northbound On-ramp
Disruption to Existing Railroads	• Caltrain and UPRR operations temporarily disrupted while they are permanently relocated to accommodate HST within Caltrain ROW from West Alma to north of Lick Street • Access to UPRR from east blocked by HST in Monterey Highway Corridor	• Major disruption to Caltrain Tamien Station during its reconstruction needed to accommodate HST • Temporary disruption to Caltrain and UPRR operations during relocation of tracks from Tamien Station to north of Lick Street needed to accommodate HST • Access to UPRR from east blocked by HST in Monterey Highway Corridor
Disruption to and Relocation of Utilities	• 1 Electrical Utility (60 Kilo Volts [KV] Overhead [OH]) • 1 Natural gas line (distribution feeder main) • 1 Fiber optic line located within Caltrain easement • Potential Santa Clara Valley Water District (SCVWD) Facilities Conflict	• 1 Electrical Utility (60 Kilo Volts [KV] Overhead [OH]) • 1 Natural gas line (distribution feeder main) • 1 Fiber optic line located within Caltrain easement • Potential Santa Clara Valley Water District (SCVWD) Facilities Conflict
Disruption to Communities		
Displacements		
Residential Displacement	• 0 dwelling units - Single-Family Residential (SFR) • 0 dwelling units - Multi-Family Residential (MFR) • 0 dwelling units – Mobile Home Parks (MHP)	• 0 dwelling units - Single-Family Residential (SFR) • 0 dwelling units - Multi-Family Residential (MFR) • 0 dwelling units – Mobile Home Parks (MHP)
Business Displacement	• 5-6 units – Commercial • 0 units – Industrial	• 0 units – Commercial • 0 units – Industrial
Properties with Access Affected	• 49 parcels	• 49 parcels
Local Traffic Effects Around Stations	Not Applicable	Not Applicable
Highway Grade Separations and Closures	• 3 grade separations • 1 road closures	• 3 grade separations • 1 road closures

**TABLE 2 – MONTEREY HIGHWAY SUBSECTION
EVALUATION MATRIX**

Measurement Criteria	REFINED PROGRAM ALIGNMENT (CARRIED FORWARD)	EAST OF CALTRAIN/UPRR (WITHDRAWN)
	East of Caltrain/UPRR Alignment Alternative	East of Caltrain/UPRR Alignment Alternative
Environmental Resources		
Biological Resources	• `57 ac – California Tiger Salamander (CTS) Range • 19 ac – San Joaquin Kit Fox Range • 2 ac – Vernal Pool Regions	• `57 ac – California Tiger Salamander (CTS) Range • 19 ac – San Joaquin Kit Fox Range • 2 ac – Vernal Pool Regions
Cultural Resources	• 7 properties identified • No known archaeological sites • Moderately sensitive for archaeological deposits	• 7 properties identified • No known archaeological sites • Moderately sensitive for archaeological deposits
Parklands	• 0 ac of publicly-owned land • 3 publicly-owned lands potentially indirectly affected (Danna Rock Park, Edenvale Garden Park, Silver Leaf Park)	• 0 ac of publicly-owned land • 3 publicly-owned lands potentially indirectly affected (Danna Rock Park, Edenvale Garden Park, Silver Leaf Park)
Agricultural Land	• 0.2 ac – Prime Farmland	• 0.2 ac – Prime Farmland
Natural Environment		
Noise	• 376 ac - SFR • 178 ac – MFR • 173 ac – MHP	• 376 ac - SFR • 178 ac – MFR • 173 ac – MHP
Vibration	• 39 ac – SFR • 17ac – MFR • 11 ac – MHP.	• 39 ac - SFR • 17ac – MFR • 11 ac – MHP
Visual/Scenic Resources	• Mature Trees along Monterey Highway replaced with new landscaping and soundwalls	• HST runs at same grade as existing railway near Tamien Station • Mature Trees along Monterey Highway replaced (see East of Caltrain for various options)
Geotechnical Constraints	• No crossings of seismic faults or fault rupture hazard zones • 101.5 ac – liquefaction zones	• No crossings of seismic faults or fault rupture hazard zones • 101.5 ac – liquefaction zones
Agency and Public Input		
Agency and Public Input	While some people favored this alignment because current rail lines run adjacent to Monterey Highway and limited land acquisitions would be required, some Silverleaf neighborhood residents expressed concern about increased traffic and noise impacts, as well as damage to homes from vibration. Concern was also expressed regarding impacts from a tunnel option at the portal due to construction and equipment staging areas. Residents, especially in the Edenvale neighborhood, are also concerned about traffic impacts from the narrowing of Monterey Highway and the closure of local roads. Requests were made to preserve the oak and walnut trees and bike lanes, and to be mindful of the new development in the vicinity of Blossom Hill Road. The City of San Jose Department of Transportation has taken steps to assist the Authority in evaluating the potential reduction of lanes of Monterey Highway to accommodate the project.	Public concerns centered on impacts to surrounding communities, including the New Horizons Condominiums, noise, traffic, and planned parks and trails near the Tamien Station. Concern was also expressed regarding impacts from a tunnel option at the portal due to construction and equipment staging areas. The Greater Gardner NAC chairman noted that a Native American burial site was discovered on the east side of Tamien Station. VTA facilities at Tamien Station may be impacted by high-speed rail. Some members of the public voiced their opposition to the alignment from Capitol Expressway to Bailey Road, and from Blossom Hill Road to Bernal Road, while others requested that the alignment be in a tunnel through this area.

TABLE 3A – MORGAN HILL-GILROY SUBSECTION EVALUATION MATRIX

Measurement Criteria	EAST OF UPRR TO DOWNTOWN GILROY - PROGRAM ALIGNMENT (CARRIED FORWARD)		US 101 TO DOWNTOWN GILROY (CARRIED FORWARD)	GILROY STATION LOOP (WITHDRAWN)	US 101 TO EAST GILROY (CARRIED FORWARD)	EAST OF UPRR TO EAST GILROY (CARRIED FORWARD)
	East of UPRR Alignment Alternative	**Design Option** Downtown Gilroy: HST Trench	**US 101 to Downtown Gilroy Alignment Alternative**	**Gilroy Station Loop Alignment Alternative**	**US 101 to East Gilroy Alignment Alternative**	**East of UPRR to East Gilroy Alignment Alternative**
Design Objectives						
Journey Time and Route Length	8.73 min 32.01 miles	Not Applicable	8.75 min 32.10 miles	8.34 min 30.58 miles	8.34 min 30.58 miles	8.70 min 31.77 miles
Intermodal Connections	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Operating Costs	1.16	Not Applicable	1.17	1.48	1.11	1.15
Capital Costs	1.04	1.13	1.37	1.48	1.22	1.00
Land Use						
• **Potential for TOD**	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
• **Consistency with Other Planning Efforts**	• Consistent with Morgan Hill's General Plan Supporting: • Infill Development due to existing Caltrain alignment • Efficient Transit system to reduce congestion • Locating transit stops that can be conveniently accessed from downtown • Consistent with City County general plan policies to: • Expand public transit and other related infrastructure to improve regional and inter-regional access; and • Provide for a safe, efficient and technologically advanced multi-modal transportation system.	Not Applicable	Consistent with City County general plan policies to: • Expand public transit and other related infrastructure to improve regional and inter-regional access. • Expand local transit to connect major shopping and employment centers with downtown. • Provide for a safe, efficient and technologically advanced multi-modal transportation system Not Consistent with: • Infill Development due to existing Caltrain alignment • Locating transit stops that can be conveniently accessed from downtown	Consistent with City of Gilroy and Santa Clara County general plan policies to: • Expand public transit and other related infrastructure to improve regional and inter-regional access; and • Provide for a safe, efficient and technologically advanced multi-modal transportation system	Consistent with City of Gilroy and Santa Clara County general plan policies to: • Expand public transit and other related infrastructure to improve regional and inter-regional access; and • Provide for a safe, efficient and technologically advanced multi-modal transportation system.	Consistent with City of Gilroy and Santa Clara County general plan policies to: • Expand public transit and other related infrastructure to improve regional and inter-regional access; and • Provide for a safe, efficient and technologically advanced multi-modal transportation system.
Constructability						
• Constructability	• Impact on train operations • Tight clearances to UPRR tracks and Monterey Highway • Squeezed between Monterey Highway and UPRR tracks • Impact on Monterey Highway traffic • Viaduct through town • Urban noise restrictions through Gilroy • Urban utility relocations for new stations • 1 mile tunnel section	• Most complicated design option to construct. • Involves below-grade structural work and excavation. • Significant Utility Support and Relocation • Local Traffic impacts during over-head bridge construction • 1 mile tunnel section	• Impact on train operations • Tight clearances to UPRR tracks in Gilroy • Traffic impacts in Gilroy • 1 mile tunnel section • Trench along airport • Viaduct through town • Urban noise restrictions through Gilroy • Urban utility relocations • Relocate runway • Utility support relocation	• May disrupt train operations • Tight clearances to UPRR tracks in Gilroy • Traffic impacts in Gilroy • 1 mile tunnel section • Viaduct through Gilroy • Urban noise restrictions through Gilroy • Urban utility relocations for new station	• Minimal impact to railway and highway operations • 1 mile tunnel section • Moderate bridge impacts • Impact on US 101 Ramps • Impact at CHP Weight Station	• Impact on train operations • Tight clearances to Rail-road tracks • Squeezed between Monterey Highway and Railroad tracks • Impact on Monterey Highway traffic • Viaduct through town • 1 mile tunnel section

TABLE 3A – MORGAN HILL-GILROY SUBSECTION EVALUATION MATRIX

Measurement Criteria	EAST OF UPRR TO DOWNTOWN GILROY - PROGRAM ALIGNMENT (CARRIED FORWARD)		US 101 TO DOWNTOWN GILROY (CARRIED FORWARD)	GILROY STATION LOOP (WITHDRAWN)	US 101 TO EAST GILROY (CARRIED FORWARD)	EAST OF UPRR TO EAST GILROY (CARRIED FORWARD)
	East of UPRR Alignment Alternative	Design Option Downtown Gilroy: HST Trench	US 101 to Downtown Gilroy Alignment Alternative	Gilroy Station Loop Alignment Alternative	US 101 to East Gilroy Alignment Alternative	East of UPRR to East Gilroy Alignment Alternative
• Disruption to Existing Railroads	• Existing UPRR spur track and associated property in Downtown Gilroy to be relocated • Access to UPRR from east blocked by HST from Bernal Way to Metcalf Road • Issacson business spur needs to be relocated	• Access to UPRR from east mostly blocked by HST from Bernal Way to Metcalf Road	• Access to UPRR from east mostly blocked by HST from Bernal Way to Metcalf Road	• Access to UPRR from east mostly blocked by HST from Bernal Way to Metcalf Road	• Access to UPRR from east mostly blocked by HST from Bernal Way to Metcalf Road	• Access to UPRR from east mostly blocked by HST down to north Gilroy
• Disruption to and Relocation of Utilities	• 7 Electrical utility overcrossings (115KV, 230 KV, and 500 KV lines) • 3 crossings of natural gas distribution feeder mains. • Potential third party fiber optic line, located within Caltrain easement. • Potential conflict with Santa Clara Valley Water District (SCVWD) Facilities; and trenching poses potential conflict with Santa Clara Conduit, Pacheco Tunnel and Hollister Conduit.	• Included within alignment data	• 7 Electrical utility overcrossings (115KV, 230 KV, and 500 KV lines) • Potential interference on electrical utilities115KV and 230 KV on parallel path. • 4 crossings of natural gas distribution feeder mains. • Potential conflict with SCVWD Facilities.	• 3 electrical utilities (115 Kilo Volts [KV] Overhead [OH], 230 KV OH and 500 KV OH) • Crosses distribution feeder main twice and backbone transmission system twice • 1 Fiber Optic Line (located within Caltrain easement) • Potential SCVWD Facilities Conflict • Need to investigate potential conflict with Santa Clara conduit, Pacheco tunnel and Hollister conduit	• 3 electrical utilities (115 KV OH, 230 KV OH and 500 KV OH) • Crosses distribution feeder main twice and backbone transmission system twice • 1 Fiber Optic Line (located within Caltrain easement) • Potential conflict with SCVWD Facilities; and trenching poses potential conflict with Santa Clara Conduit, Pacheco Tunnel and Hollister Conduit.	• 7 Electrical utility overcrossings (115KV, 230 KV, and 500 KV lines) • 3 crossings of natural gas distribution feeder mains. • Potential third party fiber optic line, located within Caltrain easement. • Potential conflict with SCVWD Facilities; and trenching poses potential conflict with Santa Clara Conduit, Pacheco Tunnel and Hollister Conduit.
Disruption to Communities						
Displacements						
• Residential Displacement	• 10-15 dwelling units – Single-Family Residential (SFR) • 10-20 dwelling units – Multi-Family Residential (MFR) • 0 dwelling units – Mobile Home Park (MHP)	• Not Applicable	• 20-25 dwelling units – SFR • 10-20 dwelling units – MFR • 0 dwelling units – MHP	• 15-30 dwelling units – SFR • 10-20 dwelling units – MFR • 0 dwelling units – MHP	• 15-25 dwelling units – SFR • 0 dwelling units– MFR • 0 dwelling units – MHP	• 20-30 dwelling units – SFR • 0 dwelling units– MFR • 0 dwelling units -- MHP
• Business Displacement	• 10-15 units – Commercial • 15-25 units – Industrial	• Not Applicable	• 5-10 units – Commercial • 15-20 units – Industrial	• 5-10 unit – Commercial • 10-15 units – Industrial	• 0 units – Commercial • 0-1 unit – Industrial	• 5-10 units – Commercial • 0-5 units – Industrial
• Properties with Access Affected	• 78 parcels	• Included within alignment data	• 57 parcels	• 106 parcels	• 78 parcels	• 93 parcels
• Local Traffic Effects around Stations	• Not Applicable	• Not Applicable	• Not Applicable	• Not Applicable	• Not Applicable	• Not Applicable
Highway Grade Separations and Closures	• 7 grade separations • 8 road closure	• Included within alignment data	• 3 grade separations • 6 road closures	• 3 grade separations • 2 road closures	• 6 grade separations • 6 road closures	• 9 grade separations • 8 road closures

TABLE 3A – MORGAN HILL-GILROY SUBSECTION EVALUATION MATRIX

Measurement Criteria	EAST OF UPRR TO DOWNTOWN GILROY - PROGRAM ALIGNMENT (CARRIED FORWARD)		US 101 TO DOWNTOWN GILROY (CARRIED FORWARD)	GILROY STATION LOOP (WITHDRAWN)	US 101 TO EAST GILROY (CARRIED FORWARD)	EAST OF UPRR TO EAST GILROY (CARRIED FORWARD)
	East of UPRR Alignment Alternative	Design Option Downtown Gilroy: HST Trench	US 101 to Downtown Gilroy Alignment Alternative	Gilroy Station Loop Alignment Alternative	US 101 to East Gilroy Alignment Alternative	East of UPRR to East Gilroy Alignment Alternative
Environmental Resources						
Biological Resources	• 403 ac – California Tiger Salamander (CTS) Range • 16 ac – CTS Critical Habitat • < 1 mi of stream within South-Central California Coast (SCCC) Steelhead Habitat. • < 1 ac – Bay Checkerspot Habitat • 96 ac – San Joaquin Kit Fox (SJKF) Range • 15 ac – California Red-legged Frog (CRLF) Range • 17 ac – CRLF (Proposed) • 434 ac – Vernal Pool Complex • 2 ac – Wetland Habitat • < 1 mile – Streams, creeks and (or) canals	• Included within alignment data	• 401 ac – CTS Range • 47 ac – CTS Critical Habitat • < 0.1 mi stream within Central California Coast (CCC) Habitat • 0.2 mi within SCCC Habitat • 126 ac – SJKF Range • 39 ac – CRLF Range • 48 ac – CRLF (Proposed) • 261 ac – Vernal Pool Regions • 2 ac – Wetland Habitat • 1 mile – Streams, creeks and (or) canals	• 230 ac – CTS Range • 5 ac – CTS Critical Habitat • < 0.1 mi stream within CCC Habitat • 0.1 mi stream within SCCC Habitat • 54 ac – SJKF Range • 4 ac – CRLF Range • 3 ac – CRLF (Proposed) • 230 ac – Vernal Pool Regions • < 1 ac – Wetland Habitat • 1 mile – Streams, creeks and (or) canals	• 195 ac – CTS Range • 5 ac – CTS Critical Habitat • < 0.1 mi stream within CCC Habitat • 0.1 mi stream within SCCC Habitat • 54 ac – SJKF Range • 4 ac – CRLF Range • 3 ac – CRLF (Proposed) • 195 ac – Vernal Pool Regions • < 1 ac – Wetland Habitat • < 1 mile – Streams, creeks and (or) canals	• 241 ac – CTS Range • 26 ac – CTS Critical Habitat • 0.1 mi stream within SCCC Habitat • 76 ac – SJKF Range • 23 ac – CRLF Range • 23 ac – CRLF (Proposed) • 434 ac – Vernal Pool Regions • < 1 ac – Wetland Habitat • < 1 mile – Streams, creeks and (or) canals
Cultural Resources	• 19 properties (with buildings over 45 years old) • Keesling's Shade Trees (California Registered Point of Historical Interest) • 1 National Register Resource • High potential to disturb archaeological resources outside of existing railroad Right-Of-Way (ROW)	• Included within alignment data	• 7 properties (with buildings over 45 years old) • Keesling's Shade Trees (California Registered Point of Historical Interest) • 1 National Register Resource • High potential to disturb archaeological resources outside of existing US 101 railroad ROWs	• 15 properties (with buildings over 45 years old) 1 National Register Resource • High potential to disturb archaeological resources outside of existing US 101 railroad ROWs	• 8 properties (with buildings over 45 years old) • High potential to disturb archaeological resources outside of existing US 101 railroad ROWs	• 6 properties (with buildings over 45 years old) • Keesling's Shade Trees (California Registered Point of Historical Interest) • High potential to disturb archaeological resources outside of existing railroad ROW
Parklands	• Potential for temporary use (indirect impact) of: • Coyote Creek Park Chain and Forest Park	• Included within alignment data	• Direct Impact of 10 ac of Coyote Creek Park Chain, north of Bailey Avenue • Potential temporary use (indirect impact) of: • Coyote Creek Park Chain, Coyote Creek, Anderson Lake County Park, Diana Estates Park, Las Animas Park and Forest Park.	• Direct Impact of 10 ac of Coyote Creek Park Chain, north of Bailey Avenue • Potential temporary use (indirect impact) of: • Coyote Creek Park Chain, Coyote Creek, Anderson Lake County Park, Diana Estates Park, Las Animas Park and Forest Park.	• Direct Impact of 10 ac of Coyote Creek Park Chain, north of Bailey Avenue Potential temporary use (indirect impact) of: • Coyote Creek Park Chain, Coyote Creek, Anderson Lake County Park and Diana Estates Park.	• Potential for temporary use (indirect impact) of Coyote Creek Park Chain.

TABLE 3A – MORGAN HILL-GILROY SUBSECTION EVALUATION MATRIX

Measurement Criteria	EAST OF UPRR TO DOWNTOWN GILROY - PROGRAM ALIGNMENT (CARRIED FORWARD)		US 101 TO DOWNTOWN GILROY (CARRIED FORWARD)	GILROY STATION LOOP (WITHDRAWN)	US 101 TO EAST GILROY (CARRIED FORWARD)	EAST OF UPRR TO EAST GILROY (CARRIED FORWARD)
	East of UPRR Alignment Alternative	Design Option Downtown Gilroy: HST Trench	US 101 to Downtown Gilroy Alignment Alternative	Gilroy Station Loop Alignment Alternative	US 101 to East Gilroy Alignment Alternative	East of UPRR to East Gilroy Alignment Alternative
• **Agricultural Land**	• 167 ac – Prime Farmland • 58 ac – Farmland of Statewide Importance • 6 ac – Unique Farmland • 38 ac – Farmland of Local Importance • 225ac – Williamson Act (2004,2009)	• Included within alignment data	• 137 ac – Prime Farmland • 53 ac – Farmland of Statewide Importance • 5 ac – Unique Farmland • 33 ac – Farmland of Local Importance • 254 ac – Williamson Act (2004,2009)	• 59 ac - Prime Farmland • 13 ac – Farmland of Statewide Importance • 1 ac – Unique Farmland • 21 ac – Farmland of Local Importance • 80 ac – Williamson Act (2004,2009)	• 50 ac – Prime Farmland • 10 ac – Farmland of Statewide Importance • 1 ac – Unique Farmland • 23 ac – Farmland of Local Importance • 81 ac – Williamson Act ((2004,2009)	• 85 ac – Prime Farmland • 9 ac – Farmland of Statewide Importance • 2 ac – Unique Farmland • 25 ac – Farmland of Local Importance • 102 ac – Williamson Act (2004,2009)
Natural Environment						
• Noise	• 1089.1 ac – SFR • 57.5 ac – MFR • 60.0 - MHP	• Included within alignment data	• 828.5 ac – SFR • 24.3 ac – MFR • 14.1 ac - MHP	• 1264.2 ac – SFR • 24.3 ac – MFR • 14.1 ac - MHP	• 984.5 ac – SFR • 5.6 ac – MFR • 14.1 ac - MHP	• 1217.9 ac – SFR • 72.7 ac – MFR • 60.0 ac - MHP
• Vibration	• 144.5 ac – SFR • 4.2 ac – MFR • 2.6 ac – MHP	•	• 96.3 ac – SFR • 3.5 ac – MFR • 0 ac – MHP	• 197.7 ac – SFR • 4.2 ac – MFR • 0 ac - MHP	• 138.3 ac - SFR • 0.6 ac – MFR • 0 ac MHP	• 194.4 ac - SFR • 4.2 ac – MFR • 2.6 ac - MHP
• Visual/Scenic Resources	• HST adjacent to existing railroad corridor • Aerial structures in downtown Morgan Hill and Gilroy out of scale with existing development • Tall aerial crossing of US 101 south of Gilroy.	• HST adjacent to existing railroad corridor • Aerial structures in downtown Morgan Hill and Gilroy out of scale with existing development • Clearing buildings for trench would affect downtown visual cohesion with neighborhoods to east of trench	• HST on cut-and-fill across hillside open space along freeway • Portion of alignment passes low density residential • Aerial along freeway though Morgan Hill blocks some views to hills • Tall aerial crossing of US 101 south of Gilroy.	• HST on cut-and-fill across hillside open space along freeway • Portion of alignment passes low-density residential • Aerial along freeway though Morgan Hill blocks some views to hills • Single track aerial crossing of US 101 and HST main lines north of Gilroy • Aerial structure in downtown Gilroy out of scale with existing development • Tall aerial crossing of US 101 south of Gilroy. • Single track aerial crossing of HST mainlines south of Giroy	• HST on cut-and-fill across hillside open space along freeway • Portion of alignment passes low-density residential • Aerial along freeway though Morgan Hill blocks some views to hills	• HST adjacent to existing railroad corridor • Aerial structures in downtown Morgan Hill out of scale with existing development • Aerial crossing of US 101 north of Gilroy
• Geotechnical Constraints	• 1 Fault line crossing • 1 Fault rupture hazard zone • 93.8 acres in liquefaction zones	• Included within alignment data	• 1 Fault line crossing • 1 Fault rupture hazard zone • 70.8 acres in liquefaction zones	• 1 Fault line crossing • 1 Fault rupture hazard zone • 71.2 acres in liquefaction zones	• 1 Fault line crossing • 1 Fault rupture hazard zone • 62.9 acres in liquefaction zones	• 1 Fault line crossing • 1 Fault rupture hazard zone • 85.9 acres in liquefaction zones

TABLE 3A – MORGAN HILL-GILROY SUBSECTION EVALUATION MATRIX							
Measurement Criteria	EAST OF UPRR TO DOWNTOWN GILROY - PROGRAM ALIGNMENT (CARRIED FORWARD)		US 101 TO DOWNTOWN GILROY (CARRIED FORWARD)	GILROY STATION LOOP (WITHDRAWN)	US 101 TO EAST GILROY (CARRIED FORWARD)	EAST OF UPRR TO EAST GILROY (CARRIED FORWARD)
	East of UPRR Alignment Alternative	Design Option: Downtown Gilroy: HST Trench	US 101 to Downtown Gilroy Alignment Alternative	Gilroy Station Loop Alignment Alternative	US 101 to East Gilroy Alignment Alternative	East of UPRR to East Gilroy Alignment Alternative
Agency and Public Support						
Agency and Public Input	• Several key state and federal agencies, including the California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS) prefer US 101 over the East of UPRR because the area along Monterey Highway serves as a critical linkage for wildlife movement. An elevated structure would be preferred to allow for wildlife movement from the Gabilan Range to southwest of the Diablo Range. The CDFG, USFWS, and NOAA Fisheries suggested crossing the Soap Lake floodplain using elevated/aerial structures to minimize the crossing distance. The City of Morgan Hill opposes this alignment due to impacts to existing and future developments, including downtown Main Street. The City of Gilroy prefers a trench over an aerial structure for its downtown station. Public comments regarding this alignment were mixed: some residents prefer using the existing rail corridor to the greatest extent possible, while others are concerned about noise, impacts to property, historical and sensitive structures, traffic and circulation, and biological resources.	• The City of Gilroy has expressed some support for a downtown station if it is in a trench rather than aerial. A joint resolution between the cities of Morgan Hill and Gilroy states a preference for a HST station in Gilroy. Some members of the public are concerned that the size/scale of the facility may negatively impact the downtown area, including noise; impacts to property; historical and sensitive structures; traffic and circulation; and biological resources.	• Many residents who live east of US 101 in the Gilroy area, particularly in unincorporated Santa Clara County, are largely opposed to this alignment due to impacts to properties, farmland, open space, recreational facilities and their rural quality of life. However, other residents prefer US 101 due to the East of UPRR alignment's impacts to property and downtown areas of Morgan Hill, San Martin and Gilroy. • • The City of Morgan Hill prefers the US 101 Alignment rather than Refined Program Alignment. The City of Gilroy has expressed some support for a downtown station if it is in a trench rather than aerial.	• The City of Gilroy prefers a downtown station if it is in a trench, and agrees that a two-track system in downtown Gilroy would have fewer right-of-way impacts. However, concern has been expressed that a Gilroy station could be postponed or eliminated under this alignment alternative, with the express tracks built in advance of the station loop. • For all alternatives that pass through the Soap Lake floodplain southeast of Gilroy, the CDFG, USFWS and NOAA Fisheries prefer an alignment with the shortest crossing of the floodplain. • Members of the Frazier Lake Airpark made requests to avoid the airpark and interference with its operations. • Some residents expressed concern for impacts on agricultural land. •	• Many residents who live east of US 101 in the Gilroy area, particularly in unincorporated Santa Clara County, are largely opposed to this alignment due to impacts to properties, farmland, open space, recreational facilities and their rural quality of life. • • It was noted that an elevated alignment on the east side of US 101 would be closer in proximity to sensitive serpentine grasslands and the Bay Checkerspot Butterfly habitat, but would still allow wildlife to move through the area at the same rate as it does now. The USFWS and CDFG agreed that wildlife movement is more important in this area. • • The City of Morgan Hill prefers this alignment rather than Refined Program Alignment. • • It was noted that a trench would be needed next to San Martin Airport in order to meet airspace safety requirements. While some members of the public have acknowledged that an east Gilroy station would avoid impacts to the downtown area, others are concerned that an eastern station strays too far from the existing downtown Gilroy transportation hub. Some also feel that the size/scale of the station is not appropriate in this setting.	The City of Morgan Hill opposes this alignment due to impacts to existing and future developments, including downtown Main Street. Concerns were expressed by residents and businesses regarding impacts to properties, farmland and waterways from alignments leading to the East Gilroy station.

**TABLE 3B – MORGAN HILL-GILROY HST STATION OPTIONS
EVALUATION MATRIX**

Measurement Criteria	Morgan Hill Station: Downtown (WITHDRAWN)	Downtown Gilroy Station: Four-Track (CARRIED FORWARD)	Downtown Gilroy Station: Two-Track (WITHDRAWN)	East Gilroy Station: Four-Track (CARRIED FORWARD)	Morgan Hill Station: US 101 at Cochrane (WITHDRAWN)
Design Objectives					
Journey Time and Route Length	Not Applicable		• Additional route length of track to Gilroy Downtown Station= 13.2 miles	Not Applicable	Not Applicable
Intermodal Connections	• Currently served by VTA buses, Caltrain, and Monterey-Salinas Transit • Future service would include Monterey County Rail Service (TAMC)	• Currently served by VTA buses, Caltrain, Amtrak thruway buses, San Benito County Transit Shuttle, Monterey-Salinas Transit, and Greyhound • Future service would include Monterey County Rail Service (TAMC)	• Currently served by VTA buses, Caltrain, Amtrak thruway buses, San Benito County Transit Shuttle, Monterey-Salinas Transit, and Greyhound • Future services would include Monterey County Rail Service (TAMC)	• Future services would include VTA buses, Caltrain (via potential shuttle), Amtrak thruway buses, San Benito County Transit Shuttle, Monterey-Salinas Transit and Monterey County Rail Service (TAMC) (future service - via potential shuttle)	• Future services would include VTA buses, Caltrain (via potential shuttle), Monterey-Salinas Transit, and Monterey County Rail Service (TAMC) (future service - via potential shuttle)
Operating Costs	Not Applicable		Included within alignment data	Not Applicable	Not Applicable
Capital Costs	Not Applicable		Included within alignment data	Not Applicable	Not Applicable
Land Use					
Potential for TOD	• Some zoning in area is supportive of TOD: Mixed Use, Multi-Family High, Industrial, Public Facility • Existing single-family neighborhood one block to east • Existing downtown borders west side of site • Site served by existing transit and Caltrain	• Zoning in Downtown Specific Plan is supportive of TOD • Historic Downtown borders site to northwest • TOD to east could entail redevelopment of single-family residential area • Site served by existing transit and Caltrain	• Zoning in Downtown Specific Plan is supportive of TOD • Historic Downtown borders site to northwest • TOD to east could entail redevelopment of single family residential area • Site served by existing transit and Caltrain	• Current zoning is Agricultural • Current land use is agricultural • Site is part of Gilroy's 660 plan for large mixed-use development • Site is distant from Caltrain and existing downtown	• Area zoning is supportive of TOD: Multi-Family Medium, Commercial, General Commercial, Industrial and Public Facility (Hospital) • Much of site is currently vacant land • Site is distant from Caltrain and existing downtown
Consistency with Other Planning Efforts	See above	See above	See above	See above	See above
Constructability					
Constructability	Included within alignment data		Included within alignment data	Included within alignment data	Included within alignment data
Disruption to Existing Railroads	• Caltrain short-term parking needs to be separate from market-rate HST parking	• Caltrain short-term parking needs to be separate from market-rate HST parking	• Caltrain short-term parking needs to be separate from market-rate HST parking	No disruption	No disruption
Disruption to and Relocation of Utilities	Included within alignment data		Included within alignment data	Included within alignment data	Included within alignment data
Disruption to Communities					
Displacements					
Residential Displacement	• 0 dwelling units– SFR • 0 dwelling units – MFR • 0 dwelling units – MHP	• 0 dwelling units – SFR • 0 dwelling units – MFR • 0 dwelling units – MHP	• 0 dwelling units – SFR • 0 dwelling units – MFR • 0 dwelling units – MHP	• 0-1 dwelling unit – SFR • 0 dwelling units – MFR • 0 dwelling units – MHP	• 0-1 dwelling unit – SFR • 0 dwelling units – MFR • 0 dwelling units – MHP
Business Displacement	• 0-2 units – Commercial • 0 units - Industrial	• 0-1 unit – Commercial • 0-1 unit - Industrial	• 0-1 unit – Commercial • 0-1 unit - Industrial	• 0 units – Commercial • 0 units - Industrial	• 0 units – Commercial • 0 units – Industrial

TABLE 3B – MORGAN HILL-GILROY HST STATION OPTIONS EVALUATION MATRIX

Measurement Criteria	Morgan Hill Station: Downtown (WITHDRAWN)	Downtown Gilroy Station: Four-Track (CARRIED FORWARD)	Downtown Gilroy Station: Two-Track (WITHDRAWN)	East Gilroy Station: Four-Track (CARRIED FORWARD)	Morgan Hill Station: US 101 at Cochrane (WITHDRAWN)
Properties with Access Affected	Included within alignment data		Included within alignment data	Included within alignment data	Included within alignment data
Local Traffic Effects around Stations	• Potential increase in traffic congestion on several local streets			• Lesser disruption to local traffic • Impacts to fewer streets that are mostly under utilized	• Lesser disruption to local traffic • Impacts to fewer streets that are mostly under utilized
Highway Grade Separations and Closures	Included within alignment data		Included within alignment data	Included within alignment data	Included within alignment data
Environmental Resources					
Biological Resources	• 21 ac – CTS Range • 21 ac – Holland Vernal Pool in the Central Coast Region	• 22 ac – CTS Range • 22 ac – Holland Vernal Pool in the Central Coast Region	• 22 ac – CTS Range • 22 ac – Central Coast Vernal Pool Region	• 59 ac – CTS Range • 59 ac - Central Coast Vernal Pool Region	• 39 ac – CTS Range • 39 ac – Central Coast Vernal Pool Region • 0.33 miles – Streams, creeks and (or) canals
Cultural Resources	• 2 properties (with buildings over 45 years old) • 2 California Historical Landmark	• 3 properties (with buildings over 45 years old) • Gilroy Station (likely to be eligible for National Register)	• 3 properties (with buildings over 45 years old) • Gilroy Station (likely to be eligible for National Register)	• 1 property (with buildings over 45 years old)	• No cultural resources
Parklands	• No parklands	• <1 acre of potential temporary use (indirect impact) of Forest Street Park	Potential temporary use of: • <1 ac - Forest Street Park	• No parklands	• No parklands
Agricultural Land	No agricultural resources		No agricultural resources	• 59 ac – Prime Farmland • 21 ac – Williamson Act (2006)	• 7 ac – Unique Farmland
Natural Environment					
Noise	Included within alignment data		Included within alignment data	Included within alignment data	Included in alignment data
Vibration	Included within alignment data		Included within alignment data	Included within alignment data	Included in alignment data
Visual/Scenic Resources	• Large parking garage is out of scale with surrounding area	• Aerial structure taller than many surrounding buildings • Large parking garage is out of scale with surrounding area	• Caltrain overnight storage tracks moved away from station • Aerial structure taller than many surrounding buildings • Large parking garage is out of scale with surrounding area	• Station located in an agricultural area	• Location near similar sized development (big box retail)
Geotechnical Constraints	Included within alignment data		Included within alignment data	Included within alignment data	Included within alignment data

TABLE 3B – MORGAN HILL-GILROY HST STATION OPTIONS EVALUATION MATRIX

Measurement Criteria	Morgan Hill Station: Downtown (WITHDRAWN)	Downtown Gilroy Station: Four-Track (CARRIED FORWARD)	Downtown Gilroy Station: Two-Track (WITHDRAWN)	East Gilroy Station: Four-Track (CARRIED FORWARD)	Morgan Hill Station: US 101 at Cochrane (WITHDRAWN)
Agency and Public Support					
Agency and Public Input	• A joint resolution between the cities of Morgan Hill and Gilroy states a preference for a HST station in Gilroy because it would better serve the travel shed in the counties to the south. • The City of Morgan Hill was not in favor of the Morgan Hill Downtown station because they did not desire an aerial structure through their downtown.	Included within alignment data.			• A joint resolution between the cities of Morgan Hill and Gilroy states a preference for a HST station in Gilroy because it would better serve the travel shed in the counties to the south. • The City of Morgan Hill was not in favor of the Morgan Hill Downtown station because they did not desire an aerial structure through their downtown.

TABLE 4 -- PACHECO PASS SUBSECTION
EVALUATION MATRIX

Measurement Criteria	REFINED PROGRAM ALIGNMENT (CARRIED FORWARD)	CLOSE PROXIMITY TO SR 152 (CARRIED FORWARD)
	Refined Program Alignment Alternative	Close Proximity to SR 152 Alignment Alternative
Design Objectives		
Journey Time and Route Length	6.30 min 23.09 miles	6.23 min 22.85 miles
Intermodal Connections	Not Applicable	
Operating Costs (Cost Factor)	1.01	1.00
Capital Costs (Cost Factor)	1.09	1.00
Land Use		
Potential for TOD	Not Applicable	
Consistency with Other Planning Efforts	Consistent with Santa Clara County General Plan to: • Expand public transit and other related infrastructure to improve regional and inter-regional access; and • Provide for a safe, efficient and technologically advanced multi-modal transportation system. Consistent with Merced County General Plan to: • Encourage the movement of people, goods and services through non-automotive transportation, reducing traffic congestion, air pollution, energy consumption and the costs of personal transportation. • Identify and recognize the development potential of vacant parcels within communities. • Provide opportunities to accommodate the specialized needs of the traveling public balanced with circulation and other County needs. Inconsistent with Merced County General Plan to: • Regulate the location, density and design of development to minimize adverse impacts to encourage enhancement of rare and endangered species habitats. • Encourage urban uses, which could result in significant loss of sensitive habitat, be directed to less sensitive wetland, wildlife and vegetation habitat areas. • Ensure open space lands are used for public protection purpose.	
Constructability		
Constructability	• 20 mi. Access Roads for Tunnels • Bridges lower than 200' • Longer Tunnel(2.69 mi)	• 17 mi. access roads for tunnels • Bridges lower than 200' • Shorter Tunnel (1.96 mi)
Disruption to Existing Railroads	No Impacts	
Disruption to and Relocation of Utilities	• 7 Electrical Utilities (70 Kilo Volts (KV) Overhead (OH); 500KV; and 230KV OH • 1 Natural Gas Line (Backbone Transmission System) • 1 Water Supply • Potential conflict with Pacheco Tunnel and Hollister Conduit	
Disruption to Communities		
Displacements	• 0 units – SFR • 0 units – MFR • 0 units – MHP	• 0 units – SFR • 0 units – MFR • 0 units – MHP
Properties with Access Affected	• 3 parcels	• 3 parcels
Local Traffic Effects around Stations	Not Applicable	
Highway Grade Separations and Closures	• 0 grade separations • 0 road closure	• 0 grade separations • 0 road closure

TABLE 4 -- PACHECO PASS SUBSECTION
EVALUATION MATRIX

Measurement Criteria	REFINED PROGRAM ALIGNMENT (CARRIED FORWARD) Refined Program Alignment Alternative	CLOSE PROXIMITY TO SR 152 (CARRIED FORWARD) Close Proximity to SR 152 Alignment Alternative
Environmental Resources		
Biological Resources	• 958 ac –CTS Range • 808 ac – SJKF range • 751 ac – CRLF Range • 122 ac - CRLF critical habitat • < 1 ac – CTS critical habitat • 530 ac – within proposed CRLF critical habitat • 439 ac - of Holland Vernal Pool regions • 15 ac – Vernal Pool Complex • 23 ac – Wetland Habitat • 2 mi – Streams, creeks and (or) canals • 28 ac – Lakes/Ponds	• 995 ac –CTS Range • 844 ac – SJKF range • 792 ac – CRLF Range • 123 ac - CRLF critical habitat • 1 ac – CTS critical habitat • 594 ac – within proposed CRLF critical habitat • 404 ac - of Holland Vernal Pool regions • 12ac – Vernal Pool Complex • 14 ac – Wetland Habitat • 2 mi – Streams, creeks and (or) canals • 15 ac – Lakes/Ponds
Cultural Resources	• No Cultural Resources	
Parklands	• 234 ac of publicly-owned lands (San Luis State Recreation Area, Cottonwood Creek Wildlife Area, San Luis Reservoir and Wildlife Area) • No additional publicly-owned lands indirectly affected • 158 ac - TNC land	• 255 ac of publicly-owned lands (San Luis State Recreation Area, Cottonwood Creek Wildlife Area, San Luis Reservoir and Wildlife Area) • No additional publicly-owned lands indirectly affected • 185 ac - TNC land
Agricultural Land	• 153 ac - Prime Farmland • 6 ac - Farmland of Statewide Importance • 5 ac - Unique Farmland • 37 ac - Farmland of Local Importance • 0 ac – Confined Animal Agriculture • 59 ac - Williamson Act (Prime acres) • 309 ac - Williamson Act (Non Prime acres)	• 152 ac - Prime Farmland • 6 ac - Farmland of Statewide Importance • 5 ac - Unique Farmland • 34 ac - Farmland of Local Importance • 0 ac – Confined Animal Agriculture • 59 ac - Williamson Act (Prime acres) • 451 ac - Williamson Act (Non Prime acres)
Natural Environment		
Noise	• 416 ac – SFR • 0 ac – MFR • 0 ac – MHP	• 416 ac – SFR • 0 ac – MFR • 0 ac – MHP
Vibration	• 0 ac – SFR • 0 ac – MFR • 0 ac – MHP	• 0 ac – SFR • 0 ac – MFR • 0 ac – MHP
Visual/Scenic Resources	• HST line in rural scenic setting Visible from San Luis Reservoir; visible in Pacheco Creek Valley	• HST line in rural scenic setting visible from San Luis Reservoir; visible in Pacheco Creek Valley
Geotechnical Constraints	• 0 Fault Seismic Crossings • 0 rupture hazard zones • 126ac – liquefaction zones	• 0 Fault Seismic Crossings • 0 rupture hazard zones • 126ac – liquefaction zones

TABLE 4 -- PACHECO PASS SUBSECTION
EVALUATION MATRIX

Measurement Criteria	REFINED PROGRAM ALIGNMENT (CARRIED FORWARD) Refined Program Alignment Alternative	CLOSE PROXIMITY TO SR 152 (CARRIED FORWARD) Close Proximity to SR 152 Alignment Alternative
Agency and Public Input		
Agency and Public Input	Concerns were expressed from the California Native Plant Society, Merced County Board of Supervisors, California Department of Fish and Game, Planning and Conservation League, California Rail Foundation, Bay Rail Alliance, Transportation Solutions Defense and Education Fund, Santa Clara Valley Water District, and individuals about the following biological and hydrological resources: • Coyote Creek, Coyote Valley, Coyote Reservoir • Guadalupe River • Santa Clara County Habitat Conservation Plan • San Joaquin kit fox habitat • Red –legged frog habitat • Pacheco Creek habitat • Various plant species along SR 152 • Pacheco Conduit • Anderson Reservoir • Pajaro watershed • Sycamore Alluvial Woodlands • Steelhead run in Pacheco Creek Valley • General wildlife movement due to tunnels and bridges required to navigate the topography • Tule elk and mountain lion Amongst other agency input, elevated structures were recommended as the alignment comes out of the Pacheco Pass moving east until it crosses I-5. The Merced County Farm Bureau, Defenders of Wildlife, Mariposa County Board of Supervisors and U.S. Fish and Wildlife Service requested that the Altamont Pass be used instead. There was also some support for a HST station in Los Banos or Santa Nella. Some individuals also requested that alignments across the Pacheco Pass be tunneled because they believe aerial and trench alignments are divisive.	
Environmental Resources Impacts Avoided: Alignment Alternative Within Tunnel		
Biological Resources	• 277 ac – California Tiger Salamander (CTS)Range • 258 ac – San Joaquin Kit Fox (SJKF) range • 277 ac – California Red-Legged Frog (CRLF) Range • 27 ac - CRLF critical habitat • 0 ac – CTS critical habitat • 232 ac – within proposed CRLF critical habitat • 55 ac - of Holland Vernal Pool regions • 0 ac – Vernal Pool Complex • < 1 ac – Wetland Habitat • < 1 mi – Streams, creeks and (or) canals • < 1 ac – Lakes/Ponds	• 253 ac –CTS Range • 234 ac – SJKF Range • 253 ac – CRLF Range • 27 ac - CRLF critical habitat • 0 ac – CTS critical habitat • 182 ac – within proposed CRLF critical habitat • 115 ac - of Holland Vernal Pool regions • 0 ac – Vernal Pool Complex • < 1 ac – Wetland Habitat • < 1 mi – Streams, creeks and (or) canals • < 1 ac – Lakes/Ponds
Parklands	• 73 ac of publicly-owned lands (San Luis State Recreation Area, Cottonwood Creek Wildlife Area, San Luis Reservoir and Wildlife Area) • No additional publicly-owned lands indirectly affected • 65 ac - TNC land	• 35 ac of publicly-owned lands (Cottonwood Creek Wildlife Area, San Luis Reservoir and Wildlife Area) • No additional publicly-owned lands indirectly affected • 71 ac - TNC land
Agricultural Land	• 0 ac - Prime Farmland • 0 ac - Farmland of Statewide Importance • 0ac - Unique Farmland • 0 ac - Farmland of Local Importance • 0ac – Confined Animal Agriculture • 0 ac - Williamson Act (Prime acres) • 291 ac - Williamson Act (Non Prime acres)	• 0 ac - Prime Farmland • 0 ac - Farmland of Statewide Importance • 0 ac - Unique Farmland • 0 ac - Farmland of Local Importance • 0 ac – Confined Animal Agriculture • 0 ac - Williamson Act (Prime acres) • 167 ac - Williamson Act (Non Prime acres)

TABLE 5 – SAN JOAQUIN VALLEY CROSSING SUBSECTION EVALUATION MATRIX

Measurement Criteria	HENRY MILLER ROAD TO AVE 24:REFINED PROGRAM ALIGNMENT (CARRIED FORWARD)	SR 140 (WITHDRAWN)	SOUTH OF GEA (WITHDRAWN)	HENRY MILLER ROAD TO SR 152 (WITHDRAWN)	HENRY MILLER ROAD TO AVENUE 21 (CARRIED FORWARD)	HENRY MILLER ROAD TO AVENUE 22 (WITHDRAWN)
Design Objectives						
Journey Time and Route Length						
I-5 to Merced (includes two subsections from I-5 to Merced)	• 14.98 min • 54.92 miles	• 10.76 min • 39.47 miles	• 29.17 min • 106.93 miles	• 14.45 min • 53.00 miles	• 18.7 min • 68.6 miles	• 14.73 min • 54.00 miles
I-5 to Fresno (includes two subsections from I-5 to Fresno)	• 21.26 min • 77.95 miles	• 25.54 min • 93.67 miles	• 21.11 min • 77.38 miles	• 21.20 min • 77.73 miles	• 21.54 min • 79 miles	• 20.41 min • 74.84 miles
Costs (Cost Factor)						
Operating Costs - I-5 to Wye	• 1.16	• 1.00	• 2.06	• 1.07	• 1.42	• 1.03
Operating Costs - I-5 to Merced (includes two subsections from I-5 to Merced)	• 1.40	• 1.00	• 2.70	• 1.34	• 1.74	• 1.37
Operating Costs - I-5 to Fresno (includes two subsections from I-5 to Fresno)	• 1.04	• 1.21	• 1.00	• 1.00	• 1.02	• 1.50
Capital Costs I-5 to Wye	• 1.30	• 1.00	• 2.10	• 1.60	• 1.20	• 1.16
Land Use						
Consistency with Other Planning Efforts	Consistent with Merced County General Plan to: • Encourage the movement of people, goods and services through non-automotive transportation, reducing traffic congestion, air pollution, energy consumption and the costs of personal transportation. • Identify and recognize the development potential of vacant parcels within communities. • Provide opportunities to accommodate the specialized needs of the traveling public balanced with circulation and other County needs. Inconsistent with Merced County General Plan to: • Regulate the location, density and design of development to minimize adverse impacts to encourage enhancement of rare and endangered species habitats. • Encourage urban uses, which could result in significant loss of sensitive habitat, be directed to less sensitive wetland, wildlife and vegetation habitat areas. • Ensure open space lands are used for public protection purpose.					
Constructability						
Constructability	• Moderate grading • 3 mile low bridge in a sensitive area • Adjacent to Henry Miller Road	• Moderate grading • 2 mile bridge in a sensitive area	• Moderate Grading • Sensitive Environmental Areas	• Moderate grading • 3 mile bridge in a sensitive area. • 14 miles of freeway reconstruction, major constructability issues along SR 152.	• Moderate grading • 3 mile bridge in a sensitive area	• Moderate grading • 3 mile bridge in a sensitive area
Disruption to Existing Railroad	• Temporary impacts during construction of HST crossing over California Northern Railroad track at Volta	• Temporary impacts during construction of HST crossing over California Northern Railroad track south of Gustine	• Temporary impacts during construction of HST crossing over California Northern Railroad track north of Firebaugh	• Temporary impacts during construction of HST crossing over California Northern Railroad track at Volta	• Temporary impacts during construction of HST crossing over California Northern Railroad track at Volta	• Temporary impacts during construction of HST crossing over California Northern Railroad track at Volta
Disruption to and Relocation of Utilities	• 3 Electrical Utilities (60 Kilo Volts [KV] Overhead [OH], 115 KV OH, 70 KV OH) • Crossing San Luis Canal, Delta-Mendota Canal and San Luis drain	• 1 Electrical Utility (115 KV OH) • 1 Natural gas line (backbone transmission system) • Crossing San Luis Canal, Delta-Mendota Canal and San Luis drain	• 6 Electrical Utilities (60 KV OH, 115 KV OH, 70 KV OH) • 3 Natural gas lines (backbone transmission system, distribution feeder main & local transmission system) • Crossing San Luis Canal, Delta-Mendota Canal and San Luis drain	• 2 Electrical Utilities (115 KV OH, 70 KV OH) • 1 Natural gas line (local transmission system) • Crossing San Luis Canal, Delta-Mendota Canal and San Luis drain	• 2 Electrical Utilities (115 KV OH, 70 KV OH) • 1 Natural gas line (local transmission system) • Crossing San Luis Canal, Delta-Mendota Canal and San Luis drain	• 2 Electrical Utilities (115 KV OH, 70 KV OH) • 1 Natural gas line (local transmission system) • Crossing San Luis Canal, Delta-Mendota Canal and San Luis drain

TABLE 5 – SAN JOAQUIN VALLEY CROSSING SUBSECTION EVALUATION MATRIX

Measurement Criteria	HENRY MILLER ROAD TO AVE 24:REFINED PROGRAM ALIGNMENT (CARRIED FORWARD)	SR 140 (WITHDRAWN)	SOUTH OF GEA (WITHDRAWN)	HENRY MILLER ROAD TO SR 152 (WITHDRAWN)	HENRY MILLER ROAD TO AVENUE 21 (CARRIED FORWARD)	HENRY MILLER ROAD TO AVENUE 22 (WITHDRAWN)
Disruption to Communities						
Displacements						
Residential Displacement	• 3-6 dwelling units – SFR • 0 dwelling units – MFR • 0 dwelling units - MHP	• 30-40 dwelling units • 0 dwelling units – MFR • 0 dwelling units – MHP	• 25-50 dwelling units • 0 dwelling units – MFR • 0 dwelling units – MHP	• 10-20 dwelling units • 0 dwelling units – MFR • 0 dwelling units – MHP	• 5-10 dwelling units • 0 dwelling units – MFR • 0 dwelling units – MHP	• 15-25 dwelling units • 0 dwelling units – MFR • 0 dwelling units – MHP
Business Displacement	• 0 units – Commercial • 0 units - Industrial	• 5-10 units - Commercial • 0-5 units - Industrial	• 0-1 units – Commercial • 0-2 units – Industrial	• 0-5 units – Commercial • 0 units - Commercial	• 0 units – Commercial • 0 units – Industrial	• 0 units – Commercial • 0 units - Industrial
Properties with Access Affected	• 84 parcels	• 83 parcels	• 65 parcels	• 74 parcels	• 63 parcels	• 91 parcels
Highway Grade Separations and Closures	• 15 grade separations • 10 road closures	• 30 grade separations • 17 road closures	• 31 grade separations • 39 road closures	• 82 grade separations • 10 road closures	• 14 Grade Separations • 15 Road Closures	• 15 Grade Separations • 16 Road Closures
Environmental Resources						
Biological Resources	• 497 ac – CTS Range • 327 ac – SJKF Range • 0 ac – CRLF Range • 16 ac – Vernal Pool Complex • 24 ac – Wetland Habitat • 3.8 miles – Streams, creeks and (or) canals • 2.6 ac – Lakes/Ponds • 2.7 ac – Swamps/Marshes	• 526.5 ac – CTS Range • 351.5 ac – SJKF Range • 48.5 ac – CRLF Range • 45.5 ac – Vernal Pool Complex • 23.9 ac – Wetland Habitat • 1.9 miles – Streams, creeks and (or) canals • 1 ac – Lakes/Ponds • 1.4 ac – Swamps/Marshes	• 696 ac – CTS Range • 748 ac – SJKF Range • 49 ac – CRLF Range • 61 ac – Vernal Pool Complex • 19.5 ac – Wetland Habitat • 6.4 miles – Streams, creeks and (or) canals • 0.5 ac – Lakes/Ponds	• 520 ac – CTS Range • 225 ac – SJKF Range • 0 ac – CRLF Range • 5 ac – Vernal Pool Complex • 13.05 ac – Wetland Habitat • 5.3 miles – Streams, creeks and (or) canals • 0.35 ac – Lakes/Ponds • 0.4 ac – Swamps/Marshes	• 550 ac - CTS Range • 298 ac – SJKF Range • 0 ac – CRLF Range • 13 ac – Vernal Pool Complex • 26 ac – Wetland Habitat • 4.8 miles – Streams, creeks and (or) canals • 2.6 ac – Lakes/Ponds • 2.7 ac – Swamps/Marshes	• 564 ac – CTS Range • 304 ac – SJKF Range • 0 ac – CRLF Range • 13 ac – Vernal Pool Complex • 25 ac – Wetland Habitat • 4.3 miles – Streams, creeks and (or) canals • 2.6 ac – Lakes/Ponds • 2.7 ac – Swamps/Marshes
Cultural Resources	No known archaeological sites Moderately sensitive for archaeological deposits					
Parklands	• 0 ac of publicly-owned lands	• 33.6 ac of publicly-owned lands (North Grasslands WA) • 2 publicly-owned lands potentially indirectly affected (Great Valley Grasslands State Park, San Luis NWR)	• 9.2 ac of publicly-owned lands (Dos Amigos WA) • 1 potentially indirectly affected property (Forebay Public Golf Course)	• 0 ac of publicly-owned lands • 1 publicly-owned land potentially indirectly affected (Los Banos WA)	• 0 ac of publicly-owned lands •	• 0 ac of publicly-owned lands
Agricultural Land	• 209 ac – Prime Farmland • 112 ac – Farmland of Statewide Importance • 82 ac – Unique Farmland • 24 ac – Farmland of Local Importance • 11 ac – Confined Animal Agriculture • 192 ac – Williamson Act	• 166 ac – Prime Farmland • 146.5 ac – Farmland of Statewide Importance • 47.5 ac – Unique Farmland • 34 ac – Farmland of Local Importance • 14.5 ac – Confined Animal • 336 ac – Williamson Act	• 216 ac – Prime Farmland • 267.5 ac – Farmland of Statewide Importance • 64 ac – Unique Farmland • 93.5 ac – Farmland of Local Importance • 0.5 ac – Confined Animal • 18 ac – Williamson Act • Major farmland severance issues	• 197.4 ac – Prime Farmland • 114.5 ac – Farmland of Statewide Importance • 98.1 ac – Unique Farmland • 17.7 ac – Farmland of Local Importance • 11.7 ac – Confined Animal • 67.8 ac – Williamson Act	• 220 ac – Prime Farmland • 140 ac – Farmland of Statewide Importance • 96 ac – Unique Farmland • 24 ac – Farmland of Local Importance • 9 ac – Confined Animal Agriculture • 222 ac – Williamson Act	• 228 ac – Prime Farmland • 169 ac – Farmland of Statewide Importance • 63 ac – Unique Farmland • 27 ac – Farmland of Local Importance • 8 ac – Confined Animal Agriculture • 232 ac – Williamson Act
Natural Environment						
Noise	• 784 ac – SFR • 9.7 ac – MFR • 0 ac – MHP	• 2222 ac – SFR • 17.7 ac – MFR • 0 ac – MHP	• 2271 ac – SFR • 0 ac – MFR • 9.6 ac – MHP	• 519 ac - SFR • 9.7 ac – MFR • 0 ac – MHP	• 1661 ac – SFR • 9.7 ac – MFR • 0 ac – MHP	• 1483 ac – SFR • 9.7 ac – MFR • 0 ac – MHP
Vibration	• 220 ac – SFR • 0 ac – MFR	• 305.5 ac - SFR • 1.7 ac – MFR	• 578 ac – SFR • 0 ac – MFR	• 220 ac - SFR • 0 ac – MFR	• 201 ac – SFR • 0 ac – MFR	• 326 ac – SFR • 0 ac – MFR

TABLE 5 – SAN JOAQUIN VALLEY CROSSING SUBSECTION EVALUATION MATRIX

Measurement Criteria	HENRY MILLER ROAD TO AVE 24:REFINED PROGRAM ALIGNMENT (CARRIED FORWARD)	SR 140 (WITHDRAWN)	SOUTH OF GEA (WITHDRAWN)	HENRY MILLER ROAD TO SR 152 (WITHDRAWN)	HENRY MILLER ROAD TO AVENUE 21 (CARRIED FORWARD)	HENRY MILLER ROAD TO AVENUE 22 (WITHDRAWN)
	• 0 ac – MHP	• 0 ac – MHP	• 1.5 ac – MHP	• 0 ac – MHP	• 0 ac – MHP	• 0 ac - MHP
Visual/Scenic Resources	• HST Line in rural setting	• HST river crossing at state park	• HST Line in rural setting	• HST Line in rural setting	• HST Line in rural setting	• HST Line in rural setting
Geotechnical Constraints	• No geological constraints					
Agency and Public Input						
Agency and Public Input	This alignment is supported by the EPA, USACE, Merced County, UC Merced, Congressman Dennis Cardoza, the County of Madera Board of Supervisors, City of Madera City Council, City of Chowchilla City Council (with reservations noted below), City of Atwater, City of Merced, City of Los Banos, Merced County Association of Governments, Merced County Economic Development Corporation, Merced College, Merced County Hispanic Network, and the Greater Merced Chamber of Commerce as the most direct route that uses existing east-west roadways and has the fewest impacts to agricultural and biological areas. The City of Chowchilla is opposed to this alignment because it does not consider the city's General Plan or its Infrastructure Master Plans, and extends through lands that are developed or planned for urban development. The alignment along Avenue 24 would also split the two State Correctional Facilities that lie east of Highway 99 Agencies with concerns about this alignment included the Grasslands Water District, USFWS, City of Chowchilla, Defenders of Wildlife, Sierra Club Merced Chapter, Merced County Board of Supervisors, and the Volta School. Questions were raised about access to parcels along the existing roadway network after the project is built, access to farmland, impacts to the Grasslands Ecological Area, impacts to the Volta School, and coordination with the Highway 152 Bypass Project.	This alignment was specifically opposed by the Merced County Association of Governments, UC Merced, the Greater Merced Chamber of Commerce, the County of Merced, the City of Atwater, the City of Merced, and Congressman Dennis Cardoza. These agencies and individuals expressed concern about impacts to the Grasslands Ecological Area (GEA), Gustine Municipal Airport, the planned Applegate Road Interchange, agricultural properties, biological habitats, future transportation projects and existing residential, commercial and recreation areas. Increased construction costs and travel times were also a concern. The Grasslands Water District had requested additional review of this alignment.	This alignment was specifically opposed by the Merced County Association of Governments, Merced County Economic Development Corporation, Merced College, Merced County Hispanic Network, UC Merced, Greater Merced Chamber of Commerce, County of Merced, City of Atwater, City of Merced, and Congressman Dennis Cardoza. • These agencies (and some individuals) expressed concerns about impacts to agricultural land, natural habitats, endangered species, and planned and zoned urban development areas. One person in support of the alignment noted that while trains can travel the fastest along this alignment, it would bypass populated cities. The Grasslands Water District had requested additional review of this alignment. Several also noted beneficial travel time from San Francisco to Merced and poor travel times to Fresno.	Limited feedback was received on this and other alignments through the Central Valley. Support for this alignment was however indicated by the Merced County Planning Department, the City of Atwater, City of Merced, Merced County Association of Governments, Merced County Economic Development Corporation, Merced College, and the Merced County Hispanic Network because it takes advantage of existing right of ways, has fewer impacts to wildlife and wetlands, is consistent with proposed development plans, and avoids conflicts with I-5, Highway 33, and major canal systems. The City of Chowchilla noted that an alignment south of SR 152 would have less impact on existing community uses and would also avoid the two State Correctional Facilities that lie east of Highway 99. Caltrans noted that traffic impacts to state highways (including SR 152) need to be evaluated.	The City of Chowchilla is in favor of an alignment south of SR 152, which would avoid Fairmead, cross Highway 99 near the new interchange, avoid the prisons, and provide an opportunity for a maintenance facility.	The City of Chowchilla is in favor of an alignment south of SR 152, which would avoid Fairmead, cross Highway 99 near the new interchange, avoid the prisons, and provide an opportunity for a maintenance facility.

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Appendix C

Downtown San Jose Tunnel Alternatives Report

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California High Speed Train (CA HST) Project – San Jose to Merced Section Downtown San Jose Tunnel Alternatives

Prepared for:

California High-Speed Rail Authority

June 2010

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 EXECUTIVE SUMMARY

Project Description

This report discusses alignment and station alternatives under consideration for the California High-Speed Train (HST) in the area from the San Jose (Diridon) Station south to the Tamien Caltrain Station. The California High-Speed Rail Authority (Authority) and the Federal Railroad Administration (FRA) are evaluating alignments and station location options (Figure 1) in this area as part of an Alternatives Analysis (AA) for this portion of the San Jose to Merced HST engineering and environmental review.

The Program Alignment shown on Figure 1 was identified as the Preferred Alternative in the Program Environmental Impact Report/Statement for the Bay Area to Central Valley that was certified by the Authority Board in 2008. The other eight alignments are the result of comments from the public and various stakeholders during the Scoping phase of the project-level environmental review that is currently ongoing for the San Jose to Merced HST section.

Figure 1. Downtown San Jose Alignment Alternatives

Conceptual designs for these alternatives were developed as part of the AA phase. These designs were then preliminarily evaluated against established criteria set forth by the Authority and FRA. Three of the options were at grade along the program alignment, two were aerial bridges, and four were tunnels including the "Shallow Tunnel" option (i.e., a tunnel alignment with a shallow cut-and-cover station).

Following this preliminary review, the Authority and FRA consulted and agreed that the tunneling options had high risks and costs and should not be carried forward for more detailed analysis into the Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the San Jose to Merced Section.

Following this, and after additional consultation with stakeholders and the public, however, the Authority agreed to further evaluate the four tunnel options ("Deep Tunnel", "Shallow Tunnel", "5100 Meter", and "Thread the Needle") and report on the constructability and practicality of each.

The Station Area Construction

A tunneled solution for the underground HST station and alignment in downtown San Jose (i.e., "Deep Tunnel" option) would be nearly 140-feet deep. This depth would be necessary to be under the foundations of the I-280 interchange just south of downtown, SR 87, Guadalupe River, and the proposed Silicon Valley Rapid Transit (SVRT) Project – San Jose BART station.

Tunneled alignments would include approach tunnels north and south of the station for each of four tracks needed at the station. There are tunnel boring machines capable of constructing these tunnels, even at the depth and in the groundwater that is present at this location.

On the deep tunnel alternative, the HST station itself would be a mined cavern over 1,380-feet long with a cross section of 40-feet high by 70-feet wide. Tunnel boring machines would not be used for construction of the station or the track transition structures. Instead, conventional sequential excavation method (SEM) mining would be used to remove the soil. Thus, to construct the underground station, the soil would be frozen, grouted, or chemically stabilized to stop the flow of groundwater present in this location to reduce the likelihood of cave-ins during mining, and the station would be mined from below in the stabilized soil.

The City of San Jose requested the study of a shallow tunnel option in response to issues with a deep tunnel option. This option may have significantly less constructability and fewer risk issues than a deep tunnel and station, but greater impacts at the surface and to future development.

This shallow tunnel concept was built on information obtained during the preparation of the deep tunnel alignment estimate and its alignment. A significant difference is that the shallow tunnel concept locates the HST tracks above the future east-west oriented BART tracks instead of below them as was done for the deep tunnel concept. The station box would be 1,380-feet long with a cross section of 80-feet high by 90-feet wide.

Both the station and the approach tunnels would need to be structurally complete with watertight materials as the work progresses. The flowing water in this soil would complicate the soil stabilization process and would add a higher degree of risk that a cave-in could occur.

Ground Conditions for the Deep Station/Tunnel and the Shallow Station/Tunnel in this Location

The City of San Jose is located in the Santa Clara Valley, a broad plain lying between the Santa Cruz Mountains to the west and the Diablo Range to the east. The basin of the Santa Clara Valley consists of gently sloping topography formed of predominantly fine grained soils; clay, silty clay, and silt with varying amounts of sand and gravel. The thickness of these sediments is as deep as 1,000 feet. The soils are underlain by sedimentary rock. The water table is very near the ground surface.

Based on the ground investigations performed for the proposed (SVRT) Project, it is assumed that the proposed HST Tunnel and Station would be excavated within generally silty clays, with some layers and/or lenses of sand and gravel. In some areas, more significant deposits of coarse-grained soils, consisting of silty sands and gravels, are expected. Water flows easily through the sands and gravels, as mentioned above. High water pressure caused by the depth of the work would further complicate the stabilization of soil and the control of water and water borne soils. Stabilizing these soils to allow for mining operations is a significant challenge facing the contractor.

On both tunnel alternatives, ground movements and settlements may occur during construction of underground works as a result of relaxation of the ground when excavation removes groundwater and lowers the water table. Lowering the groundwater table can result in compaction or consolidation of loose or soft overburden. Removal of fines by water seepage or through dewatering wells or the failure of the soil stabilization system can also cause settlements. Gross instability and collapse of tunnel face, shaft walls or bottom may cause surface depressions. Hence, ground movement control is a major issue for tunnels and excavations in soil in urban areas, especially if such works are performed below the groundwater table. Such settlement can cause damage to streets, utilities, railroad tracks, and buildings surrounding the construction. This constitutes one of the main risks associated with the tunneling process in this soil.

Conclusions

Two of the four tunnel alignments under consideration (i.e., “5100 Meter” and “Thread the Needle”) would operate under the active railroad tracks used by Caltrain, ACE, and Capitol Corridor, commuter services as well as AMTRAK service and the Union Pacific Railroad freight services. The location of the “Deep Tunnel” alignment is somewhat east of Diridon Station and well clear of active railroad tracks. This becomes an important distinction in the evaluation of risks for these four alternatives. The high potential of track settlement from the tunneling operation for the “5100 Meter” tunnel and the “Thread the Needle” tunnel puts the train riding public at risk, which is of major concern for these alignments.

While it may be possible to design and construct a station and the four track tunnels needed for the “Deep Tunnel” alignment, there is significant risk of soil failures during construction as a result of the ground conditions in this area. Further, this does not take into account other surface impacts associated with ground stabilization, access and ventilation shafts and other mining equipment related impacts, making the “Deep Tunnel” alignment impractical.

The Shallow Tunnel assumes that the proposed BART Diridon Station and Tunnels would be constructed below the HST Station/Tunnels. Constructing the HST station and track transition structures using cut-and-cover construction techniques has major surface impacts to residential and commercial properties, and has greater impacts on future development. However, the “Shallow Tunnel” option may have less ground conditions to contend with than the “Deep Tunnel” but greater surface related impacts which makes the “Shallow Tunnel” impractical. and few risk issues than the “Deep Tunnel” option.

Additionally, even if all elements of construction went as planned, it may well take a decade to construct the deep station, track transition structures and tunnel approaches. This alone would be well outside the schedule approved by the State when funding the project.

Since the underground tunnel/station alternatives are being compared to aerial alternatives in downtown San Jose, the advantages and disadvantages of each alignment type are presented in Table 1. Please refer to Table 1 for comparison of the two different alignment types.

Table 1. Comparison of Underground Tunnel/Station and Aerial Alternatives

Alignment Type	PRO's	CON's

Underground Tunnel/ Station Alternative	• For a deep tunnel and station option, less surface disruption – although ground stabilization will be necessary from surface for underground station construction and crossovers
	• Less visual impact at surface
	   o Although "Refined Program" Alignment would be located in existing rail transportation corridor and
	   o Much of "SR 87/I-280" Alignment would be located in freeway rights-of-way.
	• Minimal residential and business displacement (deep tunnel and station)
	• Straighter alignments means shorter journey time by nearly 2 minutes
	• While "Downtown Tunnel" alignment limits disruption to existing railroad operations compared to Aerial alignments, other tunnel options ("5100 Meter" and "Thread the Needle") could severely impact existing railroad operations
	• Less susceptible to earthquake
	• Design supports high-speed rail operations with less impact to vehicular traffic operations – e.g., neighborhood streets for Program Alignment and freeway traffic disruption for "SR 87/I-280" Alignment
		• Loose soil below water table – will require soil stabilization (freezing or jet grout into soil) from surface above station
		• Cross passages required every several hundred to thousand feet (varying)
		   o Will require stabilization of soils from surface at these locations.
		   o Difficult to construct under water – costly and time consuming
		• Risk of settlement for all infrastructure above tunnel and mined station (train tracks, utilities, buildings)
		• Would require maintaining VTA Vasona Extension operational during construction of Shallow Station
		• Would require maintaining adequate flows in the Los Gatos Creek during construction of Shallow Station
		• Would limit development above tunnel and station
		   o Authority may prohibit or
		   o May, at best, limit development, e.g., low rise only, depending on building foundations in relation to underground structures
		• Not scenic for HST rider
		• Tracks in tunnel may require wider right of way
		• Longer distance for passengers to get down to rails (particularly for handicapped riders)
		• Sensitive for archaeological resources
		• Potential impact to existing foundations (e.g., as tunnels pass under SR 87/I-280)
		• Deep Station/Tunnel requires less right-of-way (ROW), but greater ROW width will be needed at tunnel entrance/exit (portals) both during construction and for final configuration
		• Greater time required for emergency response (in case of fire)
		• Requires surface access for ventilation and evacuation shafts
		• More difficult fire prevention
		• Higher operating costs -- ~at least 10% more
		• Longer distances required to make elevation changes (the deeper, the longer mined section)
		• Construction cost Factor at least 3 to 6 times greater than aerial
		• Longer time to build – by a factor of 3

Aerial Alternative	• Consistent vertical profile reduces the number of vertical curves
	• Allows for redevelopment east of tracks
	• Can use space under tracks for portions of "SR 87/I-280" Alignment
	   o Train operations under "Refined Program" Alignment
	• Less sensitive archaeological resources
	• No impact to existing foundations under freeway for tunnel alignment
	• Construction less affected by geologic conditions
	• Less time for emergency response
	• Riders prefer scenery
	• Lower operating costs compared to underground options, estimated at ~10%
	• At least 6 times lower capital costs compared to underground options
	• Construction time substantially less than tunnel option
		• Vehicular traffic disruption in neighborhood for "Refined Program" Alignment and for SR 87/I-280 freeway traffic
		   o Several grade separations required
		   o May require re-alignment of tracks and/or roads to maintain train and traffic service during construction
		• Operating railroad impacts (Caltrain, ACE, Capital Corridor, AMTRAK, UPRR) during construction of aerial sections
		• Sound/noise issue -- parapet walls may be required
		• Potential visual impacts
		   o Possible aerial station visual effects on Historic Diridon Station
		• More susceptible to earthquake damage, but will be designed to withstand earthquakes
		• Utility relocation
		• Requires at a minimum the entire width beneath the structure for construction
		• Would require more private property acquisitions

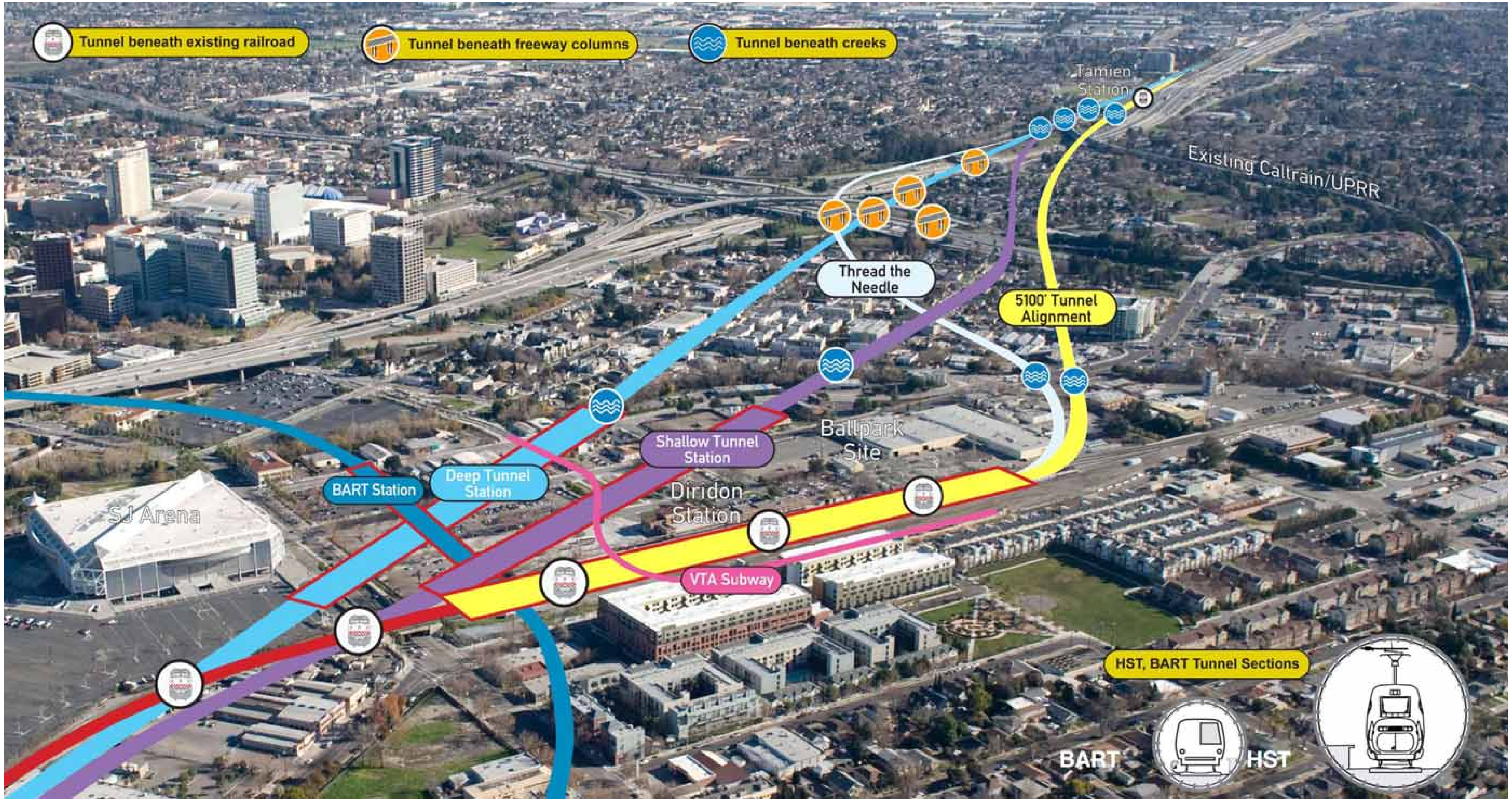
2 SCOPE OF STUDY

2.1 Objectives of Study

The primary objective of the study is to compare I-280/SR 87 Aerial Alternative and the Refined Program Alignment with the four tunnel alignment alternatives proposed by the community and the City of San Jose, as well as provide additional information on the four tunnel alternatives (see Figure 2). Specifically, the scope of this report required considering the following:

- Analyze and assess the downtown San Jose tunnel alignment alternatives and station options that extend between Tamien Station to the south and Diridon Station to the north.
- Present the technical information and data that further informs all interested stakeholders about the feasibility and practicality of building a deep tunnel/station and a shallow tunnel/station in this area.
- Supplement the Alternatives Analysis Report so that consequences of "Deep Tunnel" and "Shallow Tunnel" alternatives are more clearly understood.
- Assist in providing a basis for comparison of all alignment alternatives south of Diridon Station.
- Respond to requests by stakeholders for more detailed information about tunnel feasibility and practicality, and establish more comprehensive understanding of alignment alternatives such that all parties feel comfortable with what options are carried forward into the detailed environmental analysis and Draft Environmental Impact Report/Statement.
- Adhere to Alignment Design Standards for High-Speed Train Operation (TM 2.1.2) – The Technical Memorandum (TM) presents alignment design guidance. On the shared use segments speeds will be equal or less than 125 mph and the geometric design requirements are defined to achieve a safe and reliable operating railway that meets regulatory and CHSTP functional, programmatic, operational, and performance requirements. Grades shall be as low as possible where maximum grades are above 1.25% and shall be as low as practical up to 2.5%. Multiple changes in grades vertically with combined horizontal curve changes are to be avoided to the greatest extent possible. All the tunnel alignment alternatives will have to meet these standards.
- Consider Station Platform Geometric Design Standards (TM 2.2.4) – The TM noted establishes that Stations shall have a minimum of four tracks, where two tracks are for the station platforms and two tracks are for the express trains bypassing the station. The center platform length shall be 1380-feet long by 30-feet wide without curves and with a minimal slope.
- Consider turnouts to transition from two to four tracks (using 110 mph turnouts). The turnouts would be located on a tangent track near or at a distance from the station at both ends. Storage tracks are desired to be adjacent to the platforms but were moved outside of the tunnels to shorten the mined tunnel.
- Consider the length of the station and tunnel complex will extend over 11,123 feet or over 2.1 miles
- Consider geologic and hydrogeologic impacts, and the extremely difficult construction methodology particularly on the Sequential Excavation Method (SEM) proposed for the deep station.
- Consider that the tunnels are anticipated to travel 10 feet beneath the foundations of the SR87/I-280 interchange and the concern for the underpinning of the foundation.
- Consider that the construction access shafts, the permanent ventilation shafts, passenger ingress and egress structures will require right-of-way acquisitions.
- Consider reconstruction of the Tamien Station to accommodate the tracks from both the Deep and Shallow Tunnel options

Figure 2. Downtown San Jose Tunnel / Station Alternatives



3 DOWNTOWN SAN JOSE DEEP TUNNEL/STATION ALTERNATIVES

The scoping process for the downtown San Jose tunnel/station alternatives includes six potential alignment alternatives as shown in (see Figure 1 and Figure 2). The proposed alignment alternatives include four underground tunnel and two aerial options as follows (examples of typical HST underground tunnel, shallow tunnel with cut-and-cover methods, and aerial alternatives are shown in Figure 3, Figure 4 and Figure 5, respectively):

- San Jose "Deep Tunnel"
- San Jose "Shallow Tunnel"
- Voices of San Jose "Thread the Needle Tunnel"
- Voices of San Jose "5100 Meter Tunnel"
- I-280/SR 87 Aerial Alternative
- Refined Program Alignment

The existing Caltrain alignment between Diridon Station and Tamien Caltrain Station traverses a primarily residential neighborhood, crossing Los Gatos Creek and Guadalupe River. Curvature along existing railway limits speed in the area. The right of way is immediately next to homes, parks and a church. Additional alignments were suggested by the City of San Jose and Voices of San Jose (VoSJ), a group representing the Gardner Neighborhood. These alignment alternatives have been developed primarily in response to neighborhood concerns about the effects of adding two tracks for HST to the existing Caltrain/UPRR right-of-way in the Greater Gardner neighborhood. Additional concerns were the effects of the HST on the planned development in the Diridon Station area; constructing HST over an active railroad at the Diridon Station with operations by Caltrain, Union Pacific Railroad (UPRR), Altamont Commuter Express (ACE), Capitol Corridor, and AMTRAK; and provision of a good connection between all existing and planned public transit servicing the San Jose Station.

Figure 3. Deep Tunnel/Underground Station Alternative

Figure 4. Shallow Tunnel/Station Alternative (LA Metro – Wilshire to Vermont)

Figure 5. Aerial Alternative

3.1 San Jose "Deep Tunnel"

The Downtown Tunnel alternative is a relatively straight alignment which runs north of the existing Diridon Station near the HP Pavilion to south of Tamien Station (see Figure 6 for Plan and Profile of this alignment). It includes a new underground HST station to the east of the existing Caltrain Diridon Station. The tunnel would extend southeast from the proposed tunnel alignment from the San Francisco-San Jose corridor at Lenzen Avenue. The proposed underground station will extend from beneath the HP Arena parking lot, past West Santa Clara Street, the planned Diridon BART station, ending near South Autumn Street. The alignment then passes beneath Los Gatos Creek, the Lakehouse and Park/Lorrain neighborhoods and the I-280/SR 87 interchange. South of the interchange, the alignment travels beneath SR 87 and Guadalupe River, rising back to grade on the Caltrain/UPRR right-of-way at West Alma Avenue.

3.2 San Jose "Shallow Tunnel"

Beginning at Tamien station, tunnels would be constructed with tunnel boring machines to cross under SR 87 and I-280 (see Figure 7) . With shallower depth, the transition to cut-and-cover construction methods would be used for north of I-280 for special track work (transition sections from 2 to 4 tracks) and the station. North of station, tunnel boring would resume until cut and cover could be utilized for additional special track work. The profile of the shallow tunnel alignment is generally flat with top of rail at El. 15 (65 to 75 feet below ground surface) over the northernmost 10,000 feet, and then climbing at a constant grade of 2.5 percent over the remaining 2,700 feet to the portal south of Willow Street. A significant difference between "Deep Tunnel" and "Shallow Tunnel" options is that the shallow tunnel concept locates the HST tracks above the future BART tracks instead of below them as was done for the deep tunnel concept.

"Shallow Tunnel" and "Deep Tunnel" options are compared in terms of construction methods, cost, station configurations, track work and risks/impacts in Table 2.

Table 2. Comparison between "Deep Tunnel" and "Shallow Tunnel" Alignment Alternatives

	"Deep Tunnel" Alternative	**"Shallow Tunnel" Alternative**
Construction Methods-Station	Conventional segmental mining (SEM) requiring ground stabilization installed with equipment operating improvements from the surface	Cut and cover for station and track transition sections
Construction Methods-Tunnel	• SEM for turnouts, cross-overs and cross passages • EPBM for tunnels	• EPBM or slurry tunnel boring machine south of San Carlos Ave. • Cut and cover north of San Carlos Ave. • SEM for cross passages
Station Configuration	Platforms 1,380-ft long, 140-ft deep, 70-ft wide by 40-ft high	Platform 1,380-ft long, 90-ft wide by 30-ft high and 80-ft deep
Construction Cost	Stations and tunnels at Diridon: $3 billion	$1.3 billion (increases BART cost by more than $140 million)
Track Work	Multiple track configurations including 2 bore, 4 bore, non-circular locations for track switching, turnouts and cross-overs (see Figure 6)	Express tunnels constructed by TBM methods and will run outside the station
Location relative to BART station	Below proposed BART station	Above BART station (BART to be lowered to accommodate HST)
Risks/Impacts	• Ground stabilization injected from the surface along the alignment, as needed prior to and during construction to reduce surface settlement and cave-ins at the station and tunnels • Vertical access shafts for tunnel entrance, vents, fire-life safety personnel and equipment • Construction access areas for concrete plants, contractor's "lay down" areas for equipment and excavated materials • Tunnel construction requires additional areas for assembly of TBM's "trailing gear" • Ground movement and settlement • Vibration • Reconstruct Tamien Station • Adversely affect a National Register archaeological site	• Extensive site preparations including utility relocations and muck removal • Disruption to existing railroad (Caltrain, Amtrak, PACE, UPRR, Freight VTA-Vasona Line), traffic, utilities, communities, residences and business • Extensive right-of-way for construction and staging • Up to 1-2 acres adjacent to and outside the cut & cover footprint for staging and equipment • Support VTA LRT during construction • Maintain Los Gatos Creek flows during construction • Limits on future development • Reconstruct Tamien Station • Adversely affect a National Register archaeological site • Redesign BART alignment and BART Diridon Station to pass under the HST Station • Requires BART to adopt design exceptions to increase vertical grades to pass under the HST station. • Requires BART to build deep, mined station increasing construction risks, schedule, and cost.

Figure 6. Plan & Profile and Track Configuration for "Deep Tunnel" Option

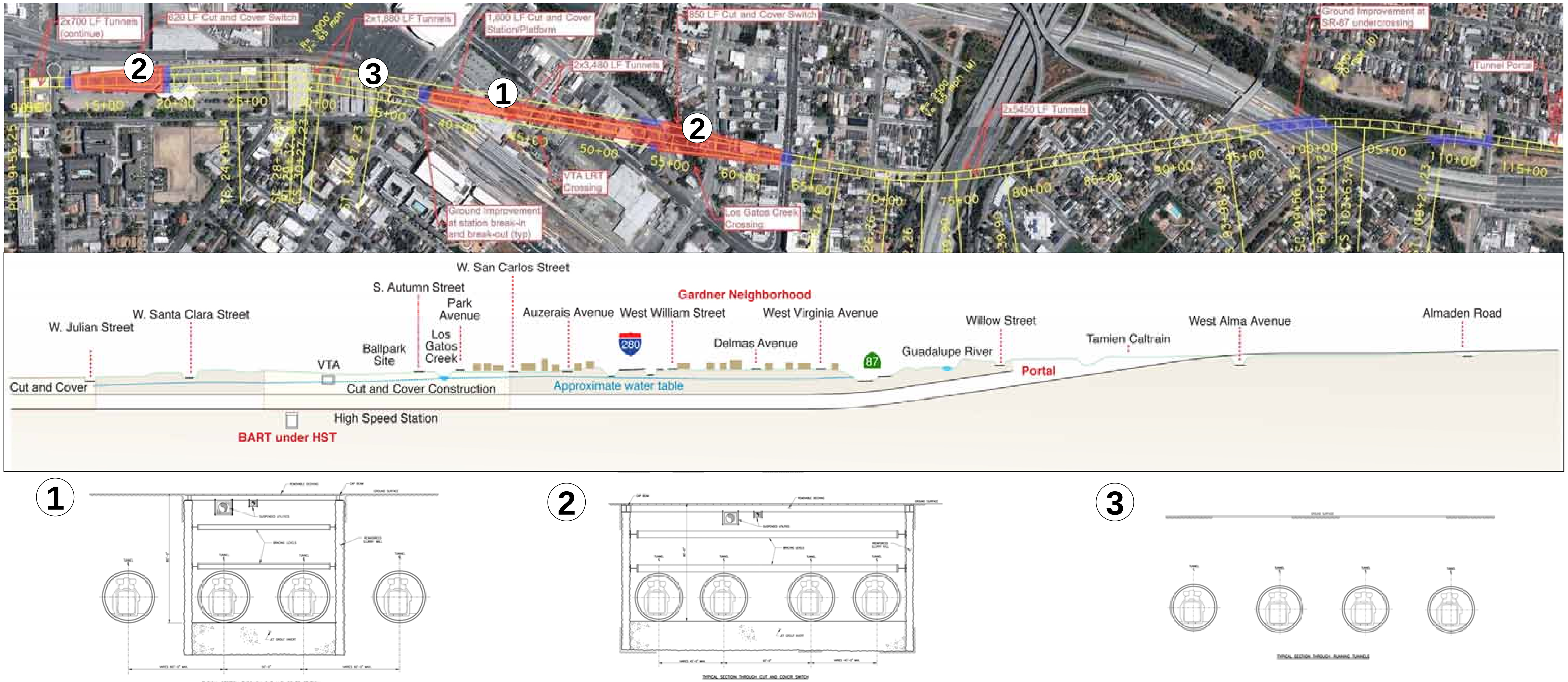


Figure 7. Plan & Profile and Track Configuration for "Shallow Tunnel" Option

3.3 Voices of San Jose "Thread the Needle"

Thread the Needle was proposed by the Voices of San Jose, a not-for-profit public policy group working with the residents of the Greater Gardner and North Willow Glen neighborhoods. It assumes an underground HST station beneath the existing platforms at Diridon Station and turns sharply east to pass beneath the intersection of Autumn Street and Park Avenue and then under Los Gatos Creek. The proposed alignment passes under the Park/Lorrain and Auzerais/Josefa neighborhoods before surfacing under the northbound I-280 to southbound SR 87 connector ramp. It then ascends to an aerial structure to pass over SR 87, West Virginia Street, and the Guadalupe River before rejoining the Program Alignment near Willow Street (see Appendix B for Plan and Profile of this alignment).

3.4 Voices of San Jose "5100 Meter Tunnel"

The 5100-m Tunnel proposed by the Voices of San Jose is similar to the Thread the Needle alignment alternative but will remain below-grade until south of the Tamien Station (see Appendix B for Plan and Profile of this alignment). It assumes an underground HST station beneath the existing Diridon Station platforms and veers away from the Program Alignment at the south end of the existing Caltrain Diridon tracks. The alignment then turns sharply east to pass beneath the intersection of Autumn Street and Park Ave before passing under Los Gatos Creek. The alignment then passes under the Park/Lorrain and Auzerais/Josefa neighborhoods and west of the I-280/SR 87 interchange. The tunnel then crosses under SR 87 at a shallow skew and rises to be at-grade between Almaden Expressway and Curtner Road.

3.5 I-280/SR 87 Aerial Alternative

The I-280/SR 87 aerial alignment alternative turns sharply east at the south end of the proposed elevated Diridon HST platforms (see Figure 8). The alignment crosses over the intersection of Bird Avenue and Auzerais Avenue and then uses the right-of-way of I-280 and SR 87 to bypass the Greater Gardner neighborhood. It then passes over West Virginia Street and descends to join the Program Alignment near Willow Street. This alternative follows existing transportation corridor to the greatest extent possible, however, curvature of the alignment is not conducive to high speeds.

3.6 Refined Program Alignment

Starting at the south end of the platforms at the HP Pavilion, at Park Avenue, there are four elevated tracks departing the station (see Figure 9). The alignment runs on an aerial structure approximately 45 feet high above the existing Caltrain/UPRR railroad tracks. The standard calls for a 6,000-foot long pair of platform tracks to serve trains diverging from the mainline. At West Virginia Street, south of I-280, the tracks come down to grade and run adjacent to the shifted Caltrain/UPRR tracks in order to share the existing right-of-way, which is generally wide enough to accommodate both HST and Caltrain/UPRR tracks. As the tracks cross over SR 87, they will ascend to an elevated structure and run south adjacent to the SR 87 freeway. This alternative utilizes much of existing Caltrain corridor to the greatest extent possible, however, curvature is not conducive to high speeds.

Figure 8. Plan and Profile for I-280/SR 87 Alignment

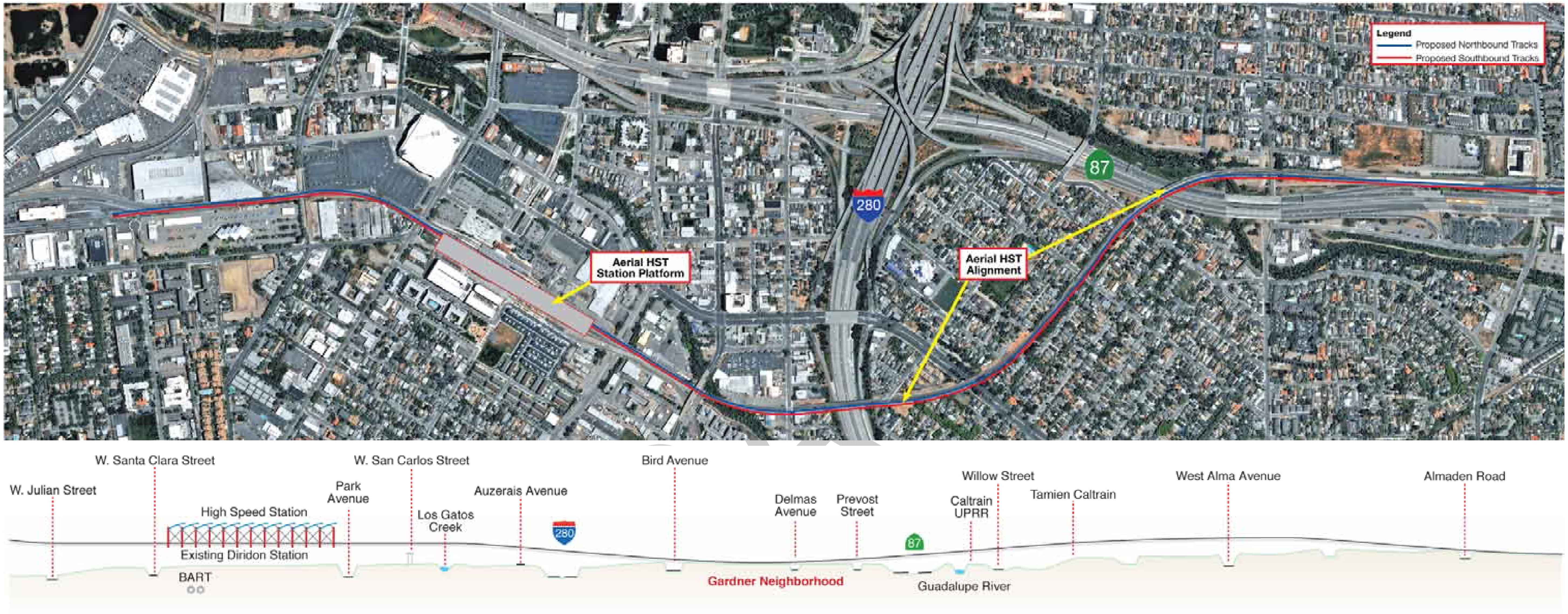


Figure 9. Plan and Profile for Refined Program Alignment

4 GEOLOGY/GEOTECHNICAL CONDITIONS FOR DEEP TUNNEL/STATION

4.1 General

The Santa Clara Valley Transportation Authority (VTA) is working on finishing the designs for the Silicon Valley Rapid Transit (SVRT) Project in the San Jose area, California. The project will extend the Bay Area Rapid Transit (BART) system 16.3 miles from Warm Springs in Fremont to San Jose. The project has been organized into three geographic areas. The Northern Area will include construction of the guideway, stations, campus facilities and parking structures from the end of the proposed Warm Springs extension to the East Tunnel Portal. The Central Area will include approximately five miles of tunnel guideway, with associated ventilation shafts and cross-over structures, three underground stations, campus facilities and parking structures from the East Tunnel Portal to the West Tunnel Portal. The Western Area will include the guideway, Yard & Shops facilities, Santa Clara Station, campus facilities and parking structure from the West Tunnel Portal to the end of the tail track.

Several geological, hydrogeological and geotechnical site investigations have been performed along the proposed SVRT alignment to support the design works.

The proposed HSR tunnel and station alternative alignments (Figure 2) are situated in the general vicinity of the Central Area Guideway section of the SVRT project, and thus, information from these investigations, presented in the Central Area Guideway 65% Engineering (HMM/Bechtel, 2008e) and the Central Area Guideway, Contract C301, 95% Geotechnical Basis of Design (HMM/Bechtel, 2008d), was reviewed and used for evaluation of anticipated ground conditions along the proposed HSR alignments. The site specific subsurface investigation for the proposed tunnel and underground station of the HSR project will be performed when a final alignment and construction option is established.

4.2 Regional Geology

The City of San Jose is located in the northern part of the Santa Clara Valley, a broad alluvial plain lying between the Santa Cruz Mountains to the west and the Diablo Range to the east. The alluvium filled basin of the Santa Clara Valley consists of gently sloping topography formed by coalescing alluvial fans, with natural and manmade levees along the principal stream channels that drain generally northward to San Francisco Bay. The Valley and the entire San Francisco Bay region are situated within the Coast Range Geomorphic Province, an area where the geology is dominated by the deformation of the earth's surface due to the movement of the Pacific and North American tectonic plates. The San Andreas Fault system lies along the intersection of these two plates. Generally, geologic units within the Santa Clara Valley include fills, colluvium, alluvial (Holocene/Pleistocene) inter-layered deposits comprising predominantly fine grained soils; clay, silty clay and silt with varying amounts of sand and gravel. The maximum thickness of these alluvial sediments is approximately 1000 feet. The alluvial deposits are underlain by Tertiary and Cretaceous marine sedimentary rocks and Franciscan Complex. Surficial distribution of geologic units within the northern part of the Santa Clara Valley (general area of the proposed SVRT and HSR projects) is shown on Figure 10.

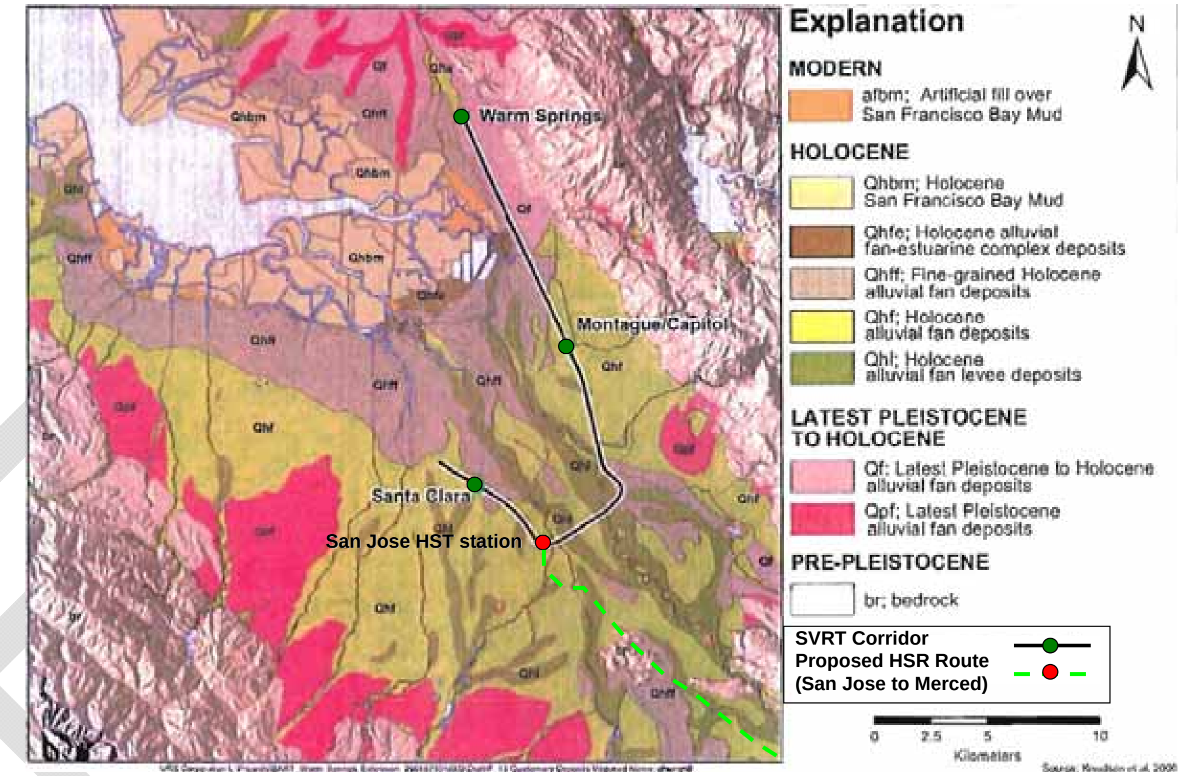


Figure 10. Geologic Map of Santa Clara Valley (Source: URS Corporation, 2003)

4.3 Site Geology

Based on the ground investigations performed for the proposed Silicon Valley Rapid Transit (SVRT) Project it is assumed that the proposed CSJ Downtown Deep HSR Tunnel and Station will be excavated within the alluvium consisting predominantly of stiff fine-grained soils (silty clays and organic soils) with some layers and/or lenses of sand and gravel. In some areas, more significant deposits of coarse-grained soils, consisting of silty sands and gravels, are expected. Vertical and horizontal distribution (i.e., thickness and lateral extent) of these alluvial sediments is variable and will be confirmed through the site specific ground investigation for the proposed HSR alignment. A preliminary, interpretative geologic profile showing anticipated subsurface conditions along the proposed SVRT tunnel and stations is presented on Figure 11.

A brief classification and description of Holocene-age (less than 11,000 years old) alluvium sediments to be most likely encountered during excavation for the HSR tunnel and station are as follows.

Qhf – alluvial fan sediments deposited by streams and rivers cutting into the alluvial valley floor, consisting predominantly of mixture of fine- to coarse-grained soils; silt, clay, sand and gravel

Qhff – alluvial fan sediments deposited on the flatter distal portion of the fan, consisting primarily of fine-grained soils: silt and clay, with occasional layers or lenses of sand and gravel

Qhl – alluvial fan levee sediments formed naturally where streams have overtopped their banks and deposited sand, silt and clay adjacent to the main channel

Regional groundwater regime expected within the proposed HSR project site is briefly discussed in Section 4.5, below.

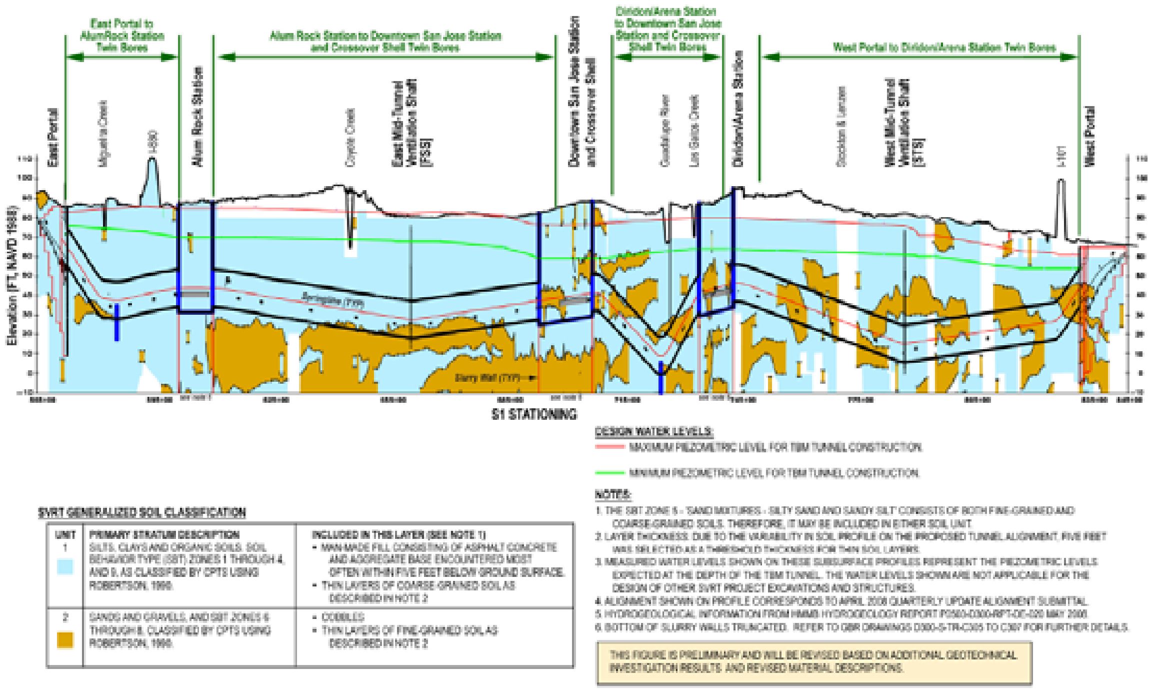


Figure 11. Preliminary Geologic Profile along the Proposed SVRT Project Site (Source: HMM/Bechtel, 2008d)

4.4 Regional Seismicity

In general, the San Jose area is part of the seismically-active coastal region of California. The area is classified (UBC Seismic Zones) as Seismic Zone 4, the most seismically-active ranking in the United States. The project site is in the region that was and will be subject to strong ground shaking resulting from earthquakes occurring along the two major fault systems, associated with the San Andreas and Calaveras Faults. The main trace of the San Andreas Fault line is situated approximately 15 miles to the west and Hayward and Calaveras Faults are approximately 5 and 7 miles to the east, respectively, from the proposed project site. In addition, the geographical relation of the proposed project site to the Shannon Fault and Coyote Creek Faults should be further investigated and evaluated, as both faults are subject to the City of San Jose Special Studies Zones and the City of San Jose Potential Hazard Zones regulations. A review of available information indicates that the portion of the Coyote Creek Fault is potentially active, while there is no indication on recent seismic events (activity) along the Shannon Fault. On review of the Regional Fault Map for the general San Francisco Bay area (http://www.sanjoseca.gov), it appears that the known traces of these faults are located approximately 12 miles (Shannon Fault) and 17 miles (Coyote Creek Fault) to the south from the proposed HSR site.

The most recent large earthquake to affect the area was the 1989 Loma Prieta Earthquake, which measured 6.9 on the Richter scale. The Working Group on California Earthquake Probabilities has estimated that there is a 60 - 70% probability for one or more magnitude 6.7 or greater earthquakes to occur in the region between the years 2000 and 2030. Therefore, the probability of at least one moderate or strong earthquake occurring during the life span of the proposed project is considered high.

4.5 Regional Hydrogeologic Conditions

It is anticipated that groundwater will be encountered during construction of the proposed tunnels and underground station at depths (subject to seasonal fluctuations) ranging from 4 to 18 feet below the existing ground surface. Groundwater pressures at the construction depths will be influenced by the hydrostatic pressure in both the surficial aquifer, which is unconfined, and the upper aquifer, which is confined. In some instances, confined hydrostatic pressures are seasonally artesian, meaning that pressure heads periodically exceed ground surface level. If the underground alignment is selected, depending on a depth, the hydrostatic head above the tunnel and station excavations, as well as around the access/ventilation shafts must be considered in the design, selection of proper means and methods of excavation, as well as methods for temporary and final ground support.

The regional hydro-geologic conditions and units within the Santa Clara Valley were formed as early as the Holocene (approximately 11,000 years ego) and can be characterized as follows (HMM/Bechtel 2008c and 2008d):

- Surficial Aquifer*: Holocene alluvial deposits of silt and silty sand. Thickness is typically less than 15 feet. At some locations, the water table will be below these sediments.
- Confining Layer: Holocene alluvial deposits composed of clays and silts, with local channels of sand. The sand channels are most common near the Guadalupe River and Los Gatos Creek. The general thickness varies from 50 feet to 80 feet.
- Upper Aquifer: Holocene and possibly Late Pleistocene older alluvial deposits composed of mixture of silty sand, sand, gravelly sand and sandy gravel. Includes intersecting and coalescing channels of varying thickness and differing hydraulic conductivity. The top of this unit generally varies from 50 to 80 feet below ground surface. Thickness generally ranges from 10 to 40 feet.
- Major Aquitard**: Pleistocene alluvial deposits composed primarily of clays and silts, but can include deposits of sand and silty sand. The depth to the top of this unit appears to range from about 80 feet to 150 feet. The thickness can be approximately 100 feet.
- Lower Aquifer: Pleistocene and Pliocene sediments composed of sand and gravel zones, with intervening clay and silt layers. The top of this unit maybe about 200 feet to 250 feet below ground surface, and the thickness may be about 800 feet or more. This is a primary zone of ground water supply in Santa Clara Valley.
- Basement: the underlying non-water-bearing stratigraphy consists of portions of the Santa Clara Formation and the Mesozoic age Franciscan Complex.

***Aquifer** – an underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt, clay) from which groundwater can be usefully extracted using water well

****Aquitard** – an impermeable layer of rock or unconsolidated materials along an aquifer

5 CONSTRUCTION METHODS FOR TUNNEL/STATION

5.1 General

Construction methods are heavily influenced by conditions at the site. Ground conditions, the presence of water, existing building and structure foundations, available areas to establish a base of operations for access to the construction, and the project-specific requirements such as track and switch geometries, allowable horizontal and vertical curve radii, operating clearances, and other design criteria all have a profound influence on the means and methods that can be employed for subsurface construction.

The various alternatives under consideration in this study require construction of tunnels and a station at depths of up to 140 feet for the "Deep Tunnel" option, and at depths of up to 80 feet for the "Shallow Tunnel" option. For both "Deep Tunnel" and "Shallow Tunnel" options, the tunnel will be constructed in highly variable and uncemented ground that will exhibit a full hydrostatic pressure. What this means is that feasible construction methods (and the end product) must be capable of withstanding the anticipated combined soil, groundwater, and seismic loads. They must also provide a way for supporting the ground as it is being excavated since the presence of water will make the ground "stand-up" time, or time that the soil can remain unsupported while being excavated, very low or more likely, non-existent. The only alternative to this is to dewater the ground in advance of and during construction so that construction can be performed "in the dry," as discussed below.

Careful consideration and engineering evaluation must be made of the salient factors including geology, hydrogeology, soil/rock type and properties, site location, type and dimensions of excavations, environmental issues such as long-term impacts to aquifers, the potential for ground settlement due to dewatering or tunnel construction. To this, experience and professional expert judgment must be exercised in order to select the most safe, cost effective, and practical solution.

5.2 Dewatering during Construction

The purpose of construction dewatering is to control surface and subsurface hydrologic environments in such a way as to permit the structure to be constructed "in the dry". In its simplest form, dewatering involves placing a device that collects water and pumps it to a location away from the work. Most often this is accomplished by drilling a series of wells.

A well is a drilled hole, usually 6 inches or larger large in diameter, that is drilled to some depth below the lowest part of the work to be constructed; in this case deeper than 140 feet. Wells are usually lined with a slotted PVC casing that prevents the hole from caving in but permits water to drain into the hole. A pump with a small diameter discharge line is lowered to the bottom of the hole. The pump pumps out water in the well through a discharge line to the surface, where it is collected and disposed of. Often, many wells must be drilled to dewater a construction site and the spacing and number of wells is determined by ground properties such as its permeability, or the rate at which groundwater travels through the ground.

Regardless of the number of wells, they must be installed and operated throughout the construction period if water is to be eliminated during construction. And since the purpose of dewatering is to lower the regional groundwater table to an elevation lower that of the construction work, this means that the ground surface above the area being dewatered can subside over the long term, causing problems with building and structure foundations. For this reason, dewatering is not considered a viable option unless there are no structures in the area.

Another limitation of dewatering is that it is ineffective for dewatering large regional groundwater regimes due to the sheer volume of water that must be handled. If the permeability of the ground is relatively low, such as those of predominantly clayey or silty soils, a continuous recharging system may be employed where water is drawn out of one well, and pumped to another well some distance away where it is recharged into the groundwater supply. Clearly, such a scheme requires that the pumping rate be greater than the recharge rate.

5.3 Shafts Construction Methods

Shaft construction will be required to access the tunnels and stations. Feasible methods will therefore need to provide means for supporting soils under full hydrostatic head or provide for method of erecting a groundwater cutoff barrier during construction.

Methods that do not rely on dewatering involve constructing a water-proof barrier around the area to be excavated before starting the main shaft excavation itself. The shaft support must be capable of being constructed to depths even deeper than the 140 feet, since the support will need to be "toed", or embedded into the ground for a sufficient distance to provide adequate resistance against loads generated as the shaft is excavated. Furthermore, the bottom of the shaft must be somehow made watertight and strong enough to resist against "boiling" of the shaft. Shaft boiling occurs when the weight of overlying material inside the shaft does not provide a sufficient reaction against the hydrostatic pressure and the water and ground "boil" or flow in an uncontrolled fashion under the shaft perimeter support and up into the shaft.

There are essentially two methods that shafts can be constructed under such conditions; slurry wall methods and ground freezing methods.

5.3.1 Slurry Wall Methods

A slurry wall consists of a number of vertical panels constructed end-to-end around the shaft perimeter to provide a watertight support system during excavation of the shaft interior. Typical slurry wall panels are 3 to 4 feet wide and about 10 feet long. The depth of the panel can be up to 200 or more feet deep. The panel is usually excavated with a hydromill (Figure 12) or hydraulic clamshell. The excavation is flooded with slurry—a mixture of bentonite, clay, and water—to keep the excavation open. Once excavated, the panels are usually reinforced with a rebar cage (Figure 13) before concrete is "tremied" into the panel. Tremie concrete is concrete that is pumped through a line to the bottom of the panel, displacing the slurry.

Once all the panels are completed and a continuous circular shaft wall is formed, the center of the shaft is excavated. This slurry wall shaft shown in Figure 14 is 135 feet in diameter, about the size of the various shafts that will be needed for access to the tunnels and station.

The final lining may be added to all or a portion of the shaft for additional support as the excavation is deepened. Circular sections of this size and depth are preferable to rectangular sections, since rectangular sections require intermediate bracing or strutting, which reduces space for, and complicates the passage of equipment and materials used later underground.

Figure 12. Hydromill used to Excavate Panels

Figure 13. Slurry Wall Reinforcement

Figure 14. Slurry Wall Panels Complete and Ready for Interior Mass Excavation

In ground conditions such as those for this project, the shaft "invert" or floor must be strengthened before excavation proceeds too far, or else the shaft invert will boil, as described above. This can be accomplished using methods such as jet grouting. Jet grouting is a process where holes are drilled from the ground surface to the depth desired, and a cement-water mixture injected into the ground through a rotating horizontal nozzle. The cement-water mixture is ejected at such force that it loosens and mixes with the surrounding soil to form a hard, impermeable column over the desired thickness of the future jet-grouted slab. Holes are usually drilled on triangular grid. The spacing between holes is dependent on the type of jet grouting technology used and the ground conditions so that the columns overlap to provide a continuous mass of cemented material.

Figure 15 shows the shaft excavation essentially complete to a depth of 160 feet. The photo was taken from the top of the boom of the crane servicing the removal of excavated material. The crane will continue to be used for installation and servicing of the tunneling equipment. The shaft invert has been jet grouted to densify and strengthen the soils so that groundwater under the invert and under pressure does not boil into the shaft.

Figure 15. Shaft Excavation Near Completion

5.3.2 Ground Freezing Methods

Ground freezing is typically used for shaft depths greater than about 200 feet where it becomes competitive in terms of price and construction time with slurry wall methods. It is also very versatile since it can be used to construct odd-shaped openings. Common applications include shaft-to-shaft or tunnel-to-tunnel (cross passage) connections, for settlement control under buildings, and for emergency recovery of tunnel boring machines (TBMs). The process can be used for both groundwater cutoff and creating a bottom seal, so it is an alternate method for slurry walls and jet grouting. It works in all types of soil and groundwater conditions, and it increases the mechanical properties of soil so that the soil acquires mechanical strength, which in turn is usable as structural support.

The method involves drilling a series of holes around the perimeter of the shaft and installing a double-wall piping system whereby the refrigerant (usually brine and sometimes liquid nitrogen) is pumped down the center pipe where it exits at the bottom of the hole and returns to the surface within the annulus between the casing pipe and the delivery pipe. Figure 16 below illustrates the process. Over time, the refrigerant will freeze the water in the ground. The freezing time required is a function of many variables, such as whether the groundwater is moving or not, but a typical period needed to freeze the ground can be on the order of two months. The chillers and pumps are mounted on trailers and set up on site, along with a portable generator if commercial power is not available.

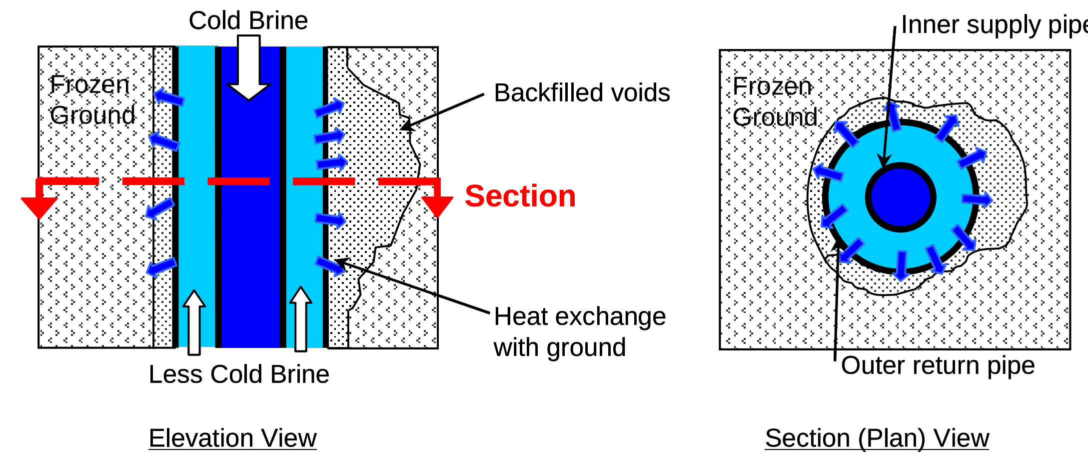


Figure 16. Freeze Pipe Arrangement

Once the ground and groundwater surrounding the shaft is frozen, mass excavation of the shaft interior can begin. Figure 17 shows the excavation of a freeze wall shaft using conventional steel ribs and wood lagging for initial support. A double row of freeze pipes about the shaft perimeter can be seen in part at the bottom of the photograph. The initial shaft support system is typically not watertight since it is not designed to support a hydrostatic head. Therefore the final shaft lining must be constructed before turning off the shaft freezing equipment. This includes the construction of an invert cutoff wall, as shown in Figure 18 to prevent the phenomenon of "invert boiling" described in Section 5.3.

One of the many technical issues to address at the time of design is that of surface heave. When water is frozen, it expands. Similarly, when bearing ground is frozen, the frozen groundmass expands, on the order of about 9 percent. Since the ground is frozen in-situ, or in its unexcavated state, the confining pressures of the surrounding ground usually result in expansion in the only direction that the ground is not constrained-up.

Another issue relates to designing a system that provides a continuous frozen barrier without un frozen pockets or "windows". If the permeability of the groundwater mass is high, as is the case on this project, the groundwater will migrate while it is being frozen, and may therefore never entirely freeze. In such cases, one or more additional rows of freeze pipes must be installed.

Figure 17. Freeze Shaft Excavation Near Completion

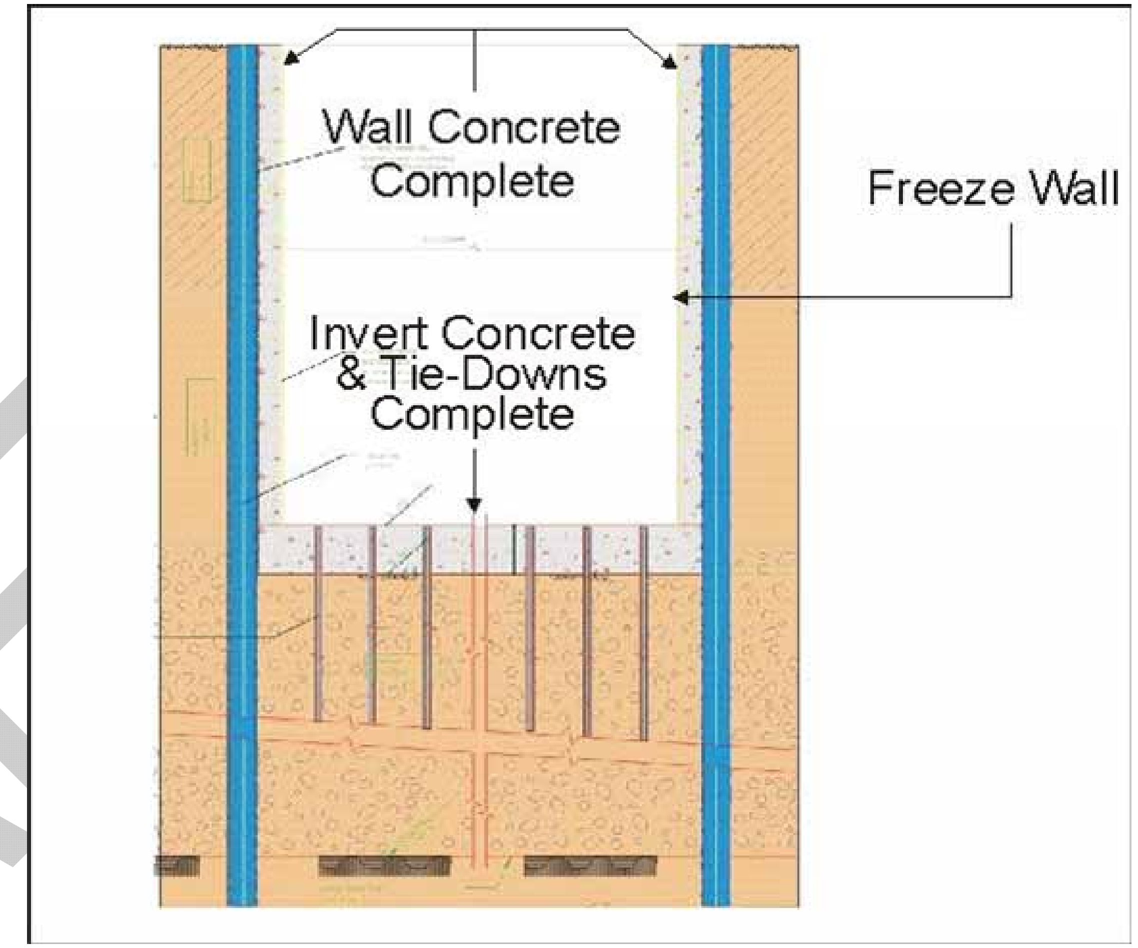


Figure 18. Freeze Shaft Construction Complete

5.4 Mechanized Tunneling Methods

This term applies to a broad range of tunnel construction methods that all use specialized equipment to advance and support a tunnel. For the purposes of this discussion, attention will be focused on those methods that employ a shielded Tunnel Boring Machine (TBM).

In general, a shielded TBM consists of a cylindrical steel shell that is pushed forward along the axis of the tunnel, while excavating the ground inside the shield. The steel shield supports the excavated ground as required until the preliminary or final tunnel lining is constructed. The shield is propelled using hydraulic jacks that thrust against the tunnel primary support system that is installed within and to the back of the tunnel shield. The shield is designed to withstand the pressure of the surrounding ground. When a tunnel shield is fitted with a rotating cutterhead, it is termed a Tunnel Boring Machine (TBM).

While the excavated ground is supported by the shield itself, additional measures to secure the tunnel face may be required, depending on the ground and groundwater conditions. A shield may be used in any of the configurations below:

- Natural Support – in ground that is inherently stable or ground that has been stabilized by ground modification. This is commonly referred to as "open-face" support.

- Mechanical Support – sometimes referred to as "partial-face" support.
- Compressed Air Support – sometimes referred to as pressurized tunneling.
- Slurry Support – also referred to as "pressure-face" support.
- Earth Pressure Balance Support – also referred to as "pressure-face" support.

Figure 19 shows sketches of each of these five measures for stabilizing the tunnel face. The anticipated ground conditions for the Deep Tunnel/Station alternative are variable and uncemented silts, sands, gravels, and cobbles with the presence of a high groundwater table:

- A TBM with an open face and natural support would not be appropriate, as the unsupported tunnel face would flow into the TBM in an uncontrolled manner.
- Mechanical support could be applicable if ground improvement measures, such as grouting either from the surface or from the tunnel face or dewatering were carried out in advance of the tunnel excavation.
- Compressed air support system is applicable only for shallow tunnels with limited hydrostatic head conditions. Compressed air is typically used for water heads of 30 feet or less. Therefore, this method would not be practical due to the high permeability and relatively high head conditions.

Slurry and earth pressure balance support are methods for stabilizing the tunnel face in subsurface conditions such as those anticipated along the San Jose tunnel alignment.

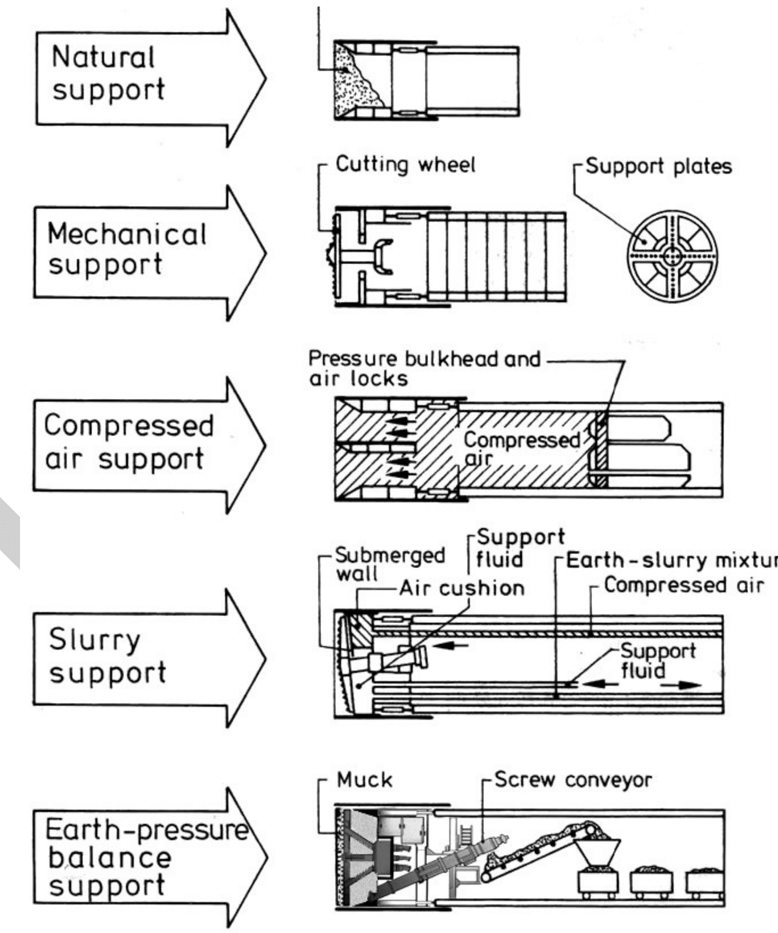


Figure 19. Shielded TBM Face Support Methods (Adapted from Bickel et al., 1996; After Maidl et el., 1996)

5.4.1 Earth Pressure Balance Tunnel Boring Machines

Earth Pressure Balance Tunnel Boring Machines (EPBMs) operate by maintaining positive pressure against the unexcavated ground through the use of a counterbalancing mass of excavated materials that are contained within the sealed cutterhead or plenum (see Figure 20). The excavated material is metered out of the cutterhead chamber using a sealed screw auger that then discharges the excavated materials onto a conveyor belt or into muck cars for transport out of the tunnel. The rate of material ingestion into the cutterhead, i.e., tunnel excavation, is carefully coordinated with the rate that material is removed from the cutterhead chamber via the screw auger so that the counterbalancing pressure against the face is maintained within required limits. EPBMs have the capacity to handle groundwater pressures up to a practical maximum of approximately 3 bars (100 feet of head) which is slightly below the upper limit of groundwater pressures anticipated for the depths contemplated on this project.

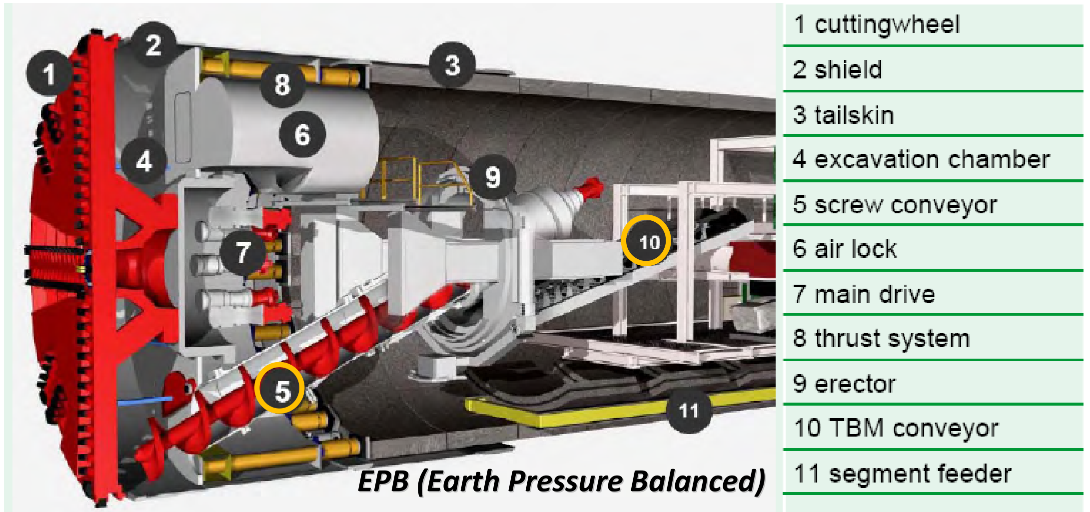


Figure 20. EPBM Schematic

5.4.2 Slurry Tunnel Boring Machines

Slurry TBMs operate on much the same principle, using bentonite pressure in lieu of earth pressure to apply a pressure to the tunnel face in the plenum, which counterbalances earth and hydrostatic pressures (see Figure 21). This is achieved via a sealing bentonite mud cake that naturally forms on the tunnel face as excavation proceeds. The excavated material is suspended by the slurry and extracted through closed pipes, using a pumped system. The muck and slurry are pumped to a processing plant, where solids are separated from the slurry. Separated muck is disposed off-site, while slurry is reconditioned and recirculated back to the tunnel face.

Slurry-shield TBMs can be used in a wide range of ground conditions. However, such systems require the use of a surface separation plant. The finer the spoil grading, the more complicated and expensive the separation plant becomes. Slurry TBMs have the capacity to handle double the groundwater pressures of an EPBM, up to a practical maximum of approximately 6 bars (180 feet of head), which is well within the limits expected.

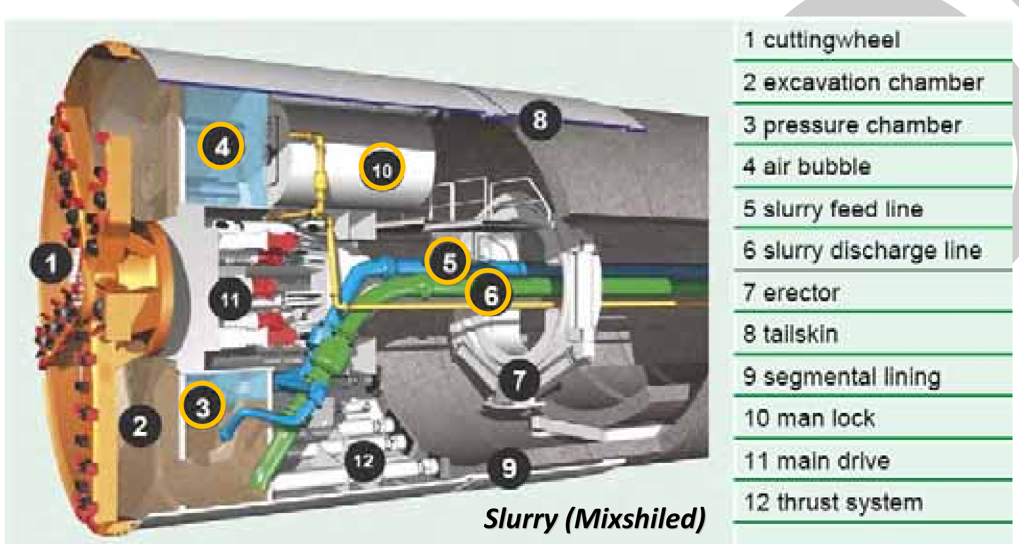


Figure 21. Slurry TBM Schematic

5.4.3 Project-Specific Limitations of Shielded TBMs

As discussed above, shielded rotary TBMs of the type suitable for use on this project are propelled using hydraulic jacks that thrust against the tunnel primary support system that is installed within and to the back of the tunnel shield. More importantly, they are generally only capable of constructing tunnels with a circular cross section (The exception to this is dual or tri-TBM technology discussed in Section 5.6.2). Figure 22 depicts a typical tunnel supported by a bolted and gasketed precast concrete segmental lining erected within the tail shield area of the TBM.

Since a significant amount of tunneling for this project will involve construction of non-circular openings, such as at locations where train tracks merge (i.e., switches and cross-overs), shielded TBMs cannot be used in these locations.

Another limitation concerns the amount of supplemental back-up equipment on the “trailing gear” which trails the shielded TBM in the tunnel during construction. The trailing gear is very long, on the order of hundreds of feet, because shielded TBMs require complicated and specialized support equipment. The trailing gear:

- Facilitates the installation of the primary segmental lining while also allowing passage of excavated material out of the tunnel by creating passing areas for rail transport.
- Houses transformers to step down the voltage supply to the machine, and supplemental tunnel ventilation and dust removal equipment.
- Accommodates other equipment needed to perform the backfilling of annular voids behind the segmental lining to prevent ground subsidence, storage areas for materials used, and work areas and other space for the tunnel crew who must minimize travel out of the tunnel to maintain efficiency.

Depending on the diameter of tunnel, the trailing gear length is typically around 400 feet long for a TBM sized to excavate a single running High-Speed Rail tunnel that is about 33 feet in diameter. For a TBM sized to excavate the station cavern, i.e., on the order of 50 feet in diameter, the trailing gear can easily be more than 1,000 feet long. These features of trailing gear are difficult to capture in photographs or illustrations.

Considering that the station platform length is on the order of 1,400 feet in length, the construction of the station using a TBM would be very inefficient and therefore expensive, not only because the short station length would make tunneling with only part of the trailing gear installed very expensive and inefficient, but also because the high capital cost of this specialized equipment must be absorbed by the project, since there is relatively low demand, even world-wide for 50-foot diameter TBMS that cost on the order of $40 million, and require between one and two years to fabricate.

Figure 22. Bolted and Gasketed Precast Segmental Lining

5.5 Sequential Excavation Method (SEM) / New Austrian Tunneling Method (NATM)

5.5.1 Basic Principles of SEM / NATM

The basic principle of Sequential Excavation Method (SEM)/New Austrian Tunneling Method (NATM) design is to allow limited ground deformations (or ground movements) as excavation proceeds in order to mobilize the strength of the rock mass with the initial support erected. As defined by the Austrian Society of Engineers and Architects (ASEA), SEM/NATM "constitutes a method where the surrounding rock or soil formation of a tunnel is integrated into an overall ring-like support structure. Thus, the surrounding ground will itself be part of this support structure." (ASEA, n.d.) In order to control ground deformations, it is crucial to support the ground in a timely manner. Typical support measures in SEM/NATM tunnels include: shotcrete, lattice girders, welded wire fabric (WWF), rock dowels, and pipe canopies.

Figure 23 illustrates some of the various types of support measures used in NATM/SEM construction.

The support elements are installed based on need by direct examination of the ground as it is being excavated. For a tunnel width of 40 to 70 feet, such as will be required on this project, Figure 23 could be considered an optimistic design, with typical dimensions after excavating up to, say 4 feet of tunnel (a 4-foot advance length), as follows:

- 2 inches of shotcrete, or sprayed concrete, applied to the working "face" where excavation is taking place plus 40-foot long fiberglass dowels drilled into the face on a regular pattern.
- 12 inches of shotcrete to the crown and sidewalls of the tunnel applied in up to three stages after installation of a lattice girder steel support around the tunnel perimeter. Fiber-reinforced shotcrete can be substituted for plain unreinforced shotcrete with a layer of welded wire fabric (which looks like chain link fencing) is not needed.
- 16-foot rock dowels drilled around the crown and sidewalls as shown, and grouted with a cement/water mixture.
- Installation of a concrete "mud mat" or temporary concrete slab to prevent the "invert", or travelled way from degrading into a mud pool with equipment traffic.
- Installation of one or more rows of "spiling", or 1 inch diameter rebar dowels up to 12 feet long spaced 4 inches on centers and grouted in place. The spiles are drilled at a low angle to the tunnel axis and around the tunnel perimeter to provide support while the next advance is excavated.

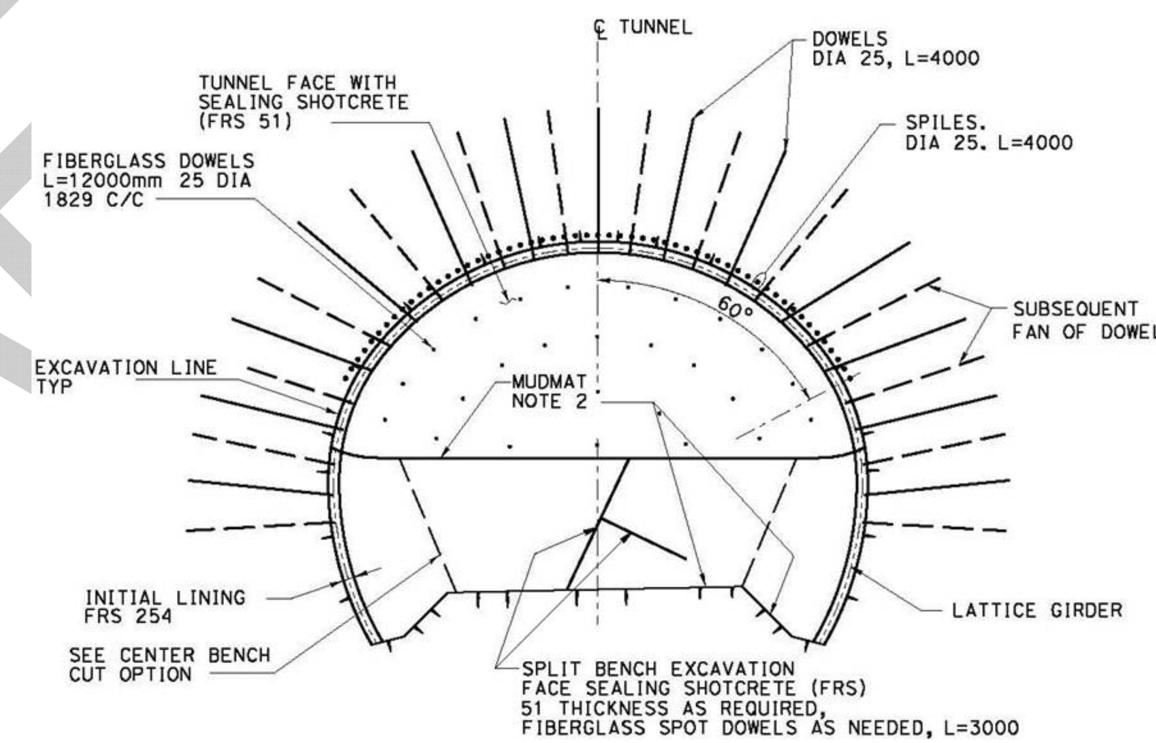


Figure 23. SEM / NATM Support Elements

The installation of all this support takes time, and the excavated tunnel dimensions must be balanced against the "standup time" of the ground, or the time that the ground will support itself without collapsing, and the time it takes to excavate the ground and then support it; all with due consideration of the size of equipment used to perform the work.

Therefore, SEM/NATM tunnels are usually excavated in a series of drifts or headings (see Figure 24) that are successively enlarged until the full tunnel cross section shown in Figure 23 is achieved. Again, the drift sizes and excavation sequence for SEM/NATM tunnels are based on anticipated ground behavior as well as typical construction equipment limitations and construction logistics. The rate of excavation or advance length is primarily controlled by anticipated stand-up time and the size of the drift. Usually a "flash" coat or thin layer of shotcrete is applied immediately after the drift is excavated. This prevents loosening of the ground mass and provides continuous support and surface protection to the opening. A pipe canopy installed ahead of the tunnel face is often used to help reduce “overbreak”, or unintentional additional excavation of the ground which must be backfilled. A pipe canopy also minimizes ground movements and surface settlement. This is especially useful in areas of low stand-up time and where the cover above the tunnel is limited.

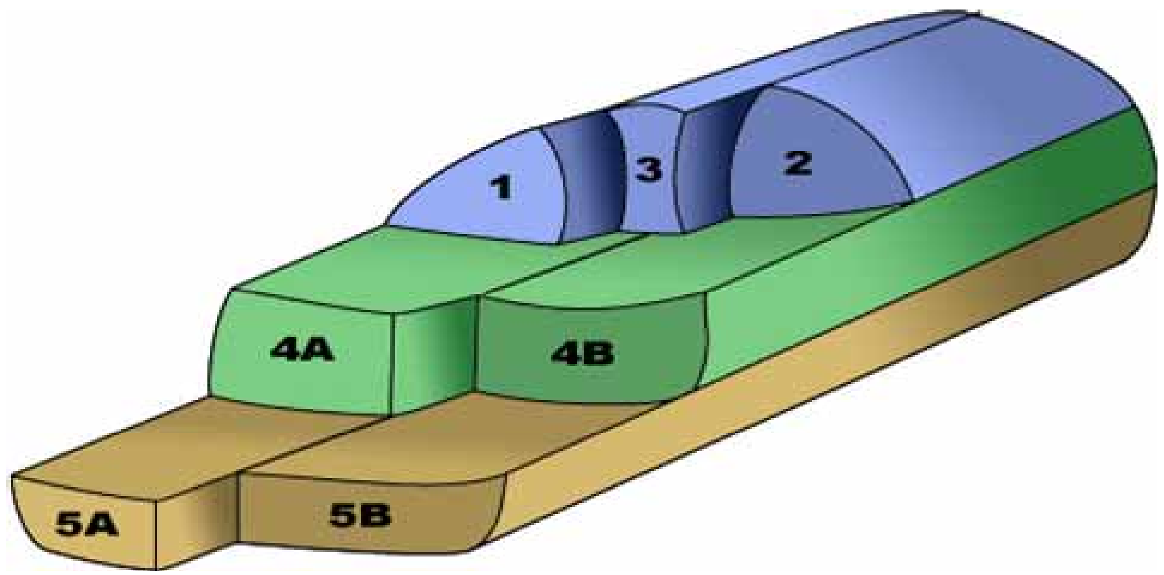


Figure 24. SEM / NATM Sequential Excavation of a Tunnel

Figure 25 illustrates the use of pipe canopies that are usually on the order of 50 feet long and which comprise 4-inch or 6-inch steel pipes grouted in place. Figure 25 also shows a sloping core of unexcavated ground that buttresses the working face. This kind of ground support is expected to be needed frequently in ground such as that anticipated for this project.

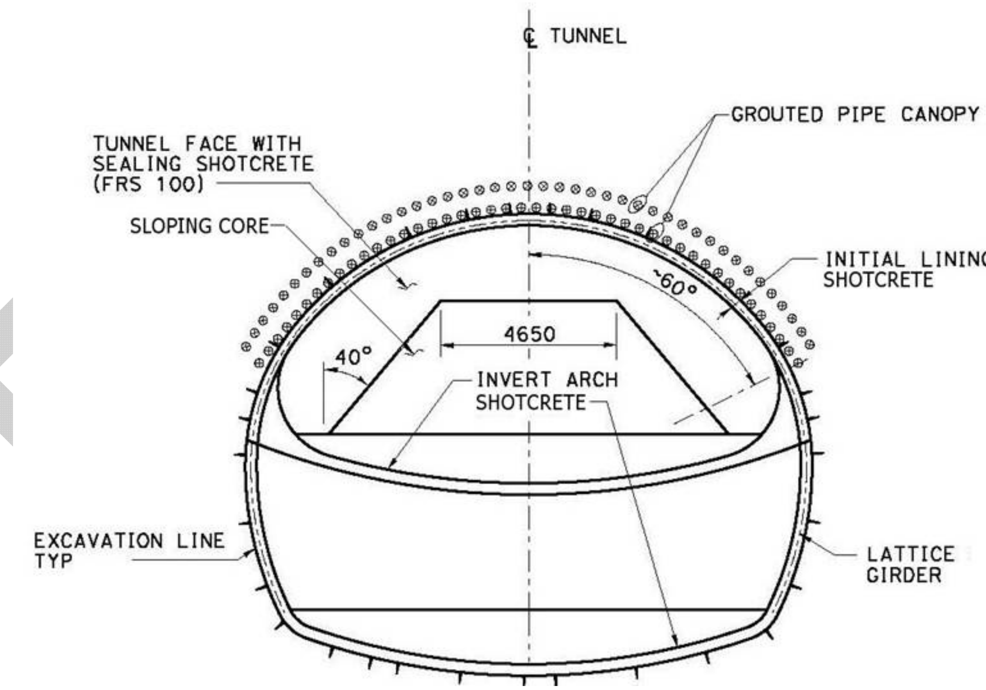


Figure 25. SEM / NATM Sequential Excavation of a Tunnel

In a SEM/NATM tunneling approach, ground conditions are characterized into reaches or ground classes. For these defined reaches, initial ground support systems are designed to accommodate the conditions in the reach. This approach provides a high degree of flexibility during construction and makes it possible to adapt it to virtually any ground condition. This is useful in tunnels which will be excavated in varying ground conditions, because unlike tunneling methods that are limited to uniform support provisions and therefore designed for the worst ground condition, SEM/NATM allows support measures to be modified as needed.

Because initial support measures can be changed as the tunnel is excavated, SEM/NATM requires extensive monitoring during construction. It is important that the rock or soil conditions, as well as deformations within and above the tunnel, are continuously monitored and interpreted. This is performed in order to verify the design assumptions, assess tunnel stability, and check that the tunnel excavation sequence and installed support elements are controlling ground movements as anticipated. This critical task is normally the responsibility of the design engineer to ensure compatibility between the support measures installed and actual ground conditions.

5.5.2 Ground Stability and Groundwater Control

SEM/NATM is a method for supporting the ground during construction, but by itself, it does not address the issues raised by the presence of a high groundwater table. Groundwater presents a number of fundamental issues:

It enters the tunnel and must be handled as a part of the tunnel excavation. If the hydrostatic head is high and the water source essentially unlimited, as is the case on this project, inflow rates will be sustained and high. This means that unless the flow of water is somehow cut off, water will enter the tunnel continuously during construction. This water must be handled and disposed of.

It causes ground instability. When an underground opening is made, the action of water flows into the excavated opening can wash out any binding agents in the soil, causing catastrophic inflows of soil and water.

The presence of groundwater increases loads on ground support systems. Support systems such as shotcrete linings require pressure relief holes to bleed off water buildup behind the lining, contributing to water that must be handled in the tunnel.

When excessive groundwater inflows are anticipated, other measures are needed. Some of these include:

- Dewatering from the ground surface. This would require wells located along the surface trace of the tunnel alignment. And, as discussed in Section 5.2, dewatering is not expected to be feasible for this project.
- Ground modification using cement or chemical grouts. This method decreases the permeability of the groundmass by filling the area between individual soil particles through which water travels with grout. The method involves drilling holes and grouting with a fluidized mix that is pumped under pressure to penetrate the ground and later harden. The mix itself is dependent on the type of soils anticipated and its ability to set or harden in the presence of flowing groundwater. Although there are many criteria to be considered when designing a ground modification scheme, as a rule, the holes for injecting grout are generally on some pattern that produces something like a five foot by five foot pattern at the tunnel horizon.
- Care must be exercised to avoid overpressuring the grout mix and creating a “frac-out”, or inadvertent grout return to the ground surface. This would be of specific concern in the Guadalupe Riverbed or Los Gatos Creek bed, and of lesser concern at other locations due to the unlikelihood of such an event considering the depth of the tunnels.
- Grouting can be performed from the surface or from within the tunnel. The advantage of performing the work from the surface is that the work does not delay tunnel construction by inserting another task into the cyclical process of excavating and supporting the ground. However, this also requires that ready access is available along the reaches where such effort is needed.

5.6 Other Underground Station Construction Methods

5.6.1 Pipe Roof Arch Method

One alternative method for mining stations underground that are possible besides the pressurized tunnel shield discussed in Section 5.3 or the SEM/NATM and ground modifications discussed in Section 5.4 is to create a temporary canopy above the station area using the “pipe roof” jacking method or the “cellular arch” method. Similar to the SEM/NATM, the pillar in between the two 30 ft diameter bored tunnels would be mined but under a protective canopy of a series of pipes jacked from shafts on either end of the station. The construction shafts would later be used for fire-life safety, ventilation, and access/egress. The pipe roof jacking method has been used in Berlin and Bochum, Germany to build the platform areas of mined subway stations.

Like, the SEM/NATM, the two twin bored tunnels would be advanced through the station area first, and so that the ground conditions would be well known in the immediate area. The pillar between the two tunnels is removed and structural reinforced concrete or steel columns would be installed to support the tunnel liner and the station roof. While ground treatment in advance of tunnel excavation with pipe forepoling and spiles or jet grouted spiles or freeze pipe spiles would likely be employed with the SEM/NATM, these methods would not be used extensively with the pipe roof or cellular arch method. Control of groundwater and ground stability would nevertheless still be an issue at the working face. The individual pipes may be interlocked to minimize groundwater inflow. A haunch or side drift may be employed support the pipe roof depending on the design and ground conditions. Figure 26 shows construction phases for a conceptual example of the pipe roof method. The advantages of the pipe roofing system in comparison to SEM/NATM are somewhat less skilled labor-intensive, more psychologically-positive ground control, and avoiding uncertainties sometimes associated with forepoling or spiling methods. The disadvantages are the depth and costs of deep jacking and receiving shafts, and the pipe jacking itself are separate tunneling operations for each pipe. The cost and time required to construct such a system rivals the cost and schedule for a deep SEM/NATM underground station.

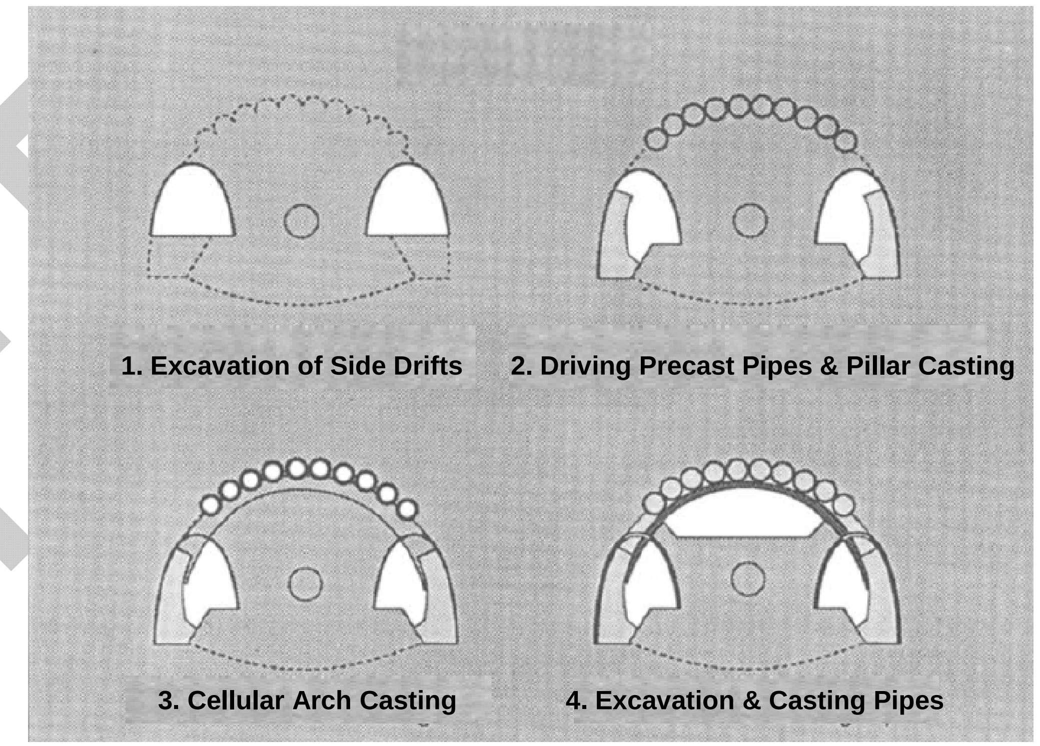


Figure 26. Construction Phases of the Pipe Roof Method (Lunardi, 1990)

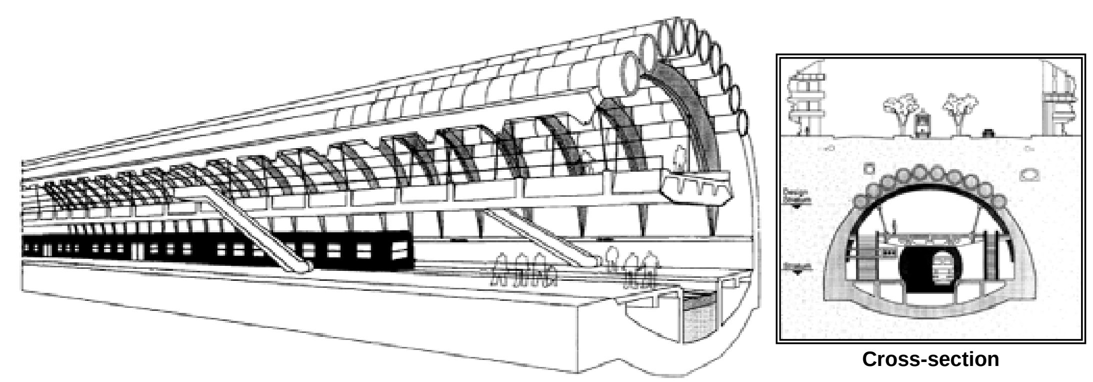


Figure 27. Longitudinal and Cross-sectional Views of Venezia Station (Lunardi, 1990)

5.6.2 Dual (Binocular) and Tri - Bore TBM

In Japan and China, special twin bore and even telescoping Tunnel Boring Machines have been employed. These are custom made TBMs specifically for tunneling the subway station and avoid the requirement for NATM/SEM excavations or the pipe roof jacking method. Figure 28 shows an example of the TBM and the finished station cross section. The advantages of this method is that it avoids hand mining, and specialized skilled labor while offering the security of working within a tunnel shield or fully erected initial support system. It also avoids dewatering issues, and uncertainties sometimes associated with forepoling or spiling methods, reduce wasted space, and provide more clearances for transportation tunnels. The disadvantages are the depth and costs of deep shafts to launch the machine, the high cost of the dual or tri-TBM, and the confidence in the skill sets to implement such a technology in the USA. The cost of such a system rivals the cost of a deep SEM/NATM underground station and pipe roof jacking. The current information indicates the cost for the dual bore TBM (binocular) tunnel is more or less the same of that for two single tubes, but the time required for completion was 50 percent to 60 percent of that for two single tubes. Thus, the overall cost will be less for binocular tunnel than for conventional single tube (Huang et al., 2006).

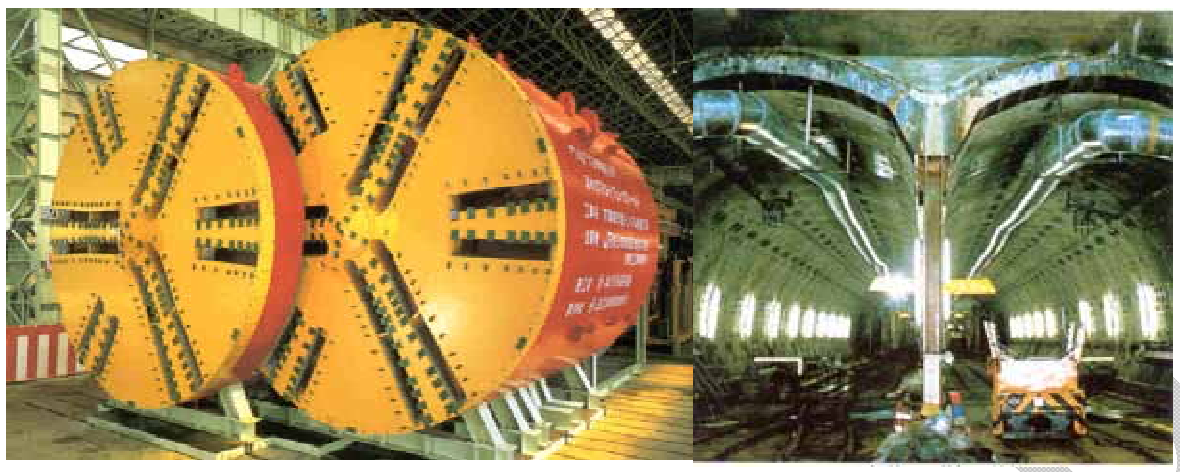


Figure 28. Dual TBM Configuration (Hitachi Shield Tunneling Machine, 1996)

5.6.3 Double Box Jacking

In Japan, very low clearance between existing buildings and subway stations has been accomplished by box jacking with essentially zero clearance between the other buried structure/foundation and the new structure. This would allow building a subway station directly under the BART/VTC station. Figure 29 shows and example of the configuration. The advantages of this method is easier shallower access to the HS rail station and to a BART/VTC station, and therefore, less costly for the station itself, security and safety compared to NATM/SEM, and avoids dewatering issues. The disadvantages is the connection from circular TBM section to a boxed section, the cost of controlled face rectangular shaped box section, the possible large shafts in plan required for jacking the box, and the pile interference at the I-280/SH 87 intersection (see Section 6.5) would require underpinning. Other disadvantages are the cost of such a layout not including the underpinning of freeway piles and it would not appear to be viable for the curved alignments. Moreover, deep alignments using box jacking would require jacking and receiving shafts, although they could be used for access and egress, and other fire life safety facilities.

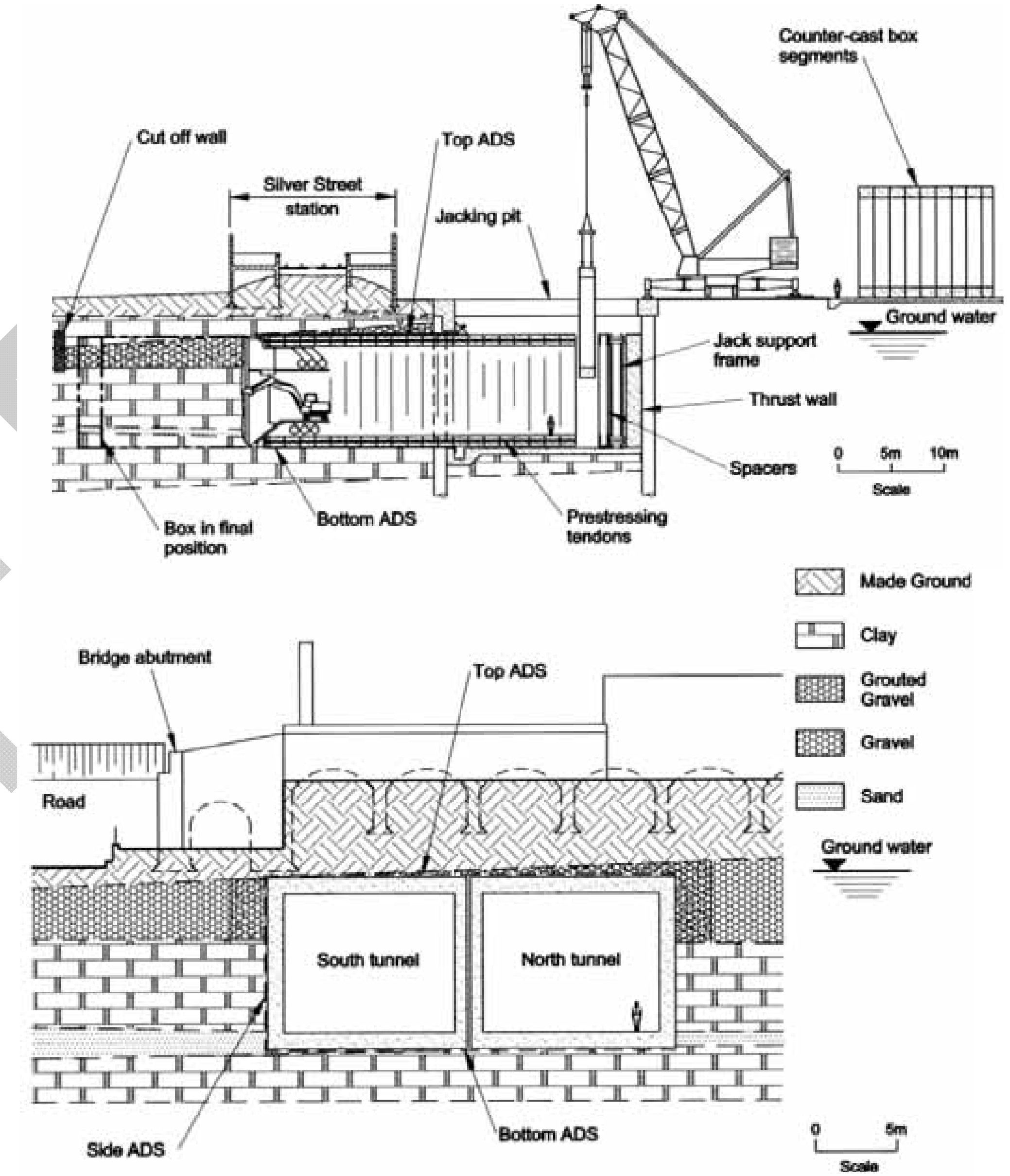


Figure 29. Jacked Box Construction – Silver Street Station in London (AllenBy, 2006)

5.6.4 Buried Station/Open Cut Construction of Deep or Shallow Station

It is possible to build the station by open cut and cover or cover and cut methods. Open cut and cover work would require long term temporary re-routing of traffic and re-location of businesses whereas cover and cut work would require plating of the road and "top-down" construction as shown in Figure 30. The deep excavation would be supported by concrete diaphragm walls to prevent seepage of water during construction. Dewatering may be required to temporarily prevent groundwater from entering the bottom of the excavation or the wall, if an impermeable layer cannot be found. Otherwise the wall would have to be deep enough to help extend the seepage path of groundwater entering the excavation, or the base would have to be treated or a tremie slab poured to prevent water from flowing in. During construction the walls would be tied back (if possible) internally braced and shored and plated to allow traffic flows to continue during construction of the underground station. The advantages of this method is it avoids safety and security issues related to NATM/SEM methods of construction, avoids linear DSC issues related to tunneling, and is generally less costly. The disadvantages are tremendous community and business impacts to the local area, the total costs including social and congestive pricing costs are higher than a mined or tunneled option, dewatering is an issue temporarily, the deep underground cover and cut alternative would be very costly in comparison to the shallow underground cover and cut alternative, and the shallow buried station has conflicts with piles at the I-280/SR 87 interchange (Refer to Section 6.5).

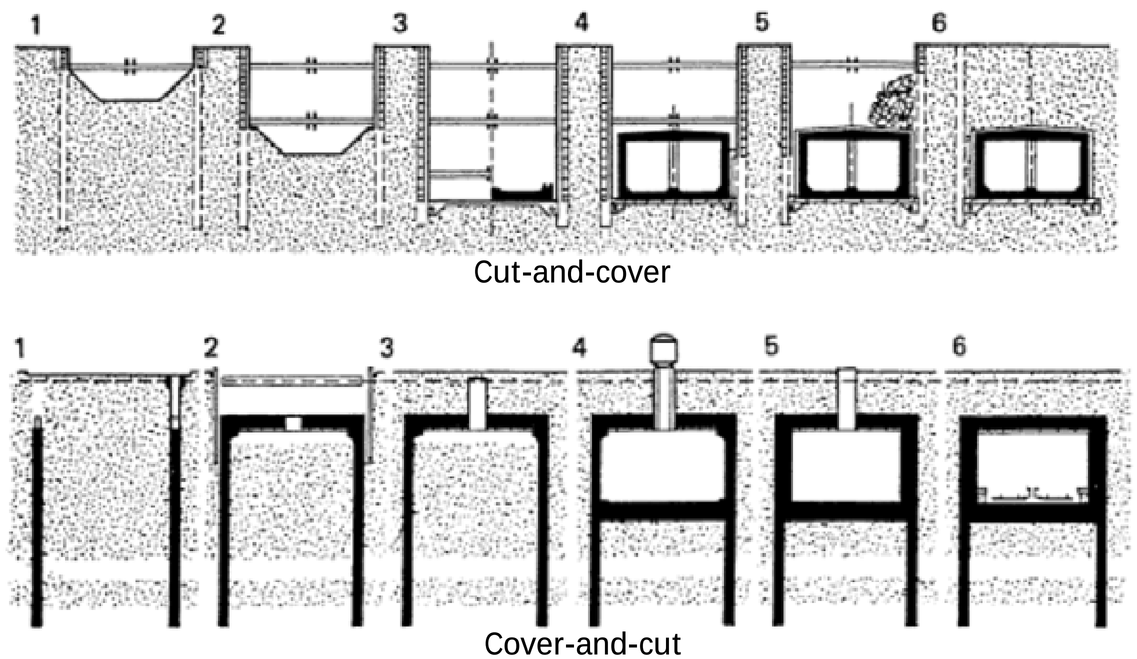


Figure 30. Comparison of Construction Stages (Vuchic, 2007)

6 INHERENT RISKS/PRACTICALITY ASSOCIATED WITH STATION/TUNNEL ALTERNATIVES

6.1 Construction Risks and Impacts

Tunneling and underground construction always carries a number of risks and uncertainties, mainly associated with the inherent variability of the geological and hydrological conditions and mechanical properties of soils in which construction takes place. The most common problems are associated with ground movements and settlements that may occur during construction of underground works as a result of elastic or inelastic relaxation of the ground when excavation relieves in situ pressures or as a result of groundwater lowering. Lowering the groundwater table can result in compaction or consolidation of surface soils. Removal of fines by seepage water or through dewatering wells can also cause settlements. Gross instability and collapse of tunnel face, shaft walls or bottom may cause surface depressions. Hence, ground movement control is a major issue for tunnels and excavations in soil in urban areas, especially if such works are performed below the groundwater table. Groundwater ranges from 4 to 18 feet below the ground surface (i.e., presence of a high groundwater table), construction must be water tight to prevent excessive groundwater inflows.

When damaging settlements are deemed possible during soft ground tunneling, mined underground station, cut and cover station or shaft excavations, the following provisions should be taken:

- Preconstruction surveys with photos and videos documenting existing conditions particularly on the existing Vasona Extension.
- Contract requirements to limit or eliminate effects that can cause settlements
- Monitoring of construction performance through measurements of ground motions, settlements, groundwater level, etc.
- Ground stabilization injected from the surface along the alignment, as needed prior to and during construction to reduce surface settlement and cave-ins at the station and tunnels (for “Deep Tunnel” option)
- Provisions to pay for damage, if any

In general, contractual provisions should be devised that will encourage the contractor to conduct his works with a minimum of ground motions.

In terms of constructability and the current state of the art, mechanized pressurized face tunneling methods employing an Earth Pressure Balance Tunnel Boring Machine (EPBM) or Slurry Tunnel Boring Machine similar to that envisioned for construction of VTA/BART tunnels, should be used to the greatest extent possible. Sequential Excavation Methods (SEM) can be used for construction of noncircular cross-section openings (i.e., turnouts and cross passages). Construction methods such as SEM where a positive balancing pressure cannot be continuously applied at the advancing tunnel face will require ground freezing or ground modification techniques such as permeation or jet grouting to control groundwater inflows and limit surface settlement.

Some of other major construction risks and impacts for “Deep Tunnel” and “Shallow Tunnel” options were also discussed in Table 2.

An evaluation of foreseeable potential risks and impacts associated with three different types of the proposed HSR San Jose Tunnel/Station alternatives (i.e., “Aerial option”, “Deep mined option” and “Shallow Station/Tunnel or Cut-and-Cover option”) is provided in Table 3. Seven evaluation criteria including 24 potential risk items are considered. It should be noted that weighting factors or values between each item have not been considered, and only relative degrees of impact of risks among three different options/alternatives for each item have been evaluated.

The evaluation result implies that the “Deep-Mined option” and “Shallow Cut-and-Cover option” carry more “high” risks and less “low” risks than “Aerial option”, in particular for the evaluation criteria of “cost and schedule”, “constructability” and “geotechnical constraints”. While “Shallow Cut-and-Cover option” has major impacts on future development and surface disruption, this option may have less constructability and few risk issues than the “deep mined option as shown in Table 3.

Table 3. Risk/Impact Evaluation Matrix for San Jose Tunnel/Station Alternatives

Evaluation Criteria		Aerial Option[1]			Deep Mined Option[2]			Shallow Cut & Cover Option[3]		
Cost and Schedule	Operating Costs	L					H		M	
	Capital Costs	L					H		M	
	Schedule	L					H		M	
Constructability	Constructability	L					H		M	
	Surface Disruption		M			M				H
	Disruption to Existing Railroads		M		L					H
	Damage to Surface/Near Surface Structure	L					H		M	
	Impact to Existing Foundations	L					H		M	
	Disruption to and Relocation of Utilities		M		L					H
Geotechnical Constraints	Ground Type	L					H		M	
	Settlement	L				M		L		
	Flooding/Inrush of Water to the Excavation	L					H		M	
	Groundwater	L					H		M	
Disruption to Communities	Residential/Business Impact		M		L					H
	Local Traffic Maintenance & Detour Routing		M		L					H
	City Division		M		L			L		
Environmental Impacts	Noise/ Vibration/ Dust			H	L					H
	Visual/Aesthetic Issues			H	L				M	
Environmental Resources	Biological Resources		M		L			L		
	Cultural/ Archaeological Resources	L				M	H		M	H
Others	Emergency Response	L					H		M	
	Staging	L			L			L		
	Future Development	L				M				H
	ROW		M			M			M	

Notes:
1. I-280/SR 87 Aerial Alternative & Refined Program Alignment
2. Deep Tunnel Option, 5100m Tunnel & Thread the Needle Tunnel
3. Shallow Tunnel Option

Risk/Impact Rating | L | M | H |

6.2 Construction Impacts to Local Aquifers

If an underground alignment option, as discussed in this report, is selected, the construction of the project will require tunneling and other underground works utilizing a variety of construction techniques. Potential impact of construction on groundwater quality must be considered in planning, design and construction documents. Pre-construction activities including preparation of an Environmental Impact Statement (EIS) and an Environmental Impact Report (EIR) shall adequately address these issues to ensure a full compliance with all federal, state and local laws, rules and regulations.

All construction activities that may impact local hydrology, surface and/or groundwater quality must be conducted in close coordination with local agencies and organizations which share jurisdiction and interest relative to water supply and water quality.

Based on investigations for the Silicon Valley Rapid Transit Project in San Jose, California, contained in the report (Tunnel Boring Machine Geotechnical Basis of Design, HMM/Bechtel, 2008d) and, as summarized in section 4.5 in this report, the lower regional aquifer is the main source for public drinking water supply wells in the Santa Clara Valley area. The top of this aquifer layer is estimated to be about 200 feet to 250 feet below ground surface and the thickness may be about 800 feet or more. The deepest portion of excavation for the proposed HSR tunnel and station alignment is approximately 140 feet below ground surface (for "Deep Tunnel" option).

Hence, the direct potential negative impact of the proposed construction on the main aquifer characteristics seems unlikely. However, dewatering of the groundwater resource affecting surficial and upper aquifer and possibly associated reduced or disturbed flow of surface water are potential negative impacts when constructing the proposed underground facilities. It is therefore of great importance that such potential negative impacts are realized in the early stages of planning and designing works and adequate investigations, evaluations and monitoring programs developed and performed to mitigate the potential problems. The main factors to be considered and the general methodology for establishing a procedure for identification of impacts is outlined below:

- Investigation and good understanding of the occurrence and quality of groundwater in the vicinity of the proposed project.
- Quantitative investigations and analysis of surficial groundwater conditions and aquifer(s) characteristics (recharge, storage capacities, seasonal fluctuations, water movement, precipitation, regional/site geology, soil/rock characteristics, permeability etc.
- Establishment of a "baseline" preconstruction groundwater regime and conditions, for determining seasonal and annual fluctuations unaffected by construction activities.
- Development and implementation of groundwater monitoring program during the construction activities. Such monitoring program should continue through a post-construction phase.
- Development of impact detection procedures.
- Identification and assessment of factors causing the negative impact and development of mitigation measures.

6.3 Seismic and Liquefaction Potential

As mentioned in section 4.4 the proposed project is located within the seismically active San Francisco Bay area and severe ground shaking during a major earthquake on one of the region's active faults is highly probable during the life span of the project. Potential seismic hazard associated with ground shaking would be mitigated by use of standard engineering techniques and practice for Seismic Zone 4, as mandated by the Uniform Building Code.

A potential for the ground rupture within the project area is considered unlikely, as there are not known active or potentially active faults crossing the proposed alignment.

Liquefaction is a condition where saturated loose granular soils near the ground surface undergo a rapid and substantial decrease of sheering resistance associated with an increase of pore pressure during intense ground shaking from seismic event. The effects of liquefaction to be considered for the tunnel and underground station design include: uplift, buoyancy and flotation, post-liquefaction settlements and lateral deformations (total/differential) and lateral sliding stability.

Review of Liquefaction Susceptibility Map (Knudsen et al. 2000) for the general San Jose area indicates that the project site is situated within the State of California Seismic Hazard Zone for liquefaction (susceptibility level high). Hence, a design-level site specific geotechnical sub-surface investigation shall be performed to allow for adequate analysis and evaluations of liquefaction hazard. Such analysis should identify and quantify liquefaction potential and describe engineering design approach and sound engineering practices to be used to eliminate or minimize the effects of liquefaction on the proposed structures.

6.4 Vibration Induced by Construction Activities and Subsurface Train Operations

Ground-borne vibration induced by a mechanized tunneling machine, and vibrations caused by high speed trains and the movement of the rolling stock can be an important environmental issue during tunnel construction in urban areas. Construction schedule and cost may also be affected by the extent of vibration impacts on adjacent structures and properties during construction and train operations.

It is required to identify number of potential impacted areas (residential and business parcels) that would be affected by construction activities and HST pass-by ground vibration.

However, it should be noted that vibration impacts induced by tunnel construction activities and subsurface train operations are generally much less problematic than the aerial alignment option since vibrations generated from deep underground could be attenuated through the ground (see Table 3),

6.5 Impacts on the Guadalupe River, Los Gatos Creek, and the SR87/ I-280 Interchange Foundations

The proposed "Deep Tunnel" alignments pass under the Guadalupe River, and directly under the SR 87/I-280 Interchange pile footings contributing to the challenges of tunneling in the area in terms of constructability and cost since four tunnel bores are required to be 140-feet deep (see Figure 2 and Figure 6). Four tunnel bores pass under SR 87/I-280 and the proposed BART station. Therefore, tunnels need to be constructed in approximately 140-feet deep in order to avoid surface settlement and potential settlement of structures caused by loose soil, non-cohesive fill and large buried obstructions below foundations and the proposed BART station. In addition, tunneling beneath SR 87/I-280 may require underpinning of the piles by installation of permanent support to span the future underground HSR tunnels depending on the final depth of the underground station.

Tunnel crown (top of the tunnel) needs to be located greater than 40 feet below the creek bed in order to avoid any adverse impact on surface waters and avoid a retaining wall that was constructed as part of the Guadalupe River Park and Flood Protection Project.

The proposed "Shallow Tunnel" alignments pass under the Los Gatos Creek, Guadalupe River, and under the SR 87/I-280 Interchange pile footings. This option requires maintaining the Los Gatos Creek flows during construction and needs to perform permeation grouting for stabilization purposes in areas of low tunnel cover at the SR 87 undercrossing.

6.6 Implications of a Deep BART Tunnel/Station Underneath HST

A shallow HST tunnel alignment would require BART to construct its station and tunnels below the HST shallow tunnel/station at Diridon Station as discussed in Section 3.2. It is anticipated that a deep BART tunnel and station would face the same construction impacts and challenges identified for the deep HST station and tunnels, which include:

- Excavation of station and tunnels in an area with poor soil and a high water table
- Soil stabilization and ground improvements/ Ground movement and settlement
- Extensive right-of-way / Limited future development
- Vibration
- Large vertical grade difference Diridon Station and BART West Portal, and between proposed Downtown Station (1st & Santa Clara) and Diridon Station

It is also anticipated that a deep BART tunnel and station would likely have higher construction costs and longer construction schedules. The effects of "Deep Tunnel" and "Shallow Tunnel" options on BART tunnel and station in terms of construction methods, station configurations, and cost are compared in Table 4.

Table 4. Comparison of BART Tunnel/Station for "Deep Tunnel" and "Shallow Tunnel"

	BART Tunnel/Station for "Deep Tunnel" option	**BART Tunnel/Station for "Shallow Tunnel" option***
Construction Methods – Station	Cut and cover –requiring acquisition and access to entire surface area above tunnel	Conventional segmental mining (SEM) requires ground improvements from the surface
Construction Methods – Tunnel	Earth Pressure Balance tunnel boring machine (EPBM) or Slurry tunnel boring machine; SEM for cross passages	Earth Pressure Balance tunnel boring machine (EPBM) or Slurry tunnel boring machine; SEM for cross passages
Size & Depth of Station	Approximately 50 ft wide by 900 ft long and 60 ft deep	Approximately 50 ft wide by 900 ft long and 140 ft deep
Approximate Cost	Multiple stations and tunnels $3.1 billion	Multiple stations and tunnels $3.2 billion (includes the additional proportional cost of $140~200M for constructing a deep BART station underneath HST)

*Subject to validation by VTA and BART

7 HST UNDERGROUND TUNNELS/STATIONS IN OTHER COUNTRIES

There are several underground High Speed Train stations which have been constructed in other parts of the world.

A summary of information from the case histories including two in Europe and three in Taiwan are presented in Table 5. The main features of each station such as capacity, dimension, intermodality, geologic/geotechnical conditions, construction methodologies are compared in this table.

Some of these stations were built in somewhat similar geology as that found in the San Jose area, however all HST underground stations identified were constructed at much shallower depths (i.e., less than 70 ft). Note that the construction time required to build an HST underground station ranges from 7 years to 16 years.

Descriptions and images of each HST underground station including one planned in Italy are provided in more detail in Appendix A.

Table 5. Features of Subsurface Underground High Speed Rail Stations

Name	**Antwerp Central Station**	**Berlin Central Station**	**Banciao Station**	**Taoyuan Station**	**Taipei Station**
Location	Antwerp, Belgium	Berlin, Germany	Banciao City, Taiwan	Chungli City, Taoyuan County, Taiwan	Zhongzheng District, Taipei, Taiwan
Passengers	5,500,000/year	220,000/day	120,000/day (in year 2021)	Appx. 100,000/day	1,000,000/day
Available modes	International train, interurban train, urban train, urban bus, regional bus, tramway, subway, taxi, private car, bicycle, pedestrian	International train, InterCityExpress, InterCity, RegionalExpress and S-Bahn trains, subway, taxi, private car	TRA system, the Taiwan High Speed Rail system, the Taipei Metropolitan Rapid Transit (MRT) system, buses	TRA system, Taiwan High Speed Rail system, Taipei Metropolitan Rapid Transit (MRT) system, buses, taxi, passenger drop-off areas, park-and-ride	TRA system, the Taiwan High Speed Rail system, the Taipei Metropolitan Rapid Transit (MRT) system, Intercity Bus, City Bus
Construction Duration (Station Only)	1993 ~ 2009 (16 years)	1995 ~ 2006 (11 years)	1995 ~ 2007 (12 years)	2001 ~ 2008 (8 years)	2005 ~ 2012 (7 years)
Developed area**	5 hectares	10 hectares (German railways); 6.5 hectares (commercial use)	48 hectares	34 hectares (total floor area)	Size Main Station area: 47 hectares Size towers (floor size) C1: 21 hectares / D1: 31 hectares
Regional trains	75,000/year	314 trains/day	N/A*	N/A*	N/A*
Long-distance trains	100,000/year	164 trains/day	N/A*	N/A*	N/A*
Rapid transit railway	N/A*	620 trains/day	N/A*	N/A*	N/A*
Number of tracks	14 tracks	16 tracks	N/A*	N/A*	N/A*
Station dimensions	Junction line length: 3.8km Tunnel length: 2.5km Station project length: 710m Station depth: 18m below ground	Length of station concourse N-S: 160m Length of station concourse E-W: 321m Height of beam buildings: 46m Station depth: 15m below ground	N/A*	N/A*	N/A*
Number of parking spaces	1,040	900	1,100 vehicles and 234 motorcycles	1,088 vehicles and motorcycles 140 m of drop-off & pick-up space 343 m of taxi pick-up space 9 bus bay terminals / 6 bus bays	N/A*
Geology	Tertiary Miocene Sands: fine, dense-slightly silty-sands with inclusions of shells, of clay, and presence of glauconite Quaternary alluvial and relatively recent backfilled grounds water table: 3 to 5 m below street level, locally lowered down to 20 m	Sandy, medium to coarse the Quaternary fluvial gravels to fine sandy, Tertiary clayey silts Groundwater pressure: up to 18 m	Geological conditions varying between soil, gravel and sedimentary rock, or combination of these conditions	Geological conditions varying between soil, gravel and sedimentary rock, or combination of these conditions	Sungshan Formation underlain by the Chingmei Gravels (Quaternary deposits) Sungshan Formation: silty clay, silty sand Chingmei Gravel: gravels with various sizes
Tunneling & construction methods	Bored Tunnel Section (Slurry Shield machine): 1,225 m long and OD of 8 m 3 shafts and 2 cross-passages Pipe-jacked roof Sheeted trenches	Four tunnel tubes by TBM Mix of cut and cover and sunken pre-fabricated tubes Wall Sole Building Method	Sequential excavation method (SEM) or cut & cover	Sequential excavation method (SEM) or cut & cover	Sequential excavation method (SEM) or cut & cover

*N/A: no information available

** Except for Taoyuan station, no information is available whether they are base floor area only or total floor area.

8 CONCLUSIONS

Four tunnel alignment alternatives proposed for the California High-Speed Train (HST) in downtown San Jose including “Deep Tunnel”, “Shallow Tunnel”, “5100 Meter Tunnel”, and “Thread the Needle Tunnel” have been evaluated in this report in terms of the constructability and practicality of each alternative.

The feasibility and practicality of building deep tunnels and an underground high speed train station were evaluated as follows:

1. The proposed location(s) of the HST underground station under the existing Diridon station include fatal cost flaws. To construct the underground station below the Diridon station and yard would impose critical operational constraints on the operating railroads particularly during deep soil stabilization performed from the surface during the mining of the underground station.
2. The ground conditions make the construction of the tunnels, and particularly the underground station extremely difficult and costly resulting in a prolonged construction schedule.
3. Construction of an underground, deep HST station by SEM methods in the geology found in San Jose will be new technology in the United States. Included in Appendix A is a list and description of other underground High Speed Train stations in other parts of the world. In general, practical implementation of construction technologies and innovations used overseas are more risky for- and less applicable to- the US contracting market place.
4. Deep tunneling and underground station construction always involve a high degree of risks and uncertainties associated with inherent variability of the geological and hydrological conditions, construction methodologies, constructability, community/environmental impacts, cost and schedule. An evaluation of foreseeable potential risks and impacts associated with deep mined tunnel/station option was compared to aerial alignment option and shallow cut and cover station option. Based on risk/impact evaluation results, deep mined tunnel/station option carries significantly more potentially high risks than the aerial alignment option particularly with regard to the evaluation categories of cost and schedule, constructability and geotechnical constraints. The depth of the facility, cost, surface disturbance, and the soil conditions render deep cut and cover option impractical.

The feasibility and practicality of building a shallow tunnels and a cut-and-cover station were evaluated as follows:

1. A shallow cut-and-cover station will be built above the BART station, which is one of the major differences compared to deep mined option.
2. Extensive site preparation and disruption to existing railroad and utilities would be expected, and extensive right-of-way for construction and staging will be required.
3. The “Shallow Tunnel” option requires underpinning the LRT train box in service during construction where it crosses the station cut and cover box.
4. Since this alignment crosses under the Lost Gatos Creek, and SR 87, construction of “Shallow Tunnel” option requires maintaining the Los Gatos Creek flows during construction, and performing permeation grouting for stabilization purposes in areas of low tunnel cover at the SR 87 undercrossing.
5. The “Shallow Tunnel” alternative has major surface impacts to residential and commercial properties, and has greater impacts on future development while the “Shallow Tunnel” option may have less constructability and few risk issues than the “Deep Tunnel” option.

Two of the four tunnel alignments under consideration are under the active tracks of Caltrain commuter services. The “Deep Tunnel” alternative is somewhat east of Diridon Station and well clear of active tracks. This becomes an important distinction in the evaluation of risks and practicality for these four alternatives. However, it should be noted that while it may be possible to design and construct a station and the four track tunnels needed for the “Deep Tunnel” alignment, the potential of soil failures during construction, as well as unknown site conditions that might cause significant delays in the construction schedule while driving up construction costs make the “Deep Tunnel” impractical. The “Shallow Tunnel” alternative has major surface impacts to residential, VTA LRT, Los Gatos Creek, and commercial properties, and has greater impacts on future development making the “Shallow Tunnel” impractical. The high potential of track settlement from the tunneling operation for the “5100 Meter Tunnel” and the “Thread the Needle Tunnel” puts the train riding public at risk, which is of grave concern for these alignments.

Even if all elements of construction went as planned, it may well take a decade to construct the station and the four tunnel approaches. This alone would be well outside the schedule approved by the State when funding the project.

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Appendix D

Alternative Alignment Development Quantm Report

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Alternative Alignment Development

Quantm Report

California High Speed Train Project (CHSTP) San Jose to Merced Section Pacheco Pass Rail Corridor

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Table of Contents

ACRONYMS

LIST OF ACRONYMS

AA	Alternative Alignment
CHSTP	California High Speed Train Project
DTM	Digital Terrain Model
PMT	Project Management Team

1. INTRODUCTION AND PROCESS

Background Summary

As part of the program environmental process for a statewide high-speed train (HST) system, the California High Speed Rail Authority conducted a screening evaluation of alignment options allowing it to focus the technical studies being prepared for the statewide system at that time. The alignment alternatives considered in this statewide screening process were largely constrained by land use related issues and/or associated environmental constraints. However, there were two areas of the statewide system where the alignment options and associated costs were more constrained by physical features and associated environmental constraints. These areas are: the northern mountain crossing (Diablo Mountain Range) between the Central Valley and the San Francisco Bay Area, and the southern mountain crossing (Tehachapi Mountain Range) between Los Angeles and Bakersfield.

At the outset of the statewide screening, the Authority used the standard and "best practices" for conceptual engineering corridor evaluation analyses. In early 2000, the Authority became aware of a new automated alignment optimizations system developed and applied in Australia called "Quantm©". Due to the potential for a wide range of impacts within the mountain passes, the Authority embarked upon an alignment optimization and refinement effort to further clarify the screening decisions using the Quantm© system.

Currently, an Alternatives Analysis (AA) is being prepared for the project level environmental review in the San Jose to Merced Section of the statewide system. This Section included the Diablo Mountain Range specifically through the Pacheco Pass – a portion of the San Jose to Merced Section. The Quantm tool has again been applied to aid in the AA review of alternative alignments for the project-level environmental review of the San Jose to Merced Section.

Quantm System

The Quantm© system is a unique route optimization technology supported by a team that incorporates road and rail engineers, Geographic Information Systems (GIS) technicians, mathematicians, transport researchers and system developers. The Quantm© system is an automated route selection and optimization tool that carries out automated alignment searches and corridor screening using client or user specified geometry, constraints and cost parameters. Quantm© analyzes a linear route based on classic mathematical optimization techniques in three dimensions to establish, analyze, and compare a large number (thousands) of alternative three-dimensional (3D) lines through the designated background mapping space. This helps to define planning-level alignments that represent a starting point for alignment selection discussion. In effect, it optimizes and balances earthwork (cuts and fills) based on the constraints to yield a cost effective alignment.

During the San Jose to Merced Alternatives Analysis for Pacheco Pass, the Quantm© system returned the fifty (50) least costly possibilities of each alignment variation per run, driven by technical, community, environmental, and geologic constraints. Of each run, the minimum relative cost solution was generated by this process. Note: the minimum relative cost referred to in this technical memorandum is not a detailed estimate of the cost of construction; rather, it is merely a metric to gage the magnitude of construction cost.

Introduction and Objective

As part of the AA for the San Jose to Merced Section, the Authority has been identifying and evaluating HST alignment alternatives from locations near Gilroy, CA to the central valley location in Merced County near the intersection of Santa Nella Road and Henry Miller Road, a distance between forty (40) to fifty (50) miles. The general route contains varied topography including urban areas, agricultural areas, mountainous terrain, reservoirs, and grasslands.

Quantm© has been used to assist in the engineering analysis of feasible and constructible HST routes. The ultimate goal of this work has been to identify possible routes that meet the CA HST pre-established criteria, avoid environmentally sensitive areas, and provide a comparative analysis of alternative alignments to support the planning and route selection process. Quantm© has allowed the Authority to zero in on a small group of alignments that could be modified by alignment engineers to develop an acceptable route(s) through the Diablo Mountains at Pacheco Pass.

2. EXPLANATION OF PROCESS AND GENERAL RATIONALE

Route Optimization

Members of the PARSONS and HDR team collaborated to systematically use Quantm© to create fifty-six (56) alignments consisting of two terminal points located on the west/south end of the corridor. One set of solutions had the alignment beginning point near Gilroy, CA, and the other began near Leavesley Lane on the east side of US 101 near Gilroy, CA. (Note: some alignments were discarded purely for duplication reasons. See the Appendix for a complete list of alignment runs with parameters). Each computational strategy used the same constraints and then each Quantm© run was performed with every combination of the Desirable, Minimum, and Exception geometric criteria as delineated in HST Technical Memorandum, Alignment Design Standards for High Speed Train Operation, TM 2.1.2., March 26, 2009. The operating speed used to set the curve geometry for each alignment was 220 MPH.

Of the alignments computed, many were discarded due primarily to bridge heights in excess of 500 feet, some even as high as 900 feet. Bridge heights in excess of 300 feet were deemed as having a fatal flaw. Some alignments were discarded because of tunnels longer than six miles. Future engineering efforts will include reducing elevations at high bridge locations in an effort to facilitate seismic design and limit structure heights to 200'. Other alignments generated were eliminated from consideration because they encroached onto environmentally or culturally sensitive areas such as Henry Coe State Park or the San Joaquin Valley National Cemetery.

Quantm© returned some alignments that exhibited reduced impacts to environmentally sensitive areas. These alignments are located primarily in the HWY 152 transportation corridor having varying options of traversing around the Frazier Lake Airpark, crossing Calaveras Fault at grade, and avoid the San Joaquin Valley National Cemetery. None of the original Quantm© runs except run #47 had bridges low enough to be considered practical to construct and to engineer further in the 15% Preliminary Engineering Design Phase. One alignment offered a horizontal alignment that the team considered to meet all of the engineering criteria once grade adjustments were applied. This alignment was similar in many ways to the original program alignment, although changed due to new geometric constraints, and thus was named the Refined Program Alignment (run #45).

The Authority noted in its Notice of Intent and Notice of Preparation for the Environmental documents the desire to evaluate alignment refinements that would place the HST system closer to SR 152, thus potentially reducing impacts by providing closer access to construction sites from the state highway.

This “Close to 152”alignment option, would diverge from the Refined Program Alignment near the reservoir and follow close to US 152 across the Cottonwood Bay. This option would tie back into the Refined Program Alignment just east of the San Joaquin National Cemetery.

The alignment description of the Refined Program Alignment along with the individual Quantm© drawing output is included herein in the section titled ‘AA Corridor Alignments’.

ALIGNMENT CONSTRAINTS, DATA, AND REPRESENTATIVE CORRIDOR ALIGNMENTS

Alignment Constraints

The basis of this effort was defined by guiding parameters (bounding constraints) stemming from a requirement to optimize safety. In this vein, the primary constraint and objective for all alignments was that each alignment developed cross the Calaveras Fault either at-grade or on a low elevated structure. No alignments were allowed to cross the fault below ground. Furthermore, the Quantm© effort minimized impacts to known areas of environmental, cultural, and recreational concern. A general list of constraints is given below as Table 1.

Table 1

Feature	Constraints
Highways	Width 32.81ft,Bridge Crossing <-28.50 or >21.50
Lakes	High Priority Avoid Zone
Ponds	Low Priority Avoid Zone
Freshwater Emergent Wetland	Low Priority Avoid Zone
Freshwater Forested/Shrub Wetland	Low Priority Avoid Zone
Freshwater Pond	Low Priority Avoid Zone
Streams	72" Culvert
FEMA-Inundated by 100 year flood	Low Priority Avoid Zone
Global X-ing	<500 to surface
Earthwork Limit	Max Fill=100, Max Cut=200, Max Tunnel=31680
Faults	Cross At-grade
Reservoir	Water Zone to be bridged
Volta Wildlife Area	High Priority Avoid Zone
San Martin East of 101	High Priority Avoid Zone
San Luis Reservoir and Forebay	High Priority Avoid Zone
San Joaquin Valley National Cemetery	High Priority Avoid Zone
Pacheco State Park	High Priority Avoid Zone
Casa De Fruta	High Priority Avoid Zone
Henry Coe State Park	High Priority Avoid Zone
Frazier Lake Airpark	High Priority Avoid Zone
East Gilroy	High Priority Avoid Zone

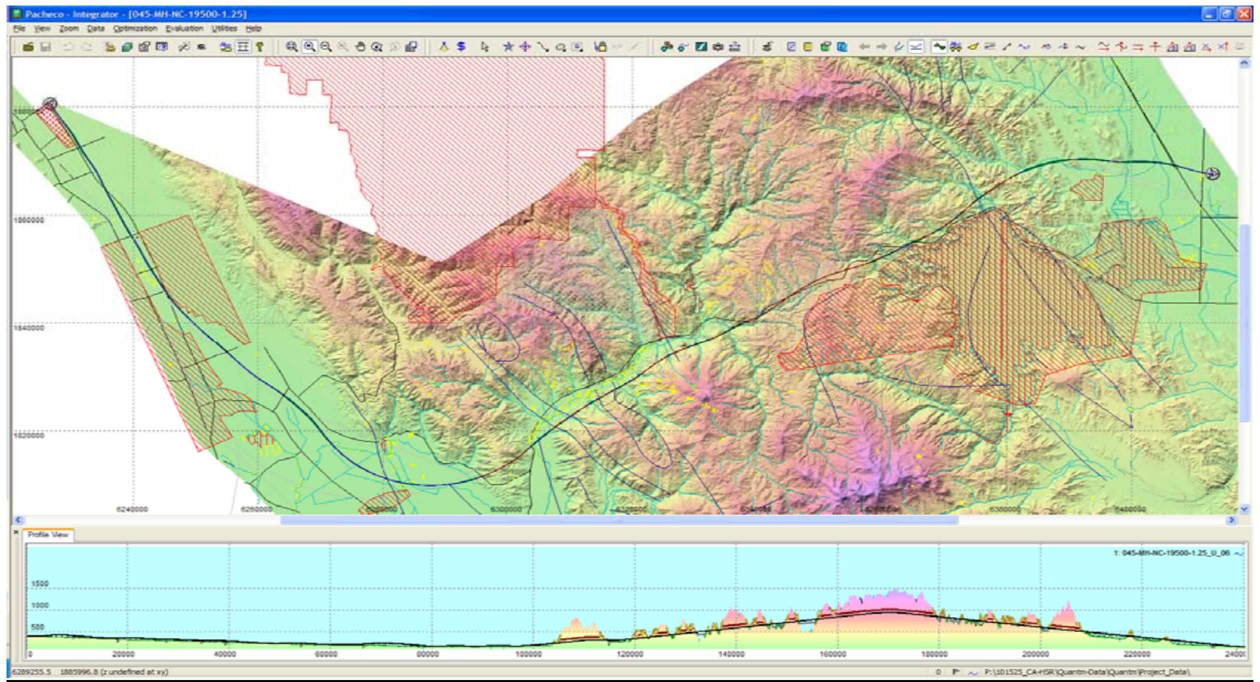
AA Corridor alignments

<u>**PACHECO PASS ALIGNMENT 45 (REFINED PROGRAM ALIGNMENT)**</u> **Basis for Analysis**

Length: 39.57 miles

The Refined Program Alignment (Alignment 45) closely resembles the programmatic EIR alignment and is aligned north of the San Joaquin Valley National Cemetery as well as featuring smaller radius horizontal curvature. The alignment begins in Gilroy and proceeds easterly where it ends approximately 2000’east of Santa Nella Road and approximately 1.6 mi. north of W. Henry Miller Ave. The primary features, advantages, and disadvantages, and other issues, related to the characteristics of this alignment are as follows:

Figure 3 – Refined Program Alignment – Rmin = 19,500', Gmax= 1.25%



Alignment Advantages/Disadvantages:

- Alignment is fairly direct, proceeding approximately 1250' north of the Frazier Lake Airpark, approximately following the programmatic alignment in the vicinity of state Hwy 152, thus precluding the need for a new transportation corridor.
- Proximity to HWY 152 provides ease of maintenance road access.
- Alignment features a speed of 220 MPH, with minimum curve radii of 19,500 feet.
- Alignment features 'desirable' grades of 1.25%.
- Avoids or minimizes to the extent possible the constraint areas entered into Quantm©, such as urban areas of San Martin and Gilroy East of Hwy 101, Henry W. Coe State Park, and the San Luis Reservoir State Recreational Area (minor impact on the north end).
- The alignment is located approximately 3100' north of the San Joaquin Valley National Cemetery with no impact to the O'Neill Forebay.
- Alignment features bridge heights are in the range of 100 to 200 feet high with an approximate maximum height of 400 feet high. Adjustments to the alignment profile will reduce the bridge heights to 200 ft. of less.
- Alignment requires 23 bridges with a total bridge length of 13,500 L.F. and longest bridge length approximately 3600 L.F.
- Requires 7 tunnels with a total tunnel length of 46,500 L.F. and longest tunnel length approximately 4.33 mi.
- This alignment meets all the CA HSRA engineering alignment design criteria.

PACHECO PASS ALIGNMENT 45A (CLOSE PROXIMITY TO 152) **Basis for Analysis**

Length: 39.36 miles

Alignment 45A (Close Proximity to 152) closely resembles the Refined Program Alignment (Run # 45) with the exception that it proceeds adjacent to 152 near the San Luis Reservoir to avoid the Cottonwood Creek Wildlife Area. The alignment is the same as the Refined Program Alignment, except at the north east end where the alignment parallels HWY 152 bridge crossing of the San Luis Reservoir. The primary features, advantages, and disadvantages, and other issues, related to the characteristics of this alignment are as follows:

Alignment Advantages/Disadvantages:

- Alignment proceeds north of the Frazier Lake Airpark, and then approximately follows the programmatic alignment in the vicinity of state Hwy 152, thus precluding the need for a new transportation corridor.
- Proximity to HWY 152 provides ease of maintenance road access.
- Alignment features 'desirable' grades of 1.25%.
- Avoids the constraints entered into Quantm©, such as urban areas of San Martin E. of Hwy 101 (very minor impact), Frazier Lake Airpark, Henry W. Coe State Park, and San Luis Reservoir State Recreational Area (very minor impact on the north end).
- Requires 7 tunnels with a total tunnel length of 42,650 L.F. and longest tunnel length approximately 4.33 mi. The overall tunnel length is over 3800 feet shorter than the refined program alignment.
- Alignment features a speed of 220 MPH, with a minimum curve radius of 19,500 feet.
- This alignment meets all the CA HSRA engineering alignment design criteria.

Data Sources

Mapping Data: The Quantm© runs were based on a single digital terrain model (DTM) provided by Intermap, which provided a contoured base for the project with a three foot vertical accuracy.

Additional planimetric features were obtained in the form of GIS shape files, and many of these were also used to define the assorted constraints for the Quantm© system to compute each alignment. (GIS source information available on request).

Quantm© Background and General information extracted from report titled "Alignment Refinement/Optimization and Evaluation of the Quantm© System" dated April 30, 2002. Report was prepared by Parsons Brinckerhoff in association with P&D Environmental, Parsons Transportation Group and Quantm Limited.

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Appendix E

Environmental Maps

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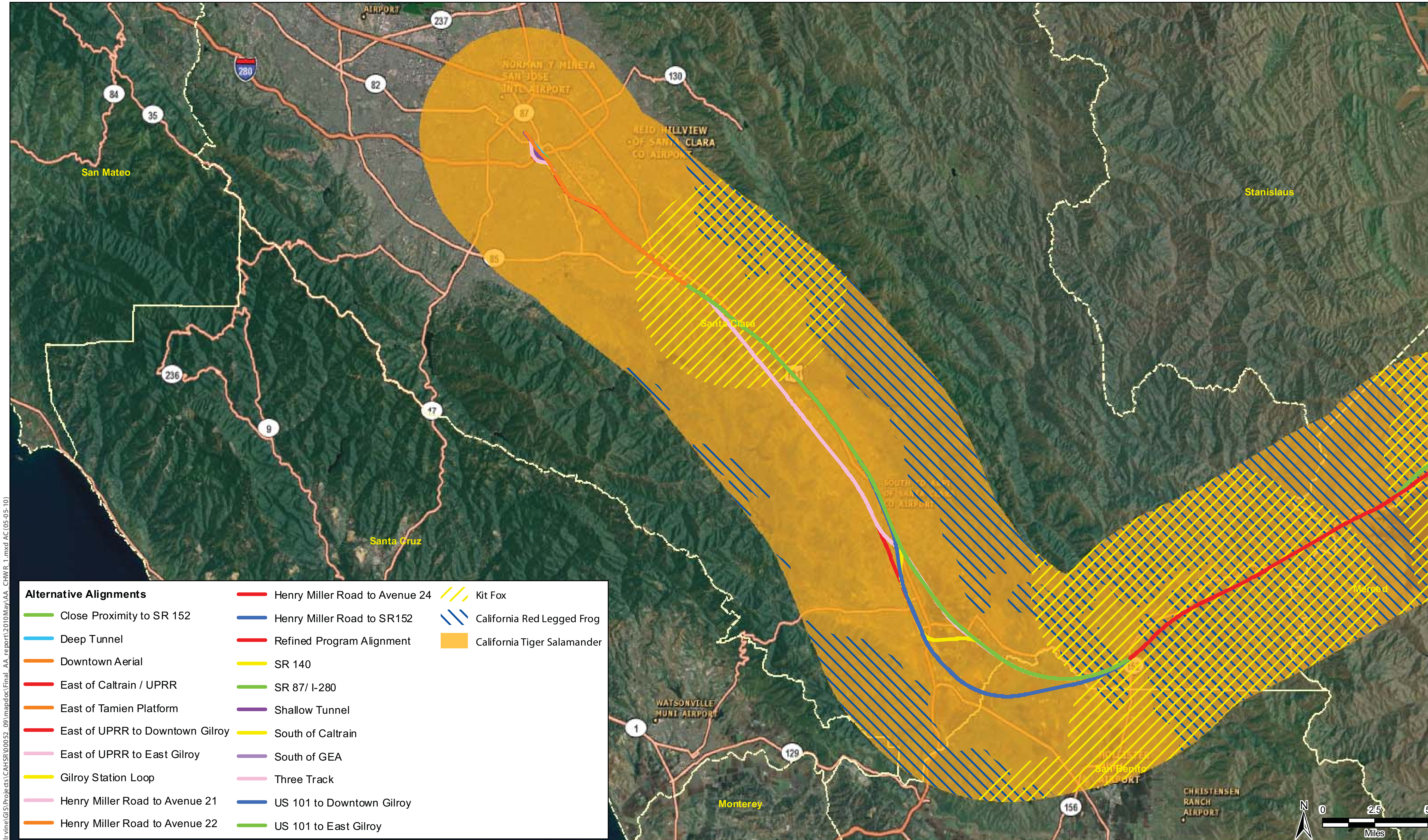

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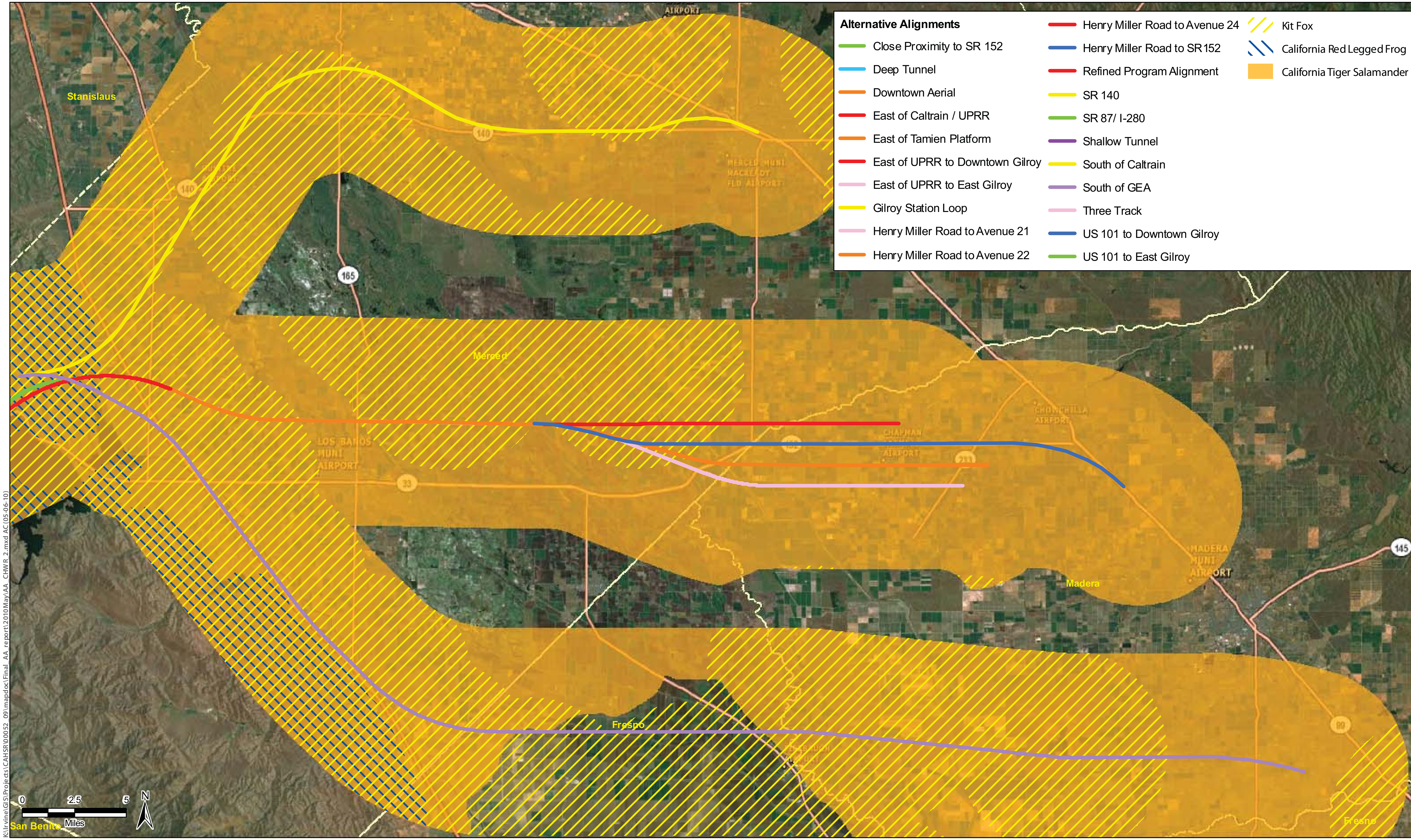
Sheet 1
Alternatives Analysis - CHWR
California High-Speed Rail



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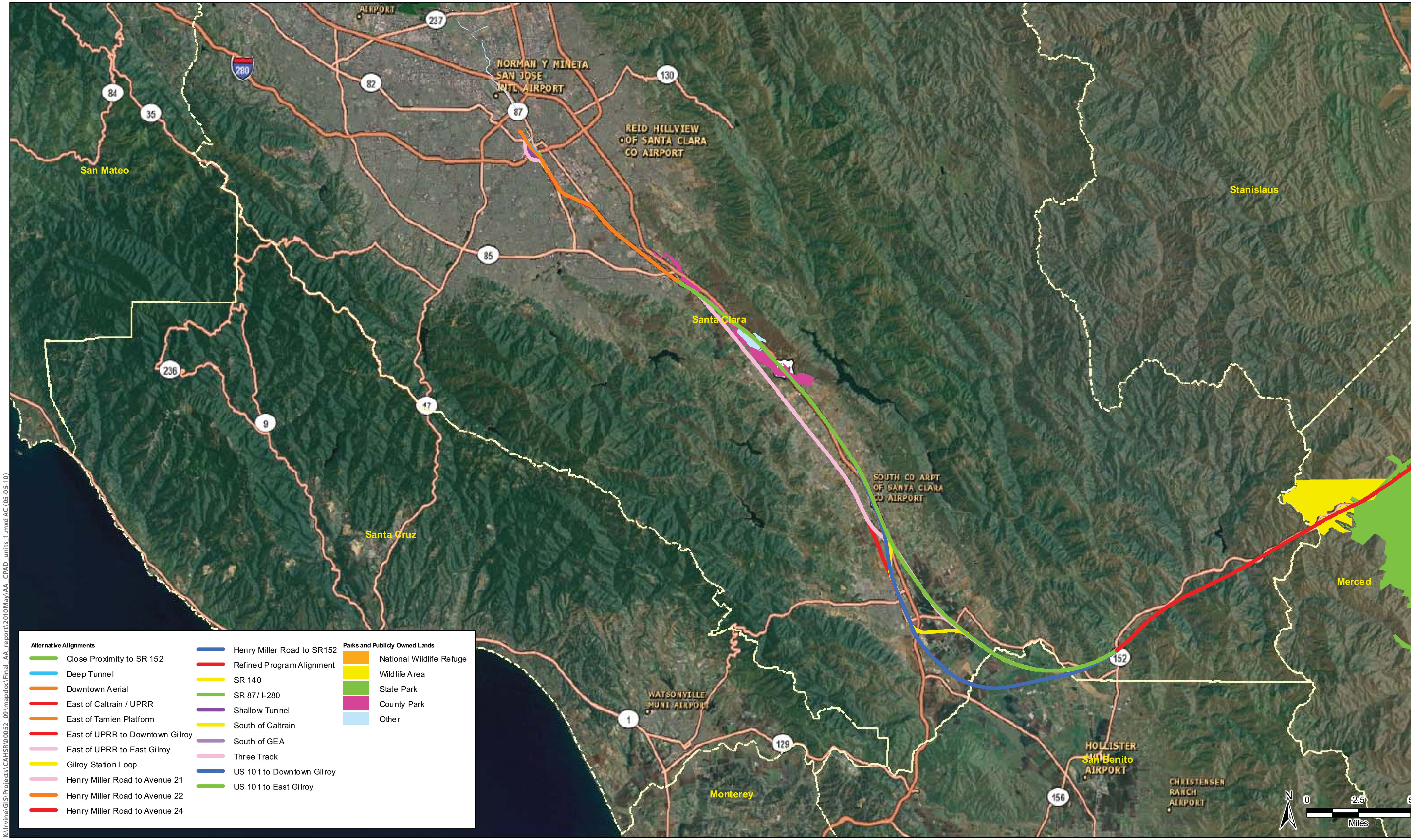
Sheet 2
Alternatives Analysis - CHWR
California High-Speed Rail



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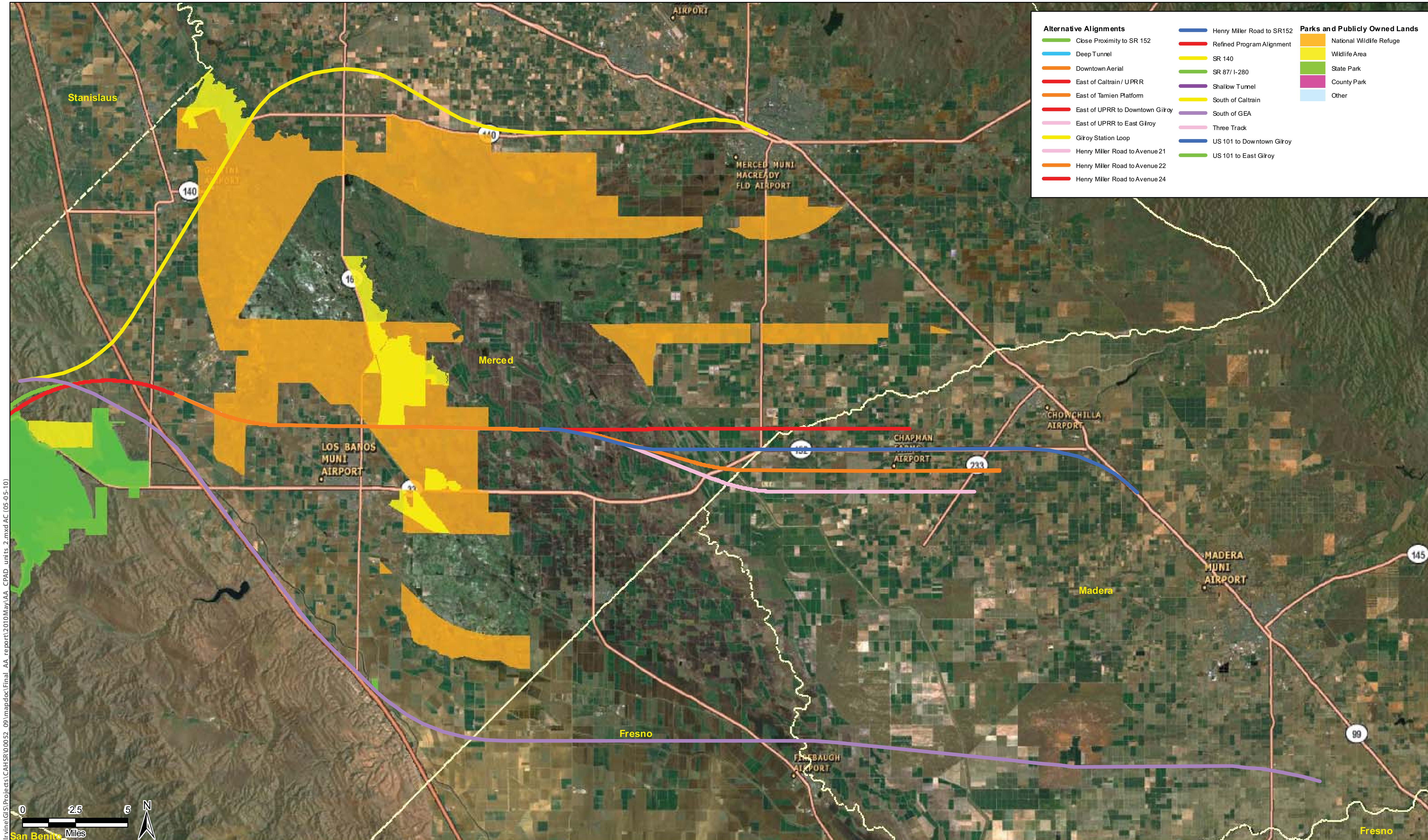
Sheet 1
Alternatives Analysis - Parks and Publicly Owned Lands
California High-Speed Rail



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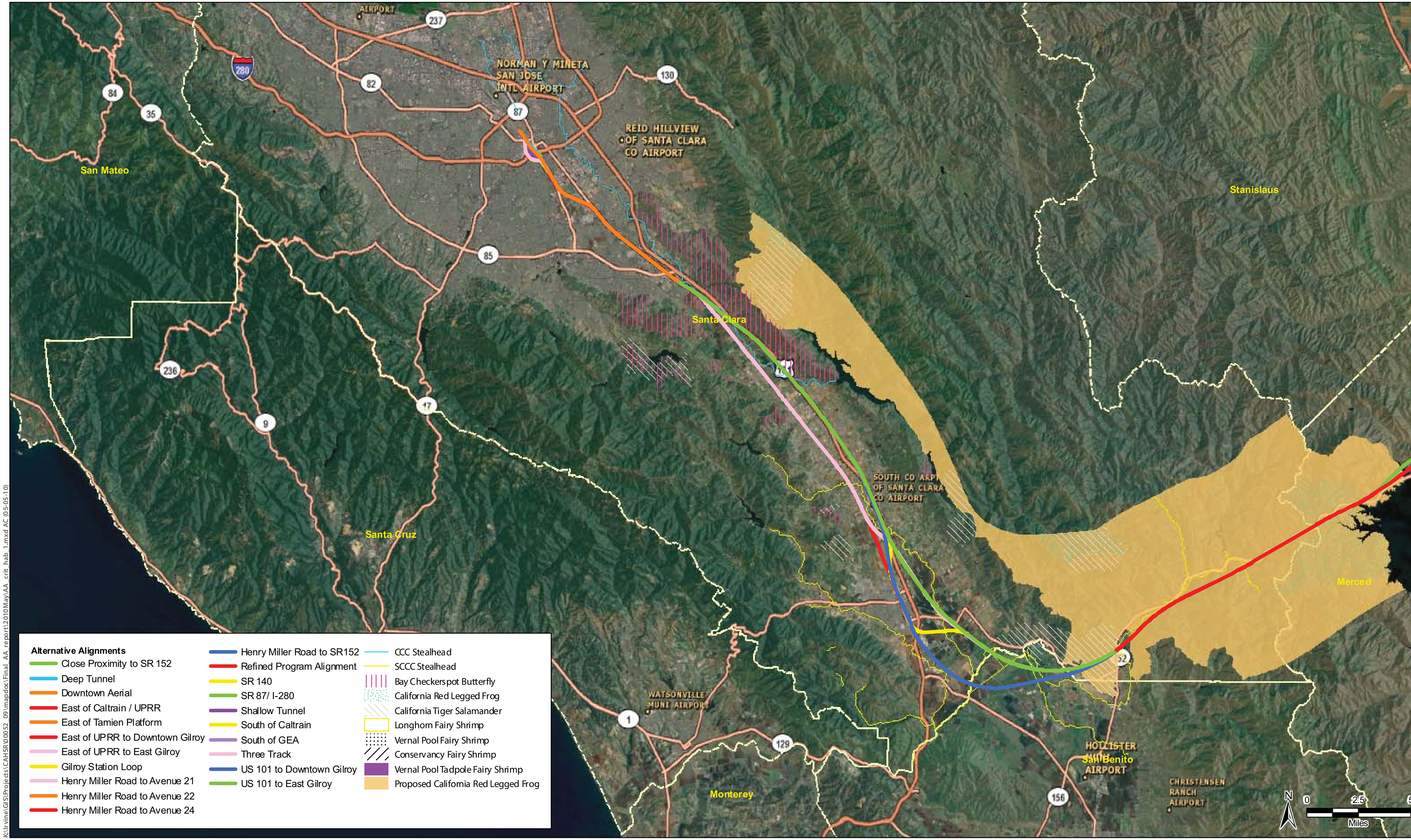
Sheet 2
Alternatives Analysis - Parks and Publicly Owned Lands
California High-Speed Rail



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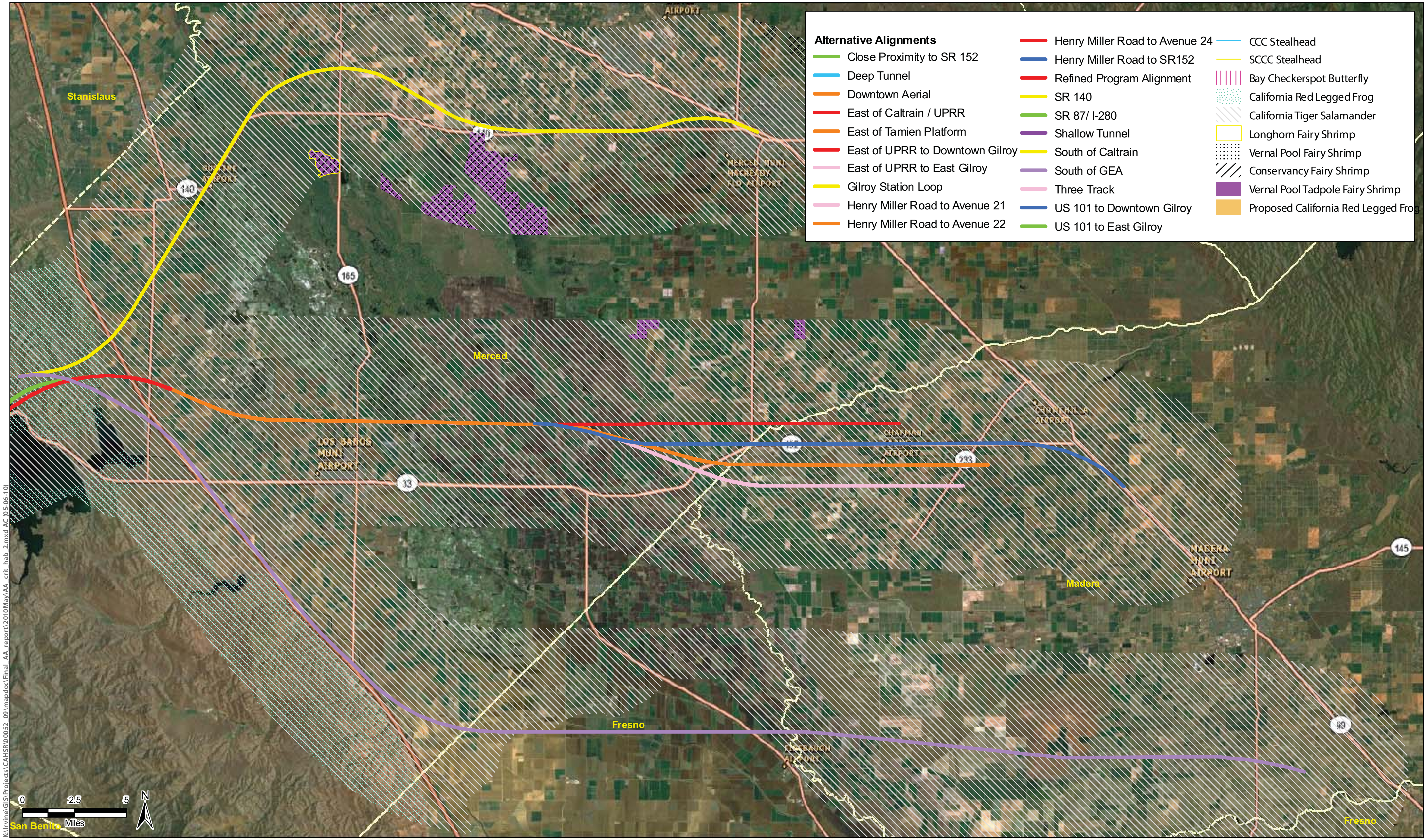
Sheet 1
Alternatives Analysis - Critical Habitat
California High-Speed Rail



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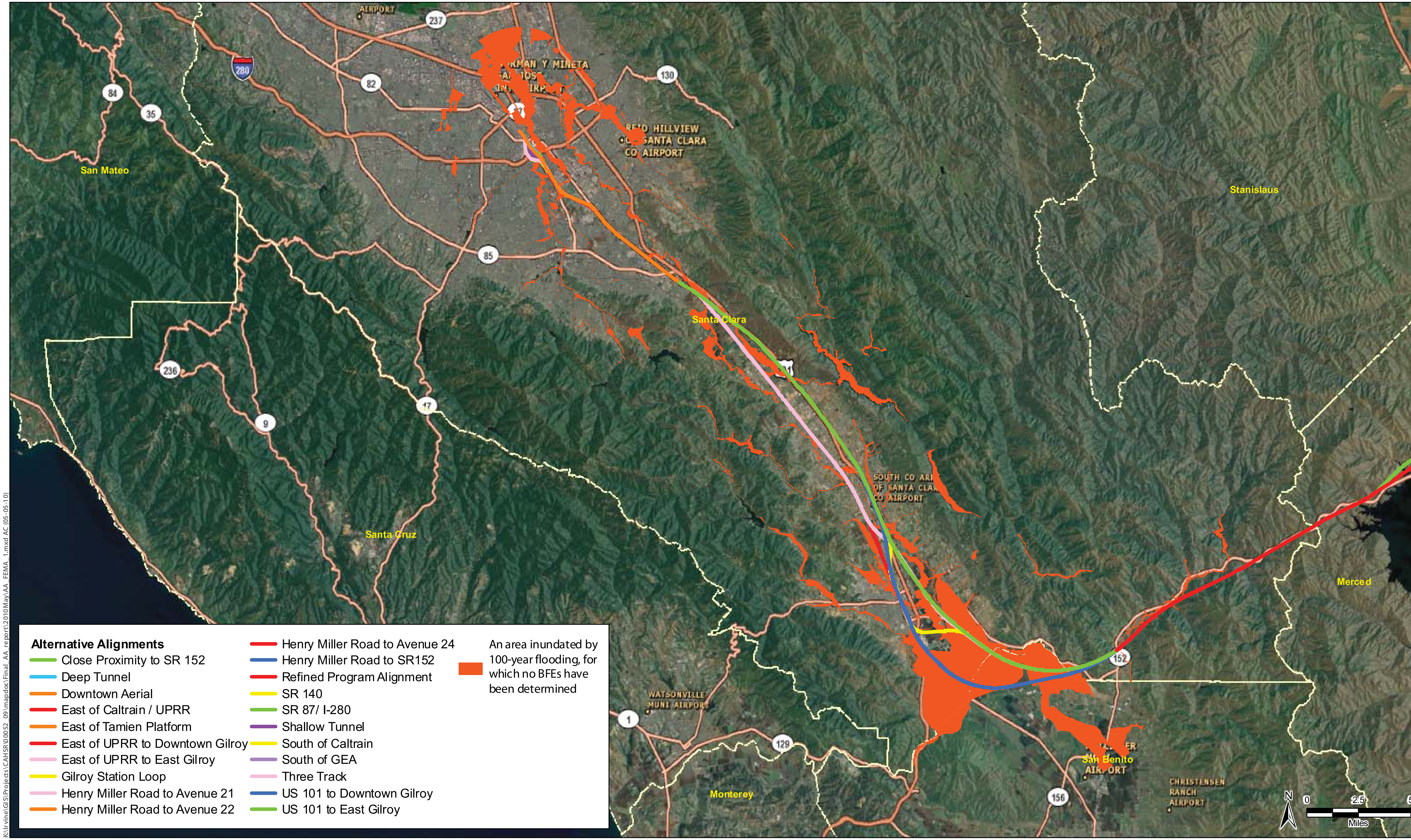
Sheet 2
Alternatives Analysis - Critical Habitat
California High-Speed Rail



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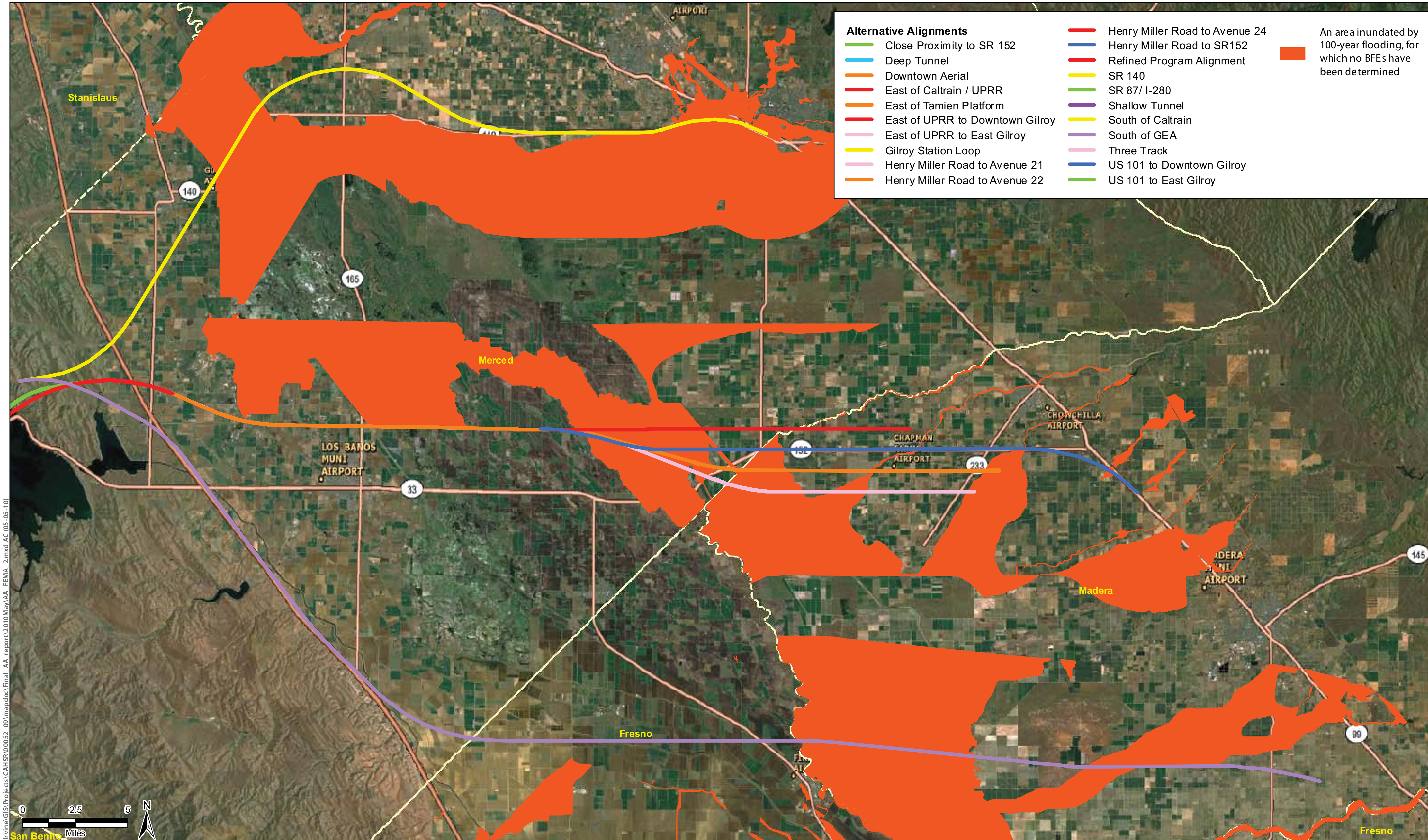
Sheet 1

Alternatives Analysis - FEMA 100-yr Flood Zone

California High-Speed Rail



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Sheet 2
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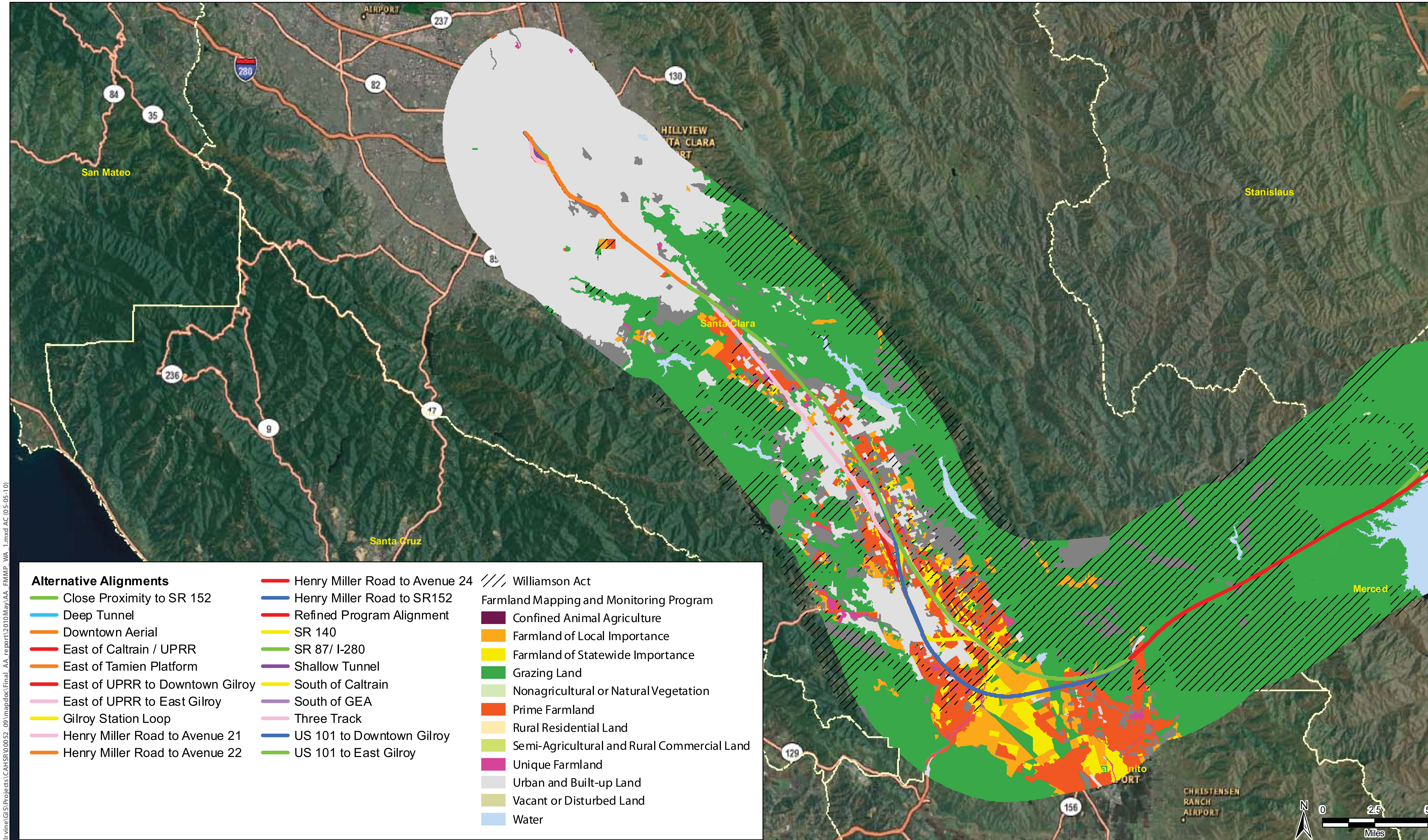
California High-Speed Rail



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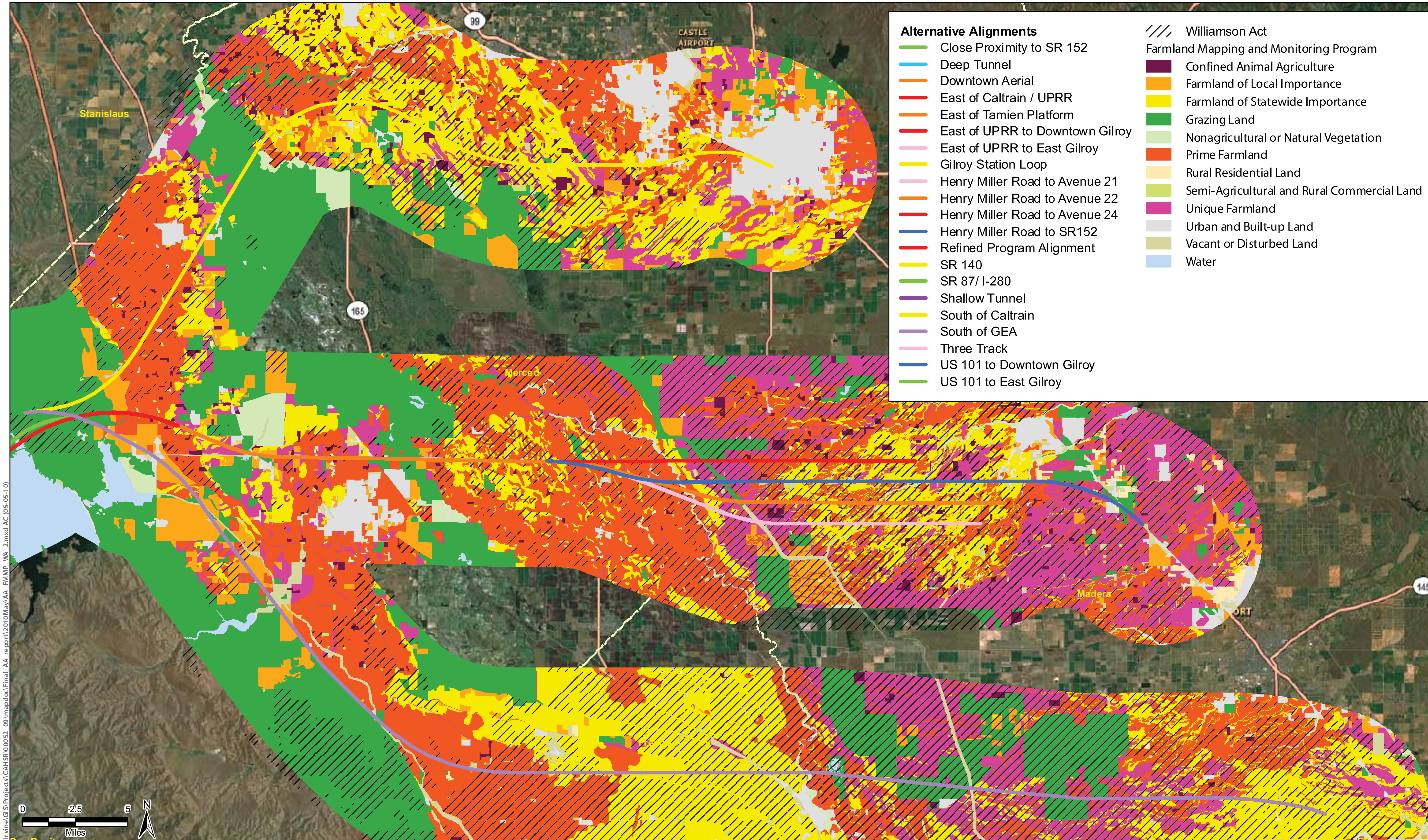
Sheet 1
Alternatives Analysis - Farmland Mapping and Monitoring Program and Williamson Act
California High-Speed Rail



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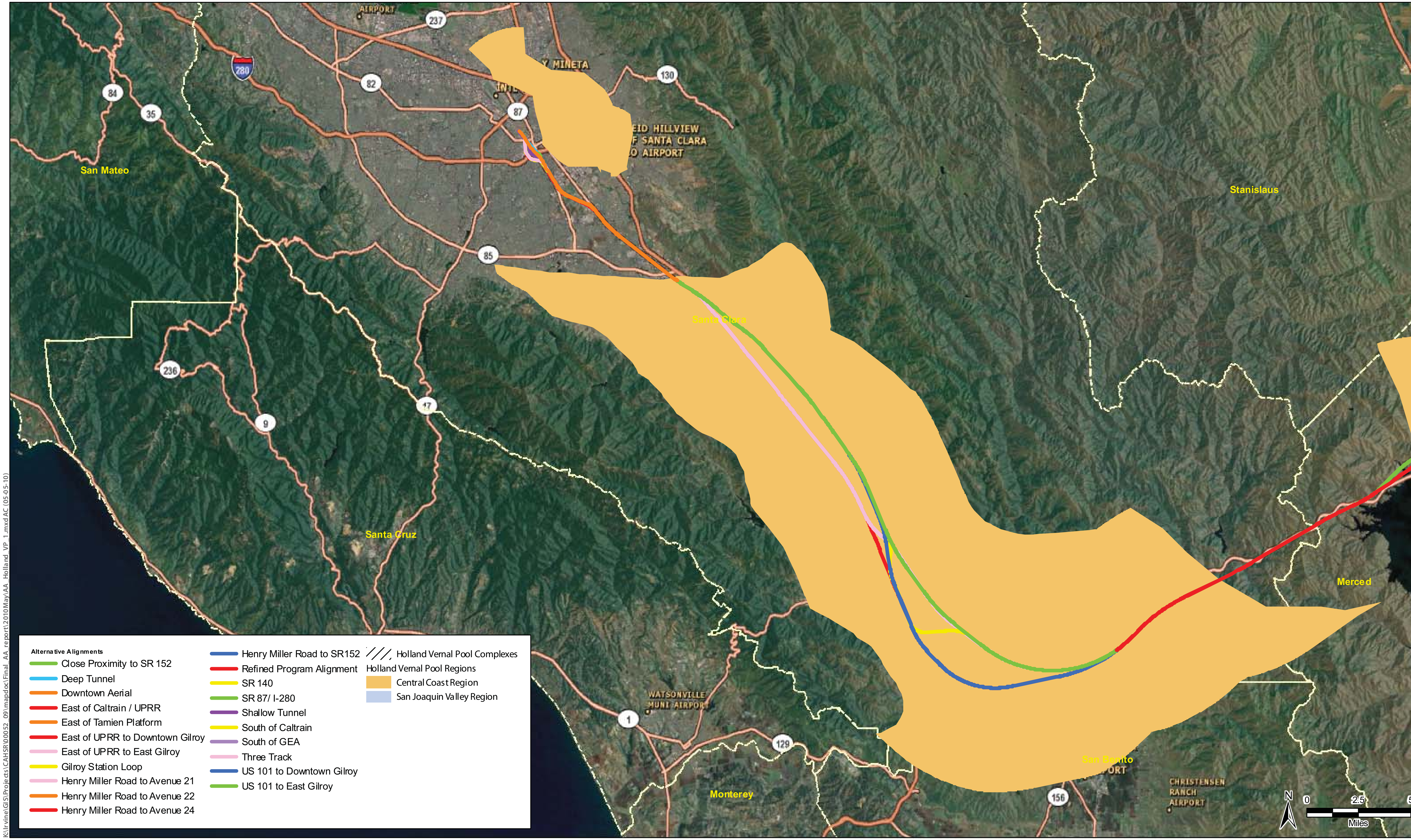
Sheet 2
Alternatives Analysis - Farmland Mapping and Monitoring Program and Williamson Act
California High-Speed Rail



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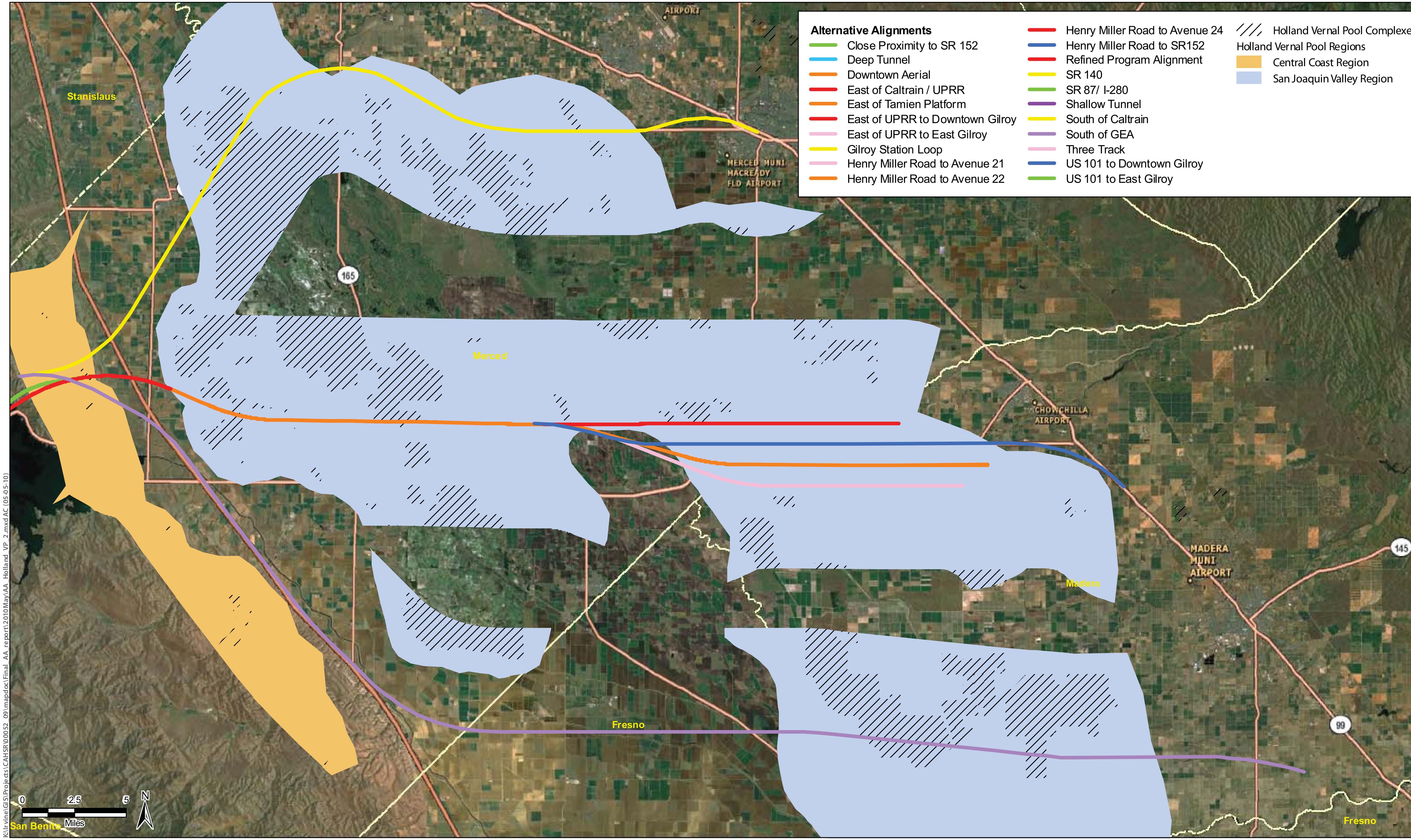
Sheet 1
Alternatives Analysis - Holland Vernal Pools
California High-Speed Rail



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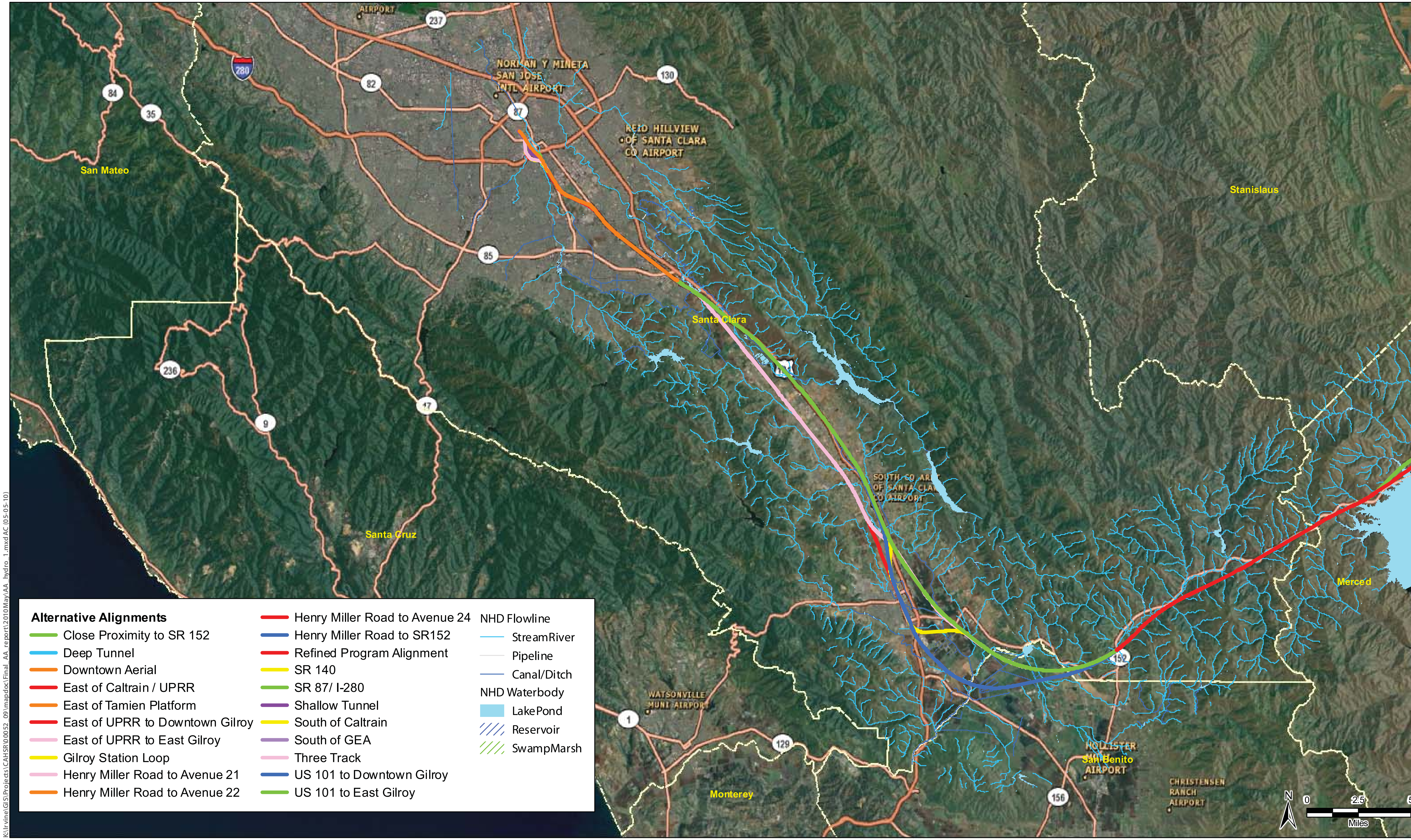
Alternatives Analysis - Holland Vernal Pools
California High-Speed Rail



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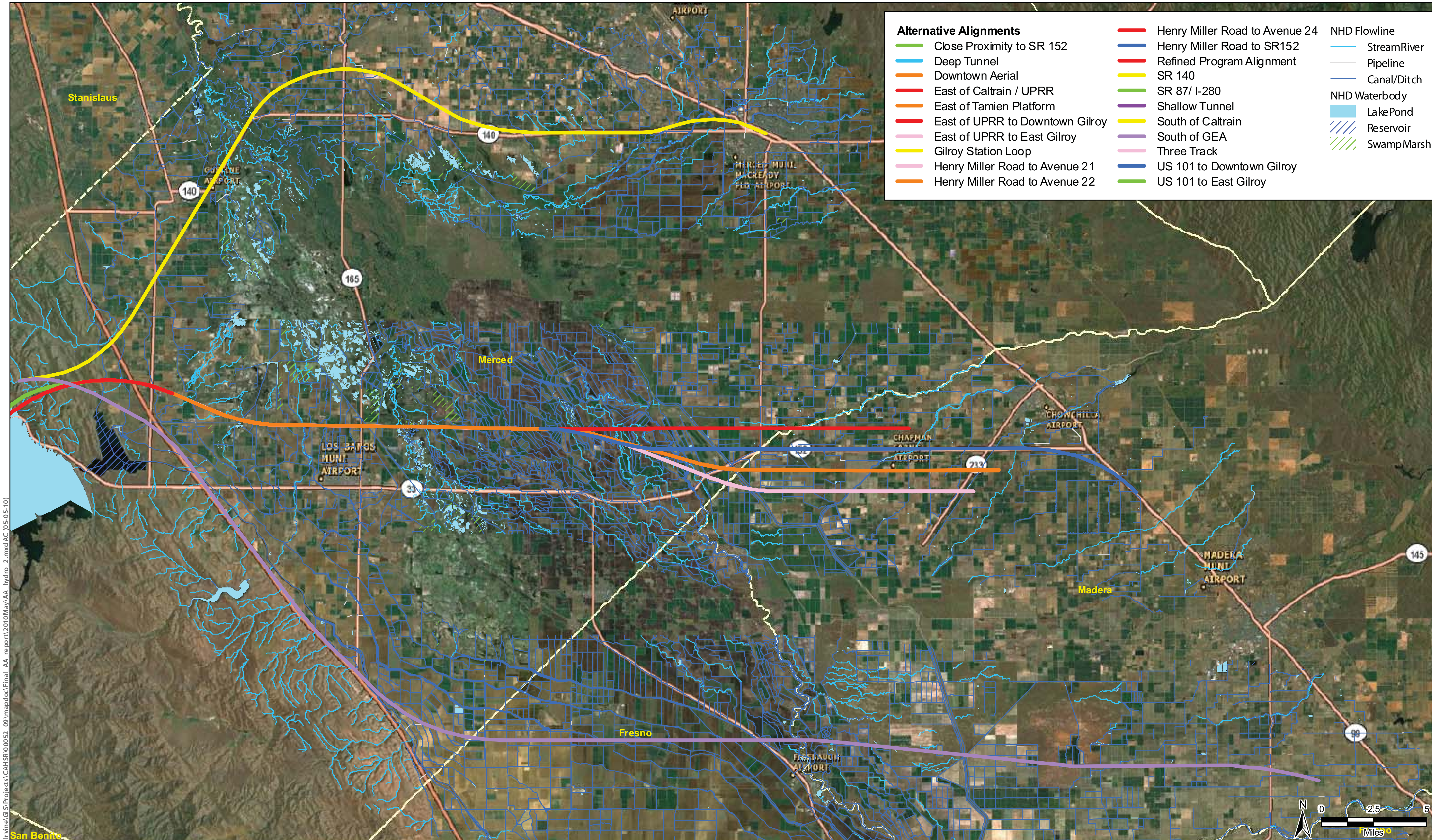
Sheet 1
Alternatives Analysis - Hydrology
California High-Speed Rail



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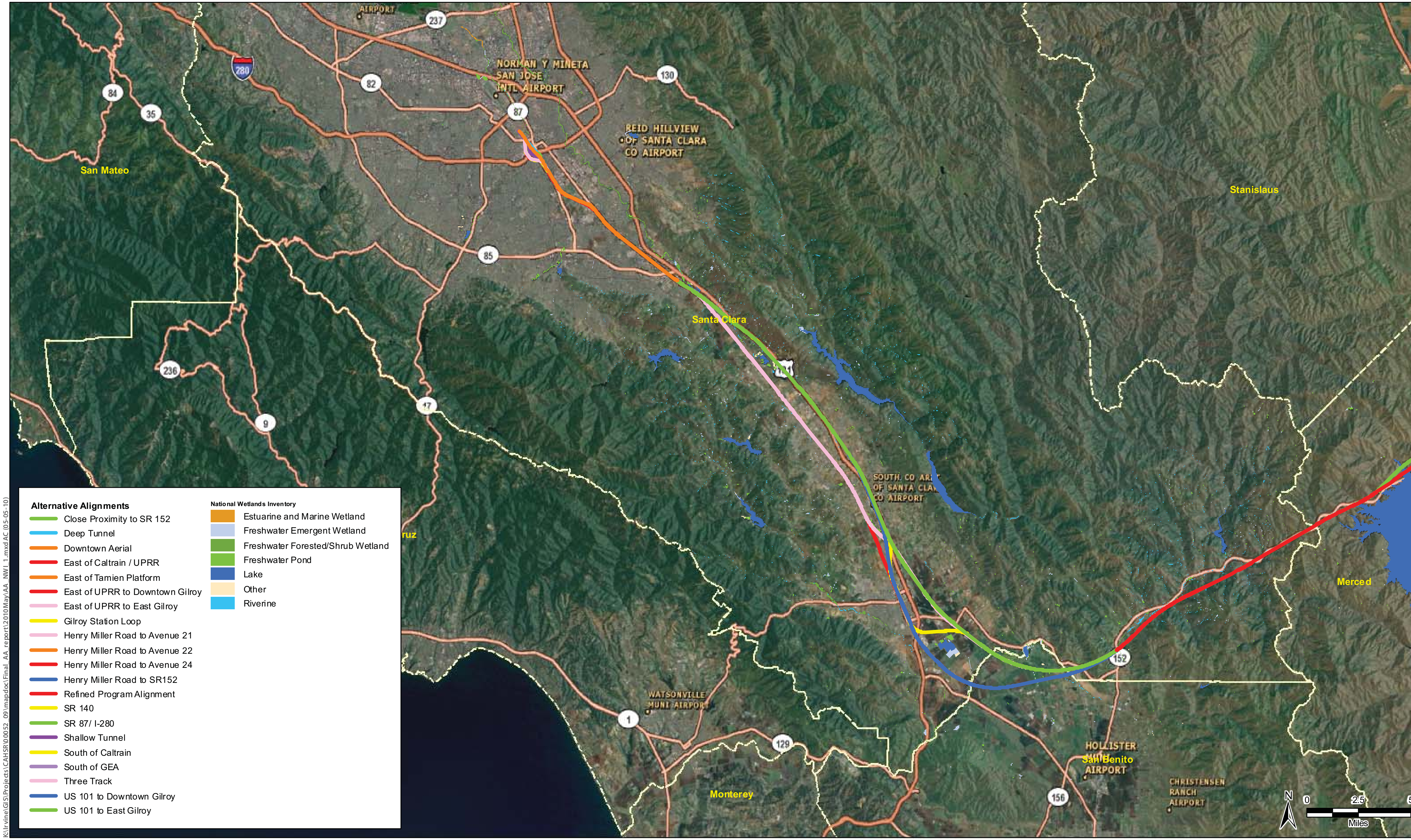
Sheet 2
Alternatives Analysis - Hydrology
California High-Speed Rail



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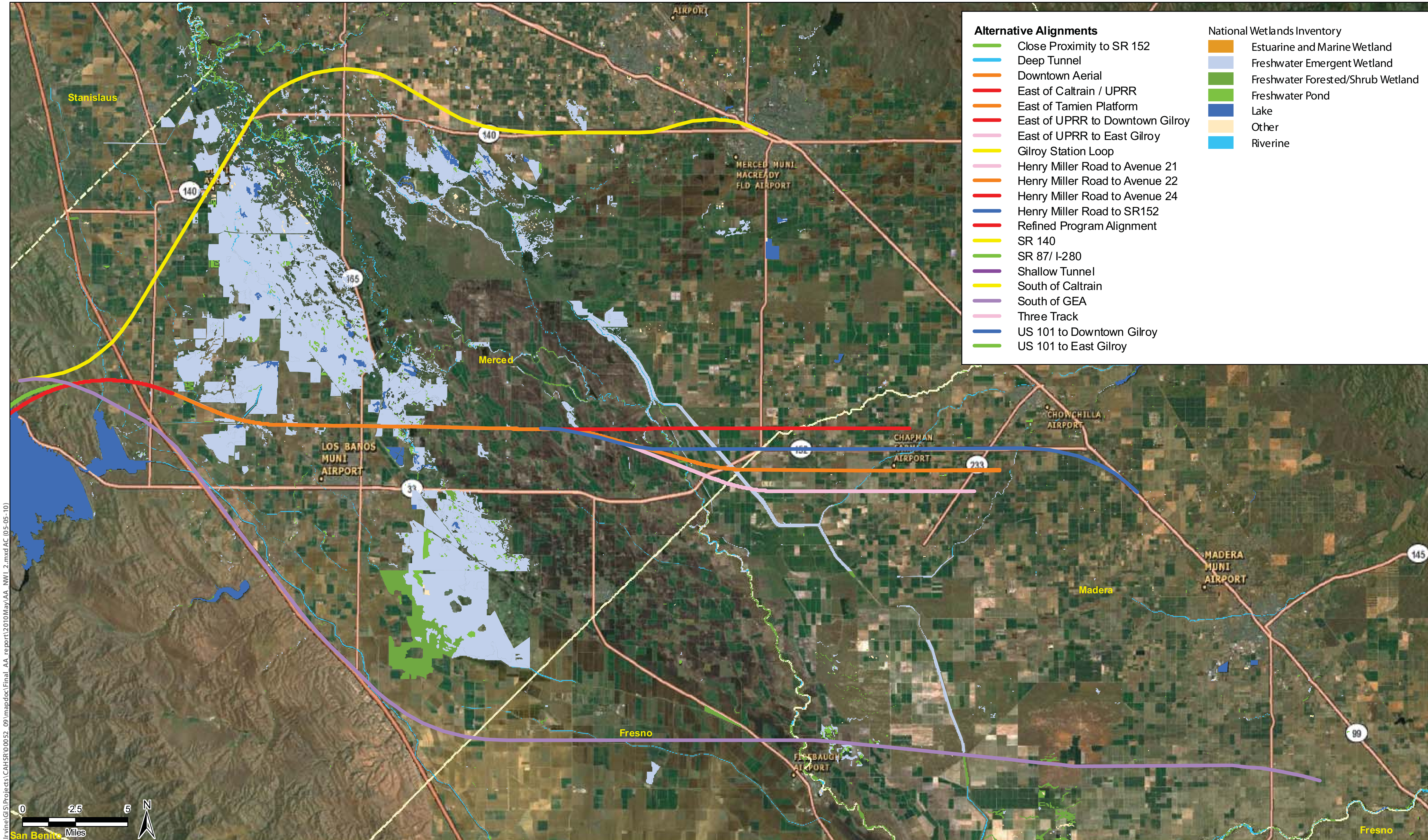
Sheet 1
Alternatives Analysis - National Wetlands Inventory
California High-Speed Rail



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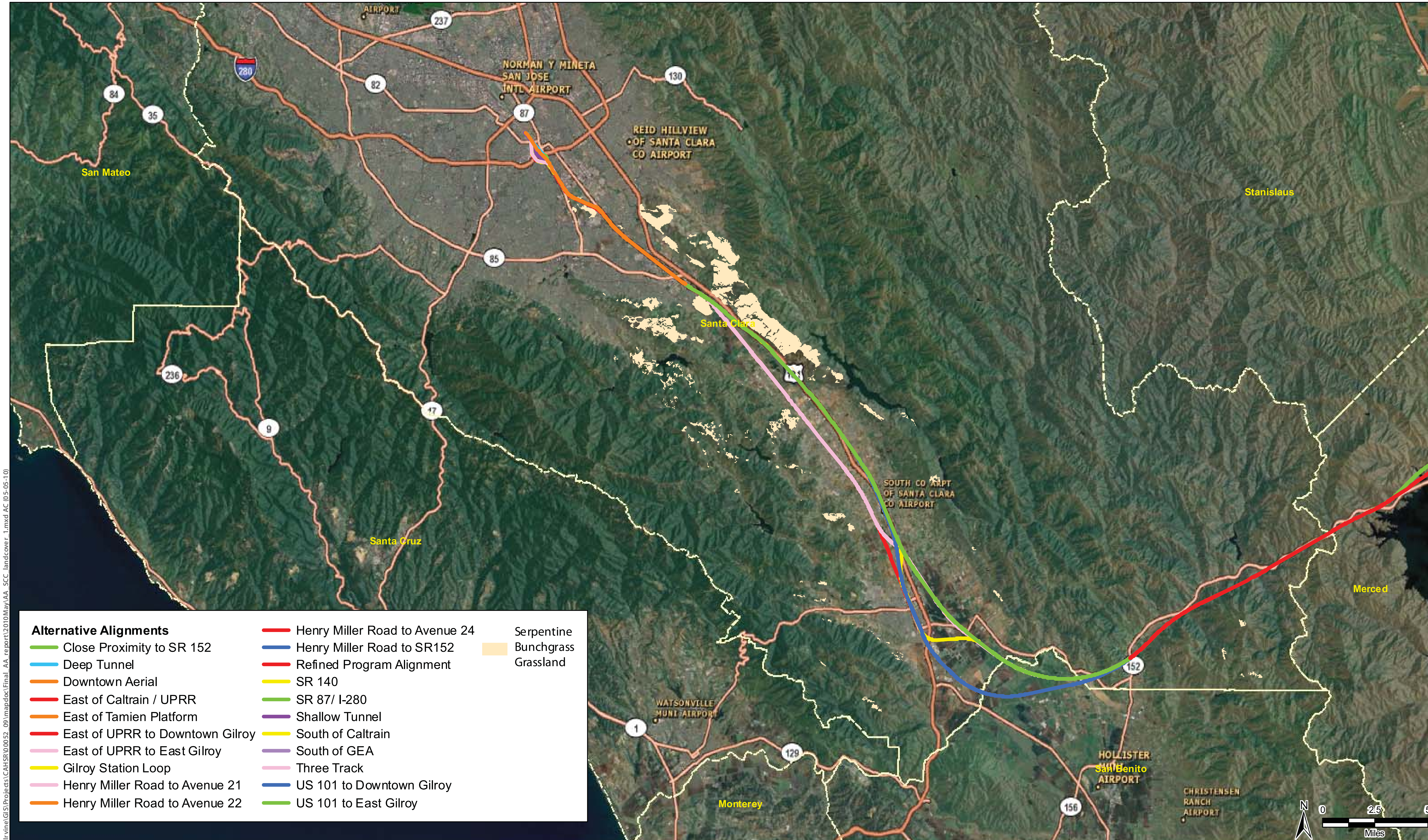
Sheet 2
Alternatives Analysis - National Wetlands Inventory
California High-Speed Rail



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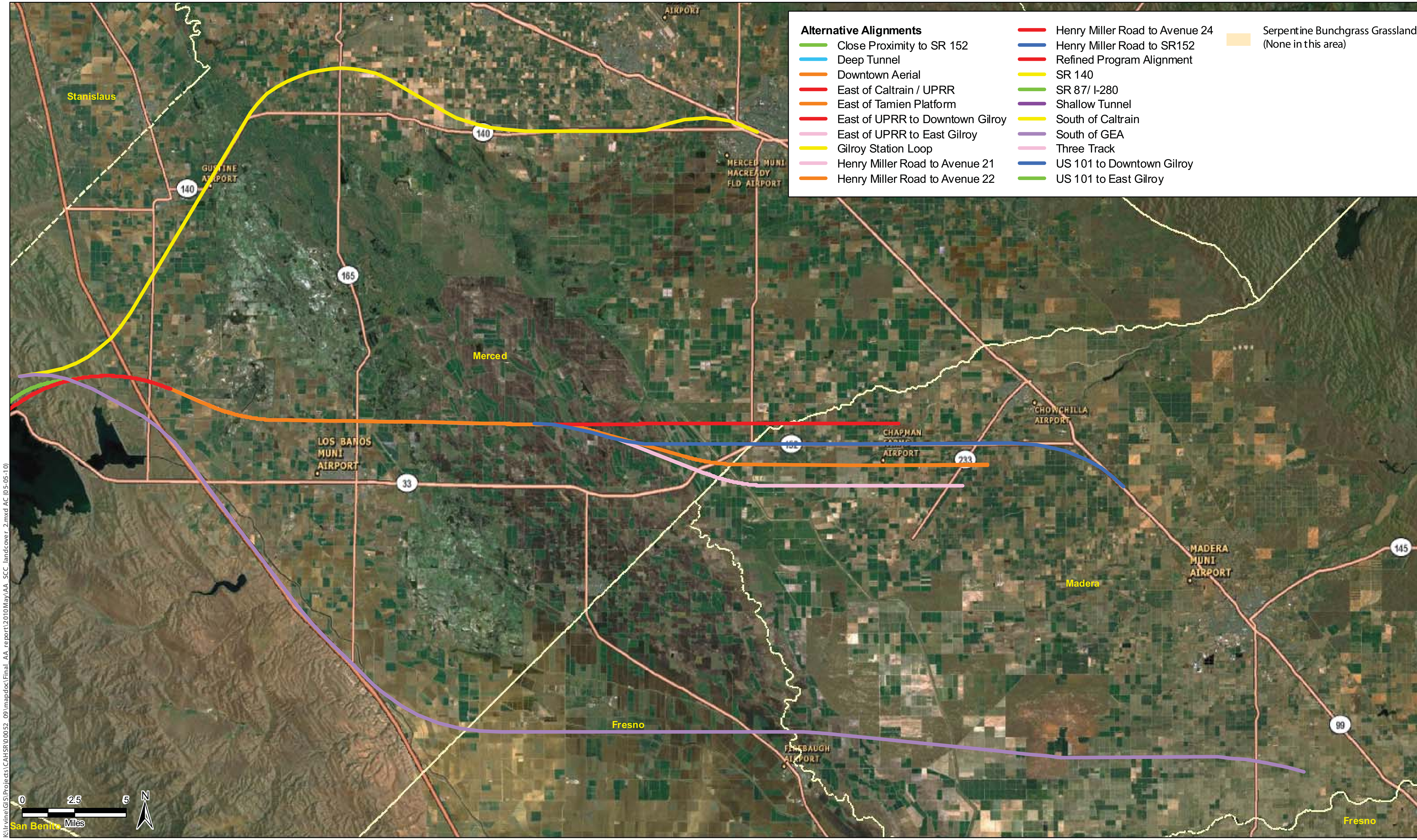
Sheet 1
Alternatives Analysis - SCC Landcover
California High-Speed Rail



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Sheet 2
Alternatives Analysis - SCC Landcover
California High-Speed Rail

Appendix F

Abbreviations and Acronyms

ABBREVIATIONS / ACRONYMS

AMTRAK	National Railroad Passenger Corporation
AA	Alternatives Analysis
ACE	Altamont Commuter Express
Authority	California High-Speed Rail Authority
BART	Bay Area Rapid Transit
BNSF	Burlington Northern Santa Fe
CAHSR	California High Speed Rail
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNG	Compressed Natural Gas
CHRIS	California Historical Resource Information System
CTS	California Tiger Salamander
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FRA	Federal Railroad Administration
GEA	Grasslands Ecological Area
GIS	Geographic Information System
GPS	Global Positioning System
HOV	High Occupancy Vehicle
HST	High-Speed Train
KOP	Key Observation Point
LRT	Light Rail Transit
MPH	Miles per Hour
NEPA	National Environmental Protection Act
NOI	Notice of Intent
NOP	Notice of Preparation
NRHP	National Register of Historic Properties
PA	Program Alignment
PIM	Public Information Meeting
PMT	Program Management Team
ROW	Right-of-Way
RRC	Regional Rebuild Center
RTP	Regional Transportation Plan
SJVNC	San Joaquin National Cemetery
SR	State Route
SRA	State Recreation Area
T&E	Threatened and Endangered
TNC	The Nature Conservancy
TOD	Transit Oriented Development
TWG	Technical Working Group
USGS	United States Geological Survey
UP	Union Pacific
UPRR	Union Pacific Rail Road
VTA	Santa Clara Valley Transportation Authority

Appendix F

Abbreviations and Acronyms

ABBREVIATIONS / ACRONYMS

AMTRAK	American Track
AA	Alternatives Analysis
ACE	Altamont Commuter Express
Authority	California High-Speed Rail Authority
BART	Bay Area Rapid Transit
BNSF	Burlington Northern Santa Fe
CAHSR	California High-Speed Rail
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNG	Compressed Natural Gas
CHRIS	California Historical Resource Information System
CTS	California Tiger Salamander
EDD	Employment Development Department
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPBM	Earth Pressure Balance Machines
FRA	Federal Railroad Administration
GEA	Grasslands Ecological Area
GIS	Geographic Information System
GPS	Global Positioning System
HOV	High Occupancy Vehicle
HST	High-Speed Train
KOP	Key Observation Point
LRT	Light Rail Transit
MPH	Miles per Hour
NEPA	National Environmental Policy Act
NOI	Notice of Intent
NOP	Notice of Preparation
NRHP	National Register of Historic Properties
PA	Program Alignment
PIM	Public Information Meeting
PMT	Program Management Team
ROW	Right-of-Way
RRC	Regional Rebuild Center
RTP	Regional Transportation Plan
SJVNC	San Joaquin National Cemetery
SEM	Segmental Mining
SR	State Route
SRA	State Recreation Area
T&E	Threatened and Endangered
TNC	The Nature Conservancy
TOD	Transit Oriented Development
TWG	Technical Working Group
USGS	United States Geological Survey
UP	Union Pacific
UPRR	Union Pacific Rail Road
VTA	Valley Transportation Authority

Appendix G

Draft Alternatives Analysis Public Participation Report

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Appendix G

Draft Alternatives Analysis Public Participation Report

for the

San Jose to Merced High-Speed Train Project EIR/EIS

October 2009 - May 2010

Prepared for:

California High-Speed Rail Authority
and
U.S. Department of Transportation
Federal Railroad Administration

Prepared by:

CirclePoint
135 Main Street, Suite 1600
San Francisco, CA 94105

A subconsultant to Parsons

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY

In 2005, the California High-Speed Rail Authority (Authority) and the Federal Railroad Administration (FRA) completed a Final Statewide Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS) as the first phase of a tiered environmental review process for the proposed California High-Speed Train (HST) system. The Authority and the FRA completed a second program EIR/EIS in July 2008 and selected the Pacheco Pass to San Francisco via San Jose as the preferred program corridor and alignment for this section (see **Figure 1**). However, due to a November 2009 court ruling, the Authority has reopened the related environmental document and is working to address issues identified by the court as part of a revised and recirculated environmental document. The revised document was released on March 4, 2010 and a 45-day review period began on March 11, 2010. The Authority will consider the revised materials and the entire record before making a new certification decision on the revised program EIR under CEQA. The Authority also will make a new programmatic decision on a network alternative for connecting the Bay Area with the Central Valley that it will study at the project level. The court ruling did not require the Authority to stop the work being done on the project-specific environmental review.

Tiering from the two program studies, the Authority and the FRA will prepare nine Project EIR/EISs, including one that examines site-specific impacts of alignments, station locations, and HST operations of the section between San Jose and Merced, and identifies specific mitigation measures, as necessary.

In February 2009, the Authority, in cooperation with the FRA, began a project environmental review of the San Jose to Merced section per requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). "Scoping" was the first major step to help inform the public and agencies about the project and gather input on environmental-related issues, concerns and interests to be studied. During March 2009, more than 300 people attended public scoping meetings in San Jose, Gilroy and Merced. The Authority received more than 500 distinct comments, submitted verbally and in writing through comment cards, letters and e-mails. These comments were made by interested agencies and the public to ensure the full range of issues related to the proposed action were addressed, including all reasonable alternatives. A scoping report summarizing this input is available in English and Spanish on the Authority's website (http://www.cahighspeedrail.ca.gov/library.asp?p=8281).

Based on scoping comments, the Authority developed a number of potential alignment alternatives and is analyzing and evaluating these to determine which ones to carry forward for detailed environmental review. Public meetings to present and obtain input on these alternatives occurred in October 2009 in San Jose, Gilroy and Merced. These initial alignment alternatives were then evaluated using established criteria, and the evaluation of the alternatives was reviewed with the FRA and Authority at a workshop in November 2009. At the workshop, the FRA and Authority made a preliminary identification of which alignment alternatives, stations, and design options should be carried forward into the EIR/EIS process. These recommendations were presented to the Authority Board of Directors in early December 2009.

Follow-up public meetings to share the refined alternatives selected for analysis in the Project EIR/EIS occurred in Merced in December 2009, and in Gilroy and San Jose in January 2010. An additional community workshop on the downtown San Jose alternatives was held in March 2010. In May 2010, the project team presented an update on the alternatives analysis process before the Gilroy City Council, and also hosted two open houses about the alternatives analysis in the south of Diridon Station to Coyote Creek area.

FIGURE 1: PROGRAM CORRIDOR ALIGNMENT

1.0 OVERVIEW OF PUBLIC PARTICIPATION DURING THE ALTERNATIVES ANALYSIS PHASE

This report provides an overview of the verbal and written comments received during the Alternatives Analysis (AA) phase for the Project EIR/EIS for the San Jose to Merced section of the California HST system. The purpose of this report is to summarize agency and public comments, issues and concerns that arose during this period, which spanned from October 2009 to May 2010. The report will help the Authority and the FRA to understand agency and public issues and concerns, and to narrow the alignments to be studied in detail in the Project EIR/EIS.

1.1 Project Description

In July 2008 the Authority selected the Pacheco Pass to San Francisco via San Jose as the network alternative for connecting the Bay Area with the Central Valley. The selected Pacheco Pass network alternative included general alignments between San Jose and Gilroy, over the Pacheco Pass, across the San Joaquin Valley, and north to Merced, which would be studied further in project EIRs. However, as discussed in the project summary on **page 2**, due to a recent court ruling, the Authority has re-opened the related environmental document and is working to address issues identified by the court as part of a revised and recirculated environmental document. The Authority will consider the revised materials and the entire record before making a new certification decision on the revised program EIR under CEQA. The Authority will also make a new programmatic decision on a network alternative for connecting the Bay Area with the Central Valley that it will study at the project level. The court ruling did not require the Authority to stop the work being done on the project-specific environmental review.

The corridor that is being studied at the project level extends approximately 125 miles, starting at the Diridon train station in San Jose, where it connects with the San Francisco to San Jose HST section, runs south through Gilroy and then east through the mountainous Pacheco Pass to Chowchilla, where it connects with the Merced to Fresno HST section. Stations are planned in San Jose, Gilroy and Merced. The Program Alignment is fully described in the Authority/Federal Railroad Administration (FRA) Final Bay Area to Central Valley Program Environmental Impact Report/Environmental Impact Statement (EIR/EIS), which can be located on the project website (http://www.cahighspeedrail.ca.gov/library.asp?p=8052).

1.2 Alternatives Analysis Process

After the formal scoping period ended in April 2009, the Authority and the San Jose to Merced section team reviewed all comments and feedback received. Based on these comments, the team identified a number of potential alignment alternatives, which were analyzed and evaluated to determine which should be carried forward for detailed environmental review in the EIR/EIS. Technical Working Group (TWG) meetings with jurisdictional and resource agencies were conducted to get input and comments on the preliminary alternative alignments. A series of alternatives analysis public meetings (of which this report is the subject) were held in October and December 2009 and January, March and May 2010 to present to the public these new alternative alignments, explain the alternatives analysis process, and gather feedback. Smaller meetings with stakeholders and other agencies were also conducted during this time (see **Table 7**). Public input and preliminary analysis of each alternative alignment will be used to narrow the range of potential alignments studied in the Draft Project EIR/EIS. Verbal and written comments received at the public meetings and subsequent correspondence, are summarized in this report.

The FRA and Authority will meet in spring 2010 to discuss the studies to date and provide recommendations on the alignments to carry forward into the environmental review in a Preliminary Alternatives Analysis Report. Following review by the Authority Board of Directors, another round of TWG and public informational meetings will be held in order to capture agency and public comment on the findings. Ultimately, a supplemental Alternatives Analysis Report will be delivered to the Authority Board for their review and approval.

It is important to note that although the alternatives analysis phase is a distinct stage in the Project EIR/EIS process, public involvement activities extend throughout the entire process. These activities allow for regular interaction and identification of public and agency issues and concerns throughout the study process.

1.3 Overview of Notification of Public Meetings

The team provided public notification of all public meetings, open houses, workshops, study sessions and City Council meetings held about the Alternatives Analysis Phase. Display advertisements were run in local papers (for some meetings), including Spanish language newspapers, with contact information in Vietnamese and Chinese. E-mail blasts in English and Spanish with contact information in Chinese and Vietnamese were sent to agencies and members of the public who had requested e-mail notifications. Bilingual (English and Spanish, with contact information in Vietnamese and Chinese) postcards were mailed to people in the project area. Information about the meetings was posted on the Authority website. In addition, a toll-free informational phone line was made available for people to leave messages in English, Spanish, Vietnamese, and Chinese to request information in those languages.

2.0 ALTERNATIVES ANALYSIS PUBLIC MEETINGS: OCTOBER 2009

The alternatives analysis began in October 2009, when public meetings were held in San Jose, Gilroy and Merced to share the potential alignment alternatives that were developed following comments from scoping.

2.1 Notification of October 2009 Alternatives Analysis Public Meetings

A bilingual postcard was mailed to more than 18,000 people, including property owners and stakeholders within the programmatic alignment and new alternative alignment options. Additional postcards were distributed to local neighborhood groups and community members via the Gardner Community Center and Diridon Station ticket counter.

Display ads ran twice in the following newspapers: *San Jose Mercury News, Merced Sun Star, Morgan Hill Times, Gilroy Dispatch, El Observador* and *La Oferta Review*. Three e-mail blasts were sent to approximately 3,100 agencies and members of the public.

2.2 October 2009 Meeting Activities

Three formal agency and public alternatives analysis meetings were conducted in October 2009 in San Jose, Gilroy and Merced (see **Table 1**). In total, these meetings drew approximately 300 participants.

The format of each meeting included an open house (providing an opportunity to talk with project staff); a presentation providing an overview of the project schedule, activities to date and more information about potential alignments; and a question and answer session. A short video ran on a loop during the open house, which featured simulations of the statewide system and San Jose to Merced corridor, and interviews from Authority team members.

Table 1: Alternatives Analysis October 2009 Meeting Locations and Times

Date	City	Location/Address	Time
10/6/2009	San Jose	Gardner Community Center 520 W. Virginia Street, San Jose	6:00-8:00 p.m.
10/8/2009	Merced	Merced Community Senior Center 755 West 15th Street, Merced*	6:00-8:00 p.m.
10/12/2009	Gilroy	Gilroy Hilton Garden Inn 6070 Monterey Road, Gilroy	6:00-8:00 p.m.

*Members of the Merced to Fresno HST project section were present at this meeting.

Materials distributed at the meetings included agendas and fact sheets. Spanish translators were available, as were project fact sheets in Spanish, Chinese and Vietnamese.

At each meeting, attendees were asked to sign in and provide contact information so that they could be notified of future project activities.

Verbal and written comments (submitted through comment cards, e-mails and letters) are summarized in **Section 2.3**.

2.3 Summary of Comments Submitted During the October 2009 Meetings

Written comments were received from several commenters, through letters, e-mails and comment cards (submitted during the meetings and via mail). Verbal comments made at the meetings are also summarized (Note: some comments included here were submitted by mail or e-mail following this set of meetings). The outline below provides a general overview of the comments received during the October 2009 meetings, organized by geographical alignment location and then by EIR comment category.

GEOGRAPHICAL ALIGNMENT LOCATION

San Jose Near Station Alignment Alternatives

- Explain four-track and three-track systems, and whether the high-speed trains will share existing Caltrain tracks.
- Upgrade Caltrain lines and connect them to a high-speed rail hub in Merced.
- Will Diridon Station be elevated or put underground? How many trains will stop there?
- Diridon Station is a landmark and should not be negatively impacted by high-speed trains.
- Why is there no connection to San Jose Airport?
- Split the high-speed rail tracks so that express trains go underground in a tunnel and trains that stop in San Jose follow the I-280/SR 87 route.
- Explain why the Pacheco Pass was chosen over the Altamont Pass.
- Aerial structures are divisive; underground alignments would preserve quality of life in neighborhoods adjacent to the alignments (including Gardner and Willow Glen).

Monterey Highway Alignment Alternatives

- Monterey Highway is the most effective route because current rail lines run there and no land acquisitions or new easements would be required.
- Follow SR 85 to U.S. 101 to avoid Monterey Highway and decrease the impact to neighborhoods, or put the route underground.
- Preserve the walnut trees along Monterey Road.
- If Monterey Road or other roads are reconstructed, preserve or restore bike lanes.
- The proposed SR 87/85 alignment and associated construction and operating impacts would significantly impact Gunderson High School and the Pinehurst neighborhood.

Morgan Hill Alignment Alternatives

- Avoid moving the VTA Trolley Line.
- What happens to UP buildings adjacent to the UP corridor?
- Does the Authority have condemnation power?
- Use the alignment along U.S. 101 rather than the alignment through downtown Morgan Hill, San Martin and Gilroy, which will have significant negative impacts on the community, historical and sensitive structures, and biological resources.
- Consider the U.S. 101 alignment's potential impacts to the Morgan Hill Aquatic Center and Soccer Field Park, South County Airport, and Gilroy's Saint Louise Hospital.
- A 120-foot right-of-way through Gilroy would wipe out the downtown area.
- Explain the differences in width requirements between elevated and trench options.
- Consider a station to the east of Gilroy, by the outlets.
- How fast will trains run through Gilroy? How loud will they be?
- Build a tunnel in Gilroy.
- Do not impact Frazier Lake Airpark.

Pacheco Pass Alignment Alternatives

- The alignment should stay north of Highway 152 at Dinosaur Point Road to avoid homes and water wells.
- Tunnel the alignment in this area; trench and aerial alignments are divisive.

San Joaquin Valley Crossing Alignment Alternatives

- The program alignment is the fastest, most efficient route for crossing the San Joaquin Valley, has the fewest environmental impacts, is the only alternative that uses existing east-west roadways for most of the route, and is consistent with existing and proposed development.
    - This alignment is supported by the County of Madera Board of Supervisors, City of Madera, City of Chowchilla, EPA, USACE, Congressman Dennis Cardoza, City of Atwater, City of Merced, City of Los Banos, Merced County Association of Governments, Merced County Economic Development Corporation, UC Merced, Merced College, Merced Hispanic Network, Greater Merced Chamber of Commerce, and the Merced County Office of Education.
- The program alignment may impact the Santa Nella County Water District's Wastewater Treatment Plan, Water Distribution location and administrative office.
- The alignments with connections to SR 152 help to merge the valleys.
- The alignment south of the Grasslands Ecological Area (GEA) follows few existing right-of-ways, greatly impacts the natural habitat and agricultural resources, and bypasses populated cities.
    - This alignment is opposed by the City of Atwater, City of Merced, Congressman Dennis Cardoza, UC Merced, the Merced County Economic Development Corporation, Merced College, Merced Hispanic Network, Greater Merced Chamber of Commerce, and the Merced County Office of Education.
- The alignment north of the GEA adds significant travel time and cost to the project, and negatively impacts the GEA, residential, commercial, recreational and agricultural properties.
    - This alignment is opposed by the City of Atwater, Congressman Dennis Cardoza, UC Merced, and the Greater Merced Chamber of Commerce.
- Use the Altamont Pass, which has fewer environmental impacts than the Pacheco Pass.

EIR COMMENT CATEGORIES

Transportation
- Existing rail systems should be upgraded to make high-quality connections to high-speed rail.
- Conduct a comprehensive parking management study in San Jose that considers high-speed trains and other facilities in the area.

Noise and Vibration
- How does high-speed train noise and vibration compare to a freight train?

Public Utilities and Energy
- There is not 100 percent pollution reduction with high-speed trains.

Biological Resources and Wetlands
- In San Jose, the tracks should go above North Coyote Valley.
- The Morgan Hill program alignment will have significant impacts on Coyote Valley and Uagas Creek and watersheds.
- Describe the mitigation commitments in the GEA; consider elevating the tracks in this area.

Geology, Soils, Seismicity
- Will tunnels and aerial alignments be safe during an earthquake?

Safety and Security
- Describe how passengers will be kept safe and secure on high-speed trains in the face of terrorism.

Socioeconomics, Communities and Environmental Justice
- What distance from the route will eminent domain take place?
- Linear barriers, such as aerial alignments, can potentially create neighborhood blight.

Local Growth, Station Planning and Land Use
- Construct the heavy equipment maintenance facility in Chowchilla, potentially at the former Castle Air Force Base.

Agricultural Land
- Farmers need to cross Henry Miller Road frequently to access their land on both sides.

Parks, Recreation and Open Space
- What will be the high-speed train's impact to the Santa Clara County Master Trail?

Aesthetics and Visual Quality
- What are the right-of-way requirements for two tracks? Four tracks?
- How high will elevated tracks be?

Capital Costs
- What are the cost differences between underground, at-grade, and elevated options?
- How long will it take to build the system?
- Will it be completed at the projected cost without overrun?
- How will property owner taxes be affected?
- Will the project meet federal funding deadlines?

Operations and Maintenance Costs
- How often will the high-speed trains run? How many trains per hour?
- What are the operating speeds in different sections of the alignment?
- Use American companies and labor to construct the system.
- Will built sections operate while others are constructed?
- Will the trains be privately owned/operated?
- Who will ride the high-speed trains?

Public Involvement and Outreach
- Provide more visuals and track diagrams at meetings.
- Explain the purpose of the meeting better.
- Some neighborhoods along the alignment did not receive notification of the meetings.
- Who ultimately approves the Final EIR/EIS?

3.0 ALTERNATIVES ANALYSIS PUBLIC MEETINGS: DECEMBER 2009-JANUARY 2010

The initial alignment alternatives distilled from scoping and shared with the public during meetings in October 2009 were further evaluated using established criteria. This evaluation of the alternatives was reviewed with the FRA and Authority at a workshop in November 2009. At the workshop, the FRA and Authority preliminarily identified which alignment alternatives, stations, and design options should be carried forward into the EIR/EIS process. These recommendations were presented to the Authority Board of Directors in early December, and were shared with the public during meetings held in December 2009 and January 2010.

3.1 Notification of December 2009-January 2010 Meetings

A bilingual postcard was mailed to approximately 14,000 property owners and stakeholders within the programmatic alignment and new alternative alignment options (Note: this figure was reduced from the October 2009 mailing due to mail sent to undeliverable addresses).

Display ads ran twice in the following newspapers: *San Jose Mercury News, Merced Sun Star, Madera Tribune, Fresno Bee, Morgan Hill Times, Hollister Freelance, Gilroy Dispatch, Big Valley Classifieds, Thang Mo* (Vietnamese), *Sing Tao Daily* (Chinese), *El Observador* (Spanish), and *La Oferta Review* (Spanish). Two e-mail blasts were sent to approximately 3,350 agencies and members of the public.

3.2 December 2009-January 2010 Meeting Activities

Three formal agency and public alternatives analysis open house meetings were conducted in December 2009 and January 2010 in San Jose, Gilroy and Merced (see **Table 2**). In total, the public meetings drew approximately 300 participants.

Each meeting was an open house format (providing an opportunity to talk with project staff). A short PowerPoint presentation ran on a loop, with information about the alignment alternatives and decision-making process by the Authority, as well as visual simulations of the project area.

Table 2: Alternatives Analysis December 2009-January 2010 Meeting Locations and Times

Date	City	Location/Address	Time
12/17/2009	Merced	Merced Community Senior Center 755 West 15th Street, Merced*	4:00-7:00 p.m.
1/11/2010	Gilroy	Gilroy Hilton Garden Inn 6070 Monterey Road, Gilroy	6:00-8:00 p.m.
1/12/2010	San Jose	Roosevelt Community Center 901 East Santa Clara Street, San Jose	6:00-8:00 p.m.

**Joint meeting with the Merced to Fresno HST project section.*

Fact sheets were distributed, and alternatives analysis evaluations and aerial maps were available. The fact sheet can be found on the Authority's website(www.cahighspeedrail.ca.gov). Spanish-speaking members of the project team and informational materials were made available, as were project fact sheets in Chinese and Vietnamese.

At each meeting, attendees were asked to sign in and provide contact information so that they could be notified of future project activities.

Written comments (submitted through comment cards, e-mails and letters) are included and summarized in see **Section 3.3**.

3.3 Summary of Comments Submitted During the December 2009-January 2010 Meetings

Written comments were received from several commenters, through letters, e-mails and comment cards (submitted during the meetings and via mail).*

**Note: at the joint Merced meeting with the Merced-Fresno team, letters and comment cards were submitted that applied to either the Merced-Fresno section, San Jose to Merced section, or both sections. Only comments that are applicable to the San Jose to Merced section or the entire statewide HST system are included in this count and summary.*

The outline below provides a general overview of the comments received during the December 2009 and January 2010 alternatives analysis public open houses, as well as input received after the open houses, organized by geographical alignment location and then by EIR comment category.

GEOGRAPHICAL ALIGNMENT LOCATION

San Jose Near Station Alignment Alternatives

- Tunnel the alignment in order to achieve maximum speed, avoid negative impacts to surrounding neighborhoods and communities, and minimize noise and vibration.
- Aerial structures are divisive, will cause blight and ruin the quality of life in San Jose, and will negatively impact property values.
- A preferred alternative should increase developable land, decrease noise and vibration for residents, and provide a more direct (straight) path of travel.

Morgan Hill-Gilroy Alignment Alternatives

- Avoid impacts to the Morgan Hill Aquatic Park and Sports Complex.
- Avoid impacts to Frazier Lake Airpark.
- Minimize the impact of the alignment on neighborhoods, communities and the environment, and preserve historic and environmental resources.
- Use a trench or tunnel in downtown Gilroy.
- The alignment should run through downtown Gilroy.
- The U.S. 101 East Gilroy alignment would destroy neighborhood communities, wildlife, and active farmland, as well as decrease property values due to increased noise and urbanization.
- The U.S. 101 East Gilroy alignment was conceived from a scoping process that did not include input from the communities that would suffer impacts.
- An alignment through the unincorporated area east of Highway 101 would devastate the environment and overlook the regulations which preserved much of the remaining open space land in Santa Clara County.
- The alignment should be along the Altamont Pass route, or if through the Pacheco Pass, must follow existing railway right-of-way along Monterey Highway west of 101.

Pacheco Pass Alignment Alternatives

- Keep the alignment at Dinosaur Point Road and Highway 152 north of the homes in this area.

San Joaquin Valley Crossing Alignment Alternatives

- Protect prime agricultural farmland by placing the alignment near existing transportation corridors.

EIR COMMENT CATEGORY

Transportation

- Consider a connection to the San Jose International Airport.
- The final alignments should allow maximum interconnectivity with existing rail (Caltrain/JPB) at Diridon (San Jose), Gilroy and Amtrak stations.
- Will there be connections to Salinas and the Monterey Peninsula?

Noise and Vibration

- Publish the sound impacts to neighborhoods in San Jose, Morgan Hill and Gilroy.
- Use sound walls.
- How will homes be protected from damage from movement and foundation cracks?

Public Utilities and Energy

- Build an atomic power plant to eliminate fossil fuel and carbon dioxide emissions.

Safety and Security

- What happens to homes adjacent to the tracks if a train derails?

Socioeconomics, Communities and Environmental Justice

- Keep San Jose neighborhood communities intact.
- What will be the project's financial impact on homes in neighborhoods that the train passes through?

Local Growth, Station Planning and Land Use

- Keep schools and affordable housing in mind when locating stations.
- Avoid additional sprawl.

- Put a station in downtown Gilroy rather than by the outlets.
- Build "green."
- Put the maintenance facility at the Castle Air Force Base in Merced.
- Will stations be considered in Los Banos or Santa Nella?

Agricultural Land
- Do not run trains through agricultural land, which will cause farmers to lose their land and decreases their property values.

Parks, Recreation and Open Space
- Consider planned and recreational trailways and bikeways throughout Gilroy when determining the route.

Aesthetics and Visual Quality
- Homeowners adjacent to the tracks in San Jose will have unpleasant views of the trains in their backyards.

Capital Costs
- Jobs related to the high-speed trains should be union jobs with benefits.
- How much of the project cost will be the responsibility of the residents of the cities that the trains run through?
- Why have cost estimates increased by $9 billion?
- Ridership numbers are flawed.

Operations and Maintenance Costs
- Include shields for debris as trains run through Gilroy.

Public Involvement and Outreach
- Keep routes and photos updated on the project website.
- Provide presentations at all meetings.
- The project needs imaginative new leadership and better communication efforts.

4.0 SOUTH OF DIRIDON STATION TO TAMIEN STATION ALTERNATIVES ANALYSIS COMMUNITY WORKSHOP: MARCH 2, 2010

A community workshop focusing on the alignment alternatives in the South of Diridon Station to Tamien Station area in San Jose was held on March 2, 2010. The main objective of the workshop was to continue to engage the community in a collaborative manner during the alternatives screening process. Community members were invited to learn more about the alternative alignment options in the south of Diridon Station area (including details on the tunnel alternatives) and provide input to the project team.

The desired outcome of the meeting was to increase community understanding and awareness about these particular alignment alternatives and the alternatives screening process. An additional goal was to improve trust among the stakeholders and project team and provide clarity about how community issues will be incorporated into ongoing studies.

4.1 Workshop Notification

A bilingual postcard was mailed to approximately 19,500 San Jose residents in the project area (Note: the existing mailing list for San Jose was extensively supplemented with additional postal carrier data to capture the greatest number of residents in the area). Two e-mail blasts were sent to approximately 850 San Jose-specific elected officials, agencies and members of the public.

4.2 Workshop Activities

The San Jose community workshop was held on March 2, 2010 (see **Table 3**). The workshop drew approximately 150 participants.

The workshop began with an open house, which allowed attendees to familiarize themselves with the project through graphics, maps and exhibit boards. Project staff was available to answer questions. Attendees were asked to submit questions to the panel via handwritten question cards.

Project staff gave a PowerPoint presentation, which included an overview of the project status and schedule, and information on the alignment alternative options south of Diridon Station and tunnel evaluations. The presentation showed visual simulations of the refined program alignment, SR 87/I-280 alignment, and an iconic bridge structure.

A Q&A session with a panel of local leaders (see **Table 4**) followed the presentation. Community members and a member of the project team collected and sorted the question cards submitted before the presentation, and gave the panelists 17 questions representative of the community's major concerns. Following the panel discussion around these questions, the panelists responded to additional questions from the audience. At the conclusion of the question and answer session, the open house resumed.

Table 3: San Jose Community Workshop Location and Time

Date	City	Location/Address	Time
3/3/2010	San Jose	Gardner Community Center 520 West Virginia Street	6:30-9:30 p.m.

Table 4: San Jose Community Workshop Panelists

Name	Affiliation
Dan Leavitt	California High-Speed Rail Authority Deputy Director
Gary Kennerley	Regional Program Manager
Dave Mansen	Section Project Manager
Juan Duran	Project Engineer
Harvey Darnell	San Jose Community Member
Sam Liccardo	San Jose City Councilmember, District 3
Pierluigi Oliverio	San Jose City Councilmember, District 6
Ben Tripousis	San Jose Department of Transportation
Bob Doty	Peninsula Rail Program/Caltrain
Ron Moriguchi	Caltrans
Steve Fisher	Santa Clara Valley Transportation Authority
Eileen Goodwin	Moderator

A Spanish interpreter and meeting materials were available at the meeting.

Attendees were asked to sign in and provide contact information so that they could be notified of future project activities.

Written comments are summarized in this report (see **Section 4.3**).

4.3 Summary of Comments Submitted During the March 2010 San Jose Community Workshop

Written comments were received from several commenters, through question cards, comment cards, and letters. The outline below provides a general overview of the comments received during the San Jose community workshop, organized by EIR comment category.

<u>Purpose and Need for the High-Speed Train System in California</u>
- How accurate are ridership estimates?

<u>Alternatives Carried Forward for Environmental Review</u>
- Consider the San Jose Split option, with a tunnel and aerial alignment since not all trains need to pass through Diridon Station.
- Identify the train service hours of operations and the speed of the trains.

<u>Transportation</u>
- Identify the speed benefits and feasibility of a HSR tunnel through the Diridon area and technical options with tunnel alignment, including electrification.
- How feasible is the I-280/SR-87 corridor?
- Put a tunnel under Monterey Road instead of reducing traffic lanes.
- Use the existing train corridor right-of-way to impact the fewest number of residents.
- What will be the impacts of creating two new tracks along the Fuller Park alignment (vs. previous understanding of one new track)?
- How will automobiles access neighborhoods and the freeway if right-of-way crossings are closed?

<u>Air Quality</u>
- What will be the impacts on air quality?

<u>Noise and Vibration</u>
- Provide an estimate of noise levels (including tunnel vents), and identify the noise measurement methodology that will be used.
- What are potential noise mitigation measures? Who will be responsible for enforcing them, and by when?
- What will the construction hours be?
- How many trains per day will pass through the area?

<u>Public Utilities and Energy</u>
- What constitutes clean energy? What type(s) will be used?

<u>Geology, Soils, Seismicity</u>
- Why is a BART tunnel feasible in this soil and not a HSR tunnel?

<u>Safety and Security</u>
- Identify traffic and pedestrian safety measures near HSR tracks.
- Elevated rail would avoid at-grade delays and safety concerns from cars and people on tracks.
- HSR could impact the level of neighborhood blight and therefore safety/security.

<u>Socioeconomics, Communities and Environmental Justice</u>
- What are the rights of renters who are living in potentially affected properties?
- Fuller Park alignment retaining wall could impact community cohesion.
- There is the potential for graffiti, neighborhood blight and construction disturbances along Jerome Street backyards.
- There will be environmental and social justice issues with initiating a new large-scale project in Gardner area.

<u>Local Growth, Station Planning and Land Use</u>
- Consider the land use impacts that will occur due to aerial structures; the typical land use under aerial structures is not aligned with current Gardner area land uses.
- How will home and property values be impacted?
- Will there be property takes? How will they be mitigated?
- How will damage to property be mitigated during construction?
- Consider possible property impacts caused by a potential train emergency.

<u>Parks, Recreation and Open Space</u>
- Consider the train's impacts on trees and parks, particularly Fuller Park.
- If Fuller Park is impacted, what will be the mitigation efforts and timeline to enforce them?

Aesthetics and Visual Quality
- Consider the aesthetics of fencing and retaining wall around HSR.
- Potential for a retaining wall to become a graffiti target.
- Consider impacts on historic railway bridges and aesthetics of new structures.

Cultural Resources
- There may be impacts to the San Jose Word of Faith Church (873 Delmas Ave.)
- What will be the impacts to historic railway crossing bridges?

Cumulative Impacts
- Gardner neighborhood bears a disproportionate burden of HSR impacts.

Capital Costs
- How much will it cost to build each HSR segment? How much will a tunnel cost?
- Which agency pays for which elements, particularly station elements?

Operations and Maintenance Costs
- Have other cities successfully generated HSR revenues?
- What is the City of San Jose's responsibility toward operations and maintenance costs?
- Are there long-term funding sources for mitigations against blight?

Public Involvement and Outreach
- Request for chart that explains ground-surface impacts of aerial option.
- Request for street-level views of each alternative, including scale of railroad bridges.
- Request for full Spanish translation of website.
- Provide information on the project timeline, timeline for information availability, and EIR process.

Agency Consultation
- What is the process for negotiation between the Authority, City of San Jose, BART, VTA, etc.?
- What is the effect of the Palo Alto lawsuit on the overall project?

5.0 GILROY CITY COUNCIL STUDY SESSION: MAY 3, 2010

The San Jose to Merced Section team gave a project update presentation to the Gilroy City Council and members of the public during a City Council Study Session on May 3, 2010.

The main objective of the study session was to provide the Council and the public with an update on the Revised Program-Level EIR, alternatives analysis in the Gilroy area, and a plan for a dynamic community engagement process. Prior to the study session, the team held an informal open house and displayed large preliminary alternatives analysis maps that showed each proposed alignment in the Morgan Hill-Gilroy area in detail.

The desired outcome of the study session was to increase community understanding and awareness about the latest project developments and proposed alignment alternatives.

5.1 Study Session Notification

Display ads ran in *The Gilroy Dispatch, Morgan Hill Times*, and *Hollister Freelance*. The meeting notice also was posted on the Authority and City of Gilroy's websites. Two bilingual e-mail blasts were sent to approximately 300 Gilroy, Morgan Hill, San Martin and Hollister elected officials, agencies and members of the public who had requested e-mail notifications.

5.2 Study Session Activities

The Gilroy City Council Study Session was held on May 3, 2010 (see **Table 5**) and drew approximately 100 participants.

The study session began with an informational map viewing, which allowed attendees to view the most current preliminary alternatives analysis maps in detail. Project staff was available to answer questions and respond to comments. Attendees were asked to submit speaker cards to speak during the study session.

Project staff gave a PowerPoint presentation, which included an overview of the Revised Program-Level EIR, the alternatives analysis process, and information on the targeted community engagement process. Following the presentation, Gilroy Mayor Al Pinheiro began a councilmember discussion and then invited members of the public to comment. After the public comment session, project staff answered specific questions from councilmembers and members of the public.

Table 5: Gilroy City Council Study Session Workshop Location and Time

Date	City	Location/Address	Time
5/3/2010	Gilroy	Gilroy City Council Chambers 7351 Rosanna Street	4-5:30 p.m. – Informational map viewing 5:30-7:00 p.m. – Study Session

Attendees were asked to sign in and provide contact information so that they could be notified of future project activities.

Comments from the study session are summarized in **Section 5.3**.

5.3 Summary of Comments Submitted During the Study Session

Verbal comments were made by the Gilroy mayor and councilmembers, as well as members of the public.

The following outline provides a general overview of the comments received during the Gilroy Council Study Session, organized by geographical alignment location and then by EIR comment category.

Geographical Alignment Location

Morgan Hill-Gilroy Alignment Alternatives

- What is the status of negotiations with UPRR? What will happen if UPRR does not allow the Authority to share its right-of-way?
- Why is the Authority looking at options that may not be feasible, such as those that depend on UPRR right-of-way?
- The East of 101 alignments will have substantial impacts on residents, communities, quality of life, property values, agriculture and livestock.
- It was suggested that those opposed to the project consider supporting state legislation to end funding for the Authority and/or vote "no" on future bond measures.

EIR Comment Category

Transportation

- Local road closures in the east of 101 area will adversely impact residents and property owners.

Noise and Vibration

- Vibration will damage historic buildings' unreinforced masonry.

Socioeconomics, Communities and Environmental Justice

- Historic resources in the Gilroy community need to be protected.
- The East of 101 alignments will impact property values adversely. In addition, the proposed high-speed train is inconsistent with existing land uses in the area. People in this area don't want their quality of life negatively impacted by the train in this area.

Agricultural Land

- How will the Authority mitigate impacts to agricultural land?

Capital Costs

- How will the $2 billion in federal funding be used?
- Who is budgeting for eminent domain?

Public Involvement and Outreach

- Will CSS be used? How will residents be involved?
- Money should not be an issue when it comes to outreach.
- People living in the unincorporated areas of Gilroy feel like they do not have representation or a voice in the project.
- People are just now becoming aware of the impacts of this project and their implications.
- The Authority has a one-size-fits-all outreach process, which does not work.
- There should have been a more robust public engagement effort earlier.
- Alternative alignment maps should be made available to the public immediately.
- The Santa Clara County Board of Supervisors needs to be engaged more thoroughly.
- Request to send Gilroy-related public comments to Gilroy Councilmember Cat Tucker.

6.0 SOUTH OF DIRIDON STATION TO COYOTE CREEK ALTERNATIVES ANALYSIS OPEN HOUSES: MAY 5-6, 2010

The San Jose to Merced Section team hosted two open houses about the alternatives analysis in the South of Diridon Station to Coyote Creek area on May 5 and 6, 2010.

The main objective of the open houses was to provide updated information on the alignment alternatives being considered for the San Jose area, including new information on a shallow tunnel alignment currently under evaluation.

6.1 Open House Notification

A bilingual postcard was mailed to approximately 20,000 San Jose residents in the project area. Two e-mail blasts were sent to approximately 900 San Jose elected officials, agencies and members of the public.

6.2 Open House Activities

The San Jose open houses were held on May 5th and 6th, 2010 (see **Table 6**). Together, they drew approximately 130 participants.

At the open houses, attendees viewed exhibit boards and detailed maps showing the most current information available on the alternative alignments in the area. Project staff was available to answer questions and respond to comments. **Section 6.3.** provides a summary of comments made via comment cards and flip charts at these open house meetings. Attendees were asked to sign in and provide contact information so that they could be notified of future project activities.

Table 6: South of Diridon Station to Coyote Creek Open House Locations and Times

Date	City	Location/Address	Time
5/5/2010	San Jose	Gardner Community Center 520 West Virginia Street	6:00 – 8:00 p.m.
5/6/2010	San Jose	Santa Teresa Public Library 290 International Circle	6:30 – 8:30 p.m.

6.3 Summary of Comments Submitted During the Open Houses

Written comments were made by several people during the open houses, via comment cards. The outline below provides a general overview of the comments received during the open houses, organized by geographical alignment location and then by EIR comment category.

Geographical Alignment Location

San Jose Near Station Alignment Alternatives

- Refined program alignment
  - The Authority is selecting an alternative alignment based on expediency and low cost by following the Caltrain right-of-way.
  - Impacts to the North Willow Glen, Gardner and Gregory Plaza neighborhoods, including property takes, traffic, noise, dust and vibration are a concern.
  - This alignment will cut Fuller Park in half.
  - Necessitates local road modifications with impacts:
    - Proposed closure of West Virginia Avenue eliminates one of only two roadways for the Gregory Plaza neighborhood.
    - The elimination of ingress/egress from Drake Avenue to West Virginia imposes a hardship for students walking to neighborhood schools and bus stops.
    - Expanding the Bird Avenue Bridge to accommodate two HST trains will force the pedestrian traffic from West Fuller Avenue to cross underneath four lines of tracks.
  - Any aerial option should meet surrounding communities' aesthetic standards.
- Shallow tunnel alignment
  - Has fewer neighborhood impacts
  - A straight tunnel alignment will allow trains to travel faster
  - How will conflicts between this alignment and the proposed baseball park be reconciled?
  - Follows the topography of the valley and is less intrusive.
- The selected HST alignment should provide for the connection of both parts of the planned Three Creeks Trail, either by a tunnel or by a bridge over the tracks.
- Preserve the SR 87 bike path between Willow Street and Curtner Avenue.
- The tunnel alignments are straight lines, which are the best and fastest routes for HSR. Building it as straight as possible the first time will allow the Authority to take advantage of future technologies to further reduce travel times. An alignment with sharp curves will always limit speeds and will increase travel times.

Monterey Highway Alignment Alternatives

- Concerns about pedestrian access and safety at Blossom Hill Road, Branham Lane, Capitol Expressway and Chynoweth/Roeder Road.
- Pay attention to new development in the area south of Blossom Hill Road.
- Put the Monterey Highway HST tracks in a trench
- Narrowing Monterey Highway will have significant impacts to the community.
- The Millpond Mobile Home community will be affected, especially by noise from the trains. Please build a soundwall here.
- Retain bike lanes on Monterey Highway, but don't place them adjacent to HST tracks.
- Include a pedestrian overpass over the HST tracks and Monterey Highway to connect the neighborhood.
- Concerns about the noise and visual impacts of the elevated section between Alma and Almaden.

EIR Comment Category

Transportation

- Comparison of California to Europe with regards to HST is naïve because there are multiple forms of transportation outside European HST stations, and European cities/towns are centralized and do not require additional use of a car.

Noise and Vibration

- How will the Authority deal with noise?

Safety and Security

- How will deaths at HST tracks be prevented?

Local Growth, Station Planning and Land Use

- Diridon Station should be preserved and not overshadowed by any above-ground track pylons.

Aesthetics and Visual Quality

- How will the Authority deal with graffiti?

Operations and Maintenance Costs

- How fast will the trains travel within San Jose?

Public Involvement and Outreach

- Provide "you are here" indicators and compasses on alignment maps.
- Refer to alignments as "routes."
- Why was a public meeting scheduled on Cinco de Mayo, considering that a large percentage of residents in the Gardner neighborhood and on Jerome Street are Latino?
- Thank you for gathering public opinions.

7.0 LIST OF STAKEHOLDER AND AGENCY MEETINGS

In addition to the public meetings previously summarized in this report, several stakeholder and agency meetings also took place during the alternatives analysis phase. Members of the project team met with interested stakeholders and agencies to discuss the environmental review process and alternative alignments in their particular regions. A table listing the meetings and the dates they were held is below.

Table 7: Stakeholder and Agency Meetings

Date	Organization
9/3/2009	Technical Working Group Meeting #1 (Gilroy)
9/10/2009	Technical Working Group Meeting #1 (Merced)
9/12/2009	Diridon Station Area Plan Visioning Workshop
9/17/2009	City of Gilroy
9/23/2009	USACE, US Fish and Wildlife Service, Regional Water Quality Control Board, California Department of Fish and Game
10/5/2009	City of San Jose
10/5/2009	EPA/USACE
10/6/2009	Voices of San Jose
10/7/2009	Nature Conservancy
10/7/2009	City of Morgan Hill
10/12/2009	City of San Jose
10/14/2009	Caltrans
10/28/2009	Diridon Station Working Group
10/29/2009	South Terminal/Diridon Station Working Group
11/2/2009	Gilroy City Council (Study Session)
11/12/2009	FRA
11/12/2009	HP Pavilion
11/13/2009	Gilroy Chamber of Commerce Government Relations Committee
11/13/2009	VTA
11/17/2009	Grasslands Water District
11/18/2009	South San Jose residents
11/18/2009	UPRR
11/24/2009	*Gilroy Dispatch* Editorial Board
11/24/2009	Gilroy Rotary Club
12/1/2009	Department of Water Resources
12/7/2009	Diridon Good Neighbor Committee
12/14/2009	Technical Working Group Meeting #2 (Merced)
12/15/2009	City of Gilroy
12/15/2009	City of San Jose Department of Transportation
12/16/2009	Technical Working Group Meeting #2 (Gilroy)
12/18/2009	UPRR
1/4/2010	California Department of Conservation
1/5/2010	City of San Jose
1/5/2010	National Marine Fisheries Service
1/5/2010	City of San Jose Department of Transportation and Redevelopment Agency
1/7/2010	*San Jose Mercury News* Editorial Board
1/8/2010	City of San Jose
1/11/2010	City of Gilroy
1/12/2010	City of San Jose
1/12/2010	VTA
1/14/2010	Peninsula Rail Program
1/14/2010	*San Jose Mercury News* Editorial Board
1/20/2010	Soap Lake Floodplain Representatives
1/20/2010	Santa Clara Valley Water District
1/21/2010	Voices of San Jose
1/30/2010	Shasta-Hanchett Park Neighborhood Association Annual Meeting
2/1/2010	Diridon Good Neighbor Committee
2/1/2010	Santa Clara County District 1 Supervisor Don Gage
2/1/2010	Gilroy City Council (Study Session)
2/8/2010	San Jose District 2 Constituents
2/9/2010	UPRR
2/10/2010	EPA/USACE
2/12/2010	Gilroy Chamber of Commerce Government Relations Committee
2/22/2010	Authority Chairman Pringle's Mayors Meeting
3/2/2010	City of San Jose
3/3/2010	City of Gilroy
3/10/2010	City of Morgan Hill
3/17/2010	Diridon Good Neighbor Committee
3/27/2010	Diridon Station Area Plan Community Workshop
3/29/2010	Department of Water Resources
4/5/2010	Transportation Agency for Monterey County Rail Policy Committee
4/9/2010	Merced County
4/14/2010	City of Gilroy
4/29/2010	SPUR City Trip to San Jose
5/18/2010	Cities of Los Banos and Dos Palos
5/26/2010 (upcoming)	Diridon Good Neighbor Committee

8.0 NEXT STEPS IN THE EIR/EIS PROCESS

The information obtained during the alternatives analysis meetings from public agencies, organizations, and individuals will be used in the subsequent phases of preparing the environmental documentation. Specifically, the Authority and FRA will:

- **Review the suggestions for alignment alternatives and station options** – The Authority and the FRA will determine which alternatives should be fully evaluated in the EIR/EIS. This effort will consider the Purpose and Need for the project, engineering feasibility, support of community land use plans and policies, and environmental considerations in determining the number of alternatives to be fully investigated in the EIR/EIS.

- **Implement a comprehensive public involvement process** – The Authority and the FRA are sensitive to community's desire for an open, transparent public process that allows for an increased level of sharing information and progress on the environmental documentation. To that end, the Authority and the FRA prepared an Agency Coordination Plan that will be used to identify junctures in the process when such information would be timely. As part of this plan, public agencies will be invited to a series of meetings to discuss interim engineering and environmental products. The first two series of agency meetings were held in September and November 2009 and the next round is planned for summer 2010 (following the release of the Preliminary AA Report).

- **Refine project description** – Following the alternatives analysis, the Authority and the FRA will update the project description, identify design options, and begin to formulate more detailed engineering drawings that can be used for environmental analysis. The project description will describe the proposed route, vertical profile alternatives (i.e., above grade, at grade, or below grade), operating plan (e.g., the hours of operations, the number of station stops, the frequency of service), systems and facilities needed to support the HST (e.g., safety and security measures, communications, maintenance, electrical propulsion), and techniques and length of time required to construct the HST system.

- **Commence technical studies** – The alternatives analysis and updated project description will define the focus of the environmental analyses. Technical studies that will encompass the physical and socioeconomic environment will be initiated to document the existing environmental setting and then assess how the alternatives would change this setting. Suggestions of the issues and topics to be evaluated that were received during the scoping process will be used in identifying the impacts of the project alternatives.

These tasks will occur during the coming year. It is expected that in 2011 a Draft EIR/EIS will be distributed to the public and agencies for review and comment. The Draft EIR/EIS will be a compilation of the technical studies and will describe the environmental consequences if the HST project were to be approved, as well as the mitigation measures that could be taken to avoid or reduce significant impacts identified in the Draft EIR/EIS. Substantive comments on the Draft EIR/EIS will be responded to in a Final EIR/EIS. Circulation of the Final EIR/EIS is anticipated by 2012. Authority and FRA approval of the Final EIR/EIS would follow later in 2012, and construction would begin in late 2012 or early 2013.

9.0 PREPARERS

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