California High-Speed Rail Authority

San Jose to Merced Project Section

Draft Environmental Impact Report/ Environmental Impact Statement

Section 3.20
Design Variants to Optimize Speed

April 2020

CALIFORNIA High-Speed Rail Authority

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being or have been carried out by the State of California pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated July 23, 2019, and executed by the Federal Railroad Administration and the State of California.

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ACRONYMS AND ABBREVIATIONS

APE	Area of potential effect
Authority	California High-Speed Rail Authority
BAAQMD	Bay Area Air Quality Management District
BMP	best management practice
CEMOF	Caltrain's Central Equipment and Maintenance Facility
DDV	Diridon design variant
DPM	diesel particulate matter
EIR	environmental impact report
EIS	environmental impact statement
EMF	electromagnetic field
EMI	electromagnetic interference
FRA	Federal Railroad Administration
GHG	greenhouse gas
HRA	health risk assessment
HSR	high-speed rail
I-	Interstate
IAMF	impact avoidance and minimization feature
LOS	level-of-service
MOWF	maintenance of way facility
NEPA	National Environmental Policy Act
PM	particulate matter
project or project extent	San Jose to Central Valley Wye Project Extent
PUE	public utilities and energy
RSA	resource study area
SR	State Route
TAC	toxic air contaminant
TDV	Tunnel design variant
UPRR	Union Pacific Railroad
US	U.S. Highway
VMT	vehicle miles traveled

3.20 Design Variants to Optimize Speed

3.20.1 Purpose

The purpose of this section is to document the incremental differences in environmental effects for two design variants that are available to optimize speeds along the San Jose to Central Valley Wye project extent.

3.20.2 Description and Rationale for Design Options

The Authority has developed two design variants intended to optimize train speed. The first is located north and south of Diridon Station and at the station platforms and, if adopted, would apply only to Alternative 4. The second is located at the two tunnels east of Gilroy and through the Pacheco Pass and would apply to all four alternatives.

3.20.2.1 Diridon Design Variant (DDV)

The DDV consists of alterations to Alternative 4 (i.e., as compared to the preliminary design in Volume III) in the San Jose Diridon Station north and south approaches and platform modifications to increase the 15-mph limitation to the design speed of the existing alignment to a 40-mph design. North of the station, the design alterations would change the horizontal placement of the freight and electrified passenger tracks up to 37 feet to the east between Santa Clara Street and Julian Street. This would require up to 23 feet of additional property from the SAP parking lot on the east side of the rail corridor and one additional commercial property. In the platform area of Diridon Station, the HSR southbound track would shift 4 to 10 feet to the east in two discrete areas (one 117 feet long on the north side of the station and the other 92 feet long on the south side), and the platforms would be cut or filled to adjust to the revised alignment. The HSR northbound track would shift up to 2 feet to the west in one discrete area (466 feet long in the southern part of the station), and the platform would be filled to adjust. The two westernmost station tracks (used by Caltrain and occasionally other services) would move up to 5 feet to the west on the southern end of the station. None of the track shifts in the station area would require the acquisition of additional right-of-way From the south end of the station to San Carlos Street, the design alterations would adjust the horizontal placement of the electrified passenger tracks by up to 1 foot and would not require any additional right-of-way. The Santa Clara VTA light-rail line storage track south of the station would be cut short by about 50 feet to maintain adequate spacing to the HSR mainline tracks (Authority 2020).

The rationale for the Alternative 4 preliminary design without the DDV was to bring high-speed rail service to San Jose Diridon Station with minimum changes to the Peninsula Corridor Electrification Project infrastructure, where track geometry restricts speeds approaching and through the station to 15 mph. The Authority has developed the DDV to provide design speeds of 40 mph to, from, and through Diridon Station, comparable to the design speeds provided by Alternatives 1, 2 and 3. The location of the DDV is identified in Figure 3.20-1.

Source: Authority 2019
CEMOF = Centralized Equipment Maintenance and Operation Facility

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Figure 3.20-1 Extent of Diridon Design Variant

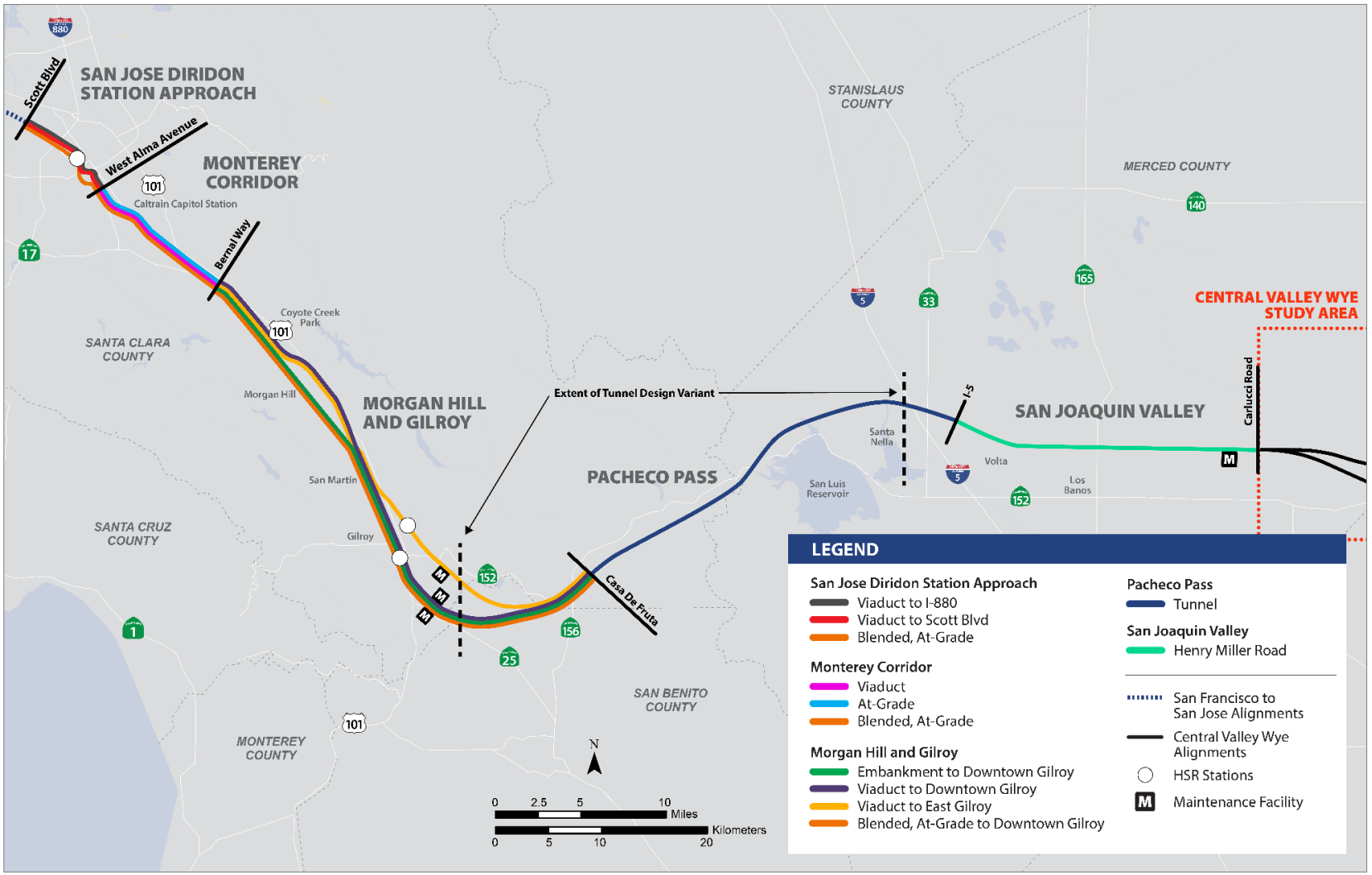
3.20.2.2 Tunnel Design Variant (TDV)

The tunnel design variant (TDV) consists of alterations to all the Alternatives (i.e., as compared to the preliminary design in Volume III) of the tunnel and tunnel approaches in the Morgan Hill and Gilroy Subsection (Tunnel 1) and the tunnel and tunnel approaches in the Pacheco Pass subsection (Tunnel 2) to accommodate an operating speed of 220 mph. Accordingly, the TDV consists of physical changes (described in the next paragraph) and operational changes (i.e., increased speed in the tunnels and outside the tunnels in the tunnel approaches from 200 mph to 220 mph).

The TDV would not change the location of the horizontal curves, the alignment through Tunnel 1 and Tunnel 2, or the diameter of the tunnels. The superelevation[1] of tracks approaching and through both tunnels would be increased to accommodate the faster operating speeds. The TDV would flatten a set of vertical curves inside Tunnel 2. The locations of the vertical curves are near the highest subsurface location within Tunnel 2. The changes to the vertical curves would modestly increase tunnel depth as compared to the Tunnel 2 design of the Alternatives without the TDV. Since the Tunnel 1 and Tunnel 2 location and design are equivalent across Alternatives 1 through 4, the TDV could be applied to any of the alternatives.

The rationale for the preliminary tunnel designs of the Alternatives without the TDV was to reduce the cost of the construction of the tunnels by reducing the tunnel diameter, despite the speed limitation. The Authority has developed the TDV to provide design speeds of 220 mph and has identified how it can achieve speeds without increasing the tunnel diameter so that costs of construction are the same. The location of the TDV is identified in Figure 3.20-2.

[1] *Superelevation* is the vertical distance between the height of the inner and outer rails at a curve. Superelevation is used to partially or fully counteract the centrifugal force acting radially outward on a train when it is traveling along the curve.



Source: Authority 2019

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Figure 3.20-2 Extent of Tunnel Design Variant

3.20.3 Environmental Impact Differences of Diridon and Tunnel Design Variants Compared to the Alternatives Without Diridon and Tunnel Design Variants

This section describes the incremental differences in environmental effects between the project with the DDV and TDV compared the project without the DDV and TDV.

3.20.3.1 Areas with No Differences

Neither the DDV nor the TDV would have environmental impact differences as compared to the Alternatives without the DDV and TDV in the following areas:

Greenhouse Gases

Construction

The construction effort and materials with the DDV and TDV would be approximately the same as the alternatives without the DDV and TDV; therefore, associated greenhouse gas (GHG) emissions would be approximately the same.

Operations

Train operation would use slightly more electricity than the alternative without the DDV and TDV due to higher speeds facilitated by the DDV and the TDV. The analysis in Section 3.3, Air Quality and Greenhouse Gases, conservatively assumes the HSR system would be powered by the state's current electrical grid, which is composed of renewable and nonrenewable generating units. The Authority's goal is to use 100 percent renewable energy to power the HSR system. If the electricity used to power HSR trains comes from renewable energy sources in whole, this energy source would avoid GHG emissions from electricity generation, and there would be no increase in GHG emissions from operations with the design variants as compared to operations with the alternatives without the DDV and TDV. If the energy used to power HSR trains is partially derived from renewable sources, then there would be a slight increase in electricity related GHG emissions. However, the project would still result in a substantial net reduction in GHG emissions so that the level of effect with the design variants would not change compared to alternatives without the DDV and TDV.

Electromagnetic Fields/Electromagnetic Interference (EMF/EMI)

Construction

Construction effort for the design variants would be approximately the same as the alternatives without the DDV and TDV and would occur in the same general location and thus construction would not result in any change in the generation of electromagnetic fields (EMFs) during construction.

Operations

Due to higher speeds in the areas of the design variants, HSR train operations would generate slightly higher EMFs in the DDV and TDV area than the alternatives without the DDV and TDV. However, the analysis in Section 3.5, EMF/EMI of the alternatives without the DDV and TDV shows that HSR train operation EMFs would not have significant effects under CEQA even at the maximum speeds with the design variants (including up to 220 mph in part of the San Joaquin Valley subsection) to receptors who are located at the same distance or closer to the alignment than receptors along the DDV and TDV segments.

Public Utilities and Energy

Construction

The change in alignment with the DDV may affect additional buried utilities, but with implementation of PUE-IAMF#3, the construction contractor would coordinate with utility providers to minimize and manage any temporary utility disruption and there would be no change in utility impacts compared to Alternative 4 without the DDV.

The change in tunnel vertical alignment with the TDV would not affect any new utilities and would consume the same amount of energy as the alternatives without the TDV. TDV superelevation construction would not change effects on utilities or energy compared to the alternatives without the TDV.

Operations

HSR train operations could use slightly more electricity due to the increase in speeds in the DDV and TDV areas. There will be adequate electricity supply to meet this slight increase in electricity. The project would still result in a substantial net reduction in energy consumption due to the offsetting effects of reducing vehicular fuel consumption.

Hydrology and Water Quality

Construction

There are no waterbodies or wetlands affected by the change in alignment or footprint associated with the DDV.

There would be no change in construction effort or footprint with the TDV, and no new surface water bodies would be directly affected. The slight shift in vertical tunnel alignment for the TDV (less than 10 feet) would not change the indirect effects related groundwater inflow into the tunnel during construction and any related effects on surface water.

The amount of construction effort for the design variants would be approximately the same as the alternatives without the DDV and TDV; therefore, the construction period potential for erosion/sedimentation/construction material spills would be approximately the same.

Operations

The DDV would slightly change the amount of impervious surfaces as compared to Alternative 4 without the DDV, but this would not materially change the amount of surficial runoff. The DDV is not located within a floodplain or regulated floodway and thus there would be no change in flooding effects.

The TDV would not change the amount of impervious surfaces. The TDV would not change the infrastructure encroachment into the Soap Lake floodplain or any other floodplains and thus there would be no change in flooding effects.

Geology, Soils, Seismicity, and Paleontological Resources

Construction

The amount of construction effort for the design variants would be approximately the same as the alternatives without the DDV and TDV and thus construction period potential for erosion would be approximately the same. The DDV and TDV are in the same geological, soils, seismic and paleontological resources setting; therefore, the construction period effects would be the same.

Operations

The design variants are in the same geological, soils, and seismic setting as the alternatives without the DDV and TDV and thus potential geological, soil, and seismic hazards to the HSR system would be the same.

Hazardous Materials and Wastes

Construction

The amount of construction effort for the design variants would be approximately the same as the alternatives without the DDV and TDV and thus construction period use of hazardous materials and potential generation of hazardous wastes would be approximately the same. The DDV and TDV are in the same locations as the alternatives without the DDV and TDV and thus the potential to encounter existing soil or groundwater contamination would be the same.

Operations

Project use of hazardous materials or generation of hazardous waste would not change with the DDV or TDV because the same amount of train operations and maintenance would occur.

Safety and Security

Construction

The amount of construction effort for the design variants would be approximately the same and would occur in the same locations as the alternatives without the DDV and TDV; therefore, construction period effects on safety and security would be the same.

Operations

The DDV and TDV would not result in a change in ridership or train service, thus there would be no change in emergency response times related to station traffic or changes in gate-down times at the at-grade crossings. The DDV and TDV alignments would be designed to safely operate at the proposed increased speeds and thus no change in the safety of HSR operations would occur. Neither the DDV nor TDV would increase structure elevation in areas of concern for aviation.

Station Planning and Land Use

Construction

The amount of construction with the design variants would be essentially the same as the alternatives without the DDV and TDV. Project features would minimize impacts by providing continuous property access, maintaining traffic flow, minimizing fugitive dust emissions, minimizing impacts from noise and vibration, and restoring construction staging areas to their original condition after construction. There would be no change in anticipated population growth during construction compared to the alternatives without the DDV and TDV.

Operations

The DDV would not introduce any additional incompatible uses that would result in substantial alteration of land use patterns compared to the alternatives without the DDV and TDV.

The TDV would not change the footprint of the project and would result in no change in land use patterns compared to the alternatives without the DDV and TDV.

Agricultural Lands

There are no agricultural lands along the DDV alignment and no change in footprint with the TDV; therefore, there would no change in effects to agricultural lands.

Parks, Recreation, and Open Space

Construction

There are no parks or open space within or adjacent to the DDV and thus the minor change in alignment and associated footprint would not change construction period effects on parks or open space.

The construction effort and footprint for the TDV would not change compared to the alternatives without the DDV and thus construction noise and vibration effects to parks and open space lands would be the same as the alternatives without the TDV.

There would be no additional acquisition of parks or open space lands due to the DDV or TDV.

Operations

There are no parks or open space within or adjacent to the DDV and thus the minor change in alignment and speeds would not change noise effects on parks or open space.

Train operations in the underground portion of TDV would not affect any parks or open space. There are no parks or open space within or adjacent to the aboveground portion of the TDV and

thus the minor change in alignment and speeds would not change noise effects on parks or open space.

Aesthetics and Visual Resources

Construction

The amount of construction effort for the design variants would be approximately the same and would occur in the same locations as the alternatives without the DDV and TDV and thus construction period effects on aesthetics and visual resources would be the same.

There is no vertical change in profile with the DDV. The DDV would require additional at-grade encroachment into the SAP parking lot which would not change the visual quality of the parking lot. In addition, the DDV would encroach on one additional commercial property, displace one additional commercial structure and expand the encroachment into the SAP Center parking lot. The only public view of the removed commercial structure is from Julian Street just east of the Caltrain ROW and the views are mostly obscured by existing fencing such that the only view of the removed buildings is of the aluminum roof. The building removal with the DDV would not materially degrade the visual quality or views from surrounding areas compared to the aesthetic effects of Alternative 4 without the DDV.

The TDV would only result in a small (up to 10 feet) vertical change in the tunnel profile underground and the aesthetic character of the portals and track alignment outside the tunnels would not change; thus there would be no change in aesthetic effects compared to the preliminary design in alternatives without the TDV.

Operations

With the design variants, there would be no change in visual aesthetics due to train operations because the number of trains would not change, there would be no change in HSR building and facility lighting, and the shift in alignment (described above) would not result in a substantial change in visual quality due to train movement compared to the alternatives without the DDV and TDV.

Cultural Resources

Construction

The footprint with the DDV alignment would shift up to 23 feet east into a new area of footprint which would expand the archaeological Area of Potential Effect (APE). The change in footprint associated with the DDV would not affect any new built-environment or archaeological resources compared to the alternatives without the DDV.

As discussed below under “Noise and Vibration”, no additional building damage (including to any potential historic buildings) due to pile driving vibration with the DDV would occur compared to Alternative 4 without the DDV.

The DDV would remove up to seven feet and add up to ten feet of infill to the platforms between tracks 6 and 7 and between tracks 8 and 9 in a 117-foot section on the north end of the station to accommodate track shifts. The DDV would add up to four feet of infill to the platforms between tracks 6 and 7 and between tracks 8 and 9 in a 92-foot section on the south end of the station to accommodate track shifts. These platforms are not historic elements of the Diridon Station. The DDV would also add two feet of infill on the west side of the platform between tracks 4 and 5. The platform between tracks 4 and 5 is not a historic feature, but the butterfly shelter over the platform is. The addition of two feet of infill will not modify the butterfly shelter structure or appearance. Thus, the track shifts and platform modifications with the DDV would not affect the character-defining features of the historic Diridon Station.

The change in TDV alignment is entirely underground, and the aboveground changes with the TDV would not change the footprint; thus, there would be no changes in effects to cultural resources would occur compared to the alternatives without the DDV and TDV.

Operations

The only operational change with the DDV and TDV would be in relation to increased vibration due to higher speeds. As discussed below under "Noise and Vibration," analysts also analyzed the DDV and TDV design effect on vibration effects. The vibration analysis associated with the design variations indicated no change to the vibration impact assessment for the alternatives without the DDV and TDV. This is because vibration effects are more influenced by the number of train events per day than minor shifts in alignment. As a result, there would be no change in vibration effects to any adjacent historic structures.

Section 4(f) and 6(f)

Construction

As described above, there would be no change in construction effects to parks, open space, or cultural resources with the design variants compared to the alternatives without the DDV and TDV. Thus, there would be no change in construction effects to Section 4(f) and 6(f) resources.

Operations

As described above, there would be no change in operational effects to parks, open space, or cultural resources with the DDV and TDV compared to the alternatives without the DDV and TDV. Thus, there would be no change in operational effects to Section 4(f) and 6(f) resources.

3.20.3.2 Areas with Impact Differences

The discussion below describes environmental impact differences of the alternatives with the design variants compared to the alternatives without the DDV and TDV for the following areas.

Transportation

Construction

The construction effort for the design variants would be approximately the same as for the alternatives without the DDV and TDV and thus construction traffic would be approximately the same. The construction of the design variants would not affect any different transportation facilities than the alternatives without the DDV and TDV.

In Alternative 4 without the DDV, up to 397 parking spaces would be temporarily displaced in and around Diridon Station, including 81 spaces in the SAP Center parking lot north of Santa Clara Avenue. With the DDV, there would be additional construction in the SAP Center parking lot north of the Diridon Station, which would temporarily displace up to 35 additional parking spaces (for a total of 116 spaces in the SAP Center parking lot and 432 spaces overall). At any one time, some of this parking may be available for station or special event users, but this analysis conservatively assumes that temporary loss of these spaces may occur at the same time. Construction of the San Jose Diridon Station and approaches and related parking displacement could take 2 to 2.5 years.

The loss of up to 432 parking spaces adjacent to San Jose Diridon Station during construction of Alternative 4 with the DDV would affect 3 percent of the approximately 13,695 total publicly available parking spaces within 0.5 mile of the station and 13 percent (Alternative 4) of 3,390 total publicly available parking spaces within 0.33 mile of the station.[2]

The amount of parking available for use under Alternative 4 with the DDV (2,998 spaces) within 0.33 mile of the station would not meet the parking obligations specified in the Arena Management Agreement between the SAP Center and the City of San Jose (3,175 spaces). Alternative 4 with the DDV would leave enough parking outside construction areas (13,303

[2] The count of total available spaces considers the temporary loss of 755 spaces during BART Phase II construction. Data sources for parking spaces described in Section 3.2, Transportation.

spaces under Alternative 4) to meet agreement requirements relative to the 0.5-mile radius requirements (6,175 spaces).[3]

Per TR-IAMF#8, project construction contractors would identify adequate off-street parking using existing remote parking areas or vacant land to replace any temporary displacement of parking utilized for special events at the SAP Center on a 1:1 basis during construction. Contractors would arrange for shuttle vehicles between the remote parking areas and the SAP Center for any remote parking areas that are more than 0.5 mile from the SAP Center. Contractors would also work with the SAP Center to provide advance and real-time information about parking availability for special events during times in which construction displaces existing available special event parking.

As a result, while the DDV would increase the number of parking spaces temporarily displaced in the SAP Center parking lot, temporary replacement parking would be provided during construction and there would be no significant secondary effects under CEQA related to parking during construction.

Operations

The DDV and the TDV would not change HSR ridership compared to the alternatives without the DDV and TDV and thus would not change station traffic or transit operations or parking demand. There would be no change to HSR train operations at any at-grade crossing compared to the alternatives without the DDV and TDV because the speed changes would not occur at any alignment areas with grade crossings; as a result, there would be no changes in traffic effects relative to at-grade crossings.

Alternative 4 without the DDV would permanently displace up to 52 publicly available parking spaces in the SAP Center Lots A, B, and C. Replacement parking (on a 1:1 basis for all alternatives) would be provided in a new parking structure on the north side of SAP Center Lots A, B, and C. With the DDV, due to the track shift north of Diridon Station, Alternative 4 would permanently displace up to 116 publicly available parking spaces in the SAP Center Lots A, B, and C. Replacement parking (on a 1:1 basis for all alternatives) would be provided in a new parking structure on the north side of SAP Center Lots A, B, and C. Thus, the DDV would not result in any net change in available parking for the SAP Center relative to Alternative 4 without the DDV (like Alternative 4 without the DDV), nor would it result in any loss in available parking spaces; there would be no significant secondary effects under CEQA related to parking during operations with or without the DDV.

Air Quality

Construction

The amount of construction effort for the design variants would be approximately the same as the alternatives without the DDV and TDV and thus the amount of construction period criteria pollutant and TAC emissions would be approximately the same.

The DDV would be constructed closer to a few sensitive receptors east of the construction area north of the SAP Center. However, these receptors would not be immediately adjacent to construction and thus would be further than the closest sensitive receptors to construction under Alternative 4 without the DDV. As discussed in Section 3.3, Air Quality and Greenhouse Gases, construction toxic air contaminant (TAC) emissions exposure to the nearest affected receptors due to Alternative 4 without the DDV would not result in exceedance of any of the BAAQMD significance thresholds. Because the nearest affected receptors to the DDV construction would be located further away from construction than the most affected receptors along the rest of the Alternative 4 without the DDV, the nearest receptors during DDV construction would not be exposed to TAC emissions above the BAAQMD thresholds.

[3] The count of total available spaces includes the loss of 715 spaces permanently displaced by the BART Phase II Extension. Data sources for parking spaces described in Section 3.2, Transportation.

The TDV is in the same location as the alternatives without the TDV and thus would not change construction effects on any receptors.

Operations

The track shift with the DDV would move freight operations approximately 37 feet closer to receptors off West Julian Street and North Montgomery Street, which would put them closer to diesel particulate emissions from freight trains and could increase their health risk. Analysts reviewed the GIS data for the freight operational health risk at this location and concluded that the revised incremental cancer risk would be 8.4 per million, which would be slightly higher at this location than Alternative 4 without the DDV, but it would be below the BAAQMD incremental cancer risk threshold 10 per million. Direct project effects would be considered less than significant under CEQA with the 37-foot shift of tracks north of the Diridon Station with the DDV. The minor track shifts in the station area and south of the station would not include a shift of MT-1 which is the dedicated freight track.

For cumulative effects relative to the DDV, there are two stationary sources within 1,000 feet of the residences most affected by the track shift. Based on BAAQMD's online database, the background cancer risks from these sources are below BAAQMD cumulative threshold of 100 per million cancer risk. Also, based on a review of the stationary sources and the existing roadway values, these sources would also be less than 100 per million for roadway risk at the cumulative level. Thus, even though the DDV could slightly increase the health risk, cumulative health risk to the most affected residences would still be less than the BAAQMD cumulative threshold so would present no significant impact under CEQA, which is the same conclusion as Alternative 4 without the DDV.

There would be no changes in operational emissions or locations with the TDV.

Noise and Vibration

Construction

The amount of construction effort for the design variants would be approximately the same as the alternatives without the DDV and TDV and thus construction generation of noise and vibration would be approximately the same.

However, the DDV would be constructed closer to a few sensitive receptors east of the construction area north of the SAP Center. As discussed in Section 3.4, Noise and Vibration, construction would temporarily and periodically substantially increase ambient noise levels in the project vicinity. The project would incorporate NV-IAMF#1 to minimize noise impacts. However, even with NV-IAMF#1, some sensitive receptors would be exposed to construction noise that exceeds FRA guidelines. The Authority would implement NV-MM#1, which would require the contractor to prepare and implement a noise-monitoring program and noise control plan to comply with the FRA construction noise limits wherever feasible. Implementation of this mitigation measure would reduce construction noise levels but not always below the FRA noise standards, particularly at night. As a result, construction noise impacts would be significant and unavoidable under CEQA. With the DDV, there may be a few additional receptors that may be subject to such unavoidable effects under CEQA during construction.

As discussed in Section 3.4, Noise and Vibration, nighttime annoyance during construction would potentially occur as far out as 300 feet from pile driving, 140 feet from vibratory compaction, and as close as 50 feet from short-duration, transient events. Pile driving may occur on bridge retrofit structures along the DDV. The only bridge structure work where the alignment may shift with the DDV is the Julian Street overpass. The DDV would only shift construction closer to sensitive receptors north of Julian Street. There are three residences along Julian Street that would be within 300 feet of the Julian Street bridge work with the DDV; the closest residence would be about 185 feet from the Julian Street bridge work. Night-time annoyance due to pile driving could increase slightly in intensity as the work may be approximately 20 feet closer to these three residences with the DDV compared to Alternative 4 without the DDV. Other construction would not result in vibration levels above the annoyance threshold for these residences. Incorporation of

NV-IAMF#1 would minimize construction vibration and the potential for it to cause annoyance to occupants at vibration-sensitive land use. However, even with NV-IAMF#1, some sensitive receptors would still be exposed to ground-borne vibration that would result in annoyance during nighttime hours.

As described in Section 3.4, Noise and Vibration, pile driving very close to buildings (within 50 feet for wood-framed building with plaster and within 30 feet for modern, reinforced concrete buildings) would potentially exceed the 0.2 inch/second PPV threshold and cause building damage. There are two modern style buildings within 30 to 50 feet of construction of the Julian Street overpass with the DDV. The nearest building would be demolished as part of the DDV construction (and thus won't be damage by vibration) and the second building is more than 30 feet from the overpass construction area with the DDV. Thus, no additional building damage due to pile driving vibration during construction is expected.

The TDV is in the same location as the alternatives without the TDV and thus would not change construction noise or vibration effects on any receptors.

Operations

As described in Section 3.4, Noise and Vibration, only severe noise impacts are considered significant impacts under CEQA. Table 3.20-1 summarizes the change in moderate and severe noise impacts with the DDV and TDV by subsection and land use category compared to the alternatives without the DDV and TDV. In some cases, new receptors would have moderate or severe noise impacts. In some cases, receptors that would not have moderate or severe noise impacts with the preliminary design would have moderate or severe impacts with the DDV and TDV. In some cases, receptors that would have moderate noise impacts with the preliminary design would have severe impacts with the DDV and TDV.

Table 3.20-1 Summary of Change in 2040 Project Noise Impacts with DDV and TDV Compared to Alternatives without DDV and TDV (before mitigation)

Subsection	Land Use Category[1]	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
		Moderate	Severe	Moderate	Severe	Moderate	Severe	Moderate	Severe
San Jose Diridon Station Approach	2	nc	nc	nc	nc	nc	nc	+4	+2
	1, 3	nc	nc	nc	nc	nc	nc	+1	nc
Monterey Corridor	2	nc	nc	nc	nc	nc	nc	nc	nc
	1, 3	nc	nc	nc	nc	nc	nc	nc	nc
Morgan Hill and Gilroy	2	-3	+7	-4	+8	+13	+8	-6	+9
	1, 3	nc	nc	-1	+1	nc	nc	nc	nc
Pacheco Pass	2	nc	+1	nc	+1	nc	+1	nc	+1
	1, 3	nc	nc	nc	nc	nc	nc	nc	nc
San Joaquin Valley	2	-2	+2	-2	+2	-2	+2	-2	+2
	1, 3	nc	nc	nc	nc	nc	nc	nc	nc
Total	**1, 2, 3**	-5	+10	-7	+12	+11	+11	-3	+14

[1] FRA Land Use Categories are summarized in **Error! Reference source not found.**. Land Use Category 1 = Areas where quiet is an essential element to the land use; Category 2 = Residential; Category 3 = Institutional use and passive-use parks
nc = no change

Under Alternative 4 without the DDV, there would be 124 severe noise impacts to sensitive receptors in the San Jose Diridon Station Approach Subsection. With the DDV (because of the horizontal shift of alignment up to 37 feet and the increased speed from 15 mph to 40 mph), the number of noise impacts to sensitive receptors would increase by two severe impacts. Two residences that would have a moderate impact under Alternative 4 without the DDV would instead have a severe impact with the DDV. The two additional severe noise impacts with the DDV could be reduced to a less- than-significant level under CEQA with noise barriers and implementation of a quiet zone along the DDV. With the DDV, there would also be four additional moderate noise impacts for Alternative 4 compared to Alternative 4 without the DDV.

Without the TDV, there would be 160 to 674 severe noise impacts to sensitive receptors in the Morgan Hill and Gilroy Subsection depending on alternative. With the increased speeds from 200 mph to 220 mph in the tunnel approaches facilitated by the TDV, the number of severe noise impacts to sensitive receptors would increase by seven to nine receptors depending on the alternative. Some of these impacts may be able to be reduced with noise barrier mitigation. With the TDV, there would also be 3 to 6 fewer moderate noise impacts with Alternatives 1, 2, or 4 and 13 more moderate noise impacts with Alternative 3 compared to the alternatives without the TDV in this subsection.

In the four alternatives without the TDV, there would be 9 severe noise impacts to sensitive receptors in the Pacheco Pass Subsection. With the TDV, the number of severe noise impacts to sensitive receptors would increase by one receptor in all four alternatives.

In the four alternatives without the TDV, there would be 99 severe noise impacts to sensitive receptors in the San Joaquin Valley Subsection depending on alternative. With the TDV, the number of severe noise impacts to sensitive receptors would increase by two receptors. With the TDV, there would also be two less moderate noise impacts compared to the alternatives without the TDV in all four alternatives.

There are no dairies or rangeland along the DDV so there would be no effect on livestock due to noise changes with increased speed. There may be livestock in agricultural or rangeland along the aboveground portions of the TDV. However, as described in Section 3.4, Noise and Vibration, the effects of noise on livestock with the alternative without the TDV for train speeds up to 220 mph in the San Joaquin Valley subsection were determined to be less than significant under CEQA and thus the increase of train speeds along the TDV from 200 mph to 220 mph would not result in a new significant impact under CEQA to livestock.

Analysts also analyzed the DDV and TDV design effect on vibration effects. The vibration analysis indicated no change to the vibration impact assessment for the alternatives without the DDV and TDV. This is because vibration effects are more influenced by the number of train events per day than minor shifts in alignment.

Biological Resources

Construction

The DDV construction area is entirely disturbed, urbanized land, without wetlands, waters, or habitat for common or rare, threatened, or endangered species and thus construction would not change effects compared to the alternatives without the DDV.

The TDV construction is in the same location as the alternatives without the TDV and thus would not change construction effects on any biological resources.

Operations

Since there are no biological resources in or adjacent to the DDV there would be no change in operational effects on biological resources.

Increasing the speeds from 200 mph to 220 mph in the Soap Lake area, as facilitated by the TDV, would increase the distances to the various effect thresholds for bird noise impacts. Analysts evaluated the alternatives without the TDV with 17-foot high noise barriers on both sides of the alignment in the Soap Lake area per Mitigation Measure BIO-MM#80 to reduce the amount

of land area exposed to noise levels above the thresholds for bird noise impacts. Those same 17-foot high noise barriers would be effective at reducing noise from trains going 220 mph (as they would for trains going 200 mph), but the area with noise above the thresholds would be somewhat larger than the alternatives without the TDV. As a result, the TDV would increase the acreage of different land cover types exposed to sound exceeding the thresholds as compared to the alternatives without the TDV.

In Section 3.7, Biological Resources, Impact BIO#44, Intermittent Noise Disturbance of Wildlife Using Corridors during Operations is considered less than significant under CEQA with mitigation for all project alternatives. This conclusion would not change with the TDV, but the mitigation commitment would likely increase.

Socioeconomics and Communities

In Alternative 4 without the DDV, there would be 66 commercial and industrial displacements. With the DDV, there would be partial acquisition of one additional commercial parcel and one additional commercial building displacement. There would also be up to 23 feet of additional property acquisition in the SAP Center parking lot in the San Jose Diridon Station Approach Subsection. Property acquisition would also occur in the SAP Center parking lot with Alternative 4 without the DDV, but the area of acquisition would be greater with the DDV.

The TDV would not result in any additional displacements compared to the alternatives without the TDV.

The design variants would not disrupt or divide established communities. There are no schools or facilities for children in or adjacent to the DDV or TDV so there would be no change in effects to children's health and safety or schools. No residences would be displaced so there would no change in effects on school district funding. Due to the commercial displacements due to the DDV, there would be a slight increase in reduction in property and sales tax revenue.

Environmental Justice

As discussed in Chapter 5, the determination of whether an alternative would have a disproportionate high and adverse effect on low-income and minority populations is made on an end-to-end basis considering the effects along the entire project extent.

Construction

As described above, the DDV and TDV would not result in any substantial differences in construction period effects compared to the alternatives without the DDV and TDV except for the additional commercial displacements associated with the DDV for Alternative 4. These displacements would occur in a census district with a disproportionate percentage of low-income persons compared to the reference community. As described in Chapter 5, Environmental Justice, Alternative 4 without the DDV would result in a disproportionate high and adverse effect to low-income and minority populations relative to commercial displacements. The DDV would add to that effect for Alternative 4.

Operations

As discussed above in the analysis of noise and vibration, the DDV and TDV would increase the number of moderate and severe noise impacts. Some of these impacts would occur within in census districts with a disproportionate percentage of low-income persons compared to the reference community. As described in Chapter 5, Environmental Justice, Alternatives 2 and 4 without the DDV and TDV would result in a disproportionate high and adverse effect to low-income and minority populations relative to noise on an end to end basis. The DDV would add to that effect for Alternative 4 and the TDV would add to that effect for Alternatives 2 and 4. Alternatives 1 and 3 without the DDV and TDV would not have a disproportionate effect relative to noise based on the end to end analysis along the entire project extent. The additional noise impacts due to the TDV are not sufficiently large to change the noise effects to low-income and minority populations from not disproportionate to disproportionate on an end-to-end basis.

Cumulative Impacts

The Resource Study Areas (RSAs) used for the cumulative analysis in Section 3.19, Cumulative Impacts, are at least 1,000 feet from the project. The maximum DDV alignment change would be approximately 37 feet, so all relevant cumulative projects are already accounted for in the analysis of Alternative 4 without the DDV. The TDV would not change construction or operational locations so no additional cumulative projects need to be included in the cumulative analysis.

For most resource resources, the design variants would not change effects relative to the alternatives without the DDV and TDV. As described above, environmental effects of the alternatives without the DDV and TDC would be increased due to the DDV and TDV relative to SAP Center event parking, biological resources, noise, and commercial displacements. Accordingly, the project's contribution to cumulative impacts related to SAP Center event parking, biological resources, noise, and commercial displacements would be slightly greater with the DDV and TDV compared to the alternatives without the DDV and TDV. However, due to the limited scale of these changes, there would be no change in the significance of any cumulative impacts or the project's contribution to cumulative impacts under CEQA.