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Peninsula Corridor Electrification Project

Final Environmental Impact Report

VOLUME I: REVISED DRAFT EIR

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January 2015

Caltrain Peninsula Corridor Joint Powers Board

FINAL

PENINSULA CORRIDOR ELECTRIFICATION PROJECT ENVIRONMENTAL IMPACT REPORT

VOLUME I: REVISED DRAFT EIR

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Executive Summary

This section summarizes the key findings of this Environmental Impact Report (EIR) for the Caltrain Peninsula Corridor Electrification Project (Proposed Project or PCEP). This section summarizes the Proposed Project's background, purpose and need and objectives, description, costs and funding, environmental impacts and mitigation, alternatives, areas of controversy and areas to be resolved.

ES.1 Project Background

Caltrain trains presently consist of diesel locomotive-hauled, bi-level passenger cars. As of mid-2013, Caltrain operates 46 northbound and 46 southbound (for a total of 92) trains per day between San Jose and San Francisco during the week. Three of these trains start in Gilroy during the morning commute period, and three terminate in Gilroy during the evening commute period. Eleven trains in each direction are "Baby Bullet" express service trains that make the trip between San Francisco and San Jose in less than 1 hour. Service is frequent during the peak periods (five trains per peak hour per direction [pphpd]) and is provided every hour in both directions during the midday. Caltrain provides hourly service in both directions on Saturdays and Sundays (36 trains on Saturdays and 32 trains on Sundays) between San Jose Diridon and San Francisco 4th and King Stations only. Weekend service includes two "Baby Bullet" express service trains per day in each direction. Caltrain also provides extra service for special events such as San Jose Sharks and San Francisco Giants games.

In addition to Caltrain commuter rail service, Union Pacific Rail Road (UPRR) operates approximately six daily freight trains between Santa Clara and San Francisco under a "Trackage Rights Agreement" with Caltrain. From Santa Clara to San Jose, on a joint use corridor, UPRR operates approximately 9 daily freight trains. Three passenger train services also operate on the Santa Clara to San Jose segment: the Capitol Corridor (14 daily trains), the Altamont Commuter Express (ACE, eight daily trains during weekdays only), and the Amtrak Coast Starlight (two daily trains).

The Proposed Project is part of a program to modernize operation of the Caltrain rail corridor between San Jose and San Francisco. There is a lengthy history of planning for modernization of the Caltrain Peninsula Corridor. Modernization projects include the installation of an advanced signal system and the electrification of the rail line. The advanced signal project (Caltrain Communications Based Overlay Signal System Positive Train Control (commonly referred to as CBOSS PTC or CBOSS), and corridor electrification are discussed below. The Peninsula Corridor Joint Powers Board (JPB) previously evaluated corridor electrification in a prior EIR, for which a draft was completed in 2004 and a final was completed in 2009. The JPB did not certify the Final EIR because of the need for resolution of issues regarding joint planning for shared use of the Caltrain corridor for Caltrain service and for future high-speed rail (HSR) service. The Federal Transit Administration (FTA) completed the final environmental assessment (EA) and adopted a Finding of No Significant Impact in 2009.

Since 2009, the JPB, the California High-Speed Rail Authority (CHSRA), the California Legislature, the Metropolitan Transportation Commission (MTC), and other parties have worked together to develop a vision of a "blended system" whereby both Caltrain and HSR would utilize the existing

Caltrain Peninsula Corridor to reach the 4th and King area in San Francisco and then be able to reach downtown San Francisco via the Downtown Extension (DTX) to the Transbay Transit Center (TTC). This vision for implementing Blended Service was included in the *Revised 2012 Business Plan* that the CHSRA Board adopted in April 2012 for the California High-Speed Rail System (CHSRA 2012a).

The JPB and CHSRA are committed to advancing a blended system concept. In 2013, the JPB and CHSRA signed a Memorandum of Understanding (MOU) to this effect. This local vision was developed with stakeholders interested in the corridor. The blended system would remain substantially within the existing Caltrain right-of-way (ROW) and accommodate future high-speed rail and modernized Caltrain service by primarily utilizing the existing track configuration. It is important to note that "accommodating" future HSR means in the context of the Proposed Project providing the electrical infrastructure compatible with HSR and not precluding HSR.

Based on the blended system vision, the Caltrain Peninsula Corridor has been designated to receive an initial investment of Proposition 1A bond funds that would benefit Caltrain's modernization program and HSR. The JPB, CHSRA and seven other San Francisco Bay Area agencies (City and County of San Francisco, San Francisco County Transportation Authority, Transbay Joint Powers Authority, San Mateo County Transportation Authority, Santa Clara Valley Transportation Authority, City of San Jose, and MTC) have approved an MOU (*High Speed Rail Early Investment Strategy for a Blended System in the San Francisco to San Jose Segment known as the Peninsula Corridor of the Statewide High-Speed Rail System*) to pursue shared use of the corridor between San Jose and San Francisco to provide Blended Service of both Caltrain commuter rail service and HSR intercity service (JPB 2012). The MOU includes agency and funding commitments toward making an initial investment of approximately $1.5 billion in the corridor for purchasing and installing an advanced signal system, electrifying the rail line from San Francisco to San Jose, and purchasing electrified rolling stock for Caltrain. The MOU also conceptually outlines potential additional improvements (i.e., "Core Capacity" projects[1]) needed beyond the first incremental investment to accommodate Blended Service in the corridor.

Corridor improvements identified in the MOU include the following:

- **Advanced Signal System (commonly referred to as CBOSS PTC or CBOSS):** This project (currently being installed, including a new fiber optic backbone) will increase the operating performance of the current signal system, improve the efficiency of at-grade crossing warning functions, and automatically stop a train when there is violation of safe operating parameters. This project, which includes implementation of safety improvements mandated by federal law, is scheduled to be operational by 2015 as mandated by the Federal Railroad Administration (FRA).

[1] "Core Capacity" projects (as described in the nine-party MOU) consist of needed upgrades to stations, tunnel, bridges, potential passing tracks, other track modifications, and rail crossing improvements, including selected grade separations, and will be required to accommodate the mixed traffic capacity requirements of high-speed rail service and commuter services on the Caltrain corridor. The specific Core Capacity projects have not been identified or defined at this time. These projects will be identified in future discussions and evaluations between CHSRA and the JPB. Core Capacity projects would be subject to separate, project-level environmental evaluation by the implementing agency. Core Capacity projects do not include the TJPA Downtown Extension/Transbay Transit Center project, which is an approved and environmentally cleared independent project.

- **Corridor Electrification:** The JPB decided to prepare this new EIR for the corridor electrification due to the changes in existing conditions[2] that have occurred along the corridor since the prior EIR analyses were ~~was~~ conducted, to update the environmental analysis, and to update the cumulative analysis of Blended Service and other cumulative developments along the corridor. Completion of a new EIR will also allow public agencies, stakeholders, the public and decision-makers the opportunity to review and comment on the Proposed Project's environmental effects in light of current information and analyses. This project will provide for operation of up to 6 Caltrain trains per peak hour per direction (an increase from 5 trains per peak hour per direction at present). Electrification can be analyzed as a separate project under the California Environmental Quality Act (CEQA) because it has independent utility (providing Caltrain electrified service) and logical termini (station end points). Electrification of the rail line is scheduled to be operational by 2020/2021[3] ~~2019~~. The Proposed Project includes 114 trains per day between San Jose and San Francisco and six trains per day between Gilroy and San Jose. Future proposed actions to expand service beyond 114 trains per day may require additional environmental review.

- **Blended Service:** The JPB, CHSRA, and the MOU partners have agreed on shared use of the Caltrain corridor for use of up to six Caltrain trains per peak hour per direction and up to four HSR trains per peak hour per direction.[4] The operational feasibility of Blended Service has been studied, but this project is presently only at the conceptual planning phase. The potential addition of HSR service to this corridor will be the subject of a separate environmental review process that will be undertaken by CHSRA as the lead agency subsequent to the environmental process for the Proposed Project. Based on the current CHSRA *Revised 2012 Business Plan* and the Draft *2014 Business Plan* (CHSRA 2014), Blended Service along the Corridor is scheduled to commence sometime between 2026 and 2029. Blended Service would connect with the DTX near the Fourth and King Station allowing Caltrain and HSR service to downtown San Francisco at the TTC.

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[2] For example, there have been changes in existing development adjacent to the Caltrain ROW and stations, in levels of traffic, and in adopted land use plans around stations.

[3] The first year of project operation would be 2020/2021 depending on the timing of construction completion. For the sake of simplicity and in recognition that the first year of operations could be in 2020, this EIR refers to the operational year as 2020.

[4] The CHSRA ~~2012 Revised Business Plan *Ridership and Revenue Forecasting* (CHSRA 2012b) and the~~ 2014 Business Plan (CHSRA 2014) ~~both~~ presumes Phase 1 Blended Service would have up to four trains per peak hour and up to four trains per off-peak hour. As explained in Chapter 4, Section 4.1 *Cumulative Impacts,* this EIR presumes up to 40 to 53 daily round-trip high-speed trains in 2040 based on the CHSRA 2012 Business Plan, *Estimating High-Speed Train Operating and Maintenance Cost for the CHSRA 2012 Business Plan* (CHSRA 2012c), which presumed 40 HSR daily round-trips per day and, the Draft 2014 Business Plan *Service Planning Methodology* document (CHSRA 2014~~b~~) which includes an assumption of 53 daily round trip trains starting in 2029 and continuing beyond 2040. The 2014 Business Plan does not make an explicit statement about the level of service on the Caltrain corridor. Thus, the exact amount of daily HSR service is unknown. ~~Caltrain's Blended Service planning to date has not studied the 2014 Business Plan estimates because the plan was released on February 7, 2014 and conceptual Blended Service studies were completed in 2012 and 2013. Thus, the cumulative analysis in this EIR is based on the 40 daily round-trip high-speed trains consistent with Blended Service studies by Caltrain completed to date.~~ The subsequent CHSRA project-level environmental evaluation will address proposed high-speed train service levels along the San Francisco Peninsula.

ES.2 Purpose and Need

The Proposed Project's purpose and need and project objectives are summarized below.

ES.2.1 Need for the Project

The needs addressed by the Proposed Project consist of the following: meeting current and future transportation demand between San Jose and San Francisco; offsetting existing and future worsening roadway congestion; addressing continuing regional air quality issues; reducing greenhouse gas emissions because of their effect on climate change; modernizing the Caltrain service; and providing electrical infrastructure compatible with future high-speed rail service.

Current and Future Transportation Demand in the Caltrain Service Area

The population of the Bay Area is increasing and, with it, traffic congestion. Commute traffic between major employment centers in San Francisco, the San Francisco Peninsula, and the South Bay is growing, and there has been a substantial increase in "reverse commute" trips from San Francisco to Peninsula and South Bay locations over the past decade. Off-peak travel between San Francisco and Peninsula and South Bay locations is also on the rise. Caltrain has experienced increases in ridership as people seek alternate ways to meet these travel needs. Caltrain anticipates continued increases in demand for its rail services over time.

The long-term rise in gas prices has contributed to increased use of public transportation. Commuting to work by automobile has decreased approximately 4 percent in Santa Clara and San Mateo Counties from 2000 to 2010 in part due to increases in gas prices as well as traffic congestion and other factors. Regional commuter transportation systems, including Caltrain, would be the logical beneficiaries of a shift from private autos to public transportation, because these systems accommodate the home-work trip. Home-work trips constitute the largest share of person trips and they are the easiest trips to shift modes, assuming convenient origin-destination pairs. Should gasoline prices remain at high levels over the long-term or increase further, increased Caltrain ridership from this source would be reasonable to expect.

ES.2.2 Current and Future Roadway Congestion in the Caltrain Corridor

Economic growth and the corresponding demand for transportation services in the San Francisco Bay Area have exceeded the region's ability to provide the needed roadway capacity. Existing demand for north-south travel along the Peninsula via U.S. Highway 101 (US 101) and Interstate 280 (I-280) regularly exceeds existing highway capacities and results in congestion that is increasing in both frequency and duration. US 101 is the most severely congested freeway through the corridor (MTC 2009). Between San Francisco and San Jose, many roadway segments are at or over capacity during the peak commute hour.

Without future roadway improvements, congestion on corridor freeways is bound to worsen to the point at which travel would partially divert to surface routes and the peak periods would spread both into the midday and to later in the evening. Bottlenecks would continue to constrain movement through the corridor. Job growth in the Bay Area is expected to increase approximately 33 percent between 2010 and 2040 (ABAG and MTC 2013). The resultant new transportation demand will lead to high levels of congestion that will take a toll on economic development by constraining goods and people movements.

Opportunities to improve highway capacity are constrained by a number of factors, including funding availability, the need for extensive and costly ROW acquisitions, and potentially adverse environmental impacts, such as displacements of residences and businesses, and impacts on natural resources and redesign of local roadways beyond the interchanges. For these reasons, substantial capacity improvements to US 101 and I-280 cannot be relied upon to fully address long-term travel demands in the corridor.

ES.2.3 Corridor Air Quality and Greenhouse Gas Emissions

High rates of auto ownership and increasing vehicle miles of travel (VMT) have contributed to air quality problems throughout California. Pollutants of concern include ozone (O_3); nitrogen oxides (NO_X) and sulfur dioxides (SO_2) (precursors of smog); carbon monoxide (CO); and particulate matter (PM). Greenhouse gases (including carbon dioxide, nitrous oxide and methane) are now a focus of environmental planning in California because of their role in global climate change. Motor vehicles are substantial contributors to the production of all of these pollutants.

The San Francisco Bay Area's air quality has improved in recent years, largely in response to technological improvements in motor vehicles and fuels that are less polluting but is still designated as in nonattainment area under state and federal standards for certain pollutants. Because transportation is the major contributor to ozone precursors, increasing auto travel threatens the area's improvement in air quality. Growing congestion will add to the potential problems because of increased emissions of vehicles operating in stop-and-go traffic.

California also has ambitious goals to reduce greenhouse gas emissions throughout the state in or der to help face the challenge posed by climate change. Most of the communities in the Peninsula Corridor have also adopted climate action plans to lower their community contributions of greenhouse gas emissions, with all seeking to lower transportation emissions given that transportation is usually the largest source of such emissions in most areas.

ES.2.4 Modernizing the Caltrain Service

Improving the appearance and attractiveness of Caltrain to potential consumers has long been suggested as a means of increasing ridership. Caltrain put new diesel locomotives and bi-level passenger cars into service as part of the "Baby Bullet" express service program in 2004. Rider response to this service has demonstrated the benefits of modernizing image, improving passenger comfort, and reducing travel times between major origins and destinations. The increase in ridership associated with the introduction of the Baby Bullet and new passenger cars suggests that there is an unmet demand for rapid transit along the Peninsula corridor. With the Proposed Project, additional stops could be added (optimized stops) without loss of travel times or travel times could be reduced.

ES.2.5 Accommodating Future High-Speed Rail

An electrified Caltrain system would set the stage for an expanded modern regional electric train service and a statewide HSR service. The Proposed Project facilities evaluated herein would be designed to accommodate HSR service, as well as Caltrain service. The term "accommodate" is being used in this case to mean that the Caltrain Proposed Project would install the same type of power supply and distribution system proposed for the HSR system. It is important to note that PCEP is a *separate* project from the HSR project. Other improvements needed to enable high-speed trains to use the Caltrain line would be evaluated in a separate environmental process led by the CHSRA as the lead agency for HSR.

Extension of Caltrain from its present 4th and King Street terminus to the site of the Transbay ~~Terminal~~ Transit Center (TTC) was evaluated in a separate environmental document, the Transbay Terminal/Caltrain Downtown Extension (DTX)/Redevelopment Project EIS/EIR, by FTA, the City and County of San Francisco, the San Francisco Redevelopment Agency, and the JPB. The Final EIS/EIR was certified in 2004 and the Record of Decision on the EIS was issued in February 2005. The ~~Transbay Terminal~~ DTX/TTC project includes construction of an underground rail line extension ~~electrification of the Caltrain line~~ from 4th and King Streets to the ~~Transbay Terminal~~ TTC and construction of the TTC. The DTX/TTC project would provide for both Caltrain and HSR service to the TTC as well as consolidation of many transit service linkages at the TTC as well as development surrounding the TTC. Subsequent addenda have been completed, and a Supplemental EIS/EIR is presently being prepared for certain limited proposed changes to the design of the project.

ES.3 Purpose and Objectives of Project

The primary purposes of the Proposed Project are to improve train performance and reduce fuel costs, reduce long-term environmental impact by reducing noise and vibration, improve regional air quality and reduce greenhouse gas emissions, and provide electrical infrastructure that would be compatible with separate later use for Blended Service. An electrified Caltrain system would address Peninsula commuters' vision of an environmentally friendly and reliable service. Electrification also is expected to help accommodate increased system ridership through improved system operations.

Electrification would modernize Caltrain and supports increased service levels and it offers several advantages in comparison with existing diesel power use. These benefits serve the primary purposes of the Proposed Project. These purposes comprise the project objectives required by CEQA, as follows:

- **Provide electrical infrastructure compatible with high-speed rail:** An electrified Caltrain system would set the stage for an expanded modern regional electric express service and for Blended Service. While the Proposed Project would not include all infrastructure necessary to implement HSR service in the corridor (such as HSR maintenance facilities, station platform improvements, or passing tracks), the electrical infrastructure (such as overhead wire systems) would accommodate future Blended Service and the Proposed Project would not preclude HSR.
- **Improve train performance, increase ridership and increase service:** The Proposed Project envisions the use of electric multiple unit (EMU) trains, which are self-propelled electric rail vehicles that can accelerate and decelerate at faster rates than diesel-powered trains, even with longer trains. With EMUs, Caltrain could run longer trains without degrading speeds, thus increasing peak-period capacity. Electrification performance would support increased peak service levels from the current five trains per peak hour per direction to six with existing trackage.

A substantial portion of a Caltrain trip is spent accelerating and decelerating between stations because of Caltrain's close-set station stops. For the same service profile of stops, EMUs can provide travel time reductions. Alternatively, due to the time savings, additional stops could be added without increasing existing total transit time from San Jose to San Francisco. Travel time savings and/or additional stops are expected to stimulate additional Caltrain ridership. By providing electric trains, Caltrain will also be able to use the DTX to reach the TTC and serve Downtown San Francisco, which will also increase ridership.

- **Increase revenue and reduce fuel costs**: Anticipated increased ridership would increase fare revenues, and conversion from diesel to electricity would reduce fuel costs. ~~These efforts would substantially reduce but not eliminate the need for financial subsidy.~~
- **Reduce environmental impact by reducing noise emanating from trains**: Noise emanating from the passage of electrified train sets is measurably less than diesel operations. With the increases in peak and off-peak Caltrain service that are either under way or planned for implementation during the next decades, electrification would be an important consideration for reducing noise of train passersby and maintaining Peninsula quality of life. Train horns would continue to be sounded at at-grade crossings, consistent with FRA and California Public Utilities Commission safety regulations, whether or not electrification is pursued.
- **Reduce environmental impact by improving regional air quality and reducing greenhouse gas emissions:** Electric operations would produce substantial reductions in corridor air pollution emissions when compared with diesel locomotives, even when the indirect emissions from electrical power generation are included in the analysis. In addition, the increased ridership allowed by the Proposed Project would reduce automobile usage, thereby resulting in additional air quality benefits. Electrically powered trains are more energy efficient than diesel-electric trains. Reduced energy use also translates into reduced air emissions. Reductions in air pollutant emissions represent long-term health benefits for Caltrain riders, and for residents and employees along the Caltrain corridor. In addition, reduction of greenhouse gas emissions with electrification would help California to meet its goals under AB 32, the 2006 Global Warming Solutions Act, as well as post-2020 state greenhouse gas emission reductions goals.

ES.4 Project Description

The Proposed Project consists of converting Caltrain from diesel-hauled to EMU trains for service between the 4th and King Street Station terminus station in San Francisco and the Tamien Station in San Jose. Operating speed would be up to 79 mph, which would match the existing maximum speed.

By 2020 ~~2019~~, approximately 75 percent of the service fleet between San Jose and San Francisco would be electrified, with the remaining 25 percent being diesel-powered. After 2020 ~~2019~~, diesel locomotives used for San Francisco to San Jose service would be replaced with EMUs over time as diesel locomotives reach the end of their service life. Because the Proposed Project only involves electrification of the Caltrain ROW from San Francisco to a point approximately 2 miles south of Tamien Station, Caltrain's diesel-powered locomotives would continue to provide service between the San Jose Diridon Station and Gilroy.

The Proposed Project would require the installation of 130 to 140 single-track miles of overhead contact system (OCS) for the distribution of electrical power to the new electric rolling stock. The

OCS would be powered from a 25 kilovolt (kV), 60 Hertz (Hz), single-phase, alternating current (AC) traction power system consisting of two traction power substations (TPSs), one switching station and seven paralleling stations. These facilities are described in more detail in Chapter 2, *Project Description*.

The Proposed Project is the electrification of the Caltrain line from its current northern terminus at 4th and King Street in the City of San Francisco to 2 miles south of the Tamien Station in San Jose, a total distance of approximately 51 miles. The Proposed Project location is shown in Figure ES-1, and a project vicinity map showing each of the stations on the line is provided in Figure ES-2.

ES.4.1 Project Elements

ES.4.2 Overhead Contact System

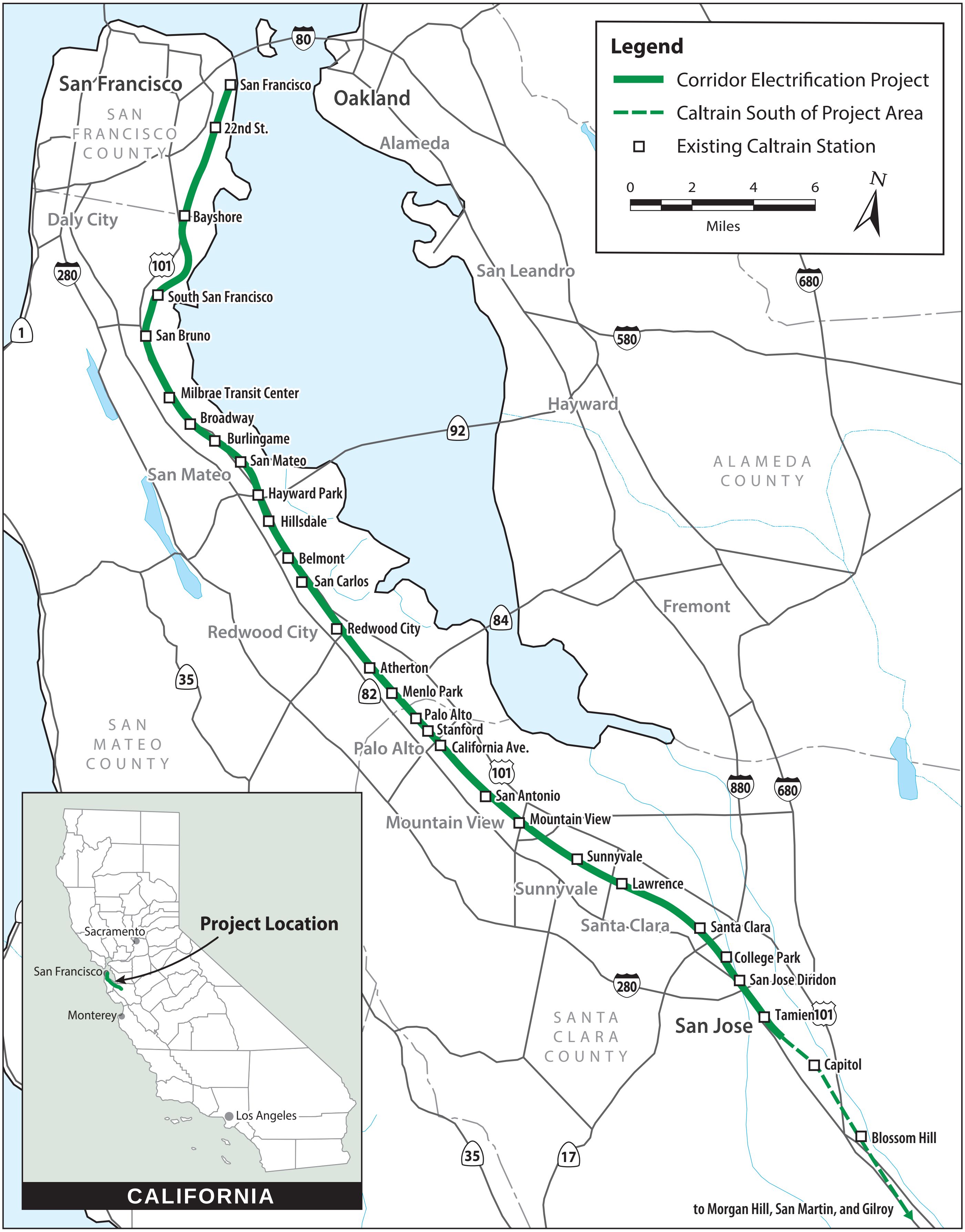
This Proposed Project would utilize a 25 kV AC OCS operating at 60 Hz. A mainline OCS typically consists of two conductors above each track in what is known as a catenary configuration: A messenger wire (much like a utility transmission line) sags between support points, below which a near-level contact wire is suspended. Both main wires are energized and are part of the same circuit. The pantograph, mounted on top of the electric vehicles, slides along the underside of the contact wire and collects the traction current from it.

The messenger wire is typically supported by means of cantilevered, hinged bracket arms that extend horizontally over the track from vertical steel poles mounted clear of the dynamic envelope (i.e., the range of motion of the train on the track) of the vehicles. These poles are placed approximately 9 to 11 ~~10 to 12~~ feet of the centerline of the tracks they serve. Multi-track support structures, such as multi-wire headspans attached to taller steel poles, are also employed where necessary. Depending upon the clearance requirements of particular sections of the route, the contact wire height would vary from approximately 16 feet to 23 feet. Pole heights would range from 30 to 50 feet although in most locations the heights would be between 30 to 40 feet. The 50-foot maximum includes the potential height for headspans, which are only proposed for use in certain areas such as CEMOF and the San Jose Diridon Station.

Clearances for maintenance and operation of the OCS would be designed to allow for existing freight railroad and tenant passenger rail clearances and operations. Normal design clearances up to 23 feet would be provided in all open, unconstrained areas. Special designs could be employed in close clearance tunnels or under bridges in order to provide sufficient clearances to existing freight and diesel passenger trains.

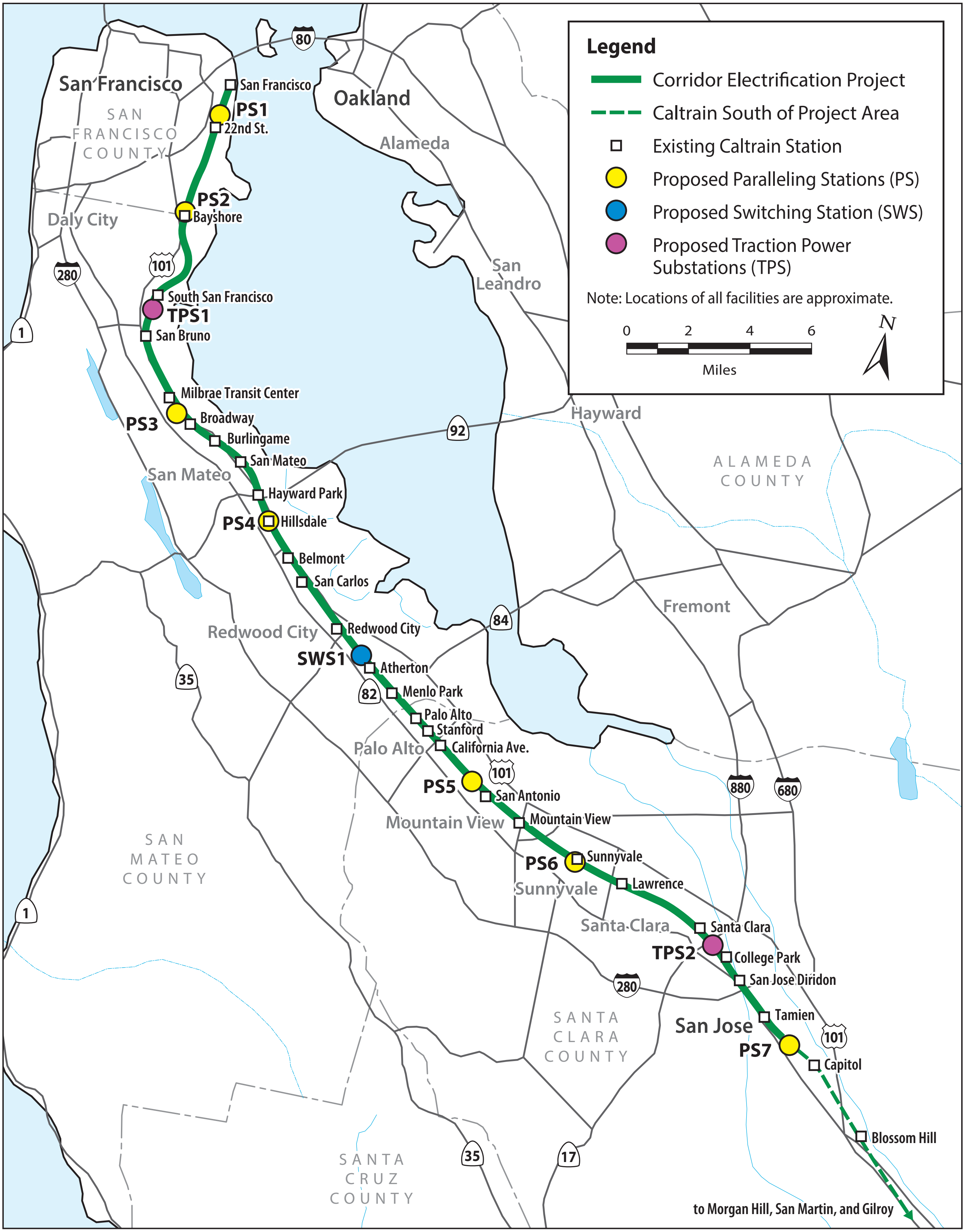
On tangent, or straight, sections of track, the OCS supports can be spaced up to 230 feet apart, though they would typically be about 180 to 200 feet apart. On curved track sections, the span lengths between supports must be reduced.

As noted above, the OCS poles nominally need to be approximately ~~10 to 12~~ 9 to 11 feet from the centerline of the railway tracks. In addition, there needs to be clearance of vegetation within approximately 10 feet of the OCS poles and catenary system for the electrical safety zone (ESZ). The ESZ would be approximately 21 feet from the centerline of the outer electrified track in two-track areas and approximately 18 feet from the centerline of the outer electrified track in multi-track areas. Trimming or removal of trees would be required along the tracks and electrical facilities



Note: This figure replaces Figure ES-1 from the Draft EIR.

Figure ES-1
Project Location
Peninsula Corridor Electrification Project



Note: This figure replaces Figure ES-2 from the Draft EIR.

Figure ES-2
Project Vicinity
Peninsula Corridor Electrification Project

where they would otherwise pose a maintenance or safety concern. In addition, structures cannot be closer than 6 feet to the OCS pole alignment (the 6 feet is within the 10-foot ESZ).

The MT-1 track owned by Union Pacific will not be electrified from Santa Clara (MP 44.6) to the southern end of the JPB-owned ROW (MP 52.0).

At three tunnel locations and four bridge overcrossings where vertical height is constrained, the Proposed Project also would involve minor tunnel modifications and/or track lowering to accommodate existing and future passenger vehicles as well as existing freight equipment.

ES.4.3 Auto-Transformer Power Feed Arrangement

The autotransformer (ATF) power feed system arrangement reduces the need for traction power substations and would require the installation of only two traction power substations spaced 36 miles apart. The ATF is the overall power feed system and includes the traction power substations, switching station, paralleling stations and the OCS

~~There are three potential locations for the site of each of the traction power substations analyzed in this EIR.~~

There are four potential locations for the site of the traction power substation in South San Francisco (TPS1) and three potential locations for the site of the traction power substation in San Jose (TPS2) analyzed in this EIR. In addition, there would be one switching station (SWS1) and seven paralleling stations (PS1 through PS7) at a spacing of approximately 5 miles. Two potential locations have been identified for the ~~PS4,~~ SWS1, PS3, P~~S5~~, and PS6 sites. Three potential locations have been identified for the PS4 and PS5 sites.

The paralleling stations provide additional power support to the power distribution system and permit increased spacing of the primary traction power substations. In addition to reducing the number of traction power substations—and thereby minimizing the introduction of new, large equipment installations into the corridor—the auto-transformer feed arrangement for implementation along the Caltrain corridor would help reduce electromagnetic fields (EMF) and electromagnetic interference (EMI) because the arrangement includes two parallel aerial feeders, one on each side of the alignment. The currents in the parallel feeders flow in the opposite direction to that in the main catenary conductors, reducing the EMF/EMI effects created by current flow in the OCS.

Figure ES-2 shows the proposed general locations for potential TPFs.

ES.4.4 Overbridge Protection Structures

Electrification of the corridor would require the construction or enhancement of overbridge protection barriers on 47 roadway or pedestrian bridges across the Caltrain alignment. These barriers are necessary to prohibit access to the rail corridor and prevent objects from being thrown off the bridges in a manner that would damage or interfere with the electrical facilities.

ES.4.5 Grade Crossing Warning Devices

The Proposed Project would also require a change in the warning devices for at-grade crossings. As part of the Proposed Project, the existing warning devices would be removed because they operate on a DC circuit and the proposed EMUs would operate on an AC circuit. Caltrain trains equipped with onboard CBOSS PTC equipment will communicate with the grade crossings wirelessly, allowing the grade crossing gates to function safely. CBOSS PTC will be in place by 2015. For non-Caltrain trains (which will not have onboard CBOSS PTC equipment), Audio Frequency Overlays (AFOs), also known as track circuits, will be installed at fixed locations along the Caltrain ROW, allowing the grade crossing gates to function safely. An AFO is a sensor that activates the grade crossings when the train is approaching.

ES.4.6 Rolling Stock

New EMUs are the preferred rolling stock option for the Proposed Project. New EMUs would replace the portion of Caltrain's existing diesel locomotives and passenger cars that will reach the end of its useful life by 2020 ~~2019~~. Caltrain would operate electric service between San Francisco and San Jose with EMUs. With EMUs, each car, or set of cars (unit), can have its own pantograph mounted on the roof and separate electric motor drives to each axle. EMUs can be operated in a variety of train consists, dependent upon the requirements of the rail system operator. Options include single motor cars (where each car is fitted with a driving cab at both ends) and paired cars (where there is a driving cab at only one end of each car). A pair can comprise two motor-cab cars, or a motor-cab plus a non-motored trailer-cab car. Another option would be two motorized cab cars with multiple non-motored trailer cab-cars in between. There is currently no United States-based prototype for the EMU proposed for the Proposed Project. The EMU vehicle for the Proposed Project would be a multi-level car of comparable dimensions to the existing Caltrain gallery car. Caltrain has received a waiver from the FRA that would allow modern European EMU equipment to operate on the Caltrain Peninsula Corridor provided that temporal separation is provided between the light-weight EMUs and heavy freight trains (this is referred to as the FRA waiver) but Caltrain now presumes that temporal separation will not ultimately be required for the Proposed Project.[5]

ES.4.7 Operations and Maintenance

ES.4.8 Caltrain Operating Scenario(s) Under Electrification

Caltrain's existing schedule includes five trains per peak hour during the a.m. and p.m. peaks, as well as mid-day service, for a total of 92 trains per day between San Jose and San Francisco. In addition to local service (stopping at every station), existing weekday Caltrain service consists of six baby bullet trains and ten limited-stop trains in the a.m. northbound and p.m. southbound and five baby bullet trains and 11 limited-stop trains in the a.m. southbound and p.m. northbound. There is approximately one train per hour per direction from 10 a.m. until 2 p.m. and after 7 p.m.

The proposed level of Caltrain operations consists of six trains per peak hour during the a.m. and p.m. peaks, as well as mid-day service, for a total of 114 trains per day between San Jose and San Francisco. Based on a prototypical schedule, with Proposed Project implementation there would be

[5] It should be noted that the FRA is currently in a rulemaking process for "Alternative Compliant Vehicles" that is relevant to the EMUs in the Proposed Project. It is Caltrain's understanding that ~~when the rule is in place,~~ the FRA waiver can be modified and/or the temporal separation requirement will ~~may~~ no longer be necessary when rule-making is in place. There is prior precedent of approval of alternative compliant vehicles without requiring temporal separation (for Denton County Transportation Authority) and the proposed EMU's can provide equivalent safety to the FRA's Tier 1 passenger safety requirement. For the purposes of this EIR, it is assumed that temporal separation will not be required. ~~the current FRA waiver requirement would be in force~~.

approximately six a.m. and p.m. baby bullet trains per direction. There would be approximately two trains per hour per direction from 9 a.m. until 4 p.m. and after 7 p.m.

ES.4.9 Ridership

Implementation of the Proposed Project is anticipated to result in increased ridership by 2020 and by 2040. Table ES-1 shows the existing Caltrain ridership and the projected Caltrain ridership from 2020 and 2040, with and without the Proposed Project.

Table ES-1. Estimated Ridership with the Proposed Project

	2013	2020[a]	2040
Existing/No Project[b]	47,000	57,000	84,000
With Project[c, d]	N/A	69,000	111,000

Source: Appendix I, *Ridership Technical Memorandum*. Ridership above is based on boardings, not boardings and alightings.

[a] 2020 was used for ridership analysis to ensure full operation of the new electrified service.

[b] No Project analysis assumes the same schedule as at present (5 trains per peak hour; 1 train per off-peak hour per direction; total of 92 trains per day) for both 2020 and 2040

[c] For 2020, analysis assumed 75% electrified and 25% diesel service from San Jose to San Francisco.

[d] For 2040, analysis presumes fully electrified service between San Jose and San Francisco. As described above, the Proposed Project only has sufficient funding at present to provide 75% electrified service between San Jose and San Francisco. It is presumed that additional funding will be obtained to allow full electrified service between San Jose and San Francisco to occur by 2040.

ES.4.10 Energy Consumption

With the Proposed Project, the primary energy source would be electricity. Through conversion of trains from diesel motor propulsion to EMUs, the Proposed Project would substantially decrease diesel fuel use and substantially increase annual electricity use. Existing fuel consumption is approximately 4.5 million gallons per year (mid-2012 to mid-2013). With the Proposed Project, in 2020 ~~2019~~ diesel trains would provide approximately 25 percent of service from San Francisco to San Jose and all of the service from San Jose to Gilroy. These diesel trains would require 1.1 million gallons of fuel per year, a reduction of approximately 3.4 million gallons per year from current conditions. Proposed Project operation would require approximately 88 ~~83~~ million kWh of electricity in 2020 ~~2019~~. This includes energy expended during both train travel and idling.

ES.4.11 Maintenance

Trimming or removal of trees will be required along the tracks and electrical facilities where they would otherwise pose a maintenance or safety concern. One maintenance item that is unique to electric vehicles is the need to inspect the pantograph carbon collector strips for wear and damage. Carbon is a relatively soft material, even when mixed with copper particles to create "metalized" strips. However, carbon, rather than the contact wire, is designed to be the sacrificial element in the sliding current collection interface. As a result, the pantograph would need to be frequently inspected to ensure that there is sufficient carbon interface.

ES.4.12 Construction Schedule/Durations

The preliminary project schedule (subject to change) is provided below.

- Environmental review/design/permitting: 1–2 years.
- Construction: 3–4 years.
- Testing: 1–2 years.

The goal is to commence electric revenue service in 2020 ~~2019~~.

The construction activities described above are not sequential; construction could occur simultaneously at several locations.

ES.4.13 Right-of-Way and Easement Needs

Based on the current system design, and assuming a worst-case-pole-placement scenario, there would be a need for acquisition of new ROW for one TPS (and possibly a second TPS, depending on location) as well as for some areas where OCS poles and wires would need to be placed outside the current ROW.

For the two TPSs, the JPB is considering several different sites for each traction power substation. Sites for intermediate paralleling and switching station facilities have also been identified, but all of the locations are within the Caltrain ROW. The total estimated area needed for the two substations is up to 1.4 acres.

In most cases, the OCS poles would be placed within the Caltrain ROW. However, in certain locations, there may be insufficient clearance from the railway track centerlines and the JPB may need to acquire ROW for placement of poles and wires. At this time, based on ~~35 percent design~~ preliminary engineering and worst-case pole placements (i.e., side poles in two-track areas and portals in multi-track areas) in terms of ROW need, it is estimated that new easements on adjacent public roads and on rail ROW ~~is estimated as 0.6~~ would be up to 0.9 acres and ROW acquisition on private property is estimated as 0.2 acres, for a total of ~~0.9~~ 1.1 acres.~~[6]~~ These calculations presume placement of OCS poles on the outside of the outermost track. If alternative pole alignments are used in some locations, these estimates may change.

In addition, in some locations there is insufficient ROW width to provide for the necessary 10 feet of electrical safety clearance within the current ROW to adjacent vegetation and structures. Where electrical clearance is necessary outside the Caltrain ROW, the JPB will need to obtain an electrical safety easement from property owners to permit the trimming and removal of vegetation and to maintain structures outside a 6-foot safety zone from the OCS alignment. ~~At this time~~ The Draft EIR presumed a worst-case electrical safety zone up to 24 feet from the outer track centerline. The Final EIR describes that the electrical safety zone is more likely to be 21 feet in most two-track areas and 18 feet in most multi-track areas. Using a range between the Draft EIR and Final EIR safety zone assumptions, it is estimated that approximately 5 to 8 acres of new easement would be required on adjacent public road and rail ROW, 2 to 10 acres on private residential, commercial, or industrial property, and 0.1 to 0.3 acres on parklands for a total of approximately 7 to 18 acres. These

~~[6] Total does not add because of rounding.~~

calculations presume placement of OCS poles on the outside of the outermost track. If alternative pole alignments are used in some locations, these estimates may change.

Maps in Appendix J of this Final EIR show the ROW encroachments based on preliminary engineering.

The JPB is presently examining the design for Proposed Project facilities and the amount of needed ROW may be more or less than that discussed above.

ES.4.14 Relation to the High-Speed Rail Project

The electrification system envisioned for the corridor would be configured in such a way that it would support the future operation of California HSR. The power supply system of choice for a steel-wheel-on-steel-rail high-speed train operation is 25-kV, 60-Hz, single-phase AC electrification. The Caltrain corridor is currently only rated for a maximum of 79 mph[7] and, thus, there may be need for track and other system upgrades in order to support higher speeds than at present. The Proposed Project includes electrification infrastructure that would first be used by Caltrain and can later be used for high-speed trains. However, the Proposed Project does not include other improvements necessary for high-speed trains such as platform improvements, high-speed rail maintenance facilities, passing tracks or other Core Capacity projects. The Proposed Project does not include improvements to support speeds greater than 79 mph or high-speed rail operations on the Caltrain corridor at speeds up to 110 mph.[8] High-speed rail construction and operations would be the subject of a later, separate environmental analysis to be conducted by CHSRA and FRA. The cumulative impact analysis in this document does address cumulative impacts of Blended Service (see Chapter 4, Section 4.1, *Cumulative Impacts*) but only provides a conceptual analysis of those impacts given that HSR design for Blended Service has not been completed.

ES.5 Costs and Funding

ES.5.1 Capital Costs

An updated estimate of the capital costs associated with the Proposed Project including rolling stock and the fixed facilities was completed in 2014 ~~for the 2009 EA/EIR (FTA and JPB 2009).~~ The cost of the fixed facilities (e.g., OCS, traction power facilities) is ~~was~~ estimated at approximately $950 to 958 ~~$785~~ million and the cost of rolling stock is ~~was~~ estimated to be $524 to $573 ~~$440~~ million for a total

[7] The Federal Railway Administration (FRA) regulates track safety through its track safety standards. Speed restrictions are based on a number of factors including curvature, signaling, track conditions, the physical condition of trains, and the presence of grade crossings.

[8] As described in Section 4.1, *Cumulative Impacts*, the cumulative analysis in this EIR presumes speeds for Blended Service up to 110 mph because the blended system has been simulated by Caltrain at speeds of up to 110 mph and shown to be viable. In addition, CHSRA has confirmed that with speeds up to 110 mph, a 30-minute express travel time can be achieved between San Jose and San Francisco as required by Proposition 1A (CHSRA 2013). If it is determined to be necessary to analyze speeds greater than 110 mph in the future, additional simulations will be performed to understand the viability and implications of the 100 to 125 mph speed range identified by CHSRA in the 2012 Partially Revised Program EIR (CHSRA 2012d). If speeds faster than 110 mph are ultimately proposed by CHSRA for the Caltrain corridor, they will be evaluated in the separate environmental document for high-speed train service on the San Francisco Peninsula.

of $1,474 to $1,531 ~~$1,225~~ million. ~~(FTA and JPB 2009). The JPB is presently developing updated capital costs that will be presented in the Final EIR.~~

ES.5.2 Capital Funding Sources and Programming

The Proposed Project's capital costs are proposed to be funded from the sources shown in Table ES-2. As noted in Table ES-2, additional sources of funding need to be identified in order for the project to be fully funded.

Table ES-2. Funding Sources for Corridor Electrification Project (Millions of Dollars)

Source	Amount (YOE$)
Estimated Capital Costs	**$1,474 to $1,531**
State Proposition 1A[a], Proposition 1B[b]	$620
JPB	$121
Regional (Bay Area Air Quality Management District, Tolls)	$31
Federal (Federal Transit Administration)	$453
Total Secured Funding	**$1,225**
Funding Needed	**$249 to 306**
Potential Additional Sources of Funding: JPB Financing / Transportation Infrastructure Finance and Innovation Act (TIFIA) Loan; JPB; Fare; Regional Measure 2 State Cap & Trade FTA Core Capacity; FTA Vehicle Replacement	

[a] Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century of 2008.
[b] The Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006.
YOE = year of expenditure.

ES.5.3 Operating and Maintenance Costs and Revenues

The prior 2009 EA/EIR (FTA and JPB 2009) presented estimates of operating and maintenances costs and revenues for the Proposed Project. ~~The JPB is presently developing new estimates that reflect current assumptions and the recent ridership estimates. The updated operations and maintenance costs will be presented in the Final EIR.~~

A total operation and maintenance (O&M) estimate for the PCEP is in progress. The specific costs associated with operating and maintaining the rail services and infrastructure analyzed in the PCEP EIR will be influenced by organization and management structure to be further examined and refined through the design-build contractor and vehicle procurement and contract approvals targeted for late 2015.

Operating fuel costs have been estimated for the PCEP and the analyzed alternatives and are presented in Chapter 5, *Alternatives*.

ES.6 Project Variants

Caltrain has identified a number of variants that may be implementing to lower project costs including the following:

- *Project Variant 1 - Electrification to just south of the Tamien Station*: This variant would include only electrifying the Caltrain corridor to Milepost (MP) 49.9 (approximately 0.5 miles south of the Tamien Station just south of the railyard near CP Michael) instead of MP 51.1 (a subvariant would defer electrification of the railyard temporarily or permanently). This variant would require moving paralleling station PS7 from the Proposed Project location near MP 51.1 adjacent to Kurte Park to one of two locations adjacent to Alma Street.
- *Project Variant 2 - Deferral of electrification of storage tracks at the San Francisco 4th and King Station*. Under this variant, the storage tracks would not be electrified temporarily or permanently.
- *Project Variant 3 - Electric locomotives may be used instead of EMUs for backup train sets*. This variant would only affect temporary replacement of individual EMUs at discrete times.
- *Project Variant 4 - Combining guy wire and OCS pole foundations*. This variant would result in slightly less construction by combining foundations for the guy wires and for the OCS pole foundations.

One or more of these variants may be implemented as means to lower infrastructure costs.

ES.7 Summary of Environmental Impacts and Mitigation

The potential impacts of the Proposed Project are presented in Chapter 3, *Settings, Impacts, and Mitigation Measures*, and cumulative impacts are presented in Chapter 4, *Other CEQA-Required Analysis*, and are summarized in Table ES-3. Mitigation measures were also identified, where available, for significant impacts identified in this EIR. These mitigation measures are also listed in Table ES-3. Please note that in Table ES-3, the term “significant” refers to the level of impact and the term ”considerable” refers to Proposed Project contribution to a cumulative impact.

The Draft EIR analyzes the construction impacts, operational impacts, and cumulative impacts for each separate subject area. The following summary describes the key conclusions in this Draft EIR. This list is not a comprehensive list of impact conclusions; for a comprehensive review, please refer to Table ES-3, Chapter 3, and Chapter 4.

- Key Project Construction Impact Summary
  - *Aesthetics:* The Proposed Project would temporarily change aesthetic conditions and light and glare adjacent to residential areas and a number of parks. Project mitigation would minimize the duration and extent of these temporary impacts.
  - *Air Quality*: Proposed Project construction impacts regarding criteria pollutants and toxic air contaminants can be reduced to less-than-significant levels with routine project mitigation measures.
  - *Biological Resources*: The Caltrain ROW is primarily a disturbed urban rail corridor with only limited biological resources. The Proposed Project would impact limited areas of habitat for special-status species as well as riparian vegetation, wetlands and sensitive natural communities during construction but routine project mitigation would reduce these impacts to a less-than-significant level. Project construction would also require removal of

up to 1,000 ~~2,200~~ trees[9] and pruning of an addition 3,200 ~~3,600~~ trees for the OCS alignment and ESZ under worst-case assumptions. Project mitigation would require tree avoidance, minimization, and/or replacement. While the biological impacts of tree removal can be mitigated, this is considered a significant and unavoidable aesthetic impact (see discussion under operational impacts below).

- *Cultural Resources*: Construction of the Proposed Project's OCS has the potential to affect certain historic resources, specifically the Caltrain San Francisco tunnels, historic Caltrain stations, certain bridges and underpasses, and several other potential historic resources. Mitigation would require specific design treatments to reduce and avoid impacts where feasible. Tunnel modifications necessary to provide heights for Caltrain and freight rail cars, such as tunnel notching, the removal of decorative stone portals, and OCS infrastructure attachment to tunnels, may result in significant and unavoidable impacts on the San Francisco Tunnel 4 portal even with mitigation. Potential impacts on archaeological resources can be reduced to a less-than-significant level with routine project mitigation.
- *Geology, Soils and Seismicity*: Proposed Project construction impacts related to erosion, geological conditions, and soils can be reduced to less-than-significant levels with routine project mitigation measures.
- *Greenhouse Gas Emissions*: Proposed Project construction would result in greenhouse gas (GHG) emissions, but, as discussed below, those emissions would be offset by operational reductions within a matter of months.
- *Hazards and Hazardous Materials*: Some parts of the Caltrain ROW are contaminated because of prior activities. Project mitigation would control exposure of workers and the public to contamination where encountered. Project mitigation would also control potential spills of hazardous materials during construction, as well as potential effects on emergency plans.
- *Hydrology and Water Quality*: Proposed Project construction impacts on water quality can be reduced to less-than-significant levels with routine project mitigation measures.
- *Land Use and Recreation:* Temporary disruption of land use and recreation resulting from Proposed Project construction can be reduced to less-than-significant levels with routine project mitigation measures.
- *Noise and Vibration:* Construction would be required during the day and night in order to maintain Caltrain passenger service during construction. Although project mitigation would reduce noise in many locations, mitigation might not always reduce noise impacts during nighttime construction to a less-than-significant level. Project mitigation would reduce construction vibration impacts to a less-than-significant level.
- *Population and Housing*: The Proposed Project would not displace any housing and would not result in substantial changes in population during construction.
- *Public Services and Utilities*: The Proposed Project would require relocation of certain utilities and Caltrain would coordinate with all utility owners to conduct relocation activities in a way that minimizes potential disruption.

[9] Estimated tree removals based on the current tree survey and assessment. It was previously estimated that there are approximately 19,250 trees located within and immediately adjacent to Caltrain's ROW. See Appendix F, *Tree Inventory and Canopy Assessment*.

- *Transportation and Traffic*: The Proposed Project could result in temporary disruption of traffic as well as passenger and rail service during construction. Project controls would include coordination with local roadway agencies and other passenger and freight rail service operators to minimize disruption.

- Key Project Operational Impact Summary
  - *Aesthetics*: The Proposed Project would change local visual character through addition of the OCS, TPFs and tree removal along the existing Caltrain ROW. While the effect of the OCS and the TPFs can be mitigated to a less-than-significant level, the change in aesthetics with tree removal is identified as a significant and unavoidable impact, even with tree avoidance, minimization, and replacement mitigation.
  - *Air Quality*: The Proposed Project would substantially improve both local and regional air quality. Reductions in Caltrain system criteria pollutant emissions compared with existing (2013) conditions would range from 66 to 86 ~~56 to 84~~ percent in 2020 and more for 2040 with full electrification. Toxic air contaminant health risks along the Caltrain corridor between San Jose and San Francisco due to train emissions would be reduced by 87 ~~74~~ percent in 2020 and by 100 percent in 2040 with full electrification compared to existing conditions.
  - *Biological Resources*: Operationally, the Proposed Project would have limited impacts on biological resources except on nesting birds and bats during vegetation maintenance. These impacts would be less than significant with mitigation to control the timing of maintenance. The Proposed Project would have benefits for local and regional natural habitats by reducing diesel emissions and their effects on terrestrial and aquatic habitats.
  - *Cultural Resources*: The Proposed Project would have no impact on cultural resources during operations.
  - *Electromagnetic Fields/Electromagnetic Interference (EMF/EMI):* EMF levels associated with EMU and OCS operation and traction power facilities would be less than health guidelines and, thus, the impacts would be less than significant concerning public health. EMU and OCS operation could result in interference with sensitive equipment at discrete facilities, such as hospitals with imaging equipment and freight and passenger rail signal systems, but design mitigation controls can address this potential similar to measures applied for prior electrified railroads including the Northeast Corridor.
  - *Geology, Soils and Seismicity*: With mitigation, the Proposed Project would have a less-than-significant impact on geology, soils, or seismicity during operation.
  - *Greenhouse Gas Emissions*: The Proposed Project would substantially reduce GHG emissions compared with existing conditions and future No Project conditions. Reductions in Caltrain system GHG emissions compared with existing (2013) conditions would be 24,000 metric tons (MT) of carbon dioxide equivalent (CO_2e) in 2020 and 30,000 ~~31,000~~ MT CO_2e for 2040 with full electrification. When taking into account the reduction in regional vehicle miles traveled with increased Caltrain ridership, the Proposed Project would reduce GHG emissions compared with No Project conditions by 79,000 ~~68,000~~ MT CO_2e in 2020 and 189,000 ~~177,000~~ MT CO_2e for 2040 with full electrification. Construction GHG emissions would be offset within a matter of months of operation.

- *Hazards and Hazardous Materials*: With mitigation, the Proposed Project would have a less–than-significant impact on hazards and hazardous materials during operation.
- *Hydrology and Water Quality*: Some of the new project facilities would be located within the 100-year floodplain, but project mitigation would reduce impacts to a less-than-significant level. Minor increases in impervious spaces would occur, but runoff impacts would be controlled with implementation of stormwater regulation requirements. Portions of the Caltrain ROW and some of the new project facilities are at risk of future coastal flooding due to the projected sea level rise with climate change. Existing trackbed elevations along the alignment were compared to the future state projections of sea level rise elevations for 2050 and 2100(CO-CAT 2013). Given that effective coastal flooding mitigation requires the involvement of multiple parties beyond Caltrain, at this time it cannot be concluded that future flooding impacts on the Caltrain system would be fully avoided. Mitigation to develop and implement a ~~seal~~ sea level rise adaptation plan is proposed in the Draft EIR. Given the *Ballona Wetlands* court decision, it is unknown whether or not the impacts of sea level rise on a project are properly considered significant impacts under CEQA and, thus, this EIR explains this impact for disclosure purposes.
- *Land Use and Recreation:* The Proposed Project would be located along an existing rail corridor. Traction power substations constructed separate from the Caltrain ROW would be allowable compatible uses in the proposed commercial/industrial locations. The Proposed Project would not divide existing communities. Aesthetic impact mitigation would help reduce potential operational impacts at ~~one~~ two park locations where a paralleling station is proposed and where paralleling stations are adjacent to current or future residential areas. Tree mitigation would also help to reduce impacts on park amenities where tree removal in parks is required.
- *Noise and Vibration*: EMUs are quieter than the current diesel locomotives, but increased service will mean more train horn events at the at-grade crossings. The Draft EIR evaluated noise impacts with the Proposed Project at 49 locations along the project corridor and found that the Proposed Project would lower noise levels compared to existing conditions at 37 ~~33~~ locations, would not change levels at eight locations and would result in small increases in noise at four ~~eight~~ other locations. However, the increases would be less than FTA noise thresholds. Noise associated with the traction power facilities was also evaluated and significant impacts were only identified at one potential location for a traction power substation in South San Francisco and one potential location for a paralleling station in Palo Alto; noise design treatments proposed as mitigation would reduce impacts at this location to a less-than-significant level. Vibration effects were also analyzed in the Draft EIR and found to be less than significant for the Proposed Project.
- *Population and Housing*: The Proposed Project would not result in substantial changes in population or housing demand during operation.
- *Public Services and Utilities*: The Proposed Project would have less-than-significant impact on public services and utilities during operations.
- *Transportation and Traffic*:
    - The Draft EIR analyzes the potential traffic benefits and adverse effects of the Proposed Project. In 2020, the Proposed Project would reduce daily regional VMT by 235,000 miles and would reduce daily VMT in every city along the corridor from San Jose to San

Francisco. In 2040, with full electrification, daily VMT reductions would be even greater (619,000 miles).

- Despite the overall traffic reduction benefits, the Proposed Project would result in localized traffic impacts at certain intersections near at-grade crossings and around Caltrain stations. The impact at the at-grade crossings is a combination of more gate-down time due to more train service and less gate-down time due to faster acceleration and deceleration of the EMUS. Compared to No Project conditions, at the at-grade crossings with gates, the net effect of the Proposed Project would be to have longer gate-down times at about 45 ~~50~~ percent, shorter gate-down times at about 23 ~~25~~ percent, and mixed results at the remaining 32 ~~25~~ percent (shorter gate-down times in one peak period and longer in the other). With increased ridership, there will also be increased traffic around Caltrain stations.
- The Draft EIR studied a total of 82 intersections along the Caltrain corridor that were selected as the most likely locations of potential project impact. Of those intersections, the Proposed Project in 2020 would have significant impacts at 21 intersections. Project-level mitigation would reduce these impacts to a less-than-significant at all but seven ~~nine~~ intersections. An additional nine intersections were evaluated in the FEIR, but no additional significant impacts were identifies in this additional analysis.
- The Proposed Project would have less-than-significant impacts on other transit services and station access and parking and less-than-significant impacts with mitigation on pedestrian and bicycle facilities.
- The Proposed Project would have less-than-significant impacts on freight rail service and operations as existing freight heights would be accommodated by the Proposed Project, the project would not electrify the Union Pacific owned "MT-1" track south of Santa Clara and the ~~limited amount of existing freight service can continue to function with the reduction in~~ project would not result in any substantial change in freight operational windows ~~due to the temporal separation requirements of the FRA waiver~~. ~~If current FRA rule-making for alternative compliant vehicles results in elimination of the temporal separation requirement, then impacts on freight service would be less than disclosed in this EIR.~~

- Key Cumulative Impacts, Including those Related to Blended Service
  - *Aesthetics*: Blended service with more than two high-speed trains would require a set of passing tracks. Depending on location, this may result in a significant change in local visual character in combination with the Proposed Project's impacts related to tree removal and OCS installation. Because the Proposed Project would result in changes in visual character at some locations due to tree removal where tree replacement is not possible on-site, the Proposed Project may contribute considerably to localized changes in visual character.
  - *Air Quality*: Since the Proposed Project would improve air quality, it would not contribute adversely to cumulative air quality impacts.
  - *Biological Resources*: Blended Service improvements and other cumulative projects may affect some of the same biological resources affected by the Proposed Project but these impacts can likely be mitigated to a less than significant level with mitigation similar to the Proposed Project. With mitigation, the Proposed Project would not contribute to any cumulatively significant impacts.

- *Cultural Resources*: Cultural resource impacts usually result from construction; therefore, no significant cumulative impacts on cultural resources were identified.
- *Electromagnetic Fields/Electromagnetic Interference (EMF/EMI):* Combined Proposed Project and HSR EMF levels are expected to be less than EMF threshold levels. HSR operations could also result in EMI impacts on facilities with sensitive equipment like the Proposed Project. Design level treatments could address potential contributions of the Proposed Project to EMI impacts.
- *Geology, Soils and Seismicity*: Proposed Project contributions to cumulative impacts related to geology, soils and seismicity can be reduced to less than significant levels with routine project mitigation measures.
- *Greenhouse Gas Emissions*: As noted above, the Proposed Project would reduce GHG emissions and thus would not contribute to cumulative impacts related to GHG emissions.
- *Hazards and Hazardous Materials:* Proposed Project contributions to cumulative impacts related to hazards and hazardous materials can be reduced to less-than-significant levels with routine project mitigation measures.
- *Hydrology and Water Quality*: Proposed Project contributions to cumulative impacts related to hydrology and water quality can be reduced to less than significant levels with routine project mitigation measures except potentially related to flooding associated with sea level rise, which may be considerable and unavoidable.
- *Land Use and Recreation:* Proposed Project contributions to cumulative impacts related to land use and recreation can be reduced to less-than-significant levels with project mitigation related to tree avoidance and replacement, and with aesthetic mitigation addressing new infrastructure.
- *Noise and Vibration*:
    - Cumulative noise impacts were evaluated for 2040 with the combined effect of the Proposed Project, HSR trains, increases in freight service, and increases in other tenant passenger rail services (ACE, Capitol Corridor, AMTRAK, and Dumbarton Rail Corridor). Cumulative noise increases were found to increase noise levels in excess of FTA noise thresholds in 2040 at nearly all study locations if all rail increases come to fruition. Cumulative noise mitigation is proposed to consider a long-term program of noise reductions including multiple approaches such as ~~wayside horns,~~ building sound insulation and quiet zones[10]. Long-term grade separations and road closures are also considered, where acceptable to local jurisdictions and where funding is available.
    - Cumulative vibration impacts were evaluated with cumulative rail service increases and were found to be significant due to the cumulative number of increases trains and potentially due to the increase in vibration associated with potential increased speeds for the Blended Service 110 mph scenario. Cumulative vibration mitigation is proposed that includes track treatments and design that would address potential cumulative effects.

[10] Quiet zones may be adopted only by local jurisdictions (i.e., cities and counties), not by rail operators like Caltrain. As discussed in Section 4.1, *Cumulative Impacts*, in this EIR, this mitigation strategy would only apply where a local jurisdiction is willing to approve a quiet zone and where feasible at-grade crossing improvements are identified that meet the FRA requirements for quiet zones.

- *Population and Housing*: The Proposed Project would not contribute considerably to any cumulative impacts related to population and housing.
- *Public Services and Utilities*: The Proposed Project would not contribute considerably to any cumulative impacts related to public services and utilities.
- *Transportation and Traffic*:
  - Since the Proposed Project would reduce regional VMT, it would not contribute adversely to cumulative regional traffic.
  - The Draft EIR studied cumulative impacts with and without the Proposed Project at 82 intersections along the Caltrain corridor. Of those intersections, there would be 39 locations where the Proposed Project would contribute considerably to significant localized cumulative traffic impacts. Cumulative mitigation includes signalization a minor roadway improvements. Proposed mitigation would reduce the Proposed Project's cumulative contribution to less than significant at all but 17 intersections. While grade separations are a technically feasible mitigation, as noted above it is financially infeasible for Caltrain to adopt a comprehensive program of grade separations as mitigation. However, in the long-term where funding becomes available and it is acceptable to local jurisdictions, Caltrain would support grade separations in the long run.
  - The Proposed Project would have less-than-considerable contributions or less-than-considerable contributions with mitigation to cumulative impacts on other transit services, pedestrian and bike facilities, and station access and parking.
  - ~~Blended Service operations could further limit the freight operational window depending on the specific HSR operational windows. Future freight increases may also be challenged with the narrowing of operational windows.~~ Lowering of existing overhead heights at certain locations may limit the ability of freight operators to use freight train equipment with higher heights than at present. While it is likely that freight operators can adapt to these changed conditions with scheduling and equipment selection options, it is possible that a limited amount of future freight service might not be accommodated on the Caltrain corridor and could be diverted to other locations or to other modes (such as trucks) that may result in secondary impacts on localized traffic and localized noise[11]. ~~Limiting of passenger rail service to avoid narrowing of freight operational windows would be counterproductive to Proposed Project and Blended Service purposes and would only decrease project benefits to regional traffic, air quality, and noise.~~ However, mitigation is identified to provide for restoration of existing effective vertical clearances where needed and feasible.

[11] As described in Section 4.1, *Cumulative Impacts,* due to the Proposed Project's substantial regional traffic, air quality, and greenhouse gas emission benefits, a limited amount of freight diversion from rail to truck would not result in significant cumulative regional traffic, air quality, or greenhouse gas impacts. The impact identified associated with limited diversion, if it occurs, would be confined to potential localized traffic and noise along truck haul routes.

ES.8 Other Alternatives Studied

The JPB considered a wide range of alternatives suggested during the scoping process and then conducted a three-part screening evaluation to select the alternatives to be analyzed in this EIR. Alternatives determined to be infeasible, to not avoid or substantially reduce one or more significant impacts of the Proposed Project, or to not meet all or most of the project's objectives ~~purpose and need~~ were dismissed from further analysis. Based on the screening process results, ~~this EIR~~ the JPB selected the following alternatives for further analysis: the No Project Alternative and four~~three~~ other alternatives: a Diesel Multiple Unit (DMU) Alternative, a Dual-Mode Multiple Unit Alternative, a Tier 4 Diesel Locomotive Alternative, and an Electrification with OCS Installation by Factory Train Alternative.

A key feature of different train alternatives that is critical to providing train service along a commute corridor with many potential stops is acceleration and deceleration. Table ES-4 compares the initial acceleration rates and time to accelerate to 79 mph of the alternatives analyzed in this EIR:

Table ES-4. Estimated ~~Initial~~ Acceleration Rates of Different Alternatives

Operator	Diesel Locomotives (No Project)	Dual-Mode Multiple Units	Diesel Multiple Units	Tier 4 Diesel Locomotive Alternative	Electric Multiple Units (Proposed Project)
Initial Acceleration Rate (mph/second)	0.5 (Existing) 1.1 (New)	~~1.1 (Diesel)~~ ~~1.5 (Electric)~~ 1.7 (both modes)	~~1.4~~ 1.8	1.1 (Single-head) 2.1 (Double-head)	2.1
Time to Accelerate to 79 mph	2'33"	2'44"	1'45"	1'24" (Double-head) 2'33" (Single-Head)	1'06"
Sources provided in Chapter 5, *Alternatives*					

ES.8.1 The No Project Alternative

Section 15126.6(e) of the State CEQA Guidelines requires the analysis of a No Project Alternative.

The No Project Alternative would include no electrification of the Caltrain ROW between San Jose and San Francisco, no purchase of EMUs, and no increase in train service. The current train service is assumed to continue unchanged to 2020 and 2040. As noted above, this service consists of five trains per peak hour, 92 trains per day, through use of diesel engine–hauled locomotive trains. Locomotives and passenger carriages would be replaced when they reach the end of their service life, meaning that approximately 75 percent of the existing fleet would be replaced by 2020. If new equipment is purchased, then new locomotives would need to meet the U.S. Environmental Protection Agency (USEPA) Tier 4 emissions standards.

While this alternative would not increase train service, ridership would still increase, similar to how ridership has been increasing in recent years, meaning that trains would have a higher occupancy average in the future.

ES.8.2 Diesel Multiple Unit Alternative

Diesel Multiple Units (DMUs) are self-propelled diesel-mechanical vehicles with engines located below the passenger compartment. The key DMU characteristic related to desired service improvements is the reduction of running times due to faster acceleration than traditional diesel locomotive push-pull service. DMUs require less time to accelerate up to full speed from stations stops and slow areas (compared to existing single-head diesel locomotive trains), reducing overall travel times, particularly on a corridor featuring frequent stops.

A DMU Alternative is considered feasible, would avoid or substantially reduce one or more significant impacts of the Proposed Project and would meet some, but not all of the project's objectives~~purpose and need~~. ~~Specifically, a~~ A DMU Alternative would not meet the project's purpose to provide electrical infrastructure compatible with high-speed rail. In addition, while the increased train service under this alternative would increase revenue, this alternative would also increase diesel fuel consumption compared with existing conditions[12] which would increase operating costs and would have lower ridership than the Proposed Project. ~~Because this alternative fails to meet the project's fundamental purposes, the JPB could decide not to analyze it in this EIR. However, there has been community interest, expressed most recently in scoping comments, in the analysis of a DMU Alternative and, thus, the JPB decided to provide this alternative analysis for informational purposes.~~

For the purposes of this EIR, this alternative assumed the following:

- An eight-car single-level DMU train, with a capacity of 78 passengers per car (624 passengers per train) was analyzed in order to analyze an alternative that would roughly match the approximate number of seats ~~ridership~~ per train capacity of the Proposed Project. Only a single-level is being evaluated because ~~a~~ the currently available double-deck DMU designs would not fit in the Caltrain system tunnels and because there are a number of other constraints to a double-deck design including that there is no existing market for double-deck DMUs (see further discussion in Chapter 5, *Alternatives*).
- Caltrain service schedule for the DMU Alternative would be the same as the Proposed Project but with lower ridership. DMUs do not accelerate ~~or decelerate~~ as fast as EMUs and thus the number of station stops ~~steps~~ would likely have to be reduced to maintain the same trip time as the Proposed Project EMUs or travel times would be longer ~~less~~.
- The eight-car single-level DMU train length of 680 feet would exceed the length of Caltrain platforms at most Caltrain stations and would require platform extension construction.
- The DMU Alternative is assumed to terminate at the San Francisco 4th and King Station and would not proceed to the ~~Transbay Terminal Center (~~TTC~~)~~ because the Downtown Extension (DTX) tunnel and the TTC are designed only for electric trains.

[12] In general, DMUs are more fuel efficient than diesel locomotives for consists of five cars or fewer but less fuel efficient for consists longer than five cars. The Proposed Project includes six-car consists to accommodate approximately 600 passenger seats per train to meet ridership demands. Thus, an eight-car DMU was assumed to accommodate a similar level of passengers. Among many other considerations described in Chapter 5, *Alternatives*, train length and fuel efficiency are two reasons that a DMU option is not as favorable for the Caltrain service as EMUs would be.

ES.8.3 Dual-Mode Multiple Unit (Dual-Mode MU) Alternative

Dual-mode MUs are self-propelled vehicles that can operate in both a diesel mode and in an electrified mode. While there are dual-mode locomotives in operation on the East Coast, there are no known dual-mode MUs in operation in the United States at present. However, there are dual-mode MUs in operation in Europe and others in construction that can operate in both a diesel mode in non-electrified territory and in an electrified mode using an overhead 25 kVA OCS.

A Dual-Mode MU Alternative is considered feasible, would avoid or substantially reduce one or more significant impacts of the Proposed Project and would meet some, but not all of the project's objectives~~purpose and need~~. The Dual-Mode MU Alternative would not meet the project's purpose to provide electrical infrastructure compatible with high-speed rail. In addition, while the increased train service under this alternative would increase revenue, this alternative would also increase diesel fuel consumption compared with existing conditions[13] which would increase operating costs and would have lower ridership than the Proposed Project. ~~Because this alternative fails to meet the project's fundamental purposes, the JPB could decide not to analyze it in this EIR. However, there has been community interest, expressed most recently in scoping comments, in the analysis of a Dual-Mode MU Alternative and, thus, the JPB decided to provide this alternative analysis for informational purposes.~~

For the purposes of this alternative analysis, existing European train designs were used to derive alternative assumptions.

- A 10-car single-level dual-mode MU train, consisting of two coupled five-car trainsets, with an approximate capacity of 600 passenger seats per train was analyzed in order to analyze an alternative that would roughly match the per train capacity of the Proposed Project.
- The 10-car single-level dual-mode MU train length would be 600 feet which would require lengthening at some of the Caltrain platforms including the platforms at 22nd Street, Broadway, California Street, Sunnyvale, and Santa Clara.
- Caltrain service schedule for the Dual-Mode MU Alternative would be the same as the Proposed Project but with lower ridership. Dual-mode MUs do not accelerate ~~or decelerate~~ as fast as EMUs and thus the number of station steps would likely have to be reduced to maintain the same trip time as the Proposed Project EMUs or travel times would be less.
- This alternative does not include electrification between San Jose and the 4th and King Station in San Francisco. However, this alternative would need to include traction power facilities to link the electrified lines in the DTX to power from PG&E. This electrification would involve connecting overhead or underground transmission wires from PG&E to a new traction power substation, and connecting transmission lines from the new traction power substation to the OCS for the DTX.
- This Alternative is assumed to operate in a diesel mode from San Jose to San Francisco and then either terminate at the San Francisco 4th and King Station or proceed in an electric mode to the TTC. In 2020, this alternative, like the Proposed Project, would terminate at the 4th and King Station. In 2040, this alternative is presumed to operate with split service with 4 trains terminating at the 4th and King Station and two trains proceeding to TTC.

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[13] A Dual-Mode MU Alternative would have similar, but likely somewhat greater, fuel consumption than the DMU Alternative would have because the multiple units are often heavier (due to dual-mode equipment) and the train consist would likely be longer, as assumed in this EIR.

ES.8.4 Tier 4 Diesel Locomotive Alternative (T4DL)

A Tier 4 Diesel Locomotive (T4DL) Alternative is feasible, as new diesel locomotives are under construction in the U.S. that can meet the USEPA's Tier 4 emissions standards.

The T4DL Alternative would not meet the project's objective of providing electrical infrastructure compatible with high-speed rail. In addition, while the increase train service under this alternative would increase revenue, this alternative would also increase diesel fuel consumption compared with existing conditions which would increase operating costs. Therefore, this alternative would only partially meet the project's objective to increase operating revenue and would not meet the project objective to reduce operating fuel costs. In addition, as discussed below, this alternative would not lower engine noise compared to the No Project Alternative.

The new Tier 4 diesel locomotives under construction by Siemens can reach up to 125 mph top speed and have a maximum deceleration of approximately 1.8 mphps (Siemens 2013), but the deceleration profile would be somewhat less than that of the EMUs as the passenger coaches would not have independent braking like the EMUs.

This alternative includes two variants: 1) a single-head (SH) scenario which includes operation of train consists with only one locomotive; and 2) a double-head (DH) scenario in which trains are operated with two locomotives in order to match the Proposed Project schedule.[14]

For the purposes of this alternative analysis in order to make "apples to apples" comparisons to the Proposed Project to contrast the consequences of using a different train technology, the following assumptions were made.

- Train consists would be the same as today with a single or double locomotive hauling 5 bi-level passenger coaches with a nominal capacity of 600 passenger seats per train order to analyze an alternative that would roughly match the ridership per train capacity of the Proposed Project.
- It was assumed that the Caltrain service levels (6 trains per peak hour, 114 trains/weekday) would be the same as the Proposed Project.
- For 2040, the T4DL Alternative is assumed to terminate at the San Francisco 4th and King Station and would not proceed to the TTC because the DTX and the TTC are designed only for electric trains.

ES.8.5 Electrification with OCS Installation by Factory Train Alternative

This alternative consists of the same operational elements as the Proposed Project (electrified service with EMUs) but with a different method for construction of the OCS.

An alternative method of installing the OCS could be through the use of a so-called "Factory Train" (also called an "Electrification Train" and a "High Output Plant System" or the HOPS train), which is a moveable assembly line system, mounted on rails. One of the prime advantages of a Factory Train is the rate of progress in OCS installation. Rates of progress up to 1 mile/night have been reported, and

[14] In order to provide an "apples to apples" comparison, the Tier 4 Diesel Locomotive Alternative presumes replacement of approximately 75 percent of the existing diesel locomotives in 2020 with Tier 4 Diesel Locomotives and the use of the other remnant Caltrain diesel locomotives until they reach the end of their service life, which is the same assumption made about the use of EMUs for the Proposed Project.

the system can reportedly be used while allowing for adjacent rail lines to be used by existing trains although there may be speed restrictions for the use of adjacent lines.

This alternative is only a construction methodology alternative to conventional construction of the OCS. Thus, analysis is limited to differences between the Proposed Project and this alternative relative to OCS construction. As noted above, about 80 percent of the OCS is presumed to be installed using a Factory Train with the remaining 20 percent assumed to be installed using conventional construction. Thus, the discussion below is only relevant to the 80 percent installed by a Factory Train. Construction impacts for the other 20 percent would be the same as for the Proposed Project.

ES.9 Comparison of Alternatives and the Environmentally Superior Alternative

The State CEQA Guidelines require a comparison of alternatives analyzed in an EIR and identification of an environmentally superior alternative. The environmentally superior alternative is the alternative that would avoid or substantially lessen, to the greatest extent, the environmental impacts associated with the project while feasibly obtaining most of the major project objectives. If the alternative with the least environmental impact is determined to be the No Project Alternative, the EIR must also identify an environmentally superior alternative among the other alternatives.

For construction, the No Project Alternative and the Tier 4 Diesel Locomotive Alternative would both be the environmentally superior alternative because neither ~~it~~ would require any ~~have no electrification infrastructure (OCS or TPFs)~~ construction.~~ Excluding the No Project Alternative,~~ The Dual-Mode MU Alternative would ~~be the environmentally superior construction alternative because it would~~ result in a lower level of construction than the DMU Alternative, the Proposed Project and the Electrification with OCS Installation by Factory Train Alternative. Given what is known about the Factory Train construction at this time,[15] it is considered environmentally superior to the Proposed Project for construction.

For operations, the No Project Alternative would be environmentally inferior to the DMU Alternative, the Dual-Mode MU Alternative, the Tier 4 Diesel Locomotive Alternative and the Proposed Project because it would result in substantially lower ridership and, thus, higher criteria pollutant and GHG emissions,~~ higher noise levels at a majority of location~~s, and worse regional traffic conditions. However, the No Project Alternative would have lower noise levels than the DMU Alternative, the Dual-Mode MU Alternative and the Tier 4 Diesel Locomotive Alternative. The Dual-Mode MU Alternative would have higher 2020 operational impacts than the DMU Alternative for 2020 (due to a heavier train set and likely more fuel consumption), but due to likely higher ridership in the long run with DTX/TTC, the Dual Mode MU Alternative is likely to result in long-term better air quality, lower GHG emissions and better regional traffic conditions than the DMU Alternative and

[15] As noted above, this is a new technology, and the first OCS installation using it starts in early 2014, so there is no in-practice data by which to judge the impacts of that project, only the one single Environmental Statement completed for the Great Western Main Line Electrification Project. Despite that project lacking certain data, such as quantification of construction air quality or GHG emissions, the evidence in the Environmental Statement appears to support a conclusion that taking into account all construction subjects, a Factory Train alternative would be environmentally superior.

the Tier 4 Diesel Locomotive Alternative. Thus, for operations of the alternatives to the Proposed Project, the Dual-Mode MU Alternative would be the environmentally superior alternative.

However, compared with the Proposed Project, the non-electrification alternatives ~~Dual-Mode MU Alternative and the DMU Alternative~~ would result in higher criteria pollutant and GHG emissions, higher noise levels, and likely worse regional traffic in the long run, but would avoid the long-term impacts of the OCS infrastructure and tree removal.[16] The tradeoffs between aesthetics impacts versus air quality, GHG emissions, noise, and traffic impacts are ~~is~~ not easily evaluated given the dissimilar nature of these different impacts.

The following summarizes the key differentiators between the Dual-Mode Alternative, the DMU Alternative and the Proposed Project.

- Residents, park users, and other sensitive receptors along the Caltrain ROW would have less aesthetic impacts, slightly higher TAC emission health risks, and higher noise impacts with the non-electrification alternatives ~~Dual-Mode Alternative and the DMU Alternative~~.
- Bay Area residents would be more affected relative to air quality and regional traffic by the non-electrification alternatives ~~Dual-Mode Alternative and the DMU Alternative~~ than by the Proposed Project.
- Contributions to GHG emissions, which cumulatively affect the entire planet, would be higher with the non-electrification alternatives ~~Dual-Mode Alternative and the DMU Alternative~~ than with the Proposed Project

While respecting the negative aesthetic impacts that would be experienced by individual receptors, on balance, the Proposed Project is considered environmentally superior to the non-electrification alternatives ~~Dual-Mode Alternative and the DMU Alternative~~ for operations because the air quality, TAC emission, GHG emissions, noise levels, and regional traffic all affect the physical health or safety of receptors along the Caltrain ROW, in the San Francisco Bay Area, and on the planet as a whole. Comparison of different impact subjects requires one to make value judgments; on balance, the JPB places a greater value on overall public health and safety in making this judgment.

When considering construction and operations together, a similar reasoning is applied. Given the long-term benefits to public health and safety and the temporary nature of construction, the Proposed Project is considered environmentally superior to the No Project Alternative, the Dual-Mode Alternative and the DMU Alternative and the Tier 4 Diesel Locomotive Alternative. Inclusion of the Factory Train Alternative as part of the Proposed Project would be environmentally superior to the Proposed Project only using conventional OCS construction methods. Excluding the Factory Train Alternative, which is only a partial alternative, the Dual-Mode MU Alternative would be the environmentally superior alternative among the full alternatives because it would result in better long-term benefits to public health and safety by having lower criteria pollutant emissions, lower GHG emissions, and lower regional traffic than the DMU Alternative and the No Project Alternative.

[16] As described in Section 3.3, *Biological Resources*, the Proposed Project's biological impacts relative to tree removal can be mitigated to less-than-significant levels, but as noted in Section 3.1, *Aesthetics*, the visual aesthetic impacts of tree removal may not always be mitigable to a less-than-significant level; thus, the comparison herein focuses on the visual aesthetic impacts of tree removal.

ES.10 Issues of Controversy and Issues to be Resolved

There are a number of notable areas of controversy for the Proposed Project including, but not limited to, the following:

- *Relation of the Project to the California High-Speed Rail Project:* This EIR describes the relation of the Proposed Project both in terms of funding, electrical infrastructure compatibility, as well as separate environmental review of the electrification project by Caltrain and of Blended Service by CHSRA. Some individuals may oppose high-speed rail or may oppose the electrification project because of its relation to the high-speed rail project. Some individuals may prefer to delay project analysis of the electrification project until a project analysis of Blended Service is conducted ~~connected~~.
- *Aesthetic Impacts of the Overhead Contact System and Tree Removal*[17]: This EIR discloses the impacts of new overhead infrastructure and tree removal on local visual character and proposes feasible mitigation to minimize the change in visual aesthetics. Affected parties may object to these impacts and may advocate for non-electrification alternatives or rejection of the Proposed Project to avoid the potential for these impacts to occur.
- *Noise Impacts of Existing and Future Trains*: As noted above, project-level train noise impacts would be less than significant but cumulative train noise impacts would be significant at many locations along the Caltrain corridor. Given funding limitations, Caltrain alone cannot commit to a comprehensive set of improvements to avoid all cumulative noise impacts. Affected parties may advocate that the Proposed Project should commit to these improvements, despite the financial limitations, think that the Proposed Project should be delayed until funding is obtained to make such a commitment, or that the Proposed Project should not go forward with these impacts. When Caltrain obtains sufficient funding for all EMU service between San Jose and San Francisco, then the Caltrain service would not contribute to cumulative noise increases compared to existing conditions.
- *Traffic Impacts of Future Train Service Increases*: As noted above, project-level and cumulative localized traffic impacts would be reduced to a less than significant level at some, but not all locations with proposed mitigation. Given funding limitations, Caltrain alone cannot commit to a comprehensive set of improvements to avoid all project or cumulative traffic impacts. Affected parties may advocate that the Proposed Project should commit to these improvements, despite the financial limitations, think that the Proposed Project should be delayed until funding is obtained to make such a commitment, or that the Proposed Project should not go forward with these impacts.
- *Project Impacts on Freight Service*: ~~As described above, the Proposed Project could affect freight service because of changes in freight operational hours, which would be of concern to Union Pacific Railroad and freight users.~~ The Proposed Project would provide adequate vertical clearances to accommodate existing freight equipment, and the ~~Draft~~ EIR identifies mitigation to restore existing effective vertical clearances where feasible, but there would be a slight (1-foot) reduction in effective vertical clearances between the Butterhouse Spur and Bayshore and any

[17] The EIR addresses tree removal as both a biological resource impact and an aesthetic impact. A key controversy is the aesthetic impact on local visual character due to tree removal, but individuals may also be highly concerned about the biological resource impacts of tree removal.

~~necessary and appropriate. Still,~~ changes in vertical clearance would be of concern to the affected parties.

- *Consideration of Alternatives*: The Draft EIR analyzes several alternatives to the Proposed Project at a lesser level of detail as allowed by CEQA. Some individuals may desire that Caltrain consider alternatives to electrification at an equal level to the Proposed Project and that the JPB Board would select one of such alternatives instead of the Proposed Project.

The following issues remain to be resolved:

- ~~*Consideration of Comments on this Draft EIR*: Caltrain will consider and respond to substantive comments on the Draft EIR in the Final EIR scheduled for completion later in 2014.~~
- *Certification of the EIR and Adoption of the Project:* The JPB will need to consider the Final EIR, ~~once prepared,~~ and decide whether to certify the document. If certified, then the Board would need to decide whether to adopt the Proposed Project.
- *Design of the Proposed Project and Procurement of Rolling Stock*: The final design of the Proposed Project needs to be completed following the environmental process as does the procurement process for EMU rolling stock.
- *FRA Rule-Making on Alternative Compliant Vehicles:* The FRA is currently engaged in rule-making that may influence Proposed Project operations.~~, including whether or not the current FRA waiver requirements concerning temporal separation need to be retained~~.
- *California Public Utility Commission (CPUC) Draft General Order:* The CPUC initiated rule-making (13-03-009) in 2013 pursuant to Petition 12-10-011 concerning a new General Order governing safety standards for the use of 25 kVA electrical lines to power high-speed trains. Because the OCS for the Proposed Project would be used in the future by both Caltrain and high-speed rail, some of the issues addressed in the draft General Order may apply to the Proposed Project OCS. It also appears additional CPUC rule-making proceedings would be needed for the Proposed Project because it would not be a fully grade-separated shared system.
- *Resolution of Legal Challenges to the Use of Proposition 1A Funds by CHSRA*: There are existing challenges to the current proposed use of Proposition 1A bond funds for the high-speed rail project. Depending on the resolution of these legal challenges, there might be ~~affects to~~ effects on the proposed use of Proposition 1A funds to fund a significant portion of the capital costs of the Proposed Project.
- *Planning and Design of the Blended Service Improvements*: Blended Service needs further evaluation and design in order to define specific improvements necessary along the Caltrain corridor, including station design, track improvements, passing track location and design, maintenance facility design and location, as well as other details.
- *Project-Level Evaluation of Blended Service Improvements by CHSRA*: Following further design, CHSRA will need to conduct project-level environmental evaluation of Blended Service in accordance with federal and state environmental regulations.
- *Preemption of CEQA by Federal Law*: As discussed in Section 1.5.1, there is considerable legal authority for the proposition that CEQA does not apply to the construction, improvement and operation of rail lines that are subject to federal jurisdiction. Consequently, as a federally-regulated rail carrier, in the event of litigation, the JPB reserves the right to assert that federal law may preempt aspects of CEQA as applied to the Proposed Project.

Table ES-3. Summary of Project Impacts and Required Mitigation Measures

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
Aesthetics				
AES-1: Have a substantial adverse effect on a scenic vista	Both	Less than significant	--	--
AES-2: Substantially degrade the existing visual character or quality of the site and its surroundings	Construction	Significant	AES-2a: Minimize OCS construction activity on residential and park areas outside the Caltrain ROW	Less than significant
	Operations	Significant	AES-2b: ~~Apply aesthetic surface treatments to new infrastructure to and provide screening vegetation at TPFs in sensitive visual locations~~ Aesthetic treatments for OCS poles, TPFs in sensitive visual locations, and Overbridge Protection Barriers BIO-5: Tree Avoidance, Minimization, and Replacement Plan CUL-1d: Implement design commitments at historic railroad stations	Significant and unavoidable (tree removal/pruning); Less than significant (TPFs, OCS, and overbridge protection structures)
AES-3: Substantially damage scenic resources, including trees, rock outcroppings, and historic buildings, along a scenic roadway	Both	Less than significant	--	--
AES-4: Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area	Construction	Significant	AES-4a: Minimize spill over light during nighttime construction	Less than significant
	Operations	Significant	AES-2b: ~~Apply aesthetic surface treatments to new infrastructure to and provide screening vegetation at TPFs in sensitive visual locations~~ Aesthetic treatments for OCS poles, TPFs in sensitive visual locations, and Overbridge Protection Barriers AES-4b: Minimize light spillover at TPFs	Less than significant

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
CUMUL-1-AES: Cumulative impacts on visual aesthetics	Construction	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
	Operation	Considerable (significant)	Project-level mitigation noted above	Considerable and unavoidable (significant)
Air Quality				
AQ-1: Conflict with or obstruct implementation of the applicable air quality plan	Operations	Less than significant	--	--
AQ-2: Violate any air quality standard or contribute substantially to an existing or projected air quality violation	Construction	Significant	AQ-2a: Implement BAAQMD basic and additional construction mitigation measures to reduce construction-related dust AQ-2b: Implement BAAQMD basic and additional construction mitigation measures to control construction-related ROG and NO_X emissions AQ-2c: Utilize clean diesel-powered equipment during construction to control construction-related ROG and NO_X emissions	Less than significant
	Operations	Less than significant (Beneficial)	--	--
AQ-3: Cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard	Construction	Significant	AQ-2a: Implement BAAQMD basic and additional construction mitigation measures to reduce construction-related dust AQ-2b: Implement BAAQMD basic and additional construction mitigation measures to control construction-related ROG and NO_X emissions AQ-2c: Utilize clean diesel-powered equipment during construction to control construction-related ROG and NO_X emissions	Less than significant
	Operations	Less than significant	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
AQ-4: Expose sensitive receptors to substantial pollutant concentrations	Construction	Less than Significant	--	--
	Operations	Less than Significant	--	--
AQ-5: Creation of objectionable odors affecting a substantial number of people.	Both	Less than significant	--	--
CUMUL-2-AQ: Cumulative effects on air quality	Construction	Considerable (significant)	Project-level mitigation noted above.	Less than considerable (less than significant)
	Operations	Beneficial	--	--
Biological Resources				
BIO-1: Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service	Construction	Significant	BIO-1a: Implement general biological impact avoidance measures BIO-1b: Implement special-status plant species avoidance and revegetation measures BIO-1c: Implement California red-legged frog and San Francisco garter snake avoidance measures BIO-1d: Implement western pond turtle avoidance measures BIO-1e: Implement Townsend's big-eared bat, pallid bat, hoary bat, and fringed myotis avoidance measures BIO-1f: Implement western burrowing owl avoidance measures BIO-1g: Implement northern harrier, white-tailed kite, American peregrine falcon, saltmarsh common yellowthroat, purple martin, and other nesting bird avoidance measures BIO-1h: Conduct biological resource survey of future contractor-determined staging areas BIO-1i: Minimize impacts on Monarch butterfly overwintering sites	Less than significant

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
	Operations	Significant	BIO-1j: Avoid nesting birds and bats during vegetation maintenance	Less than significant
BIO-2: Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations	Construction	Significant	BIO-1a: Implement general biological impact avoidance measures BIO-1b: Implement special-status plant species avoidance and revegetation measures BIO-2: Implement serpentine bunchgrass avoidance and revegetation measures BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan	Less than significant
	Operation	Less than significant	--	--
BIO-3: Have a substantial adverse effect on federally protected waters or wetlands as defined by Section 404 of the Clean Water Act or state waters or wetlands through direct removal, filling, hydrological interruption, or other means	Construction	Significant	BIO-1a: Implement general biological impact avoidance measures BIO-1h: Conduct biological resource survey of future contractor-determined staging areas BIO-3: Avoid or compensate for impacts on wetlands and waters HYD-1: Implement construction dewatering treatment	Less than significant
	Operation	Less than significant	--	--
BIO-4: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	Both	Less than significant	--	--
BIO-5: Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance	Construction	Significant	BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan	Less than significant
	Operation	Less than significant	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
BIO-6: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan	Construction	Significant	BIO-6: Pay *Santa Clara Valley Habitat Plan* land cover fee (if necessary)	Less than significant
	Operation	Less than significant	--	--
CUMUL-3-BIO: Cumulative effects on biological resources	Construction	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
	Operation	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
Cultural Resources				
CUL-1: Cause a substantial adverse change in the significance of historic built resources pursuant to Section 15064.5	Both	Significant	CUL-1a: Evaluate and minimize impacts on structural integrity of historic tunnels CUL-1b: Minimize impacts on historic decorative tunnel material CUL 1-c: Install project facilities in a way that minimizes impacts on historic tunnel interiors CUL-1d: Implement design commitments at historic railroad stations CUL-1e: Implement specific tree mitigation considerations at two potentially historic properties and landscape recordation, as necessary CUL-1f: Implement historic bridge and underpass design requirements BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan	Less than significant for all resources except possibly significant and unavoidable at Tunnel 4 and possibly for several potential historic resources affected by tree removal

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
CUL-2: Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5	Both	Significant	CUL-2a: Conduct an archaeological resource survey and/or monitoring of the removal of pavement or other obstructions to determine if historical resources under CEQA or unique archaeological resources under PRC 21083.2 are present CUL-2b: Conduct exploratory trenching or coring of areas where subsurface project disturbance is planned in those areas with "high" or "very high" potential for buried site CUL-2c: Conduct limited subsurface testing before performing ground-disturbing work within 50 meters of a known archaeological site CUL-2d: Conduct exploratory trenching or coring of areas within the three zones of special sensitivity where subsurface project disturbance is planned CUL-2e: Stop work if cultural resources are encountered during ground-disturbing activities CUL-2f: Conduct archaeological monitoring of ground-disturbing activities in areas as determined by JPB and SHPO	Less than significant
CUL-3: Disturb any human remains, including those interred outside of formal cemeteries	Both	Significant	CUL-3: Comply with state and county procedures for the treatment of human remains discoveries	Less than significant
CUMUL-4-CUL: Cumulative effects on cultural resources	Construction	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
	Operation	No impacts	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
Electromagnetic Fields and Electromagnetic Interference				
EMF-1: Substantially increase electromagnetic fields along the Caltrain corridor	Operation	Less than significant	--	--
EMF-2: Substantially increase electromagnetic interference along the Corridor	Operation	Significant	EMF-2: Minimize EMI effects during final design, Monitor EMI effects during testing, commission and operations, and Remediate Substantial Disruption of Sensitive Electrical Equipment	Less than significant
CUMUL-5-EMF: Cumulative increase in electromagnetic fields or electromagnetic interference	Construction	Less than Considerable	--	--
	Operation	Less than considerable (less than significant) (EMF)	--	--
		Considerable (significant) (EMI)	Project-level mitigation noted above	Less than considerable (less than significant)
Geology and Soils				
GEO-1: Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death, involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides.	Both	Significant	GEO-1: Perform a site-specific geotechnical study for traction power facilities	Less than significant
GEO-2: Result in substantial soil erosion or the loss of topsoil.	Both	Less than Significant	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
GEO-3: Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the Project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse.	Both	Significant	GEO-1: Perform a site-specific geotechnical study for traction power facilities	Less than significant
GEO-4: Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.	Both	Significant	GEO-4a: Identification of expansive soils GEO-4b: Mitigation of expansive soils	Less than significant
GEO-5: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater.	Both	No Impact	--	--
GEO-6: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature	Both	No Impact	--	--
CUMUL-6-GEO: Cumulative exposure of people or structures to geologic or seismic hazards or destruction of unique paleontological/geologic resources	Construction	Less than considerable (less than significant)	--	--
	Operation	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
Greenhouse Gas Emissions and Climate Change				
GHG-1: Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.	Both	Less than significant (beneficial)	--	--
GHG-2: Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.	Both	Less than significant	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
GHG-3: Place people or structures at substantial risk of harm due to predicted climate change effects (other than sea level rise)	Both	Less than significant	--	--
CUMUL-7-GHG: Cumulative greenhouse gas emissions or exposure of people or structures to reasonably foreseeable impacts of climate change	Both	Less than considerable (less than significant)	--	--
Hazards and Hazardous Materials				
HAZ-1: Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.	Both	Less than significant	--	--
HAZ-2: Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment	Both	Significant	HAZ-2a: Conduct a Phase II Environmental Site Assessment prior to construction HAZ-2b: Implement engineering controls and best management practices during construction	Less than significant
HAZ-3: Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.	Both	Less than significant	--	--
HAZ-4: Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.	Both	Significant	HAZ-2a: Conduct a Phase II Environmental Site Assessment prior to construction HAZ-2b: Implement engineering controls and best management practices during construction	Less than significant
HAZ-5: Result in an airport-related safety hazard for people residing or working in the project area.	Both	Less than significant	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
HAZ-6: Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	Both	Significant	TRA-1a: Implement construction road Traffic Control Plan	Less than significant
HAZ-7: Expose people or structures to a significant risk of loss, injury or death involving wildland fires.	Both	Less than significant	--	--
CUMUL-8-HAZ: Cumulative effects related to hazards and hazardous materials	Construction	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
	Operation	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
Hydrology and Water Quality				
HYD-1: Violate any water quality standards or WDRs, or otherwise substantially degrade water quality	Construction	Significant	HYD-1: Implement construction dewatering treatment, if necessary	Less than significant
	Operation	Less than Significant	--	--
HYD-2: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level	Construction	Significant	HYD-1: Implement construction dewatering treatment, if necessary	Less than significant
	Operation	Less than significant	--	--
HYD-3: Substantially alter the existing drainage pattern of the site or area, or substantially increase the rate or amount of surface runoff, in a manner that would cause substantial erosion or siltation onsite or offsite, exceed the capacity of existing or planned stormwater drainage systems, or provide substantial additional sources of polluted runoff	Both	Less than significant	--	--
HYD-4: Place housing within a 100-year flood hazard area, or place structures that	Construction	Less than significant	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
would impede or redirect flood flows within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or FIRM or other flood hazard delineation map	Operation	Significant	HYD-4: Minimize floodplain impacts by minimizing new impervious areas for new TPFs or relocating these facilities	Less than significant
HYD-5: Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam	Construction	Less than significant	--	--
	Operation	Significant	HYD-5: Provide for electrical safety for all new TPFs subject to periodic or potential flooding	Less than significant
HYD-6: Contribute to inundation by seiche, tsunami, or mudflow	Both	Less than significant	--	--
HYD-7: Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of SLR	Operation	Significant	HYD-7: Implement a sea level rise vulnerability assessment and adaptation plan	Potentially significant and unavoidable
CUMUL-9-HYD: Cumulative impacts related to hydrology and water quality (including flooding due to sea level rise)	Construction	Considerable (significant)	Project-level mitigation noted above	Less than considerable
	Operation	Considerable (significant)	Project-level mitigation noted above	Potentially considerable and unavoidable (flooding associated with sea level rise) (significant)
Land Use and Recreation				
LUR-1: Physically divide an established community	Both	Less than significant	--	--
LUR-2: Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Proposed Project adopted for the purpose of avoiding or mitigating an environmental effect and compatibility with existing surrounding land uses.	Both	Less than significant	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
LUR-3: Conflict with any applicable habitat conservation plan or natural community conservation plan.	Both	Less than significant	--	--
LUR-4: Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	Construction	Significant	BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan	Less than significant
	Operation	Significant	AES-2b: ~~Apply aesthetic surface treatments to new infrastructure to and provide screening vegetation at TPFs in sensitive visual locations~~ Aesthetic treatments for OCS poles, TPFs in sensitive visual locations, and Overbridge Protection Barriers	Less than significant
LUR-5: Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.	Both	No impact	--	--
CUMUL-10-LUR: Cumulative effects related to land use and recreation	Construction	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
	Operation	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
Noise and Vibration				
NOI-1: Expose sensitive receptors to substantial increase in noise levels	Construction	Significant	NOI-1a: Implement Construction Noise Control Plan	Significant and unavoidable (certain locations)
	Operation	Significant	NOI-1b: Conduct site-specific acoustical analysis of ancillary facilities based on the final mechanical equipment and site design and implement noise control treatments where required.	Less than significant
NOI-2: Expose sensitive receptors to substantial increase in ground-borne vibration levels from proposed operations	Construction	Significant	NOI-2a: Implement Construction Vibration Control Plan	Less than significant
	Operation	Less than significant	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
CUMUL-11-NOI: Cumulative increase in noise or vibration	Construction	Considerable (significant)	NOI-1a: Implement Construction Noise Control Plan NOI-2a: Implement Construction Vibration Control Plan	Less than considerable (less than significant)
	Operation	Considerable (significant)	Project-level mitigation noted above NOI-CUMUL-1: Implement a phased program to reduce cumulative train noise along the Caltrain corridor, as necessary to address future cumulative noise increases over FTA thresholds. NOI-CUMUL-2: Conduct project-level vibration analysis for Blended System operations and implement vibration reduction measures as necessary and appropriate for the Caltrain corridor.	Considerable and unavoidable for noise (significant); Less than considerable for vibration (less than significant)
Population and Housing				
POP-1: Induce substantial population growth, either directly or indirectly	Both	Less than significant	--	--
POP-2: Displace a substantial number of existing housing units, necessitating the construction of replacement housing elsewhere	Both	No impact	--	--
POP-3: Displace a substantial number of people, necessitating the construction of replacement housing elsewhere	Both	No impact	--	--
CUMUL-12-POP: Cumulative impact to population and housing	Both	No impact	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
Public Services and Utilities				
PSU-1: Substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or a need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services: fire protection, police protection, schools, or other public facilities	Both	Less than significant	--	--
PSU-2: Exceed wastewater treatment requirements of the applicable Regional Water Board	Construction	Significant	HYD-1: Implement construction dewatering treatment, if necessary	Less than significant
	Operations	Less than significant	--	--
PSU-3: Require or result in the construction of new water, wastewater, or stormwater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects	Both	No impact	--	--
PSU-4: Have sufficient water supplies available to serve the project from existing entitlements and resources, or would new or expanded entitlements be needed	Both	Less than significant	--	--
PSU-5: Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments	Both	Less than significant	--	--

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
PSU-6: Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs	Both	Less than significant	--	--
PSU-7: Comply with federal, state, and local statutes and regulations related to solid waste	Both	Less than significant	--	--
PSU-8: Construction activities would result in a substantial disruption to utility service systems	Construction	Significant	PSU-8a: Provide continuous coordination with all utility providers PSU-8b: Adjust OCS pole foundation locations PSU-8c: Schedule and notify users about potential service interruptions	Less than significant
PSU-9: Construction activities would result in the construction of new utility facilities or expansion of existing utility facilities, the construction of which could cause significant environmental effects	Construction	Significant	PSU-9: Require application of relevant construction mitigation measures to utility relocation and transmission line construction by others	Less than significant
CUMUL-13-PSU: Cumulative impacts related to public services and utilities	Both	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
Transportation and Traffic				
TRA-1a: Substantially disrupts existing or future traffic operations during construction	Construction	Significant	TRA-1a: Implement construction Road Traffic Control Plan	Less than significant
TRA-1b: Conflicts or creates inconsistencies with regional traffic plans or substantially disrupts future regional traffic operations from Proposed Project operation	Operation	Less than significant	--	--
TRA-1c: Conflicts or creates inconsistencies with local traffic plans or substantially disrupts future local traffic operations from Proposed Project operation in 2020	Operation	Significant	TRA-1c: Implement signal optimization and roadway geometry improvements at impacted intersections for the 2020 Project Condition	Significant and unavoidable

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
TRA-2a: Disrupts existing or planned transit services or facilities during construction	Construction	Significant	TRA-1a: Implement construction road Traffic Control Plan TRA-2a: Implement railway disruption control plan	Less than significant
TRA-2b: Creates demand for public transit services above the capacity which is provided or planned; interferes with existing or planned transit services or facilities; or conflicts or creates inconsistencies with adopted transit system plans, guidelines, policies, or standards from Proposed Project operations	Operations	Beneficial (Caltrain); Less than significant (other transit services)	--	--
TRA-2c: Substantially increase hazards for transit system operations because of a design feature or otherwise substantially compromise the safety of transit facilities	Operations	Less than significant	--	--
TRA-3a: Disrupts existing or planned pedestrian facilities during construction	Construction	Significant	TRA-1a: Implement construction road Traffic Control Plan	Less than significant
TRA-3b: Disrupts existing pedestrian facilities, interferes with planned pedestrian facilities, or conflicts or creates inconsistencies with adopted pedestrian system plans, guidelines, policies, or standards from Proposed Project operations	Operations	Significant	TRA-3b: In cooperation with the City and County of San Francisco, implement surface pedestrian facility improvements to address the Proposed Project's additional pedestrian movements at and immediately adjacent to the San Francisco 4th and King Station	Less than significant
TRA-4a: Substantially disrupts existing bicycle facilities or interferes with planned bicycle facilities during construction	Construction	Significant	TRA-1a: Implement construction road Traffic Control Plan	Less than significant

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
Substantially disrupts existing bicycle facilities or interferes with planned bicycle facilities; or conflicts or creates substantial inconsistencies with adopted bicycle system plans from Proposed Project operations	Operations	Significant	TRA-4b: Continue to improve bicycle facilities at Caltrain stations and partner with bike share programs where available, using the guidance in the Caltrain's Bicycle Access and Parking Plan	Less than significant
TRA-5: Results in inadequate emergency vehicle circulation and/or access.	Construction	Significant	TRA-1a: Implement construction road Traffic Control Plan	Less than significant
	Operations	Less than significant	--	--
TRA-6a: Provide inadequate parking supply during construction	Construction	Less than significant	--	--
TRA-6b: Does not meet Caltrain's *Comprehensive Access Program Policy Statement* or *Bicycle Access and Parking Plan* or would result in the construction of off-site parking facilities that would have secondary physical impacts on the environment from Proposed Project operations	Operations	Less than significant	--	--
TRA-7: Results in a change in freight rail service such that resultant diversions to truck or other freight modes would result in significant secondary impacts during operations	Construction	Significant	TRA-2a: Implement railway disruption control plan	Less than significant
	Operations	Less than significant	--	--
CUMUL-14-TRA: Cumulative effects to transportation and traffic	Construction	Considerable (significant)	Project-level mitigation noted above	Less than considerable (less than significant)
Regional Traffic	Operation	Beneficial	--	--
Localized Traffic	Operation	Considerable (significant)	TRA-CUMUL-1: Implement a phased program to provide traffic improvements to reduce traffic delays near at-grade crossings and Caltrain stations	Considerable and unavoidable

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation
Transit Systems	Operation	Considerable (significant)	TRA-CUMUL-2: Implement technical solution to allow electric trolley bus transit across 16th Street without OCS conflicts in cooperation with SFMTA	Less than considerable (less than significant)
Pedestrian and Bicycle Facilities	Operation	Considerable (significant)	Project level mitigation noted above	Less than considerable (less than significant)
Station Access and Parking	Operation	Less than considerable (less than significant)	--	--
Freight Service	Operation	Considerable (significant)	TRA-CUMUL-3: As warranted, Caltrain and freight operators will partner to provide Plate H clearance as feasible between San Jose and Bayshore ~~site improvements to restore existing effective vertical height clearances along the Caltrain corridor.~~	Considerable and unavoidable for ~~operational window change~~ potential localized noise and traffic if freight diversion to trucks occur (significant); Less than considerable for vertical height clearance (less than significant)

Impact	Phase	Significance before Mitigation	Mitigation	Significance after Mitigation

-- = not applicable
BAAQMD = Bay Area Air Quality Management District
EMF = electromagnetic field
EMI = electromagnetic interference
FTA = Federal Transit Administration
GHG = greenhouse gas
JPB = Peninsula Corridor Joint Powers Board
NO_x = oxides of nitrogen
OCS = overhead contact system
ROG = reactive organic gases
ROW = right-of-way
PRC = Public Resources Code
SFMTA = San Francisco Municipal Transportation Agency
SHPO = State Historic Preservation Officer
TPFs = traction power facilities

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Acronyms and Abbreviations

μg/m^3	Micrograms per cubic meter
μT	microTesla
2035 Plan	MTC Transportation 2035 Plan for the San Francisco Bay Area
AB	Assembly Bill
ABAG	Association of Bay Area Governments
AC	alternating current
ACE	Altamont Commuter Express
ACGIH	American Conference of Governmental Industrial Hygienists
ACS	American Community Survey
ADA	Americans with Disabilities Act
AFOs	Audio Frequency Overlays
AIA	Airport Influence Area
<u>ANSI</u>	<u>American National Standards Institute</u>
APE	Area of Potential Effect
APM	Automated People Mover
APU	auxiliary power unit
ARB	California Air Resources Board
<u>ATF</u>	<u>autotransformer</u>
AWR	average weekday ridership
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
BAT	Best Available Technology
BC	Business Commercial
BCDC	Bay Conservation and Development Commission
BFEs	base flood elevations
bgs	below ground surface
BIA	Building Industry Association
BMPs	best management practices
BRT	Bus Rapid Transit
BTP	Business Technology Park
<u>BTU</u>	<u>British Thermal Unit</u>
C&D	construction and demolition
C/CAG	City/County Association of Governments
C_2H_3Cl	vinyl chloride
CAA	Clean Air Act
CAAA	Clean Air Act amendments
CAAQS	California ambient air quality standards

cal BP	calibrated years before the present
Cal OSHA	California Division of Occupational Safety and Health
CalEEMod	California Emissions Estimator Model
CalEPA	California Environmental Protection Agency
CalMod	Caltrain Modernization
Caltrans	California Department of Transportation
CBOSS	Caltrain Communications Based Overlay Signal System
CCAA	California Clean Air Act
CCAs	Community Choice Aggregations
CCSF	City and County of San Francisco
CCJPA	Capitol Corridor Joint Powers Authority
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CEMOF	Central Equipment Maintenance Operations Facility
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CGP	Construction General Permit
CH_4	methane
CHSRA	California High-Speed Rail Authority
CHWMP	County Hazardous Waste Management Plan
cm	centimeter
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CO-CAT	California Climate Action Team
CP	Control Point
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
CRPR	California Rare Plant Rank
CT	computerized tomography
CTP	California Transportation Plan
CWA	Clean Water Act
CWSC	California Water Service Company
dB	Decibel

dBA	A-Weighted Decibel
DC	direct current
DCF	direct center feed
CWT	Constant Warning Time
DH	double-head
DMU	Diesel Multiple Unit
DNA	deoxyribonucleic acid
DOT	Department of Transportation
DPM	diesel particulate matter
DPR	California Department of Pesticides Regulation
DRC	Dumbarton Rail Corridor
DSOD	California Department of Safety and Dams
DTP	Denver Transit Partners
DTX	Downtown Extension
DTSC	California Department of Toxic Substances Control
Dual-Mode MU	Dual-Mode Multiple Unit
EC 4	Electrocode 4
DTX	Downtown Extension
DWR	California Department of Water Resources
EA	environmental assessment
EDR	Environmental Data Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ELF	extremely low frequency
EMF	electromagnetic fields
EMI	electromagnetic interference
EMU	electric multiple unit
EO	Executive Order
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
EP3	Eagle P3 Commuter Rail Project
ESA	Environmental Site Assessment
ESD	Emergency Services Department
ESP	energy service providers
ESRB	Electric Safety and Reliability Branch
ESZ	electrical safety zone
ETB	electric trolley bus
FC	Freeway Commercial
ETF	Engineering Task Force

<u>FAA</u>	<u>Federal Aviation Administration</u>
<u>FAR</u>	<u>Federal Aviation Regulations</u>
<u>FHWA</u>	<u>Federal Highway Administration</u>
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMMP	Farmland Mapping and Monitoring Project
FOEA	Finding of Effect Amended
FONSI	Finding of No Significant Impact
FR	Federal Register
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
G	ground factor
<u>GETS</u>	<u>General Electric Transportation System</u>
GCFI	Ground Fault Circuit Interrupter
GHG	greenhouse gas
GHz	gigahertz
GOs	General Orders
GWP	global warming potential
H_2S	hydrogen sulfide
HABS	Historic American Building Surveys
HAER	Historic American Engineering Record
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCP	habitat conservation plan
HFCs	hydrofluorocarbons
HI	hazard index
HMP	Hydromodification Management Plan
HOPS	High Output Plant System
HSR	high-speed rail
HST	high-speed train
Hz	Hertz
<u>ICDs</u>	<u>Implantable Cardioverter-Defilibrators</u>
I	Interstate
ICF	ICF International
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronics Engineers
in/sec	inches per second
IOUs	investor-owned utilities
IPCC	Intergovernmental Panel on Climate Change
<u>ISA</u>	<u>International Society of Arboriculture</u>

ISP	iron/steel pipe
JPB	Peninsula Corridor Joint Powers Board
kHz	kilohertz
kV	kilovolt
Kv/m	kilovolt per meter
L_{dn}	Day-Night Sound Level
lbs	pounds
L_{eq}	Equivalent Sound Level
LID	Low Impact Development
LIRR	Long Island Railroad
L_{max}	maximum noise level
L_{min}	Minimum Sound Levels
LOS	Level of Service
L_p	level
LUPs	Linear Underground/Overhead Projects
L_v	velocity level
m	meter
MAA	Management Agency Agreement
MARC	Maryland Regional Commute trains
MBTA	Migratory Bird Treaty Act
MEP	maximum extent practicable
mG	milligaus
mg/m^3	milligrams per cubic meter
MNRR	Metro-North Railroad
MOU	Memorandum of Understanding
MPE	Maximum Permissible Exposure
MP	mile post
mph	miles per hour
MPO	metropolitan planning organization
MRI	magnetic resonance imaging
MS4 Permit	General Permit for Municipal Separate Storm Sewer Systems
MSL	mean sea level
MST	Monterey-Salinas Transit
MT	metric tons
MTC	Metropolitan Transportation Commission
MU	Multiple Unit
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NAHC	Native American Heritage Commission
NCCP	Natural Community Conservation Planning

NCP	National Contingency Plan
NEC	Northeast Corridor
NES	Natural Environmental Study
NFIP	National Flood Insurance Act
NJT	New Jersey Transit
NO_2	nitrogen dioxide
NOP	Notice of Preparation
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	National Research Council
NRHP	National Register of Historic Place
O_3	ozone
O&M	operation and maintenance
OCS	overhead catenary system
OES	Office of Emergency Services
OSHA	Occupational Safety and Health Administration
PARCS	Palo Alto Rail Corridor Study
PA	Programmatic Agreement
Pb	lead
PCEP	Peninsula Corridor Electrification Project
Proposed Project	Peninsula Corridor Electrification Project
PDA	Priority Development Area
PFCs	perfluorinated carbons
PFRUG	Peninsula Freight Rail Users' Group
PG&E	Pacific Gas & Electric Company
PM	particulate matter
PM10	particulate matter less than 10 micrometers in size
PM2.5	particulate matter that is 2.5 microns in diameter or less
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
ppb	parts per billion
PPE	Personal Protective Equipment
pphpd	per peak hour per direction
ppt	parts per thousand
PPV	Peak Particle Velocity
PRC	Public Resources Code
PS	Paralleling Station
PSD	Prevention of Significant Deterioration
PTC	Positive Train Control
QA/QC	quality assurance/quality control

R&D	Research &Development
RCP	reinforced concrete pipe
RCRA	Resource Conservation and Recovery Act
REL	reference exposure level
Regional Water Board	Regional Water Quality Control Board
RF	Radio Frequency
RMS	root-mean-square
ROG	reactive organic gases
ROW	right of way
ROSB	Rail Operations and Safety Branch
RPS	Renewable Portfolio Standard
RTPs	Regional Transportation Plans
RTSS	Rail Transit Safety Section
RWD	Report of Waste Discharge
RWQCB	Regional Water Quality Control Board
SAFETEA-LU	Safe, Accountable, Flexible, Efficient, Transportation Equity Act – A Legacy for Users
SamTrans	San Mateo County Transit District
Santa Cruz METRO	Santa Cruz Metropolitan Transit District
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SB	Senate Bill
SCP	Stormwater Control Plan
SCS	sustainable communities strategy
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SCVWD	Santa Clara Valley Water District
SEL	sound exposure level
SEMS	Standardized Emergency Management System
SEPTA	Southeastern Pennsylvania Transportation Authority
SF&SJ RR	San Francisco and San Jose Railroad
SF_6	hexafluoride
SFBAAB	San Francisco Bay Area Air Basin
SFMTA	San Francisco Municipal Transportation Agency
SFO	San Francisco International Airport
SFPUC	San Francisco Public Utilities Commission
SFRWQCB	San Francisco Regional Water Quality Control Board
SH	single-head
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SLR	sea level rise

SJIA	San Jose International Airport
SJRRC	San Joaquin Regional Rail Commission
SMART	Sonoma-Marin Area Rail Transit
SMCTA	San Mateo County Transportation Authority
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SO_2	sulfur dioxide
SO_4	sulfates
SOIS	Secretary of the Interior's standards
SPPH	Separate phase product
SR	State Route
SSM	supplemental safety measures
STA	South Terminal Area
State Water Board	State Water Resources Control Board
SWPPP	Storm Water Pollution Prevention Plan
SWS	switching station
TAC	Toxic Air Contaminant
T4DL	Tier 4 Diesel Locomotive
TCM	traffic control measure
TCP	Traffic Control Plan
TDS	total dissolved solids
TGV	Train A Grande Vitesse
TIFIA	Transportation Infrastructure Finance and Innovation Act
TJPA	Transbay Joint Powers Authority
TMDL	total maximum daily load
TOD	Transit-oriented development
TPF	traction power facility
TPS	traction power substation
TRA	Trackage Rights Agreement
TTC	Transbay Transit Center
U.S.C	United States Code
UBC	Uniform Building Code
UCSF	University of California San Francisco
UK	United Kingdom
UPRR	Union Pacific Rail Road
US 101	U.S. Highway 101
USACE	U.S. Army Corps of Engineers
UOM	Use, Operating and Maintenance Agreement
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VCB	vacuum circuit breaker

VCP	vitrified clay pipe
VdB	velocity in decibels
VMT	vehicle miles of travel
VTA	Santa Clara Valley Transportation Authority
VdB	Vibration Velocity Level
WAPA	Western Area Power Administration
WBWG	Western Bat Working Group
WDR	waste discharge requirement
WHO	World Health Organization
WIA	Wilson, Ihrig and Associates
WIC	Women Infants & Children
WIU	Wayside Interface Unit
YOE	year of expenditure

Chapter 1

Introduction

1.1 Overview

The Peninsula Corridor Electrification Project (PCEP or Proposed Project) consists of converting Caltrain from diesel-hauled to Electric Multiple Unit (EMU) trains for service between the Fourth and King Street terminus station in San Francisco and the Tamien Station in San Jose. Operating speed would be up to 79 mph, which would match the existing maximum speed.

By 2020/2021[1] ~~2019~~, approximately 75 percent of the service between San Jose and San Francisco would be electrified, with the remaining 25 percent being diesel-powered. After 2020 ~~2019~~, diesel locomotives used for San Francisco to San Jose service would be replaced with EMUs over time as they reach the end of their service life. Because the Proposed Project only involves electrification of the Caltrain right-of-way (ROW) from San Francisco to a point approximately 2 miles south of Tamien Station, Caltrain's diesel-powered locomotives would continue to provide service between the San Jose Diridon Station and Gilroy.

The Proposed Project would require the installation of 130 to 140 single-track miles of overhead contact system (OCS) for the distribution of electrical power to the new electric rolling stock. The OCS would be powered from a 25 kilovolt (kV), 60 Hertz (Hz), single-phase, alternating current (AC) traction power system consisting of two traction power substations, one switching station and seven paralleling stations. These facilities are described in more detail in Chapter 2, *Project Description*.

1.2 Project History

The Proposed Project is part of a program to modernize operation of the Caltrain rail corridor between San Jose and San Francisco. In addition to corridor electrification, modernization involves the installation of an advanced signal system which is discussed further below. The Peninsula Corridor Joint Powers Board (JPB), which operates Caltrain, previously evaluated corridor electrification in a prior EIR, for which a draft was completed in 2004 and a final was completed in 2009. The JPB did not certify the Final EIR due to the need for resolution of issues regarding joint planning for shared use of the Caltrain corridor by Caltrain and future high-speed rail (HSR) service. The Federal Transit Administration (FTA) completed the final Environmental Assessment (EA) and adopted a Finding of No Significant Impact (FONSI) in 2009.

Since 2009, JPB, the California High-Speed Rail Authority (CHSRA), the California Legislature, the Metropolitan Transportation Commission (MTC), and other parties have worked together to develop a vision of a "blended system" whereby both Caltrain and HSR would use the existing Caltrain corridor on the San Francisco Peninsula and would reach downtown San Francisco via the Downtown Extension (DTX) to the Transbay Transit Center (TTC). This vision for implementing

[1] Depending on timing for completion of construction, the first year of operations would be in 2020 or 2021. Since the first year of operations could be 2020, this EIR simply refers to 2020 as the first operational year.

Blended Service on the San Francisco Peninsula was included in the *Revised 2012 Business Plan* that the CHSRA Board adopted in April 2012 for the California High-Speed Rail System (CHSRA 2012) as well as the 2014 ~~Draft~~ Business Plan (CHSRA 2014).

JPB and CHSRA are committed to advancing a blended system concept, which was developed with stakeholders interested in the corridor. The blended system would remain substantially within the existing Caltrain ROW and would accommodate future HSR and modernize Caltrain service along the Peninsula corridor by primarily utilizing the existing track configuration. It is important to note that “accommodating” future HSR, in the context of the Proposed Project, means providing the electrical infrastructure compatible with HSR and not precluding HSR. The blended system would be primarily a two-track system shared by Caltrain, HSR and existing tenant passenger and freight rail operators.

Based on the blended system vision, the Caltrain Peninsula Corridor has been designated to receive an initial investment of Proposition 1A bond funds that would benefit Caltrain and its modernization program in the short term and HSR in the long run. JPB, CHSRA and seven other San Francisco Bay Area agencies (City and County of San Francisco, San Francisco County Transportation Authority, Transbay Joint Powers Authority, San Mateo County Transportation Authority, Santa Clara Valley Transportation Authority, City of San Jose, and MTC) have approved a Memorandum of Understanding (MOU) (*High Speed Rail Early Investment Strategy for a Blended System in the San Francisco to San Jose Segment known as the Peninsula Corridor of the Statewide High-Speed Rail System*) to pursue shared use of the corridor between San Jose and San Francisco to provide Blended Service of both Caltrain commuter rail service and HSR intercity service (JPB 2012). The MOU includes agency and funding commitments toward making an initial investment of approximately $1.5 billion in the corridor for purchasing and installing an advanced signal system, electrifying the rail line from San Jose to San Francisco, and purchasing electrified rolling stock. The MOU also conceptually outlines potential additional improvements needed beyond the first incremental investment of $1.5 billion to accommodate future HSR service in the corridor.

Corridor improvements identified in the MOU include the following:

- ***Advanced Signal System (CBOSS PTC or CBOSS)***: CBOSS stands for Communications Based Overlay Signal System and PTC stands for Positive Train Control. This project would increase the operating performance of the current signal system, improve the efficiency of at-grade crossing warning functions, and automatically stop a train when there is violation of speed or route. This project, which includes implementation of safety improvements mandated by federal law (i.e., the Rail Safety Improvement Act of 2008), has already been cleared environmentally, installation is underway (including the fiber optics communications backbone), and CBOSS PTC is scheduled to be operational by late 2015 as mandated by the Federal Railroad Administration (FRA).
- ***Corridor Electrification***: JPB decided to prepare this new EIR for the corridor electrification due to the changes in existing conditions since the prior EIR analyses ~~was~~ were conducted and to update cumulative impacts analysis of Blended Service and other developments along the corridor. Completion of a new EIR will also allow public agencies, stakeholders, the public and decision makers the opportunity to review the Proposed Project’s environmental effects in light of current information and analyses. This EIR analyzes operation of up to six Caltrain trains per peak hour per direction (an increase from five trains per peak hour per direction at present). Electrification may be analyzed as a separate project under CEQA because it has independent

utility (providing Caltrain electrified service) and logical termini (station end points). Electrification of the rail line is scheduled to be operational by 2020 ~~late 2019~~.

- ***Blended Service***: JPB, CHSRA, and the MOU partners have agreed on shared use of the Caltrain corridor by up to six Caltrain trains per peak hour per direction and up to four HSR trains per peak hour per direction.[2] Operation of more than two HSR trains per hour per direction would require one set of passing tracks somewhere between San Jose and San Francisco. In concept, Blended Service has been analyzed at operating speeds of 79 mph (the current maximum) to 110 mph[3]. The operational feasibility of Blended Service has been studied but remains only at the conceptual planning phase. The potential addition of HSR service to this corridor will be the subject of a separate environmental review by CHSRA that will be undertaken subsequent to the environmental process for the Proposed Project. Based on the current CHSRA *Revised 2012 Business Plan* (and the ~~Draft~~ 2014 Business Plan), Blended Service along the Caltrain corridor is scheduled to commence sometime between 2026 and 2029. Blended Service would connect with TJPA's DTX/TTC project to provide Caltrain and HSR service to the TTC, which is the mandated northern terminus of the HSR project per Proposition 1A.

1.3 Need for Project

Passenger trains have operated between San Jose and San Francisco since 1863. Caltrain is the oldest commuter rail operation in the San Francisco Bay Area and the only commuter rail service provided on the San Francisco Peninsula. It is operated by the JPB, a joint powers agency with representation from San Francisco, San Mateo, and Santa Clara Counties. Caltrain provides service between the South Bay and San Francisco including the Peninsula communities of San Jose (College Park, Diridon, and Tamien Stations), Santa Clara, Sunnyvale (Sunnyvale and Lawrence Stations), Mountain View, Palo Alto, Menlo Park, Atherton, Redwood City, San Carlos, Belmont, San Mateo (San Mateo, Hillsdale, and Hayward Park Stations), Burlingame (Burlingame and Broadway Stations), Millbrae, San Bruno, South San Francisco, and Brisbane (Bayshore Station) in Santa Clara and San Mateo Counties, and the 22nd Street and the 4th and King Stations in the City and County of San Francisco. Limited service is provided to College Park in San Jose and there is no weekday service to the Atherton or Broadway Stations. There is also special service to Stanford on football game days. In 1992, peak-period service was extended approximately 25 miles south of downtown San Jose,

[2] The CHSRA *2012 Business Plan: Ridership and Revenue Forecasting* (CHSRA 2012~~b~~) and the Draft 2014 Business Plan (CHSRA 2014) presume Phase 1 Blended Service would have up to four trains per peak hour and up to four trains per off-peak hour. As explained in Chapter 4, Section 4.1 *Cumulative Impacts,* this EIR presumes up to 40 HST daily trains in 2040 based on CHSRA's *Estimating High-Speed Train Operating and Maintenance Cost for the CHSRA 2012 Business Plan* (CHSRA 2012c). After 2040, which is the horizon for the cumulative impact analysis in this EIR, CHSRA may pursue additional daily service beyond the 40 daily trains assumed for the analysis in this EIR.

[3] As described in Section 4.1, *Cumulative Impacts*, the cumulative analysis in this EIR presumes speeds for Blended Service up to 110 mph because the blended system has been simulated by Caltrain at speeds of up to 110 mph and shown to be viable. In addition, CHSRA has confirmed that with speeds up to 110 mph, a 30-minute express travel time can be achieved between San Jose and San Francisco as required by Proposition 1A (CHSRA 2013). If it is determined to be necessary to analyze speeds greater than 110 mph in the future, additional simulations will be performed to understand the viability and implications of the 100 to 125 mph speed range identified by CHSRA in the 2012 Partially Revised Program EIR (CHSRA 2012d). If speeds beyond 110 mph are ultimately proposed by CHSRA for the Caltrain corridor, they will be evaluated in the separate environmental document for HST service on the San Francisco Peninsula.

creating a 77-mile-long Caltrain corridor, with new stops in South San Jose, Morgan Hill, San Martin, and Gilroy.

The population of the Bay Area is increasing and, with it, traffic congestion. Commute traffic between major employment centers in San Francisco, the San Francisco Peninsula, and the South Bay is growing, and there has been a substantial increase in “reverse commute” trips from San Francisco to Peninsula and South Bay locations over the past decade. Off-peak travel between San Francisco and Peninsula and South Bay locations is also on the rise. Caltrain has experienced increases in ridership as people seek alternate ways to meet these travel needs. Caltrain anticipates continued increases in demand for its rail services over time. To meet that increasing demand, JPB adopted the Rapid Rail Program and has already implemented additional three and four track sections in certain portions of the corridor and introduced the Baby Bullet Service in 2004.

Weekday Caltrain ridership in 1992 reached approximately 21,100 passengers, more than half of whom boarded or alighted at the Caltrain San Francisco terminus. By 2001, weekday Caltrain ridership had increased to approximately 34,000 passengers, with 38 percent boarding or alighting at the San Francisco terminus. Ridership dropped to approximately 27,000 daily passengers in 2003 as a result of declining economic conditions in the Bay Area, but rebounded to approximately 30,000 by 2004 following introduction of the Baby Bullet service. By 2008, average daily ridership reached 37,000 and, by 2013, average daily ridership had grown to approximately 47,000.

The following sections detail current and future transportation needs in the Caltrain corridor that would be addressed by the Proposed Project.

1.3.1 Current and Future Transportation Demand in the Caltrain Service Area

1.3.1.1 Current and Future Employment in the Caltrain Corridor

Current San Francisco Downtown Area Employment. Employment has continued to grow in San Francisco. From 1990 to 2000, employment in San Francisco increased approximately 10.6 percent; from 2000 to 2010, employment increased 3.9 percent. In 2010, the Downtown San Francisco Priority Development Area (PDA) area had 315,570 employees, 56 percent of the total San Francisco employment (Association of Bay Area Governments and MTC 2012). The Downtown San Francisco PDA contains the downtown neighborhoods of Rincon Hill, Transbay, and mid-Market. It also encompasses the Transit Center District, the Transbay Redevelopment Area, the Yerba Buena Center area, Van Ness Avenue, Japantown along Geary Boulevard, and the broad corridor around the Muni J line (Association of Bay Area Governments et al. 2013).

Anticipated Future San Francisco Employment. Based on Association of Bay Area Governments (ABAG) 2013 Projections, employment is expected to increase by approximately 34 percent between 2010 and 2040, with growth concentrated in a few areas (ABAG and MTC 2013). Between 2010 and 2040, the Downtown San Francisco PDA is projected to experience an increase in employment of approximately 17 percent. Employment in the Mission Bay area is projected to grow by almost 900 percent. Employment in the ~~Transbay terminal~~ TTC area is projected to grow by almost 400 percent. These changes will shift the balance of downtown San Francisco employment concentration somewhat southward, although the downtown area will retain its lead in all City employment. ABAG anticipates that by 2040, this area will still contain approximately 49 percent of citywide employment (ABAG and MTC 2012). The Proposed Project would terminate at the San

Francisco 4th and King Station; a substantial amount of the growth in San Francisco would occur within walking distance to this station. Under a separate project, the Transbay Joint Powers Authority will build an extension of the line from 4th and King to the TTC. Table 1-1 summarizes anticipated changes in San Francisco employment by workplace location.

Table 1-1. Anticipated Changes in San Francisco Employment 2010–2040

Jurisdiction or Area Name	2010 Employment	% of Total	2040 Employment	% of Total	% Change 2010–2040
Downtown	315,570	55.5	368,140	48.5	16.7
Mission Bay	2,770	0.5	27,200	3.6	882.0
Transbay ~~Terminal~~ Transit Center	7,950	1.4	37,660	5.0	374.0
Remainder of City	242,430	42.6	326,470	43.0	34.6
San Francisco Total	**568,720**	**100.0**	**759,470**	**100.0**	**33.5**

Source: ABAG and MTC 2012.

Current South Bay and Peninsula Employment. In both 2000 and 2010, Santa Clara County, with its fast-growing, high-technology companies, had the greatest number of jobs of all Bay Area counties. From 2010 to 2012, San Mateo and Santa Clara Counties experienced employment increases of 7 and 6 percent, respectively.

Future Peninsula Employment. Between 2010 and 2040, San Mateo County employment is expected to grow by 29 percent, while Santa Clara County employment growth is forecast at 33 percent. In 2040, Santa Clara County employment is expected to total 1.2 million jobs, 26 percent of total Bay Area employment. San Mateo County is expected to have 445,000 jobs in 2040.

The three counties of the Caltrain Peninsula Corridor are projected to have 2.4 million jobs in 2040, more than half of the employment in the Bay Area (ABAG and MTC 2013). Because of the constraining geography of the Peninsula, many of these jobs will be within a short distance of the Caltrain tracks. In addition, corridor travel demand is two-directional. In February 2013, morning peak-period Caltrain ridership (i.e., before 9:00 a.m.) was 60 percent northbound and 40 percent southbound. The reverse commute (i.e., southbound in the morning and northbound in the afternoon and evening) grew by 8.5 percent from 2012 to 2013 (Caltrain 2013).

1.3.1.2 Characteristics of Work Trips in the Peninsula Corridor

Journeys to Downtown San Francisco Employment

Year 2010 U.S. Census journey-to-work data indicate that approximately 14 percent of work trips to San Francisco come from San Mateo and Santa Clara Counties, while more than half come from San Francisco. San Francisco-originating work trips had the highest transit mode share (34 percent transit) of all Bay Area residence regions. In 2011, of the 265,164 San Francisco workers who commuted from outside of the City and County (of which 75,047 were from San Mateo County and 9,570 were from Santa Clara County), 38 percent drove alone (U.S. Census 2013).

More San Mateo and Santa Clara county residents drove alone to jobs in San Francisco than San Francisco and East Bay residents. The Proposed Project would improve commuter rail service, making it more attractive to South Bay and Peninsula workers commuting to San Francisco.

Journeys to South Bay and Peninsula Employment

According to the 2006–2010 American Community Survey (ACS), relatively high proportions of San Mateo and Santa Clara county jobs are filled by county residents. Fifty-eight percent of San Mateo County workers reside within the county, while San Francisco and Santa Clara counties each providing 12 percent of the San Mateo County workforce. Seventy-seven percent of Santa Clara County jobs are filled by county residents, with 5 percent coming from San Mateo County and 2 percent from San Francisco (MTC and ABAG 2010).

Use of transit for work trips by Peninsula residents is much lower than for San Francisco residents. According to the 2010 Census, only 2 percent of travel to work by Santa Clara County residents was on public transit, compared with 33 percent of work trips on public transit by residents of San Francisco. In San Mateo County, 8 percent of residents use public transit to get to work, a higher percentage than in Santa Clara County, but well below that of San Francisco County. The high-tech employment boom in the Caltrain corridor from San Jose to South San Francisco has, however, increased the absolute demand for transit, if not the mode share.

Caltrain boardings in Santa Clara and San Mateo Counties are continuing to grow. From 2012 to 2013, boardings grew by 9 percent in San Mateo County and 13 percent in Santa Clara County. By supporting improved Caltrain service—in concert with other transit improvements in the Corridor—the Proposed Project would better serve the Peninsula-based and reverse commuter ridership.

1.3.1.3 Other Peninsula Travel Served by Caltrain

Off-peak trips comprise approximately one-fifth of the person trips made in the region daily. Caltrain provides an important off-peak travel service. From 2012 to 2013, midday off-peak ridership increased by 24 percent. Weekend travel using Caltrain is also significant. In 2011, weekend Baby Bullet trains were added as a pilot program. Due to their success, two Baby Bullet trains run on weekends in each direction at present. In 2013, an estimated 13,846 passengers used Caltrain on Saturdays for trips within the corridor; Sunday trips averaged 10,448 passengers (Caltrain 2013).

1.3.1.4 Influence of Changes in Gas Prices

The long-term rise in gas prices has contributed to increased use of public transportation. Commuting to work by automobile has decreased approximately 4 percent in Santa Clara and San Mateo Counties from 2000 to 2010 in part due to increases in gas prices as well as traffic congestion and other factors. Regional commuter transportation systems, including Caltrain, would be the logical beneficiaries of a shift from private autos to public transportation, because these systems accommodate the home-work trip. Home-work trips constitute the largest share of person trips and they are the easiest trips to shift modes, assuming convenient origin-destination pairs. Should gasoline prices remain at high levels over the long-term or increase further, increased Caltrain ridership from this source would be reasonable to expect.

1.3.2 Current and Future Roadway Congestion in the Caltrain Corridor

Economic growth and the corresponding demand for transportation services in the San Francisco Bay Area have exceeded the region's ability to provide the needed roadway capacity. Existing demand for north-south travel along the Peninsula via U.S. Highway 101 (U.S. 101) and Interstate 280 (I-280) regularly exceeds existing highway capacities and results in congestion that is increasing in both frequency and duration. US 101 is the most severely congested freeway through the corridor (MTC 2009). Between San Francisco and San Jose, many roadway segments are at or over capacity during the peak commute hour. Caltrans travel time and speed studies indicate that major delays occur on both US 101 and I-280. The peak congestion generally results from traffic going into Silicon Valley in the morning and going out in the afternoon.

Based on Caltrans' most recent travel time and speed studies for 2008, the most congested highway segment was US 101 in Santa Clara County from Fair Oaks Avenue (Sunnyvale) to Oakland Road (San Jose) during afternoon commute hours. Motorists on this 7-mile segment experienced a daily delay of approximately 3,810 vehicle hours. The second most congested highway segment was US 101 in San Mateo County from Whipple Avenue (Redwood City) to Hillsdale Boulevard (San Mateo) during afternoon commute hours. Motorists on this 5-mile segment experienced daily delay of approximately 2,440 vehicle hours. The third most congested highway segment was on the parallel I-280 in Santa Clara County from Meridian Avenue (San Jose) to Wolfe Road (Cupertino) during morning commute hours. Motorists on this 5-mile segment experienced daily delay of approximately 2,120 vehicle hours. US 101 in San Mateo County from Hillsdale Boulevard (San Mateo) to 3rd Avenue (San Mateo) during morning commute hours was the fourth most congested segment. Motorists experienced daily delay of approximately 1,580 vehicle hours on the 2-mile segment.

Without future roadway improvements, congestion on corridor freeways is bound to worsen to the point at which travel would partially divert to surface routes and the peak periods would spread both into the midday and to later in the evening. Bottlenecks would continue to constrain movement through the corridor. ABAG Projections 2013 indicates that job growth in the Bay Area is expected to increase approximately 33 percent between 2010 and 2040 (ABAG and MTC 2013). The resultant new transportation demand will lead to high levels of congestion that will take a toll on economic development by constraining goods and people movements.

Opportunities to improve highway capacity are constrained by a number of factors, including funding availability, the need for extensive and costly ROW acquisitions, and potentially adverse environmental impacts, such as displacements of residences and businesses, and impacts on natural resources and redesign of local roadways beyond the interchanges. For these reasons, substantial capacity improvements to US 101 and I-280 cannot be relied upon to fully address long-term travel demands in the corridor. In this environment, Caltrain provides an essential and viable transportation alternative to costly highway capacity expansion. By reducing trip times and increasing transit ridership, the Caltrain Proposed Project would help to ease congestion on Peninsula and South Bay freeways.

1.3.3 Corridor Air Quality and Greenhouse Gas Emissions

High rates of auto ownership and increasing vehicle miles of travel (VMT) have contributed to air quality problems throughout California. Pollutants of concern include ozone (O_3); nitrogen oxides (NO_X) and sulfur dioxides (SO_2) (precursors of smog); carbon monoxide (CO); and particulate matter (PM). Greenhouse gases (including carbon dioxide, nitrous oxide and methane) are now a focus of environmental planning in California because of their role in global climate change. Motor vehicles are substantial contributors to the production of all of these pollutants.

The San Francisco Bay Area's air quality has improved in recent years, largely in response to technological improvements in motor vehicles and fuels that are less polluting. The project study area for air quality is within the San Francisco Bay Area Air Basin (SFBAAB), for which local air quality conditions are regulated by the Bay Area Air Quality Management District (BAAQMD). Despite this progress, the SFBAAB is still designated a nonattainment area for the 8-hour federal standards for ozone and PM2.5 (particulate matter smaller than 2.5 microns in diameter), a maintenance area for the federal CO standard, and an attainment/unclassified area for the federal PM10, NO_2, SO_2, and lead standards. With respect to the California standards, the SFBAAB is currently a serious nonattainment area for the 1-hour ozone standard, a nonattainment area for the 8-hour ozone, PM2.5, and PM10 standards, and an attainment area for all other standards.

A number of ambient air quality monitoring stations, maintained by BAAQMD, are located in the Bay Area to monitor progress toward air quality standards attainment. Six BAAQMD monitoring stations are on or near the Caltrain route. Chapter 3, Section 3.2, *Air Quality*, provides a summary of data collected at these stations and a discussion of the total number of days that state and federal ambient air quality standards were exceeded.

Because transportation is the major contributor to ozone precursors, increasing auto travel threatens the area's improvement in air quality. Growing congestion will add to the potential problems because of increased emissions of vehicles operating in stop-and-go traffic. Shifting commuters and other travelers to higher occupancy modes is highly desirable as a means to partially offset the effects on air quality produced by the growth in auto travel. Improved Caltrain service offers the greatest potential for increased high-occupancy travel along the San Francisco Peninsula, particularly in southern San Mateo County and Santa Clara County, the areas with the most severe air quality problems in the corridor. Based upon projections of potential Caltrain use in 2020, approximately 234,000 VMT would be removed from corridor roadways daily as a result of electrifying the Caltrain service (see Chapter 3, Section 3.14, *Transportation and Traffic*.)[4]

Equally important, the Proposed Project would substantially reduce diesel train emissions in the Caltrain corridor and result in a net decrease in criteria air pollutant emissions, even taking into account the indirect emissions associated with electricity consumption. The reduction of diesel emissions would help to improve regional air quality and reduce the localized emissions of toxic air contaminants associated with diesel particulate matter into the communities surrounding the Caltrain ROW and stations, which would be a substantial local health benefit.

Most of the communities in the Peninsula Corridor have adopted climate action plans to lower their community contributions of greenhouse gas emissions, with all seeking to lower transportation emissions given that transportation is usually the largest source of such emissions in most areas. As

[4] With fully electrified service and the Downtown Extension to the ~~Transbay Terminal~~ TTC~~,~~ VMT would be reduced by approximately 618,000 VMT in 2040 (see Appendix I, *Ridership Technical Memorandum*).

noted above, California has ambitious goals to reduce greenhouse gas emissions throughout the state. By reducing vehicle travel on regional roadways and replacing diesel locomotives with cleaner EMUs, the Proposed Project would also help Peninsula communities and California as a whole to meet their goals for greenhouse gas reductions.

1.3.4 Modernizing the Caltrain Service

Improving the appearance and attractiveness of Caltrain to potential consumers has long been suggested as a means of increasing ridership. Caltrain put new diesel locomotives and bi-level passenger cars into service as part of the “Baby Bullet” express service program in 2004. Rider response to this service has demonstrated the benefits of modernizing image, improving passenger comfort, and reducing travel times between major origins and destinations. The increase in ridership associated with the introduction of the Baby Bullet and new passenger cars suggests that there is an unmet demand for rapid transit along the Peninsula corridor. The existing Caltrain service cannot serve all Caltrain stations without a corresponding increase in travel time. With the Proposed Project, additional stops could be added (optimized stops) without loss of travel times and/or travel times could be reduced.

1.3.5 Accommodating Future High-Speed Rail

In June 2000, CHSRA issued its *Final Business Plan for Building a High-Speed Train System for California*. This document recommended that the governor and state legislature prepare a state-level program EIR and federal-level Environmental Impact Statement (EIS) for a statewide high-speed train network. The Final Program EIS/EIR was completed in August 2005. The Caltrain corridor is presented in the 2000 CHSRA Business Plan as an alignment for Bay Area access. In addition, Proposition 1A identified San Francisco’s TTC as the northern terminus for a bullet train from Los Angeles to the Bay Area. CHSRA subsequently issued a program-level environmental analysis of the Bay Area to Central Valley alignments that identified Pacheco Pass and the Caltrain alignment as its preferred alternative.

An electrified Caltrain system would set the stage for an expanded modern regional electric train service and a statewide HSR service. The Proposed Project facilities evaluated herein would be designed to accommodate HSR service, as well as Caltrain service. The term “accommodate” is being used in this case to mean that the Caltrain Proposed Project would install the same type of power supply and distribution system proposed for the HSR system. It is important to note that PCEP is a *separate* project from the HSR project. Other improvements needed to enable high-speed trains to use the Caltrain line would be evaluated in a separate environmental process conducted by CHSRA as the lead agency for the HSR project.

Extension of Caltrain from its present 4th and King Streets terminus to the site of the ~~Transbay Terminal~~ TTC was evaluated in a separate environmental document, the Transbay Terminal/Caltrain Downtown Extension/Redevelopment Project EIS/EIR, by FTA, the City and County of San Francisco, the San Francisco Redevelopment Agency, and the JPB. The Final EIS/EIR was certified in 2004 and the Record of Decision on the EIS was issued in February 2005. The ~~Transbay Terminal~~ TTC project includes electrification of the Caltrain line from 4th and King Streets to the ~~Transbay Terminal~~ TTC. Subsequent addenda have been completed between 2005 and the present and a Supplemental EIS/EIR is presently being prepared for certain limited proposed changes to the design of the project.

1.4 Purpose of Project

The primary purposes of the Proposed Project are to improve train performance and reduce costs, reduce long-term environmental impact by reducing noise and vibration, improve regional air quality and reduce greenhouse gas emissions, and provide electrical infrastructure that would be compatible with separate later use for Blended Service. An electrified Caltrain system would address Peninsula commuters' vision of an environmentally friendly and reliable service. Electrification also is expected to help accommodate increased system ridership through improved system operations.

Electrification would modernize Caltrain and supports increased service levels and it offers several advantages in comparison with existing diesel power use. These benefits serve the primary purposes of the Proposed Project. These purposes embody the project objectives required by CEQA, as follows:

- **Provide electrical infrastructure compatible with high-speed rail:** An electrified Caltrain system would set the stage for an expanded modern regional electric express service and for future blended HSR service. While the Proposed Project would not include all infrastructure necessary to implement HSR service in the corridor (such as HSR maintenance facilities, station platform improvements, or passing tracks), the electrical infrastructure (such as overhead wire systems) would accommodate future Blended Service, and the Proposed Project would not preclude HSR.
- **Improve train performance, increase ridership and increase service:** The Proposed Project envisions the use of EMUs, which are self-propelled electric rail vehicles that can accelerate and decelerate at faster rates than diesel-powered trains, even with longer trains. With EMUs, Caltrain could run longer trains without degrading speeds, thus increasing peak-period capacity. Electrification performance would support increased peak service levels from the current five trains per peak hour per direction to six with existing trackage.

  A substantial portion of a Caltrain trip is spent accelerating and decelerating between stations because of Caltrain's close-set station stops. For the same service profile of stops, EMUs can provide travel time reductions. Alternatively, due to the time savings, additional stops could be added without increasing existing total transit time from San Jose to San Francisco. Travel time savings and/or additional stops are expected to stimulate additional Caltrain ridership. By providing electric trains, Caltrain will also be able to use the DTX to reach the TTC and serve Downtown San Francisco, which will also increase ridership.
- **Increase revenue and reduce fuel cost**: Anticipated increased ridership would increase fare revenues, and conversion from diesel to electricity would reduce fuel costs. These efforts would substantially reduce but not eliminate the need for financial subsidy.
- **Reduce environmental impact by reducing noise emanating from trains**: Noise emanating from the passage of electrified train sets is measurably less than diesel operations. With the increases in peak and off-peak Caltrain service that are either under way or planned for implementation during the next decades, electrification would be an important consideration for reducing noise of train passersby and maintaining Peninsula quality of life. Train horns would continue to be sounded at at-grade crossings, consistent with FRA and California Public Utilities Commission (CPUC) safety regulations, whether or not electrification is pursued.
- **Reduce environmental impact by improving regional air quality and reducing greenhouse gas emissions:** Electric operations would produce substantial reductions in

corridor air pollution emissions when compared with diesel locomotives, even when the indirect emissions from electrical power generation are included in the analysis. In addition, the increased ridership allowed by the Proposed Project would reduce automobile usage, thereby resulting in additional air quality benefits. Electrically powered trains are more energy efficient than diesel-electric trains. Reduced energy use also translates into reduced air emissions. Reductions in air pollutant emissions represent long-term health benefits for Caltrain riders, and for residents and employees along the Caltrain corridor. In addition, reduction of greenhouse gas emissions with electrification would help California to meet its goals under AB 32, the 2006 Global Warming Solutions Act, as well as post-2020 state greenhouse gas emission reductions goals.

1.5 Environmental Review Process

1.5.1 California Environmental Quality Act

1.5.1.1 General Requirements

CEQA applies to all discretionary activities proposed to be implemented by California public agencies, including state, regional, county, and local agencies (California Public Resources Code Section 21000 et seq.). CEQA requires agencies to estimate and evaluate the environmental impacts of their actions, avoid or reduce significant environmental impacts when feasible, and consider the environmental implications of their actions prior to making a decision. CEQA also requires agencies to inform the public and other relevant agencies and consider their comments in the evaluation and decision-making process. The State CEQA Guidelines are the primary source of rules and interpretation of CEQA. (California Public Resources Code sections 21000 et seq.; 14 California Code of Regulations (CCR) 15000 et seq.).

1.5.1.2 Independent Utility

<u>CEQA requires an EIR to analyze “the whole of a project” (CEQA Guidelines Section 15378) and prohibits “piecemealing” or “segmentation.” Piecemealing applies to artificially dividing a single, integrated project into segments so as to not reveal its full extent. Piecemealing a project could result in improper disclosure of environmental effects. There are several tests that are applied to a project in order to evaluate whether or not it is improperly piecemealing analysis.</u>

<u>There are several tests that are applied to a project in order to evaluate whether or not it is improperly piecemealing analysis:</u>

- <u>**Independent Utility**: Can the project stand on its own with all the physical improvements included in the project description or does it require additional actions that are not analyzed in the project EIR? In this case, all the necessary infrastructure and rolling stock necessary to provide Caltrain electrified service is included in the project description and analyzed in this EIR. Operating a Caltrain electrified service does not physically require operation of blended high-speed rail service. All of the project elements included in the PCEP EIR are required to provide Caltrain electrified service. If blended high-speed rail service does not occur for any reason in the future, Caltrain electrification can fully function as intended to provide Caltrain commuter electrified service. There are no unnecessary elements to the PCEP included solely to serve or facilitate high-speed rail in the future. Electrified 25 kVA systems using overhead</u>

contact systems are one of the most common platforms for electrified service in the world and a proven technology. Long-before the 2008 Proposition 1A or any discussion of a blended system, Caltrain was already envisioning electrification using a 25 kVA overhead contact system and electrified trains (as demonstrated by the 2000 Notice of Preparation for the prior EIR, the 2004 Caltrain DEIR, and the 2009 EIR, all of which describe using a 25 kVA overhead contact system). That HSR would also use a 25 kVA OCS system only demonstrates the commonality and utility of this technology for electrified rail systems, whether for commuter or intercity purposes.

- **Logical Termini**: Does the project have logical end points in terms of fully disclosing all elements of the project and providing for an independently functioning project? Improper piece-mealing can occur if a portion of a project is included in the project description that requires completion in an undisclosed future process in order to operate. For example, this could occur if one only disclosed electrification along a portion of the intended route and someone else had to complete the rest of the electrification at some future date in order for the project to operate. That is not the case here: The PCEP project description includes a full end to end description of the infrastructure and operation of EMUs to complete the project's purposes.

- **Environmental Evaluation/Impact Disclosure:** Another consideration is whether evaluation of the current project in any way avoids environmental review of future projects or avoids disclosure of impacts of the current project. In no way does evaluation of the PCEP in the current EIR circumvent or preclude future environmental review of high speed rail service. First, and foremost, high-speed rail service will require its own separate environmental review conducted by CHSRA as the lead agency for such any project. Second, the PCEP EIR discloses the potential environmental impacts of blended service, as they can be understood at the conceptual level, in the cumulative analysis, so that the reader is fully aware that: 1) high speed rail service has been proposed by CHSRA; 2) there are distinct potential environmental impacts of high-speed rail service on the Caltrain corridor; and 3) the potential contribution of Caltrain electrification to cumulative impacts when considering high-speed rail service is disclosed. At this time, there is no actual design for high-speed rail service on the Caltrain corridor – thus the specifics necessary to fully analyze HSR impacts at this time are not available.

CEQA court decisions validate the approach taken in this EIR. For example, the 2012 decision in *Banning Ranch Conservancy v. City of Newport Beach* (2012) 211 Cal.App.4th 1209 is of particular relevance. At issue in that case was whether installing a road that would serve two different projects – one a city park, the other a private development proposal – required both projects to be considered in the same EIR. The City prepared two separate EIRs and the court upheld that approach. As stated in the court's ruling:

> "….two projects may properly undergo separate environmental review (i.e., no piecemealing) when the projects have different proponents, serve different purposes, or can be implemented independently. (Communities for a Better Environment v. City of Richmond (2010) 184 Cal.App.4th 70, 99 [108 Cal. Rptr. 3d 478] (CBE) [refinery upgrade and construction of pipeline exporting excess hydrogen from upgraded refinery were "independently justified separate projects with different project proponents"]; Planning & Conservation League v. Castaic Lake Water Agency 2009) 180 Cal.App.4th 210, 237 [103 Cal. Rptr. 3d 124] (Castaic Lake) [water transfer had "significant independent or local utility" from broader water supply agreement, and would be implemented with or without it]; Sierra Club v. West Side Irrigation Dist. (2005) 128 Cal.App.4th 690, 699 [27 Cal. Rptr. 3d 223] (West Side Irrigation) [two water rights

> assignments to city were "approved by different independent agencies" and "could be implemented independently of each other"]; Plan for Arcadia, supra, 42 Cal.App.3d at p. 724 [shopping center EIR could exclude road work the city had "long before" decided would be needed due to new freeway].)"

The two projects have different proponents (JPB for the PCEP; CHSRA for HSR).

The two projects have different purposes. The purpose of the PCEP is to upgrade an existing commuter railroad serving the San Francisco Peninsula by replacing diesel service with electrified service and expanding service between San Jose and San Francisco with multiple local stops in between. The high-speed rail project is an inter-city rail project intending to provide rapid rail service between distant cities, including between San Francisco and Los Angeles, among other destinations. Caltrain electrified service can physically be implemented without high speed rail service.

The two projects have independent utility as described above. Is electrification of the Caltrain corridor necessary in order to operate electrified high-speed rail trains? Yes. But does analysis of the PCEP in a separate EIR avoid any disclosure of potential environmental impacts of high-speed rail service or avoid any necessary separate environmental review of high-speed rail service and any necessary improvements.? No. That is the fundamental test regarding segmentation under CEQA.

Review and approval of the PCEP does not provide the improvements necessary to operate HSR on the California corridor. First, the rest of the HSR system from south of San Jose must be completed in order for HSR service from San Jose to San Francisco to fulfill its intercity purpose. With the PCEP, there is still no physical way for HSR to connect to the Caltrain corridor from the south; additional improvements are necessary. Second, the PCEP does not include any platform improvements (such as at Diridon station in San Jose or at Millbrae station) to allow for separate HSR platforms which would allow for passengers to access HSR or any improvements to platforms to allow HSR passengers to access HSR trains at existing Caltrain stations. Third, as described in the cumulative analysis in the EIR, in order to operate a blended system with 6 Caltrain trains and 4 HSR trains per peak hour per direction (which is the current conceptual plan for blended service), passing tracks would also be necessary (and the locations for passing tracks are yet to be determined). Fourth, in order to meet service goals for HSR, which envisions speeds faster than the current allowable speed of 79 mph up to 110 mph on the Caltrain corridor, system improvements to be determined later would be necessary on the route to allow for an increase in top speed.

Review and approval of the PCEP does not make HSR service on the Caltrain Corridor an inevitability. Neither does provision of approximately $600 million in funds from Proposition 1A for electrification provide the improvements described above for HSR service on the Caltrain Corridor; the funding only provides electrified infrastructure in terms of poles and wires and traction power facilities.

Further, it is premature to analyze HSR service along the Caltrain corridor at this time given the conceptual level of definition of HSR service and necessary physical improvements. There is no specific design yet for blended system improvements that could support a project level analysis and it will take a number of years of further planning and design in order to actually frame the blended system and the project details. In contrast, there is already a preliminary design for the PCEP that does allow for that project-level analysis in this EIR.

Caltrain electrification also has independent utility from HSR. Caltrain electrification is planned to be in operation starting in 2020, which can then immediately start to provide project benefits in terms of improved service, lower fuel costs, improved air quality, lower greenhouse gases, and lower operational subsidy for Caltrain compared to that of a diesel system. Current plans for HSR in the 2014 Business Plan envision the earliest date for HSR service on the Caltrain Corridor would be 2027, thus the PCEP would provide project benefits for a minimum of 8 years before HSR service occurs on the corridor. More critically, HSR is designed to provide intercity rail services between Northern California, the Central Valley, and Southern California with only a few stops on the Caltrain corridor -in San Jose, Millbrae (and possibly Redwood City) and San Francisco whereas the PCEP is intended to provide electrified commuter rail services between San Jose and San Francisco with stops at numerous locations along the statewide route. In order for Caltrain to start providing electrified service in 2020, it is necessary to complete the environmental process now to allow for the approximately four years it will take to complete the PCEP final design, construct the system, and complete testing and commission by 2020. Since it will take a number of years of a planning process to figure out a specific design for the blended system, as well as the time to complete environmental analysis of the blended system, delaying the environmental process for both the PCEP and the HSR together would delay the ability to derive project benefits from the PCEP as soon as possible.

Thus, it is completely appropriate and fully in compliance with CEQA requirements and precedent to analyze the PCEP in the current EIR, disclosing the potential future cumulative impacts with high-speed rail in the cumulative section of the current EIR based on the current conceptual understanding of that future project, and completing separate environmental review of high-speed rail service in a separate future document.

1.5.1.3 Pre-Emption of CEQA by Federal Law

The JPB is a federally-regulated rail carrier, pursuant to proceedings before the Interstate Commerce Commission (predecessor to the Surface Transportation Board) related to the acquisition of the Peninsula rail corridor in 1991. A number of court and regulatory decisions have held that the construction, improvement and operation of federally-regulated railroads are exempt from state environmental regulatory laws, including CEQA. (See *Friends of the Eel River v. North Coast Railroad Authority*, (October 17, 2014, A139222) Cal.App.4th; *City of Auburn v. U.S. Government* (9th Cir. 1998) 154 F.3d 1025, 1027-1031); the City of Encinitas, CA ((North San Diego County Transit Development Board Petition for Declaratory Order, No. FD 34111, 2002 WL 1924265 (August 19, 2002); and *City of Encinitas v. North San Diego County Transit Development Board* (2002 US Dist. LEXIS 28531, 2002 WL 34681621). These decisions have all held that state and local environmental regulation of railroad construction and operations are pre-empted by federal law.

Despite the absence of a legal obligation on the part of the JPB to prepare and certify an EIR for the Peninsula Corridor Electrification Project, the JPB has decided to complete this document and make the findings that CEQA otherwise would require when applicable. By taking this action, the JPB desires to fulfill the fundamental policies and objectives of CEQA in terms of providing the public and decision makers with detailed information about the potential effects that the project is likely to have upon the environment. By having voluntarily adhered to the strictures of CEQA, however, the JPB does not intend to waive its ability to assert that CEQA is preempted by federal law. In short, the JPB expressly preserves its ability to assert preemption if legal challenges to the EIR are initiated. Notwithstanding any position the JPB may take regarding the preemption of CEQA, the JPB will remain fully committed to implementing the mitigation measures that will be adopted as conditions for any approval of the project.

1.5.2 Purpose of this EIR

The purpose of the EIR is to provide the information necessary for the JPB to make an informed decision about the Proposed Project, and to supply the information necessary to support related permit applications and review processes.

This Draft EIR has been prepared in compliance with CEQA to achieve the following goals.

- Identify potential direct, indirect, and cumulative environmental impacts associated with the Proposed Project.
- Describe feasible mitigation measures intended to avoid or reduce potentially significant impacts to a less-than-significant level.
- Disclose the environmental analysis, including the potential project impacts and proposed mitigation measures, for public and agency review and comment.
- Discuss potential alternatives to the Proposed Project that meet the purpose and need, are feasible, and would avoid or reduce identified significant project impacts.

One of the purposes of CEQA is to establish opportunities for the public and relevant agencies to review and comment on projects that might affect the environment. Scoping activities are discussed below. The JPB will provide a public review period for this Draft EIR of 60 days from release of the Draft EIR for comment. The JPB will also conduct public meetings to receive comment during the comment period. Once the public review period is complete, the JPB will prepare a Final EIR that includes all the comments received on the Draft EIR, responses to all comments, and any necessary revisions to the Draft EIR. CEQA requires the JPB decision-making body, the Board, to review and consider the information in the EIR before making a decision on the Proposed Project.

1.5.3 Scope and Content of the EIR

Scoping refers to the process used to assist the lead agency (for the Proposed Project, the JPB) in determining the focus and content of an EIR. Scoping solicits input on the potential topics to be addressed in an EIR, the range of project alternatives, and possible mitigation measures. Scoping is also helpful in establishing methods of assessment and in selecting the environmental effects to be considered in detail.

1.5.3.1 Notice of Preparation and Scoping Meeting

The scoping process for this EIR was formally initiated on January 31, 2013, when the JPB submitted the Notice of Preparation (NOP) to the California State Clearinghouse for distribution to state agencies and to the San Francisco, San Mateo, and Santa Clara County Clerks for public posting. The purpose of the NOP is to solicit participation from relevant agencies and from the public in determining the scope of an EIR. The scoping period ended on March 18, 2013.

Public scoping meetings were held on February 27, 2013 at the Caltrain Office, February 28, 2013, at Palo Alto City Hall, March 5, 2013 at VTA Headquarters, and March 7, 2013 at San Francisco City Hall to provide an opportunity for attendees to comment on environmental issues of concern.

Written and oral comments received during the scoping process are on file at JPB offices (1250 San Carlos Avenue, San Carlos, CA) and included in the scoping summary report in Appendix A.

1.5.3.2 Resource Topics

Consistent with Appendix G of the State CEQA Guidelines, this Draft EIR evaluates the potential impacts of the Proposed Project for the following resource areas.

- Aesthetics
- Air Quality
- Biological Resources
- Cultural and Paleontological Resources
- Electromagnetic Fields (EMF) and Electromagnetic Interference (EMI)
- Geology, Soils, and Seismicity
- Greenhouse Gas Emissions and Climate Change
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use and Recreation
- Noise and Vibration
- Population and Housing
- Public Services and Utilities
- Transportation and Traffic

The following topics are also analyzed in this DEIR.

- Cumulative impacts
- Significant unavoidable impacts
- Significant irreversible changes in the environment
- Growth inducement
- Alternatives to the Proposed Project

Although agricultural and mineral resources are identified in Appendix G of the State CEQA Guidelines, this EIR analysis does not include these topics because there would be no impact, as described in Chapter 3.

1.6 EIR Organization

This DEIR is organized as described in the chapters and appendices listed below.

- Chapter 1, *Introduction*, includes a brief overview of the Proposed Project; an overview of the environmental review process; and the scope, content and organization of the Draft EIR.

- Chapter 2, *Project Description*, includes a comprehensive description of the Proposed Project.
- Chapter 3, *Setting, Impacts, and Mitigation Measures*, includes an evaluation of the resource topics outlined above. Each resource-specific section discusses the environmental setting, impacts, and mitigation measures.
- Chapter 4, *Other CEQA-Required Analysis*, includes a discussion of cumulative impacts, significant environmental impacts that cannot be avoided, significant irreversible changes in the environment and growth-inducing impacts.
- Chapter 5, *Alternatives*, includes a description of the project alternatives considered, and evaluation of several alternatives to the Proposed Project.
- Chapter 6, *Report Preparation*, includes a list of staff who contributed to preparation of the Draft EIR.
- Chapter 7, *References*, includes a list of the printed references and personal communications cited in the Draft EIR.
- Appendices

  A. *NOP and Scoping Summary Report*

  B. *Air Quality and Greenhouse Gas Analysis Technical Data*

  C. *Noise and Vibration Technical Report*

  D. *Transportation Analysis*

  E. *Cultural Resources Programmatic Agreement*

  F. *Tree Inventory and Canopy Assessment*

  G. *Biological Resources Information*

  H. *Land Use Information*

  I. *Ridership Technical Memorandum*

  J. *Preliminary Overhead Contact System/Electrical Safety Zone/Tree Impact Maps*

  K. *Key Assumptions for Alternative Analysis*

Chapter 2
Project Description

The Proposed Project is the electrification of the Caltrain line from its current northern terminus at 4th and King Streets in the City of San Francisco to 2 miles south of the Tamien Station in San Jose, a total distance of approximately 51 miles. The project location is shown in Figure 2-1; a project vicinity map showing each of the stations on the line is provided in Figure 2-2.

2.1 Location and Limits

The Peninsula Corridor Joint Powers Board (JPB) owns and operates approximately 51 miles of primarily two-track mainline railroad right-of-way (ROW) between the 4th and King Street Station in San Francisco and south of the Tamien Station in San Jose, Santa Clara County. The JPB purchased this ROW from the Southern Pacific Transportation Company in 1991. Between Tamien Station and Gilroy, the mainly single-track ROW is owned by the Union Pacific Rail Road (UPRR). Caltrain has trackage rights with UPRR to provide commuter service in this approximately 25-mile segment between Tamien Station and Gilroy. This project area consists of the Caltrain ROW, immediately adjacent areas where certain project facilities or project actions are proposed, several areas separate from the ROW proposed for project traction power substations, and other nearby areas that may be used for construction staging or access.

2.2 Background

Caltrain trains presently consist of diesel locomotive-hauled, bi-level passenger cars. As of mid-2013, Caltrain operates 46 northbound and 46 southbound (for a total of 92) trains per day between San Jose and San Francisco during the week. Three of these trains start in Gilroy during the morning commute period, and three terminate in Gilroy during the evening commute period. Eleven trains in each direction are "Baby Bullet" express service trains that make the trip between San Francisco and San Jose in less than 1 hour. Service is frequent during the peak periods (five trains per peak hour per direction [pphpd]) and is provided every hour in both directions during the midday. Caltrain provides hourly service in both directions on Saturdays and Sundays (36 trains on Saturdays and 32 trains on Sundays) between San Jose Diridon and San Francisco 4th and King Stations only. Weekend service includes two "Baby Bullet" express service trains per day in each direction. Caltrain also provides extra service for special events such as San Jose Sharks and San Francisco Giants games.

In addition to Caltrain commuter rail service, UPRR operates approximately six daily freight trains (three round-trips) between Santa Clara and San Francisco under a Trackage Rights Agreement with Caltrain. From Santa Clara to San Jose, on a joint use corridor, UPRR operates approximately nine daily freight trains. Three passenger train services also operate on the Santa Clara to San Jose segment: the Capitol Corridor (14 daily trains), the Altamont Commuter Express (ACE, eight daily trains during weekdays only), and the Amtrak Coast Starlight (two daily trains).

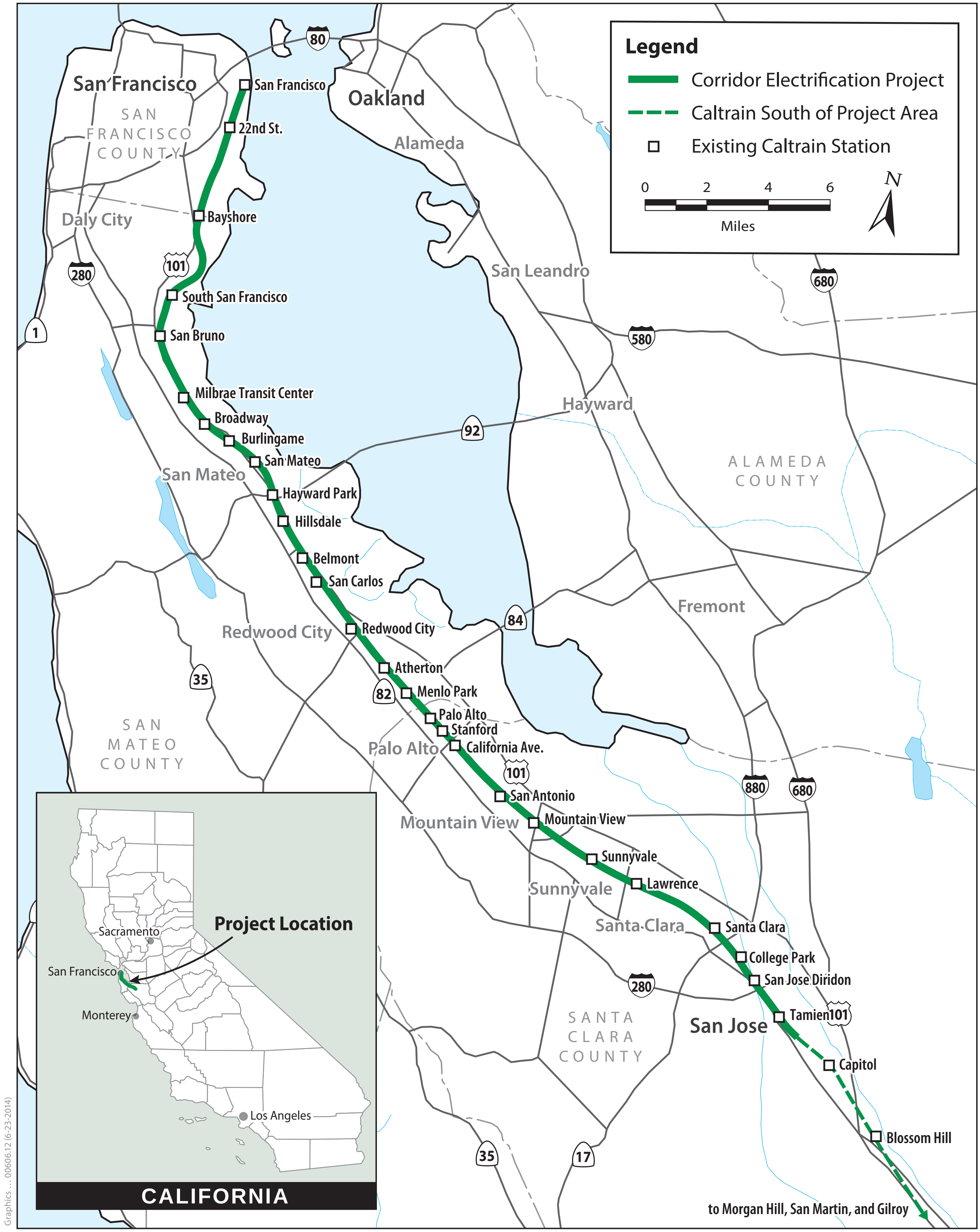
The Proposed Project is part of a program to modernize operation of the Caltrain rail corridor between San Jose and San Francisco.[1] There is a lengthy history of planning for modernization of the Caltrain Peninsula Corridor. Modernization projects include the installation of an advanced signal system and the electrification of the rail line. The advanced signal project (Caltrain Communications Based Overlay Signal System (CBOSS) Positive Train Control (PTC) commonly referred to as CBOSS PTC or CBOSS), and corridor electrification are discussed below. The JPB previously evaluated corridor electrification in a prior EIR, for which a draft was completed in 2004 and a final was completed in 2009. The JPB did not certify the Final EIR due to the need for resolution of issues regarding joint planning for shared use of the Caltrain corridor for Caltrain service and for future high-speed rail (HSR) service. The Federal Transit Administration (FTA) completed the final EA and adopted a Finding of No Significant Impact in 2009.

Since 2009, the JPB, the California High-Speed Rail Authority (CHSRA), the California Legislature, the Metropolitan Transportation Commission (MTC) and other parties have worked together to develop a vision of a "blended system" whereby both Caltrain and HSR would utilize the existing Caltrain Peninsula Corridor. This vision for implementing Blended Service was included in the *Revised 2012 Business Plan* that the CHSRA Board adopted in April 2012 for the California High-Speed Rail System (CHSRA 2012a).

The JPB and CHSRA are committed to advancing a blended system concept. In 2013, the JPB and CHSRA signed a Memorandum of Understanding (MOU) to this effect. This local vision was developed with stakeholders interested in the corridor. The blended system would remain substantially within the existing Caltrain ROW and accommodate future high-speed rail and modernized Caltrain service by primarily utilizing the existing track configuration.

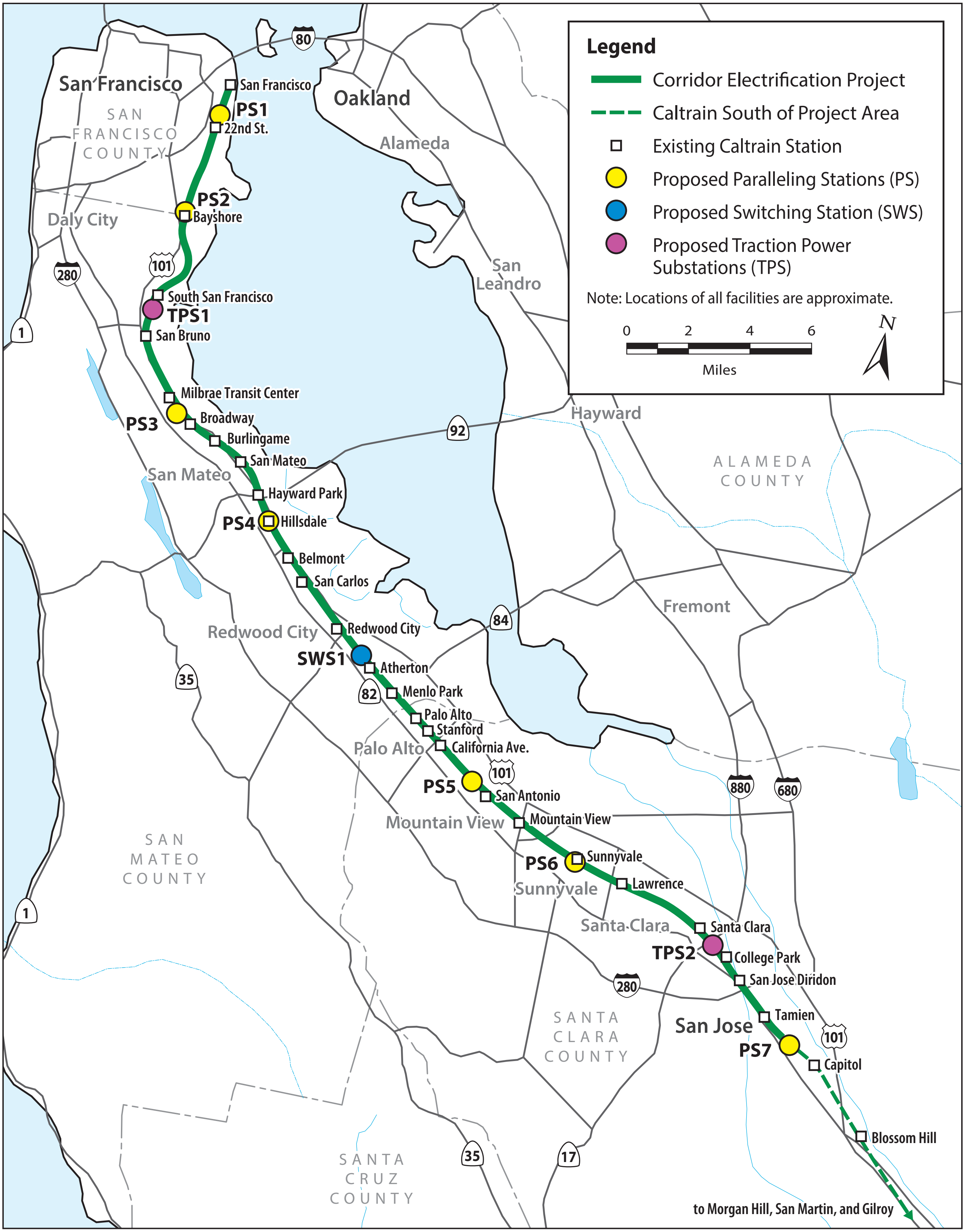
Based on the blended system vision, the Caltrain Peninsula Corridor has been designated to receive an initial investment of Proposition 1A bond funds that would benefit Caltrain's modernization program and HSR. The JPB, CHSRA and seven other San Francisco Bay Area agencies (City and County of San Francisco, San Francisco County Transportation Authority, Transbay Joint Powers Authority, San Mateo County Transportation Authority, Santa Clara Valley Transportation Authority, City of San Jose, and MTC) have approved an MOU (*High Speed Rail Early Investment Strategy for a Blended System in the San Francisco to San Jose Segment known as the Peninsula Corridor of the Statewide High-Speed Rail System*) to pursue shared use of the corridor between San Jose and San Francisco to provide Blended Service of both Caltrain commuter rail service and HSR intercity service (JPB 2012). The MOU includes agency and funding commitments toward making an ~~initial~~ investment of approximately $1.5 billion in the corridor for purchasing and installing an advanced signal system, electrifying the rail line from San Francisco to San Jose, and purchasing electrified rolling stock for Caltrain. The MOU also conceptually outlines potential additional improvements

[1] JPB is currently updating its Strategic Plan to account for recent policy commitments (Caltrain Modernization [CalMod], Blended Service, and High-Speed Rail).



Note: This figure replaces Figure 2-1 from the Draft EIR.

Figure 2-1
Project Location
Peninsula Corridor Electrification Project



Note: This figure replaces Figure 2-2 from the Draft EIR.

Figure 2-2
Project Vicinity
Peninsula Corridor Electrification Project

(i.e., "Core Capacity" projects[2]) needed beyond the first incremental investment to accommodate Blended Service in the corridor.

Corridor improvements identified in the MOU include the following:

- **Advanced Signal System (commonly referred to as CBOSS PTC or CBOSS):** CBOSS stands for Communications Based Overlay Signal System and PTC stands for Positive Train Control. This project (currently being installed, including a new fiber optic backbone) will increase the operating performance of the current signal system, improve the efficiency of at-grade crossing warning functions, and automatically stop a train when there is violation of safe operating parameters. This project, which includes implementation of safety improvements mandated by federal law, is scheduled to be operational by 2015 as mandated by the Federal Railroad Administration (FRA).
- **Corridor Electrification:** The JPB decided to prepare this new EIR for the corridor electrification due to the changes in existing conditions[3] that have occurred along the corridor since the prior EIR analyses was conducted, to update the environmental analysis, and to update the cumulative analysis of Blended Service and other cumulative developments along the corridor. Completion of a new EIR will also allow public agencies, stakeholders, the public and decision-makers the opportunity to review and comment on the Proposed Project's environmental effects in light of current information and analyses. This Proposed Project would provide for operation of up to six Caltrain trains per peak hour per direction (an increase from five trains per peak hour per direction at present). Electrification can be analyzed as a separate project under the California Environmental Quality Act (CEQA) because it has independent utility (providing Caltrain electrified service) and logical termini (station end points). Electrification of the rail line is scheduled to be operational by 2020/2021[4] ~~2019~~. The Proposed Project includes 114 trains per day between San Jose and San Francisco and six trains per day between Gilroy and San Jose. Future proposed actions to expand service beyond 114 trains per day may require additional environmental review.
- **Blended Service:** The JPB, CHSRA, and the MOU partners have agreed on shared use of the Caltrain corridor for use of up to six Caltrain trains per peak hour per direction and up to four

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[2] Core Capacity projects (as described in the nine-party MOU) consist of needed upgrades to stations, tunnels, bridges, potential passing tracks, other track modifications, and rail crossing improvements, including selected grade separations, and will be required to accommodate the mixed traffic capacity requirements of high-speed rail service and commuter services on the Caltrain corridor. The specific Core Capacity projects have not been identified or defined at this time. These projects will be identified in future discussions and evaluations between CHSRA and the JPB. Core Capacity projects would be subject to separate, project-level environmental evaluation by the implementing agency. The TJPA DTX/TTC project is a separate project from the Core Capacity projects that has already been environmentally cleared.

[3] For example, there have been changes in existing development adjacent to the Caltrain ROW and stations, in levels of traffic, and in adopted land use plans around stations.

[4] Operations may commence as early as 2020 or in 2021. Since 2020 is the first potential operational year, this EIR refers to 2020 as the first operational year instead of always referencing 2020/2021.

HSR trains per peak hour per direction.[5] The operational feasibility of Blended Service has been studied, but this project is presently only at the conceptual planning phase. The potential addition of HSR service to this corridor will be the subject of a separate environmental review process that will be undertaken by CHSRA as the lead agency subsequent to the environmental process for the Peninsula Corridor Electrification Project (PCEP or Proposed Project). Based on the current ~~CHSRA *Revised 2012 Business Plan* (and~~ the ~~Draft~~ 2014 Business Plan~~)~~, Blended Service along the corridor is scheduled to commence sometime between 2026 and 2029. Blended Service would connect with the DTX near the Fourth and King Station allowing Caltrain and HSR service to downtown San Francisco at the TTC.

2.3 Project Description

The Proposed Project consists of converting Caltrain from diesel-hauled to Electric Multiple Unit (EMU) trains for service between the 4th and King Street Station in San Francisco and the Tamien Station in San Jose. Operating speed would be up to 79 miles per hour (mph), which is what it is today.

In ~~2019~~ 2020, service between San Jose and San Francisco would use a mixed fleet of EMUs and diesel locomotives, with approximately 75% of the service being electric and 25% being diesel in ~~2019~~ 2020.[6] After 2020 ~~2019~~, diesel locomotives would be replaced with EMUs over time as they reach the end of their service life. Caltrain's diesel-powered locomotive service would continue to be used to provide service between the San Jose Diridon Station and Gilroy.[7] Fleet requirements under the Proposed Project are presented in Table 2-1.

[5] The CHSRA ~~2012 Revised Business Plan *Ridership and Revenue Forecasting* (CHSRA 2012b) and the Draft~~ *2014 Business Plan* (CHSRA 2014a) presumes Phase 1 Blended Service would have up to four trains per peak hour and up to four trains per off-peak hour. As explained in Section 4.1 *Cumulative Impacts,* this EIR presumes ~~up to~~ 40 to 53 HST daily round-trip trains in 2040 based on the CHSRA 2012 Business Plan, *Estimating High-Speed Train Operating and Maintenance Cost for the CHSRA 2012 Business Plan* (CHSRA 2012c), which estimates 40 round trip trains and the~~. The Draft~~ 2014 Business Plan *Service Planning Methodology* document (CHSRA 2014b) which includes an assumption of 53 daily round trip trains starting in 2029 and continuing beyond 2040 (although the 2014 Business Plan does not specifically state what the daily service would be). ~~Caltrain's Blended Service planning to date has not studied the *2014 Business Plan* estimates because the plan was released on February 7, 2014 and conceptual Blended Service studies were completed in 2013. Thus, this EIR is based on a service level of 40 daily round-trip trains that has been studied by Caltrain to date.~~ The exact amount of HSR service along the corridor is unknown. The subsequent CHSRA project-level environmental evaluation will address proposed HST service levels along the San Francisco Peninsula.

[6] This project only includes funding for EMUs representing approximately 75 percent of the operational fleet between San Jose and San Francisco. In 2020 ~~2019~~, some peak period service (e.g., bullet/Gilroy-SF trains) would be diesel on weekdays. All other service, including off-peak, would be EMU-based in 2020 ~~2019~~. Funding for replacement of the remainder of the diesel fleet between San Jose and San Francisco would have to come from future funding sources. It is expected that 100 percent of the San Jose to San Francisco fleet would be EMUs by 2026 to 2029, because the fleet would need to be fully electrified to operate in a Blended Service environment with HSR. Fully electrified service between San Jose and San Francisco is included in the cumulative impact analysis contained in Chapter 4, *Other CEQA-Required Analysis*, but is not part of the Proposed Project.

[7] The Proposed Project only includes electrification to a point approximately 2 miles south of Tamien Station (MP 51.1) ~~the JPB-owned ROW).~~ The Union Pacific Corridor south of this point would not be electrified by this Project. Between Santa Clara MP 44.6 and the southern end of the JPB-owned corridor, the MT-1 track is owned by Union Pacific and will not be electrified.

Table 2-1. Fleet Requirements of the Electrification Program

Year	Diesel Locomotives	Diesel-Hauled Coaches/Cabs	Electric Multiple Units	Total Passenger Vehicles
2020 ~~2019~~[a] (six trains per peak hour/direction)	9	45	96	150
2040[b] (six trains per peak hour/direction)	6	31	138 to 150	175 to 187

Source: Callen pers. comm.

[a] The majority of vehicles would be replaced ~~in 2019~~ by 2020 as they reach the end of their design life. Additional vehicles would be replaced after ~~2019~~ 2020as they reach the end of their design life.

[b] Diesel operation limited to San Jose – Gilroy shuttle service in 2040. 2040 operations assume fully electrified operations between San Jose and San Francisco and that the San Francisco Downtown Extension (DTX) has been completed. However, the Proposed Project only includes funding for 75 percent of the rolling stock for this service at this time. The fleet estimates for 2040 are only conceptual at this time.

The level of Caltrain operations and, therefore, fleet requirements under the Proposed Project are based on six trains per peak hour per direction (pphpd) from Tamien Station in San Jose to San Francisco, with a mixed EMU and diesel locomotive fleet. Caltrain service would also include six diesel-powered trains per day in the San Jose to Gilroy segment in 2020 ~~2019~~.

The Proposed Project would require the installation of 130 to 140 single-track miles of overhead contact system (OCS) for the distribution of electrical power to the electric rolling stock. The OCS would be powered from a 25 kilovolt (kV), 60 Hertz (Hz), single-phase, alternating current (AC) supply system consisting of traction power substations (TPSs), one switching station (SWS), and paralleling stations (PSs). These traction power facilities (TPFs) are described in more detail in the following pages. Figure 2-2 shows the general location of TPF sites.

2.3.1 Overhead Contact System

To permit electric vehicles to run along a railroad track, two types of electrical power distribution system are in general use. The first type is a low-voltage direct current (DC) third rail system, as employed in the 1,000-volt DC BART system. The second type is an overhead contact wire system, used for both light and heavy rail transit. Light rail applications typically use low-voltage OCS, such as the Muni in San Francisco at 600 volts, or the Santa Clara Valley Transportation Authority light rail service at 750 volts. For high-speed, intercity passenger or commuter rail lines, the OCS is usually a high-voltage AC system, as used by Amtrak, Maryland Regional Commute trains (MARC), Southeastern Pennsylvania Transportation Authority (SEPTA), New Jersey Transit (NJT), and Metro-North Railroad (MNRR) at 11.5 to 12.5 kV, and at 25 kV on Amtrak's Northeast Corridor and portions of the NJT. This project would have an AC OCS. The typical voltage used for regional and intercity rail throughout Europe and the rest of the world is 25 kV at commercial frequencies (50 to 60 Hz). As noted above, this project would have a 25 kV AC OCS at 60 Hz.

This power supply and distribution system and voltage would be compatible with the requirements of HSR and would accommodate future development of HSR in the Caltrain Peninsula Corridor. The OCS conductors and traction power equipment would be sized and located based on a computerized analysis of traction power load flow requirements using the probable maximum capacity of the Peninsula corridor alignment of Caltrain.

A mainline OCS typically consists of two conductors above each track in what is known as a catenary configuration: a messenger wire (much like a utility transmission line) sags between support points, below which a near-level contact wire is suspended. Both main wires are energized and are part of the same circuit. The pantograph, mounted on top of the electric vehicles, slides along the underside of the contact wire and collects the traction current from it.

The messenger wire is typically supported by means of cantilevered, hinged bracket arms that extend horizontally over the track from vertical steel poles mounted clear of the dynamic envelope (i.e., the range of motion of the train on the track) of the vehicles. The OCS also includes negative feeder and static wires. The autotransformer system is described further below. These are also supported on the OCS poles. These poles are placed approximately ~~10 to 12~~ 9 to 11 feet ~~of~~ from the centerline of the tracks they serve. Multi-track support structures, such as multi-wire headspans attached to taller steel poles, are also employed where necessary. The poles themselves are supported by cast-in-place concrete foundations or driven pile footings, which are typically set back approximately ~~10 to 12~~ 9 to 11 feet from the track centerline. Depending upon the clearance requirements of particular sections of the route, the contact wire height would vary from approximately 16.0 feet to 23.0 feet. Pole heights range from 30 to 50 feet. Also, depending on along-track span length and other requirements, the messenger wire would typically be positioned between 2 feet and 5 feet directly above the contact wire.

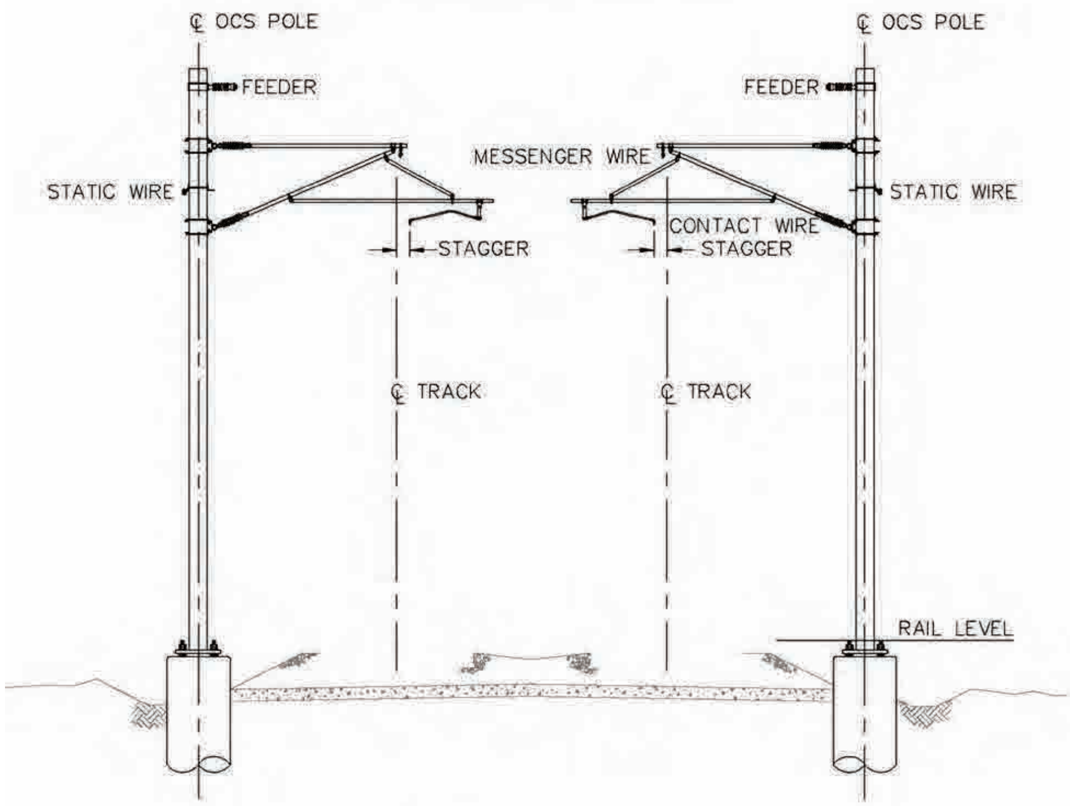
Clearances for maintenance and operation of the OCS would be designed to allow for existing freight railroad and tenant passenger rail clearances and operations. Normal design clearances up to 23 feet would be provided in all open, unconstrained areas. Special designs could be employed in close clearance tunnels or under bridges in order to provide sufficient clearances to existing freight and diesel passenger trains.

On tangent, or straight, sections of track, the OCS supports can be spaced up to 230 feet apart, though they would typically be about 180 to 200 feet apart. On curved track sections, the span lengths between supports must be reduced. The Caltrain ROW has two small radius curves, one just south of the San Francisco terminus and one north of the San Jose Diridon Station, where the support spacing would be reduced to approximately 75 feet. For the larger radius curves along the route, pole spacing would range from 120 to 150 feet.

The particular type of OCS support on a given segment is dependent upon the track segment's exact configuration (e.g., number of tracks) and other site-specific requirements and constraints. Figure 2-3 shows typical side cantilever bracket arms and poles for two-track sections. Figure 2-4 shows a portal arrangement, where the central wires are supported over multiple tracks by means of a solid steel beam and cantilever brackets. Figure 2-5 shows typical center cantilever bracket arms and poles for two track sections. Figure 2-6 shows typical multi-track arrangement with headspan construction. Figure 2-7 shows a typical two track cantilever and bracket arms. Visual impacts of the proposed OCS facilities and treatments in different corridor locations are evaluated in Section 3.1, *Aesthetics*.

Power would be supplied to the OCS at each of the TPFs, either by means of non-insulated aerial connections or by insulated underground connections. Power would generally be delivered to the OCS through a pole-mounted disconnect switch, which permits energization or de-energization of a particular section of the OCS conductors. The overhead electrical system would include an integrated bonding and grounding system to protect the public during all system operations.

Amtrak's North End Electrification



Source: JPB Staff.

Graphics ... 00606.12 (12-10-13)

Figure 2-3

OCS Two Track Arrangement with Side Pole Construction

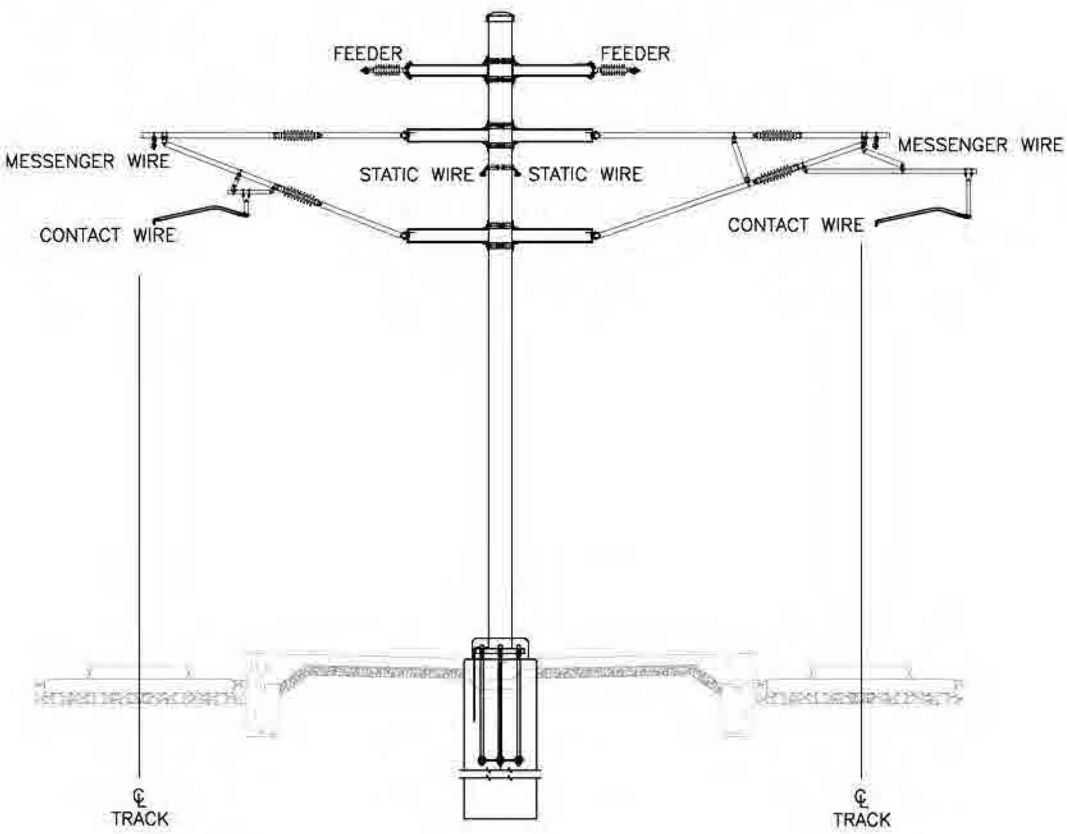
Peninsula Corridor Electrification Project

Amtrak's North End Electrification

Source: JPB Staff.

Graphics ... 00606.12 (12-10-13)

Figure 2-4
OCS Typical Portal Arrangement
Peninsula Corridor Electrification Project

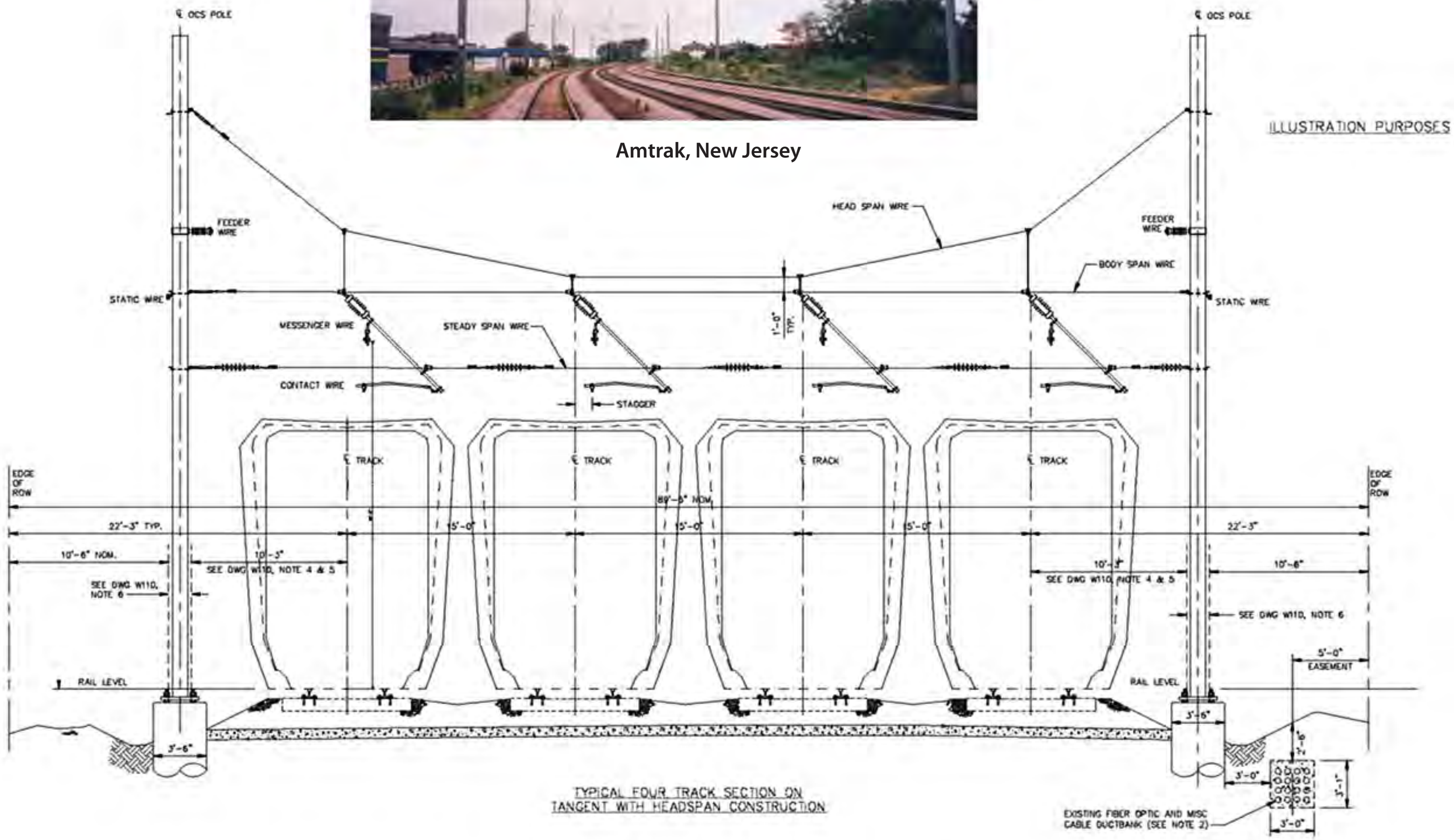


Graphics ... 00606.12 (12-10-13)

Source: JPB Staff.

Figure 2-5
OCS Two Track Arrangement with Center Pole Construction
Peninsula Corridor Electrification Project

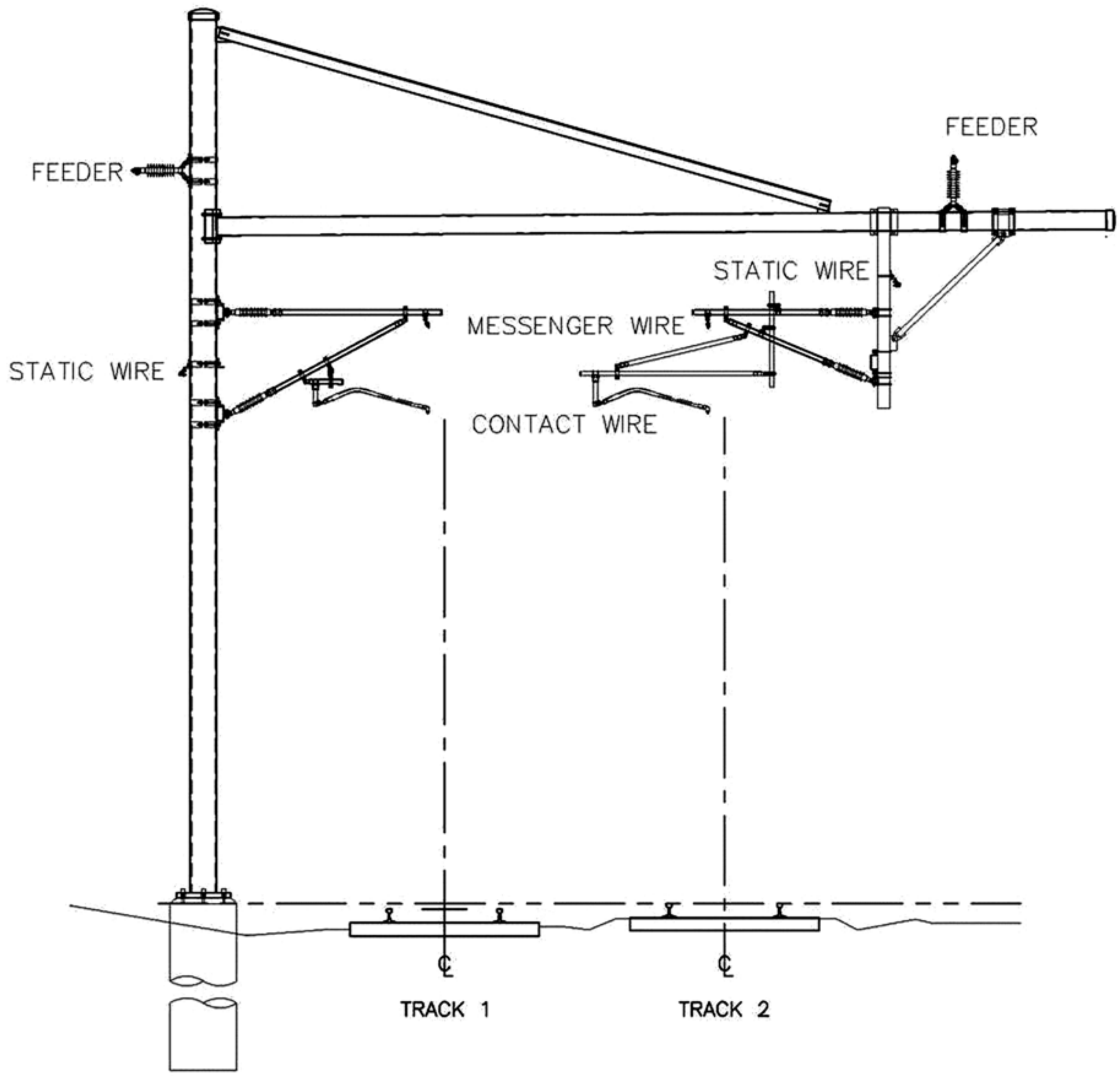
Amtrak, New Jersey



Source: JPB Staff.

Graphics … 00606.12 (12-10-13)

Figure 2-6
OCS Multi-Track Arrangement with Headspan Construction
Peninsula Corridor Electrification Project



Source: JPB Staff.

Figure 2-7
OCS Two Track Cantilever
Peninsula Corridor Electrification Project

As noted above, the OCS poles nominally need to be approximately ~~10 to 12~~ 9 to 11 feet from the centerline of the railway tracks. In addition, there needs to be clearance of vegetation within approximately 10 feet of the OCS poles and catenary system for electrical safety. Pruning or removal of trees would be required along the tracks and electrical facilities where they would otherwise pose a maintenance or safety concern. The distance from the railway outside track centerlines to the outer edge of the vegetation clearance zone (called the electrical safety zone or ESZ) would be up to ~~24~~ 21 feet (~~up to 12~~ 11 feet to the OCS pole alignment + ~~2 feet for the width of the pole +~~ 10 feet for the vegetation clearance). In areas of multi-track (i.e., more than 2 tracks), the ESZ would be up to 18 feet from the centerline of the outer electrified track. In certain areas with site-specific concerns such as curves, signal equipment, access or other concerns, the ESZ may need to be up to 24 feet in width from the centerline of the outer track. In addition, structures cannot be closer than 6 feet to the OCS pole alignment (the 6 feet is within the 10-foot ESZ). Figure 2-8 shows the structural and vegetation clearance zones relative to the track and OCS pole alignment. The system is being designed to be resilient to high winds.

The MT-1 track owned by Union Pacific will not be electrified from Santa Clara (MP 44.6) to the southern end of the JPB-owned ROW (MP 52.0).

At three tunnel locations, all within San Francisco, the Proposed Project includes potential tunnel and track modifications necessary to provide adequate vertical clearances for the OCS for both passenger and existing freight operations. The amount of additional clearance, depending on location, varies from 0.25 to 1.75 feet. These improvements could include potential "notching" (i.e., minor excavation of the tunnel wall) of the tunnel, horizontal realignment of tracks to maximize vertical clearance, and potential lowering of the track grade. If lowering of the track grade is necessary, construction would involve temporary removal of the track and track ballast, excavation, and then replacement of track ballast and tracks. At four bridge overcrossings where vertical height is constrained, the Proposed Project also would involve lowering the track by 0.25 foot to 1 foot to provide adequate vertical clearance for existing passenger and freight vehicles. Track lowering would be coordinated with the jurisdictional agency for the overcrossing, including Caltrans, if necessary. Existing clearances and clearances with the project are presented in Section 3.14, *Transportation and Traffic*.

At San Francisquito Creek Bridge, the standard OCS pole design has been modified to avoid impacts on the historic bridge and to avoid using side poles near the landmark tree El Palo Alto. The OCS cables would be suspended from the San Francisquito Creek Bridge truss in a manner that would not alter the existing structure. The power cables, fasteners and support brackets would be attached to the existing structure, but no part of the existing structure would be removed as a part of the Proposed Project. Installation of the main support brackets would require no permanent modification to the bridge structure and would be completely removable. To avoid impacts on neighboring trees, no poles would be set on the bridge itself or on the side of the bridge superstructure.

Between 1st and 3rd Avenues in San Mateo, the project design would be modified, such as using an alternative pole arrangement (likely to be either a center pole or a two-track cantilever from the east side of the tracks), to avoid affecting buildings on the west side that are very close to the Caltrain ROW.

2.3.2 Auto-Transformer Power Feed Arrangement

The auto-transformer power feed system arrangement reduces the need for substations and would require the installation of only two TPSs spaced 36 miles apart. The ATF is the overall power feed system and includes the traction power substations, switching station, paralleling stations and the OCS. There are four options for the site of the northern TPS and three options for the site of ~~each of~~ the southern TPS~~s~~. In addition, there would be one switching station (SWS1) (with two site location options) and seven paralleling stations (PS1 through PS7) at a spacing of approximately 5 miles. Two options have been identified for the PS3, ~~PS4, PS5~~, and PS6 sites. Three options have been identified for the PS4 and PS5 site.

The paralleling stations provide additional power support to the power distribution system and permit increased spacing of the primary substations. In addition to reducing the number of substations—and thereby minimizing the introduction of new, large equipment installations into the corridor—the auto-transformer feed arrangement for implementation along the Caltrain corridor would help reduce electromagnetic fields (EMF) and electromagnetic interference (EMI) because the arrangement includes two parallel aerial feeders, one on each side of the alignment. The currents in the parallel feeders flow in the opposite direction to that in the main catenary conductors, reducing the EMF/EMI effects created by current flow in the OCS.[8]

The Proposed Project would protect the existing railroad signal system, the at-grade crossing system, and the PTC system from EMI created by the 25kv AC system the following ways.

- Designing the catenary system using proven solutions that minimize the effect of EMI.
- Providing sufficient shielding for electronic equipment.
- Installing specialized components, such as filters, capacitors, and inductors.
- Ensuring that the electric vehicles are designed with a frequency that does not interfere with the frequency of the at-grade crossing warning system.

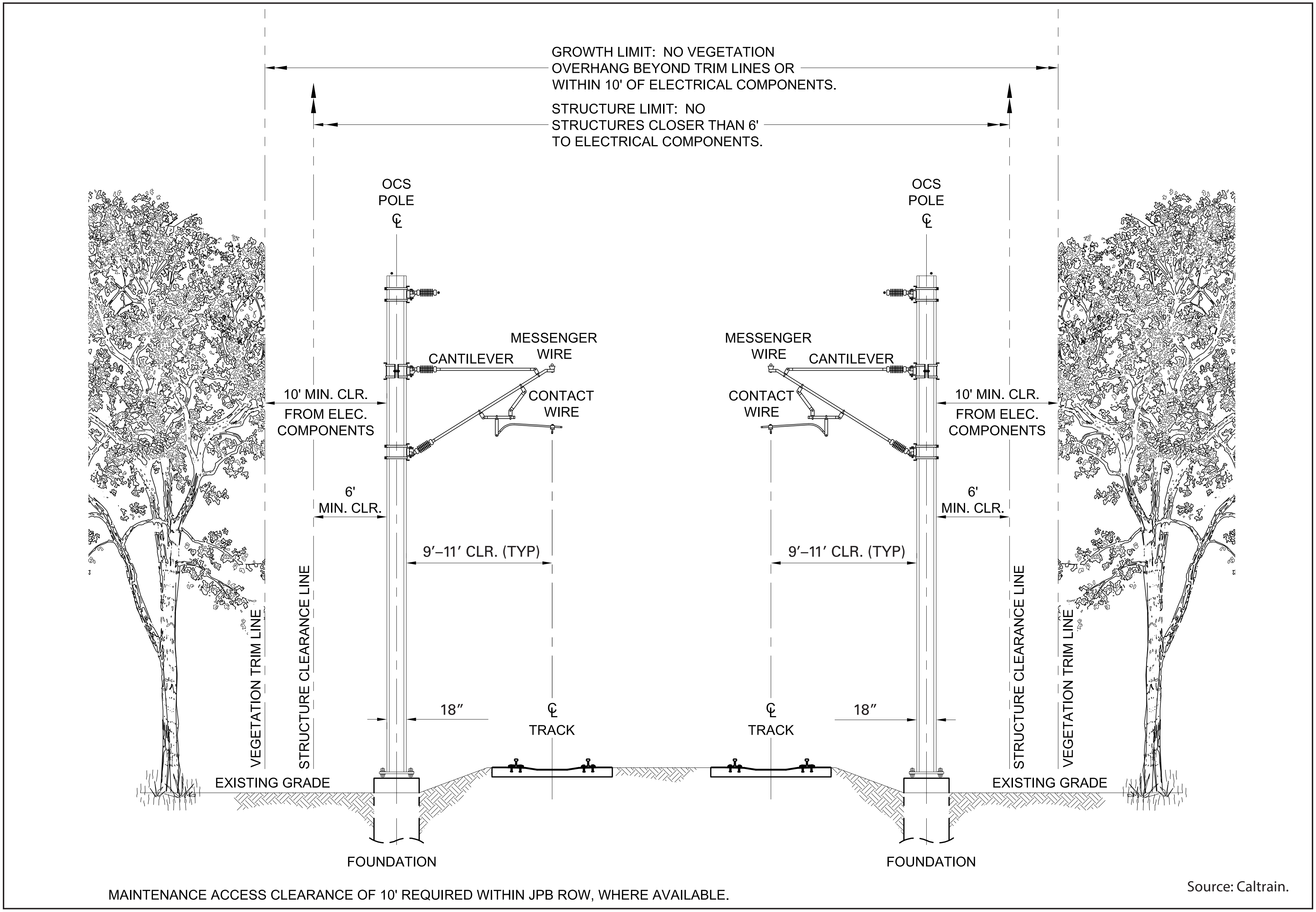
See Chapter 3, Section 3.5, *Electromagnetic Field and Electromagnetic Interference*, for the evaluation of the EMF/EMI effects of this power feed arrangement.

Figure 2-2 shows the proposed general locations for potential TPFs and Figures 2-9 to 2-18 show their specific location, including different options for certain facilities.

2.3.3 Traction Power Substations, Switching Stations, and Paralleling Stations

The two traction power substations would each include two 60MVA (million Volt-amperes) oil-filled transformers that would step down the power utility supplied voltage of 115 kV to the 2 by 25 kV distribution voltage needed for the OCS. The source power utility would be requested to provide two incoming feeds, which would tap two phases of each three-phase transmission line. The traction

[8] As explained in Section 3.5, Exponent (2001) studied the EMF associated with a direct center feed (DCF) configuration and the ATF configuration. As described in this study, the ATF system generally reduces magnetic fields compared to a DCF configuration by (1) minimizing current flow necessary to operate the Caltrain commuter system and (2) optimal phasing of the catenary and feeder circuits results in partial magnetic field cancellation relative to direct center feed power delivery systems. Exponent modelled DCF and ATF EMF fields and determined that EMF levels along the ROW were lower with the ATF configuration.



Source: Caltrain.

Graphics ... 00606.12 (11-5-14)

Note: This figure replaces Figure 2-8 from the Draft EIR.

Figure 2-8
Vegetation Clearance
Peninsula Corridor Electrification Project

Source:Imagery, ESRI 2013

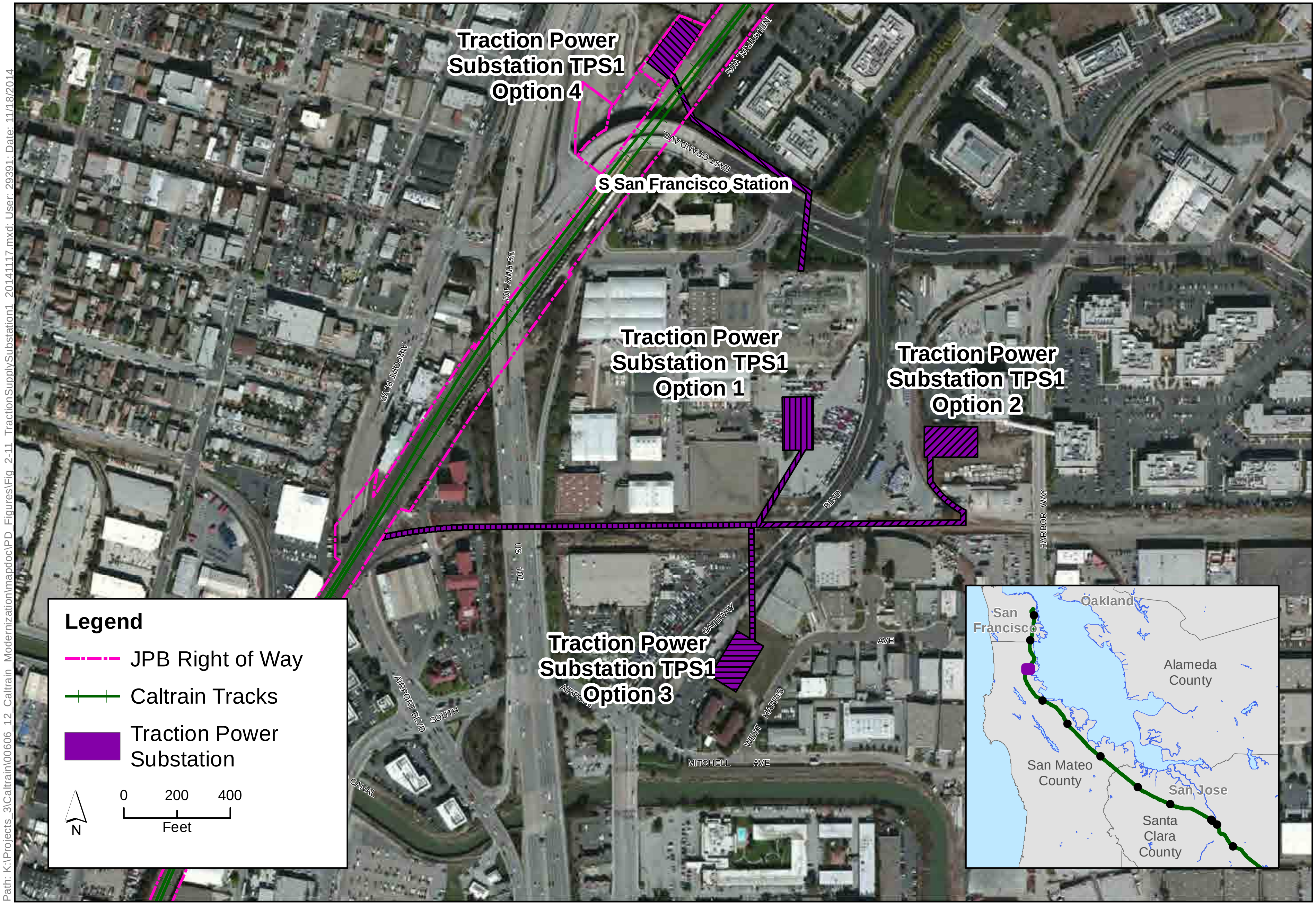
Figure 2-9
Proposed Paralleling Station 1 (PS1), San Francisco
Peninsula Corridor Electrification Project

Path: K:\Projects_3\Caltrain\00606_12_Caltrain_Modernization\mapdoc\PD_Figures\Fig_2-10_ParallelingStation2_20130626.mxd; User: 29391; Date: 6/28/2013

Source: Imagery, ESRI 2013

Figure 2-10
Proposed Paralleling Station 2 (PS2), San Francisco
Peninsula Corridor Electrification Project

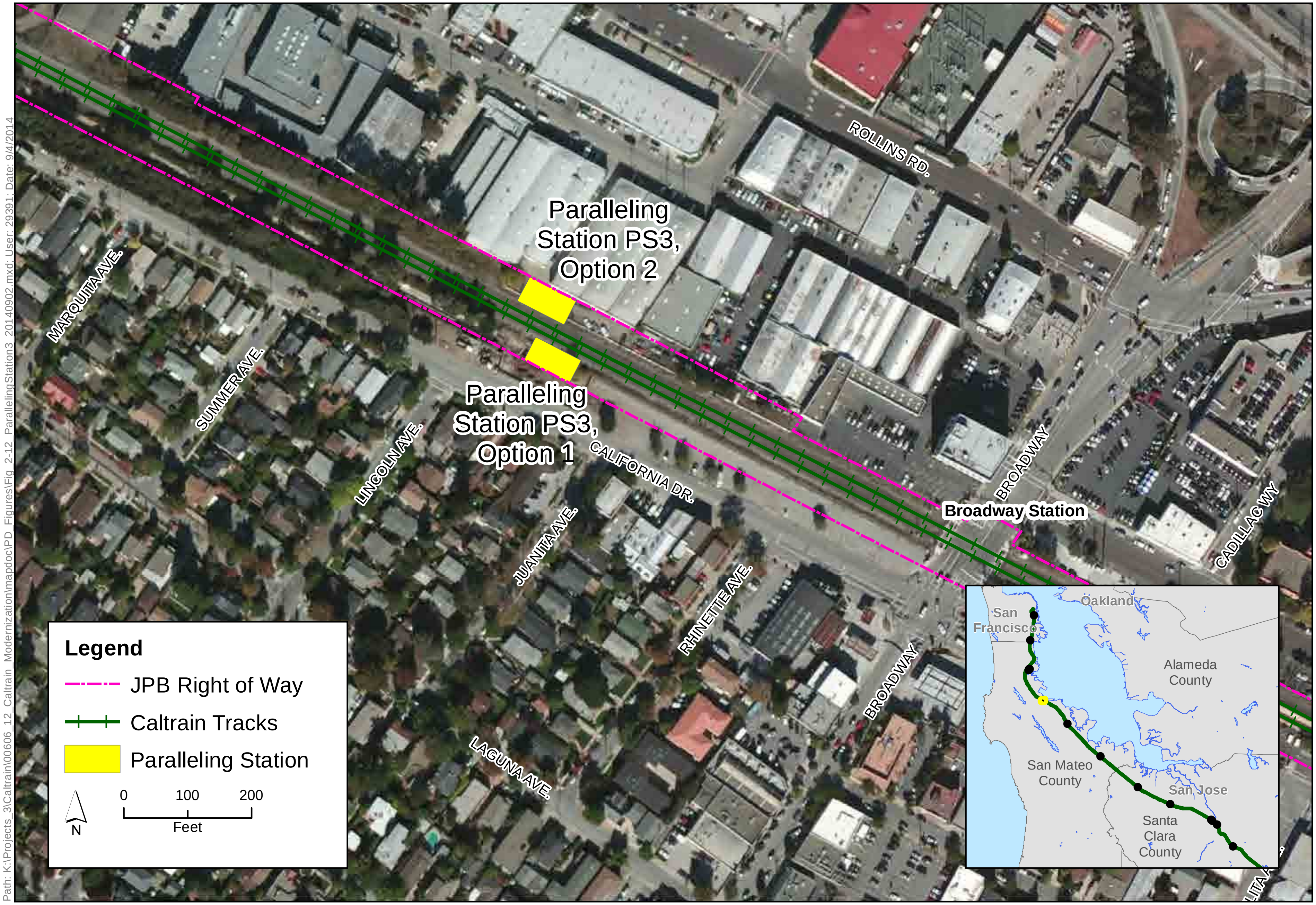
Path: K:\Projects_3\Caltrain\00606_12_Caltrain_Modernization\mapdoc\PD_Figures\Fig_2-11_TractionSupplySubstation1_20141117.mxd; User: 29391; Date: 11/18/2014



Source: Imagery, ESRI 2013

Note: This figure replaces Figure 2-11 from the Draft EIR

Figure 2-11
Traction Power Substation 1 (TPS1), South San Francisco
Peninsula Corridor Electrification Project



Path: K:\Projects_3\Caltrain\00606_12_Caltrain_Modernization\mapdoc\PD_Figures\Fig_2-12_ParallelingStation3_20140902.mxd; User: 29391; Date: 9/4/2014

Source: Imagery, ESRI 2013

Note: This figure replaces Figure 2-12 from the Draft EIR

Figure 2-12
Proposed Paralleling Station 3 (PS3), Options 1 and 2, Burlingame
Peninsula Corridor Electrification Project

Path: K:\Projects_3\Caltrain\00606_12_Caltrain_Modernization\mapdoc\PD_Figures\Fig_2-13a_ParallelingStation4a_20130626.mxd; User: 29391; Date: 6/28/2013

Source: Imagery, ESRI 2013

Figure 2-13a
Proposed Paralleling Station 4, Option 1 (PS4, Option 1), San Mateo
Peninsula Corridor Electrification Project

Source: Imagery, ESRI 2013

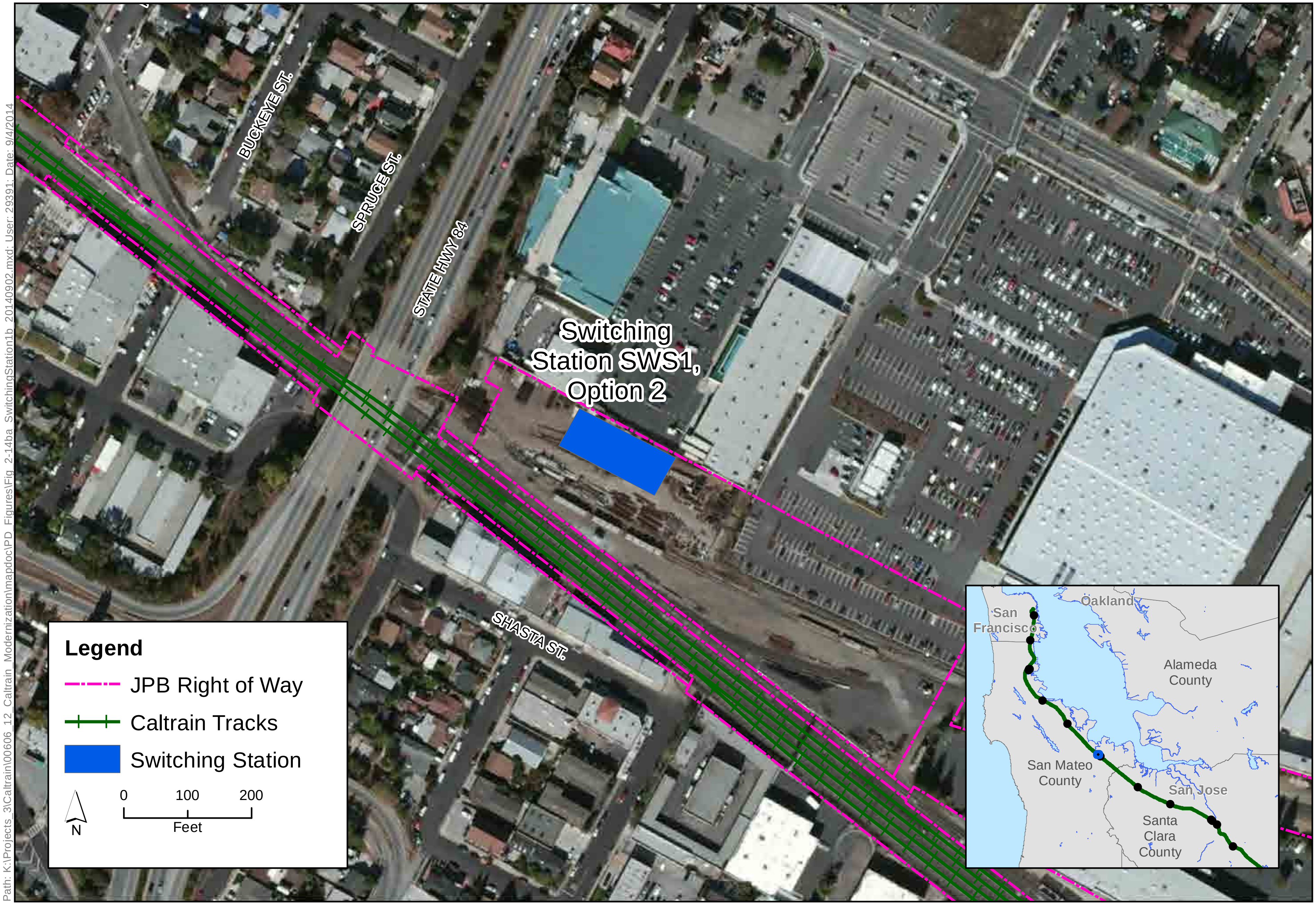
Figure 2-13b
Proposed Paralleling Station 4, Options 2 and 3 (PS4, Options 2 and 3), San Mateo
Peninsula Corridor Electrification Project

Note: This figure replaces Figure 2-13b from the Draft EIR

Source: Imagery, ESRI 2013

Figure 2-14a
Proposed Switching Station 1, Option 1 (SWS1, Option 1), Redwood City
Peninsula Corridor Electrification Project

Note: This figure replaces Figure 2-14 from the Draft EIR



Source: Imagery, ESRI 2013

Figure 2-14b

Proposed Switching Station 1, Option 2 (SWS1, Option 2), Redwood City

Peninsula Corridor Electrification Project

Note: This figure replaces Figure 2-14 from the Draft EIR

Path: K:\Projects_3\Caltrain\00606_12_Caltrain_Modernization\mapdoc\PD_Figures\Fig_2-15a_ParallelingStation5a_20141118.mxd; User: 29391; Date: 11/19/2014

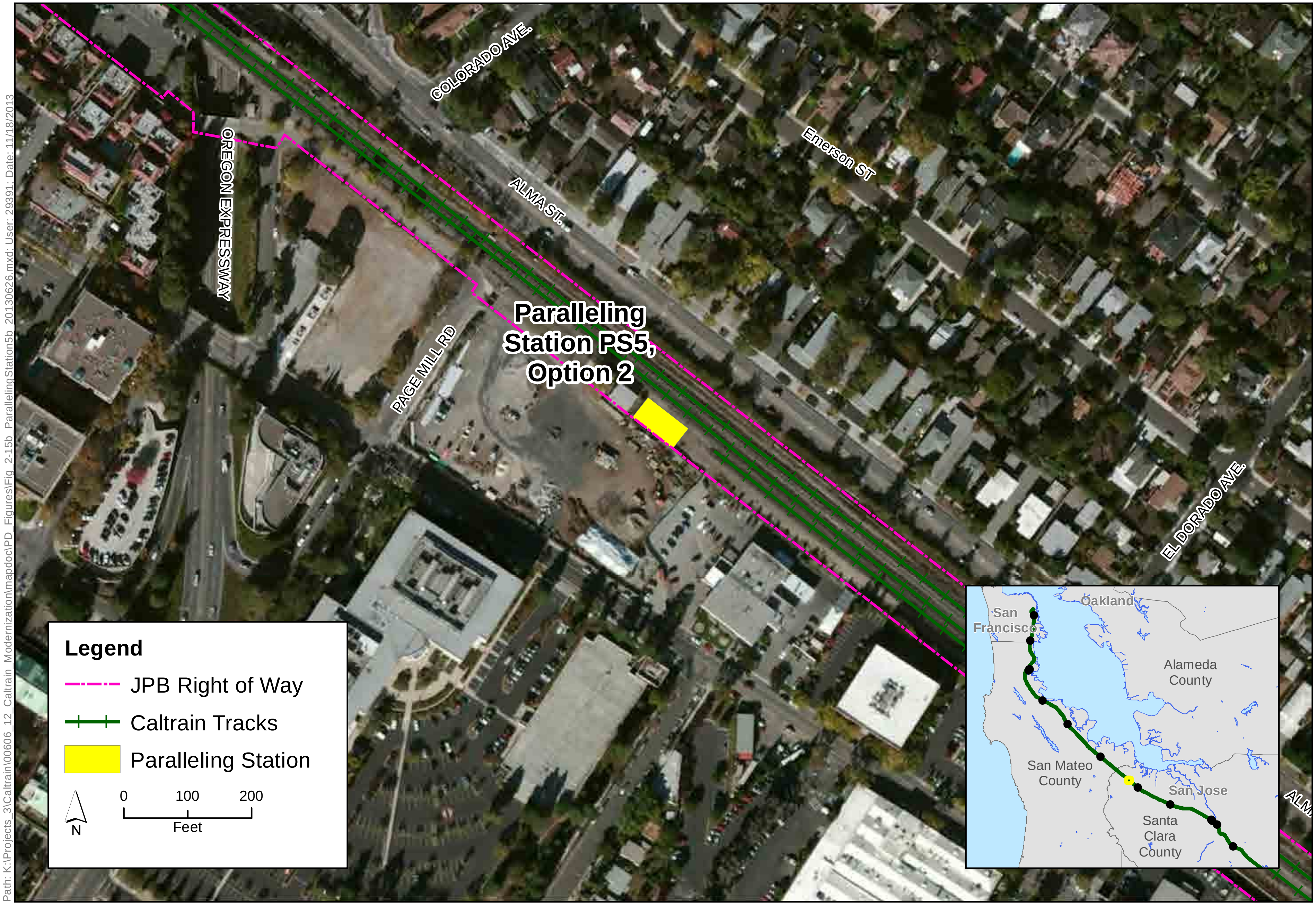
Source: Imagery, ESRI 2013

Figure 2-15a

Proposed Paralleling Station 5, Option 1a and 1b (PS5, Option 1a and 1b), Palo Alto

Peninsula Corridor Electrification Project

Note: This figure replaces Figure 2-15a from the Draft EIR



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Source: Imagery, ESRI 2013

Figure 2-15b
Proposed Paralleling Station 5, Option 2 (PS5, Option 2), Palo Alto
Peninsula Corridor Electrification Project

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Source: Imagery, ESRI 2013

Figure 2-16
Proposed Paralleling Station 6, Option 1 & 2 (PS6, Option 1 & 2), Sunnyvale
Peninsula Corridor Electrification Project

Source: Imagery, ESRI 2013

Figure 2-17a
Traction Power Substation 2, Option 1 & 2 (TPS2, Option 1 & 2), San Jose
Peninsula Corridor Electrification Project

Source: Imagery, ESRI 2013

Figure 2-17b
Traction Power Substation 2, Option 3 (TPS2, Option 3), San Jose
Peninsula Corridor Electrification Project

Source: Imagery, ESRI 2013

Figure 2-18a
Proposed Paralleling Station 7 (PS 7), San Jose
Peninsula Corridor Electrification Project

Source: Imagery, ESRI 2013

Note: This is a new figure for the Final EIR

Figure 2-18b
Proposed Paralleling Station 7, Variants (PS 7, Variants), San Jose
Peninsula Corridor Electrification Project

power substation compound would include circuit breakers and switching equipment that would feed power from the high-voltage lines to each line section of track. The line-side equipment would be designed to provide alternate switching arrangements in the event of a traction power substation equipment outage. A traction power substation compound would typically be approximately 150 feet by 200 feet in size.

Figure 2-19 shows an example TPS compound installation. Figure 2-20 shows a typical 115-kV to 50-kV primary transformer. Figure 2-21 shows a typical 10-MVA auto-transformer.

At approximately the midpoint between traction power substations, a switching station would be installed. At the switching station, a phase break would be required to ensure the power supplies from each traction power substation are isolated from each other in order to avoid a fault condition. In addition, switching would be installed to provide operating flexibility during equipment outages. Between the traction power substations and the switching station, paralleling stations would be installed to maintain the autotransformer system and system operating voltages. The switching station would be equipped with two 10-MVA oil-filled auto-transformer units and the paralleling stations with either one or two 10-MVA oil-filled auto-transformer units. These facilities would contain a variety of circuit breakers and switching equipment but would be typically as shown in the proposed location drawings above. Switching station compound dimensions are typically 80 feet wide by 160 feet long; paralleling station compound dimensions are typically 40 feet wide by 80 feet long. A typical switching station is shown in Figure 2-22.

2.3.4 Overbridge Protection Structures

Electrification of the corridor would require the construction or enhancement of overbridge protection barriers on 47 roadway or pedestrian bridges across the Caltrain alignment. These barriers are necessary to prohibit access to the rail corridor and prevent objects from being thrown off the bridges in a manner that would damage or interfere with the electrical facilities. As shown in Table 2-2, ~~15~~ 16 of the existing bridges already have such barriers on both the north and south bridge face, six bridges have a barrier on only one bridge face, and ~~26~~ 25 have no overbridge protection barriers. Overbridge protection barriers would be 6.5 feet high above sidewalk or pavement level, and placed along the parapet of the bridge at least 10 feet from the closest energized conductors crossing underneath. The existing barriers would be enhanced to meet these requirements. The overbridge protection barriers would have black, red, and white signage that says, “Danger, Live Wire.”

For two-track segments, the length of the overbridge protection barrier would be about 35 to 40 feet long. For three- and four-track segments, the overbridge protection barrier would be from 65 to 80 feet long. Overbridge protection barriers may be constructed from a variety of materials, including timber, sheet metal, small mesh wire fabric, plastic, concrete, or other solid material.

Table 2-2. Overhead Bridge Protection Barriers

Number	Mile Post	Bridge Location
Bridges with Barriers on Both Sides – Barriers may be Enhanced		
1	1.90	23rd Street, San Francisco
2	3.14	Oakdale Avenue, San Francisco
3	6.64	Tunnel Avenue, Brisbane
~~3~~ 4	8.67	Oyster Point Boulevard, South San Francisco
~~4~~ 5	9.22	Grand Avenue Westbound, South San Francisco
~~5~~ 6	9.23	Grand Avenue Eastbound, South San Francisco
~~6~~ 7	13.63	Pedestrian Crossing (Millbrae Station), Millbrae
~~7~~ 8	13.70	Millbrae Avenue, Millbrae
~~10~~ 9	35.60	Shoreline Boulevard, Mountain View
~~11~~ 10	36.49	Stevens Creek Pedestrian Crossing, Mountain View
~~12~~ 11	39.32	Pedestrian Crossing, Sunnyvale
~~13~~ 12	39.71	Wolfe Road, Sunnyvale
~~14~~ 13	40.70	Pedestrian Crossing, Sunnyvale
~~15~~ 14	40.75	Lawrence Expressway, Sunnyvale
~~16~~ 15	43.65	Lafayette Pedestrian Crossing, Santa Clara
~~17~~ 16	45.60	Hedding Avenue, San Jose
Bridges with One Barrier – Construct One New Barrier; Existing Barrier May be Enhanced		
1	1.72	22nd Street, San Francisco[a]
2	19.16	Highway 92 Eastbound, San Mateo[b]
3	26.15	Woodside Road / Highway 84, Redwood City[a]
4	36.80	Whisman Road, Mountain View[a]
5	38.60	Mathilda Avenue, Sunnyvale[b]
6	42.90	Scott Boulevard, Santa Clara[b]
Bridges with No Barriers – Construct Two New Barriers		
1	0.48	6th Street Off-Ramp, San Francisco
2	0.85	Interstate 280, San Francisco
3	1.27	Mariposa Street, San Francisco
4	2.10	Interstate 280 Southbound, San Francisco
5	2.16	Interstate 280 Northbound, San Francisco
6	2.70	Cesar Chavez Street Off-Ramp, San Francisco
7	3.66	Williams Avenue, San Francisco
8	4.15	Paul Avenue, San Francisco
~~9~~	~~6.64~~	~~Tunnel Avenue, Brisbane~~
~~10~~ 9	7.69	U.S. Highway 101, Brisbane
~~11~~ 10	7.80	Sierra Point Parkway, Brisbane
~~12~~ 11	9.40	U.S. Highway 101 Northbound, South San Francisco
~~13~~ 12	9.41	U.S. Highway 101 Southbound, South San Francisco
~~14~~ 13	10.82	Interstate 380, San Bruno
~~15~~ 14	19.12	State Route 92 Westbound, San Mateo
~~16~~ 15	34.00	San Antonio Avenue, Palo Alto
~~17~~ 16	36.50	State Route 85, Mountain View
~~18~~ 17	37.10	State Route 237 Westbound, Mountain View
~~19~~ 18	37.11	State Route 237 Eastbound, Mountain View
~~20~~ 19	39.31	Fair Oaks Avenue, Sunnyvale

Amtrak's North End Electrification

Source: JPB Staff.

Figure 2-19
Typical Substation Compound
Peninsula Corridor Electrification Project

Amtrak's North End Electrification

Source: JPB Staff.

Figure 2-20
Typical 115–50 kV (2x25 kV) Primary Transformer (40 MVA)
Peninsula Corridor Electrification Project

Amtrak's North End Electrification

Source: JPB Staff.

Graphics ... 00606.12 (12-10-13)

Figure 2-21
Typical Autotransformer (10 MVA) at Paralleling or Switching Station
Peninsula Corridor Electrification Project

Amtrak's North End Electrification

Auto-Transformers with Fire Walls

Control Building and Auto-Transformer

Graphics ... 00606.12 (12-10-13)

Source: JPB Staff.

Figure 2-22
Typical Switching Station
Peninsula Corridor Electrification Project

Number	Mile Post	Bridge Location	
~~21~~ 20	42.50	San Tomas Expressway, Santa Clara	
~~22~~ 21	43.99	De La Cruz Boulevard, Santa Clara	
~~23~~ 22	45.30	Interstate 880, San Jose	
~~24~~ 23	47.29	San Carlos Street, San Jose	
~~25~~ 24	50.10	Almaden Expressway, San Jose	
~~26~~ 25	50.49	Curtner Avenue, San Jose	
TOTALS			
Bridges with Two Existing Barriers: Barriers May Be Enhanced			~~15~~ 16
Bridges with One Existing Barrier: Construct One/May Enhance One			6
Total Bridges with No Existing Barriers: Construct Two New Barriers			~~26~~ 25
TOTAL NUMBER OF BRIDGES			47

Source: FTA and JPB 2009.
[a] For bridges with one barrier, the existing barrier is on the north face.
[b] For bridges with one barrier, the existing barrier is on the south face

Figure 2-23 shows a typical overbridge protection barrier treatment as installed on the Northeast Corridor. A fine mesh wire fabric would be used for the Proposed Project. This fabric would provide safety protection and maintainability while affording a measure of transparency for both pedestrians and motorists. See Chapter 3, Section 3.1, *Aesthetics*, for a visual simulation of the overbridge protection barrier type that would be used for the Proposed Project and an evaluation of visual impacts.

2.3.5 At-Grade Crossing Warning Devices

The Proposed Project would also require a change in the warning devices for at-grade crossings. At present, at-grade crossings are operating with Harmon Crossing Predictors and Grade Crossing Predictors as warning devices. As part of the Proposed Project, those warning devices would be removed because they operate on a DC circuit and the proposed EMUs would operate on an AC circuit.

Caltrain trains equipped with onboard CBOSS PTC equipment will communicate with the at-grade crossings wirelessly, allowing the at-grade crossing gates to function safely. CBOSS PTC will be in place by 2015.

For non-Caltrain trains (which will not have onboard CBOSS PTC equipment), Audio Frequency Overlays (AFOs), also known as track circuits, will be installed at fixed locations along the Caltrain ROW, allowing the at-grade crossing gates to function safely. An AFO is a sensor that activates the at-grade crossings when the train is approaching. New cables and wires are required for the AFOs. Cable and wire installation will be within the Caltrain ROW and construction will involve these specified activities:

- Trenching and excavating
- Installation of conduits
- Installation of cables and wires
- Installation of AFO equipment
- Connections at at-grade crossings

In the next phase of design, additional engineering will be conducted on the performance of AFOs and alternative design options.

2.3.6 Rolling Stock

New EMUs are the preferred rolling stock option for the Proposed Project. New EMUs would replace the portion of Caltrain's existing diesel locomotives and passenger cars that will reach the end of its useful life by 2020 ~~2019~~. In 2020 ~~2019~~, Caltrain would operate a mixed fleet that would have approximately 75 percent electric service between San Francisco and San Jose with EMUs, and diesel service for the remaining 25 percent. With EMUs, each car, or set of cars (unit), can have its own pantograph mounted on the roof and separate electric motor drives to each axle. EMUs can be operated in a variety of train consists, dependent upon the requirements of the rail system operator. Options include single motor cars (where each car is fitted with a driving cab at both ends) and paired cars (where there is a driving cab at only one end of each car). A pair can comprise two motor-cab cars, or a motor-cab plus a non-motored trailer-cab car. Another option would be two motorized cab cars with multiple non-motored trailer cab-cars in between.

EMUs currently in use include the 1,500-volt DC gallery cars now being operated by Metra in Chicago. These cars closely resemble the Caltrain double-level gallery cars. Northern Indiana Commuter Transportation District also operates the new 1,500-volt DC multi-level Nippon Sharyo cars in northern Indiana and Illinois. Twenty-five kV AC single-level EMUs are in service on the Deux Montagnes Commuter Railroad in Montreal. Typical modern European EMU vehicles are shown in Figure 2-24. In addition, Metro-North Railroad, NJT, and SEPTA operate single-level EMUs powered from an 11.5- to 12.5-kV and 25-kV AC OCS. There is currently no United States-based prototype for the EMU proposed for the Proposed Project. The EMU vehicle for the Proposed Project would be a multi-level car of comparable dimensions to the existing Caltrain gallery car.

Caltrain has received a waiver from the FRA that would allow modern European EMU equipment to operate on the Caltrain Peninsula Corridor provided that temporal separation is provided between the light-weight EMUs and heavy freight trains (this is referred to as the FRA waiver).[9] However, as discussed in the next section, Caltrain assumes that temporal separation will not be required for the Proposed Project.

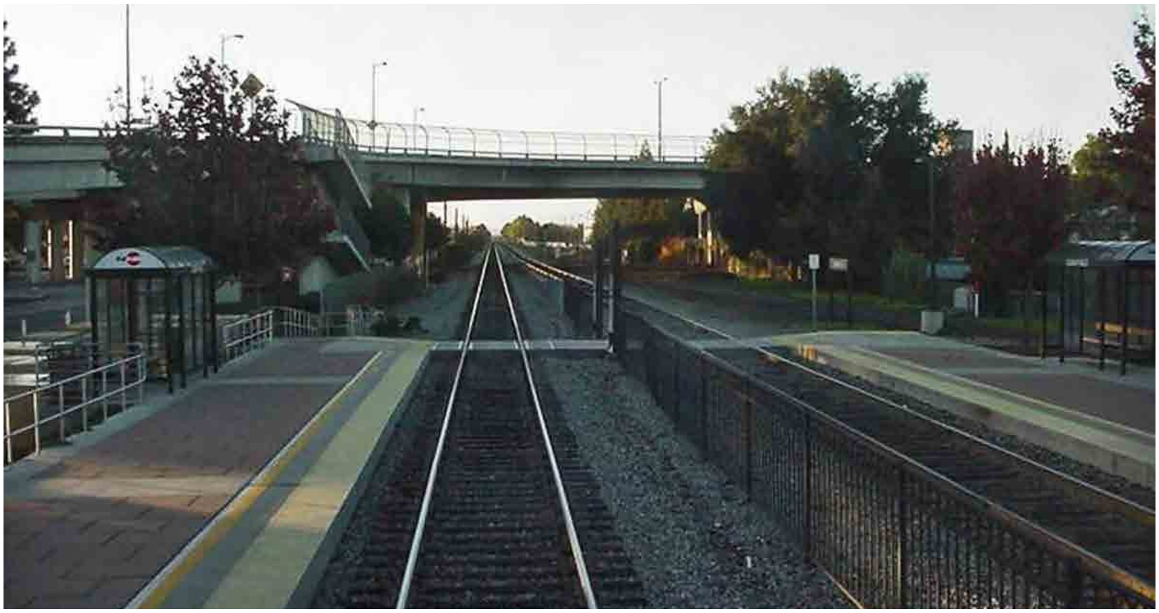
Power for the electric vehicles would be drawn from the OCS through a roof-mounted pantograph on the power car(s) or locomotive. The pantograph is a hinged, mechanical device that can extend vertically to follow variations in the OCS contact wire height, with a typical extension from as low as 14 feet up to 24 or 25 feet. A typical pantograph is depicted in Figure 2-25.

2.3.7 Operations and Maintenance

2.3.7.1 Caltrain Operating Scenario(s) Under Electrification

Caltrain's existing service includes five trains per peak hour during the a.m. and p.m. peaks, as well as mid-day service, for a total of 92 trains per day. In addition to local service (stopping at every station), existing weekday Caltrain service consists of six baby bullet trains and ten limited-stop

[9] It should be noted that the FRA is currently in a rulemaking process for "Alternative Compliant Vehicles" that is relevant to the EMUs in the Proposed Project. It is Caltrain's understanding that when the rule is in place, the FRA waiver and the temporal separation requirement will ~~may~~ no longer be necessary. ~~For the purposes of this EIR, it is assumed that the current FRA waiver requirement would be in force.~~



Existing Caltrain Pedestrian Walkway with Overbridge Protection Barrier

Simple wire mesh

Vertical Parapet with Security Fence

Lexan polycarbonate sheet

Source: JPB Staff.

Graphics ... 00606.12 (9-8-14)

Note: This figure replaces Figure 2-23 from the Draft EIR.

Figure 2-23
Typical Overbridge Protection Barrier
Peninsula Corridor Electrification Project

Siemens EMU

TER-2N EMU

Source: JPB Staff.

Graphics … 00606.12 (12-10-13)

Figure 2-24
Typical EMU Vehicles
Peninsula Corridor Electrification Project

Source: JPB Staff.

Figure 2-25
Typical Pantograph
Peninsula Corridor Electrification Project

trains in the a.m. northbound and p.m. southbound and five baby bullet trains and 11 limited-stop trains in the a.m. southbound and p.m. northbound. There is approximately one train per hour per direction from 10 a.m. until 2 p.m. and after 7 p.m.

The proposed level of Caltrain operations includes six trains per peak hour during the a.m. and p.m. peaks, as well as mid-day service, for a total of 114 trains per day. Based on a prototypical schedule, with project implementation, there would be approximately six a.m. and p.m. baby bullet trains per direction. There would be approximately two trains per hour per direction from 9 a.m. until 4 p.m. and after 7 p.m. An example prototypical schedule of proposed Caltrain service is provided in Appendix I, *Ridership Technical Memorandum*. This prototypical schedule was developed to derive ridership estimates and for use in the analysis in this EIR. The actual schedule may vary.

Caltrain assumes that the Proposed Project will not utilize temporal separation for the following reasons:

- Waiver of current FRA Tier 1 passenger vehicle requirement (49 CFR 238 et seq.) requires that the waiver demonstrate an equivalent level of safety. That can be demonstrated through vehicle design criteria, track improvements, signal improvements, operational limitations or other means. Thus, there is no specific regulatory requirement that mandates temporal separation for mixed use operation of EMUs and FRA Compliant equipment.
- Caltrain's petition submittals (Caltrain 2009) demonstrated that the individual EMU design features, using European rail safety standards, combined with PTC, alone would provide an equivalent level of safety to current FRA Tier 1 Standards.
- The Engineering Task Force (ETF) 2011 report to the FRA's Railroad Safety Advisory Committee (RSAC) (FRA 2011) concerning alternative compliant equipment demonstrates that design criteria for such equipment can provide an equivalent level of safety to current Tier 1 Standards and that temporal separation would only be an option in the event that a rail operator could not demonstrate the equivalent level of safety through design features. Caltrain would not be the first commuter rail authority to obtain approval to operate non-standard passenger equipment without temporal separation. The Denton County Transportation Authority received a FRA Waiver to operate alternative compliant Stadler GTW 2/6 Diesel Multiple Units (DMUs) without temporal separation.
- FRA rule-making concerning alternative compliant equipment, expected to be released for public comment in early 2015, is expected to draw heavily on the recommendations in the 2011 ETF report. A March 2013 discussion draft of the proposed rule text does not include temporal separation as a requirement for mixed use operation. Therefore, the FRA will not likely mandate temporal separation as a requirement for mixed use operation of Alternative Compliant Equipment and FRA Compliant equipment.
- Caltrain EMUs will meet current European safety standards and will be able to meet the equivalent level of safety criteria in the ETF report and those likely to be included in the future FRA rule-making.
- With adoption of the forthcoming FRA rule-making and Caltrain EMU design compliance with the new design criteria, the current FRA Waiver requirements, including temporal separation would no longer be required. Should the subject FRA rule-making not proceed for any reason, Caltrain will apply for a revision of the FRA Waiver prior to mixed use operations to request a removal of temporal separation.

- Thus, the reasonably foreseeable project condition for the PCEP in 2020 is that temporal separation will not be required and this condition is therefore the basis of the EIR analysis.
- Should Caltrain's expectations about FRA rule-making (or the fall-back provision of amending the FRA Waiver) prove incorrect, then Caltrain will conduct supplemental environmental analysis, as necessary under CEQA, to examine potential environmental effects of requiring temporal separation, including, but not necessarily limited to, analysis of impacts on freight operations.

2.3.7.2 Ridership

Implementation of the Proposed Project is anticipated to result in increased ridership by 2020 and by 2040. Table 2-3 shows the existing Caltrain ridership and the projected Caltrain ridership from 2020 and 2040, with and without the Proposed Project.

Table 2-3. Estimated Caltrain System Ridership with the Proposed Project

	2013	2020[a]	2040
Existing/No Project[b]	47,000	57,000	84,000
With Project[c, d]	N/A	69,000	111,000

Note: ridership is reported on a boardings basis, not boardings plus alightings.
Source: Appendix I, *Ridership Technical Memorandum*
[a] 2020 was used for ridership analysis to ensure full operation of the new electrified service.
[b] No Project analysis assumes the same schedule as at present (5 trains per peak hour; 1 train per off-peak hour per direction; total of 92 trains per day) for both 2020 and 2040
[c] For 2020, analysis assumed 75% electrified and 25% diesel service from San Jose to San Francisco.
[d] For 2040, analysis presumes fully electrified service between San Jose and San Francisco. As described above, the Proposed Project only has sufficient funding at present to provide 75% electrified service between San Jose and San Francisco. It is presumed that additional funding will be obtained to allow full electrified service between San Jose and San Francisco to occur by 2040.

2.3.7.3 Energy Consumption

The Proposed Project's primary energy source would be electricity. Through conversion of trains from diesel motor propulsion to EMUs, the Proposed Project would substantially decrease diesel fuel use and substantially increase annual electricity use.

Existing fuel consumption is approximately 4.5 million gallons per year (mid-2012 to mid-2013). With the Proposed Project, in 2020 ~~2019~~ diesel trains would provide approximately 25 percent of service from San Francisco to San Jose and all of the service from San Jose to Gilroy. These diesel trains would require an estimated 1.1 million gallons of fuel per year[10], a reduction of approximately 3.4 million gallons per year from current conditions.

Proposed Project operation would require approximately ~~83~~ 88 million kWh of electricity in 2020 ~~2019~~. This includes energy expended during both train travel and idling.

[10] Fuel consumption estimates are preliminary. Further project planning may take into account additional factors in estimating potential project fuel consumption. However, the methodology for estimating fuel consumption was consistent for the No Project Alternative, the Proposed Project, and the other analyzed alternatives and thus conclusions in this EIR related to energy consumption, air quality, GHG emissions are done on a reasonable basis based on available information at the time of preparation of the EIR.

2.3.7.4 Maintenance

Pruning or removal of trees would be required along the tracks and electrical facilities where trees would otherwise pose a maintenance or safety concern. These impacts are addressed within this document; refer to Chapter 3, Section 3.1, *Aesthetics*, and Section 3.3, *Biological Resources* for analysis of the impacts of tree pruning and removal on aesthetics and biological resources.

One maintenance item that is unique to electric vehicles is the need to inspect the pantograph carbon collector strips for wear and damage. Carbon is a relatively soft material, even when mixed with copper particles to create "metalized" strips. However, carbon, rather than the contact wire, is designed to be the sacrificial element in the sliding current collection interface. As a result, the pantograph would need to be frequently inspected to ensure that there is sufficient carbon interface.

2.3.7.5 Emergency Procedures

The system is designed to protect employees and the public from voltages caused by faults (i.e., energized wires coming into contact with earth/ground) and to remove power in the affected area. Under design conditions, it is estimated that clearing of the faulted area (e.g., the shutoff of power) should not exceed 10 cycles (0.167 seconds). In the unlikely probability the protection devices fail to detect abnormalities and energized wires come into contact with the earth, there would be arcing and the earth potential is raised and a potential for fire and other damage. This probability is very small and consistent with what one would expect from overhead electrical distribution lines already in service in the area.

Requirements and standard procedures for emergency response will be developed as part of the PCEP. Current Caltrain rules and regulations will be modified to include procedures like those contained in AMTRAK's AMT-2 Electrical Operating Instructions. This document will outline, in detail, how all abnormal situations are handled with the electrification system. Once these instructions and rules have been developed, extensive training will be deployed to employees, first responders (e.g., Police, Fire, EMT etc.) adjacent transit agencies (i.e., BART, VTA, ACE, CCJPA, SamTrans AMTRAK, UPRR), other agencies and the public.

2.3.8 Construction

Construction activities for PECP would consist of the installation of OCS poles and wires; the construction of TPFs; the installation of pantograph inspection platforms; and the erection of overbridge protection barriers on roadway bridges that cross the Caltrain alignment. Installation of wiring and storage tracks within the Central Equipment Maintenance Operations Facility (CEMOF) and at the Lenzen Yard in San Jose are also included. Construction of the electrification infrastructure from San Francisco to San Jose would take approximately 3 to 4 years, including commissioning and testing.

2.3.8.1 Construction Methods

Overhead Contact System Installation

Under normal conditions, pole foundations would be excavated by means of 3-foot-diameter augers, and the soil would be removed to a depth of approximately 15 feet. In areas that are close to drainages paralleling the rail corridor or in areas where there is potential for encountering contaminated soils or groundwater, an alternate process would be used. In order to reduce impacts to the drainage banks and vegetation, a steel casing would be vibrated into place by ultrasonic vibrators. The casing would be sunk to the full 15-foot depth, and soil would be excavated to a depth of only 5 to 7 feet to place the pole foundation.

Spoils resulting from the excavations for OCS pole foundations would be relatively small in quantity. These spoils would be disposed of by spreading them along the railroad ROW in the vicinity of the excavation. Any spoils found to be contaminated with hazardous waste would not be spread within the ROW; the disposal of such material is addressed in Section 3.8, *Hazards and Hazardous Materials*.

Construction would typically occur along 1- to 2-mile sections of the corridor and would involve several "passes" per track. One pass would install the foundations, a second would place the poles, and another would install the feeder wires and support arms; these would then be followed by additional passes for installation of the messenger and contact wires. The final pass would involve a system check to ensure proper installation. This sequence is consecutive; however, construction could occur in several segments simultaneously, with different activities occurring at any or all of those locations.

The construction equipment required for these operations may include flatbed trucks, on which various items of construction equipment would be mounted. These may include auger drill rigs, directional bore machines, cranes, and telescoping boom bucket trucks. There would be other support vehicles, many of which would be fitted with hi-rail equipment, because the primary access to the construction sites for the catenary system would be from the tracks.

The track windows required for the installation of the OCS poles and foundations would be different from those required for other tasks, depending upon whether there is access for the contractor to perform the construction adjacent to the tracks, or whether there are constraints to access due to natural resources or the potential for archaeological resources in the immediate vicinity. Work adjacent to the tracks is best for minimizing impacts on train operations, but work on the tracks may be preferable where feasible to avoid impacts on sensitive resources.

Based upon the current and planned track alignment, there would be approximately 3,200 poles and 3,800 foundations. Approximately 20 to 30 percent of the poles and foundations could be installed with off-track equipment and with minimal impact on train operations. Nominal timeframes for installing OCS pole foundations and poles with off-track access would be between 10:00 a.m. and 3:00 p.m., but installations may be outside these hours if needed to meet the overall construction schedule. The remaining 70 to 80 percent of the poles and foundations would be installed with on-track equipment, requiring single-track access work windows. This work would need to be performed during off-peak operations, with single-tracking, such as:

- 8:00 p.m. to 6:00 a.m., Monday through Thursday
- 8:00 p.m. Friday to 6:00 a.m. Monday

The windows for the installation of the OCS conductors, such as static wires, parallel feeders, and messenger and contact wires, would use on-track equipment and require nighttime and weekend track occupancies, including weekend outages that would require total suspension of passenger revenue service. These track windows would primarily use single-tracking but would require some multiple track shutdowns to install the OCS conductors at the complex interlockings. The majority of such OCS wirework would need to be accomplished during the nighttime using single-track windows, but some portions of the work could only be installed by using complete weekend outages, requiring suspension of passenger service to increase working efficiency and reduce public safety risks. Typical work windows for on-track equipment would be:

- 8:00 p.m. to 6:00 a.m., Monday through Friday (night and multiple tracking)
- 8:00 p.m. Friday to 6:00 a.m. Monday (with single-tracking)

Overbridge Protection Barriers

Bridge barrier installation would consist generally of installing prefabricated components onto the existing parapets of the overhead bridges that traverse the project corridor. Work crews would install anchor bolts into the existing bridge structure and then mount the bridge barrier. Equipment used would typically be pneumatic drills, flatbed trucks, utility trucks, boom trucks, generators, and light towers. The JPB would coordinate with Caltrans or city departments of public works to obtain the required permit approvals for barriers on state or city roadways, respectively.

The installation of overbridge protection barriers would occur almost entirely with the use of off-track equipment. Installation of overbridge protection barriers would occur from 7:00 a.m. to 7:00 p.m. Monday through Sunday. Any work requiring the use of on-track equipment would be minimal and would be coordinated with the on-track window requirements for OCS wire installation.

Traction Power Substation, Switching, and Paralleling Stations and Lay-Down Area

The sites proposed for the location of the traction power substations, switching stations, and paralleling stations are mostly in industrial areas or transportation rights of way, or are proximate to existing high-voltage facilities; see Chapter 3, Section 3.10, *Land Use and Planning*, for evaluation of the use of these sites. Site preparation would include clearing, grubbing, and grading with bulldozers and dump trucks. Site access would be prepared concurrently with the site operations.

A ground grid composed of copper wire and driven ground rods, which is necessary for the protection of personnel and equipment during operation of the electrical systems, would be placed below each TPF at a depth of approximately 3 feet and then covered by fill.

Interconnections between electrical equipment would be accomplished in part by raceways contained in concrete encased conduits (duct banks). These duct banks would be installed as explained below.

- Dig a 4-foot-deep trench with backhoe.
- Construct forms as necessary (plywood and 2x4s).
- Arrange conduits per design plans.
- Place encasement concrete.
- Remove forms and backfill with soil.

Concrete foundations would be required for the mounting of freestanding electrical transformers, circuit breakers, and disconnect switches, as well as for the prefabricated control and medium voltage switchgear building. Foundations would generally be constructed as explained below.

- With bulldozer and backhoe, dig to bottom grade per design plan.
- Construct forms as necessary (plywood and 2x4s).

- Arrange reinforcing steel, anchor bolts, grounding connections, and conduits (extensions of duct banks) as required per design plans.
- Place concrete.
- Strip forms and backfill.

Electrical equipment to be installed would include outdoor high-voltage switches, transformers, and cables, as well as the prefabricated control and switchgear room. Some of the equipment would be mounted on small steel structures. Equipment weights range from several hundred pounds to 100,000 pounds; therefore, the installation rigs would range from small truck-mounted cranes to larger track-mounted units. The equipment would be electrically connected together by cable or by buss (open air copper or aluminum tubes). Small truck-mounted cranes would be used to move and arrange the reels of cable and to support buss work during installation.

The primary service from the local utility network would be via either underground or overhead transmission lines. The installation would be either through duct banks or via direct connections to the transmission lines. Station sites would typically be finished with fencing along the entire periphery. Ground surfaces would be covered with clean crushed rock.

The electrical system would be tested prior to initiation of electrified train operations. Testing would be in two main phases. The first phase would involve testing with no power to verify that the installation complies with the design. In the second phase, the system would be energized to verify performance and to adjust system protective devices.

The traction power substations, switching station, and paralleling stations would be installed with off-track equipment. The work window requirements for constructing the interface facilities to the OCS conductors would be coordinated with the installation of the OCS wires.

2.3.8.2 Potential Construction Staging and Access Areas

The JPB has preliminarily identified potential construction track access and staging locations within the Caltrain ROW, on other property owned by the JPB or the San Mateo County Transit District (SamTrans), and at the TPF sites. There could be staging locations outside the Caltrain ROW or additional staging and access areas within the ROW that are not listed below that may be used for construction. This information is provided for the purposes of analysis in the EIR to give an idea of where staging may occur.

The following requirements will be followed for identification and use of any staging areas:

- The JPB and/or its construction contractor shall prepare a construction staging plan that identifies all potential staging areas, truck routes from the work area to the staging area, and access routes and shall coordinate with local jurisdictions during development of the plan prior to use of staging areas in the jurisdiction. All necessary permits for temporary use of areas outside the JPB ROW shall be obtained from local jurisdictions prior to use of the staging areas.
- Staging areas not identified below within the JPB ROW shall be evaluated for potential biological and cultural resources prior to use by a qualified biologist and a qualified archaeologist. Disturbance of sensitive biological resources and cultural resources will be avoided. No removal of mature trees will be allowed for staging areas.
- All applicable mitigation identified for construction aesthetics, air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water

quality, noise and vibration, public services and utilities, and traffic shall apply to all staging areas, whether in the JPB ROW or not.

- Construction deliveries shall be made during daytime hours wherever feasible.
- Adjacent residents and businesses shall be notified in advance of any construction activities.

The following primary track access points have been identified along the corridor.

- San Francisco, CP Common set out tracks (MP 0.9).
- Brisbane, Visitation lead (MP 6.0).
- South San Francisco, Drill track (MP 9.5).
- Burlingame, Set out track (MP 16.0).
- San Mateo, Former Bay Meadows set out track (MP 19.9).
- San Carlos, Set out track (MP 23.4).
- Redwood City, Redwood Junction (MP 26.5).
- Menlo Park, Alma set out track (MP 29.6).
- Palo Alto, Set out track (MP 32.2).
- Mountain View, Set out track (MP 35.3).
- Santa Clara, Calstone lead (MP 40.8).
- Santa Clara/San Jose, Santa Clara Drill track (MP 45.5).
- San Jose, Tamien siding (MP 49.2).
- San Jose, Lick set out track (MP 51.6).

The following potential staging areas within the Caltrain ROW or on JPB or SamTrans property have been identified.

- San Francisco, East side of San Francisco 4th and King Yard, (MP 0.4).
- San Francisco, Northeast corner of 16th street (MP 1.1).
- Brisbane, Under Tunnel Avenue West and East side of ROW (MP 6.7).
- San Bruno, Caltrain ROW Scott Street (MP 10.6).
- San Bruno, East of San Bruno Grade Separation (MP 11.6).
- Millbrae, Caltrain ROW Center Street (MP 12.7).
- Burlingame, Caltrain ROW South of Oxford Road (MP 14.8).
- Burlingame, Caltrain ROW, East of MT-1 (MP 15.5).
- Burlingame, Southeast of Oak Grove Avenue (MP 16.0).
- Burlingame, Northeast corner of Peninsula Avenue (MP 16.8).
- San Mateo, East side of ROW at Villa Terrace (MP 17.0).
- San Mateo, West side of ROW between 9th and 16th Avenues (MP 18.3).
- San Mateo, West side of ROW past 25th Avenue (MP 19.8).

- Belmont, Belmont Station Parking Lot North (MP 22.0).
- Redwood City, East of Redwood Sidings (MP 26.5).
- Atherton, South of Atherton Station (MP 27.8).
- Atherton, Northwest of Encinal and Glenwood Avenues (MP 28.3).
- Palo Alto, Southside of Alma Crossing (MP 29.8).
- Palo Alto, South of California Avenue Station (MP 32.1).
- Palo Alto, Along ROW from Meadow to Charleston (MP 33.0).
- Mountain View, East side of ROW (MP 35.2).
- Sunnyvale, South of Sunnyvale Avenue (MP 38.9).
- Sunnyvale, West side of ROW (MP 42.9).
- Sunnyvale, West side of ROW (MP 44.0).
- Sunnyvale, South of De la Cruz Boulevard, West of ROW (MP 44.6).
- Santa Clara, Santa Clara Station parking lot (MP 45.0).
- San Jose, College Park Station (MP 46.3).
- San Jose, CEMOF (MP 46.6).
- San Jose, North of Diridon Station, corner of Alameda Street (MP 47.4).[11]
- San Jose, Southwest corner of Virginia Street (MP 48.2).

In addition to the potential staging areas noted above, the TPF sites could also be used for staging.

- TPS1 Options 1 and 2: Off Gateway Boulevard, South San Francisco.
- TPS1 Option 3: Off Harbor Way, South San Francisco.
- TPS1, Option 4: South San Francisco Caltrain Station, South San Francisco
- TPS2 Option 1: Off Newhall Street, San Jose.
- TPS2 Option 2: Off Stockton Avenue, San Jose.
- TPS2 Option 3: At CEMOF[12], San Jose.
- PS1: Pennsylvania Avenue and Mariposa Street, San Francisco (MP 1.3).
- PS2: Blanken and Tunnel Avenues, San Francisco (MP 5.0).
- PS3 Option 1: California & Lincoln Avenues, Burlingame (MP 15.0)
- PS3 Option 2: Off Star Way, Burlingame (MP 15.0)

[11] JPB would coordinate with stakeholders for the SAP center to address vehicular parking, transit and pedestrian access, delivery route and location of staging areas.

[12] TPS2 Option 3 would affect the Caltrain parking lot at the Central Control Facility. A high level assessment shows that if TPS2 is located at the Option 3 site, it would require relocation of approximately 75 Caltrain parking spaces (an approximately 150-foot-by-200-foot area) and two Caltrain storage containers (approximately 40 feet by 20 feet). If Option 3 site is selected, the parking spaces and containers would be relocated within Caltrain's ROW in non-sensitive environmental areas.

- PS4 Option 1: Hillsdale, San Mateo (MP 20.1).
- PS4 Option 2: Hillsdale, San Mateo (MP 20.3).
- PS4 Option 3: Hillsdale, San Mateo (MP 20.4).
- SWS1: Redwood Junction, Unincorporated San Mateo County near Redwood City (MP 26.7).
- SWS2: West of Redwood Junction near SR 84, Redwood City (MP 26.2).
- PS5 Option 1: Alma ~~Boulevard~~ Street and ~~Green Meadow~~ Greenmeadow Way, Palo Alto (MP 33.6).
- PS5 Option 1B: Alma Street and just south of Ferne Avenue, Palo Alto (MP 33.85).
- PS5 Option 2: Near Page Mill Road at Caltrain ROW (MP 32.0).[13]
- PS6 Option 1: West Hendy and North Murphy Avenues, Sunnyvale (MP 38.9).
- PS6 Option 2: Sunnyvale Train Station parking lot (MP 38.7).
- PS7: End of Communication Hill Boulevard, San Jose (MP 51.0).

2.3.8.3 Construction Schedule/Durations

The preliminary project schedule (subject to change) is provided below.

- Environmental review/design/permitting: 1–2 years.
- Construction: 3–4 years.
- Testing: 1–2 years (testing and commissioning would overlap with the later part of construction)

The goal is to commence electric revenue service in 2020 ~~2019~~.

The construction activities described above are not sequential; construction could occur simultaneously at several locations. Figure 2-26 shows estimated durations for construction of the Proposed Project.

2.3.8.4 Potential Construction Strategies to Accelerate Construction Completion

Although the preliminary schedule shown in Figure 2-26 shows completion of construction to allow revenue service to commence in 2020 ~~2019~~, achieving this goal will be challenging given the scale and complexity of construction. The JPB has identified a number of construction strategies (see Table 2-4) that could be used to accelerate completion of construction. These strategies may be employed on different elements of construction, different segments of construction, or construction as a whole. Construction strategies need to balance construction efficiency with minimizing construction impacts.

[13] Note that several alternative locations for PS5, Option 2 are included as potential mitigation for noise effects in Section 3.11. See Section 3.11 for discussion of these potential alternative locations.

Table 2-4. Potential Construction Strategies to Accelerate Project Completion

Potential Strategies (Not Exhaustive)	Past Caltrain Projects
Design-Build Contract	None
Flexibility for construction work permitted during the day on weekdays	San Bruno, Jerrold
Single tracking during the midday (10 a.m.–3 p.m.) on weekdays	None
Revise Caltrain schedule	San Bruno, Jerrold
Reduce the span of Caltrain service day	None
Reduce number of trains (including special trains)	None
Shut down service through specific track segments for specific weekends	South Terminal, Jerrold
Shut down service through specific track segments for extended periods	None
Close a station temporarily during construction	South Terminal, San Bruno

Some of these strategies have been used on other rail projects, including those listed below.

- The Gladstone Line OCS Pole Replacement Project for New Jersey Transit used full weekend outages throughout the summer.
- The Track Testing Program for the Long Island Railroad removed early morning train service during construction.
- The Tie Installation and Track Resurfacing Project for the Long Island Railroad eliminated midday service for 1 month during construction.
- The Catenary System Replacement Project for the North Indiana Commuter Transportation District used single tracking throughout construction.

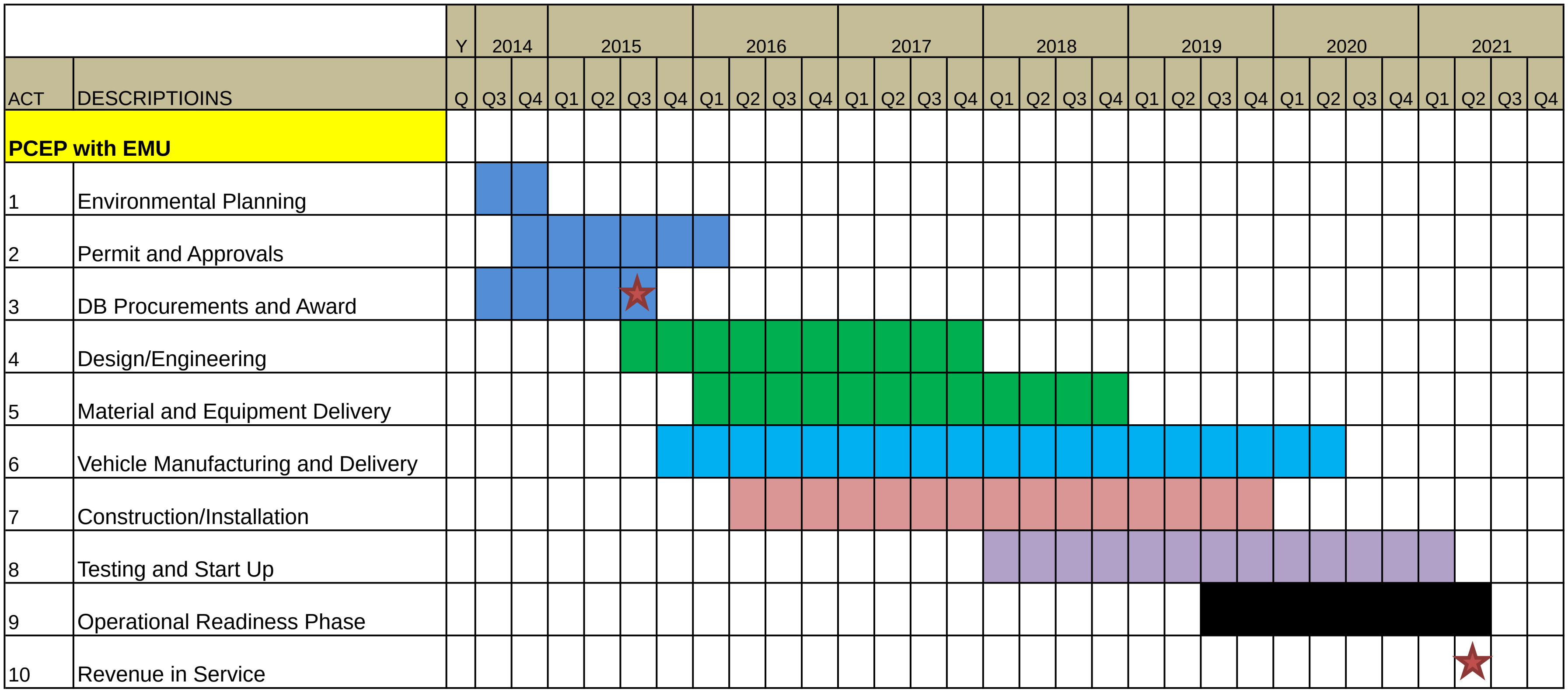
The JPB has not selected specific strategies for project delivery at this time, especially in advance of selection of contractors for design and construction of the Proposed Project. The JPB will work with its staff and future contractors to best minimize impacts on Caltrain customers and follow all applicable federal policies such as Title VI and the Americans with Disabilities Act (ADA).

2.3.9 Right-of-Way and Easement Needs

Based on the current system design, and assuming a worst-case-pole-placement scenario, there would be a need for acquisition of new ROW for one TPS (and possibly a second TPS, depending on location) as well as for some areas where OCS poles and wires would need to be placed outside the current ROW.

For the two TPSs, the JPB is considering several different sites for each substation. Sites for intermediate paralleling and switching station facilities have also been identified, but all of the locations are within the Caltrain ROW. The nominal size of the traction power substations would be 150 feet by 200 feet, which is approximately 0.7 acre. Thus, the total estimated area needed for the two traction power substations is up to 1.4 acres.

In most cases, the OCS poles would be placed within the Caltrain ROW. However, in certain locations, there may be insufficient clearance from the railway track centerlines and the JPB may



Source: JPB Staff 2014.

Graphics ... 00606.12 (11-18-2014)

Note: This figure replaces Figure 2-26 from the Draft EIR.

Figure 2-26
Estimated Construction Schedule
Peninsula Corridor Electrification Project

need to acquire ROW for placement of poles and wires. At this time, based on ~~35 percent design~~ preliminary engineering and worst-case pole placement (i.e., side poles in two-track areas and portals in multi-track areas) in terms of ROW need, it is estimated that approximately 10,200 ~~9,000~~ linear feet of the OCS alignment would be slightly outside the existing ROW, of which 8,800 ~~7,000~~ linear feet would in adjacent public road and rail ROWs (requiring easement acquisition) and 1,400 ~~2,000~~ feet would be on private commercial or industrial property (requiring ROW acquisition in fee). Assuming an average encroachment of 4 feet, new easements on adjacent public roads and on rail ROW is estimated as 0.9 ~~0.6~~ acres and ROW acquisition on private property is estimated as 0.2 acres, for a total of 1.1 ~~0.9~~ acres.~~[14]~~ These calculations presume placement of OCS poles on the outside of the outermost track. If alternative pole alignments are used in some locations, these estimates may change.

In addition, in some locations there is insufficient ROW width to provide for the necessary 10 feet of electrical safety clearance to adjacent vegetation and structures. Where electrical clearance is necessary outside the Caltrain ROW, the JPB would need to obtain an electrical safety easement from property owners to permit the pruning and removal of vegetation and to maintain structures outside a 6-foot safety zone from the OCS alignment. The Draft EIR presumed a worst-case electrical safety zone up to 24 feet from the outer track centerline. The Final EIR describes that the electrical safety zone is more likely to be 21 feet in most two-track areas and 18 feet in most multi-track areas. ~~At this time~~ Using a range between the Draft EIR and Final EIR safety zone assumptions, it is estimated that approximately 5 to 8 acres of new easement would be required on adjacent public road and rail ROW, 2 to 10 acres on private residential, commercial, or industrial property, and 0.1 to 0.3 acres on parklands for a total of approximately 7 to 18 acres. These calculations presume placement of OCS poles on the outside of the outermost track. If alternative pole alignments are used in some locations, these estimates may change.

The JPB is presently examining the design for project facilities and the amount of needed ROW may be more or less than that discussed above.

Appendix J shows the areas of ROW encroachment for the OCS and for the ESZ.

2.3.10 Relation to the High-Speed Rail Project

The electrification system envisioned for the corridor would be configured in such a way that it would support the future operation of California HSR. Twenty-five-kV, 60-Hz single-phase AC electrification would be the power supply system of choice for a steel-wheel-on-steel-rail high-speed train operation. The Caltrain corridor is currently only rated for a maximum of 79 mph and, thus, there may be a need for track and other system upgrades in order to support higher speeds than at present. The Proposed Project includes electrification infrastructure that would first be used by Caltrain and can later be used for high-speed trains. However, the Proposed Project does not include other improvements necessary for high-speed trains such as platform improvements, high-speed rail maintenance facilities, passing tracks or other Core Capacity projects. The Proposed Project does not include improvements to support speeds greater than 79 mph or high-speed rail operations on

~~[14] Total does not add due to rounding.~~

the Caltrain corridor at speeds up to 110 mph.[15] High-speed rail construction and operations would be the subject of a later, separate environmental analysis to be conducted by CHSRA and FRA. The cumulative impact analysis in this document does address cumulative impacts of Blended Service (see Chapter 4, Section 4.1, *Cumulative Impacts*) but only provides a conceptual analysis of those impacts given that HSR design for Blended Service has not been completed.

2.4 Costs and Funding

2.4.1 Capital Costs

An updated estimate of the capital costs associated with the Proposed Project including rolling stock and the fixed facilities was completed in 2014 ~~for the 2009 Environmental Assessment (EA)/EIR (FTA and JPB 2009).~~ The cost of the fixed facilities (e.g., OCS, traction power facilities) is ~~was~~ estimated at approximately $950 million to $958 ~~$785~~ million and the cost of rolling stock is ~~was~~ estimated to be $524 million to $573 ~~$440~~ million for a total of $1,474 million to $1,531 ~~$1,225~~ million. ~~(FTA and JPB 2009). The JPB is presently developing updated capital costs that will be presented in the Final EIR.~~

2.4.2 Capital Funding Sources and Programming

The Proposed Project's capital costs are proposed to be funded from the sources shown in Table 2-5. As noted in Table 2-5, additional sources of funding need to be identified in order for the project to be fully funded.

Table 2-5. Funding Sources for Corridor Electrification Project (Millions of Dollars)

Source	Amount (YOE$)
Estimated Capital Costs	**$1,474 to 1,531**
State Proposition 1A[a], Proposition 1B[b]	$620
JPB	$121
Regional (Bay Area Air Quality Management District, Tolls)	$31
Federal (Federal Transit Administration)	$453
Total Secured Funding	**$1,225**
Funding Needed	**$249 to $306**
Potential Additional Sources of Funding: JPB Financing / Transportation Infrastructure Finance and Innovation Act (TIFIA) Loan; JPB; Fare; Regional Measure 2, State Cap & Trade FTA Core Capacity; FTA Vehicle Replacement	

[a] Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century of 2008.
[b] The Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006.
YOE = year of expenditure.

15 As described in Section 4.1, *Cumulative Impacts*, the cumulative analysis in this EIR presumes speeds for Blended Service up to 110 mph because the blended system has been simulated by Caltrain at speeds of up to 110 mph and shown to be viable. In addition, CHSRA has confirmed that with speeds up to 110 mph, a 30-minute express travel time can be achieved between San Jose and San Francisco as required by Prop 1A (CHSRA 2013). If it is determined to be necessary to analyze speeds greater than 110 mph in the future, additional simulations will be performed to understand the viability and implications of the 100 to 125 mph speed range identified by CHSRA in the 2012 Partially Revised Program EIR (CHSRA 2012d). If speeds beyond 110 mph are ultimately proposed by CHSRA for the Caltrain corridor, they will be evaluated in the separate environmental document for HST service on the San Francisco Peninsula.

2.4.3 Operating and Maintenance Costs and Revenues

The prior 2009 EA/EIR (FTA and JPB 2009) presented estimates of operating and maintenances costs and revenues for the electrification project. ~~The JPB is presently developing new estimates that reflect current assumptions and the recent ridership estimates. The updated operations and maintenance costs will be presented in the Final EIR.~~

A total operating and maintenance (O&M) estimate for the PCEP is in progress. The specific costs associated with operating and maintaining the rail services and infrastructure analyzed in the PCEP EIR will be influenced by an organization and management structure to be further examined and refined through the design-build contractor and vehicle procurement and contract approvals targeted for late 2015.

Operating fuel costs have been estimated for the PCEP and the analyzed alternatives and are presented in Chapter 5, Alternatives.

2.5 Project Variants

Caltrain has identified a number of variants that may be implementing to lower project costs including the following:

- *Project Variant 1 - Electrification to just south of the Tamien Station*: This variant would include only electrifying the Caltrain corridor to Milepost (MP) 49.9 (approximately 0.5 miles south of the Tamien Station just south of the railyard near CP Michael) instead of MP 51.1 (a subvariant would defer electrification of the railyard temporarily or permanently). This variant would require moving paralleling station PS7 from the Proposed Project location near MP 51.1 adjacent to Kurte Park to one of two locations adjacent to Alma Avenue (see Figure 2-18b). PS7 Variant A would be on vacant land owned by Caltrans. Variant B would be on vacant land partially within the JPB ROW and partially on land owned by Caltrans. This variant would result in less construction due to elimination of 1.2 miles of electrified track (and not electrifying the railyard in the subvariant). Service to the Tamien Station would be the same as the Proposed Project and operations would be the same as the Proposed Project.

- *Project Variant 2 - Deferral of electrification of storage tracks at the San Francisco 4th and King Station*. Under this variant, the storage tracks would not be electrified temporarily or permanently. During the period when the tracks were not electrified, there would be no change in normal commuter operations at the station. However, if there is a need for maintenance of EMUs that needs to take place at the storage tracks at the 4th and King yard, then a diesel yard hauler would be needed to pull or push the EMUs onto the non-electrified tracks and to return the EMUs from the storage tracks to the electrified tracks.

- *Project Variant 3 - Electric locomotives may be used instead of EMUs for backup train sets (protect or ready-reserve sets)*. This variant would result in no change to normal commuter rail service. This would only affect temporary replacement of individual EMUs at discrete times.

- *Project Variant 4 - Combining guy wire and OCS pole foundations*. This variant would result in slightly less construction by combining foundations for the guy wires and for the OCS pole foundations. There would be no other changes to the Proposed Project.

One or more of these variants may be implemented as means to lower the costs below the estimates provided in Section 2.4, *Costs and Funding*. Thus, for the purposes of CEQA, the environmental effects of these variants have also been analyzed in this EIR.

2.6 Required Permits and Approvals

Pursuant to SamTrans' enabling legislation (Public Utilities Code Section 103200 et seq.) which is applicable to the JPB under the terms of its formation document and federal law governing the operations of rail carriers (which is applicable to the JPB as a result of the 1991 Interstate Commerce Commission approval of the JPB acquisition of the Caltrain line), JPB activities within the Caltrain ROW are exempt from local building and zoning codes and other land use ordinances. Nonetheless, the JPB will cooperate with local government agencies in performing improvements within its ROW and will comply with local regulations, as appropriate, affecting any of its activities within other jurisdictions.

Table 2-6 lists anticipated permits and approvals that would be required for this project; the JPB will continue to coordinate with all local, regional and state agencies to ensure that all permits and approvals are received to support the project schedule.

Table 2-6. Permits, Funding, and Other Approvals Anticipated to be Required

Agency	Funding, Approval, or Permit
Federal Agencies	
Federal Aviation Administration	Notification of Proposed Construction or Alteration on Airport (Part 77) – San Jose International Airport (for elevated structures near airport)
Federal Railway Administration	Modification of existing FRA waiver on temporal separation or approval of alternative compliance for new EMUs per new FRA rule-making.
Federal Transit Administration	NEPA review and approval (completed). Federal funding.
U.S. Army Corps of Engineers	Approval of nationwide permit for effects to wetlands and other waters of the United States under Section 404 of the Clean Water Act (CWA).
State Agencies	
California High Speed Rail Authority	Approval of funding and other agreements/documents.
California Department of Fish and Wildlife (CDFW)	Review and approval of 1602 Streambed Alteration Agreement for placement of power pole foundations affecting waterways.
California Department of Toxic Substances Control (DTSC)	Review of Worker Health and Safety Plan. Review and approval of revised JPB Soil Management Plan.
California Department of Transportation (Caltrans)	Encroachment Permit and Traffic Control Plan for overbridge barriers on State roadways.
California Public Utilities Commission (CPUC)	Approvals required for public safety considerations of Caltrain electrification facilities.
San Francisco Bay Regional Water Quality Control Board (RWQCB)	CWA Section 401 Water quality certification/waste discharge requirements for placement of power pole foundations affecting waterways. Compliance with dewatering requirements, if necessary.
State Water Resources Control Board	General Construction Activity Stormwater Permit or Section 402 National Pollutant Discharge Elimination System (NPDES) permit.

Agency	Funding, Approval, or Permit
Regional Agencies and Transportation Agencies	
Peninsula Corridor Joint Powers Board (JPB)	Certification of CEQA environmental document; project proponent; project funding.
Bay Area Air Quality Management District	Funding approvals.
Metropolitan Transportation Commission	Funding coordination and approvals.
San Francisco Bay Area Rapid Transit District (BART)	Encroachment Permit. Amend Use, Operating and Maintenance Agreement (UOM) for Millbrae/SFO Extension facilities.
San Francisco Bay Conservation and Development Commission (BCDC)	Permit for construction of facilities within 100-foot shoreline band (at Brisbane Lagoon).
San Francisco Municipal Transportation Agency (SFMTA)	Coordination regarding Muni service during Proposed Project construction and coordination regarding the 22-Fillmore rerouting project.
San Mateo County Transportation Authority (SMCTA)	Funding approvals.
Santa Clara Valley Transportation Authority (VTA)	Access permit for work adjacent to VTA light rail operations in Mountain View.
Santa Clara Valley Water District (SCVWD)	NPDES general permit for construction-related activities. Includes developing and implementing a Storm Water Pollution Prevention Plan (SWPPP). SCVWD encroachment permit if need to access any district lands or if any construction comes within 50 feet of the top of bank of any Santa Clara County stream.
Transbay Joint Powers Authority (TJPA)	Coordination regarding the Downtown Extension Project and the Transbay ~~Terminal~~ Transit Center Project.
Local Agencies (in geographic order from North to South)[a]	
San Francisco Bureau of Environmental Health	Permit for drilling or other subsurface exploration.
San Francisco Department of Public Works	Approval required for construction in public rights-of-way. If necessary, City and County of San Francisco (CCSF) Industrial Waste Ordinance 199-77 Batch Industrial Wastewater Discharge Permit for de-watering effluent discharge to the combined sewer system providing the quality of the effluent meets the NPDES General Permit discharge standards. CCSF Soil Boring and Well Regulation Ordinance, adopted as Article 12B of the San Francisco Health Code, if dewatering is necessary. Article 20 of San Francisco Municipal Code requires preparation of a Site Mitigation Plan if soil sampling and analysis indicate presence of hazardous waste in soil subject to construction disturbance.
San Francisco Planning Department/ Commission	Certificate of Appropriateness for modification of historic resources (if necessary).
San Francisco Public Utilities Commission	Permit for construction discharge and dewatering per CCSF ordinances (see San Francisco Department of Public Works above)
San Mateo County	Encroachment Permit.
City of Brisbane	Encroachment Permit, Haul Permit for transport of spoils in excess of 6 cubic yards and Traffic Control Permit for detours or traffic control measures.
City of South San Francisco	Encroachment Permit.
City of San Bruno	Department of Public Works may issue a permit in order to monitor impacts to city sewer lines and storm drains.

Agency	Funding, Approval, or Permit
City of Millbrae	Encroachment Permit for overbridge barrier. A Haul Permit if spoils are hauled off-site in Millbrae.
City of Burlingame	Encroachment Permit.
City of San Mateo	Encroachment Permit.
City of Belmont	Encroachment Permit. A Haul Permit if more than 50 cubic yards of spoils are removed via Belmont streets.
City of Redwood City	Encroachment Permit for traction power substation and overbridge protection barrier.
Town of Atherton	Encroachment Permit.
City of Menlo Park	Encroachment Permit for construction in the city ROW.
Santa Clara County	Encroachment permit for construction affecting Lawrence Expressway.
City of Palo Alto	Encroachment Permit for construction in the city ROW.
City of Mountain View	Encroachment Permit and Excavation Permit for construction in the city ROW.
City of Sunnyvale	General Encroachment Permit for construction in the city ROW.
City of Santa Clara	Street Opening Permit for construction in the city ROW.
City of San Jose	Encroachment Permit for construction in city ROW.
Other Parties	
Pacific Gas & Electric Company (PG&E)	Power supply and equipment installation for traction power; Fee or Easement Title for use of PG&E Property for traction power equipment and facilities. Utility Agreement.
Union Pacific Railroad (UPRR)	Encroachment Permit for work conducted with UPRR right-of-way; design and installation permits for electrification equipment and facilities.

[a] Activities within the Caltrain ROW are not subject to the land use jurisdiction of local governments.

Chapter 3

Settings, Impacts, and Mitigation Measures

3.0 Approach to Impact Analysis

This chapter provides environmental analyses of the physical impacts that could occur as a result of implementation of the Proposed Project. The analyses are based on the Proposed Project's ~~35 percent design~~ preliminary engineering (completed in 2008 and refreshed in 2013) and uses a "reasonable worst-case" approach to analyzing potential impacts. There is a separate section for each resource analyzed, as listed below. In each section, there is a description of the environmental and regulatory setting, significance criteria and methodology used in the impact analysis, and the potential impacts and required mitigation measures. Both construction and operational impacts are discussed, as appropriate in each subject section. Cumulative impacts are discussed separately in Chapter 4, *Other CEQA-Required Analysis*.

This chapter is organized with the following sections.

- 3.1, *Aesthetics*
- 3.2, *Air Quality*
- 3.3, *Biological Resources*
- 3.4, *Cultural Resources*
- 3.5, *Electromagnetic Fields and Electromagnetic Interference*
- 3.6, *Geology, Soils, and Seismicity*
- 3.7, *Greenhouse Gas Emissions and Climate Change*
- 3.8, *Hazards and Hazardous Materials*
- 3.9, *Hydrology and Water Quality*
- 3.10, *Land Use and Recreation*
- 3.11, *Noise and Vibration*
- 3.12, *Population and Housing*
- 3.13, *Public Services and Utilities*
- 3.14, *Transportation and Traffic*

3.0.1 Topics Considered but Dismissed from Further Analysis

Although agricultural and mineral resources are identified in Appendix G of the State CEQA Guidelines, this EIR does not include these topics because there would be no impact, as described below.

3.0.1.1 Agricultural Resources

There are no farmlands within or near the project corridor that would be affected by the Proposed Project. Using mapping from the California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP), it was determined that the Proposed Project would not cross through any significant farmland (defined as prime farmland, farmland of statewide importance, or unique farmland). The majority of the project corridor runs through urban and built-up land, which is defined as land occupied by structures with a building density of at least 1 unit to 1.5 acres, or 6 structures to a 10-acre parcel. Examples of urban and built-up land are residential, industrial, commercial, and institutional facilities. A portion of the project corridor that runs through northern San Mateo County and the southern terminus of the project corridor runs through areas defined as other land. This is land that is not included in any other FMMP mapping category. Land use examples of other land include low-density rural developments, wetlands, and riparian areas not suitable for livestock grazing. The two traction power substations included in the Proposed Project would be located in commercial or industrial areas, not in farmland areas and thus would not result in conversion of farmland to urban uses. All other facilities would be within or immediately adjacent to the Caltrain right-of-way and, thus, would not result in conversion of farmland.

Because there are no significant farmlands within or near the project corridor, there would be no impact on agricultural resources.

3.0.1.2 Mineral Resources

The Caltrain ROW does not contain mineral resources of any developable value, nor would the project facilities have any potential to affect mineral resources. Therefore, there would be no impact on mineral resources, and impacts are not discussed further.

3.0.1.3 Project Variant Analysis

As described in Chapter 2, *Project Description*, there are four project variants under consideration to lower construction costs. These variants are analyzed in the following environmental analyses as follows.

- *Project Variant 1 – Electrifying to just south of the Tamien Station*: This variant would lower OCS construction impacts south of Mile Post (MP) 49.9 but would have the same OCS construction impacts north of MP 49.9. Since OCS construction impacts would be less than the Proposed Project, they are not discussed further in the EIR. The impacts of the PS7 Variant locations, which would be adjacent to Alma Avenue south of the Tamien Station instead of near Kurte Park with the Proposed Project, is analyzed specifically in this EIR in all subject sections.
- *Project Variant 2 – Deferral of electrification of storage tracks at the San Francisco 4th and King Station*. Under this variant, the storage tracks would not be electrified temporarily or permanently. There would be no change in normal commuter operations at the station. However, if there is a need for maintenance of EMUs that needs to take place at the storage tracks at the 4th and King yard, then a diesel yard hauler would be needed to pull or push the EMUs onto the non-electrified tracks and to return the EMUs from the storage tracks to the electrified tracks. As a result, this variant is only discussed in the air quality, noise, and greenhouse gas sections.
- *Project Variant 3 – Electric locomotives may be used instead of EMUs for backup train sets*. This variant would result in no change to normal commuter rail service. This would only affect

temporary replacement of individual EMUs at discrete times. Electric locomotives would function similar to the Proposed Project EMUs and would only operate temporarily during repair or maintenance of EMUs. There would be no difference in construction impacts. Electric locomotives use slightly more electricity and are slightly noisier than EMUs, but still more fuel efficient and quieter than diesel locomotives, so use of electric locomotives instead of diesel locomotives (as done under No Project conditions) would also represent an improvement in terms of fuel use (and related emissions) and noise over No Project conditions. Operationally, the environmental impacts would be virtually the same as the Proposed Project in all aspects because electric locomotives would only be used for limited amount of service at any one time. Thus, this variant is not analyzed further in this EIR.

- *Project Variant 4 – Combining guy wire and OCS pole foundations*. This variant would result in slightly less construction by combining foundations for the guy wires and for the OCS pole foundations. There would be no other changes to the Proposed Project. Since this variant would have lesser amount of construction and less foundations than the Proposed Project, it would not result in any new or increased environmental impacts. Thus, this variant is not analyzed further in this EIR.

3.1 Aesthetics

The visual or aesthetic environment in the Caltrain corridor is described to establish the baseline against which to compare changes resulting from construction of project facilities and the alteration of existing structures. This discussion focuses on representative locations along the railroad corridor, including existing stations, railroad overpasses, locations of the proposed traction power facilities, and other areas where the Proposed Project would physically change above-ground features, where the visual appearance of the area and views experienced by area residents and users could be affected.

3.1.1 Existing Conditions

3.1.1.1 Regulatory Setting

Federal

There are no federal laws, regulations, or standards related to aesthetics that are applicable to the Proposed Project.

State

While there are no state laws, regulations, or standards related to aesthetics that are applicable to the Proposed Project, there are state requirements for electrical safety that would influence project vegetation maintenance, resulting in aesthetic changes.

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all transit agencies in California.

Rules established by the CPUC are called General Orders (GOs). The following GOs are relevant to vegetation clearance along the Caltrain right-of-way (ROW).

- **GO 95:** Overhead Electric Line Construction. This order concerns electrical clearances relative to overhead lines, including vegetation clearances. However, this order does not provide any specific guidance for 25 kV~~A~~ systems proposed for use by the Proposed Project.
- **GO 118-A:** Construction, Reconstruction and Maintenance of Walkways, and Control of Vegetation adjacent to Railroad Tracks. This order concerns safe access and vegetation control relative to physical safe passage. The JPB presently maintains the ROW to provide clearances, including vegetation, consistent with this GO.
- <u>**Others.** CPUC's General Order 72-B (Construction and Maintenance) provides guidance on standard types of pavement construction at railroad grade crossings, General Order 75-D (Warning Device Requirements) provides regulations governing standards for warning devices for at-grade highway-rail crossings, and General Order 88-B (Modification of Railroad Crossings) concerns with rules for altering public highway-rail crossings.</u>

The CPUC initiated new rule-making (13-03-009) in 2013 pursuant to Petition 12-10-011 concerning a new GO governing safety standards for the use of 25 kV~~A~~ electrical lines to power high speed trains. The new rule is intended to establish uniform safety requirements governing the design, construction, operation and maintenance of 25 kV~~A~~ OCS, which would be constructed for the operation of high-speed trains in California. CPUC meetings on this GO have resulted in discussions about the GO being specific to a fully grade-separated, dedicated high-speed rail system. The draft GO contains vegetation clearance requirements among other requirements. Because the OCS to be constructed for the Proposed Project would be used in the future by both Caltrain and high-speed rail, some of the issues addressed in the draft GO may apply to the Proposed Project OCS. It also appears additional CPUC rule-making proceedings will be needed for the Proposed Project because it would not be a fully grade-separated, shared system.

As the draft GO proceeds through rule-making, JPB will coordinate with CPUC concerning the applicability of the GO to the Proposed Project and will apply any requirements in the adopted order (as well as additional requirements) to be determined during the final design of the Proposed Project.

Local

Pursuant to the San Mateo County Transit District's (SamTrans') enabling legislation (Public Utilities Code Section 103200 et seq.) and the 1991 Interstate Commerce Commission's approval of the JPB acquisition of the Caltrain line, JPB activities within the Caltrain ROW are exempt from local building and zoning codes and other land use ordinances. Nonetheless, the JPB will cooperate with local government agencies in performing improvements within its ROW and protecting visual quality. Consequently, the description of local aesthetic regulations is provided for contextual purposes only.

Discussion of heritage tree and other tree ordinances is provided in Appendix F, *Tree Inventory and Canopy Assessment* and is not repeated here. The summary below only describes key local regulations and policies; there are likely additional references concerning visual character and aesthetics not mentioned for each city herein. The purpose of the summary below is not to provide a comprehensive assessment of each jurisdiction's policies concerning aesthetics but rather to note the importance of visual character and aesthetics in each jurisdiction.

City and County of San Francisco

Two policies within the Urban Design Element of the *San Francisco General Plan* reference aesthetic resources are relevant to the Proposed Project.

> **Policy 2.4:** Preserve notable landmarks and areas of historic, architectural or aesthetic value, and promote the preservation of other buildings and features that provide continuity with past development.

> **Policy 2.7:** Recognize and protect outstanding and unique areas that contribute in an extraordinary degree to San Francisco's visual form and character.

In addition, San Francisco Municipal Code Article 10: Preservation of Historical, Architectural, and Aesthetic Landmarks protects structures, sites, and areas of special historical, architectural, or aesthetic interest or value; prohibits unnecessary destruction or impairment of these structures and site; and outlines the procedure for application for proposed work on a landmark site.

County of San Mateo

The *San Mateo County General Plan* includes a Visual Quality Element (Chapter 4), which describes several of the planning considerations relative to the project corridor:

> **San Bruno Mountain General Plan Amendment (1976):** The San Bruno Mountain General Plan Amendment contains policies to guide the formation of specific plans for development of the area. Generally, the policies seek to preserve the area's open space character, retain the visual integrity of the main ridgeline of San Bruno Mountain, leave the Northeast Ridge and the Saddle area undisturbed except for planned development areas, protect the view of the northeast ridge from Brisbane by keeping a significant amount of the area in open space and by blending development with the natural topography of the site, and establish criteria to guide the design of both cultivated landscaping and a system of street furniture.

> ***North Fair Oaks Community Plan* (2011~~1979~~):** The *North Fair Oaks Community Plan* calls for a mixed residential/commercial/light industrial development in the "Redwood Triangle" adjacent to the location of SWS, Option 1 and includes design standards and guidelines to promote the mixed use development. ~~contains a policy that seeks to improve the appearance of commercial and industrial areas through use of the Design Review Zoning District.~~

City of Brisbane

Brisbane Municipal Code, Title 17, Chapter 17.16.110, Visual Impact Analysis, requires that all projects in the Southwest Bayshore Commercial District submit a visual impact analysis in accordance with guidelines approved by the planning commission to address the following design issues: relationship to steep slopes; public view corridors; view of San Francisco Bay and San Bruno Mountain; material and lighting, especially as pertains to light and glare; and treatment of roofs and the screening of mechanical equipment.

City of South San Francisco

South San Francisco Municipal Code, Title 2, Chapter 2.56 seeks to preserve structures, sites, and areas of special historical, architectural, or aesthetic interest; outlines the criteria for historic designation; requires a certificate of alteration for the alteration, construction, relocation, or demolition of a designated historic resource; requires design review and a public hearing for the certificate of alteration; and prohibits the demolition of potential historic resources without an proper review of a demolition permit application.

City of San Bruno

The following policy within the Environmental Resources and Conservation Element of the city's General Plan references aesthetic resources that are relevant to the Proposed Project:

> **Policy ERC-2:** Preserve as open space those portions of property which have significant value to the public as scenic resources, aesthetic, or recreation purposes.

The following policy within the Transportation Element of the city's General Plan references aesthetic resources that are relevant to the Proposed Project:

> **Policy T-C:** Preserve and enhance the unique natural features that constitute San Bruno's scenic roadways, as well as the visual quality of major gateways to the City.

City of Millbrae

The following policy within the Land Use Element of the city's General Plan references visual character:

> **LUIP-5:** Commercial and Industrial Development Guidelines and Review Process. Establish and enforce Commercial and Industrial Development Guidelines to protect and enhance the suburban character and high quality of Millbrae's neighborhoods and commercial districts. This would include the following:
>
> a. Address site and building design issues with respect to compatibility with adjacent and nearby uses, including intensity; access and internal circulation; view protection; visual characteristics (architectural style, scale, mass, bulk, color, materials, landscaping and visual screening of equipment); and nuisances and hazards (noise, odors, fire, vibrations, smoke, waste discharge, and nighttime lighting).

City of Burlingame

The following policy within the Conservation Element of the city's General Plan references aesthetic resources that are relevant to the Proposed Project:

> **Policy C(C):** To restore, where found feasible, natural features of vegetative cover, streams, marsh and bay where areas have been unduly disturbed by man.

The following policy within the Open Space Element of the city's General Plan references aesthetic resources that are relevant to the Proposed Project:

> **Policy OS(C):** Preserve the important vistas, such as the hillside leading to the Skyline Ridge as seen from the Bay plain, and the Bay as seen from the hillside.

City of San Mateo

The Circulation Element of the city's General Plan discusses the electrification of Caltrain and recommends the use of headspans to lighten overhead elements in sensitive areas to reduce the visual clutter caused by the overhead contact system of poles and wires. Further, the Circulation element suggests that the City coordinate with Caltrain to ensure the use of aesthetic treatments of overhead poles and wires throughout San Mateo.

In addition, Title XXVII, Chapter 27.66, Historic Preservation, seeks to designate, preserve, protect, enhance, and perpetuate the city's historic structures and the downtown historic district; seeks to enhance the visual and aesthetic character, diversity, and interest of the city; establishes requirements to insure the preservation and maintenance of the city's historic structures and the downtown historic district; prohibits the issuance of a building permit for exterior building modification or alteration until the site plan and Architectural Review have been approved; and prohibits demolition without approval by the City Council and/or a Historic Building Demolition Permit.

The Hillsdale Station Area Plan includes urban design guidelines to promote transit-oriented development adjacent to a relocated Caltrain Hillsdale Station.

City of Belmont

Belmont Municipal Code, Chapter 7, Article VII, Structures of Historic or Aesthetic Value, seeks to preserve, enhance, and perpetuate for the benefit of the general public those buildings, structures, and areas having historical or aesthetic interest or value which contribute to community aesthetics and identity, and to prescribe the procedure for altering, relocating, and demolishing those structures so classified.

City of San Carlos

The following goal within the Circulation and Scenic Highways Element of the city's General Plan references aesthetic resources that are relevant to the Proposed Project:

> **Goal CSH-2:** To provide a safe, efficient and aesthetically pleasing circulation network for various transportation modes in addition to the automobile.

City of Redwood City

The city's Historic Preservation Ordinance (Chapter 40 of the Municipal Code) provides for the identification, protection, and enhancement of buildings, objects, sites, and areas within the city that reflect special elements of the city's historic, architectural, cultural, aesthetic, and other heritage. The chapter mandates the appointment of a Historic Resources Advisory Committee; outlines the historic designation criteria and procedures; prohibits the removal, demolition, alteration, or relocation of any designated historic landmark without written approval of the city; and outlines the removal permit procedures and criteria and the procedure for appeals.

Town of Atherton

The following goal in the Land Use Element of the town's General Plan references aesthetic resources that are relevant to the Proposed Project:

> **Goal 1.210:** To preserve the Town's character as a scenic, rural, thickly wooded residential area with abundant open space.

The following policies within the Circulation Element of the town's General Plan references aesthetic resources that are relevant to the Proposed Project:

> **Policy 2.421:** All streets and highways in the Town of Atherton shall be preserved as scenic routes.

Atherton Municipal Code, Title 8, Chapter 8.14, Historical Artifacts, seeks to protect and enhance artifacts that reflect special aspects of the town's historical, architectural, cultural or aesthetic heritage; grants review authority; outlines the procedures for inventory and designation of historical artifacts; prohibits alterations and demolition without a city permit; requires an artifact protection plan prior to the issuance of a grading, demolition, or building permit; and outlines penalties and remedies for violating the chapter by altering or demolishing a historical artifact without a permit.

City of Menlo Park

The following goals in the Land Use Element of the city's General Plan references aesthetic resources that are relevant to the Proposed Project:

> ~~**Goal 1.210:** Preserve the Town's character as a scenic, rural, thickly wooded residential area with abundant open space.~~

> **Goal I-A:** To maintain and improve the character and stability of Menlo Park's existing residential neighborhoods while providing for the development of housing types. The preservation of open space shall be encouraged.

> **Policy I-A-I.** New construction in existing neighborhoods shall be designed to emphasize the preservation and improvement of the stability and character of the individual neighborhood.

Goal I-B: To strengthen Downtown as a vital and competitive shopping area while encouraging the preservation and enhancement of Downtown's historic atmosphere and character.

Policy I-B-4. Uses and activities shall be encouraged which will strengthen and complement the relationship between the Transportation Center and the Downtown area and nearby El Camino Real corridor.

Goal I-G: To promote the preservation of open-space lands for recreation, protection of natural resources, the production of managed resources, protection of health and safety and/or the enhancement of scenic qualities.

Policy I-G-10. Extensive landscaping should be included in public and private development, including greater landscaping in large parking areas. Where appropriate, the City shall encourage placement of a portion of the required parking in landscape reserve until such time as the parking is needed. Plant material selection and landscape and irrigation design shall adhere to the City's Water Efficient Landscaping Ordinance.

Policy I-G-11. Well-designed pedestrian facilities should be included in areas of intensive pedestrian activity.

In addition, the following policies within the Circulation and Transportation Element reference relevant aesthetic resources:

Policy II-B-4. The capacity and attractiveness of the commuter railroad service should be increased, and rights-of-ways for future transit service should be protected.

Policy II-B-5. The City shall work with appropriate agencies to agree on long-term peninsula transit service that reflects Menlo Park's desires and is not disruptive to the city.

Santa Clara County

The following policies within the Resource Conservation Element of the county's General Plan reference aesthetic resources that are relevant to the Proposed Project:

Policy C-RC 27: Habitat types and biodiversity within Santa Clara County and the region should be maintained and enhanced for their ecological, functional, aesthetic, and recreational importance.

Policy C-RC 57: Scenic and aesthetic qualities of both the natural and built environment should be preserved and enhanced for their importance to the overall quality of life for Santa Clara County.

Policy C-RC 61: Public and private development and infrastructure located in areas of special scenic significance should not create major, lasting adverse visual impacts.

Policy C-RC 62: Urban parks and open spaces, civic places, and public commons areas should be designed, developed and maintained such that the aesthetic qualities of urban settings are preserved and urban livability is enhanced. Natural resource features and functions within the urban environmental should also be enhanced.

In addition, the following policies within the Parks and Recreation Element reference relevant aesthetic resources:

Policy C-PR 34: Local and state roads and highways traversing Santa Clara County's scenic rural and urban areas should be designated and protected as local or state scenic highways.

Policy C-PR 37: The natural scenery along many of Santa Clara County's highways should be protected from land uses and other activities which would diminish its aesthetic beauty.

Policy C-PR 45: Activities along scenic highways that are of a substantially unsightly nature, such as equipment storage or maintenance, fuel tanks, refuse storage or processing and service yards should be screened from view.

City of Palo Alto

The following policies in the Land Use Element of the city's General Plan reference aesthetic resources that are relevant to the Proposed Project:

> **Policy L-69:** Preserve the scenic qualities of Palo Alto roads and trails for motorists, cyclists, pedestrians, and equestrians.

> **Policy L-79:** Design public infrastructure, including paving, signs, utility structures, parking garages and parking lots to meet high quality urban design standards and look for opportunities to use art and artists in the design of public infrastructure. Remove or mitigate elements of existing infrastructure that are unsightly or visually disruptive.

The following goal within the Natural Environment Element of the City's General Plan references aesthetic resources that are relevant to the Proposed Project:

> **Goal N-3:** A thriving "urban forest" that provides ecological, economic, and aesthetic benefits for Palo Alto.

In addition to the General Plan, the City of Palo Alto has prepared the Palo Alto Rail Corridor Study (PARCS), adopted January 2013, which contains a vision and for the rail corridor through Palo Alto (City of Palo Alto 2013). It is important to note that while the Rail Corridor Study is intended to address rail improvements overall (including Caltrain modifications), the study is dominated by concerns about the high-speed rail project. The study key recommendations on the high-speed rail project are support for a below-grade alignment and grade separation of all at-grade crossings.

The Corridor Study vision is as follows:

> **Overall vision:** To create a vibrant, safe, attractive, transit-rich area with city and neighborhood mixed-use centers that provide walkable, pedestrian and bicycle-friendly places that serve the community and beyond; and to connect the east and west portions of the city through an improved circulation network that binds the city together in all directions.

The following PARCS recommendations references aesthetic resources that are relevant to the Proposed Project:

> **Mitigate rail impacts on neighborhoods, public facilities, schools and mixed-use centers:** Neighborhoods and Mixed-Use Centers should have minimal negative impact imposed upon them by the rail operations. Of particular importance are traffic circulation, right-of-way impacts on adjacent properties, and noise and reduced air quality imposed on residential parks and schools.

The following PARCS Land Use and Urban Design improvement recommendations reference aesthetic resources that are relevant to the Proposed Project:

> **Conserve, protect and preserve historic and natural resources:** The study area and its surrounding area are, essentially, the historic core of Palo Alto. The historic resources that remain in the area are a large part of what makes it unique. Ensure that not only the natural and cultural resources, themselves, are protected but that their ultimate setting is appropriate. This should be a key consideration in the evaluation and selection of a rail alternative and any other development. Include consideration of improvements that go beyond simple mitigation of impacts on historic and natural resources and that actually correct past mistakes and restore the resource and its setting to the extent possible.

> **Protect historic cultural and natural resources**, notably the El Palo Alto Redwood, San Francisquito Creek, the Rail Station and the Hostess House building.

> **Protect existing residential neighborhoods:** The residential neighborhoods of Palo Alto in and around the study area should be enhanced and protected from potential negative impacts such as

increased traffic and the impacts of both existing and future rail operations. These include exclusively residential subareas as well as residential properties within Mixed-Use Centers.

Landscaping: PARCS generally recommends landscape improvements throughout the study area as well as in specific areas such as the Alma Street and El Camino Real Corridors. In addition, PARCS identifies specific natural areas for care and protection in the future. PARCS supports the addition of street trees to create a more pedestrian-friendly environment and to enhance streets by providing character, shade and identity. In particular, PARCS recommends amenity improvements to Alma Street and El Camino Real as primary image corridors of the city. PARCS does not define a specific program of tree replacement, although PARCS does recommend a variety of landscape improvements suited to the specific subarea or locale in the study area.

City of Mountain View

Chapter 25, Article 1, Neighborhood Preservation, in the city's Municipal Code establishes regulations to promote the health, safety, and general welfare of the public, to stabilize and protect the aesthetic appearances as well as the quality and character of neighborhoods, residential districts, commercial districts and industrial districts, and to prevent the impairment of property values.

City of Sunnyvale

The following goal within the Land Use and Transportation Element of the city's General Plan references aesthetic resources that are relevant to the Proposed Project:

Goal LT-2: Attractive Community—Preserve and enhance an attractive community, with a positive image and sense of place that consists of distinctive neighborhoods, pockets of interest and human-scale development.

City of Santa Clara

The following policy within Chapter 5 of the city's General Plan references aesthetic resources that are relevant to the Proposed Project:

Policy 5.3.1-P27: Encourage screening of above-ground utility equipment to minimize visual impacts.

City of San Jose

The following policy within the Chapter 3, Environmental Leadership, of the city's General Plan references aesthetic resources that are relevant to the Proposed Project:

Policy IN-1.9: Design new public and private utility facilities to be safe, aesthetically pleasing, compatible with adjacent uses, and consistent with the Envision General Plan goals and policies for fiscal sustainability, environmental leadership, an innovative economy, and quality neighborhoods.

In addition, General Plan Chapter 4, Quality of Life, contains the following references to aesthetic resources:

Policy CD-4.11: Accomplish sound attenuation for development along City streets through the use of setbacks and building design rather that sound attenuation walls. When sound attenuation walls are located adjacent to expressways or freeways, or railroad lines, landscaping, public art, and/or an aesthetically pleasing and visually interesting design should be used to minimize visual impacts.

Policy CD-4.12: Structures other than buildings, and including structures on top of buildings, such as solar panels, other energy-saving or generating devices, roof landscaping, steeples, bell towers, and wireless communication antennae, where substantial height is intrinsic to the function of the structures, consider heights above those established for structures in the area. Locate such structures to minimize public visibility and avoid significant adverse effects on adjacent properties. Incorporate visual amenities, such as landscaping, to offset potential adverse visual impacts.

Policy CD-6.8: Recognize Downtown as the hub of the County's transportation system and design buildings and public spaces to connect and maximize use of all types of transit. Design Downtown pedestrian and transit facilities to the highest quality standards to enhance the aesthetic environment and to promote walking, bicycling, and transit use. Design buildings to enhance the pedestrian environmental by creating visual interest, fostering active uses, and avoiding prominence of vehicular parking at the street level.

Policy CD-9.1: Ensure that development within the designated Rural Scenic Corridors is designed to preserve and enhance attractive natural and man-mad vistas.

Policy CD-9.2: Preserve the natural character of Rural Scenic Corridors by incorporating mature strands of trees, rock outcroppings, streams, lakes and reservoirs and other such natural features into project designs.

Policy CD-9.3: Ensure that development along designated Rural Scenic Corridors preserves significant views of the Valley and mountains, especially in, or adjacent to, Coyote Valley, the Diablo Range, the Silver Creek Hills, the Santa Teresa Ridge and the Santa Cruz Mountains.

3.1.1.2 Environmental Setting

Existing transportation facilities, including railroad tracks, ancillary structures, area freeways, and roadways, are the dominant visual elements along the existing Caltrain corridor itself, but the adjacent areas can vary from highly urbanized areas in San Francisco to single-family residential areas in Atherton to open space at the Brisbane Lagoon and Communications Hill in San Jose to commercial and industrial areas in South San Francisco and near Mineta San Jose International Airport.

Towards the northern end of the Caltrain route, adjacent uses are primarily industrial and urban in character, and there is little natural landscaping. Moving southward down the Peninsula, there is a greater variety of adjacent land uses, including residential and natural landscaping; however, rail facilities continue to dominate the visual environment of the corridor itself. Several schools (such as Belle Air Elementary School in San Bruno, Burlingame High School, Burlingame Montessori, Redwood High School, and Garfield Elementary School in ~~Menlo Park~~ Redwood City) and parks (such as Marina Vista and Village Parks in Millbrae, Trinta Park in San Mateo, ~~and~~ Holbrook Palmer Park in ~~Menlo Park~~ Atherton, Peers Park in Palo Alto, Rengstorff Park in Mountain View, and Fuller Park in San Jose) abut or are located across the street from the ROW at various locations along the project corridor. The visual landscape in the vicinity of the proposed traction power substations (TPSs), switching station (SWS), and paralleling stations (PSs), and at train stations and at-grade crossings is described further below.

There are few designated scenic vistas of the Caltrain corridor itself. There are elevated locations in the project area and vicinity that provide long-range views, including along elevated roadways, bridges, outdoor spaces, buildings located on hillsides, and multi-level buildings on flatter lands that are closer to the San Francisco Bay. Views from roadways or bridge crossings tend to be fleeting, unlike views from fixed locations such as buildings. Most vistas immediately available from the project corridor are from bridge crossings over the corridor, such as at Tunnel Drive in Brisbane, North Mathilda Avenue in Sunnyvale, or Curtner Avenue in San Jose.

Views in the project area are characteristic of the Bay Area and encompass views of the Santa Cruz Mountains, San Bruno Mountain, the bay, and local development. They range from being more scenic to more developed in nature and can have low to moderately high visual quality. Vistas that are low in visual quality tend to be more industrialized and have disjunctive land uses, such as abrupt transitions between residential and industrial areas that contain a great deal of utilities and infrastructure. These vistas offer limited opportunities to see the nearby mountains or bay, such as at some locations between Millbrae and San Francisco where there is a transition between suburbanized to more urban land uses. Vistas that are moderately high in visual quality tend to include areas where development is unified and there are more subtle transitions between residential and commercial land uses. In areas such as Burlingame and San Mateo, natural features like the mountains or bay add to the quality of available views. Views of the project corridor are often blocked by vegetation, buildings, and infrastructure. However, when the project corridor is visible, Caltrain features are often undistinguishable as independent visual elements due to the amount of infrastructure in the highly developed area. Viewers at locations crossing the project corridor (bridges) or immediately adjacent to the corridor (multi-level buildings) are familiar with the existing visual conditions and the presence of infrastructure associated with the rail corridor within those vistas. Views of the project corridor are more prevalent in areas with less urban density, such as in southern San Jose.

Table 3.1-1 identifies officially designated state, county, or local scenic routes within 0.25 mile of project features. In Brisbane, there is an approximately 0.25-mile segment of Bayshore Boulevard between the Old County Road/Tunnel Drive intersection with Bayshore Boulevard and the Van Waters and Rogers Road intersection with Bayshore Boulevard that has views over Brisbane Lagoon to San Francisco Bay. While views from Bayshore Boulevard are present, Bayshore Boulevard is not a designated scenic roadway and is, therefore, not include in Table 3.1-1. One-quarter of a mile falls within the foreground of views available from any given point. Because the area is highly developed, views of the project corridor from these scenic routes would not be present due to intervening vegetation, buildings, and infrastructure except at the Cesar Chavez Street crossing of the Caltrain ROW, which is in an industrial setting. Caltrain features viewed from more than 0.25 mile are undistinguishable as independent visual features due to the amount of infrastructure currently associated with existing visual conditions.

Table 3.1-1. Scenic Routes within 0.25 Mile of Project Features

Designated Scenic Route	Nearest Project Features	Visibility of Project Feature from Scenic Route
I-280 in San Francisco	Caltrain ROW, PS1	Not visible because freeway is elevated over railway.
49-Mile Scenic Drive in San Francisco	Caltrain ROW	Where the Scenic Drive is located on I-280, no visibility due to freeway elevation. Caltrain ROW visible at crossing of Cesar Chavez Street.
SR 82/El Camino Real in San Mateo County (Easton Drive to Crystal Springs Road)	Caltrain ROW, PS3	Not visible from El Camino Real because of intervening development.

Visual setting and sensitive viewers for the traction power facilities (TPSs, SWS, and PSs) are discussed below. Representative photographs of the existing sites where project features would be located accompany the discussion. These locations are included on Figure 3.1-1, and the photographs are presented in Figure 3.1-2. Additionally, other viewer groups along the corridor and at existing at-grade crossings are also discussed.

Traction Power Substations

Construction of two TPSs is proposed under the Proposed Project.

TPS1, South San Francisco

There are ~~three~~ four potential locations for TPS1, all within close proximity to one another in a highly industrialized area ~~along Gateway Boulevard~~ in South San Francisco, approximately 1.5 miles northwest of San Francisco International Airport. Options 1, 2, and 3 are along Gateway Boulevard and Option 4 is at the South San Francisco Caltrain Station off of Dubuque Avenue. The industrial area is characterized by warehouse facilities, office buildings, hotels, and a gas station and fast-food restaurant. Views to the TPS1 Option 1 site are partially screened by dense hedges along Gateway Boulevard but views from the roadway and adjacent warehouses are available (see Figure 3.1-2, Photo 1). The Option 2 site is visible from the gas station and fast-food restaurant, adjacent office buildings, and local roadways (see Figure 3.1-2, Photo 2). The Option 3 location is mostly visible from adjacent hotels, warehouses, and local roadways (see Figure 3.1-2, Photo 3). The Option 4 location is visible from the South San Francisco Caltrain Station parking lot and local roadways.

TPS2, San Jose

There are three potential locations for TPS2, all of which are in commercial/industrial settings. The sites for TPS2 Options 1 and 2 are within close proximity to one another in a commercial and industrialized area southwest of Coleman Avenue in San Jose, less than 0.5 mile southwest of Mineta San Jose International Airport. The railroad corridor is located directly southwest of the sites. The area is characterized by a large retail store, warehouse facilities, residences, and a gas station and fast-food restaurant. Views to the TPS Option 1 site are largely screened by the existing retail building, other commercial buildings, and the barrier surrounding an existing substation bordering Newhall Street (see Figure 3.1-2, Photo 4). The TPS2 Option 2 site is located behind an existing warehouse facility that is surrounded by privacy fencing (see Figure 3.1-2, Photo 5). The site is adjacent to another warehouse, which further limits views of the site. The TPS Option 3 site is located within in the southeast corner of the Caltrain Centralized Equipment Maintenance and Operations Facility (CEMOF), adjacent to the loading dock access road for a food distribution company, which is immediately northwest of the warehouse (see Figure 3.1-2, Photo 6). Employees of Caltrain site and the food distributor have views of the site.

Switching Station

There are two options for SWS1. SWS1, Option 1 would be located southwest of and behind a warehouse/business park in North Fair Oaks and directly north of the railroad corridor. The area contains a mix of warehouse and business park facilities bordered by residential land uses. Views would not be available from the warehouse/business park because SWS1, Option 1 would be located behind the building. Residents along Pacific Avenue would not have views of the site due to privacy fencing along the roadway, but residents along Westmoreland Avenue, south of the corridor, would have views across the tracks toward the site through metal mesh fencing securing the corridor (see Figure 3.1-2, Photo 7). SWS1, Option 2 would be located on the east side of the railroad corridor, adjacent to the parking lots for Costco and the Orchard Supply Hardware. There would be views of SWS1, Option 2 from these parking lots and fleeting longer-range passing views from Middlefield Avenue and State Route (SR) 84.

Paralleling Stations

Existing views at the proposed paralleling stations are shown in Figure 3.1-2, photos 8 through 17.

PS1: San Francisco

PS1 would be located in San Francisco, on the northeast corner of Mariposa Street and Pennsylvania Avenue. I-280 travels over the railroad corridor, immediately east of the proposed PS1 site. The site is at a slightly lower elevation than the area surrounding it. The visual character of the site consists of piers and the deck of I-280; the rail corridor; a mix of industrial, commercial, and residential land uses; and infrastructure such as paved roadways and sidewalks, chain link fencing, utility lines, and street lights (see Figure 3.1-2, Photo 8). Nearby residences, businesses and roads provide views toward the PS1 location.

PS2: Bayshore Station

PS2 would be located north of Bayshore Station and south of the railroad tunnel. The existing visual elements of the Bayshore Station area primarily consist of the railroad corridor and the industrial and urban land uses surrounding it. Tunnel Avenue parallels the railroad corridor to the east and is lined with residential and industrial land uses (see Figure 3.1-2, Photo 9). The old office building of the former Schlage Lock Factory (now vacant) and commercial and residential land uses are located northwest of the tunnel, along Blanken Avenue. The area to the west of the tracks is primarily vacant. The station platform is located south of the proposed PS2 location, between Recycle Road and Beatty Avenue. Residents and business along Tunnel and Blanken Avenues, rail users at Bayshore Station, and roadway users and recreationists using local roadways currently have views of the railroad right-of-way. The area surrounding the station is part of a large scale development plan known as the Visitacion Valley Transit Oriented Development Project.

PS3: Burlingame

PS3, Option 1 would be located in Burlingame, along California Drive near Broadway, west of the railroad corridor and north of a parking lot (see Figure 3.1-2, Photo 10). PS3, Option 2 would be located across the tracks, to the northeast from Option 1. The existing visual elements of the proposed PS3 area consist of industrial and commercial land uses to the east and suburban residential and commercial land uses to the west of the corridor. Nearby residents, businesses, and roadway users and recreationists using local roadways have views toward the PS3 Option 1 location and the Option 2 location, but the Option 2 location would be farther away from the residences and thus less obvious.

PS4: Hillsdale Station

PS4 Option 1 would be located northwest of the Hillsdale Station, west of the railroad corridor and within a parking lot behind retail stores (see Figure 3.1-2, Photo 11). PS4 Option 2 would be located south of the Hillsdale Station and railroad corridor and within the station's parking lot (see Figure 3.1-2, Photo 12). PS 4 Option 3 would be located just south of Hillsdale Boulevard in an existing Caltrain parking lot. The existing visual elements of the PS4 area consist of commercial land uses, with some multi-family residential uses, to the west and south of the corridor. Suburban residential land uses are located east of the corridor. The railroad corridor is raised at this location so that residents to the east cannot see the PS4 option locations. Nearby multi-family residents, businesses, rail passengers, and motorists in the parking lot have views toward the Option 1 site. Nearby businesses, rail passengers, and roadway users on local roadways have views toward the Option 2 site.

PS5: Palo Alto

The PS5 Option 1 site is located in Palo Alto, east of the railroad corridor, across from Green Meadow Way's intersection with Alma Street. The existing visual elements of the Option 1 site consist of suburban land uses and a predominantly tree-lined rail corridor that serves as a vegetative visual buffer to limit views of the corridor. However, there is a gap in vegetation northwest of the Option 1 location (see Figure 3.1-2, Photo 13). Roadway users and residents may have limited views of the Option 1 site due to this gap in vegetation and gaps in the understory of the existing vegetative buffer.

The PS5 Option 1B site is located in Palo Alto, east of the railroad corridor, just south of the Ferne Avenue intersection with Alma Street. The existing visual elements of the areas adjacent to the Option 1B site consist of suburban land uses and a predominantly tree-lined rail corridor that serves as a vegetative visual buffer to limit views of the corridor (see Figure 3.1-2). The most immediate residences to this site are located off of Ferne Avenue and back onto Alma Street with a masonry wall and vegetation in many back yards limiting direct views of the site. There is also a Jehovah's Witness Kingdom Hall located along Alma Street immediately south of the residences noted above.

The PS5 Option 2 site is located a little more than 1.5 miles northwest of Option 1 along the railroad corridor in Palo Alto, southwest of the railroad corridor and southeast of the California Avenue Station, in a business park along Park Boulevard. The existing visual elements consist of business park land uses and a construction site (see Figure 3.1-2, Photo 14). The railroad corridor is predominantly tree-lined to the northeast, and the trees limit views toward the corridor from suburban residential land uses along Alma Street. Existing roadway users and businesses would have limited views of the Option 2 area due to the new construction of four-story mixed-use (residential/commercial) buildings at the 195 Page Mill Road construction site. Once the mixed-use development at 195 Page Mill Road is complete, businesses and residences will have views from the back of the building toward the Option 2 site, where windows are provided, but the orientation of this development is inward away from the JPB ROW toward a center courtyard.

PS6: Sunnyvale Station

The PS6 Option 1 site is located northwest of the Sunnyvale Station, north of the railroad corridor and 200 feet east of the passenger platform (see Figure 3.1-2, Photo 15). The PS6 Option 2 site is located just south of the railroad corridor and within the Sunnyvale Station's parking lot (see Figure 3.1-2, Photo 16 and Photo 18). The existing visual elements of PS6 consist of suburban land uses, a predominantly tree-lined rail corridor to the north and the station, and commercial and office land uses to the south with a City Park (Plaza del sol) located south of Evelyn Avenue opposite the Option 2 site. South Mathilda Avenue crosses over the corridor west of the Option 2 site. The architecture of the station and surrounding residential, commercial, and office buildings and the associated landscaping creates a pleasing visual setting. Roadway users and residents to the north may have views of the Option 1 site because of gaps in vegetation. People in commercial and office buildings and roadway users would have views of the Option 2 site, though the ramp to South Mathilda Avenue may partially obscure views.

PS7: San Jose

PS7 would be located north of the railroad corridor at the eastern edge of the Communications Hill residential development in San Jose, immediately south of Kurte Park (see Figure 3.1-2, Photo 17). The park is a stormwater detention facility and is at a lower elevation than the surrounding development on the hillside to the north. The park and development are nicely landscaped. Residents and park users have views of and over the PS7 site and toward the surrounding hillsides. Views of the PS7 site from the mobile home community along Mill Pond Drive, south of the corridor, are not available because the community is at a lower elevation than the corridor and an existing sound barrier and landscaping further limit views.

If Project Variant 1 (Electrification to just south of the Tamien Station), described in Chapter 2, *Project Description*, is implemented, PS7 would be located approximately two miles north from where it is currently proposed. There are two proposed sites for PS7 under Variant 1: the PS7 Variant A site is on the north side of West Alma Avenue and the PS7 Variant B site is on the south side of West Alma Avenue (see Figure 2-18b). Variant A is on vacant land owned by Caltrans. Variant B is partially within the JPB ROW and partially on vacant land owned by Caltrans. Both sites are located between SR 87 and the Caltrain tracks. Photos 19 and 20 on Figure 3.1-2 show the proposed sites for PS7 Variant A and B, respectively, as seen from the pedestrian/bicycle path along West Alma Avenue. Under both variants, PS7 would be located on the far side of the existing chain link fences shown in the photographs. Views from the pedestrian/bicycle path would be limited because West Alma Avenue is depressed at this location and PS7 would be located behind the existing fences and above the roadway.

Under Variant 1, there could be views of PS7 from the adjacent multi-family residential building on the north side of West Alma Avenue, on the east side of the Caltrain tracks. Ground level views from the apartment building on the north side of Alma Avenue include the Caltrain tracks, a freeway (SR 87), the VTA light-rail tracks and overhead contact system, as well as billboards. Elevated views from the apartment building include the aforementioned features in the foreground, the developed parts of San Jose in the middle ground, and the Santa Cruz Mountains in the background. Views from adjacent townhouse development on the south side of West Alma Avenue on the east side of the Caltrain tracks would be obscured by existing trees.

Caltrain Corridor, Stations, and At-Grade Crossings

The Caltrain corridor from San Francisco to San Jose crosses through a number of cities and many stations and at-grade crossings. Representative locations have been chosen to aid in the description of the affected environment. The locations described below were selected because they are representative of the railroad corridor and at-grade crossings and are locations that possess sensitive visual receptors or offer scenic views. Table 2-3 in Chapter 2, *Project Description*, provides a list of all bridges and overbridge protection barriers.

San Francisco 4th and King Station

The aesthetic setting of the San Francisco 4th and King Station is characterized by the highly urbanized environment of the surrounding Mission Bay neighborhood. The station is bordered to the northwest by warehouses of one to four stories, and commercial, retail, and multi-family residential buildings that vary in age, material, and architectural styles common to urban development. The northeastern and southeastern sides of the station include modern high-rise buildings that are up to 17 stories tall and warehouse, commercial, retail, and multi-family residential uses. Existing vegetation is limited to mature street trees along Townsend Street near 5th Street and some semi-mature street trees along 4th and King Streets. Shrubs are also present in some locations. The vegetation does not act to obscure views of the station or corridor, which is a terminus station with 12 tracks that lead to the six passenger platforms at the station. All of the buildings and roadways surrounding the station have direct views over and toward the station and its associated infrastructure and facilities. The station has a small outdoor plaza with seating and an indoor waiting area and eateries.

22nd Street Station

The 22nd Street Station is located under I-280 and is somewhat visually enclosed because it is at a lower elevation than the surrounding street level. The aesthetic setting of this station is characterized by the freeway pier structures, station platforms, sloped earthen embankment to the west, 22nd Street bridge and rail line to the north, retaining wall to the east, and rail line and tunnel to the south. At street level, urban commercial buildings border the station to the west, and a bus storage yard borders it to the east. I-280 travels north-south near the station. Viewers of the station are limited to pedestrians and bicyclists on 22nd and Iowa Streets and workers in the commercial businesses along Pennsylvania Avenue.

Bayshore Station

The aesthetic setting of the Bayshore Station is described above under *Paralleling Stations*, *PS2: Bayshore Station*.

South San Francisco Station

The aesthetic setting of the South San Francisco Station is highly industrialized along Gateway Boulevard in South San Francisco, slightly less than 2 miles northwest of San Francisco International Airport. The station consists of a parking area and passenger platform that is partially located under the East Grand Avenue bridge over the tracks, which run northeast-southwest. The industrial area is characterized by warehouses, an office park, and a hotel to the east that has a landscape buffer that mostly limits views of the rail corridor. US 101, the station parking area, a vacant lot, and a large retail store are located west of the corridor. Double and multi-lane roadways and associated infrastructure are other visual elements of this industrialized setting.

San Bruno Station

The aesthetic setting of the San Bruno Station is characterized by an open space area, Lions Park, Belle Air Elementary School, and California National Guard Armory to the east, and single-family homes and mature landscaping in the neighborhood to the west. The station consists of a parking area and passenger platform. Existing residences to the west abut and face the railroad right-of-way and have direct views of the corridor. Views also exist from the armory and the western edge of Lions Park and along local roadways running adjacent to the rail corridor.

Separately from the Proposed Project, the San Bruno grade separation project will elevate the Caltrain tracks above the three existing at-grade street crossings at San Bruno, San Mateo and Angus Avenues and will construct a new elevated station between San Bruno and San Mateo Avenues replacing the Sylvan Avenue station. The grade separation project will be completed by 2015, so the setting of the existing station will change substantially from the current conditions.

Downtown San Bruno

Businesses in downtown San Bruno have northerly views toward the railroad corridor and San Bruno Avenue at-grade crossing. Visual elements in the immediate vicinity of the at-grade crossing include the railroad and ancillary structures and street lighting electroliers. Distant views of the hills from downtown are currently available. A grade separation with an elevated structure over San Bruno and San Mateo Avenues is currently under construction.

Millbrae Transit Center

The Millbrae Transit Center is a large Caltrain and BART station that is located north of Millbrae Avenue. The station has a parking garage and an expansive parking area that extends northeast from the station. It also has a formal entry that accommodates bus and vehicular passenger drop-offs. The station building features several aesthetic design treatments including a vaulted roofline with painted steel lattice supports attached to piers. The aesthetic setting surrounding the Millbrae Transit Center is characterized by single- and multi-family residential uses north of Millbrae Avenue, with a restaurant and convalescent hospital to the west of the station, and primarily commercial and warehouse uses south of Millbrae Avenue. Immature to mature landscaping is present in residential areas and within the station complex but does not limit views of the station and corridor.

Broadway Station

The aesthetic setting of the Broadway Station is characterized by apartment complexes and commercial uses to the north and retail and commercial uses to the south. The station consists of a parking area and passenger platform. Immature to mature landscaping is present along portions of adjacent roadways and does not limit views of the station or corridor. Adjacent residential, commercial and retail buildings abut and face the Caltrain ROW and offer direct views of the corridor.

Burlingame Station

The aesthetic setting of the Burlingame Station is characterized by Burlingame High School and commercial uses to the north, and commercial, retail, and restaurant uses to the south. The station consists of a Spanish style building with parking area, landscaping, and passenger platform. Immature to mature landscaping is present along portions of adjacent roadways and does not limit views of the station or corridor. Adjacent uses abut and face the Caltrain ROW and offer direct views of the corridor. As discussed in Section 3.4, *Cultural Resources*, the Burlingame Station is a historic train station.

San Mateo Station

The aesthetic setting of the San Mateo Station is characterized by warehouse, commercial, and limited residential uses to the northeast, and commercial, retail, and restaurant uses of downtown San Mateo to the southwest. The station consists of a modern, traditionally constructed building with parking area, palm trees, and passenger platform. A multi-story parking garage~~d~~ is located east, across the street, from the station. Street trees are present along adjacent roadways and do not limit views of the station or corridor. Adjacent uses northeast of the corridor abut and face the Caltrain ROW and offer direct views of the corridor. Adjacent uses southwest of the corridor back up to the Caltrain ROW and do not offer direct views of the corridor. There are limited views of the corridor from parking lots and sidewalks.

Hayward Park Station

The Hayward Park Station is located north of the SR 92 bridge over the rail corridor. The bridge visually separates the station from uses to the south. The aesthetic setting of the area surrounding the station is characterized by a department store and small office complex to the east, and commercial and light industrial uses of to the south. The station consists of a parking area and passenger platform that are separated by a small landscape buffer. A multi-story parking garage~~d~~ is located east, across the street, from the station. Immature to mature trees are present along the bridge embankments, adjacent roadways, and in the station parking lot but do not limit views of the station or corridor. Views of the station are available from the department store parking lot, SR 92, storage yards of light industrial uses, and from adjacent roadways.

Hillsdale Station

The aesthetic setting of the Hillsdale Station is described above under *Paralleling Stations*, *PS4: Hillsdale Station*.

Belmont Station

The Belmont Station, passenger platform, and rail corridor is raised above the surrounding area. The aesthetic setting of the station is characterized by commercial and single- and multi-family residential uses to the northeast and commercial and retail uses of to the southwest. The station consists of a parking area and drop-off area with landscaping and a raised passenger platform. Commercial uses between the Caltrain ROW and Old County Road face the roadway and act to limit most residential views toward the corridor. However, multi-family residences along Masonic Way may have limited views toward the station, but these residences are surrounding my hedges and trees that partially screen views. Commercial uses along Old County Road face the street, and views toward the station are somewhat limited to views from parking areas, sidewalks, and adjacent streets. Commercial and retail uses to the southwest face the station and El Camino Real and have views over the busy roadway toward the station. However, there is a landscaped median that limits some views of the station. The station is also partially visible from the decline and down the corridor of Hill Street, but buildings, infrastructure, and mature landscaping act to screen much of the station and corridor.

San Carlos Station

The San Carlos Station has historically been visually important because of the quality of its architecture. In 1999, the existing at-grade railroad tracks were raised approximately 15 feet, resulting in the rail alignment no longer being at-grade with the station. The elevated rail alignment with its embankment, fencing, lighting, and passenger shelters, now dominates the view of the station from proximate San Carlos streets and businesses. The primary view of the station for passengers leaving the train at San Carlos is of the historic station's roof. As discussed in Section 3.4, *Cultural Resources*, the San Carlos Station is a historic train station.

Redwood City Station and Redwood "Wye" Junction

The aesthetic setting of the Redwood City Station is characterized by surrounding commercial, retail, and restaurant uses. The station consists of the depot, a parking area with mature trees, and passenger platform. Views of the station are available primarily from parking areas, adjacent roadways, and the nearby commercial, retail, and restaurant businesses.

The Redwood "Wye" Junction is located north of the City of Atherton. An adjacent residential area is currently separated from the railroad ROW by a cyclone fence. Views of the railroad corridor are primarily from the street and sidewalk areas of the neighborhood. Existing utility wires and poles are located along the street next to the railroad.

Atherton Corridor and Station

The aesthetic setting of the railroad corridor in Atherton and Atherton Station is characterized by the spacious homes and mature landscaping in the neighborhood to the north and south of the station. The station consists of the depot, a parking area with mature trees, and passenger platform. The historic Atherton depot reflects the high visual quality of the surrounding residential area. Existing residences abut the Caltrain ROW, although backyard fences and mature vegetation currently obscure most views of the corridor. As discussed in Section 3.4, *Cultural Resources*, the Atherton Station is a historic train station.

Menlo Park Station

The aesthetic setting of the Menlo Park Station is characterized by well-manicured commercial, office, and retail uses and mature landscaping in the neighborhood to the north and south. The station consists of the depot and attached Menlo Park Chamber of Commerce, a parking area, and a passenger platform with ornamental fencing and lights. Commercial, office, and retail uses face the Caltrain ROW, with direct views toward the corridor that are limited in some locations by mature street trees and landscaping. As discussed in Section 3.4, *Cultural Resources*, the Menlo Park Station is a historic train station.

Palo Alto Station

The Palo Alto Station is a fairly large transit center that has a unique ingress and egress system from University Avenue, which crosses under the rail corridor to Alma Street and Palm Drive. The aesthetic setting of the station is characterized by well-manicured commercial, office, restaurant, and retail uses and mature landscaping in the neighborhood to the north and south. Multi-family residential is also lightly intermixed amongst the other surrounding uses. The station has long linear parking areas to the north and south. It also accommodates a bus transit center and vehicular passenger drop-off area. The Embarcadero Bike Path connects to the station southeast of the passenger platform. Stanford University, the university arboretum, and Stanford Medical Center are located south of the station and have a large influence on the surrounding community identity. Immature to mature landscaping is present to the north and south and within the station complex, and the landscaping partially limits views of the station and corridor.

As discussed in Section 3.4, *Cultural Resources*, the Palo Alto Station is a historic train station.

Stanford Station

The Stanford Stadium consists only of the rail corridor and passenger platform. The aesthetic setting of the station is characterized by single- and multi-family residential uses to the north, and Palo Alto High School and a retail center to the south. Mature trees and landscaping line the rail corridor and limits most views toward the Caltrain ROW except where the corridor crosses over Embarcadero Road, where there is no landscape buffer and nearby residents do have views of the corridor. The Embarcadero Bike Path parallels the passenger platform and rail corridor to the south.

California Avenue Station

The California Avenue Station is located just west of Oregon Expressway, which crosses under the rail corridor and serves as a visual separator from uses to the east. The aesthetic setting of the station consists of Alma Street and Jerry Bowden Park to the north and a mixed-use commercial, office, and residential complex to the south. The station consists of the depot, a parking area, and passenger platform. The railroad corridor is predominantly tree-lined to the north, and the trees limit views toward the corridor from suburban residential land uses along Alma Street. Views from the mixed-use complex are limited by mature trees and a wall surrounding the complex; however, the corridor may be seen from second- and third-story windows in some locations.

San Antonio Station

Residents in multi-story apartments located across the street from the San Antonio Station currently have views of the at-grade station platform. The station, as viewed from these residences, is characterized by railroad and ancillary structures, street utilities, and minimal landscaping. Beyond the station platform, mature trees and landscaping are visible. Passengers on the San Antonio Station platform have views of the railroad corridor and roadway overcrossing at this location.

Mountain View Station

The aesthetic setting of the Mountain View Station is characterized by suburban residential uses with mature landscaping to the north, and commercial, retail, office, and single- and multi-family suburban uses to the south. The station accommodates a bus transit center and vehicular passenger drop-off area and has a linear parking area to the southeast of the passenger platform. The station depot is located next to a paved plaza with seating and trees, called Centennial Plaza, and a wine bar is attached to the depot. Chain link fencing covered with ivy and street trees partially limits views from the north of the station and corridor, but views from the south are not limited by mature trees present within the station complex and along adjacent streets.

Sunnyvale Station

The aesthetic setting of the Sunnyvale Station is described above under *Paralleling Stations*, *PS6: Sunnyvale Station*.

Lawrence Station

The Lawrence Station rail corridor and passenger platform is partially located under the Lawrence Expressway bridge over the tracks, which run east-west in this area. The aesthetic setting of the station is characterized by the expressway overpass, an office park to the northwest, a large retail store to the northeast, multi-family residential buildings to the southeast, and a materials retail center and storage yard and single-family residential uses to the southwest. A linear parking area is located north of the passenger platform. Immature and mature trees line adjacent streets and property boundaries, and are located in parking areas. Views of the station are available primarily from parking areas, adjacent roadways, the expressway overpass, and second story windows of multi-family residential uses to the southwest.

Santa Clara Station

The rail corridor serves as a defining boundary between uses north and south of the corridor. The aesthetic setting north of the railroad corridor in Santa Clara is characterized by commercial and warehouse uses. The aesthetic setting south of the railroad corridor is made up of educational (Santa Clara University and Western Seminary), civic (police station) and residential and commercial land uses that support the university and local residents. Mature landscaping is present in the areas surrounding the station. The station is characterized by the railroad and ancillary structures, street utilities, the historical depot and associated buildings, and a landscaped plaza.

As discussed in Section 3.4, *Cultural Resources*, the Santa Clara Station is a historic train station.

College Park Station

The aesthetic setting of the College Park Station is characterized by industrial and warehouse uses to the northeast. To the southwest of the station are Bellarmine College Preparatory and associated uses, suburban residential uses, and limited industrial and commercial uses. Residential uses are mostly separated from the corridor by adjacent commercial and industrial uses. There is little landscaping to the northeast, but there is mature landscaping to the southwest. Most views of the station are available from the Bellarmine ball field, nearby parking areas, and along adjacent streets and sidewalks.

San Jose and the San Jose Diridon Station

Segments of the Caltrain ROW in southern San Jose are constructed on an elevated embankment. Existing views of the corridor from residential areas in the vicinity are dominated by the elevated railroad ROW. San Jose Diridon Station is a historical station located in this area. The aesthetic setting surrounding the station consists of the rail corridor, parking areas with mature landscaping to the north, and multi-family residential units to the south. The station is characterized by the railroad and ancillary structures, street utilities, the historical depot and associated buildings, and historic butterfly passenger shelters.

Tamien Station

The aesthetic setting of the Tamien Station is characterized by a childcare center, vacant land, transit parking, a residential high-rise structure, and the Guadalupe Expressway (SR 87). There is some landscaping associated with the access road to the station and parking lot. Guadalupe Expressway and the rail corridor are raised in this location and Alma Avenue crosses under the corridor. The Santa Clara Valley Transit Authority light rail is located between the north- and southbound lanes of Guadalupe Expressway. Most views of the station are available from upper stories of the residential high-rise, nearby parking areas, light rail, and along adjacent streets and sidewalks.

3.1.2 Impact Analysis

Physical changes attributable to the Proposed Project that would cause changes to views currently experienced by residents and other users of the area are described in this section. Mitigation measures to address significant visual impacts are also identified.

3.1.2.1 Methods for Analysis

<u>Using the concepts and terminology described at the beginning of this section, and criteria for determining significance, described below, analysis of the visual effects of the Project is based on:</u>

- direct field observation from vantage points, including neighboring buildings, property, and roadways and assessment of affected viewers (conducted June 12, 2013);
- photographic documentation of key views of and from the project corridor;
- evaluation of regional visual context;
- review of Project design figures;
- review of photo simulations; and
- review of the Project in regard to compliance with state and local ordinances and regulations and professional standards pertaining to visual quality.

Affected Viewers

For purposes of this analysis, sensitive visual receptors are defined as corridor residents and business occupants, recreational users of parks and preserved natural areas, and students of schools in the vicinity of the proposed project. Members of each of these groups could have views of the Proposed Project over extended periods of time. Scenic views are defined as long-range views towards preserved natural areas or recognized visual and historic landmarks. A visual change would be considered a significant impact if the change introduced obtrusive elements substantially out of character with existing land uses or substantially obscured a scenic view available to sensitive receptors.

Caltrain passengers navigate through stations, use station platforms while waiting for trains, and are considered to be very familiar with a station's existing visual environment. ~~Caltrain~~ Passengers at a station platform would see the Proposed Project wires, tracks, and ~~of~~ the train station. ~~; however~~ While passengers are at the station for a limited amount of time, their familiarity with the existing visual environment associated with the station would cause them to be sensitive to any substantial changes to the visual environment at the station itself. ~~so they would not be a sensitive visual receptor.~~ Train riders would not be able to see directly out in front of the train or above the train (where the tracks, wires, poles, etc. would be located), would be traveling at a high rate of speed and would not be able to see most project features from the train. Therefore, passengers not yet boarded the train would be sensitive visual receptors while those riding the train are not considered to be sensitive visual receptors.

3.1.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the Proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Have a substantial adverse effect on a scenic vista.
- Substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings along a designated scenic roadway.
- Substantially degrade the existing visual character or quality of the site and its surroundings.
- Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area.

3.1.2.3 Impacts and Mitigation Measures

Under the Proposed Project, physical changes would occur where electrification facilities, including the OCS poles and wires, traction power facilities (TPFs), and overbridge protection structures would be located. Trees and mature vegetation within the 10-foot electrical safety zone (ESZ) around the OCS alignment and TPFs would be removed or pruned to enable placement, operation, and maintenance of the facilities and to provide for electrical safety.

Most Proposed Project construction would take place within the Caltrain ROW. TPS1 (all options) and TPS2 (Options 1 and 2) would be outside the Caltrain ROW. The electrical connections to PG&E to the TPSs would be outside of the Caltrain ROW as would the connections from TPS1 (all options) and TPS2 (Options 1 and 2). In some locations, the OCS poles would be placed outside the current ROW and the ESZ would extend outside the ROW, requiring vegetation clearance on adjacent properties.

These physical changes would alter views from residential, commercial, and park areas, as well as from crossing roadways in various locations along the corridor. New facilities and vegetation maintenance would also alter the visual character of areas.

<u>Changes resulting from Project Variant 1 are described below each impact discussion.</u>

Impact AES-1a	Have a substantial adverse effect on a scenic vista during Proposed Project Construction
Level of Impact	Less than significant

Project construction would be multi-phased and would occur in different locations at different times. All construction activities would involve the use of a variety of construction equipment, and stockpiling of soils and materials.

As discussed above, the Caltrain ROW and project facilities would be visible from only one scenic roadway. The 49-Mile Scenic Drive in San Francisco is located along Cesar Chavez Street, which crosses the Caltrain ROW. However, the crossing is located in an industrial area between US 101 and I-280. The crossing is of low visual quality and there are no scenic vistas at this location. Thus, construction would have a less-than-significant impact on views from scenic roadways.

Construction may be visible from some locations with long range views such as bridges crossing the Caltrain corridor or adjacent multi-level buildings. The view from bridges would be fleeting for crossing motorists, bicyclists, and pedestrians, and construction would not affect their long-range views because viewers would be elevated above the Caltrain ROW and construction activities. The view from adjacent multi-level buildings of the Santa Cruz Mountains, San Francisco Bay, or San Bruno Mountain would not be blocked by construction activities. Construction activities would not likely be seen from distant hillsides because of intervening features and activities.

Ground level views from adjacent residential, commercial, and park areas would be affected by construction where the Caltrain ROW is visible from these adjacent areas, but these views are short-range in character, not long-range scenic vistas.

Construction activities would, thus, have less-than-significant impacts on scenic vistas. Impacts on visual character and light and glare from construction are discussed separately below.

If Project Variant 1 (Electrification to just south of the Tamien Station) is implemented, there would be fewer construction activities because the Project would terminate approximately 2 miles farther north. Construction of the PS7 Variant would on sites located between the Caltrain tracks and SR 87 and would not substantially degrade local aesthetics or views.

Impact AES-1b	Have a substantial adverse effect on a scenic vista during Proposed Project operation
Level of Impact	Less than significant

As discussed above, the Caltrain ROW and project facilities would be visible from only one scenic roadway. The 49-Mile Scenic Drive in San Francisco is located along Cesar Chavez Street, which crosses the Caltrain ROW. However, the crossing is located in an industrial area between US 101 and I-280. The crossing is of low visual quality and there are no scenic vistas at this location. Thus, permanent project facilities would have no impact on views from scenic roadways.

Most other views from nearby roadways would not be affected by OCS poles and wires. However, in Brisbane, there is an approximately 0.25-mile segment of Bayshore Boulevard between the Old County Road/Tunnel Drive intersection with Bayshore Boulevard and the Van Waters and Rogers Road intersection with Bayshore Boulevard that has views of Brisbane Lagoon and San Francisco Bay. Bayshore Boulevard is not a designated scenic roadway. Additionally, existing wooden poles and transmission lines parallel the tracks along this segment, between Bayshore Boulevard and the Caltrain corridor. There is also existing rail infrastructure including a multi-track signal bridge that is visually bulky. Mature trees and shrubs grow between Bayshore Boulevard and the Caltrain corridor to the north and south of this roadway segment and obscure views.

There are many vistas in the Proposed Project area provided from distant hillside locations, bridges that cross the project corridor, and multi-level buildings that are adjacent to the project corridor. However, direct views of the Caltrain corridor from hillsides are limited because of intervening vegetation, buildings, and infrastructure. Where the project corridor is visible from a distance, project features would be undistinguishable as independent visual elements because of the amount of infrastructure currently associated with existing visual conditions in the highly developed area. The OCS poles, ~~and~~ wires and overbridge protection structures would also not likely be readily obvious in views from distant hillsides because of intervening features and activities and because they would be lost in the view at distance. Therefore, it is anticipated that views from these locations would not be affected by the Proposed Project.

Vistas available from bridge crossings and raised rail corridor segments are brief because the viewer is in motion in a motorized vehicle, a rail car, on a bike, or on foot. Permanent facilities would not affect long-range views because viewers would be elevated above the Caltrain ROW and the OCS facilities would not block or obstruct long-range views.

The view from adjacent multi-level buildings of the Santa Cruz Mountains, San Francisco Bay, or San Bruno Mountain would not be blocked by the OCS poles or wires. Views from multi-level buildings immediately adjacent to the Caltrain corridor are longer term, but viewers at these locations are familiar with the presence of infrastructure associated with the rail corridor as a sub-element within existing vistas.

The TPF facilities, for the most part, would not block any scenic long-range views. TPS1 and TPS2 would be in commercial/industrial areas without scenic vistas. PS1 through PS6 and the switching station would not be situated so as to block long-range vistas. As shown in Figure 3.1-15, PS7 would affect the views from Kurte Park of undeveloped hills adjacent to the Caltrain corridor. While this view is not a long-range view, the medium-range view from the park has moderate visual integrity dominated by grassland vegetation that would be disrupted by the addition of an industrial element in the form of PS7.

If Project Variant 1 (Electrification to just south of the Tamien Station) is implemented, PS7 would be located near West Alma Avenue, in an undeveloped area between two existing transportation corridors: SR 87 and the Caltrain tracks. Neither of the two potential locations for PS7 under Variant 1 would affect long-range scenic vistas.

Ground level views from adjacent residential, commercial and park areas would be affected by project permanent features (such as the OCS and the TPFs) and where vegetation is removed for the ESZ, but these views are short-range in character, not long-range scenic vistas.

Views from Bayshore Boulevard in Brisbane are not considered significant as Bayshore Boulevard is not a designated scenic roadway and intervening trees and structures limit expansive views of the bay.

The Proposed Project's permanent features associated with OCS and TPFs would, thus, have less-than-significant impacts on scenic vistas.

If Project Variant 1 (Electrification to just south of the Tamien Station) is implemented, impacts on scenic vistas would be slightly less because PS7 would not affect views from Kurte Park. However, either of the proposed locations for PS7 under Project Variant 1 could affect ground-level views from adjacent residential areas. However, the existing ground-level views are not scenic due to the presence of the Caltrain tracks, freeway (SR 87), the VTA light-rail tracks and overhead contact system, as well as billboards. Therefore, implementation of Project Variant 1 would not change this impact's level of significance determination.

Impacts on visual character and light and glare from construction are discussed separately below.

Impact AES-2a	Substantially degrade the existing visual character or quality of the site and its surroundings during Proposed Project construction
Level of Impact	Significant
Mitigation Measure	AES-2a: Minimize OCS construction activity on residential and park areas outside the Caltrain ROW
Level of Impact after Mitigation	Less than significant

This impact concerns temporary visual changes during construction. Permanent visual changes to character, including vegetation removal, are discussed separately under Impact AES-2b.

Most of the construction would occur within an existing rail ROW in an urban area. The existing visual character or quality of the corridor itself is dominated by the presence of existing rail infrastructure. Proposed Project construction would be multi-phased and would occur in different locations at different times. All construction activities, whether for OCS poles and wires or traction power facilities, would involve the use of a variety of construction equipment, stockpiling of soils and materials, and other visual signs of construction. Vegetation clearance within the Caltrain ROW is a current and ongoing activity conducted for physical safety of passing trains. While evidence of construction activity would be noticeable to area residents and others in the vicinity, such visual disruptions would be short-term and are a common and accepted feature of the urban environment, including the Caltrain ROW.

While most of the construction would occur within the Caltrain ROW (including construction of OCS within the ROW, the switching station, all of paralleling stations, TPS1 (Option 4), and TPS2 (Option 3)), some of the OCS installation, vegetation clearance, and construction of TPS1 (~~all options~~ Options 1, 2, and 3) and TPS2 (Options 1 and 2) would occur outside the ROW. For the TPSs, all of the proposed options outside the Caltrain ROW are within active industrial/commercial areas; construction would not be out of character for these sites.

Installation of OCS poles and wires and vegetation clearance outside the ROW on industrial or commercial land would be consistent with the existing visual character. Installation of OCS poles and wires and vegetation clearance outside the ROW also would occur in residential areas and parks where visual quality can be moderate to high, depending on their individual setting. Construction activity in residential and park areas would be anomalous, and the visual character of such areas would be partially degraded during construction. The duration of OCS construction at any one location would be limited to the time necessary to install pole foundations and then later to install poles and string wires. The change in visual character would only occur for a limited period and the perception of the visual quality of such areas would not be altered once construction is complete. To ensure that the duration of construction disruption and activities are limited in areas of greater visual sensitivity, Mitigation Measure AES-2a would be implemented to avoid using such areas for access or staging areas and to remove all construction equipment and materials immediately following completion of construction on such sites.

With mitigation, this impact would be less than significant.

With implementation of Project Variant 1 (Electrification to just south of the Tamien Station), there would be slightly fewer construction activities because the construction boundaries would be smaller. However, Mitigation Measure AES-2a would still be required to ensure that the duration of construction disruption and activities are limited in areas of greater visual sensitivity. Implementation of Project Variant 1 would not change this impact's significance determination.

Mitigation Measure AES-2a: Minimize OCS construction activity on residential and park areas outside the Caltrain ROW

OCS construction activities outside the Caltrain ROW in residential and park areas along the Caltrain ROW shall be minimized in extent and duration to the maximum extent feasible. JPB shall include the following requirements for construction contractors:

- Staging areas shall not be located in parks or on residential land.
- Access routes shall not be located in parks and shall avoid use of residential land wherever feasible
- OCS construction on residential lands shall only be during daylight hours, wherever feasible.
- OCS construction on park lands shall be during hours when parks are closed, wherever feasible.
- The duration of OCS construction on residential and park lands shall be minimized. Material and equipment shall be brought to such sites as close to the start time of construction as

possible and shall be removed from such sites as soon after construction completion as possible.

- If multiple day construction is required on a residential or park parcel, construction materials and equipment shall be kept in good order and all trash and debris contained.
- Construction contractors shall coordinate with park facility operators and residential landowners and residents to inform them of planned construction activities well in advance of construction.

Impact AES-2b	Substantially degrade the existing visual character or quality of the site and its surroundings during Proposed Project operation
Level of Impact	Significant
Mitigation Measure	AES-2b: ~~Apply aesthetic surface treatments to new infrastructure to and provide screening vegetation at TPFs in sensitive visual locations~~ Aesthetic treatments for OCS poles, TPFs in sensitive visual locations, and Overbridge Protection Barriers BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan CUL-1d: Implement design commitments at historic railroad stations
Level of Impact after Mitigation	Significant and unavoidable (tree removal/pruning); less than significant (TPFs, OCS, and overbridge protection structures)

Permanent impacts of the Proposed Project on visual character would result from 1) introduction of the new TPFs inside and outside the Caltrain ROW, 2) OCS poles and wires, 3) vegetation removal and maintenance for electrical safety along the OCS alignment, and 4) overbridge protection structures.

Traction Power Facilities

The auto-transformer power feed system proposed for the Proposed Project would require 10 TPFs along the Caltrain corridor (see Figures 2-9 to 2-18 for locations of these facilities). Two TPSs approximately 150 feet by 200 feet would be required (see Figure 2-19). Seven paralleling stations approximately 40 feet by 80 feet (see Figures 2-20 and 2-21), and one switching station approximately 80 feet by 160 feet also would be required (see Figure 2-22).

The existing settings for the TPFs are shown in Figure 3.1-2. Visual simulations of TPFs are shown in Figures 3.1-4 (PS2), 3.1-12 (PS6 Option 1), 3.1-13 (PS6 Option 2), Figure 3.1-15 (PS7), Figure 3.1-16 (PS3), and Figure 3.1-17 (PS5 Option 1). With the exception of TPS1 (Options 1, 2, and 3~~all options~~) and TPS2 (Options 1 and 2), the proposed TPF locations are all within existing Caltrain ROW. A number of the proposed TPFs would be located in areas where the Caltrain corridor is surrounded by industrial and/or commercial uses (SWS1 Option 2, PS1, PS2, PS3 Option 2, PS4, ~~PS5 Option 2~~, PS6 Option 2, TPS1 (all options), and TPS2 (all options). Some of the proposed TPF sites are located in areas with residential uses or adjacent residential uses (SWS1 Option 1; PS3 Option 1; PS5 Option 1, Option 1b, and Option 2); PS6 Option 1). One TPF site (PS7) is directly adjacent to a local park. Another TPF site (PS6, Option 2) is across the street from a City park/plaza.

TPFs proposed in areas entirely surrounding by railroad, industrial and commercial uses would be consistent in character with surrounding uses and would not degrade the visual character of these sites. Thus, no significant impacts on visual character are identified for TPS1 (all options), TPS2 (all options), SWS1 Option 2, PS1, PS2, PS3 Option 2, or PS4 (all options). ~~PS5 Option 2, or PS6 Option 2~~.

TPFs proposed in areas adjacent to residential or park areas could change the visual character of these areas.

- SWS1 Option 1 would be located on SamTrans property in the Redwood Junction commercial and industrial area of North Fair Oaks that is surrounded by railway tracks on all sides. SWS1 Option 1 would be separated from a residential area along Westmoreland Avenue in Redwood City by Westmoreland Avenue and four railroad tracks. This area is within the North Fair Oaks Community Plan Area which is slated for future residential and mixed-use projects. The existing view from that neighborhood is of railroad tracks and commercial and industrial buildings. While residential areas along Westmoreland Avenue, south of the corridor, would have views of SWS1 Option1 across the Caltrain tracks, this view would not be substantially different than the existing view of an industrial site. The Proposed Project would not impact the existing fence along Westmoreland Avenue. The addition of a switching station would not substantially degrade the existing visual character. The switching station will not change the visual character of the residential neighborhood at all given its location on the opposite side the Caltrain ROW. Thus, no significant impacts on visual character are identified for SWS1 Option 1 for existing conditions. As described in Chapter 4, there is the potential for mixed use in the adjacent area. If residential use is proposed directly adjacent to SWS Option 1, and SWS Option 1 is used for the switching station, then Caltrain would apply Mitigation Measure AES-2b at this location to avoid significant cumulative aesthetic effects. Mitigation would not be needed for SWS, Option 2.

- PS3 Option 1 would be located within the JPB ROW across the street from residential areas along California Drive near Lincoln Avenue in Burlingame. Figure 3.1-16 depicts the existing view from the neighborhood west of the corridor to the proposed PS3 Option 1 site, a simulation with PS3 in place, and a simulation of PS3 with potential screening vegetation. The presence of existing railway facilities and commercial and industrial uses east of the Caltrain ROW already establish the visual character of the ROW and the areas to the east. The introduction of PS3 would not substantially alter views from the neighborhood toward these areas or the visual character of these areas except that PS3 Option 1 would introduce an elevated element higher than current features on the site. In addition, PS3 Option 1 would be more apparent than existing railway facilities to drivers along California Avenue and could be perceived as a visually anomalous feature adjacent to a residential area. To reduce the change in visual character, Mitigation Measure AES-2b would require screening vegetation to be placed along California Avenue between the roadway and PS3 Option 1, and ~~use of aesthetic treatments on~~ appropriate color treatment for the TPF facilities to reduce the visual effect on views from the neighborhood.

- As noted above, the current setting of PS4, Options 1, 2 and 3 (all on JPB property) are not visually sensitive. As described in Chapter 4, there is the potential for transit-oriented use in the areas of Options 1 and 2 under the Hillsdale Station Area Plan. If residential or public plaza/park uses are proposed directly adjacent to Options 1 or 2, and one of these sites is used for a Paralleling Station then Caltrain would apply Mitigation Measure AES-2b at the location to avoid significant cumulative aesthetic effects.

- PS5 Option 1, within the JPB ROW, would be located within the Caltrain ROW across Alma Street and opposite Greenmeadow Way that serves as a major ingress/egress for ~~from~~ the Greenmeadow residential neighborhood in Palo Alto. Residents exiting the development via Greenmeadow Way would see PS5 Option 1 as a focal point in their view. Figure 3.1-17 depicts a view from the neighborhood of the PS5 Option 1 site, a simulation of the view after PS5 Option 1 is constructed, and a simulation with screening vegetation in place. Because current views do not include rail facilities and PS5 Option 1 construction would require tree removal, the effect on views in the area is considered significant. Mitigation Measure AES-2b would require screening vegetation to be placed along Alma Street between the roadway and PS5 Option 1 and ~~the use of aesthetic treatments on~~ appropriate color treatment for the TPF facilities to reduce the visual effect on views from the neighborhood.

- PS5 Option 1B, within the JPB ROW, would be located within the Caltrain ROW across Alma Street south of Ferne Avenue which provides entry to a residential neighborhood. Residents exiting the neighborhood would see PS5 Option 1B most prominently if turning south off Alma Street. Residents who reside in the houses that back onto Alma Street south of Ferne Avenue may also see the site as well, but an existing masonry wall and private vegetation would obscure direct ground floor views partially or entirely. The site would also be visible to attendees at the Jehovah's Witness Kingdom Hall along Alma Street. The simulation of the view of the PS5 Option 1 site (Figure 3.1-17) shows a view that is roughly representative of the view of PS5, Option 1B as the distance from residences along the east side of Alma Street to the paralleling station would be similar for Option 1B as for Option 1. Because current views do not include rail facilities due to screening vegetation and PS5 Option 1B construction would require tree removal, the effect on views in the area is considered significant. Mitigation Measure AES-2b would require screening vegetation to be placed along Alma Street between the roadway and PS5 Option 1B (and potentially along the sidewalk median on the east side of Alma Street) as well as appropriate color treatment for the TPF facilities to reduce the visual effect on views from the neighborhood.

- PS5 Option 2, within the JPB ROW, is located adjacent to commercial areas and a construction site at present and thus would not have a significant effect on the existing visual character. However, a mixed use residential/commercial project at 195 Page Mill Road will be completed by the time the PCEP is constructed and thus there would be new commercial receptors on the ground floor and new residential receptors in the mixed-use building on the other floors. The commercial receptors are not considered sensitive viewers but the residents are. The view from the back of the development would be of the JPB ROW, an existing communications building and then Alma Street and residential development beyond. This is not considered a particularly visually vivid or attractive view. However, the addition of a paralleling station would affect the visual character by introducing new structures and an overhead gantry to make the existing transportation/industrial character more intense. The development at 195 Page Mill Road proposes to plant trees within the 10 feet immediately north of the development (on JPB land) as part of aesthetic mitigation for the development or to build a vined trellis to help reduce aesthetic impacts of the development on views from Alma Street of the elevated buildings. If these improvements are done, then they should also help to screen views from the development toward the PS5, Option 2. Mitigation Measure AES-2b would require Caltrain to work with the developer of this project to plant trees or place a vined trellis between PS5, Option 2 and the development as well as appropriate color treatment for the TPF facilities to reduce the visual effect on new residential views.[1]

- PS6 Option 1, within the JPB ROW, would be located adjacent to a residential area. PS6, Option 1 is considered to be in a sensitive visual location as it is adjacent to and directly visible from residential areas, although the present view from the residential area (as shown in Figure 3.1-

[1] As described in Section 3.11, *Noise and Vibration*, several alternative sites for PS5, Option 2 have been identified as part of mitigation for noise effects. These locations are not adjacent to the mixed residential/commercial development and instead are adjacent to commercial areas which are less visually sensitive. If one of these alternative sites is implemented, aesthetic screening mitigation may not be required.

12) is of local roadways, parked cars, overhead utility lines, and the railroad, with a multi-story building and parking structure in the background which compromises some of the aesthetic attractiveness under existing conditions. There is little screening vegetation at present. Nevertheless, given the residential setting, the addition of PS6, Option 1 at this location would increase the clash of visual character between the residential areas and the JPB ROW and this is considered a significant aesthetic impact. Mitigation Measure AES-2b would require screening vegetation to be placed between the roadway and PS6 Option 1 and appropriate color treatment for the TPF facilities to reduce the visual effect on views from the neighborhood.

- PS6 Option 2 is located within the Caltrain parking lot between the Caltrain tracks and an elevated ramp leading to Mathilda Avenue. As shown in Figure 3.1-2, Plaza del Sol is separated from the PS6, Option 2 location by W. Evelyn Avenue and the elevated ramp to Mathilda, the view is partially screened from view by existing trees along the Plaza and some low structures within the northeast corner of the plaza, and there are existing light poles as part of the existing visual setting. The plaza itself provides an attractive visual public setting with artistic features, open areas, and landscaping and is considered visually sensitive. However, the intervening features of the elevated roadway and roadway and partial screening by existing vegetation, help to reduce the potential visual impact of PS6, Option 2. The new facility would not be directly adjacent to the plaza and the intervening features, especially the elevated ramp to Mathilda would help to make the facility less obvious in the general area surrounding the plaza. The views within the parking lot or from the ramp or W. Evelyn are not considered sensitive views as they are within a transportation setting, fleeting, and not aesthetically attractive. The views from the plaza are considered sensitive. While the view would be partial and in the background from the plaza, this is considered a potential significant impact. Since the plaza is the sensitive view location, the best option for mitigation would likely consist of increased tree planting along the south side of W. Evelyn Road or increased tree planting on the Evelyn side of the Plaza itself. If Option 2 is selected, as part of implementing Mitigation Measure AES 2b, the JPB will work with the City of Sunnyvale to identify the best options for vegetated screening to be installed.

- PS7 would be located within the JPB ROW adjacent to Kurte Park in San Jose, within the JPB ROW, and below a residential neighborhood on Communications Hill. The topography of the surrounding land and the distance to the proposed facility and existing railway facilities are expected to reduce the obtrusion of PS7 on views from the adjacent residential neighborhood. However, PS7 would be directly adjacent to Kurte Park and would introduce an industrial element into views from the park that are currently dominated by adjacent grassland hills in combination with the railroad ROW. PS7 would have a significant impact on visual character. Mitigation Measure AES-2b would require screening vegetation to be placed between the park and PS7 and ~~the use of aesthetic treatments~~ appropriate color treatment for on the TPF facilities to reduce the visual effect on views from the park.

  PS7 Variant A would be located adjacent to the Caltrain tracks on the north side of West Alma Avenue between SR 87 and the Caltrain tracks. PS7 Variant B would be located on the south side of West Alma Avenue between SR 87 and the Caltrain tracks. West Alma Avenue goes under both SR 87 and the Caltrain tracks, so views from West Alma Avenue of either PS7 Variant A or PS7 Variant B would be limited to the portion of West Alma Avenue immediately adjacent to the TPF. There is an existing residential apartment building to the east of the proposed location for PS7 Variant A. Residents in the higher units would continue to have unobstructed views of the mountains to the west. Residents in the lower units would have views of PS7. However, their existing views are not visually of high quality as they consist of the existing Caltrain corridor, the elevated SR 87 corridor, VTA's light rail corridor with existing poles and wires, and billboards. Addition of PS7 would not represent a significant visual impact as existing ground-levels views are not particularly scenic and the PS7 Variant would not be out of character with the existing transportation corridors. Views from a townhouse development to the east of the ROW, and south of West Alma Avenue, would be mostly blocked by existing trees between the development and the Caltrain tracks.

As described above, Mitigation Measure AES-2b would ensure that landscaping and aesthetic design treatments would be provided for TPF-related structures and equipment in areas where they would otherwise have a significant impact on existing visual character. Implementing this measure would reduce potentially significant impacts on visual character at these locations to a less-than-significant level.

Overhead Contact System

Project Corridor as a Whole

OCS poles and wires would be introduced throughout the existing rail corridor from San Francisco to San Jose. In general, the introduction of OCS poles and wires within an existing railroad corridor would not constitute a substantial visual change; these types of facilities would be consistent with the existing visual quality of the active commuter and freight rail corridor.

It is important to note that the existing ROW is a long-standing active transportation corridor. The ROW is not a natural landscape feature; it contains train rails, warning signs and lights, overhead signal bridges, spur tracks, and the frequent presence of passenger trains and freight trains with their attendant visual features, engine noise, and horn noise at grade crossings. In some areas, the ROW includes elevated embankments and grade separations that can be substantial structures. In certain areas, such as Mountain View and Millbrae, other transit facilities such as VTA light rail and BART are adjacent to the JPB ROW. In certain areas, including in South San Francisco, in Redwood City, in Santa Clara and San Jose, there are extensive freight tracks and freight train movements. In many locations, there is existing overbridge fencing protection and fencing along the ROW. The Caltrain corridor is an active transportation corridor with intense activity and infrastructure that can be different from adjacent residential and commercial areas. The ROW has been an active transportation corridor for approximately 150 years and has operated as Caltrain commuter rail for decades. As a result, an intensity of transportation-related infrastructure and operations is the expected aesthetic character of the ROW. The addition of OCS poles and wires along the ROW will introduce a new linear visual feature, but not one that is out of character with an active transportation character.

Nonetheless, some residents or business occupants accustomed to the existing Caltrain corridor, however, may consider these visual changes to constitute a new visual intrusion that detracts from the existing visual character of the rail corridor itself. The new OCS infrastructure would be more or less visible from residences and businesses, depending on whether there would be other structural or vegetative visual screening between the rail corridor and adjacent land uses after construction.

Figures 3.1-3 through ~~3.1-17~~ 3.1-19 illustrate OCS infrastructure as it would be visible from various locations and across a variety of visual conditions throughout the project area. Potential impacts on visual character due to the OCS overhead infrastructure and vegetation removal is further described for select location examples below. The location examples were selected because they are representative of the railroad corridor and at-grade crossings and are locations that possess sensitive visual receptors.

- **Downtown San Bruno**: Existing views toward the railroad corridor in downtown San Bruno would be changed due to construction of the proposed San Bruno grade separation project (not a part of the Proposed Project), and the OCS. The OCS poles and overhead wires would be visible in comparison with street-level lighting electroliers, and they would be at or above the level of the elevated parking structure at this location.
- **Redwood "Wye" Junction**: Existing views are dominated by the railroad corridor, which is on an embankment and can be seen clearly through the cyclone fencing. Utility poles and wires are also clearly evident from the surrounding neighborhood. The OCS poles and wires would add to the visual clutter, but these types of facilities are consistent with the existing aesthetic quality of this location.
- **South San Jose**: An elevated segment of the railroad corridor with the proposed side-pole cantilever OCS configuration, as viewed from a south San Jose residential area, is simulated on Figure 3.1-14. The poles would both be placed within the embankment of the railroad overhead and attached to the railroad structure crossing Prevost Street. Large trees help to screen the view of the railroad corridor, which presents a variety of ancillary facilities, including both a concrete and a landscaped crib retaining wall alongside the railroad embankment, a drainage pipe emerging from the embankment, chain-link fencing along the railroad ROW, telephone poles, and street signs.

From a distance, OCS infrastructure would either be fully or partially screened by vegetation or other development, such as seen in Figure 3.1-8, or would not stand out amongst the visual environment, which already includes rail infrastructure and urban development.

However, where sensitive receptors such as residents and park users are located directly adjacent to the ROW, the new OCS would be readily apparent and visible as a new railway feature. In addition, the OCS would be visible from some adjacent areas where unobstructed by intervening structures or vegetation. Once one proceeds farther away from the Caltrain ROW, the OCS would be less and less apparent. The poles and structural elements other than the wires would be the most visually apparent parts of the system because the wires would be of a small diameter and would more readily blend into the background view.

Additionally, it is important to note that utility wires are a normal part of the ROW and the adjacent landscape and do not inherently compromise the visual character of adjacent areas. The addition of new poles and wires for the OCS along the Caltrain ROW would not be an unprecedented visual feature in areas with existing overhead poles and wires. As shown in the new visual simulations along Alma Street in Palo Alto (Figure 3.1-9b) and along Ravenswood (Figure 3.1-19a) and Glenwood (Figure 3.1-19b) Avenues in Menlo Park, the addition of OCS poles and wires would not substantially change the visual character of views along these roadways toward the Caltrain ROW. The addition of new poles and wires for the OCS along the Caltrain ROW would not be an unprecedented visual feature in areas with existing overhead poles and wires. As shown in the new visual simulations along Alma Street in Palo Alto and along Ravenswood and Glenwood Avenues in Menlo Park, the addition of OCS poles and wires would not substantially change the visual character of views along these roadways toward the Caltrain ROW. The poles and wires can be observed at grade crossings and when looking directly at the ROW, but then when shifting view laterally, the poles and wires are usually obscured from view by existing vegetation outside the ROW and/or other existing development.

The ROW is not readily observable from ground-level areas that are not directly adjacent to the ROW itself. The view of a long line of poles and wires shown in the visual simulations looking down the ROW, such as at Churchill Avenue in Palo Alto or Oak Grove in Burlingame is only available when crossing the ROW itself or at Caltrain stations and rarely from any other locations due to intervening vegetation and structures. From other viewpoints directly along the ROW, such as at residences with a clear view of the ROW, several poles and the immediately adjacent wires will be observable when looking at the ROW, but residences are usually setback somewhat from the ROW and intervening vegetation, fences or structures often obscure the view down the ROW except when standing right at the ROW fence itself. From streets that are not directly parallel to the ROW, it is difficult to see the ROW and will be difficult to readily observe the poles and wires due to intervening structures and vegetation. When considering the visual character of a City or a neighborhood, one must consider the full range of views available throughout daily activities and whether a new visual feature does or does not become a dominant feature that actually defines the character of an area. While the new OCS poles and wires will become part of the visual character of the Caltrain ROW itself (consistent with its current transportation intense character), and will affect certain immediate views from directly adjacent residential, commercial and park areas, the new OCS poles and wires will, over time become more of a background condition to the visual character, like the existing utility poles and wires shown in the new simulations in Menlo Park and Palo Alto.

While poles and wires themselves would not inherently result in a significant change in visual character of an existing transportation corridor for the reasons noted above, depending on design of the poles in particular, they might become more readily observable instead of blend into the background. For example, if the OCS poles were to have a shiny steel finish, this would make the poles stand-out due to sun glare on the finish, which would make them abnormally obvious and would not more readily become part of the long-range background.

Thus, although the OCS poles and wires alone would not necessarily result in a significant aesthetic impact, unusually vivid OCS pole designs or colors could result in more overtly obvious changes in visual character that would not help the system to fade into the background as one moves away from the Caltrain ROW and that would be considered a significant effect on visual character.

~~The addition of the OCS is considered to have a potentially significant impact at and adjacent to visually sensitive areas, including adjacent residential areas, parks and Caltrain stations (see separate discussion below).~~

Implementation of Mitigation Measure AES-2b would ensure that OCS poles recede into the visual landscape as much as feasible. Implementing this measure would reduce potentially significant impacts of the OCS to a less-than-significant level.

Stations

Caltrain stations and their platforms are train boarding and disembarking areas for Caltrain users. Caltrain riders passing through stations and station users are considered to be very familiar with a station's existing visual environment and, therefore, sensitive to any substantial changes to the visual environment. The Proposed Project would introduce OCS poles and wires along the entire corridor, including at all station areas between Tamien Station, in San Jose, and San Francisco (see Figures 2-3 through 2-7 for typical OCS arrangements). Installation of OCS poles and wires would result in the same or very similar visual changes at each of the stations. OCS poles may be spaced up to 230 feet apart on straight sections of the track, which would reduce the cluttered appearance of numerous poles within station areas.

Potential impacts on visual character at representative Caltrain stations are discussed below.

- **San Francisco 4th and King Station**: Figure 3.1-3 is representative of a location along the railroad corridor where project facilities would be visible from the station platform. Existing views from the station platform would be modified by the OCS because the current open-to-the-sky view would be partially obscured by the addition of the OCS, which would clutter the vertical view. Only commuters and other travelers waiting for a train at the station platforms have these views.
- **Bayshore Station**: Figure 3.1-4 is representative of a location along the railroad corridor where project facilities would be visible from both the station area platform and surrounding residential areas. Existing views from the Bayshore Station platform of the former Schlage Lock Factory (now vacant) would be modified due to construction of PS2. The close-range visual changes would be consistent with the visual quality of the existing railroad corridor and surrounding industrial land uses.
- **San Carlos Station:** Catenary facilities proposed at the San Carlos Station include side-pole cantilever OCS pole configurations. Figure 3.1-6, which shows the elevated San Carlos Station with added OCS infrastructure, gives an approximation of the visual effect. Pursuant to Mitigation Measure CUL-1d (see Section 3.4, *Cultural Resources*) poles would be constructed above the historical station on the modern elevated embankment. None would be placed directly in front of the historical station building. The OCS poles and wires would add new vertical structures similar to the existing light electroliers. These facilities would cause a physical change affecting views of the station, but the effect would be minor in comparison with the other numerous railroad facilities already in the view and the dominance of the elevated railroad embankment.
- **Atherton Station:** Proposed catenary wires at the Fair Oaks at-grade crossing as viewed from the Atherton Station are shown in Figure 3.1-7. As illustrated, the OCS poles and wires would be largely obscured by the dense landscaping and vegetation, thereby minimizing visual effects.
- **San Antonio Station**: Figure 3.1-11 shows a proposed side-pole cantilever OCS pole configuration at the San Antonio Station as viewed from a nearby multi-story apartment building. These OCS facilities would be clearly visible, given that the existing large trees at the site are all on the opposite side of the railroad corridor. These visual changes may be perceived by residents as increasing clutter in close proximity of the station, but the OCS would not be inconsistent with the existing railroad corridor, ancillary structures, and street lighting electroliers, nor would they obscure an existing scenic view.
- **San Jose Diridon Station**: There would be a side-pole cantilever OCS pole configuration at the San Jose Diridon Station. The OCS poles, catenaries, and wires proposed at the San Jose Diridon Station would add new vertical structures similar to the existing light electroliers. As described in Section 3.4, *Cultural Resources*, these would affect the historical butterfly passenger shelters, but implementation of Mitigation Measures CUL-1d would reduce impacts to a less-than-significant level. These facilities would, however, cause a physical change affecting views of the station.

As described in Section, 3.4, *Cultural Resources*, eight Caltrain station properties have heightened sensitivity to visual changes due to their historic status: Millbrae, Burlingame, San Carlos, Atherton, Menlo Park, Palo Alto, Santa Clara, and Diridon (San Jose). A visual simulation at the San Carlos Station is depicted in Figure 3.1-6. As described in Section 3.4, *Cultural Resources*, qualified architectural historians have determined that the placement of OCS poles near existing historic stations would have less-than-significant impacts on historic stations with implementation of Mitigation Measures CUL 1-d, which requires specific design commitments by station.

Separate from considerations of impacts on historic stations, the increase in infrastructure associated with OCS poles and wires would indirectly degrade the visual character at all Caltrain stations (whether historic or not) and change the visual experience for Caltrain riders. Implementation of Mitigation Measure AES-2b would ensure that OCS poles recede into the visual landscape as much as feasible. Implementing this measure would reduce potentially significant impacts at Caltrain stations to a less-than-significant level.

Vegetation Removal

To provide for electrical safety, the Proposed Project would require removal and pruning of trees that are within 10 feet of the OCS alignment. The existing trees provide screening for sensitive receptors of Caltrain tracks and service. Figure 3.1-5 depicts the Caltrain ROW before and after Proposed Project implementation in the Burlingame portion of the corridor. As shown, the OCS poles and wires would typically be more noticeable than existing railway facilities in these types of areas. JPB would remove trees only insofar as necessary to provide the required electrical safety zone (ESZ), or envelope. Figure 3.1-7 depicts a before and after simulation of tree removal and pruning in the Atherton area of the corridor where there is existing dense vegetation. As shown in Figure 3.1-8, tree removal and pruning of dense foliage and the OCS poles and wires would be less noticeable from outside the Caltrain ROW than from inside the ROW. In areas of sparse vegetation where the existing Caltrain ROW is already visible, the addition of poles and wires would be more evident. Figure 3.1-9a and Figure 3.1-9b depict ~~depicts~~ a portion of the Palo Alto area of the corridor before and after project tree removal and pruning in an area with existing dense vegetation. Figure 3.1-9a is looking down the Caltrain corridor from Churchill Avenue. Figure 3.1-9b is looking toward the Caltrain corridor from Alma Street at North California Avenue.

In addition, Tree Removal Maps are included in Appendix J that show the potential trees removed or pruned (in the tree survey areas) or canopy affected (in the non-surveyed areas). These maps are based on the worst-case assumption of outside poles and do not take into account the potential effect of mitigation.

As described in Section 3.3, *Biological Resources*, overall the Proposed Project could require the removal of an estimated 1,000 ~~2,200~~ trees and pruning of an estimated 3,200 ~~3,600~~ trees, including removal or pruning of hundreds of trees in many cities along the project route. As noted above, while most of the tree removal and pruning would occur ~~on~~ in the Caltrain ROW, some would need to occur outside the Caltrain ROW including on a number of residential properties and in three parks (see discussion of impacts of tree removal on parks in Section 3.10, *Land Use and Recreation*).

Tree removal and pruning impacts would be site-specific and would depend on the following factors:

- the OCS pole configuration and the required ESZ by location;
- existing density of vegetation within the Caltrain ROW (i.e., dense versus sparse);

- the amount of pruning needed (i.e., minimal versus intense);
- the number of trees being removed (i.e., none versus many);
- sensitive receptors present (i.e., none to few present versus many present);
- sensitive receptors' proximity to pruning and tree removal (i.e., immediately adjacent to versus farther away from);

In some locations, tree pruning and removal would be minimal. In these locations, the changes in the appearance of the vegetation and the associated screening of the Caltrain ROW for sensitive receptors would be barely perceptible or minor. This is likely to occur where vegetation is very dense; therefore, substantial amounts of vegetation would remain untouched or where there is little to no vegetation at all and thus removal of a small amount of vegetation would not meaningfully change current conditions.

On the other hand, there would be locations where tree pruning and removal would be more pronounced. This could occur even in areas with dense vegetation. Because there would be more substantial tree pruning and removal, there would be a higher degree of change to the appearance of vegetation and the screening that it provides between the Caltrain ROW and sensitive receptors. Tree removal and pruning effects would be greater where sensitive receptors are located directly across from or immediately adjacent to more pronounced changes. Effects would not be as great where sensitive receptors are located farther away and/or have limited views of more pronounced changes. Where vegetative screening is reduced, the ROW alignment would be more visible. Given the number of residents and park users that are likely to be affected to some degree, and the fact that trees and other vegetation along the ROW help screen Caltrain facilities and trains from adjacent areas, this tree removal and pruning would result in a significant change in visual character.

Mitigation Measure BIO-5 (see Section 3.3, *Biological Resources*) would require the preparation of a Tree Avoidance, Minimization, and Replacement Plan. This mitigation measure requires the evaluation of different pole types, including center poles, two-track cantilever poles, offset insulator poles and portals to reduce the amount of tree removal and pruning along the line. Section 3.3 describes a feasibility assessment of five test areas along the ROW completed to examine the potential effectiveness of this mitigation. As discussed therein, implementation of the mitigation will reduce tree removals, in some cases substantially, but will not avoid all tree removals. Thus, it is expected that with implementation of this mitigation, the amount of tree removal and pruning will be less than disclosed in Table 3.3-4 and as shown in the Tree Removal Maps in Appendix J.

In accordance with this mitigation, where tree removal or pruning cannot be avoided, JPB will work with local cities and counties and private property owners to replace trees using local tree ordinance replacement ratios for replacement of trees outside the JPB ROW, even though JPB is legally exempt from local land use regulations (inside the JPB ROW, replacement will be on a 1:1 basis).

The mitigation measure requires replanting to occur wherever possible (and feasible) to help screen locally sensitive viewers (such as residences, park users, and school children) from view of the ROW. Where replacement trees are planted between sensitive receptors and the OCS alignment, the trees would shield sensitive receptors from views of the Caltrain tracks and trains as the trees mature. However, because the exact locations for replacement trees are ~~is~~ unknown at the time, it may not be feasible in all locations to plant vegetation between sensitive receptors and the ROW. Plus, it can take many years for newly planted trees to sufficiently mature and provide replacement screening.

Therefore, impacts related to the visual effects of tree removal would be significant and unavoidable. This significant and unavoidable impact would be temporary but long term for areas where it is feasible to replace trees between sensitive receptors and the Caltrain ROW. The impact would be permanent for areas where it is not feasible to replace trees between sensitive receptors and the Caltrain ROW.

Overbridge Protection Barriers

Overbridge protection barriers are proposed on various roadway bridges that cross over the Caltrain alignment. These barriers would be designed to prevent objects from being dropped or thrown onto the OCS wires.

~~One example of an overbridge protection barrier and barrier material is shown in Figure 2-23 based on a simple fencing mesh. Other designs could include a solid Lexan barrier, which would be clear.~~

Figure 2-23 shows an example of an overbridge protection barrier and potential barrier material options such as simple fencing mesh and a solid Lexan barrier, which would be clear.

As described in Section 2.4.3, *Overbridge Protection Structures*, the barriers would be a minimum of 6.5 feet high and placed along the outside edge of the bridge parapet. The overbridge protection barriers would range from 35 to 80 feet in length, depending on the number of tracks in that segment of the alignment. Figure 3.1-10 simulates a typical overbridge protection barrier constructed from a semi-transparent wire mesh, as viewed from the San Antonio Station platform. The same barrier, as viewed from the roadway above the station platform, is shown on Figure 3.1-18. The tight wire mesh fabric, rather than solid materials, is proposed to achieve the best balance between safety and aesthetic considerations. The transparency lightens up the barrier when viewed at a distance and provides a sense of openness to the passing motorist. However, the color of the barrier could limit views. Coloring the barrier in a dark color actually improves visibility through the barrier compared with a standard grey metal surface. These barriers would be added to existing highway infrastructure that dominates the surrounding views and would, therefore, not have a substantially adverse effect on visual character.

Implementation of Mitigation Measure AES-2b would ensure that overbridge protection barriers recede into the visual landscape and ensures that overbridge protection barriers will provide the greatest access to available views and thus preventing a significant impact to the existing visual quality. Implementing this measure would reduce potentially significant impacts to a less-than-significant level.

Mitigation Measure AES-2b: ~~Apply aesthetic surface treatments to new infrastructure to and provide screening vegetation at~~ Aesthetic treatments for OCS poles, TPFs in sensitive visual locations, and Overbridge Protection Barriers

New infrastructure (OCS poles, TPF-associated structures and equipment, fencing at TPFs, and overbridge protection barriers) associated with the Proposed Project will be designed in a manner that allows these features to blend with the surrounding built and natural environments as much as possible ~~so that the new features complement the visual landscape.~~

Measures will include, but are not limited to, the following:

- Aesthetic treatments to project features will be implemented to help soften their visual intrusion upon the landscape, especially in areas of high use.

OCS Pole Design

- The JPB shall coordinate with local jurisdiction to obtain their input into OCS pole design relative to station aesthetics.
- Aesthetic considerations shall be considered when selecting pole design. Different pole designs, including round poles, square poles, and multi-face poles, have different characteristics. Some individuals find square poles to be aesthetically less desirable due to their angularity.
- In addition, the JPB shall consider options to reduce pole diameter by using thinner diameter poles that are constructed with thicker walls ~~with increased pole thickness instead of wider poles with lesser thickness~~.
- Aesthetic considerations shall be balanced with other considerations including cost, safety, maintenance, and durability.
- The JPB shall also evaluate the potential to house OCS wire-tensioning weights inside larger diameter poles.
- The JPB will also place OCS wires on the track-side of the poles, where feasible.
- Features will be constructed with low sheen and non-reflective surface materials to reduce potential for glare. Unpainted metal surfaces will not be permitted.

Traction Power Facilities

- The JPB shall coordinate with local jurisdiction regarding color selection and vegetative screening for aesthetic treatments at sensitive TPF sites for current uses (PS3, Option 1; PS5, Option 1, Option 1B and 2; PS6, Option 1 and 2; and PS7) or in the event of future adjacent residential or park/plaza uses (PS4, Options 1 and 2 and SWS Option 1).
- Vegetative screening will be provided to visually buffer views of TPFs. Vegetative screening may be achieved in a variety of ways, depending on availability of space. Where feasible and necessary, the paralleling station standard design of 40’ X 80’ shall be modified to allow for more space for vegetative screening (such as 30’ X 105’ for example). Acceptable methods of vegetative screening that may be used include:
  - Tree planting
  - Fencing with creeping vines.
  - Landscape buffer planting.
  - Vegetative wall/fence.

  The options above could be adjacent to the TPF perimeter and/or could be placed in other locations nearby where they would help to reduce the visual apparentness of the TPF and/or enhance the visual aesthetics near to the TPF location. For example, at PS5, Option 1B, tree planting on the east side of Alma Street in the sidewalk median, if allowed by the City of Palo Alto, could help to obscure the view of the facility from residences that back onto Alma Street.

The JPB shall maintain all vegetative screening on an on-going basis on JPB properties. If screening vegetation is placed outside the JPB ROW, the JPB will coordinate with the local jurisdiction on maintenance responsibilities.

- Features will be colored or painted a shade that is two to three shades darker than the general surrounding area. Light or bright colors will be avoided. Colors will be chosen from the U.S. Department of the Interior Bureau of Land Management Standard Environmental Colors Chart CC-001: June 2008. Because color selection will vary by location, the facility designer shall employ the use of color panels evaluated from key observation points during common lighting conditions (front light versus backlighting) to aid in the appropriate color selection. Color selection will be made for the coloring of the most prevalent season. Panels will be a minimum of 3 feet-by-2 feet in dimension and will be evaluated from various distances within 1,000 feet to ensure the best possible color selection.
- All paints used for the color panels and structures will be color matched directly from the physical color chart, rather than from any digital or color-reproduced versions of the color chart. Paints will be of a dull, flat, or satin finish to reduce potential for glare, and the use of glossy paints for surfaces will be avoided. Appropriate paint type will be selected for the finished structures to ensure long-term durability of the painted surfaces. The appropriate operating agency or organization will maintain the paint color over time.
- TPFs will be managed and maintained for a well-kept appearance and in a manner that vandalism and graffiti is abated semi-annually to maintain the effectiveness and attractiveness of the visual mitigation prescribed herein.

Overbridge Protection Barriers

- JPB will coordinate with the appropriate city staff on design selection of overbridge protection barriers and fencing that would be viewed from highly used public spaces and historical train stations.
- Overbridge protection barriers shall be designed to recede into the visual landscape as much as possible and to match the aesthetic character on the existing overpass.
- While Caltrain will retain final approval, Caltrain will make effort to accommodate local input and preference when selecting overbridge protection materials.

Impact AES-3	Substantially damage scenic resources, including trees, rock outcroppings, and historic buildings, along a scenic roadway during Proposed Project construction and operation
Level of Impact	Less than significant

As discussed above, the Caltrain ROW and project facilities would be visible from only one scenic roadway. The 49-Mile Scenic Drive in San Francisco is located along Cesar Chavez Street, which crosses the Caltrain ROW. However, the crossing is located in an industrial area between US 101 and I-280 and is of low visual quality. There are no scenic resources or vistas at this location. Thus, construction and operation of permanent project facilities would have less-than-significant impacts on scenic resources along scenic roadways.

Impacts on the visual appearance of historic buildings along the Caltrain ROW, none of which are along a scenic roadway, are discussed under Impact AES-2b.

Implementation of Project Variant 1 (Electrification to just south of the Tamien Station), described in Chapter 2, *Project Description*, would not result in any change to this impact analysis.

Impact AES-4a	Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area during Proposed Project construction
Level of Impact	Significant
Mitigation Measure	AES-4a: Minimize spillover light during nighttime construction
Level of Impact after Mitigation	Less than significant

Some of project construction would be accomplished at night. Artificial lighting onto the worksite could result in "spill over" light or glare in adjacent residential areas, which would be a significant impact. As described under Mitigation Measure AES-4a, the JPB will require the project contractor to ensure that construction crews working at night to minimize spill over light or glare in adjacent residential areas. With mitigation, light and glare from construction would have a less-than–significant impact.

With implementation of Project Variant 1, electrification would stop just south of Tamien Station. Therefore, there would be approximately 2 miles less of construction activities and associated light and glare. Therefore, there would, similarly, be fewer construction activities and associated light and glare. However, Mitigation Measure AES-4a would still apply and this impact's significance determination would not change.

Mitigation Measure AES-4a: Minimize spillover light during nighttime construction

During nighttime construction adjacent to residential neighborhoods, the JPB will require the contractor to direct any artificial lighting onto the worksite and away from any adjacent residential areas at all times.

The construction contractor will notify nearby residences of the construction schedule, prior to the start of construction, including the time periods for nighttime construction. A point of contact, including contact information, will be provided to residents to address concerns associated with construction and nighttime lighting.

Impact AES-4b	Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area during Proposed Project operation
Level of Impact	Significant
Mitigation Measure	AES-2b: Apply aesthetic surface treatments to new infrastructure to and provide screening vegetation at TPFs in sensitive visual locations AES-4b: Minimize light spillover at TPFs
Level of Impact after Mitigation	Less than significant

The TPFs and OCS facilities have the potential to cause minor increases in glare. While not substantial in most instances, this glare would reinforce the industrial character of the electrical infrastructure and would have a significant impact on sensitive receptors at residences or parks along the Caltrain ROW. Mitigation Measure AES-2b would reduce glare associated with TPFs and

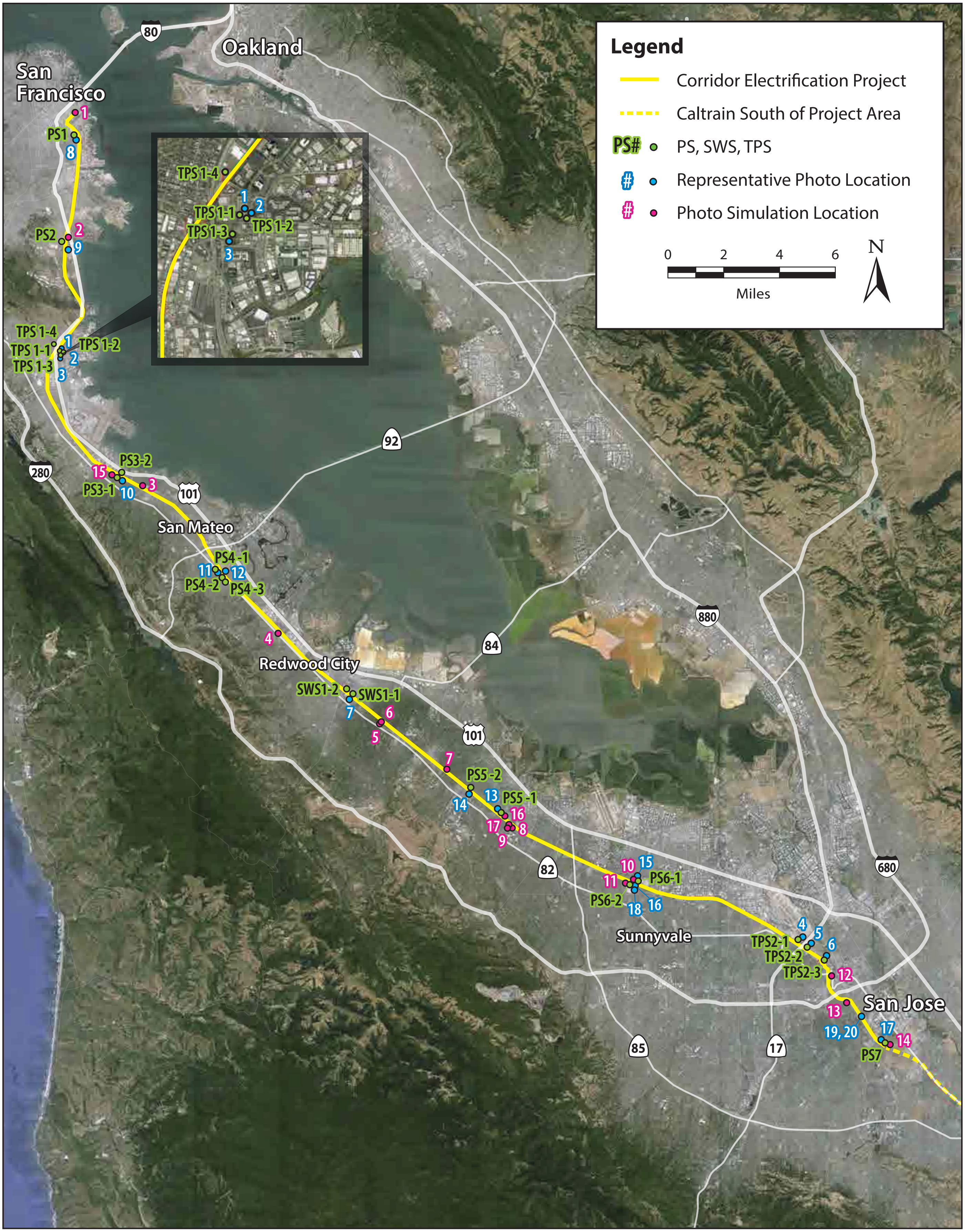
OCS facilities to a less-than-significant level by requiring paint color treatment to reduce glare and the visual obviousness of new facilities.

Installation of new nighttime lighting may be required for new TPFs for security purposes and could result in significant visual impacts if this lighting spilled outside of the site boundaries, creating a new source of nuisance lighting or glare to adjacent sensitive viewers. Implementation of Mitigation Measure AES-4b would reduce potentially significant impacts to a less-than significant level.

With implementation of Project Variant 1, electrification would stop just south of Tamien Station. Therefore, there would be approximately 2 miles less of OCS and associated glare. Therefore, there would, similarly, be less OCS and associated glare. However, there would still be the same number of TPFs and Mitigation Measure AES-4b would still apply; this impact's significance determination would not change.

Mitigation Measure AES-4b: Minimize light spillover at TPFs

The JPB will ensure that all artificial outdoor lighting associated with traction power facilities will be limited to safety and security requirements and will be designed to minimize light spill over into adjacent areas. All lighting is to provide minimum impact on the surrounding environment and will use downcast, cut-off type fixtures that are shielded and that direct the light only towards objects requiring illumination. Lights will be installed at the lowest allowable height and cast low-angle illumination while minimizing incidental light spill onto adjacent properties and open spaces. The lowest allowable wattage will be used for all lighted areas and the amount of nighttime lights needed to light an area will be minimized to the highest degree possible. Light fixtures will have non-glare finishes that will not cause reflective daytime glare. Lighting will be designed for energy efficiency, use, and have daylight sensors or be timed with an on/off program. Lights will provide good color rendering with natural light qualities with the minimum intensity feasible for security, safety, and personnel access. Lighting, including light color rendering and fixture types, will be designed to aesthetically minimize the profile of the TPFs.



Note: This figure replaces Figure 3.1-1 from the Draft EIR.

Graphics ... 00606.12 (11-18-14)

Figure 3.1-1
Representative Photo and Photo Simulation Locations
Peninsula Corridor Electrification Project

Photo 1, TPS1 Option 1. Looking southwest along Gateway Boulevard east of TPS1 Option 1.

Photo 2, TPS1 Option 2. Looking east from the Flyers gas station, Starbucks, and Wendy's convenience complex, off of Gateway Boulevard, toward TPS1 Option 2.

Graphics ... 00606.12 FEIR (11/18/2014)

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 3, TPS1 Option 3. Looking northeast from the Hotel Focus SFO parking lot, off of Gateway Boulevard and Mitchell Avenue, toward TPS1 Option 3.

Photo 4, TPS2 Option 1. Looking southwest from Newhall Drive toward the Caltrain corridor and TPS2 Option 1.

Graphics … 00606.12 FEIR (11/18/2014)

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 5, TPS2 Option 2. Looking southwest from Stockton Avenue, near the warehouse facility that is surrounded by privacy fencing, toward TPS2 Option 2.

Photo 6, TPS2 Option 3. Looking southwest from the access road between the Caltrain Centralized Equipment Maintenance and Operations Facility and Pitco Foods toward TPS2 Option 3.

Graphics … 00606.12 FEIR (11/18/2014)

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 7, SWS1. Looking north from Westmoreland Avenue toward the Caltrain corridor and SWS1.

Photo 8, PS1. Looking north along Pennsylvania Street from Mariposa Street west of the I-280 overpass and Caltrain corridor and southwest of PS1.

Graphics ... 00606.12 FEIR (11/18/2014)

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 9, PS2. Looking north along Tunnel Avenue toward the Caltrain corridor and PS2.

Photo 10, PS3. Looking northwest from the corner of California Drive and Broadway toward the Caltrain corridor and PS3.

Graphics ... 00606.12 FEIR (11/18/2014)

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 11, PS4 Option 1. Looking southeast from behind the Borders Bookstore and Ana Furniture toward the Caltrain corridor and PS4 Option 1.

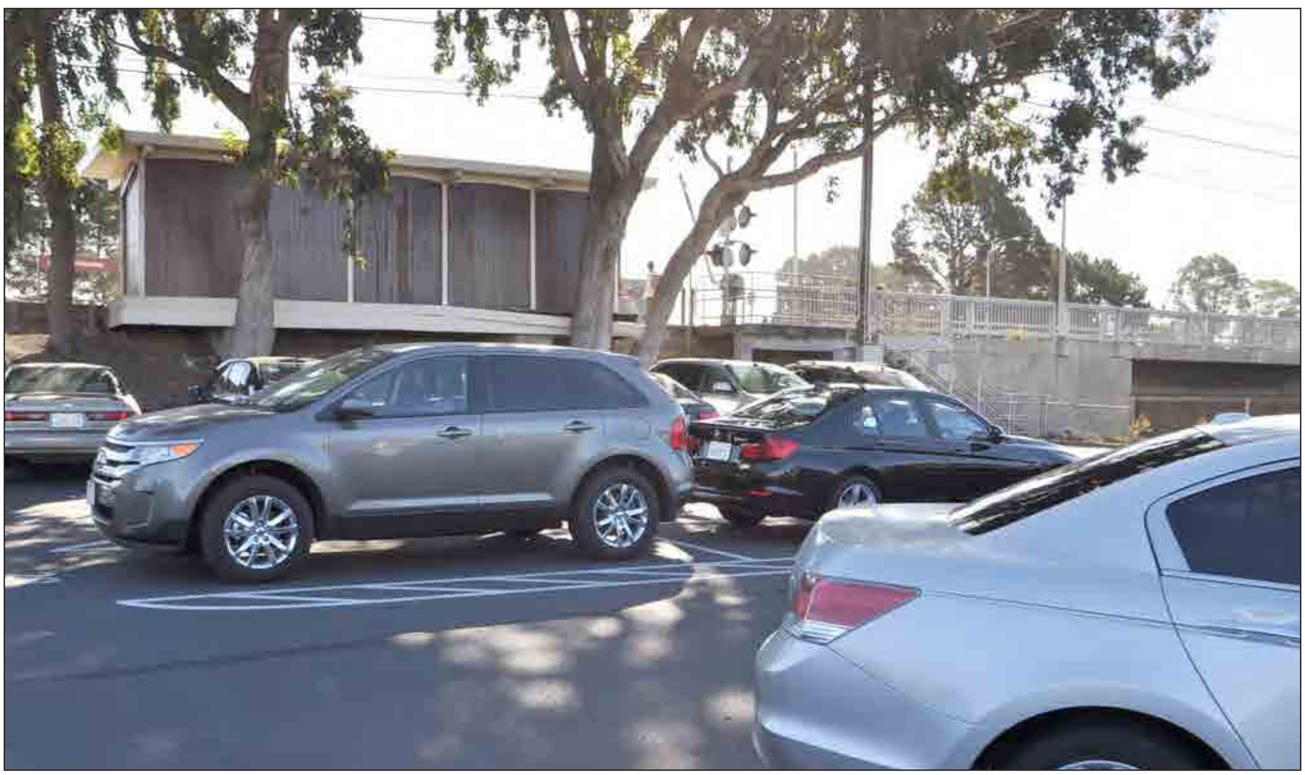


Photo 12, PS4 Option 2. Looking northeast from behind the Hillsdale Caltrain parking lot, on the corner of El Camino Real and West Hillsdale Boulevard, toward PS4 Option 2.

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 13a, PS5 Option 1A. Looking southeast from Alma Street toward the Caltrain corridor and PS5 Option 1A.

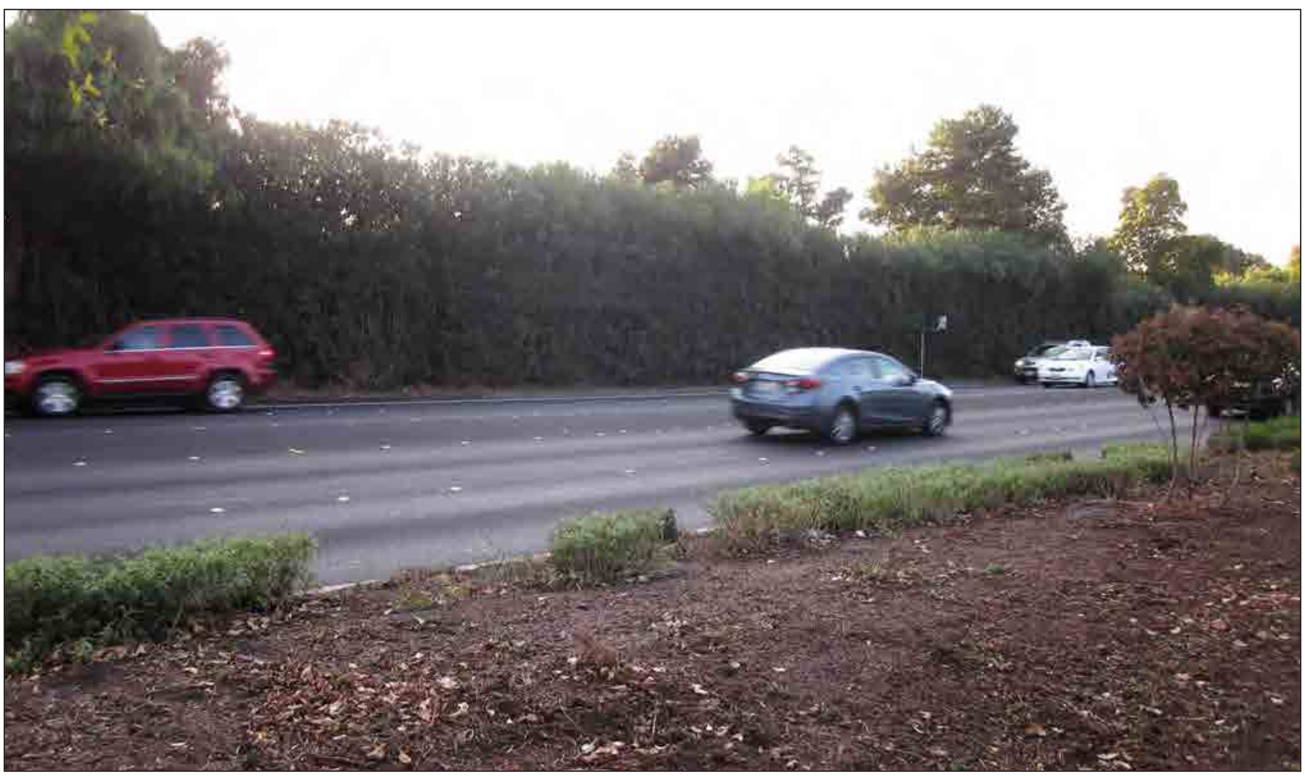


Photo 13b, PS5 Option 1B. Looking west from Alma Street, between Ferne Avenue and San Antonio Avenue, toward PS5 Option 1B.

Note: This figure replaces Figure 3.1-2 from the Draft EIR

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 14, PS5 Option 2. Looking north from Park Boulevard toward the Caltrain corridor and PS5 Option 2.

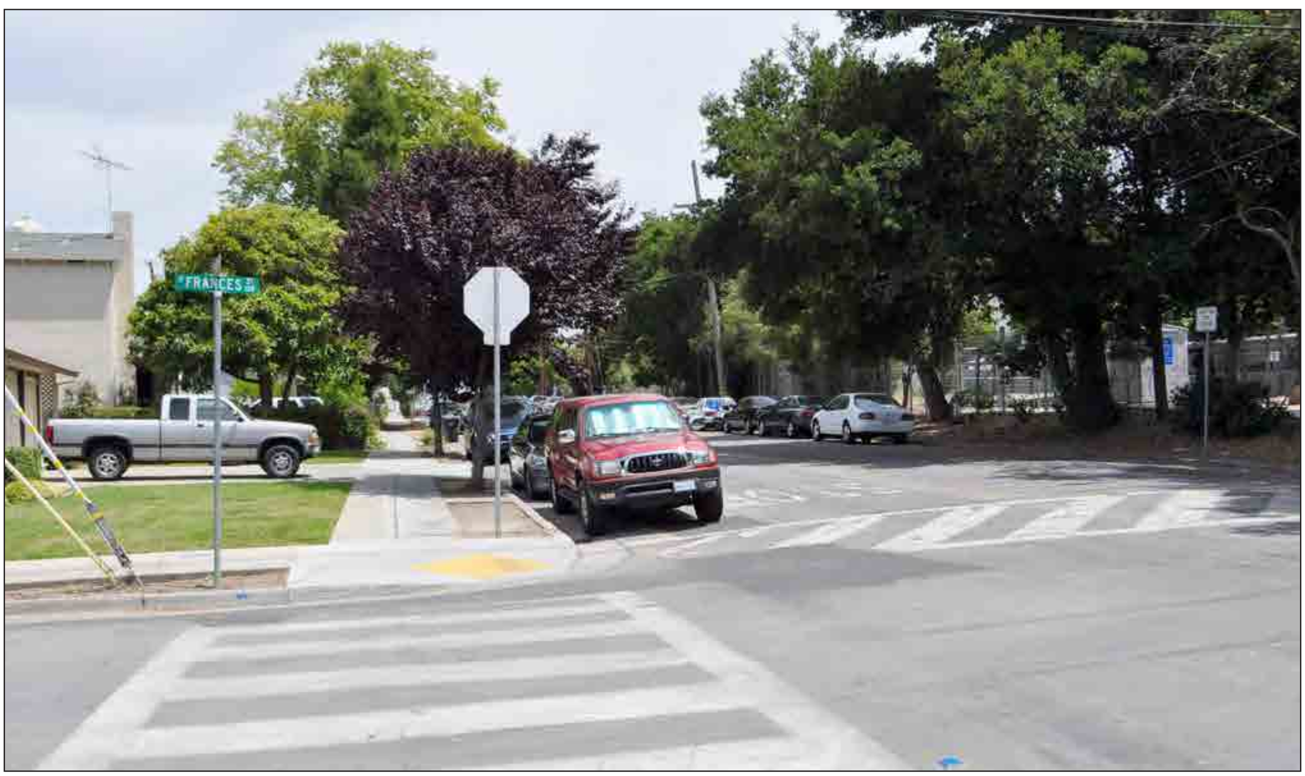


Photo 15, PS6 Option 1. Looking east from North Francis Street and West Hendy Avenue toward the Caltrain corridor and PS6 Option 1.

Note: This figure replaces Figure 3.1-2 from the Draft EIR

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 16, PS6 Option 2. Looking northwest from the Sunnyvale Caltrain station plaza toward the rail corridor and PS6 Option 2.

Photo 17, PS7. Looking southeast from Kurte Park, south of Communications Hill Boulevard, toward PS7.

Graphics ... 00606.12 FEIR (11/18/2014)

Note: This figure replaces Figure 3.1-2 from the Draft EIR

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 18, PS6 Option 2. Looking from the middle of Plaza Del Sol in Sunnyvale toward the proposed location of PS6, Option 2 in the Caltrain parking lot at the Caltrain Sunnyvale station.

Photo 19, PS7 Variant A. Looking from the pedestrian path on the south side of Alma Avenue north toward the proposed location of PS7, Variant A.

Note: This figure replaces Figure 3.1-2 from the Draft EIR

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Photo 20, PS7 Variant B. Looking from the pedestrian path on the north side of Alma Avenue south toward the proposed location of PS7, Variant B.

Graphics ... 00606.12 FEIR (11/18/2014)

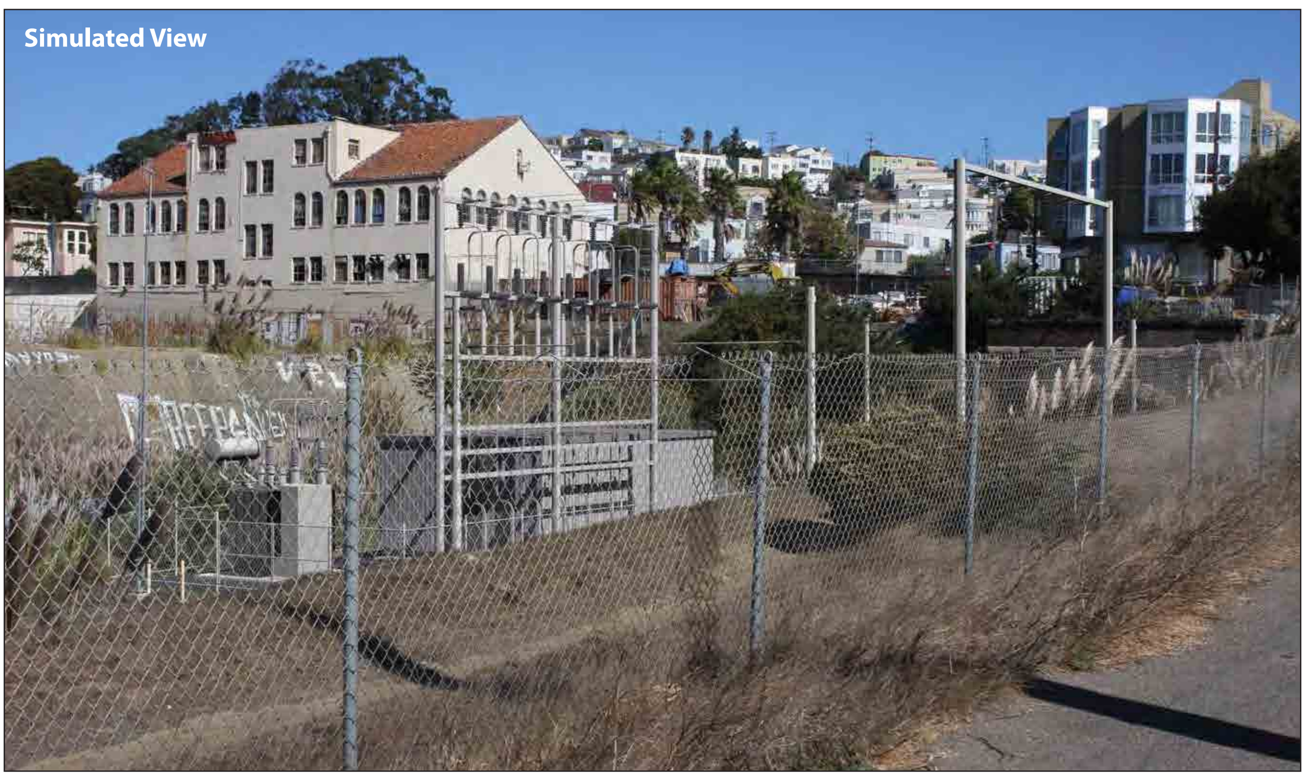
Note: This figure replaces Figure 3.1-2 from the Draft EIR

Figure 3.1-2
Representative Photos
Peninsula Corridor Electrification Project

Looking southwest down the rail corridor with the OCS system, as seen from the San Francisco Caltrain Station at 4th Street

Source: Environmental Vision 2013

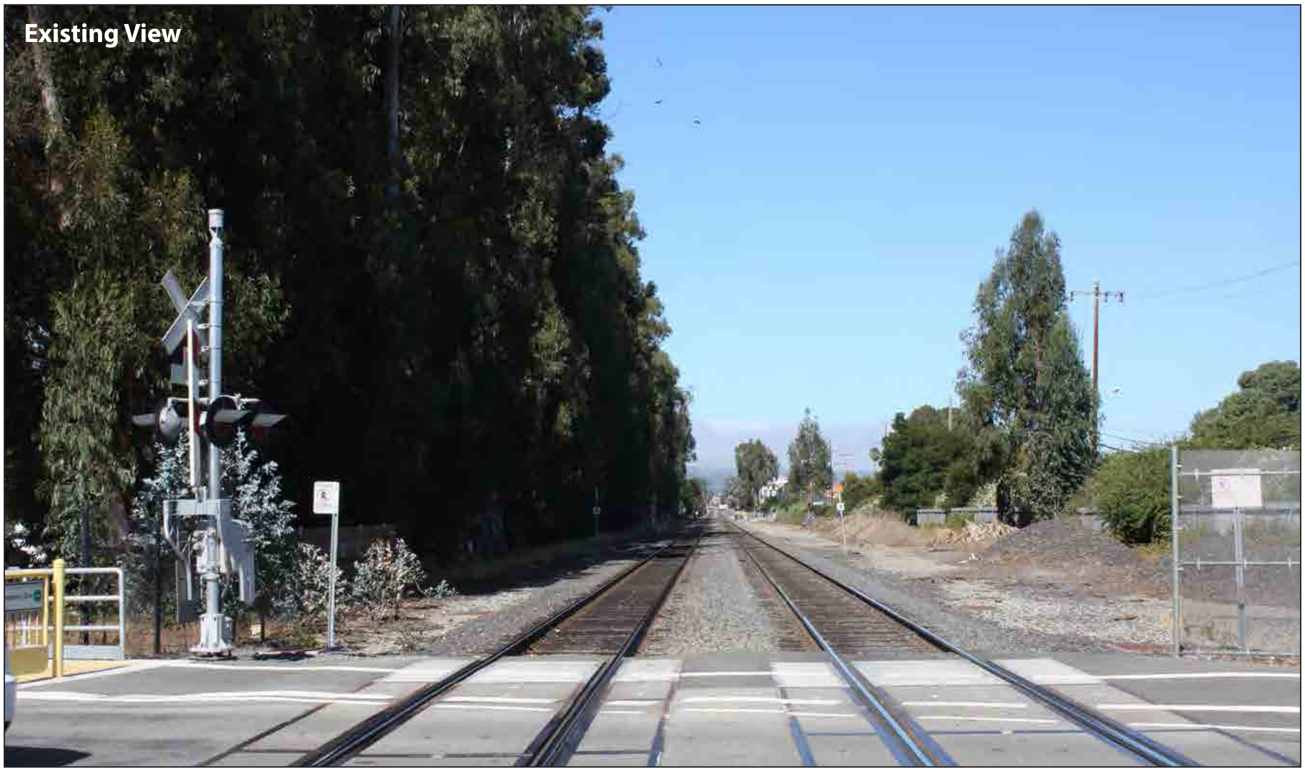
Figure 3.1-3
Simulation 1: 4th and King Station, San Francisco
Peninsula Corridor Electrification Project

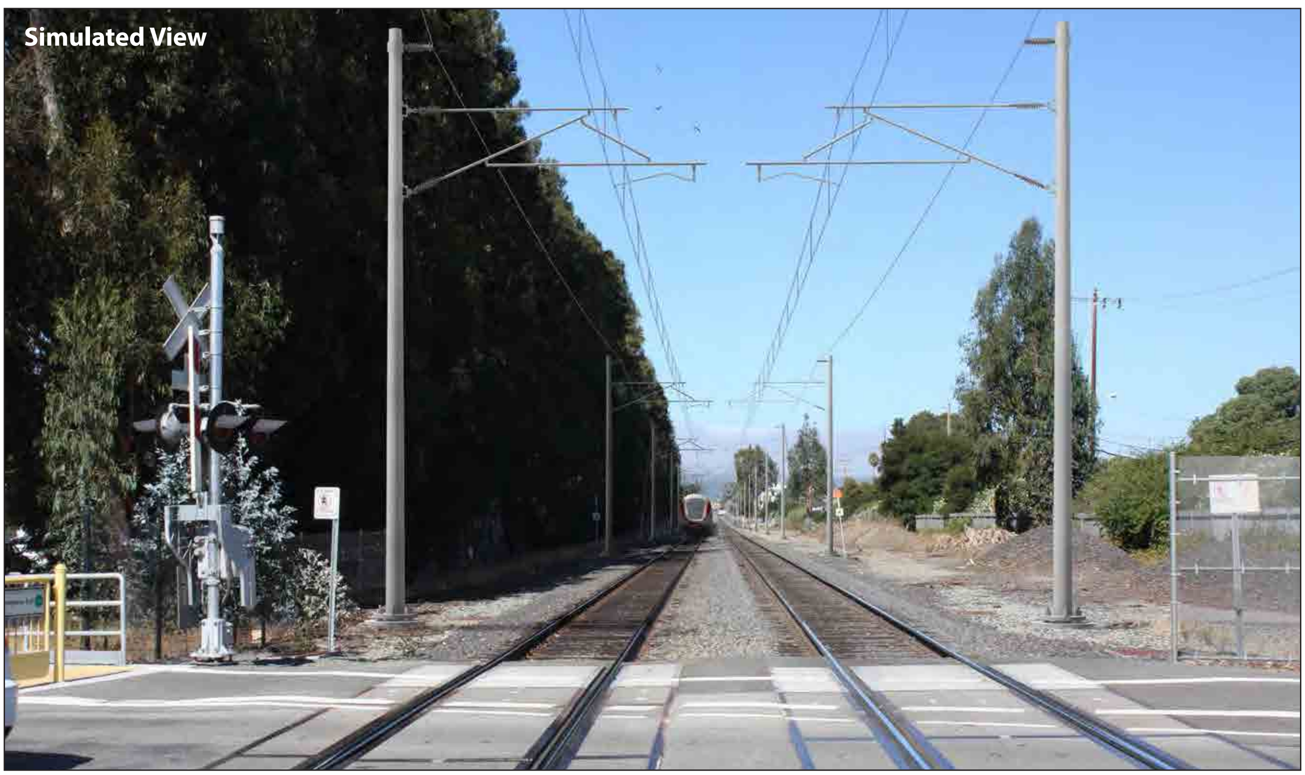


Looking northwest toward the rail corridor with the OCS system and PS2, as seen from Tunnel Avenue near Lathrop Avenue.

Source: Environmental Vision 2013

Figure 3.1-4
Simulation 2: PS2, San Francisco (near Bayshore)
Peninsula Corridor Electrification Project



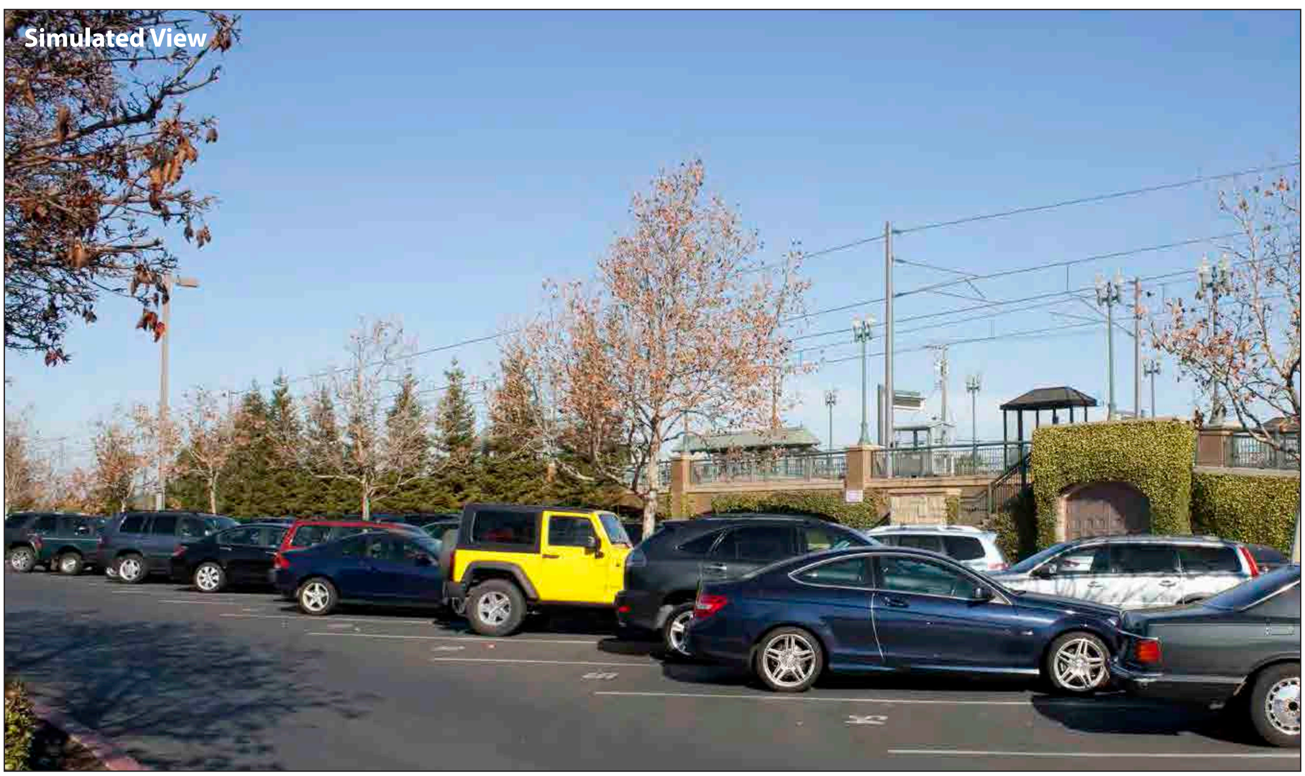


Looking northwest down the rail corridor with the OCS system and tree trimming, as seen from Oak Grove Avenue.

Source: Environmental Vision 2013

Note: This figure replaces Figure 3.1-5 from the Draft EIR

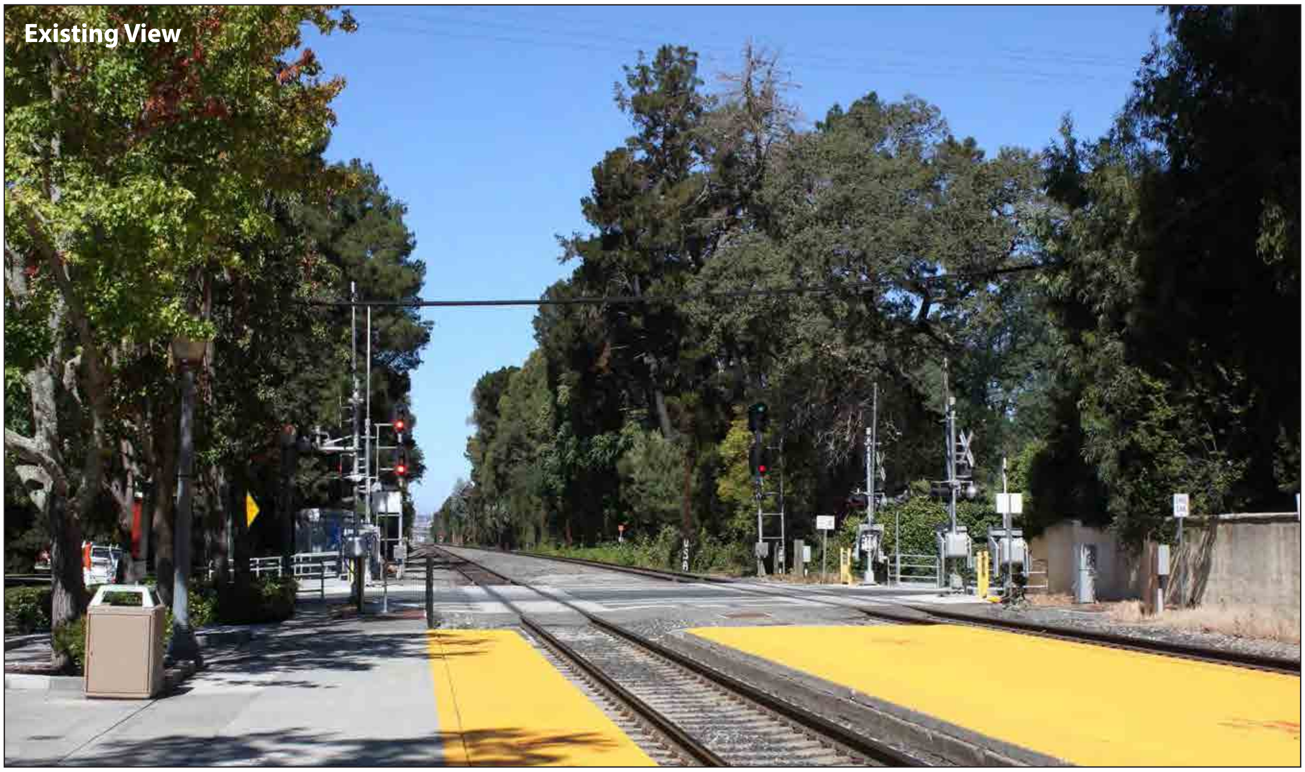
Figure 3.1-5
Simulation 3: Oak Grove Avenue, Burlingame
Peninsula Corridor Electrification Project



Looking northeast toward the OCS system with the headspan and portal arrangement at the San Carlos Caltrain Station, as seen from the station parking lot.

Source: Environmental Vision 2014

Figure 3.1-6
Simulation 4: San Carlos Caltrain Station, San Carlos
Peninsula Corridor Electrification Project



Looking northwest down the rail corridor with the OCS system and tree trimming, as seen from the Atherton Caltrain Station platform near Fair Oaks Lane.

Graphics … 00606.12 FEIR (00359.14) (9-9-2014)

Source: Environmental Vision 2013

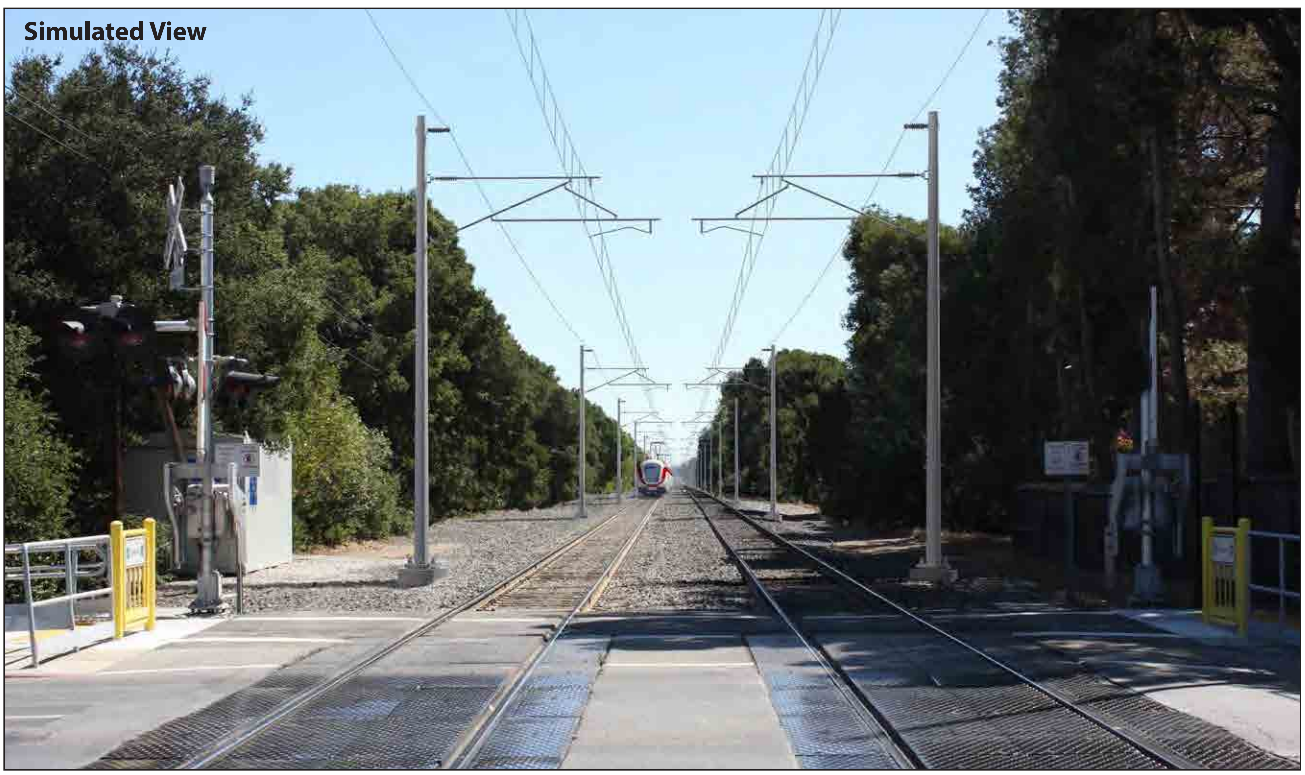
Note: This figure replaces Figure 3.1-7 from the Draft EIR

Figure 3.1-7
Simulation 5: Atherton Caltrain Station, Atherton
Peninsula Corridor Electrification Project

Looking north toward the rail corridor with the OCS system, as seen from Fair Oaks Lane.

Source: Parsons 2004

Figure 3.1-8
Simulation 6: Fair Oaks Grade Crossing, Atherton
Peninsula Corridor Electrification Project



Looking southeast down the rail corridor with the OCS system and tree trimming, as seen from Churchill Avenue.

Source: Environmental Vision 2013

Note: This figure replaces Figure 3.1-9 from the Draft EIR

Figure 3.1-9a
Simulation 7a: Churchill Avenue, Palo Alto
Peninsula Corridor Electrification Project

Looking northwest toward the rail corridor from Alma Street at North California Avenue.

Graphics ... 00606.12 FEIR (00359.14) (9-9-2014)

Source: Environmental Vision 2013

Note: This is a new figure prepared for the Final EIR

Figure 3.1-9b
Simulation 7b: Alma Street, Palo Alto
Peninsula Corridor Electrification Project

Looking northwest down the rail corridor with the OCS system and overbridge protection barrier, as seen from the San Antonio Caltrain Station platform.

Source: Parsons 2004

Figure 3.1-10

Simulation 8: Overbridge Protection Barrier near San Antonio Caltrain Station, Mountain View

Looking northeast toward the OCS system with side pole construction at the San Antonio Caltrain Station, as seen from a multi-story apartment building on the corner of Showers Drive and Pacchetti Way.

Source: Parsons 2004

Figure 3.1-11
Simulation 9: San Antonio Caltrain Station, Mountain View
Peninsula Corridor Electrification Project

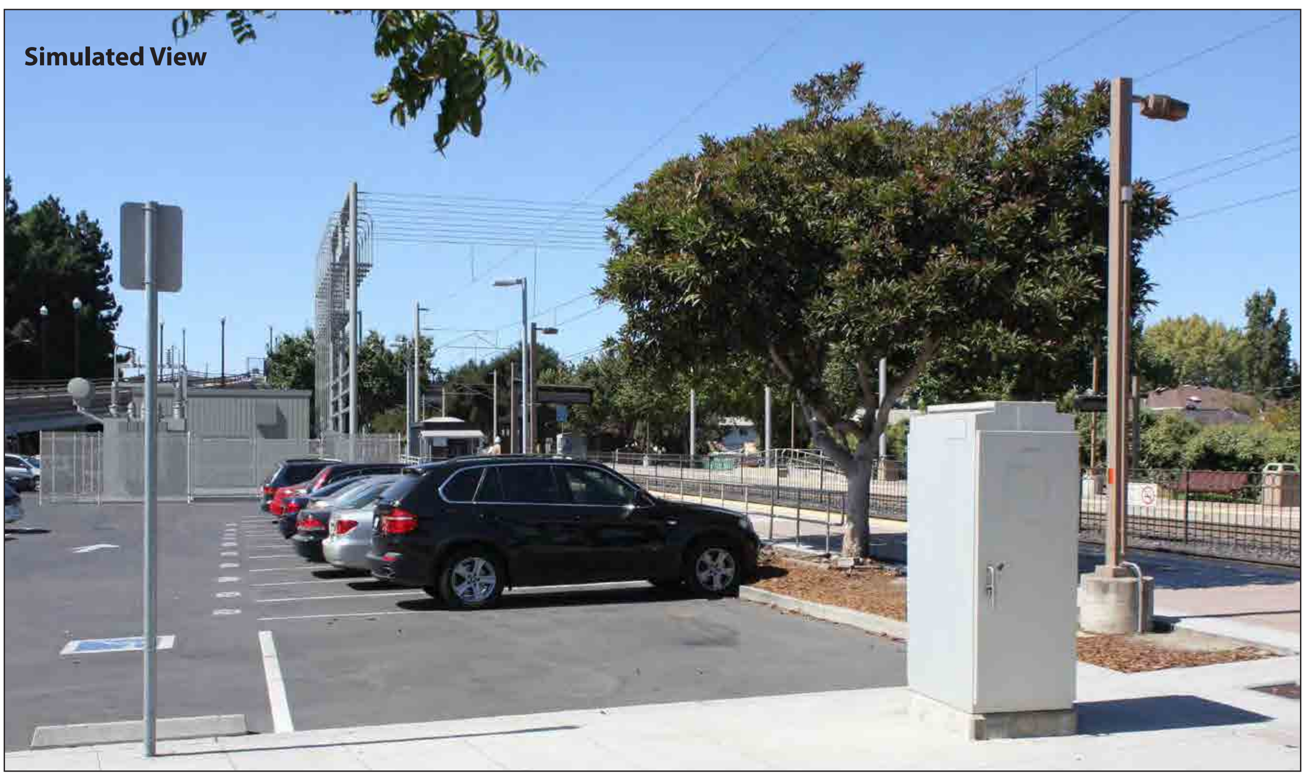
Looking south toward PS6 Option 1, as seen from North Murphy Avenue near West Hendy Avenue.

Graphics ... 00606.12 FEIR (00359.14) (9-9-2014)

Source: Environmental Vision 2014

Note: This figure replaces Figure 3.1-12 from the Draft EIR

Figure 3.1-12
Simulation 10: PS6, Option 1, Sunnyvale
Peninsula Corridor Electrification Project



Looking northwest toward PS6 Option 2, as seen from Sunnyvale Caltrain Station plaza.

Source: Environmental Vision 2013

Note: This figure replaces Figure 3.1-13 from the Draft EIR

Figure 3.1-13
Simulation 11: PS6, Option 2, Sunnyvale
Peninsula Corridor Electrification Project

Looking east toward the rail corridor with the OCS system with side pole construction, as seen from Park Boulevard near Prevost Street.

Source: Parsons 2004

Figure 3.1-14

Simulation 13: OCS System with Side Poles, San Jose

Peninsula Corridor Electrification Project

Looking southeast toward PS7 and the rail corridor with the OCS system, as seen from the Kurte Park pathway.

Source: Environmental Vision 2013

Figure 3.1-15
Simulation 14: PS7, San Jose
Peninsula Corridor Electrification Project

Looking northeast toward PS3, with and without landscape buffer mitigation, as seen from California Drive near Lincoln Avenue.

Source: Parsons 2004

Figure 3.1-16
Simulation 15: PS3, Burlingame
Peninsula Corridor Electrification Project

Existing View

Simulated View with Mitigation Landscaping (Hedge)

Simulated View with Mitigation Landscaping (Trees)

Looking south toward PS5 Option 1, with two types of landscape buffer as mitigation, as seen from Alma Street at Greenmeadow Way.

Source: Environmental Vision 2014

Note: This figure replaces Figure 3.1-17 from the Draft EIR

Figure 3.1-17

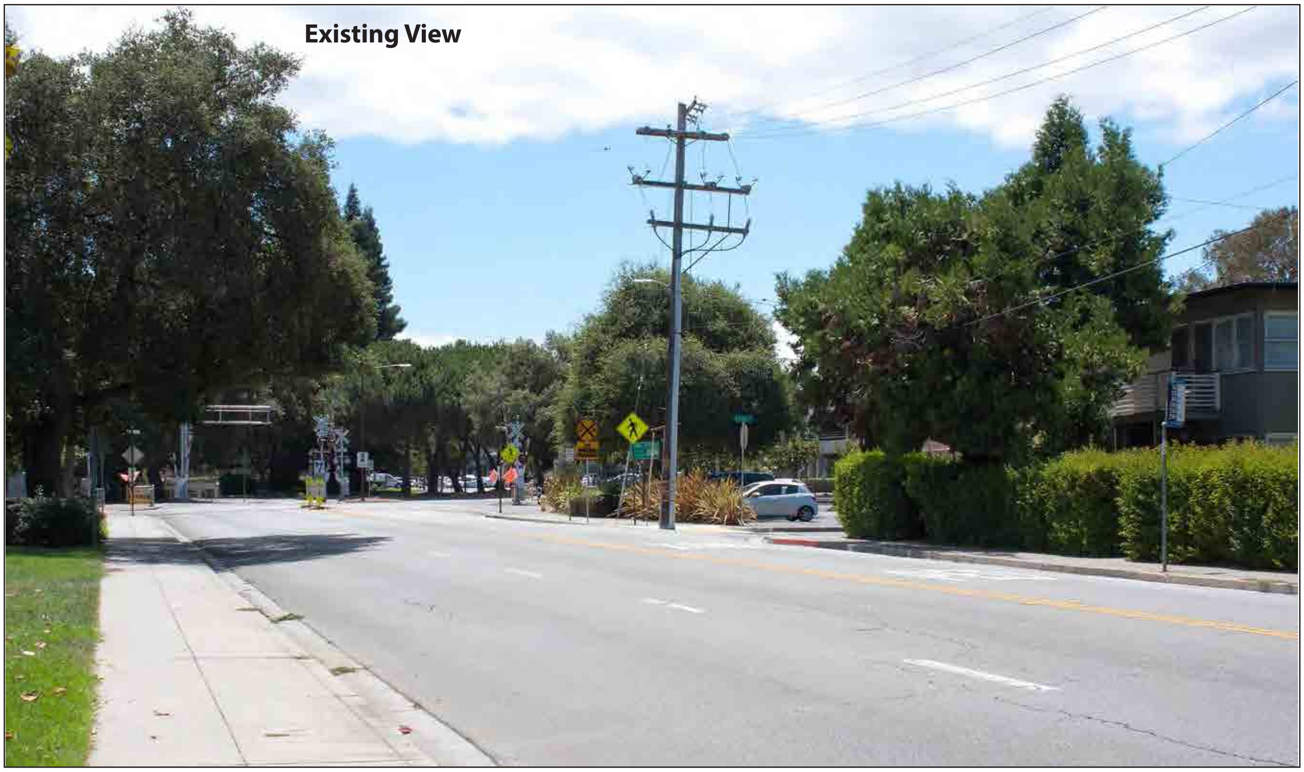
Simulation 16: PS5, Option 1, Palo Alto

Peninsula Corridor Electrification Project

Looking northeast toward the overbridge protection barrier, as seen from San Antonio Road.

Source: Environmental Vision 2013

Figure 3.1-18
Simulation 17: Overbridge Protection Barrier, Mountain View
Peninsula Corridor Electrification Project



Looking southwest toward the rail corridor from Ravenswood Avenue at Noel Drive.

Graphics ... 00606.12 FEIR (00359.14) (9-9-2014)

Source: Environmental Vision 2013

Note: This is a new figure prepared for the Final EIR

Figure 3.1-19a
Simulation 17a: Ravenswood Avenue, Menlo Park
Peninsula Corridor Electrification Project

Looking southwest toward the rail corridor from Glenwood Avenue at Mills Court.

Graphics ... 00606.12 FEIR (00359.14) (9-9-2014)

Source: Environmental Vision 2013

Note: This is a new figure prepared for the Final EIR

Figure 3.1-19b
Simulation 17b: Glenwood Avenue, Menlo Park

3.2 Air Quality

This section addresses the air quality impacts of the Proposed Project on the Caltrain corridor and San Francisco Bay Area Air Basin (SFBAAB). Air pollutants of concern along the Caltrain corridor and in the SFBAAB are ozone (O_3)—including precursors of reactive organic gases (ROG) and oxides of nitrogen (NO_X)—carbon monoxide (CO), and inhalable particulate matter (PM2.5 and PM10). This section reports the type and quantity of emissions that would be generated by the construction and operation of the Proposed Project.

3.2.1 Existing Conditions

3.2.1.1 Regulatory Setting

This section summarizes federal, state, and local regulations that apply to air quality. The air quality management agencies of direct importance in the county are the U.S. Environmental Protection Agency (EPA), the California Air Resources Board (ARB), and Bay Area Air Quality Management District (BAAQMD). EPA has established federal air quality standards for which ARB and BAAQMD have primary implementation responsibility. ARB and BAAQMD are also responsible for ensuring that state air quality standards are met.

Federal

Clean Air Act and National Ambient Air Quality Standards

The federal Clean Air Act (CAA), promulgated in 1963 and amended several times thereafter, including the 1990 Clean Air Act amendments (CAAA), establishes the framework for modern air pollution control. The act directs EPA to establish national ambient air quality standards (NAAQS) for six criteria pollutants: O_3, CO, PM, which consists of PM that is 10 microns in diameter or less (PM10) and PM that is 2.5 microns in diameter or less (PM2.5), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and lead (Pb). The NAAQS are divided into primary and secondary standards; the former are set to protect human health within an adequate margin of safety, the latter to protect environmental values, such as plant and animal life. Table 3.2-1 summarizes the NAAQS.

The CAA requires states to submit a state implementation plan (SIP) for areas in nonattainment for federal standards. The SIP, which is reviewed and approved by EPA, must demonstrate how the federal standards would be achieved. Failing to submit a plan or secure approval can lead to denial of federal funding and permits. In cases where the SIP is submitted by the state but fails to demonstrate achievement of the standards, EPA is directed to prepare a federal implementation plan.

Locomotive Emissions Standards

In March 2008, the EPA adopted a three-part emissions standard program that will reduce emissions from diesel locomotives. The regulation tightens emission standards for existing, remanufactured locomotives; sets near term engine-out emission standards (Tier 3) for newly built locomotives; and sets longer-term standards (Tier 4) for future locomotives. It is expected that the regulation will reduce PM emissions by as much as 90 percent and NO_X emissions by as much as 80 percent when fully implemented.

Table 3.2-1. National and State Ambient Air Quality Standards

Criteria Pollutant	Average Time	California Standards	National Standards[a]	
			Primary	Secondary
Ozone	1-hour	0.09 ppm	None	None
	8–hour	0.070 ppm	0.075 ppm	0.075 ppm
Particulate Matter (PM10)	24-hour	50 μg/m³	150 μg/m³	150 μg/m³
	Annual mean	20 μg/m³	None	None
Fine Particulate Matter (PM2.5)	24-hour	None	35 μg/m³	35 μg/m³
	Annual mean	12 μg/m³	12.0 μg/m³	15 μg/m³
Carbon Monoxide	8-hour	9.0 ppm	9 ppm	None
	1-hour	20 ppm	35 ppm	None
Nitrogen Dioxide	Annual mean	0.030 ppm	0.053 ppm	0.053 ppm
	1-hour	0.18 ppm	0.100 ppm	None
Sulfur Dioxide[b]	Annual mean	None	0.030 ppm	None
	24-hour	0.04 ppm	0.014 ppm	None
	3-hour	None	None	0.5 ppm
	1-hour	0.25 ppm	0.075 ppm	None
Lead	30-day average	1.5 μg/m³	None	None
	Calendar quarter	None	1.5 μg/m³	1.5 μg/m³
	3-month average	None	0.15 μg/m³	0.15 μg/m³
Sulfates	24-hour	25 μg/m³	None	None
Hydrogen Sulfide	1-hour	0.03 ppm	None	None
Vinyl Chloride	24-hour	0.01 ppm	None	None

Sources: California Air Resources Board 2013a.

[a] National standards are divided into primary and secondary standards. Primary standards are intended to protect public health, whereas secondary standards are intended to protect public welfare and the environment.

[b] The final 1-hour SO_2 rule was signed June 2, 2010. The annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until 1 year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

μg/m³ = micrograms per cubic meter

ppm = parts per million

State

California Clean Air Act and California Ambient Air Quality Standards

In 1988, the state legislature adopted the California Clean Air Act (CCAA), which established a statewide air pollution control program. CCAA requires all air districts in the state to endeavor to meet the California ambient air quality standards (CAAQS) by the earliest practical date. Unlike the federal CAA, the CCAA does not set precise attainment deadlines. Instead, the CCAA establishes increasingly stringent requirements for areas that will require more time to achieve the standards. CAAQS are generally more stringent than the NAAQS and incorporate additional standards for sulfates (SO_4), hydrogen sulfide (H_2S), vinyl chloride (C_2H_3Cl), and visibility-reducing particles. The CAAQS and NAAQS are listed together in Table 3.2-1.

ARB and local air districts bear responsibility for achieving California's air quality standards, which are to be achieved through district-level air quality management plans that would be incorporated into the SIP. In California, EPA has delegated authority to prepare SIPs to ARB, which, in turn, has delegated that authority to individual air districts. ARB traditionally has established state air quality standards, maintaining oversight authority in air quality planning, developing programs for reducing emissions from motor vehicles, developing air emission inventories, collecting air quality and meteorological data, and approving SIPs.

The CCAA substantially adds to the authority and responsibilities of air districts. The CCAA designates air districts as lead air quality planning agencies, requires air districts to prepare air quality plans, and grants air districts authority to implement transportation control measures. The CCAA also emphasizes the control of "indirect and area-wide sources" of air pollutant emissions. The CCAA gives local air pollution control districts explicit authority to regulate indirect sources of air pollution and to establish traffic control measures (TCMs).

Local

Bay Area Air Quality Management District/2010 Clean Air Plan

BAAQMD has local air quality jurisdiction over projects in SFBAAB. Responsibilities of BAAQMD include overseeing stationary-source emissions, approving permits, maintaining emissions inventories, maintaining air quality stations, overseeing agricultural burning permits, and reviewing air quality–related sections of environmental documents required by CEQA. The air quality district is also responsible for establishing and enforcing local air quality rules and regulations that address the requirements of federal and state air quality laws and for ensuring that NAAQS and CAAQS are met.

BAAQMD (2011a) has adopted advisory emission thresholds to assist CEQA lead agencies in determining the level of significance of a project's emissions, which are outlined in its *California Environmental Quality Act Air Quality Guidelines* (BAAQMD CEQA Guidelines).[1] BAAQMD has also adopted air quality plans to improve air quality, protect public health, and protect the climate. *The Bay Area 2001 Ozone Attainment Plan* was adopted to reduce ozone and achieve the NAAQS ozone standard; and the *2010 Clean Air Plan* was adopted to provide an integrated control strategy for ozone, PM, Toxic Air Contaminants (TACs), and greenhouse gas (GHG) emissions. BAAQMD also adopted a redesignation plan for CO in 1994. The redesignation plan includes strategies to ensure the continuing attainment of the NAAQS for CO in the SFBAAB.

The Proposed Project may be subject to the following district rules. This list of rules may not be all encompassing as additional BAAQMD rules may apply to the Proposed Project as specific components are identified.

- Regulation 2, Rule 2 (New Source Review). This regulation contains requirements for Best Available Control Technology and emission offsets.
- Regulation 2, Rule 5 (New Source Review of Toxic Air Contaminates). This regulation outlines guidance for evaluating TAC emissions and their potential health risks.

[1] The adoption of the 2011 CEQA guidelines was challenged in court by the Building Industry Association (BIA) who alleged that BAAQMD had to complete a CEQA evaluation of the CEQA thresholds contained in the guidelines prior to adoption. Alameda Superior Court ruled in favor of the BIA and BAAQMD withdrew its adoption of the 2011 guidelines per court orders. BAAQMD appealed the lower court ruling and it was overturned on appeal. BAAQMD has not yet readopted its guidelines, but there is no court order preventing them from doing so. For the purposes of this EIR, Caltrain has determined that there is substantial evidence in the record supporting the BAAQMD guidelines on their own including evidence supporting the thresholds in the 2011 guidelines, regardless of whether BAAQMD formally readopts the guidelines and/or formally recommends their use.

- Regulation 6, Rule 1 (Particulate Matter). This regulation restricts emissions of PM darker than No. 1 on the Ringlemann Chart to less than 3 minutes in any 1 hour.
- Regulation 7 (Odorous Substances): This regulation establishes general odor limitations on odorous substances and specific emission limitations on certain odorous compounds.
- Regulation 8, Rule 3 (Architectural Coatings): This regulation limits the quantity of VOCs in architectural coatings.
- Regulation 9, Rule 6 (Nitrogen oxides emission from natural gas-fired boilers and water heaters). This regulation limits emissions of NO_X generated by natural gas-fired boilers.
- Regulation 9, Rule 8 (Stationary Internal Combustion Engines). This regulation limits emissions of NO_X and CO from stationary internal combustion engines of more than 50 horsepower.

3.2.1.2 Environmental Setting

Air quality is affected by both the rate and location of pollutant emissions and by meteorological conditions that influence movement and dispersal of pollutants. Atmospheric conditions, such as wind speed, wind direction, and air temperature gradients, along with local topography, provide the link between air pollutant emissions and air quality. This section describes regional climate in the project area and provides monitoring data on existing air quality conditions. Receptors along the Caltrain corridor that may be sensitive to increasing levels of air pollution are also identified.

3.2.1.3 Climate and Meteorology

California is divided into 15 air basins based on geographic features that create distinctive regional climates. The Proposed Project is located within the SFBAAB, which contains all of Napa, Contra Costa, Alameda, Santa Clara, San Mateo, San Francisco, and Marin Counties, as well as portions of Sonoma and Solano Counties. Climate is primarily affected by marine air flow and the basin's proximity to the San Francisco Bay. Within the SFBAAB, Caltrain operates in the Peninsula Subregion and the Santa Clara Valley Subregion. The following sections discuss additional climate and meteorological information specific to these areas.

Peninsula Subregion

The Peninsula Subregion extends from northwest of San Jose to the Golden Gate Bridge. The Santa Cruz Mountains run up the center of the Peninsula, with elevations exceeding 2,000 feet at the southern end and decreasing to 500 feet in South San Francisco. Coastal towns experience a high incidence of cool, foggy weather in the summer. Cities in the southeastern Peninsula experience warmer temperatures and fewer foggy days because the marine layer is blocked by the ridgeline to the west. San Francisco lies at the northern end of the Peninsula. Because most of San Francisco's topography is below 200 feet, marine air is able to flow easily across most of the city, making its climate cool and windy.

The blocking effect of the Santa Cruz Mountains results in variations in summertime maximum temperatures in different parts of the Peninsula. For example, in coastal areas and San Francisco the mean maximum summer temperatures are in the mid-60s, while in Redwood City the mean maximum summer temperatures are in the low-80s. Mean minimum temperatures during the winter months are in the high-30s to low-40s in the eastern side of the Peninsula.

Air pollution potential is highest along the southeastern portion of the Peninsula. This is the area most protected from the high winds and fog of the marine layer. Pollutant transport from upwind sites is common. Also, air pollutant emissions are relatively high due to motor vehicle traffic as well as stationary sources. Pollutant emissions are also high, especially from motor vehicle congestion, at the northern end of the Peninsula in San Francisco, but there is more air movement to disperse pollution.

Santa Clara Valley Subregion

The Santa Clara Valley Subregion is bounded by the San Francisco Bay to the north and by mountains to the east, south, and west. Temperatures are warm on summer days and cool on summer nights, and winter temperatures are fairly mild. At the northern end of the valley, mean maximum temperatures are in the low-80s in the summer and the high-50s during the winter, and mean minimum temperatures range from the high-50s in the summer to the low-40s in the winter. Further inland, where the moderating effect of the bay is not as strong, temperature extremes are greater.

The air pollution potential of the Santa Clara Valley is high. High summer temperatures, stable air, and mountains surrounding the valley combine to promote O_3 formation. In addition to the many local sources of pollution, O_3 precursors from San Francisco, San Mateo, and Alameda Counties are carried by prevailing winds to the Santa Clara Valley. The valley tends to channel pollutants to the southeast. In addition, on summer days with low-level inversions, O_3 can be recirculated by southerly drainage flows in the late spring evening and early morning and by the prevailing northwesterlies in the afternoon. A similar recirculation pattern occurs in the winter, affecting levels of CO and particulate matter. This movement of the air up and down the valley increases the impact of pollutants.

Pollution sources are plentiful and complex in this subregion. The Santa Clara Valley has a high concentration of industry in the Silicon Valley at the northern end. Some of these industries are sources of air toxics as well as criteria air pollutants. In addition, Santa Clara Valley's large population and many worksite destinations generate the highest mobile source emissions of any subregion in the Bay Area.

3.2.1.4 Existing Air Quality Conditions

A number of ambient air quality monitoring stations are located in the Bay Area to monitor progress toward air quality standards attainment of the NAAQS and CAAQS (see Table 3.2-1). The BAAQMD maintains these stations. Three BAAQMD monitoring stations are on or near the Caltrain route, as noted below.

- San Francisco-Arkansas Street: Approximately 1 mile southwest of the tracks
- Redwood City station: Approximately 1 mile north of the tracks
- San Jose-Jackson Street station: Approximately 1 mile northeast of the tracks

Table 3.2-2 shows a 3-year summary (2010–2012) of data collected at these stations for monitored air pollutants and the total number of days that state and federal ambient air quality standards were exceeded.

Table 3.2-2. Ambient Air Quality Monitoring Data for the Caltrain Corridor (2010–2012)

	San Francisco-Arkansas Street			Redwood City			San Jose-Jackson Street		
Pollutant Standards	2010	2011	2012	2010	2011	2012	2010	2011	2012
Ozone (O_3)									
Maximum 1-hour concentration (ppm)	0.079	0.070	0.069	0.113	0.076	0.063	0.126	0.098	0.101
Maximum 8-hour concentration (ppm)	0.051	0.054	0.048	0.077	0.061	0.054	0.086	0.067	0.062
Number of days standard exceeded[a]									
CAAQS 1-hour (>0.09 ppm)	0	0	0	2	0	0	5	1	1
CAAQS 8-hour (>0.070 ppm)	0	0	0	1	0	0	3	0	0
NAAQS 8-hour (>0.075 ppm)	0	0	0	1	0	0	3	0	0
Carbon Monoxide (CO)									
Maximum 8-hour concentration (ppm)	1.37	1.20	1.19	1.72	1.67	1.81	2.19	2.18	1.86
Maximum 1-hour concentration (ppm)	1.8	1.8	2.0	3.3	3.8	4.0	2.7	2.4	2.5
Number of days standard exceeded[a]									
NAAQS 8-hour (≥9 ppm)	0	0	0	0	0	0	0	0	0
CAAQS 8-hour (≥9.0 ppm)	0	0	0	0	0	0	0	0	0
NAAQS 1-hour (≥35 ppm)	0	0	0	0	0	0	0	0	0
CAAQS 1-hour (≥20 ppm)	0	0	0	0	0	0	0	0	0
Nitrogen Dioxide (NO_2)									
State maximum 1-hour concentration (ppm)	92.9	93.3	124.0	58.7	56.3	60.4	64.0	61.0	67.2
State second-highest 1-hour concentration (ppm)	92	93	124	58	56	60	64	61	67
Annual average concentration (ppm)	13	14	12	12	12	11	14	14	13
Number of days standard exceeded									
CAAQS 1-hour (0.18 ppm)	0	0	0	0	0	0	0	0	0
Particulate Matter (PM10)[b]									
National[c] maximum 24-hour concentration (μg/m^3)	38.6	43.7	48.2	-	-	-	44.2	41.3	56.5
National[c] second-highest 24-hour concentration (μg/m^3)	36.6	35.6	46.6	-	-	-	37.4	40.1	46.1
State[d] maximum 24-hour concentration (μg/m^3)	39.7	45.6	50.6	-	-	-	46.8	44.3	59.6
State[d] second-highest 24-hour concentration (μg/m^3)	38.0	36.0	48.4	-	-	-	38.0	42.0	48.8
National annual average concentration (μg/m^3)	19.3	18.8	16.9	-	-	-	18.9	18.6	18.8
State annual average concentration (μg/m^3)[e]	-	19.5	17.5	-	-	-	19.5	19.2	18.8

	San Francisco-Arkansas Street			Redwood City			San Jose-Jackson Street		
Pollutant Standards	2010	2011	2012	2010	2011	2012	2010	2011	2012
Number of days standard exceeded[a]									
NAAQS 24-hour (>150 μg/m^3)[f]	0	0	0	-	-	-	0	0	0
CAAQS 24-hour (>50 μg/m^3)[f]	0	0	6	-	-	-	0	0	3
Particulate Matter (PM2.5)									
National[c] maximum 24-hour concentration (μg/m^3)	45.3	47.5	35.7	36.5	39.7	33.3	41.5	50.5	38.4
National[c] second-highest 24-hour concentration (μg/m^3)	41.0	35.6	29.0	31.2	30.7	26.8	36.0	38.7	36.6
State[d] maximum 24-hour concentration (μg/m^3)	-	-	-	32.7	24.0	34.3	41.5	50.5	38.4
State[d] second-highest 24-hour concentration (μg/m^3)	-	-	-	16.7	20.5	19.2	36.0	38.7	36.6
National annual average concentration (μg/m^3)	10.5	9.5	8.2	8.3	8.7	8.5	-	9.8	9.1
State annual average concentration (μg/m^3)[e]	-	-	-	-	8.3	-	9.0	9.9	-
Number of days standard exceeded[a]									
NAAQS 24-hour (>35 μg/m^3)	3	2	1	1	1	0	0	3	2
Sulfur Dioxide (SO_2)									
No data available									

Source: California Air Resources Board 2013b; U.S. Environmental Protection Agency 2013a.

[a] An exceedance is not necessarily a violation.

[b] National statistics are based on standard conditions data. In addition, national statistics are based on samplers using federal reference or equivalent methods.

[c] State statistics are based on local conditions data, except in the South Coast Air Basin, for which statistics are based on standard conditions data. In addition, State statistics are based on California approved samplers.

[d] Measurements usually are collected every 6 days.

[e] State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.

[f] Mathematical estimate of how many days' concentrations would have been measured as higher than the level of the standard had each day been monitored. Values have been rounded.

ppm = parts per million.
NAAQS = National Ambient Air Quality Standards.
CAAQS = California Ambient Air Quality Standards.
μg/m^3 = micrograms per cubic meter.
mg/m^3 = milligrams per cubic meter.
> = greater than.
NA = not applicable.

The data presented in Table 3.2-2 indicate that neither the federal nor state ambient air quality standards for CO or NO_2 were exceeded between 2010 and 2012 at the monitoring stations. Likewise, no violations of the state or federal ozone standards were recorded at the San Francisco-Arkansas Street monitoring station. However, the Redwood City station recorded violations of the ozone standards in 2010 and the San Jose-Jackson Street stations recorded violations in all three monitored years (2010–2012). These data indicate that ozone concentrations are slightly higher near portions of the Proposed Project that are located in the San Jose area. Annual violations of the federal PM2.5 standard were recorded at all stations, and the San Francisco-Arkansas Street and San Jose-Jackson Street both exceeded the state PM10 standard in 2012 (no data for the Redwood City station).

3.2.1.5 Attainment Status

Local monitoring data (Table 3.2-2) are used to designate areas as nonattainment, maintenance, attainment, or unclassified for the NAAQS and CAAQS. The four designations are further defined as:

- Nonattainment—assigned to areas where monitored pollutant concentrations consistently violate the standard in question.
- Maintenance—assigned to areas where monitored pollutant concentrations exceeded the standard in question in the past but are no longer in violation of that standard.
- Attainment—assigned to areas where pollutant concentrations meet the standard in question over a designated period of time.
- Unclassified—assigned to areas were data are insufficient to determine whether a pollutant is violating the standard in question.

Table 3.2-3 summarizes the attainment status of the portions of the project area within San Francisco, San Mateo, and Santa Clara Counties with regard to the NAAQS and CAAQS.

Table 3.2-3. Federal and State Attainment Status of San Francisco, San Mateo, and Santa Clara Counties

	San Francisco		San Mateo		Santa Clara	
Pollutant	Federal	State	Federal	State	Federal	State
Ozone (1 hr)	-	N (serious)	-	N (serious)	-	N (serious)
Ozone (8 hr)	N	N[a]	N	N	N	N
CO	M	A	M[a]	A	M[a]	A
PM10	A/U	N	A/U	N	A/U	N
PM2.5	N	N	N	N	N	N

Sources: U.S. Environmental Protection Agency 2013b; California Air Resources Board 2013c.

[a] Applies only to a portion of the county.

A/U = Attainment/Unclassified
CO = carbon monoxide
M = Maintenance
N = Nonattainment
PM10 = PM that is 10 microns in diameter or less
PM2.5 = PM that is 2.5 microns in diameter or less

3.2.1.6 Sensitive Receptors

The BAAQMD generally defines a sensitive receptor as a facility or land use that houses or attracts members of the population who are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples of sensitive receptors include residential areas, schools, and hospitals. The existing Caltrain corridor and the locations of the TPS outside the ROW are surrounded by a mix of industrial, commercial, residential, and recreational land uses. The closest sensitive receptors (residences) are located immediately adjacent to the Caltrain ROW, with various other receptor locations scattered along the project corridor.

3.2.2 Impact Analysis

3.2.2.1 Methods for Analysis

Air quality impacts associated with construction and operation of the Proposed Project were assessed and quantified using standard and accepted software tools, techniques, and emission factors. A summary of the methodology is provided below. A full list of assumptions can be found in Appendix B, *Air Quality and Greenhouse Gas Analysis Technical Data*.

Construction

Construction of the Proposed Project would generate emissions of ROG, NO_X, CO, PM10, and PM2.5 that would change ambient air quality temporarily in the study area. Emissions would originate from mobile and stationary construction equipment exhaust, employee vehicle exhaust, and haul truck vehicle exhaust. Approximately 2.7 acres would be graded to accommodate the TPSs and switching and paralleling stations.

Mass criteria pollutant emissions from heavy-duty equipment, on-road vehicle trips, and land disturbance were estimated using the California Emissions Estimator Model (CalEEMod) (version 2013.2.2) and the ARB's EMFAC2011 model. Vehicle and equipment assumptions were provided by the JPB (Cocke pers. comm. a) and are summarized in Appendix B. Horsepower and load factors were based on CalEEMod default data for equipment types similar to those expected for Proposed Project construction. Re-entrained road dust from construction vehicle operation in the project area was calculated using PM emission factors obtained from the EPA (2011).

Exposure to construction-related diesel particulate matter (DPM) was assessed by predicting the health risks in terms of excess cancer, non-cancer hazard impacts, and elevated PM2.5 concentrations. A screening-level health risk assessment (HRA) was performed according to the following steps.

1. Evaluation of increased DPM cancer risk and the DPM non-cancer hazard impact based on the mass emissions of PM10 and PM2.5 exhaust estimated with CalEEMod.
2. Using EPA's AERSCREEN model, which is the screening-level model for AERMOD, prediction of PM10 and PM2.5 hourly concentrations at sensitive land uses based on the maximum daily exhaust emissions for each construction period.
3. Calculation of the project-level cancer risk, non-cancer hazard index (HI), and annual PM2.5 concentrations for each Proposed Project phase based on the AERSCREEN hourly concentrations and the construction durations using BAAQMD-approved methodology.

4. Identification of background stationary sources within 1,000 feet of Caltrain corridor using Google Earth map files provided by BAAQMD. The Google Earth map files include estimated risk and hazard impacts at nearby receptors from these sources (BAAQMD 2011b).

5. Calculation of the cumulative health risks by adding the background health risk sources identified in step 4 to the project-level health risk and hazard impacts estimated in step 3.

Operation

Proposed Project operation would generate emissions of ROG, NO_X, CO, PM10, and PM2.5 that could result in long-term changes to ambient air quality. The Proposed Project fleet during the first fully operational year (2020) would consist of nine diesel locomotives, 96 Electric Multiple Units (EMU), and 45 trailer cars. By 2040, assuming a fully electrified service between San Jose and San Francisco[2], a total of six diesel locomotives, 138 to 150 EMUs, and 31 trailer cars (for the San Jose to Gilroy service) would operate in the project corridor. Proposed Project operation would also affect regional traffic volumes and onroad fuel consumption through increased transit ridership. The operational emissions analysis considers criteria pollutants generated by these sources.

Caltrain operation presently consists of diesel locomotive-hauled, bi-level passenger train cars. Operation of these trains currently generates mobile source emissions, which would be effectively replaced with operational emissions associated with the Proposed Project. The difference, or *delta*, in operational emissions between the existing Caltrain service and the Proposed Project represents the net new impact of the Proposed Project analyzed in this document. The Proposed Project would not affect operational emissions from existing transit stations or maintenance activities. Further, the new traction power facilities (substations, paralleling stations, and a switching station) are not a source of emissions. Accordingly, these sources are not discussed further.

Locomotive fuel consumption data for existing conditions, the Proposed Project and No Project scenarios were provided by the staff (Cocke pers. comm. b), and regional vehicle miles traveled (VMT) in the study area were provided by Santa Clara Valley Transportation Authority travel forecasting model (Naylor pers. comm.). Criteria pollutants generated by locomotive fuel consumption were estimated using emission factors obtained from the EPA (2009). Mass emissions from changes in regional VMT and onroad fuel consumption were quantified using the Caltrans' CT-EMFAC emissions model. Please refer to Appendix B for additional information on modeling assumptions and calculation methods.

While the Proposed Project would increase electricity consumption relative to existing conditions, the energy would be supplied by the California electrical grid. Power plants located throughout the state supply the grid with power, which would be distributed to the Caltrain corridor to meet Project demand. Because these power plants are located throughout the state, criteria pollutant emissions associated with the increased electricity required for Proposed Project operation would not likely all occur within the SFBAAB but rather occur on a distributed basis across the state (or even possibly out of state). However, as a worst-case analysis for regional air quality, emissions

[2] The Proposed Project only includes funding for electrification of approximately 75 percent of the fleet between San Jose and San Francisco. It is assumed for the sake of analysis that funding will be procured by 2040 for fully electrified service. In addition, fully electrified service is required in order to support future high-speed rail Blended Service, which is presently proposed to start sometime between 2026 and 2029 on the San Francisco Peninsula.

associated with the Proposed Project electricity consumption were included in operational analysis on the assumption that they would all occur within the SFBAAB.

The analysis of health risks of project operations typically considers receptor exposure to both DPM and CO hotspots. While NO_X and ROG influence overall atmospheric chemistry, they do not drive primary health risks associated with the types of activities that would occur under the Proposed Project. Accordingly, this analysis of health risks focuses on DPM and CO, which are the primary pollutants of concern with regard to operational mobile source emissions and local health risks.

Proposed Project implementation would reduce the number of diesel locomotives operating along the Caltrain corridor between San Francisco and San Jose, and would therefore reduce localized DPM concentrations. Accordingly, project-level operational DPM health risks were assessed qualitatively instead of comparing to BAAQMD's project-level HRA thresholds because there would be a beneficial project-level impact. Potential CO hotspots as a result of localized traffic increases around Caltrain stations associated with increased ridership were evaluated using traffic data from the traffic analysis and the CALINE4 dispersion model.

3.2.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the Proposed Project would be considered to have a significant impact if it would result in any of the conditions listed below.

- Conflict with or obstruct implementation of the applicable air quality plan.
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a nonattainment area for an applicable federal or state ambient air quality standard.
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

According to the State CEQA Guidelines, the significance criteria established by the applicable air quality management or air pollution control district may be relied on to make significance determinations for potential impacts on environmental resources. As discussed above, BAAQMD is responsible for ensuring that state and federal ambient air quality standards are not violated within the SFBAAB. Analysis requirements for construction- and operational-related pollutant emissions are contained in the BAAQMD CEQA Guidelines (Bay Area Air Quality Management District 2011a). The BAAQMD CEQA Guidelines also contain thresholds of significance for ozone, CO, PM2.5, PM10, TACs, and odors; these thresholds are presented in Table 3.2-4.

In August 2013, the Court of Appeal reversed a Superior Court ruling that the BAAQMD needed to comply with CEQA prior to adopting the 2010 CEQA Guidelines and significance thresholds. The Superior Court had issued a writ of mandate ordering BAAQMD to set aside the thresholds and cease their dissemination until BAAQMD complied with CEQA. The Court of Appeal ruled that adoption of guidelines and thresholds is not considered a project subject to CEQA review and adoption of the significance thresholds was not arbitrary and capricious. As of February 2014, BAAQMD has yet to formally re-recommend its CEQA Guidelines and significance thresholds for use by local agencies.

Table 3.2-4. Bay Area Air Quality Management District Project-Level Criteria Pollutant Emissions Thresholds

Pollutant	Construction	Operations
ROG	54 lbs/day	54 lbs/day or 10 tons/year
NO_X	54 lbs/day	54 lbs/day or 10 tons/year
CO	–	Violation of CAAQS
PM10 (total)	–	-
PM10 (exhaust)	82 lbs/day	82 lbs/day or 15 tons/year
PM2.5 (exhaust)	54 lbs/day	54 lbs/day or 10 tons/year
PM10 /PM2.5 (fugitive dust)	Implementation of best management practices	-
TACs (Project-level)	Increased cancer risk of 10 in 1 million; increased non-cancer risk of greater than 1.0 (HI); PM2.5 increase of greater than 0.3 micrograms per cubic meter	Same as construction
TACs (cumulative)	Increased cancer risk of 100 in 1 million; increased non-cancer risk of greater than 10.0 HI; PM2.5 increase of greater than 0.8 microgram per cubic meter at receptors within 1,000 feet	Same as construction
Odors	–	Five complaints per year averaged over 3 years

Source: Bay Area Air Quality Management District 2011a.

CAAQS	=	California ambient air quality standards
CO	=	carbon monoxide
HI	=	hazard index
NO_X	=	oxides of nitrogen
PM10	=	PM that is 10 microns in diameter or less
PM2.5	=	PM that is 2.5 microns in diameter or less
ROG	=	reactive organic gases
TAC	=	toxic air contaminants

3.2.2.3 Impacts and Mitigation Measures

Changes resulting from Project Variant 1 (Electrification to just south of the Tamien Station) and Project Variant 2 (Defer electrification of storage tracks at the 4th and King Station) are described below each impact analysis.

Impact AQ-1	Conflict with or obstruct implementation of the applicable air quality plan
Level of Impact	Less than significant

Santa Clara County is currently designated a nonattainment area for the federal 8-hour ozone and PM2.5 standards, as well as a maintenance area for the federal CO standard (Table 3.3-3). The BAAQMD air quality attainment plans are the *2001 Ozone Attainment Plan* and the *1994 CO*

Redesignation Request and Maintenance Plan. BAAQMD also adopted the *2010 Clean Air Plan*, which provides an integrated strategy to control ozone, PM, TACs, and GHG emissions. The BAAQMD plans estimate future emissions in the SFBAAB and determine strategies necessary for emissions reductions through regulatory controls. Emissions projections are based on population, vehicle, and land use trends typically identified by the BAAQMD, Metropolitan Transportation Commission (MTC), and Association of Bay Area Governments (ABAG).

A project is deemed inconsistent with air quality plans if it would result in population and/or employment growth that exceeds estimates used to develop applicable air quality plans. Projects that propose development that is consistent with the growth anticipated by the relevant land use plans would be consistent with the current BAAQMD air quality plans. Likewise, projects that propose development that is less dense than anticipated within a general plan (or other governing land use document) would be consistent with the air quality plans because emissions would be less than estimated for the region. If a project proposes development that is greater than the anticipated growth projections, the project would be in conflict with BAAQMD air quality plans and might have a potentially significant impact on air quality because emissions would exceed those estimated for the region. This situation would warrant further analysis to determine if a proposed project and surrounding projects would exceed the growth projections used in the BAAQMD air quality plans for a specific subregional area.

As discussed in Section 3.10, *Land Use and Recreation*, the Proposed Project would not result in significant environmental impacts with respect to consistency with local general plans and policies. Likewise, as noted in Section 3.12, *Population and Housing*, the proposed improvements would not result in population of housing growth. The Proposed Project would increase service and ridership on the Caltrain system. However, this increased service would not materially increase the overall growth pressure in the communities served by Caltrain because Caltrain presently serves only developed areas and the Proposed Project would not provide new access to undeveloped areas. Accordingly, the Proposed Project would not induce growth and would be consistent with recent growth projections for the region.

Based on the above analysis, the Proposed Project would be consistent with recent growth projections for the region and would not conflict with the current BAAQMD air quality plans. While short-term emissions would be generated during construction, these would be mitigated below BAAQMD's significance thresholds (see Impact AQ-2a). Moreover, the Proposed Project would contribute to MTC's goals to improve long-term air quality. Long-term operation of the Proposed Project would also contribute to annual emissions reductions throughout the region. Accordingly, the Proposed Project would not conflict with or obstruct implementation of any applicable land use plan or policy. Therefore, the impact would be less than significant.

<u>Neither Project Variant 1 nor 2 would change the impact description above because they would not meaningfully change the project conditions relative to air quality plans. For construction, both variants would lower emissions. Project Variant 2 (Deferral of electrification of storage tracks at the San Francisco 4th and King Station) would have minimally higher operational emissions, but would not change the emission reductions of the project overall compared to No Project Conditions.</u>

Impact AQ-2a	Violate any air quality standard or contribute substantially to an existing or projected air quality violation during Proposed Project construction
Level of Impact	Significant
Mitigation Measures	AQ-2a: Implement BAAQMD basic and additional construction mitigation measures to reduce construction-related dust AQ-2b: Implement BAAQMD basic and additional construction mitigation measures to control construction-related ROG and NO_X emissions AQ-2c: Utilize clean diesel-powered equipment during construction to control construction-related ROG and NO_X emissions
Level of Impact after Mitigation	Less than significant

Proposed Project construction has the potential to create air quality impacts through the use of heavy-duty construction equipment, construction worker vehicle trips, and truck hauling trips. In addition, fugitive dust emissions would result from grading associated with the traction power substations and the switching and paralleling stations. Mass criteria pollutant emissions generated by these sources were quantified using CalEEMod (version 2013.2.2) and information provided by JPB staff.

Estimated construction emissions are summarized in Table 3.2-5. The duration of construction and the intensity of construction activity have a substantial effect on the amount of emissions occurring at any one time. Consequently, Table 3.2-5 only presents the maximum daily emissions that would occur during each construction year. These values represent the highest emissions levels associated with construction activities. Violations of the BAAQMD thresholds are shown in underline. Please refer to Appendix B, *Air Quality and Greenhouse Gas Analysis Technical Data*, for additional information on emissions modeling and quantification methods.

Table 3.2-5. Maximum Unmitigated Construction Emissions (pounds per day)

				PM10		PM2.5	
Year	ROG	NO_X	CO	Exhaust	Dust	Exhaust	Dust
2015	1	13	7	1	0	1	0
2016	3	39	45	1	7	1	2
2017	6	75	36	3	1	3	0
2018	5	60	33	3	1	2	0
2019	3	32	21	1	0	1	0
Threshold	54	54	-	82	BMPs	54	BMPs

Note: The construction analysis assumed completion by 2019 which would be more compressed than now expected in that construction is expected to be completed by 2020 or 2021. The analysis using 2019 would be more conservative than a more elongated schedule to 2020 and 2021 and thus may slightly overstate annual construction emissions.

BMPs = best management practices
CO = carbon monoxide
NO_X = oxides of nitrogen
PM10 = PM that is 10 microns in diameter or less
PM2.5 = PM that is 2.5 microns in diameter or less
ROG = reactive organic gases

As shown in Table 3.2-5, maximum daily NO_X emissions generated in 2017 and 2018 would exceed the BAAQMD's significance threshold. Emissions would result primarily from offroad equipment and haul truck trips.

Mitigation is required to reduce NO_X emissions. Mitigation is also required to reduce fugitive dust emissions pursuant to the BAAQMD's CEQA Guidelines, which consider dust impacts to be less than significant through the application of best management practices (BMPs). Mitigation Measures AQ-2a and AQ-2b outline the BAAQMD's basic and advanced construction mitigation measures for exhaust and fugitive dust emissions. Mitigation Measure AQ-2c will reduce NO_X emissions and requires offroad equipment to be rated Tier 3 (or higher).

Table 3.2-6 summarizes estimated construction emissions after the incorporation of Mitigation Measures AQ-2a through AQ-2c. As shown in the table, NO_X emissions would not exceed the BAAQMD's significance thresholds after implementation of onsite mitigation. Accordingly, with implementation of Mitigation Measures AQ-2a through AQ-2c, construction impacts would be reduced to less than significant.

Table 3.2-6. Maximum Mitigated Construction Emissions (pounds per day)

				PM10		PM2.5	
Year	ROG	NO_X	CO	Exhaust	Dust	Exhaust	Dust
2015	1	8	7	1	0	1	0
2016	2	26	45	1	5	1	1
2017	4	47	36	3	1	3	0
2018	3	37	33	2	1	2	0
2019	2	20	21	1	0	1	0
Threshold	54	54	-	82	BMPs	54	BMPs

Note: As noted above, the analysis assumes construction completion in 2019, but construction is likely to be completed in 2020 or 2012 and thus the results above may overstate the annual level of construction emissions due to use of a more compressed construction schedule.

CO = carbon monoxide
NO_X = oxides of nitrogen
ROG = reactive organic gases
PM10 = PM that is 10 microns in diameter or less
PM2.5 = PM that is 2.5 microns in diameter or less
BMPs = best management practices

With Project Variant 1 (Electrification to just south of the Tamien Station), the Caltrain corridor would only be electrified to just south of the Tamien Station. Therefore, there would be approximately 1.2 fewer miles of construction activities and, thus, fewer construction emissions. Under Project Variant 2, the electrification of the storage tracks at the 4th and King Station in San Francisco would be deferred. Therefore, there would similarly be fewer construction emissions. However, Mitigation Measures AQ-2a through AQ-2c would still apply and implementation of either or both Project Variants would not change this impact's level of significance.

Mitigation Measure AQ-2a: Implement BAAQMD basic and additional construction mitigation measures to reduce construction-related dust

JPB will require all construction contractors to implement the basic and additional construction mitigation measures recommended by BAAQMD to reduce fugitive dust emissions. Emission reduction measures will include, at a minimum, the following measures. Additional measures may be identified by BAAQMD or the contractor as appropriate.

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) will be watered two times per day.
- All haul trucks transporting soil, sand, or other loose material off site will be covered.
- All visible mud or dirt track-out onto adjacent public roads will be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
- All vehicle speeds on unpaved roads will be limited to 15 mph.
- All roadways, driveways, and sidewalks to be paved will be completed as soon as possible. Building pads will be laid as soon as possible after grading unless seeding or soil binders are used.
- A publicly visible sign will be posted with the telephone number and person to contact at the lead agency regarding dust complaints. This person will respond and take corrective action within 48 hours. BAAQMD's phone number will also be visible to ensure compliance with applicable regulations.
- All grading and demolition will be suspended when wind speeds exceed 20 mph.
- Wind breaks will be installed on the windward side(s) of actively disturbed areas of construction.
- Vegetative ground cover (e.g., fast-germinating native grass seed) will be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.
- The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time will be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.
- Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent.

Mitigation Measure AQ-2b: Implement BAAQMD basic and additional construction mitigation measures to control construction-related ROG and NO_X emissions

JPB will implement the following BAAQMD-recommended basic and additional control measures to reduce ROG and NO_X emissions from construction equipment.

- All construction equipment will be maintained and properly tuned in accordance with manufacturer's specifications. All equipment will be checked by a certified mechanic and determined to be running in proper condition prior to operation.
- Minimize the idling time of diesel powered construction equipment to two minutes. Clear signage will be provided for construction workers at all access points.

- Require that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NO_X and PM.
- Require all contractors use equipment that meets the ARB's most recent certification standard for off-road heavy duty diesel engines.

Mitigation Measure AQ-2c: Utilize clean diesel-powered equipment during construction to control construction-related ROG and NO_X emissions

JPB will ensure that all offroad diesel-powered equipment used during construction will be equipped with an EPA Tier 3 or cleaner engines, except for specialized construction equipment in which an EPA Tier 3 engine is not available. This mitigation measure assumes emission reductions compared with a fleet-wide average Tier 2 engine.

Impact AQ-2b	Violate any air quality standard or contribute substantially to an existing or projected air quality violation during Proposed Project operation
Level of Impact	Less than significant (beneficial)

Proposed Project operation has the potential to create air quality impacts primarily associated with transit operation and changes in regional traffic patterns. Transit operation would generate criteria pollutants through diesel fuel consumption to power the diesel locomotives. Changes in regional traffic would primarily affect emissions levels through changes in gasoline consumption associated with the diversion of private automobile trips to public transit. Emissions generated under the No Project scenario, including fuel consumption by the diesel locomotives and regional vehicles, represent the baseline, against which the Proposed Project is evaluated.

Criteria Pollutant Emissions relative to Diesel Combustion, Electricity Generation, and Changes in Vehicle Miles Travelled

Existing conditions (2013) and estimated operational emissions in 2020 and 2040 with and without the project are summarized in Table 3.2-7. The difference in operational emissions between the Proposed Project and the existing Caltrain service represents the net change over existing conditions. The difference between the Proposed Project and the No Project scenarios represents the impact of the Proposed Project.

As shown in Table 3.2-7, implementation of the Proposed Project would substantially reduce criteria pollutant emissions relative to the existing Caltrain service and relative to the No Project scenario in both 2020 and 2040. Reductions in Caltrain system criteria pollutant emissions compared with existing (2013) conditions would range from 66 to 86 ~~56 to 84~~ percent for the 2020 scenario, depending on the pollutant, and from 78 to 97 ~~77 to 96~~ percent for the 2040 scenario, depending on the pollutant (comparison with existing condition does not take into account VMT reduction emissions). The No Project Caltrain system emissions would also be less than existing conditions due to improvements in diesel engine technology (see Table 3.2-7).

Table 3.2-7. Estimated Operational Emissions (pounds per day)

Condition	ROG	NOx	CO	PM10	PM2.5
Existing (2013)					
Caltrain Diesel Consumption	251	5,973	637	159	154
Caltrain Electricity Consumption	0	6	5	0	0
Total Caltrain System Emissions[a]	251	5,979	642	159	155
No Project (2020)					
Caltrain Diesel Consumption	45	1,043	731	23	23
Caltrain Electricity Consumption	0	4	4	0	0
Total Caltrain System Emissions[a]	46	1,048	735	24	23
Project (2020)					
Caltrain Diesel Consumption	32	707	131	21	20
Caltrain Electricity Consumption	5	105	86	5	5
Total Caltrain System Emissions[a]	37	812	218	26	25
Change in VMT emissions[b]	-159	-330	-1,296	-181	-53
Total Project Emissions	-122	482	-1,078	-155	-27
No Project (2040)					
Caltrain Diesel Consumption	23	539	689	8	8
Caltrain Electricity Consumption	0	4	4	0	0
Total Caltrain System Emissions[a]	23	543	693	8	8
Project with Full Electrification (2040)[c]					
Caltrain Diesel Consumption	1	26	33	0.4	0.4
Caltrain Electricity Consumption	6	133	109	6	6
Total Caltrain System Emissions[a]	7	159	142	7	7
Change in VMT Emissions[b]	-487	-1,009	-3,866	-483	-145
Total Project Emissions	-480	-850	-3,724	-477	-138
Comparisons					
2020 Caltrain System vs. Existing (2013)[d]	-373	-5,497	-1,720	-315	-182
2040 Caltrain System with Full Electrification vs. Existing (2013)[c,d]	-503	-1,393	-4,417	-485	-146
2020 Project vs. 2020 No Project[e]	-168	-566	-1,813	-179	-50
2040 Project with Full Electrification vs. 2040 No Project [c,e]	-503	-1,393	-4,417	-485	-146
BAAQMD Thresholds	**54**	**54**	**--**	**82**	**54**

[a] Includes diesel and electricity emissions; VMT-related reductions due to increased ridership are not included.
[b] Includes the net change in VMT from the No Project to the Proposed Project scenarios associated with increased ridership.
[c] The Proposed Project includes 75% electrified service from San Jose to San Francisco. Fully electrified service from San Jose to San Francisco is presumed by 2040 but is not presently fully funded.
[d] Comparison of Caltrain system emissions only. Changes in VMT emissions are not included.
[e] Includes changes in Caltrain system emissions and changes in VMT emissions.

CO = carbon monoxide
NO_X = oxides of nitrogen
ROG = reactive organic gases
PM10 = PM that is 10 microns in diameter or less
PM2.5 = PM that is 2.5 microns in diameter or less
VMT = vehicle miles traveled

Proposed Project emissions would be lower than under the No Project scenario in both 2020 and 2040. The difference in emissions would be a direct result of the Proposed Project, which would consume less diesel fuel than the No Project condition and would operate energy efficient EMUs. These features would enable the Proposed Project to increase transit service while reducing criteria pollutant emissions, relative to the No Project Caltrain system. In addition, due to the increase in service achieved by the Proposed Project, a greater number of riders would use Caltrain instead of driving. As discussed in Section 3.14, *Transportation and Traffic*, regional VMT in the peak and off-peak periods would be less under the 2020 Project scenario compared with the 2020 No Project scenario. Total daily VMT under the 2020 Project scenario is projected to decrease by approximately 235,000 miles compared with the 2020 No Project scenario. Removing vehicles from major highways and arterials ~~which~~ would reduce regional transportation emissions (as compared to the No Project scenario) (see Table 3.2-7).

~~This would~~ Overall, the project would result in substantially less emissions than under No Project Conditions, which would be an air quality benefit. Accordingly, this impact is considered less than significant. Additional discussion of particulates is provided after Table 3.2-7, but the overall conclusion for particulates is also that the project would have less than significant impacts and overall regional reduced particulate emissions compared to No Project conditions.

Particulate Matter Due to Wheel-Rail Interaction

Particulate matter may also be generated from friction between rail and locomotive wheels (wheel-rail interaction). This abrasion process can suspend metals such as iron, chromium, manganese, and copper, which can attach to the airborne particulates. This is an existing condition relative to the existing Caltrain and freight trains operating along the Caltrain corridor. The project would increase the number of trains/day by 22 trains/day compared to the 94 to 125 trains/day at present using the corridor between San Jose Diridon Station and San Francisco (including Caltrain, freight, ACE, Capitol Corridor, and Amtrak).

The amount of abrasion is influenced by the condition of the wheels and track as well as the weight on the train wheels. Because the EMUs are expected to be lighter and newer than today's diesel locomotives and carriages, they will result in lesser wear of the rails (Caltrain 2009 – EMU Report). Accordingly, while there will be approximately 20 percent more trains with the project, the new EMUs will result in less abrasion on a per train basis than existing diesel equipment. Thus, although the number of trains will increase, it may or may not result in an actual increase in particulate emissions due to wheel/rail contact.

While receptors adjacent to the Caltrain ROW may be exposed to particulates from existing and future operations, the contribution of wheel/rail wear particulates to the overall PM10 composition is expected to be minimal and well below established exposure guidelines. For example, Gehrig et al. (2007) measured PM10 and its elemental composition near two busy railway stations in Switzerland that serve over 700 trains per day, nearly exclusively electric locomotives (thus excluding diesel train emissions). Results of their study indicate that the difference in PM10 levels between urban background locations and locations 10 meters from the railway ranged from 1.4 to 2.0 $\mu g/m^3$.[3] Total PM10 levels ranged from 22.8 to 23.7 $\mu g/m^3$ at the three railway study sites indicating that railway contributions might be 6 to 8 percent of the total PM10 level. PM10

[3] The overall PM10 results are only slightly outside the uncertainty level reported for the study of 0.9 $\mu g/m^3$, thus there is some uncertainty in the overall results.

concentrations were also noted to decrease rapidly as function of distance. It is expected that elemental concentrations along the Caltrain ROW would be far lower than those reported by Gehrig et al. (2007), which are based on over 700 trains per day whereas the busiest part of the Caltrain Corridor has only 125 trains today (between Santa Clara and San Jose). It is important to note that this study did not specifically attribute the increases only due to wheel-rail abrasion, and thus the results may also reflect minor contributions of particulates due to induced wind as well as pantograph contact strip wear on electrical trains.

Other studies on wheel-rail interaction confirm that while slightly elevated concentrations of PM10 can be observed along railways, the concentrations are minimal and may be lower than levels generated from tier and brake wear along roadways (Kam 2013).

There are no studies of the exact particulate levels along the Caltrain ROW compared to urban background locations on the San Francisco Peninsula. Thus, a conceptual evaluation has been completed as follows. As noted above, the PCEP would increase train totals on the corridor by 22 trains. Using the Gehrig studies above, and crudely scaling down for the number of additional trains on the Caltrain Corridor (22/700), PM10 contributions due to increased trains might be rail wear today might be 0.04 to 0.06 $\mu g/m^3$. By comparison, the 24-hour California standard for PM10 is 50 $\mu g/m^3$ so this increase is only about 0.1% of the standard. While this is a somewhat crude estimate that is based on reasoning by proxy, it does demonstrate that the likely contributions of PM10 related to the increased number of trains and increased rail wear is very small.

Moreover, as noted above, the potential for increased rail abrasion and resultant particle suspension due to an increase in the number of trains may be somewhat or entirely offset due to the lighter weight and lesser friction of the EMU equipment compared to the diesel equipment it is replacing. Furthermore, the project will result in a substantial reduction in diesel engine PM10 emissions compared to existing and No Project conditions which will more than offset any minor increase in rail wear that might occur.

Particulate Emissions due to Entrained Dust

Another potential source of particulates from increased numbers of trains is due to the induced wind from passing trains. Trains create gusts of wind as they pass along the ROW that are short-lived and affect the area immediately adjacent to the tracks themselves. The California High-Speed Rail Authority (CHSRA 2012) studied induced winds for the Fresno-Merced segment EIR. In that study, CHSRA looked at FRA guidance and literature studies, EPA methodologies for modelling wind erosion, contacted researchers in the field, and performed calculations to identify potential induced wind and the effect on particulate matter concentrations along the high-speed rail segment. The study noted that an exact, analytical equation describing the induced wind from passing HSTs is unavailable because the technical means of obtaining it do not exist. Consequently, generally accepted scientific methods were used to extrapolate data from existing HST studies to approximate the induced winds expected from the California HST. The results showed that for trains running up to 220 mph, there would be minor resuspension of PM 10 and PM2.5 outside the track gravel between 3 to 10 feet from the train with no resuspension beyond 10 feet.

Using the same methodology as the CHSRA study, the potential for resuspension was estimated for the Caltrain service with the PCEP. The Caltrain service is only up to 79 mph and thus the induced winds are far lower than HST running at 220 mph. When running at 79 mph, the estimated induced winds within the first ten feet of the train range from 13 mph (1 foot from the train) to 4 mph (10 feet from the train). Using these estimated induced winds, assuming there is friable soil immediately adjacent to the rails (whereas in reality most of the ROW is graveled) and conservative assumptions about the threshold friction velocity of soils along the ROW (e.g., the wind speed necessary to suspend particulates), it is estimated that potential wind erosion due to induced wind would be limited to the first three feet from the train. Over the approximate 52 mile project area from San Jose to San Francisco, assuming the area within three feet were actually covered in friable soil (instead of gravel), annual fugitive dust emissions for the Caltrain service as a whole would be estimated as 1.49 tons of PM10 and 0.22 tons of PM 2.5. Averaging this on a daily basis, it would be 8.2 lbs./day of PM10 and 1.23 lbs./day of PM2.5. These are estimates for the Caltrain service as a whole. As noted above, this analysis assumes friable soils are along the entire 52-mile Caltrain corridor, whereas much of the ROW adjacent to the rails is covered in gravel (including the 3 feet from the track edge at virtually all locations), and thus is an unrealistic overestimate of the potential for particulate resuspension. This analysis also assumes that over a year, the soils in the right of way adjacent to the rails is disturbed twice monthly by maintenance, thus making soil available for resuspension.

In reality, there is very little residual soil on the gravel along the tracks that could be actually resuspended and the induced wind beyond the first three feet from the tracks falls to less than a conservative estimate of the threshold friction velocity. The existing 92 Caltrain trains per day is likely already resuspending the small amount of friable soil present within gravel along the tracks. As a result, the addition of 22 additional trains per day is not likely to result in any meaningful change in particulate resuspension along the tracks. The amount of increased fugitive dust from induced wind due to the PCEP is a trivial amount by comparison to the amount of reduced particulates from switching from diesel locomotives to EMUs.

Particulates from Pantograph Contact Strip Wear

As described in Chapter 2, the pantograph contact strips on the EMUs consist of a carbon-copper matrix. The wear characteristics of in-use pantograph contact strips of New Jersey Transit (NJT) are similar to those likely to be used for the PCEP and thus were used as the basis of evaluation for the EIR. New pantograph contact strips were weighed and compared to contact strips that had been changed out as part of regular inspection cycles. Based on the material loss over the inspection cycle period and the average miles travelled during the same period by an average vehicle, a wear characteristic pattern was calculated on a per mile basis. The average weight loss per contact strip was determined to be 10.4 grams per 1,000 miles. The impact per pantograph was identified as twice the individual strip due to the fact that there are two contact strips per pantograph on the NJT vehicles and thus the material loss per vehicle would be 20.8 grams per 1,000 miles (LTK 2014-PANTO).

In 2020, the PCEP would result in approximately 8 EMUs per peak hour (both directions) operating between San Jose and San Francisco In 2040, the PCEP would result in approximately 12 EMUs per peak hour (both directions) operating between San Jose and San Francisco. Peak hours would be the highest period of EMU activity. The project includes 6-car EMU consists. For the purposes of this analysis, it was assumed that half of the EMUs would be powered (meaning their pantograph would be active), which is a common operating scenario (actual operating scenario may vary). On a weekday daily basis, the PCEP would result in approximately 90 EMU trains per day in 2020 and 114 EMU trains per day in 2040 between San Jose and San Francisco. Using weekday daily miles, EMU daily particulate emissions from pantograph collector strip wear would be approximately 0.5 lb./day in 2020 and 0.7 lb/day in 2040.

As shown in the revised air quality analysis in the FEIR not including pantograph wear, in 2020 the PCEP would result in a net regional reduction of PM10 emissions of 179 lbs/day and a net regional reduction of PM2.5 of 50 lbs/day compared to No Project conditions. Focusing only on train emissions along the Caltrain ROW, in 2020, the PCEP would result in PM10 and PM2.5 emissions 136 to 132 lbs less than existing conditions (87 percent reduction). Compared to the 2020 No Project conditions, the project would have slightly (2 lbs./day) lower weekday train emissions along the Caltrain ROW, but this difference would only be changed by 0.5 lbs/day in 2020 when including the pantograph wear particulate emissions, and this calculation does not include the positive effect of lowering vehicle emissions along the San Francisco peninsula with the project. At any rate, the difference between the project and No Project train emissions overall is less than the BAAQMD thresholds even when including pantograph particulate emissions. A similar conclusion applies in the 2040 timeframe. As shown above, the particulate emissions along the ROW due to the pantograph wear are an extremely small source of emissions.

Tree Removal Effect on Particulates

The project would result in the removal of trees that are within 18 to 21 feet of the outer track edge.

While vegetative barriers have been shown to reduce PM10 and PM2.5 emissions under certain circumstances, their effectiveness is variable and heavily influenced by wind speed conditions (California Air Resources Board 2012; Cahill 2008). Average annual wind speeds along the project corridor range from 6.8 miles per hour (mph) to 10.3 mph (Western Regional Climate Center 2014). Induced winds from train movement, estimated as ranging from 4 to 10 mph in the first 10 feet adjacent to the train (see discussion above relative to entrained dust) can also contribute for vegetation very close to the tracks. Laboratory research conducted by Cahill (2008) demonstrates that at a wind speeds ranging of 8.4 mph with vegetation very close to and in the direct line of dispersion from the particulate source, PM removal effectiveness for three different tree types (redwood, deodar and live oak) ranged from 2 to 26 percent. Other studies document the complexity of vegetative barriers, with variable results depending on particular size, leaf density, tree species, season, and tree spacing (Steffens et al. 2012, Hagler et al. 2012). Some studies have even documented potential *increases* in downstream pollutant concentrations as a result of certain vegetative conditions (Fitzgerald and Bush 2013).

While there is some evidence that removal of existing trees could reduce filtration benefits, the research is variable, highly-location dependent, and limited with respect to real-world quantification. In addition, the specifics of the Caltrain diesel emissions need to be taken into account. The train's diesel engine exhaust exits the engine and is dispersed vertically at the top of the train meaning that it is not emitted directly toward adjacent trees, but rather is dispersed into the air column and then transported downwind. PM10 an remain suspended in the air for minutes to hours and travel from a hundred yards to as much as 30 miles (BAAQMD, no date). PM2.5 can remain suspended in the air for days or weeks, and can travel hundreds of miles before settling out of the air column (BAAQMD, no date). As a result, the PM10 emitted by diesel trains vertically from the train are not necessarily being filtered by the trees immediately adjacent to the right of way that may be most affected by project tree removal.

Even if one were to make the unrealistic assumption that the existing vegetation achieved the 26 percent filtration rate from the Cahill study (2008), electrification of the Caltrain system by 2020 would still result in over 80 percent reduction in PM10 emissions along the ROW, relative to the existing conditions. Similarly, comparisons to the No Project conditions would not be substantially changed even if you used the 26 percent assumption.

Given the pattern of train emission dispersion and the annual average wind speeds in the project area, and current literature that documents the variability in the effectiveness of vegetative barriers, the above example likely substantially overstates existing benefits achieved by trees within the Caltrain ROW. Moreover, as EMUs replace the remaining diesel locomotives over time, Caltrain will be able to completely eliminate diesel emissions from the Caltrain ROW, improving further the net PM10 reductions compared to existing conditions and No Project conditions.

Combined Effects of Project on Particulate Matter Emissions

As described above, the project will affect particulate matter in emissions in a number of ways. The dominant effect of the project is to lower diesel engine particulate emissions by replacing diesel locomotives with EMUs. While EMUs eliminate diesel engine emissions, there will be minor particulate emissions due to pantograph contact strip wear. With increased numbers of trains (independent of whether they are EMUs or diesel trains in the alternatives considered), there is a potential for increased rail wear, although with lighter EMUs this will likely be offset. With increased numbers of trains there is also the potential to increased particulates from induced winds from passing trains. With tree removal, there is a potential for a minor reduction in the filtering action of particulates adjacent to the ROW.

Above, a number of conceptual examples were derived to give an idea of the magnitude of the changes in particulate emissions other than the diesel engine emissions. Using those conceptual examples (while noting the limitations described above for each of the estimates), Table 3.2-8 gives an idea of the potential rough net effect of the project on particulate emissions compared to existing conditions.

Table 3.2-8. Comparison of 2020 Daily PM10 Emissions using Conceptual Estimates for Other Particulate Sources (lb/day)

	Existing	2020 No Project	PCEP 2020	Notes
Diesel Engine Emissions	159	23	21	From Table 3.2-7
Wheel-Rail Particulates	NA	NA	NA	Negligible change from existing conditions for PCEP or alternatives per discussion above, so not meaningful for comparison.
Entrained Particulates (Conceptual Estimate)	NA	NA	NA	Area adjacent to ROW is graveled and contains limited soil available for resuspension.
Pantograph Particulate Emissions	0	0	0.5	From calculations above.
Subtotal Emissions Along ROW	*159*	*23*	*21*	
Tree Removal Benefit	NA	NA	NA	Speculative to estimate reductions over entire route given varying tree cover, density, and proximity to route. Tree cover is also absent in many commercial, industrial, and open areas and is low density in other areas.
Subtotal Net Emissions Along ROW	*159*	*23*	*21*	
Electricity Emissions	0	0	5	Non-PCEP conditions include a small amount of emissions for idle power when plugged in at terminal.
Total Caltrain System	*159*	*24*	*26*	
Lowered VMT emissions	NA	0	-181	VMT reductions are relative to 2020 No Project.
TOTAL	**NA**	**24**	**-155**	

As shown by the analysis in Table 3.2-9, even using highly conservative assumptions, the Proposed Project would not result in a significant impact related to particulate emissions when taking into account diesel emissions, electricity generation, lowered VMT-related emissions, wheel-rail contact, entrained particulates, pantograph particulates, and potential effects due to tree removal. The analysis in Table 3.2-9 is for illustrative purposes as the methods and assumptions used for the analysis of emissions other than diesel emissions, electricity generation and VMT-related emissions involves a high level of uncertainty and thus does not have a sufficient level of scientific certainty in the result. Thus, the results presented in Table 3.2-7 represent the best estimate of particulate emissions for the Proposed Project.

Table 3.2-9. Comparison of Daily PM10 Caltrain Emissions using Conceptual Estimates for Other Particulate Sources For a Hypothetical Mile with Consistent Tree Buffer (Between San Jose and San Francisco) (lb/day)

	Existing	2020 No Project	PCEP 2020	Notes
Diesel Engine Emissions	3.07	0.45	0.35	Only includes emissions for diesel emissions north of San Jose divided by route miles.
Wheel-Rail Particulates	NA	NA	NA	Negligible change from existing conditions for PCEP or alternatives per discussion above, so not meaningful for comparison.
Entrained Particulates	NA	NA	NA	Area adjacent to ROW is graveled and contains limited soil available for resuspension.
Pantograph Particulates	0.00	0.00	0.01	
Subtotal Emissions Along ROW	*3.07*	*0.45*	*0.36*	
Tree Removal Benefit - LOW (Conceptual Estimate)	-0.06	-0.01	0.00	Used lower range (2%) of Cahill estimate for 8.4 mph wind speed in laboratory study. No reduction assumed for PCEP although replanting mitigation may provide some benefit in certain locations.
Tree Removal Benefit - HIGH (Conceptual Estimate)	-0.80	-0.12	0.00	Used higher range (26%) of Cahill estimate for 8.4 mph wind speed in laboratory study. No reduction for PCEP. Likely substantially overstates reduction because assumes complete filtering of train diesel emissions by trees next to ROW, when train diesel emissions are emitted vertically and disperse broadly, not horizontally and given periodic openings in most tree buffer areas.
Total Net Emissions per hypothetical mile (Low tree filtration scenario)	*3.01*	*0.44*	*0.36*	*Excludes VMT reductions of PCEP and alternatives*
Total Net Emissions per hypothetical mile (High tree filtration scenario)	*2.27*	*0.34*	*0.36*	*Excludes VMT reductions of PCEP and alternatives*

Note: Even if one used the hypothetical high tree filtration scenario and multiplied by the nominal 51-mile route from San Jose to San Francisco, the difference between the PCEP and the No Project (excluding VMT reduction) would only be 1 lb./day of PM10, which would be less than significant in comparison to the BAAQMD threshold of 54 lbs/day. Multiplying by 51-miles and including VMT reduction, the PCEP would have lower PM10 emissions than existing and No Project conditions.

Project Variant Impact Analysis

With Project Variant 1 (Electrification to just south of the Tamien Station), the Caltrain corridor would only be electrified to just south of Tamien Station. Under the Proposed Project, EMUs would only operate to just south of Tamien Station. Therefore, there would be no changes to operational emissions.

Under Project Variant 2, the electrification of the storage tracks at the 4th and King Station in San Francisco would be deferred. Normal commuter train operations would be the same as the Proposed Project. If maintenance or repair of EMUs would require the EMUs to be on the storage tracks, then a diesel yard hauler would be required to push or pull the EMUs onto the storage tracks and to push or pull the EMUs back onto the electrified tracks after service or repair. Under No Project conditions, such train movements would be using either diesel locomotives or diesel yard haulers and thus this variant would not represent in any increase compared to No Project conditions. While emissions would be slightly higher than the Proposed Project, this activity would be limited in extent and duration and would not meaningfully change the emissions of the Proposed Project.

Impact AQ-3a	Cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard during Proposed Project construction
Level of Impact	Significant
Mitigation Measures	AQ-2a: Implement BAAQMD basic and additional construction mitigation measures to reduce construction-related dust AQ-2b: Implement BAAQMD basic and additional construction mitigation measures to control construction-related ROG and NO_X emissions AQ-2c: Utilize clean diesel-powered equipment during construction to control construction-related ROG and NO_X emissions
Level of Impact after Mitigation	Less than significant

BAAQMD has identified project-level thresholds to evaluate criteria pollutant impacts (see Table 3.2-4). In developing these thresholds, BAAQMD considered levels at which project emissions would be cumulatively considerable. The BAAQMD CEQA Guidelines state,

> In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. If a project exceeds the identified significance thresholds, its emissions would be cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions. Therefore, additional analysis to assess cumulative impacts is unnecessary.

The criteria pollutant thresholds presented in Table 3.2-4 therefore represent the maximum emissions the Proposed Project may generate before contributing to a cumulative impact on regional air quality. Consequently, exceedances of the project-level thresholds would be cumulatively considerable.

As discussed in Impact AQ-2a, construction emissions associated with the Proposed Project would exceed BAAQMD's threshold of significance. Mitigation Measures AQ-2a through AQ-2c would be required to reduce construction-related emissions to a less-than-significant level.

As discussed above, with Project Variant 1, the Caltrain corridor would only be electrified to just south of Tamien Station and there would be approximately 1.2 fewer miles of construction activities and, thus, fewer construction emissions. Under Project Variant 2, the electrification of the storage tracks at the 4th and King Station in San Francisco would be deferred. Therefore, there would similarly be fewer construction emissions. However, Mitigation Measures AQ-2a through AQ-2c would still apply and implementation of either or both of these project variants would not change this impact's level of significance.

Impact AQ-3b	Cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard during Proposed Project operation
Level of Impact	Less than significant

As shown in Table 3.2-7, implementation of the Proposed Project would reduce criteria pollutant emissions relative to the existing Caltrain service. This would be an air quality benefit and contribute to cumulative criteria pollutant reductions within the SFBAAB. Accordingly, this impact is considered less than significant.

With Project Variant 1, the Caltrain corridor would only be electrified to just south of Tamien Station. Under the Proposed Project, EMUs would only operate to just south of Tamien Station. Therefore, there would be no changes to operational emissions. Under Project Variant 2, the electrification of the storage tracks at the 4th and King Station in San Francisco would be deferred. Operational emissions would be slightly higher because a diesel train would be required to push or pull EMUs onto and back from the storage tracks. Diesel emissions for these moves to the storage tracks would be the same as No Project conditions and would be limited in extent and duration. Thus neither of these variants would change the impact conclusion regarding air quality.

Impact AQ-4a	Expose sensitive receptors to substantial pollutant concentrations during Proposed Project construction
Level of Impact	Less than significant

Diesel-fueled engines, which generate DPM, would be used during Project construction. BAAQMD considers ultra-fine particle (PM2.5) emissions to be the DPM of greatest health concern. Cancer health risks associated with exposure to diesel exhaust are typically associated with chronic exposure, in which a 70-year exposure period is assumed. In addition, DPM concentrations, and thus cancer health risks, dissipate as a function of distance from the emissions source. BAAQMD has determined that construction activities occurring at distances of greater than 1,000 feet from a sensitive receptor likely do not pose a significant health risk.

Multiple sensitive receptors (e.g., residences) are located within 1,000 feet of construction locations. The nearest receptors are directly adjacent to the Caltrain ROW. Therefore, exposure to construction DPM emissions were assessed by predicting the health risks in terms of excess cancer, non-cancer hazard impacts, and elevated DPM (PM2.5) concentrations.

A screening-level HRA was performed using the AERSCREEN dispersion model and the mitigated PM10 and PM2.5 exhaust emissions (see Table 3.2-6). The results of the HRA are summarized in Table 3.2-~~8~~10 and are compared with BAAQMD's project-level DPM thresholds. Note that Table 3.2-~~8~~10 presents the maximum health risks associated with Proposed Project construction along the corridor, which occur at approximately 164 feet (50 meters) from the construction fence line. Detailed information on emissions modeling may be found in Appendix B.

Table 3.2-~~8~~10. Maximum Project-Level Health Risks during Construction[a]

	Maximum Project Health Risks		
Construction Phase and Location	Annual Non-Cancer Hazard Index	Increased Cancer Risk (per million)[b]	Annual PM2.5 Concentration (μg/m³)
Utilities	0.004	0.149	0.000
Traction Power Substation	0.010	1.302	0.001
Overhead Contact System	0.010	1.046	0.002
Signal & Grade Crossings	0.003	0.190	0.000
Communications	0.001	0.068	0.000
Integration/Commissioning	0.000	0.009	0.000
Total for All Construction	0.023 (for worst-year)	2.76	0.003 (for worst-year)
BAAQMD Thresholds	1	10	0.3
Exceed Thresholds?	*No*	*No*	*No*

[a] Analysis assumes implementation of all applicable onsite mitigation (Mitigation Measures AQ-2b and AQ-2c).

[b] Health risks were determined by taking the worst-year emissions for each construction element and multiplying by the years of activity for total construction. This approach likely overstates actual emissions.

μg/m³ = Micrograms per cubic meter
BAAQMD = Bay Area Air Quality Management District
PM2.5 = PM that is 2.5 microns in diameter or less

As shown in Table 3.2-~~8~~10, Proposed Project construction would not result in significant increases of the non-cancer HI, cancer risk, or annual PM2.5 concentrations. Therefore, the project-level impact is considered less than significant.

With Project Variant 1, the Caltrain corridor would only be electrified to just south of Tamien Station and there would be approximately 1.2 fewer miles of construction activities and, thus, fewer construction emissions. Under Project Variant 2, the electrification of the storage tracks at the 4th and King Station in San Francisco would be deferred. Therefore, there would similarly be fewer construction emissions. Implementation of either or both Project Variants would not change this impact's level of significance.

Impact AQ-4b	Expose sensitive receptors to substantial pollutant concentrations during Proposed Project operation
Level of Impact	Less than significant

~~Operational~~ CO Emissions from Onroad Vehicles

Changes in regional traffic patterns associated with the Proposed Project have the potential to create CO hotspots at intersections in the study area. Existing (2013) and 2020 and 2040 traffic (with and without the Proposed Project) were modeled to evaluate CO concentrations relative to the state and federal air quality standards (see Table 3.2-1). CO concentrations were modeled at the following study area intersections, as identified in the traffic impact assessment prepared by Fehr & Peers (see Appendix D, *Transportation Analysis*):

- 7th Street & 16th Street in San Francisco.

- El Camino Real & Millbrae Avenue in Millbrae.
- 31st Avenue & El Camino Real in San Mateo.
- El Camino Real & Fair Oaks Lane in Atherton.
- Central Expressway & North Rengstorff Avenue in Mountain View.
- Kifer Road & Lawrence Expressway in Santa Clara.

Table 3.2-~~9~~11 presents the results of the CO hotspot modeling and indicates that CO concentrations are not expected to contribute to any new localized violations of the 1-hour or 8-hour ambient air quality standards. This impact is therefore considered less than significant.

Table 3.2-~~9~~11. Modeled CO Concentrations at Affected Intersections (parts per million)

		Existing (2013)[b]		Project (2020)[b]				Future (2040)[b]			
				No Project		Project		No Project		Project	
Intersection	RE[a]	1-hr[c]	8-hr[e]	1-hr[c]	8-hr[e]	1-hr[c]	8-hr[e]	1-hr[c]	8-hr[e]	1-hr[c]	8-hr[e]
7th Street & 16th Street	1	5.2	3.1	4.6	2.7	4.6	2.7	4.4	2.6	4.4	2.6
	2	5.0	3.0	4.3	2.5	4.3	2.5	4.1	2.4	4.1	2.4
	3	5.1	3.1	4.5	2.6	4.5	2.6	4.2	2.4	4.2	2.4
	4	5.0	3.0	4.5	2.6	4.5	2.6	4.2	2.4	4.2	2.4
El Camino Real & Millbrae Avenue	5	6.8	4.3	5.8	3.6	5.8	3.6	5.1	3.1	5.1	3.1
	6	6.2	3.8	5.5	3.3	5.5	3.3	4.9	2.9	4.9	2.9
	7	6.4	4.0	5.3	3.2	5.4	3.3	4.9	2.9	5.0	3.0
	8	6.5	4.0	5.6	3.4	5.6	3.4	5.1	3.1	5.1	3.1
31st Avenue & El Camino Real	9	5.8	3.6	4.9	2.9	4.9	2.9	4.5	2.6	4.5	2.6
	10	6.0	3.7	5.0	3.0	5.0	3.0	4.6	2.7	4.6	2.7
	11	5.6	3.4	4.8	2.9	4.8	2.9	4.4	2.6	4.4	2.6
	12	5.9	3.6	5.0	3.0	5.0	3.0	4.6	2.7	4.6	2.7
El Camino Real & Fair Oaks Lane	13	6.0	3.7	4.9	2.9	4.9	2.9	4.6	2.7	4.6	2.7
	14	6.8	4.3	5.4	3.3	5.3	3.2	4.9	2.9	4.8	2.9
	15	5.2	3.1	4.5	2.6	4.5	2.6	4.2	2.4	4.2	2.4
	16	6.9	4.3	5.4	3.3	5.4	3.3	4.8	2.9	4.8	2.9
Central Expressway & N Rengstorff Avenue	17	6.3	3.9	5.1	3.1	5.2	3.1	4.7	2.8	4.8	2.9
	18	5.7	3.5	4.9	2.9	4.9	2.9	4.7	2.8	4.7	2.8
	19	6.2	3.8	5.2	3.1	5.2	3.1	4.7	2.8	4.7	2.8
	20	5.7	3.5	4.9	2.9	4.9	2.9	4.6	2.7	4.6	2.7
Kifer Road & Lawrence Expressway	21	7.2	4.5	5.5	3.3	5.5	3.3	4.9	2.9	5.0	3.0
	22	8.1	5.2	6.0	3.7	6.1	3.8	5.3	3.2	5.3	3.2
	23	7.3	4.6	5.6	3.4	5.6	3.4	5.1	3.1	5.1	3.1
	24	7.5	4.7	5.8	3.6	5.7	3.5	5.0	3.0	5.0	3.0

[a] Receptors 1 through 16 were placed 3 meters from the traveled way at each intersection corner.
[b] Background concentrations of 3.7 and 2.1 ppm were added to the modeling 1- and 8-hour results, respectively.
[c] The federal and state 1-hour standards are 35 and 20 ppm, respectively.
[d] The federal and state 8-hour standards are 9 and 9.0 ppm, respectively.
[e] Concentrations modeled using CALINE4.
RE = Receptor

~~Operational~~ DPM Emissions from Locomotive Diesel Combustion

As described above, the Proposed Project would substantially reduce PM emissions compared with ~~both~~ existing conditions (2013) ~~and with the No Project 2020 and 2040 scenarios~~. Assuming 100 percent of PM10 emissions associated with diesel locomotives is DPM, annual DPM emissions along the Caltrain corridor between San Jose and San Francisco would be reduced with the Proposed Project by 87 ~~71~~ percent in 2020 and by 100 percent in 2040 (assuming 100 percent electrified service between San Jose and San Francisco). Relative to the No Project scenarios, the Proposed Project would reduce DPM emissions along the ROW by 12 percent in 2020 and by 100 percent in 2040.

As an example of the localized health benefit of the Proposed Project, a 2011 HRA for the EIR for a residential and mixed use development ~~project~~ associated with the Menlo Park *El Camino Real Downtown Specific Plan* (Menlo Park 2012) along the Caltrain corridor was reviewed to identify the potential risks of current and No Project DPM emissions. The plan includes residential, commercial and mixed use development along the Caltrain corridor in Menlo Park. Based on current and projected diesel locomotive emissions into the future (taking into account the effects of current regulations that will reduce locomotive particulate emissions over time [refer to section 3.2.1.1]), the HRA conducted for the project's EIR identified that the unmitigated cancer risks of new residents 50 feet from the Caltrain ROW would be up to 58 ~~51~~ in a million (outdoors) and 38.6 ~~34~~ in a million (indoors). The estimated non-cancer HI for receptors near Caltrain was identified as 0.036 ~~0.032~~ and is considered less than significant (less than hazard index of 1.0). The project's EIR identified that the cancer risk health impacts could be reduced with project level mitigation requiring air filtration systems for new residences.

Under 2020 No Project Conditions, DPM emissions would be reduced by 85 percent along the Caltrain corridor between San Jose and San Francisco compared with existing conditions. Using the study results above, an 85 percent reduction in the unmitigated indoor cancer risk would roughly correlate to a cancer risk of only 5.7 in a million, which would be a reduction of 33 in a million. There would similar scale reductions in non-cancer health risks associated with DPM.

The Proposed Project would reduce DPM emissions by 87 ~~71~~ percent along the Caltrain corridor between San Jose and San Francisco compared with existing conditions ~~the No Project scenario~~, and by 100 percent between San Jose and San Francisco with full electrification between San Francisco and San Jose. A 87 ~~71~~ percent reduction in the unmitigated indoor cancer risk would roughly correlate to a cancer risk of only 5.0 ~~10~~ in a million, which would be a reduction of 34 ~~24~~ in a million.[4] There would similar scale reductions in non-cancer health risks associated with DPM (hazard index change from 0.036 ~~0.032~~ to 0.005 ~~0.009~~ a reduction in non-cancer risk of 0.031 ~~0.023~~).

As described above in the discussion of criteria pollutant emissions, trees would be removed with implementation of the project where they are within 18 to 21 feet of the electrified outer track. These trees may currently filter a portion of diesel particulates generated by the trains and buffer

[4] The actual risk reduction compared to existing conditions would be somewhat less than 87 ~~71~~ percent because the Menlo Park HRA included 70 years of risk associated with diesel locomotives, including some years before 2020. The Proposed Project would only affect operational risks associated with years of 2020 and after. Health risks under the No Project scenarios would reduce over time due to the effect of adopted federal regulations. ~~Thus, the amount of risk reduction would not apply to the entire risk, but only that part occurring after 2020. However, from a 2020 perspective, whatever the health risks going forward from that point are, they would be reduced by 71 percent with the Proposed Project.~~

adjacent residences from associated health risks. However, as discussed above, while there is some evidence that removal of existing trees could reduce filtration benefits; the research is variable, highly-location dependent, and limited with respect to real-world quantification. Furthermore, diesel particulate emissions from trains is not emitted horizontally but vertically and then dispersed laterally by prevailing winds, which means that the trees adjacent to the ROW likely do not provide much filtering of DPM from trains which is more likely to disperse outside the ROW and then settle vertically in a highly dispersed pattern away from the ROW.

Despite these real-world limitations, even if it were assumed that existing vegetation to be removed by the PCEP actually achieved a filtration rate of train DPM by the 2 to 26 percent range per Cahill (2008), electrification of the Caltrain system would still result in a substantial reduction in DPM, relative to the existing conditions and would likely result in a reduction relative to No Project conditions.

For 2020, Proposed Project PM10 train emissions along the ROW are 21 lbs./day, compared to the No Project condition of 23 pounds/day and the existing conditions of 159 lbs./day. If one were to apply a 2 to 26 percent reduction due to trees, which is a highly optimistic assumption given all the factors noted above concerning tree filtration effectiveness, then the adjusted existing conditions would be PM10 of 118 to 156 lbs./day and No Project conditions would be PM10 emissions of 17 to 23 lbs./day along the ROW. Thus, the Proposed Project would still reduce PM10 emissions along the ROW by 82 to 87 percent. Relative to No Project conditions, the Proposed Project would reduce PM10 emissions along the ROW by 7 percent in the low filtration scenario, but would increase PM10 emissions by 23 percent in the high filtration scenario. Even if the high filtration scenario were accurate (which the evidence suggests it is not), applying to the cancer health risks above, the adjusted No Project cancer health risk would be reduced to 4.2 in a million and the Proposed Project would only result in a theoretical increase of 0.8 in a million (to 5.0 in a million), which is far less than the BAAQMD threshold of 10 in a million and would be less than significant.

This conceptual calculation does not likely represent real-world conditions for all the reasons noted above in the discussion of criteria pollutants. It is more likely that the trees along the ROW only provide a very limited role in filtering DPM from trains and that in 2020 the Proposed Project will also result in reduced DPM emissions relative to the No Project conditions.

In any case, in the long run, with 100 percent EMUs, the project would completely eliminate train diesel emissions from Caltrain passenger trains and any associated health risks. Under No Project conditions, DPM emissions will also be substantially reduced after 2020 as the remaining older diesel trains are replaced with cleaner Tier 4 Diesel Locomotives, but diesel emissions will not be eliminated entirely.

Thus, the Proposed Project would result in a net reduction in DPM health risk along the Caltrain corridor.

Detailed information on emissions modeling may be found in Appendix B.

TAC Emissions from Power Plants

Concerning increased electricity generation emissions due to the Proposed Project, the potential exists for increased health risk at locations of increased power plant emissions if such power plants generate TACs. However, power plant emissions are highly regulated at both the state and federal level to manage health risks of adjacent communities. Further, California regulations (e.g., the Renewables Portfolio Standard or RPS) require an increasing share of electricity generation to come from sources that do not produce greenhouse gas emissions, meaning a substantial reduction in the use of fossil fuel-based electricity generation over time, which will reduce associated TAC emissions from fossil-fuel-based electrical power plants in the aggregate over time.

Metal Particulates from Wheel-Rail Contact

As noted above, particulate matter may be generated from friction between rail and locomotive wheels (wheel-rail interaction). This abrasion process can suspend metals such as iron, chromium, manganese, and copper, which can attach to the airborne particulates. While receptors adjacent to the Caltrain ROW may be exposed to these particulates, the contribution of metals to the overall PM10 composition is expected to be minimal and well below established exposure guidelines. For example, Gehrig et al. (2007) measured PM10 and its elemental composition near two busy railway stations that serve over 700 trains per day. Results of their study indicate that iron constituted only 1 $\mu g/m^3$ of the total PM10 concentration at a distance of 10 meters from the tracks. Contributions of copper, manganese, chromium, and other metals were far lower, ranging from 0.001 to 0.06 $\mu g/m^3$. Gehrig et al. (2007) also found no significant contributions from rock material (e.g., calcium, aluminum, sodium). PM10 concentrations were also noted to decrease rapidly a function of distance; measurements at 120 meters from the track showed PM10 concentrations that were less than 25% of the concentrations observed at 10 meters.

Exposure to concentrations reported by Gehrig et al. (2007) would also be well below recommended exposure levels published by OEHHA (2014). For example, the reference exposure level for copper is 100 $\mu g/m^3$ but the increased level over background found due to 700 trains range from 0.03 to 0.06 $\mu g/m^3$.[5] It is expected that elemental concentrations along the Caltrain ROW would be lower than those reported by Gehrig et al. (2007), which are based on over 700 trains per day. Moreover, since EMUs are lighter than the existing diesel locomotives, wheel-rail friction and resultant particle suspension may be reduced with implementation of the project, assuming all other variables (e.g., aerodynamic drag, track curvature), relative to existing conditions.

Other studies on wheel-rail interaction confirm that while elevated concentrations of metals can be observed along railways, the concentrations are minimal and may be lower than levels generated from tier and brake ware along freeways (Kam 2013).

Thus, the Proposed Project would not exposure receptors to significant concentrations of suspended metals as a result of wheel-rail contact.

Copper Emissions from Pantograph Collector Strip Wear

As described above, the pantograph contact strips on the EMUs consist of a carbon-copper matrix. The wear characteristics of in-use pantograph contact strips of New Jersey Transit (NJT) were used as the basis of evaluation for the EIR. Particulate emissions overall were analyzed above. Copper emissions were estimated by using the particulate emissions overall and adjusting for the average copper content of the contact strip of 12 percent. (LTK 2014-PANTO).

The threshold used for evaluation of copper emission is the acute reference exposure level (REL) from OEHHA (OEHHA 1999) of 100 $\mu g/m^3$ over a one-hour period. Based on the unrealistically

[5] Another example is total chromium, where the Gehrig study found increased levels due to 700 trains of 0.003 to 0.004 $\mu g/m^3$ compared to background compared to the California OEHHA inhalation REL for hexavalent chromium of 0.2 $\mu g/m^3$ (not to mention that the total chromium may not consist entirely of hexavalent chromium).

conservative assumptions used for the particulate emissions analysis of pantograph wear and using the 12 percent copper fraction noted above, hypothetical worst-case peak hour increase in copper concentrations within the ROW could be approximately 0.33 to 0.49 μg/m^3 on a one-hour basis (range is from 2020 to 2040) which is less than 0.5% of the threshold of concern of 100 μg/m^3. Twenty-four hour and annual averages would be lower than the peak hour and emissions outside the ROW would be far less with dispersion. The Gehrig et al. (2007) study of the increased daily particulate concentrations compared to background for 700 trains/day in Switzerland, all of which (or virtually all) are identified as electric trains (which utilize pantographs) indicated that the copper increase in ambient concentrations was only 0.03 to 0.06 μg/m^3. This shows that the hypothetical calculation above is unrealistic and overstates potential emissions. The Gehrig (2007) study is a more reasonable real-world source of data by which to conclude that pantograph wear-related copper emissions would be less than significant.

Cumulative DPM Emissions

Some locations along the Caltrain corridor between San Jose and San Francisco have existing non-cancer and cancer risks due to existing toxic air contaminant emission sources, including Caltrain diesel trains, freight trains, other passenger trains, heavy trucks, marine vessels, and industrial sources. In the future, as explained in Section 4.1, *Cumulative Impacts*, there could be additional sources of toxic air contaminant emissions along the corridor. However, state and federal regulations of diesel and other emissions sources are getting much stricter over time in order to substantially reduce health risk associated with diesel and other toxic air contaminant emissions.

BAAQMD guidance recommends evaluation of cumulative health risks from cumulative projects and background sources when assessing a project's contribution to cumulative emissions. That guidance is applicable when a project increases toxic air contaminant emissions in order to evaluate whether a project increase is considerable in light of all cumulative emissions. Because the Proposed Project would lower operational emissions along the Caltrain corridor between San Jose and San Francisco, relative to both existing conditions and to the No Project scenarios, it can be concluded that the Proposed Project would have a cumulatively beneficial effect without the need for a quantitative analysis.

Project Variant Analysis

Neither Project Variant 1 or 2 would affect roadway volumes in any way and thus would not affect roadway CO levels compared to the Proposed Project. Neither Project Variant 1 nor 2 would change normal train service or operations or associated normal operational diesel engine emissions, TAC emissions from power plants, wheel-rail particulates, or pantograph wear emissions and thus would not change associated health risk.

Under Project Variant 2, the electrification of the storage tracks at the 4th and King Station in San Francisco would be deferred. Therefore, operational diesel emissions would be slightly higher than under the Proposed Project because a diesel train would be required to push or pull EMUs onto the storage tracks and then back to the electrified tracks after service or operations. Under No Project conditions, these moves would be made using diesel locomotives or diesel yard haulers and thus Variant 2 would not represent a change in conditions at the 4th and King Station yard and associated health risks. While emissions would be slightly higher than the Proposed Project, this would not result in additional impact compared to No Project conditions.

Impact AQ-5	Creation of objectionable odors affecting a substantial number of people
Level of Impact	Less than significant

Although offensive odors rarely cause any physical harm, they can be unpleasant and lead to considerable distress among the public. This distress may often generate citizen complaints to local governments and air districts. Any project with the potential to frequently expose the public to objectionable odors would be deemed as one having a significant impact.

According to ARB's (2005) *Air Quality and Land Use Handbook*, land uses associated with odor complaints typically include sewage treatment plants, landfills, recycling facilities, and manufacturing. Odor impacts on residential areas and other sensitive receptors, such as hospitals, daycare centers, and schools, warrant the closest scrutiny, but consideration should also be given to other land uses where people may congregate, such as recreational facilities, work sites, and commercial areas.

Potential odor sources during construction activities include diesel exhaust from heavy-duty equipment and the application of architectural coatings. Construction-related operations near existing receptors would be temporary in nature, and construction activities would not be likely to result in nuisance odors that would violate BAAQMD Regulation 7 (Odorous Substances).

Diesel-fueled locomotives would be the Proposed Project's primary potential odor sources. Because the existing Caltrain service includes substantially more diesel-powered trains than the Proposed Project would have, operation of the Proposed Project would reduce odors. Accordingly, Proposed Project operation is not expected to result in odor impacts that would exceed BAAQMD's odor thresholds (see Table 3.2-4). This impact would be less than significant.

<u>Project Variants 1 and 2 described in Chapter 2, *Project Description*, would not result in any changes to odor impacts of the Proposed Project.</u>

3.3 Biological Resources

3.3.1 Existing Conditions

3.3.1.1 Regulatory Setting

The relevant federal, state, and local regulations that apply to biological resources consist of those listed below. A summary of each regulation is provided in Appendix G, *Biological Resources Information*.

Federal

- Endangered Species Act (ESA)
- Migratory Bird Treaty Act (MBTA) and Executive Order 13186
- Federal Clean Water Act (CWA) (Sections 401 and 404)
- Wetlands and other waters of the United States subject to U.S. Army Corps of Engineers (USACE) jurisdiction
- Executive Order 13112 (Invasive Species)

State

- California Endangered Species Act (CESA)
- California Fish and Game Code (Sections 1600, 3503, 3503.3, 3511, 4700, 5050, and 5515)
- California Native Plant Protection Act
- Porter-Cologne Water Quality Control Act

Local

- City and County of San Francisco *Urban Forest Plan*
- City and County of San Francisco Public Works Code
- County of San Mateo Heritage Trees ordinance
- County of San Mateo Significant Trees ordinance
- City of Brisbane Protected Trees ordinance
- City of San Bruno Street Trees ordinance
- City of San Bruno Heritage Trees ordinance
- City of Millbrae Tree Protection and Urban Forestry Program
- City of Burlingame Street Trees ordinance
- City of Burlingame Urban Reforestation and Tree Protection ordinance
- City of San Mateo Street Trees ordinance

- City of San Mateo Heritage Trees ordinance
- City of Belmont Trees ordinance
- City of San Carlos Tree Removal and Maintenance ordinance
- City of Redwood City Street Trees ordinance
- City of Redwood City Tree Preservation ordinance
- Town of Atherton Heritage Trees ordinance
- City of Menlo Park City (Street) Trees ordinance
- City of Menlo Park Heritage Trees ordinance
- County of Santa Clara Tree Preservation and Removal ordinance
- City of Palo Alto Tree Preservation Management Regulations
- City of Mountain View Heritage Trees ordinance
- City of Sunnyvale City Trees ordinance
- City of Sunnyvale Tree Preservation ordinance
- City of Santa Clara Trees and Shrubs ordinance
- City of San Jose Tree Removal ordinance
- *Santa Clara Valley Habitat Plan*

3.3.1.2 Environmental Setting

A variety of natural resources is present along the project corridor. These include tidal basins filled with rubble from the 1906 San Francisco earthquake and more than 40 wetlands and creeks, some influenced by tidal action. Storm drains (both open and closed systems) consisting of highly altered creeks in urban settings are also present. The project corridor also transects several well-known streams with riparian corridors, including San Francisquito Creek, Stevens Creek, Los Gatos Creek, and the Guadalupe River.

Although ruderal disturbed areas dominate the vast majority of the project corridor, some special-status species may still have the potential to occur within the greater Project vicinity, and several of the resource areas are in close proximity to the Caltrain right-of-way (ROW). For example, the southernmost portion of the project corridor cuts through Communications Hill in San Jose, which is composed of serpentine outcrops of rock and soil and may be inhabited by special-status wildlife and plants. Several trees and shrubs that provide suitable nesting substrate for a number of bird species also occur within in the project corridor. Despite these infrequent areas with greater potential for special-status species, the vast majority of the project corridor is in a disturbed state with a low potential to harbor special-status species. Appendix G provides a comprehensive discussion of the project corridor's environmental setting.

Previous Studies Conducted within the Project Corridor for the Prior EIR

A Natural Environmental Study (NES) (Parsons 2002a) was prepared in 2002, consisting of a comprehensive literature review and background search, multiple reconnaissance-level field surveys for biological resources, and coordination with state and federal resource agency personnel.

A subsequent biology letter report assessment was prepared in 2008 to determine if project modifications would affect the "no significant impact" conclusion of the NES (Garcia and Associates 2008a). In addition, Garcia and Associates (2008b) conducted a follow-up visit to the proposed paralleling station (PS) 7 site in April 2008 and prepared a biology letter report to confirm that this site has little to no value to protected biological resources, including the California tiger salamander and Western burrowing owl. Another biology letter review was prepared in 2008 to determine potential project effects at the sites for traction power substation (TPS) 1, Options 2 and 3 (Garcia and Associates 2008c). Vegetation communities and incidental wildlife sightings were recorded during the surveys. Wetlands and waters of the United States that may be subject to the jurisdiction of USACE under Section 404 of the CWA were also surveyed and delineated.

A routine on-site determination of jurisdictional waters, including wetlands, was conducted along the project corridor in November and December 2000 and 2001, and in January 2002. Findings of the wetlands determination are presented in the Preliminary Wetlands Delineation Report (Parsons 2002b), which will be submitted to USACE for review and verification as part of the permit application. Several locations within the project corridor were identified as meeting the criteria for waters of the United States under CWA Section 404 (see Table 3.3-1 and Figure 3.3-1).

Table 3.3-1. Summary of Jurisdictional Features in the Peninsula Corridor Electrification Project's Vicinity

Location	Name and Type of Resource
Paul Avenue Station (closed 2005)	Unnamed ditches
Millbrae Transit Center	South Lomita Canal
Broadway Station	Easton Creek, Sanchez Creek, and Cherry Creek Canyon ditches
Hillsdale Station	Seal Slough Tributary B
Lawrence Station	Calabazas Creek
Los Gatos Creek Crossing	Los Gatos Creek
TPS-1 Option 3[a]	Depressional seasonal wetland

Source: Parsons 2002b.
[a] Source data for this site was collected during ICF's wetland assessment in June 2013.

Field surveys and site assessments for special-status wildlife and plant species and their habitat were conducted on the following dates: April 25, 2000; June 10 and November 30, 2001; December 6, 2007; January 3, 22, 29, and 30, 2008; and April 28, 2008. For the 2000–01 surveys, detailed species-specific studies were not conducted, owing to the 51-mile length of the corridor and because most construction would occur within the Caltrain ROW, where ground-disturbing activities would be limited to installation of Overhead Contact System (OCS) poles. All areas with at least a moderate potential to provide suitable habitat for a particular special-status species were evaluated in the inventory; however, particular attention was paid to drainages paralleling the railroad corridor and to the proposed locations for the Traction Power Facilities (TPFs).

New Studies Conducted for this EIR

Vegetation/Wildlife

After reviewing the previously prepared biological resources documents, ICF biologists conducted a reconnaissance-level survey of the project corridor on June 26, 2013 at the updated proposed station sites (TPS1 Options 1, 2, and 3 and access roads, PS3 Option 1, PS4 Options 1 and 2, switching station 1 [SWS1] Option 1, PS5 Options 1 and 2, PS6 Options 1 and 2, TPS2 Options 1, 2, and 3, and PS7) and on September 9, 2011 at the proposed sites for PS3 Option 2 and SWS1 Option 2. The PS1 and PS2 sites were previously surveyed and, based on aerial photographs, it was determined that conditions were unchanged. The site for PS1 is a small ruderal area surrounded by commercial development and I-280, and the PS2 site is also a small ruderal area that includes an existing utility facility expected to be associated with train operation. The site for PS2 was also evaluated from aerial photographs and a ground-level photograph taken on May 30, 2011 (Google Earth 2011). PS4 Option 3, PS5 Option 1B, and TPS1 Option 4 were evaluated using aerial photography (Google Earth 2012). The purpose of this survey was to determine the potential for any special-status wildlife and plant species to occur within the project corridor, as well as to characterize biotic communities that could be affected by Proposed Project construction and operation, and to determine locations of jurisdictional waters within the project corridor. The Project Variant 1 locations for PS7 were evaluated using aerial photography due to the disturbed ruderal nature of the sites.

During the reconnaissance-level surveys, biotic communities were characterized based on plant composition and distribution. Seven biological communities have been identified as occurring within or immediately adjacent to the project corridor: non-native annual grassland, willow scrub riparian, ruderal/disturbed, windrow, freshwater marsh, Northern Coastal salt marsh, and coastal brackish marsh. These biological communities were evaluated for their potential to support special-status plant and animal species. Brief descriptions of each biological community and associated species are provided in Appendix G.

Jurisdictional Waters

A wetlands assessment was conducted on June 26, 2013 to survey the locations of new permanent facilities for potential wetlands that were not included in the previous wetland delineation report (Parsons 2002b). The wetland assessment focused on proposed permanent facility locations where project design might not be able to avoid these resources. At all other locations within the ROW where the OCS poles would clearly span creeks or rivers, wetland resources were not assessed in the field. One depressional seasonal wetland feature was observed during the assessment. This 0.035-acre feature was located in the vicinity of the TPS1 Option 3 site in South San Francisco east of U.S. Highway 101 (US 101) and adjacent to Gateway Boulevard.

For potential staging areas within the Caltrain ROW, a desktop study was conducted to identify potential wetlands and waters using aerial photography. Potential wetlands and waters were identified at nine potential staging areas in Brisbane, San Bruno, Millbrae, Burlingame, San Mateo, and Palo Alto (see Appendix G).

Special-Status Species

Special-status species are defined as species that meet one or more of the following criteria.

- Species listed or proposed for listing as threatened or endangered under ESA (50 CFR 17.12 [listed plants], 50 CFR 17.11 [listed animals], and various notices in the Federal Register [FR] [proposed species]).
- Species that are candidates for possible future listing as threatened or endangered under ESA (77 FR 69994, November 21, 2012).

Legend

- 5-Mile Facilities Buffer
- Caltrain Tracks
- Alameda song sparrow
- American badger
- American peregrine falcon
- Bay checkerspot butterfly
- California black rail
- California clapper rail
- California least tern
- California red-legged frog
- Mission blue butterfly
- Myrtle's silverspot
- San Bruno elfin butterfly
- San Francisco Bay Area leaf-cutter bee
- San Francisco dusky-footed woodrat
- San Francisco garter snake
- big free-tailed bat
- burrowing owl
- callippe silverspot butterfly
- fringed myotis
- hoary bat
- monarch butterfly
- pallid bat
- saltmarsh common yellowthroat
- steelhead - central California coast DPS
- western pond turtle
- western red bat

0 2 4 Miles

N

Source: CNDDB, CDFW May 2013; Caltrain Tracks, Caltrain JPB 2013; Base Imagery, ESRI, Digital Globe, 2013

Figure 3.3-1a
Special Status Wildlife Occurrences within 5 miles of Caltrain Peninsula Corridor Electrification Project Area

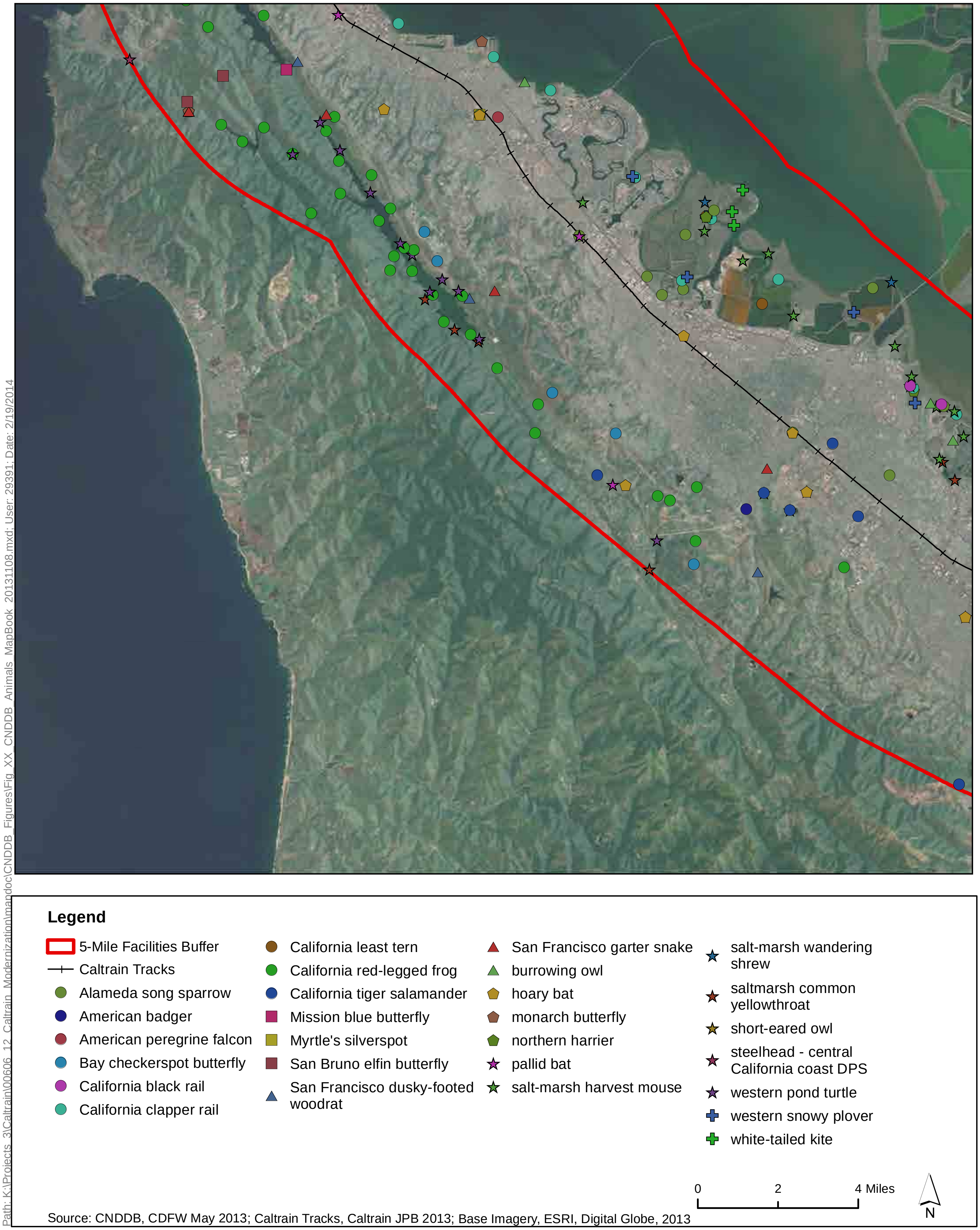
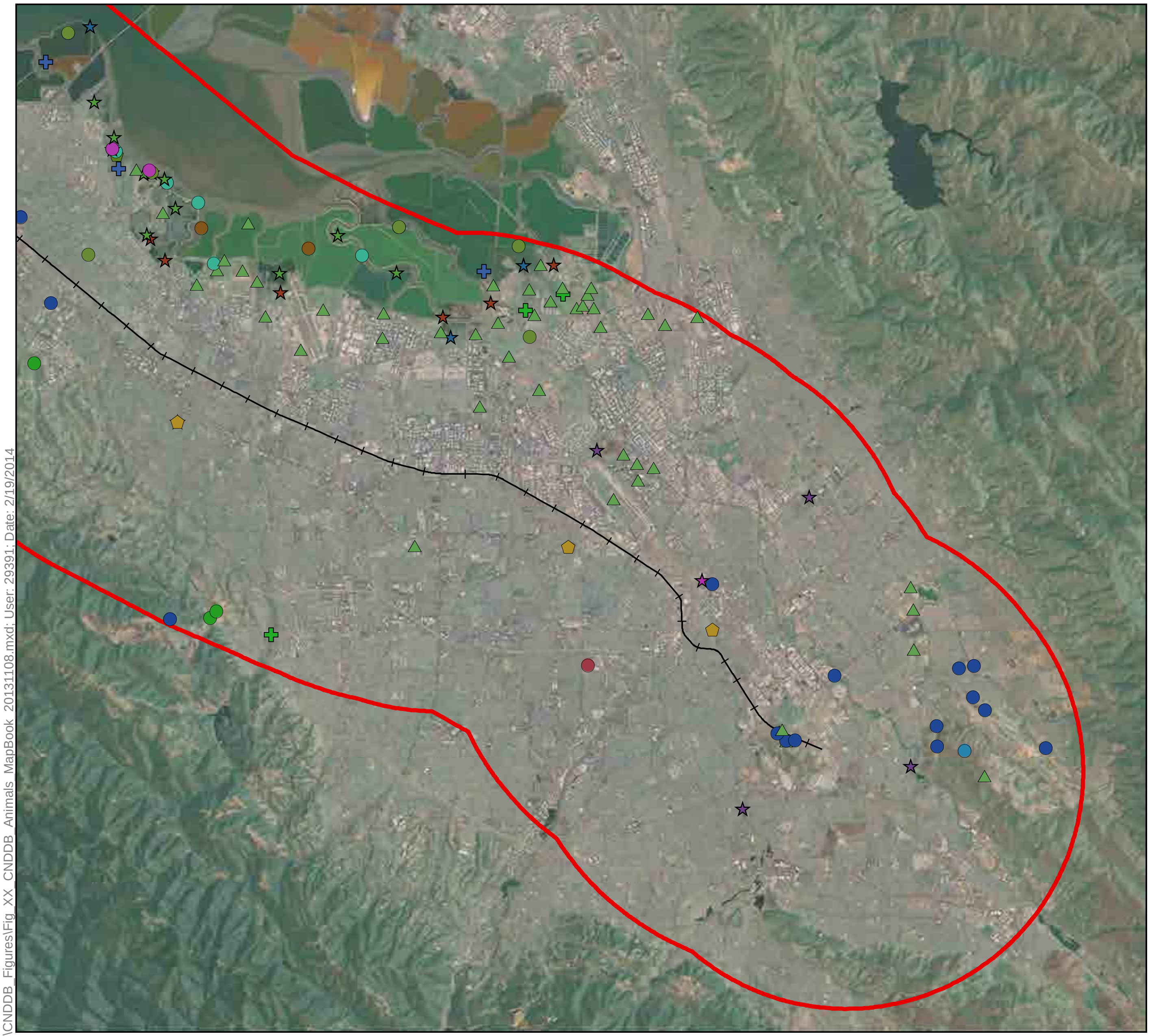


Figure 3.3-1b
Special Status Wildlife Occurrences within 5 miles of Caltrain Peninsula Corridor Electrification Project Area



Legend

- 5-Mile Facilities Buffer
- Caltrain Tracks
- Alameda song sparrow
- American peregrine falcon
- Bay checkerspot butterfly
- California black rail
- California clapper rail
- California least tern
- California red-legged frog
- California tiger salamander
- burrowing owl
- hoary bat
- northern harrier
- pallid bat
- salt-marsh harvest mouse
- salt-marsh wandering shrew
- saltmarsh common yellowthroat
- western pond turtle
- western snowy plover
- white-tailed kite

0 2 4 Miles

N

Source: CNDDB, CDFW May 2013; Caltrain Tracks, Caltrain JPB 2013; Base Imagery, ESRI, Digital Globe, 2013

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Figure 3.3-1c
Special Status Wildlife Occurrences within 5 miles of Caltrain Peninsula Corridor Electrification Project Area

- Species listed or proposed for listing by the State of California as threatened or endangered under CESA (14 California Code of Regulations [CCR] 670.5).
- Species that meet the definitions of rare or endangered under the California Environmental Quality Act (CEQA) (State CEQA Guidelines Section 15380).
- Plants listed as rare under the California Native Plant Protection Act (California Fish and Game Code Section 1900 et seq.).
- Plants considered by California Department of Fish and Wildlife (CDFW) to be "rare, threatened, or endangered in California" (California Rare Plant Rank [CRPR] 1B and 2) (California Department of Fish and Wildlife 2013; California Native Plant Society 2013).
- Plants listed by CDFW as plants about which more information is needed to determine their status, and plants of limited distribution (CRPR 3 and 4) (California Department of Fish and Wildlife 2013; California Native Plant Society 2013). These plants may be included as special-status species on the basis of local significance or recent biological information.
- Animal species of special concern to CDFW (Shuford and Gardali 2008 [birds]; Williams 1986 [mammals]; Jennings and Hayes 1994 [amphibians and reptiles]).
- Animals fully protected in California (California Fish and Game Code Sections 3511 [birds], 4700 [mammals], and 5050 [amphibians and reptiles]).
- Bat species designated as high or medium priority by the Western Bat Working Group (WBWG). The WBWG is a partner in the Coalition of North American Bat Working Groups. High-priority bat species are those species that, based on available information on distribution, status, ecology, and known threats, should be considered the highest priority for funding, planning, and conservation actions. These species are imperiled or are at high risk of imperilment. Medium-priority species are those species that are considered to warrant closer evaluation, both of the species and of possible threats, as well as more research and conservation actions (Western Bat Working Group 2007).

Information on the biology, distribution, taxonomy, status, and other aspects of the special-status species that could occur in the project vicinity was obtained from standard references for biological resources. Searches of the U.S. Fish and Wildlife Service's (USFWS) Quadrangle query (U.S. Fish and Wildlife Service 2013), California Natural Diversity Database (CNDDB) (California Department of Fish and Wildlife 2013), and California Native Plant Society's (CNPS) Inventory of Rare and Endangered Vascular plants of California (California Native Plant Society 2013) were conducted to determine if there are any recorded occurrences of special-status species in the project area (results are included in Appendix G). Suitable habitat for special-status species is defined as areas where special-status species are known to exist or have potential to exist based on a range, habitat, and presence of important habitat elements. The primary objective of the 2013 survey was to assess the 10 proposed paralleling station facility sites, locations of the six traction power substation options, and one switching station facility site for potential suitable habitat and the presence of special-status species. The area surveyed included a 100-foot buffer around each site when not obstructed by private property or other access issues.

Special-status wildlife species with a potential to occur within or immediately adjacent to the project corridor are Central California steelhead (*Oncorhynchus mykiss*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), western pond turtle (*Emys marmorata*), California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana draytonii*), Townsend's big-eared bat (*Corynorhinus townsendii*), pallid bat (*Antrozous pallidus*), hoary bat (*Lasiurus cinereus*), fringed myotis (*Myotis thysanodes*), western burrowing owl (*Athene cunicularia hypugaea*), northern harrier (*Circus cyaneus*), white-tailed kite (*Elanus leucurus*), American peregrine falcon (*Falco peregrines anatum*) (foraging), purple martin (*Progne subis*), and saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*).

Special-status plant species with a potential to occur within the project corridor are Franciscan onion (*Allium peninsulare* var. *franciscanum*), bent-flowered fiddleneck (*Amsinckia lunaris*), round-leaved filaree (*California macrophylla*), bristly sedge (*Carex comosa*), Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*), Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*), marsh microseris (*Microseris paludosa*), white seaside tarplant (*Hemizonia congesta* ssp. *congesta*), San Francisco campion (*Silene verecunda* ssp. *verecunda*), and showy rancheria clover (*Trifolium amoenum*).

The primary areas where special-status plant and wildlife species may occur along the ROW are where remnant intact natural habitat is present along or adjacent to the Caltrain ROW and in areas with suitable tree nesting for special-status birds and suitable roosting/foraging habitat for bats. A few special-status species also use man-made structures such as bridge structures. The key areas where special-status species are most likely to occur are listed here.

- Open land adjacent to and north of the Brisbane lagoon.
- Open land between San Francisco International Airport/US 101 and the BART/Caltrain ROW[1];
- Non-native annual grassland and ruderal grassland near San Jose International Airport.
- Communications Hill in San Jose.
- Stream crossings with riparian vegetation and/or aquatic habitat (including Mills Creek, San Mateo Creek, San Francisquito Creek, Stevens Creek, Los Gatos Creek, and the Guadalupe River).
- Mature trees (nesting for special-status birds and roosting for special-status bats).

Most of the TPFs would be located in disturbed, developed areas that do not contain habitat for special-status species. The site for TPS-1, Option 3 contains a freshwater emergent wetland. PS7 would be located in an area of serpentine bunchgrass grassland within and around the proposed facility site, based on *Santa Clara Valley Habitat Plan* (ICF International 2012) mapping data.

Special-status wildlife and plant species descriptions and areas of suitable habitat are provided in Appendix G. Table 3.3-2 provides information regarding special-status wildlife species status, geographic distribution, habitat requirements, and potential to occur in the project corridor. Table 3.3-3 provides information regarding special-status plant species status, geographic distribution, habitats, blooming period, and potential to occur in the project corridor. Special-status wildlife and plant species occurrences within 5 miles of the project corridor are respectively shown in Figures 3.3-1 and 3.3-2.

[1] Habitat near San Francisco International Airport is mostly blocked by BART facilities (tracks and tunnels) from the entire Caltrain corridor, except for the northernmost approximately300 feet. In this 300-foot segment, the nearby creek is bound by a concrete control structure and upland habitat is separated from the Caltrain corridor by small (approximately 2- to 3-foot-tall) concrete walls that line the access road (based on Google streetview) immediately east of the Caltrain and BART corridors.

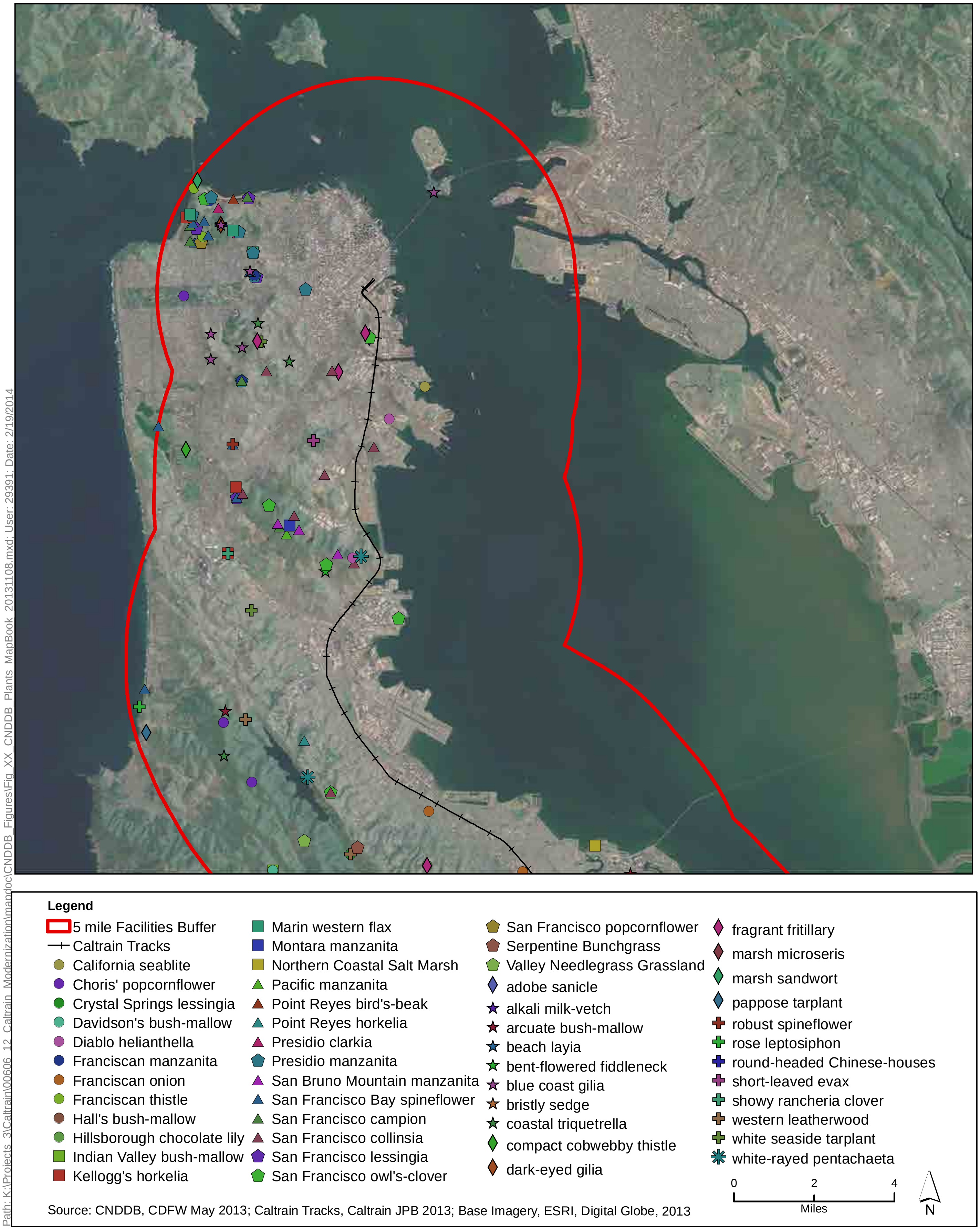

Figure 3.3-2a
Special Status Plant Occurrences within 5 miles of the Caltrain Peninsula Corridor Electrification Project Area

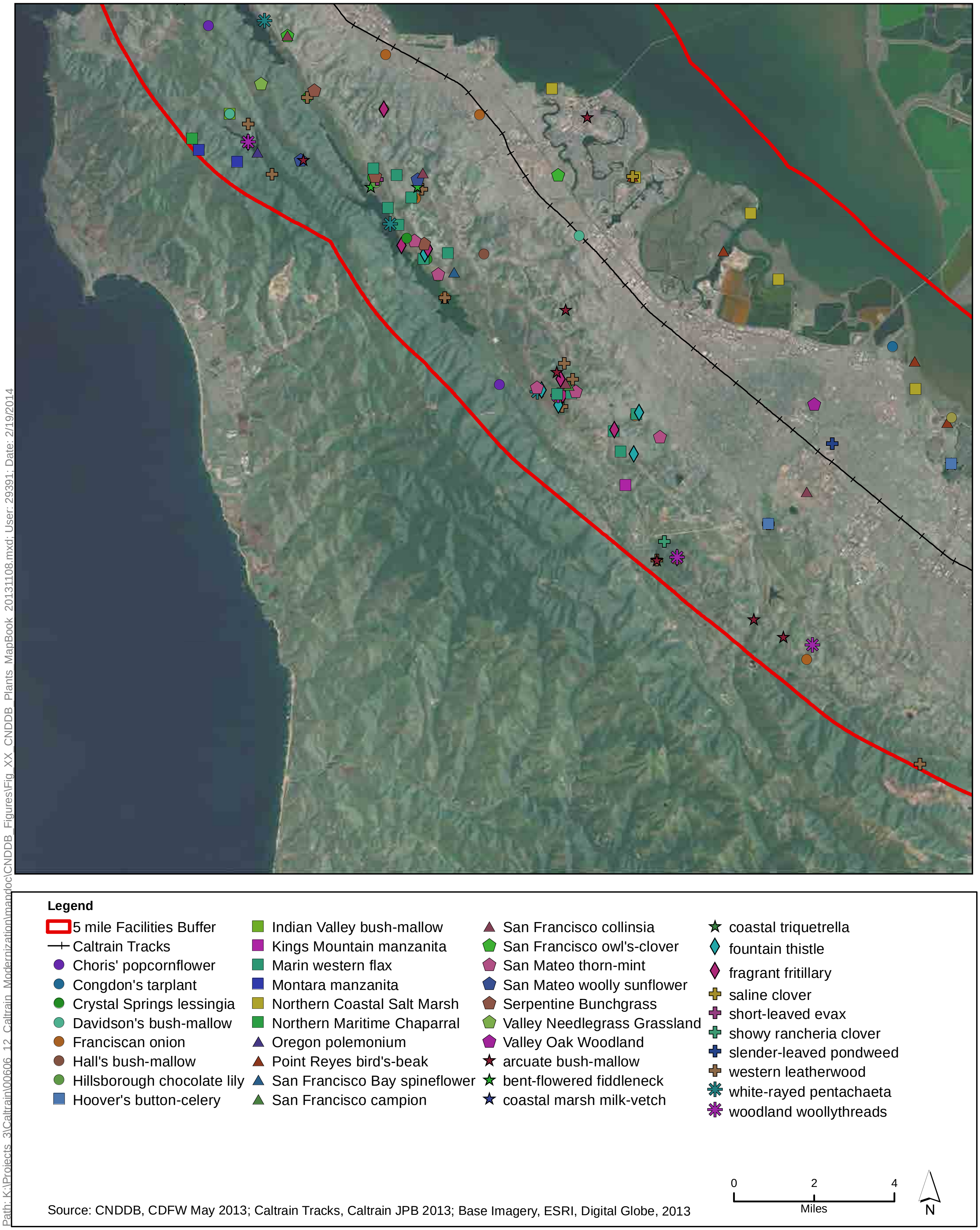

Figure 3.3-2b
Special Status Plant Occurrences within 5 miles of the Caltrain Peninsula Corridor Electrification Project Area

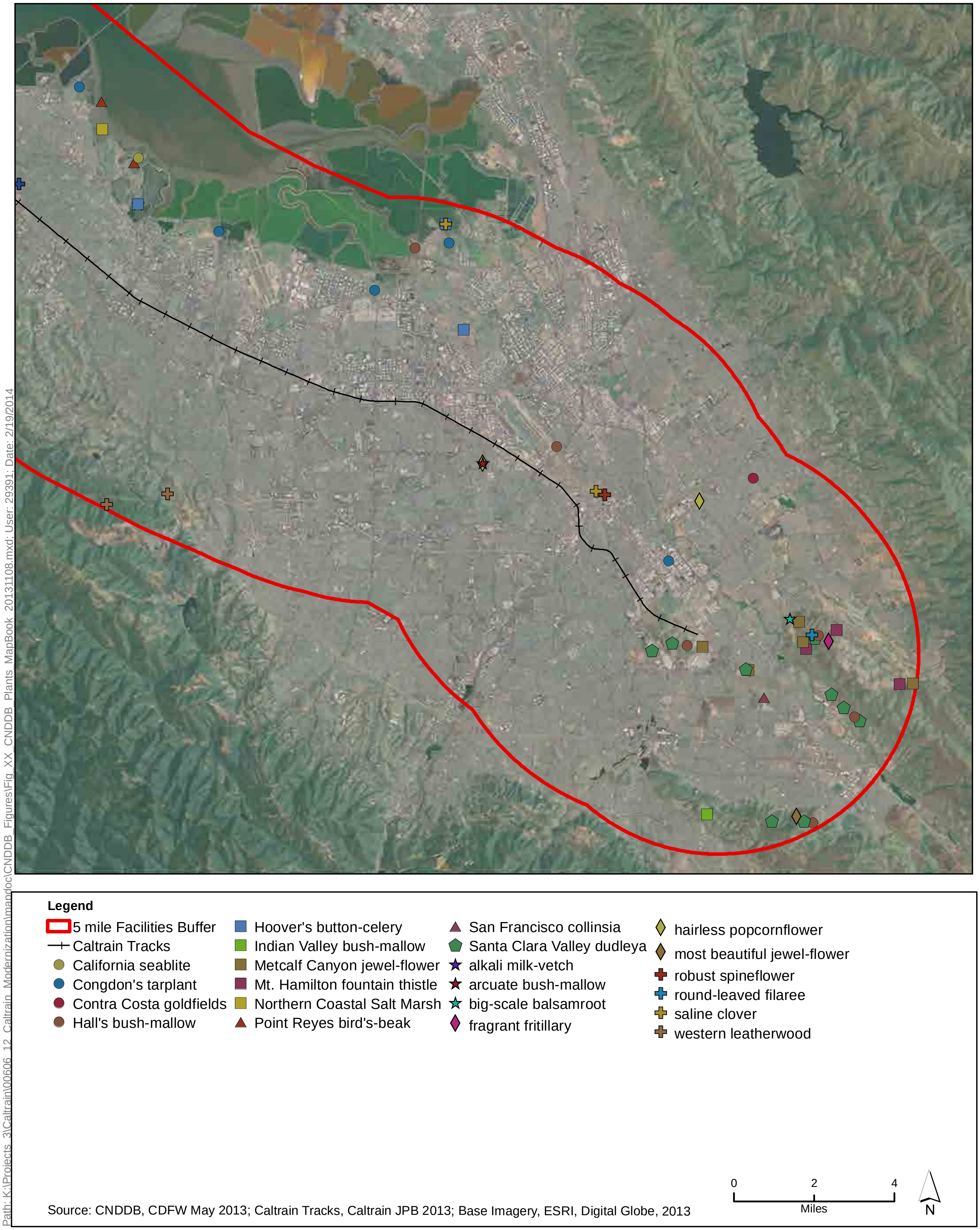

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Figure 3.3-2c
Special Status Plant Occurrences within 5 miles of the Caltrain Peninsula Corridor Electrification Project Area

Table 3.3-2. Special-Status Wildlife Species with Potential to Occur in the Project Corridor

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Invertebrates				
Branchinecta lynchi Vernal pool fairy shrimp	T/--	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County. Isolated populations also in Riverside County.	Common in vernal pools; also found in sandstone rock outcrop pools.	None—no suitable habitat present in project corridor.
Callophrys mossii bayensis San Bruno elfin butterfly	E/--	San Bruno Mountain, Montara Mountains, and northern end of Santa Cruz Mountains in San Mateo County.	North-facing slopes and ridges facing Pacific Ocean from 600 to 1,100 feet in elevation.	None—no suitable habitat present within project corridor.
Danaus plexippus Monarch butterfly	--/-- (overwintering trees)	Winter roost sites extend along the coast from northern Mendocino County to Baja California.	Roosts located in wind-protected tree groves (Eucalyptus, Monterey pine, Cypress), with nectar and water sources nearby.	High potential for individuals—eight CNDDB occurrences within 5 miles of project corridor, suitable habitat present within project corridor. This species has no legal protection, but known overwintering sites are afforded legal protection. Overwintering sites are relatively well known because this species has high site fidelity. There are no known overwintering sites in the project corridor.
Euphydryas editha bayensis Bay checkerspot butterfly	T/--	Disjunct occurrences in San Mateo and Santa Clara Counties.	Associated with specific host plants that typically grow on serpentine soils.	None—no suitable habitat present within project corridor.
Haliotes cracherodii Black abalone	E/--	Santa Barbara County.	Mid to low rocky intertidal areas.	None—no suitable habitat present within project corridor, outside of species range.
Haliotes sorenseni White abalone	E/--	Coastal California, Oregon, and Mexico.	Intertidal marine and subtidal habitats.	None—no suitable habitat present within project corridor.
Lepidurus packardi Vernal pool tadpole shrimp	E/--	Shasta County south to Merced County.	Vernal pools and ephemeral stock ponds.	None—no suitable habitat present within project corridor.
Plebejus icarioides missionensis Mission blue butterfly	E/--	San Bruno Mountain in San Mateo County; Twin Peaks in San Francisco County.	Hill and ridgetops, as well as slopes with south exposure with caterpillar food plants, Lupinus spp.	None—species is known to occur on San Bruno Mountain and adjacent hills, but there is no suitable habitat present within project corridor.

Table 3.3-2. Continued

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Speyeria callippe callippe Callippe silverspot butterfly	E/--	San Bruno Mountain in San Mateo County, and a single location in Alameda County.	Open hillsides where wild pansy (*Viola pendunculata*) grows; larvae feed on Johnny jump-up plants, whereas adults feed on native mints and non-native thistles.	None—species is known to occur on San Bruno Mountain and adjacent hills, but there is no suitable habitat present within project corridor.
Speyeria zerene myrtleae Myrtle's silverspot butterfly	E/--	Historically known from San Mateo County north to the mouth of the Russian River in Sonoma County. No butterflies have been observed recently at the known population sites near Pacifica and San Mateo in San Mateo County.	Coastal terrace prairie, coastal bluff scrub, and associated non-native grassland habitats where the larval foodplant, *Viola* sp., occurs.	None—no suitable habitat present within project corridor.
Fish				
Acipenser medirostris Green sturgeon	T/SSC	Upper Sacramento River and Feather River.	Ocean water, bays, and estuaries while not spawning. Spawn in the mainstem of freshwater rivers with connection to marine habitat and suitable deep pools.	None—no suitable habitat present within project corridor.
Eucyclogobius newberryi Tidewater goby	E/SSC	Lagoons of coastal streams from the Smith River (Del Norte County) to the south in Agua Hedionda Lagoon (San Diego County). Extirpated from San Francisco Bay (Moyle 2002).	Coastal lagoons along California. Prefers water with high dissolved oxygen levels and salinities less than 10 parts per thousand (ppt) (Moyle 2002).	None—no suitable habitat present within project corridor.
Hypomesus transpacificus Delta smelt	T/E	Primarily in the Sacramento–San Joaquin Estuary, but has been found as far upstream as the mouth of the American River on the Sacramento River and Mossdale on the San Joaquin River; range extends downstream to San Pablo Bay.	Estuary habitat in the Delta where fresh and brackish water mix in the salinity range of 2–7 ppt (Moyle 2002).	None—no suitable habitat present within project corridor.

Table 3.3-2. Continued

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Mylopharodon conocephalus Hardhead	--/SSC	Tributary streams in the San Joaquin drainage; large tributary streams in the Sacramento River and the main stem.	Low to mid-elevation streams and clear, deep pools and runs with slow velocities. Also occur in reservoirs.	None—no suitable habitat present within project corridor.
Oncorhynchus kisutch Central California coast coho salmon	E/E	From Punta Gorda in northern California south to and including the San Lorenzo River in central California, tributaries to San Francisco Bay, excluding the Sacramento-San Joaquin River system	Coastal streams with water temperatures < 15°C. Need cool, clear water with instream cover. Spawn in tributaries to large rivers or streams directly connected to the ocean (Moyle 2002).	None—no suitable habitat present within project corridor.
Oncorhynchus mykiss Central California coast steelhead	T/--	Coastal drainages along the central California coast.	Cold, clear water with clean gravel of appropriate size for spawning. Most spawning occurs in headwater streams. Steelhead migrate to the ocean to feed and grow until sexually mature.	Moderate—occurs in Mills Creek, Permanente Creek, Stevens Creek, San Mateo Creek, San Francisquito Creek, Los Gatos Creek, and Guadalupe River. Uses aquatic habitat crossed by the project corridor for migration to upstream habitat.
Oncorhynchus tshawytscha Central Valley spring-run Chinook salmon	T/T	Upper Sacramento River and Feather River.	Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 8.0°C to 12.5°C. Habitat types are riffles, runs, and pools (Moyle 2002).	None—no suitable habitat present within project corridor,
Reptiles				
Caretta caretta Loggerhead turtle	T/--	On the Pacific coast they are found from near Santa Cruz Island south to Chile. They are occasionally seen farther north.	Continental shelves, bays, lagoon, and estuaries in temperate and tropical waters.	None—no suitable habitat present within project corridor
Chelonia mydas Green turtle	T/--	East and West Coasts of United States and throughout open ocean.	Completely herbivorous; needs adequate supply of seagrasses and algae	None—no suitable habitat present within project corridor.

Table 3.3-2. Continued

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Dermochelys coriacea Leatherback turtle	E/--	Monterey Bay, the north end of Pigeon Point Beach in San Mateo County, and southeast of Santa Cruz, Santa Cruz County.	Pelagic, living in the open ocean and occasionally entering the shallower water of bays and estuaries.	None—no suitable habitat present within project corridor.
Lepidochelys olivacea Olive (Pacific) ridley sea turtle	T/--	Near Noyo in Mendocino County, near Table Bluff in Humboldt County, and Stinson Beach and Tamales Bay in Marin County.	Marine. Found well out to sea and in protected, relatively shallow bays and lagoons and the shallow water between reefs and the shore.	None—no suitable habitat present within project corridor.
Masticophis lateralis euryxanthus Alameda whipsnake	T/T	Restricted to Alameda and Contra Costa Counties; fragmented into 5 disjunct populations throughout its range.	Valleys, foothills, and low mountains associated with northern coastal scrub or chaparral habitat; requires rock outcrops for cover and foraging.	None—no suitable habitat present within project corridor, outside of species range.
Thamnophis sitralis tetrataenia San Francisco garter snake	E/E, FP	Northern San Mateo County southward along the coast and the eastern slope of the Santa Cruz Mountains to the Santa Clara County line.	Favors ponds, lakes, slow moving streams and marshy areas containing abundant vegetation, which it uses for cover; nearby upland habitat is important during fall and winter	Moderate—13 CNDDB occurrences within 5 miles of project corridor, no suitable habitat present within project corridor but suitable habitat located near project corridor adjacent to San Francisco International Airport.
Emys marmorata Western pond turtle	--/SSC	From the Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through the Sacramento Valley, and on the western slope of Sierra Nevada.	Ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies or other aquatic vegetation in woodlands, grasslands, and open forests.	High—19 CNDDB occurrences within 5 miles of project corridor, suitable habitat present within project corridor.
Amphibians				
Ambystoma californiense California tiger salamander	T/T, SSC	Central Valley, including Sierra Nevada foothills, up to approximately 1,000 feet in elevation, and coastal region from Sonoma County south to Santa Barbara County.	Small ponds, lakes, or vernal pools in grasslands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover for adults and for summer dormancy.	High—14 CNDDB occurrences within 5 miles of project corridor, low-quality habitat present within project corridor in the Communications Hill area.

Table 3.3-2. Continued

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Rana draytonii California red-legged frog	T/SSC	Found along the coast and coastal mountain ranges of California from Mendocino County to San Diego County and in the Sierra Nevada from Butte County to Stanislaus County.	Permanent and semipermanent aquatic habitats, such as creeks and cold-water ponds, with emergent and submergent vegetation; may aestivate in rodent burrows or cracks during dry periods.	High—51 CNDDB occurrences within 5 miles of project corridor, suitable habitat present within project corridor adjacent to San Francisco International Airport.
Mammals				
Antrozous pallidus Pallid bat	--/SSC	Widespread throughout California.	Roosts in fissures in caves, tunnels, mines, hollow trees, and locations with stable temperatures.	Moderate—six CNDDB occurrences within 5 miles of project corridor, suitable manmade habitat present within project corridor.
Arctocephalus townsendi Guadalupe fur seal	T/--	Along California coast.	Island shores with solid rock and large lava blocks, usually at the base of tall cliffs.	None—no suitable habitat present within project corridor.
Balaenoptera borealis Sei whale	E/--	Throughout the world's oceans.	Marine, generally in deep water, along edge of continental shelf and in open ocean.	None—no suitable habitat present within project corridor.
Balaenoptera musculus Blue whale	E/--	Throughout the world's oceans; seen with some regularity in deep coastal canyons off central and southern California.	Mainly pelagic; generally prefers cold waters and open seas, but young are born in warmer waters of lower latitudes.	None—no suitable habitat present within project corridor
Balaenoptera physalus Finback (fin) whale	E/--	Worldwide in temperate and polar waters. In the eastern North Pacific, summers north to the Chukchi Sea, winters north to California.	Pelagic; usually found in largest numbers 25 miles or more from shore. Young are born in the warmer waters of the lower latitudes.	None—no suitable habitat present within project corridor
Eumetopias jubatus Steller (Northern) sea-lion	E/--	Coastal waters of the North Pacific Ocean from California and northern Honshu, Japan, and Korea, north to the Bering Strait	Coastal waters near shore and over the continental slope; sometimes rivers are ascended in pursuit of prey.	None—no suitable habitat present within project corridor.

Table 3.3-2. Continued

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Corynorhinus townsendii Townsend's big-eared bat	--/PTE,SSC	Coastal regions from Del Norte County south to Santa Barbara County.	Roosts in caves, tunnels, mines, and dark attics of abandoned buildings. Very sensitive to disturbances and may abandon a roost after one onsite visit.	Low—low-quality suitable foraging habitat present within project corridor, no suitable roosting habitat within project corridor. Nearest CNDDB occurrence located 6.8 miles north of project corridor on Angel Island.
Lasiurus blossevillii Western red bat	--/SSC	Scattered throughout much of California at lower elevations.	Primarily riparian and wooded habitats. Occurs at least seasonally in urban areas. Day roosts in trees within the foliage. Fruit orchards and sycamore riparian habitats in the Central Valley.	None—no suitable habitat present within project corridor.
Lasiurus cinereus Hoary bat	--/--C	Widespread throughout California.	Roosts in trees, typically within forests.	Moderate—14 CNDDB occurrence within 5 miles of project corridor, low-quality suitable habitat present within project corridor.
Myotis thysanodes Fringed myotis	--/--C	Throughout California except the southeastern deserts and the Central Valley.	A wide variety of habitats from low desert scrub to high-elevation coniferous forests. Day and night roosts in caves, mines, trees, buildings, and rock crevices.	Low—one CNDDB occurrence within 5 miles of project corridor, low-quality suitable habitat present within project corridor.
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	--/SSC	West side of Mount Diablo to coast and San Francisco Bay.	Chaparral habitat and forest habitats with a moderate understory.	None—no suitable habitat present within project corridor.
Nyctinomops macrotis Big free-tailed bat	--/SSC	Distribution in California is uncertain because occurrences are very rare; most likely to be found in southern California, but has been recorded in Berkeley, Alameda County.	Arid, rocky areas; roosts in crevices in cliffs.	None—no suitable habitat present within project corridor.

Table 3.3-2. Continued

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Physeter catodon Sperm whale	E/--	Throughout the world's oceans.	Pelagic, prefers deep water, sometimes around islands or in shallow shelf waters.	None—no suitable habitat present within project corridor.
Reithrodontomys raviventris Salt-marsh harvest mouse	E/E,FP	The San Francisco Bay Estuary and Suisun Marsh.	Saline to brackish salt marsh habitat.	None—no suitable habitat present within project corridor.
Sorex vagrans halicoetes Salt-marsh wandering shrew	--/SSC	San Mateo, Santa Clara, Alameda, and Contra Costa Counties	Salt marshes from 6 to 9 feet above mean sea level (MSL).	None—no suitable habitat present within project corridor.
Taxidea taxus American badger	--/SSC	The majority of the northern, western, and central United States south to Baja California.	Found in dry grasslands and open forests. Needs friable soil for digging burrows.	None—no suitable habitat present within project corridor.
Vulpes macrotis mutica San Joaquin kit fox	E/T	San Joaquin Valley and adjacent open foothills to the west; recent records from 17 counties extending from Kern County north to Contra Costa County.	Saltbush scrub, grassland, oak, savanna, and freshwater scrub.	None—no suitable habitat present within project corridor.
Birds				
Asio flammeus Short-eared owl	--/SSC	Permanent resident along the coast from Del Norte County to Monterey County although very rare in summer north of San Francisco Bay, in the Sierra Nevada north of Nevada County, in the plains east of the Cascades, and in Mono County; small, isolated populations.	Freshwater and salt marshes, lowland meadows, and irrigated alfalfa fields; needs dense tules or tall grass for nesting and daytime roosts.	None—no suitable habitat present within project corridor.
Athene cunicularia hypugaea Western burrowing owl	--/SSC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast.	Level, open, dry, heavily grazed or low stature grassland or desert vegetation with available burrows.	High—47 CNDDB occurrences within 5 miles of project corridor, low-quality suitable habitat present within project corridor near the San Jose Airport and Communications Hill.

Table 3.3-2. Continued

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Brachyramphus marmoratus Marbled murrelet	T/E	Nesting sites from the Oregon border to Eureka and between Santa Cruz and Half Moon Bay; winters in nearshore and offshore waters along the entire California coastline.	Mature, coastal coniferous forests for nesting; nearby coastal water for foraging; nests in conifer stands greater than 150 years old and may be found up to 35 miles inland; winters on subtidal and pelagic waters often well offshore.	None—no suitable habitat within the study area.
Charadrius alexandrines nivosus Western snowy plover	T/SSC	Population defined as those birds that nest adjacent to or near tidal waters, including all nests along the mainland coast, peninsulas, offshore islands, and adjacent bays and estuaries. Twenty breeding sites are known in California from Del Norte to Diego County.	Coastal beaches above the normal high tide limit in flat, open areas with sandy or saline substrates; vegetation and driftwood are usually sparse or absent.	None—no suitable habitat present within project corridor.
Circus cyaneus Northern harrier	--/SSC	Throughout lowland California. Has been recorded in fall at high elevations.	Grasslands, meadows, marshes, and seasonal and agricultural wetlands.	Moderate—two CNDDB occurrences within 5 miles of project corridor, low-quality foraging and nesting habitat present within grasslands in project corridor.
Diomedea albatrus Short-tailed albatross	E/SSC	Widespread in temperate and subarctic North Pacific.	Pelagic, nests on ground on small oceanic islands.	None—no suitable habitat present within project corridor.
Elanus leucurus White-tailed kite	--/FP	Lowland areas west of Sierra Nevada from the head of the Sacramento Valley south, including coastal valleys and foothills, to western San Diego County at the Mexico border.	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging.	Moderate—six CNDDB occurrences within 5 miles of project corridor, low-quality foraging and nesting habitat present within project corridor.

Table 3.3-2. Continued

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Falco peregrines anatum American peregrine falcon	D/D, FP	Permanent resident along the north and south Coast ranges. May summer in the Cascade and Klamath Ranges and through the Sierra Nevada to Madera County. Winters in the Central Valley south through the Transverse and Peninsular Ranges and the plains east of the Cascade Range.	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large prey populations.	Low (foraging only)—two CNDDB occurrences within 5 miles of project corridor, no suitable nesting habitat present within project corridor.
Geothlypis trichas sinuosa Saltmarsh common yellowthroat	--/SSC	Found only in the San Francisco Bay Area in Marin, Napa, Sonoma, Solano, San Francisco, San Mateo, Santa Clara, and Alameda Counties.	Freshwater marshes in summer and salt or brackish marshes in fall and winter; requires tall grasses, tules, and willow thickets for nesting and cover.	Low (foraging only)—14 CNDDB occurrences within 5 miles of project corridor, no suitable nesting habitat present within project corridor.
Laterallus jamaicensis conturniculus California black rail	--/T, FP	Permanent resident in the San Francisco Bay and eastward through the Delta into Sacramento and San Joaquin Counties; small populations in Marin, Santa Cruz, San Luis Obispo, Orange, Riverside, and Imperial Counties.	Tidal salt marshes associated with heavy growth of pickleweed; also brackish marshes or freshwater marshes at low elevations.	None—no suitable habitat present within project corridor.
Melospiza melodia pusillula Alameda song sparrow	--/SSC	Marshes along the southern portion of San Francisco Bay.	Brackish marshes associated with pickleweed; may nest in tall vegetation or among the pickleweed.	None—no suitable habitat present within project corridor.
Pelecanus occidentalis californicus California brown pelican	D/D, FP	Pacific coast from Canada through Mexico.	Coastal areas. Nests on islands and occasionally along Arizona's lakes and rivers.	None—no suitable habitat within the study area.
Progne subis Purple martin	--/SSC	Coastal mountains south to San Luis Obispo County, west slope of the Sierra Nevada, and northern Sierra and Cascade ranges. Absent from the Central Valley except in the greater Sacramento area. Isolated, local populations in southern California.	Nests in abandoned woodpecker holes in oaks, cottonwoods, and other deciduous trees in a variety of wooded and riparian habitats. Also nests in vertical drainage holes under elevated freeways and highway bridges.	Low—suitable nesting habitat present within project corridor.

Table 3.3-2. Continued

Scientific and Common Names	Status[a] Federal/State	Geographic Distribution	Habitat Requirements	Potential Occurrence in Project Corridor[b]
Rallus longirostris obsoletus California clapper rail	E/E, FP	Along the Pacific Coast in Monterey and San Luis Obispo Counties.	From tidal mudflats to tidal sloughs.	None—no suitable habitat present within project corridor.
Sternula antillarum browni California least tern	E/E, FP	Along the Pacific Coast of California from San Francisco to Baja California.	Nests on open beaches kept free of vegetation by natural scouring from tidal action.	None—no suitable habitat present within project corridor.

[a] Status explanations:

Federal

E = listed as endangered under the Endangered Species Act (ESA)
T = listed as threatened under the ESA
PT = proposed for federal listing as threatened under the ESA
C = species for which USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded
D = delisted
-- = no listing

State

E = listed as endangered under California Endangered Species Act (CESA)
T = listed as threatened under CESA
PTE = proposed for state listing as threatened or endangered under the CESA
FP = fully protected under the California Fish and Game Code
SSC = species of special concern in California
D = delisted
-- = no listing

[b] Definitions of levels of potential occurrence

High: Known occurrences of the species within the study area, or CNDDB or other documents record the occurrence of the species within a 5-mile radius of the study area; and suitable habitat is present within the study area.
Moderate: CNDDB or other documents record the occurrence of the species within a 5-mile radius of the study area; and low-quality suitable habitat is present within the study area.
Low: CNDDB or other documents record the occurrence of the species within a 5-mile radius of the study area; or suitable habitat is present within the study area.
None: CNDDB or other documents do not record the occurrence of the species within a 5-mile radius of the study area; and suitable habitat is not present within the study area.

[c] Townsend's big-eared bat, pallid bat, Western red bat, and fringed myotis all have additional status listing designations by the Western Bat Working Group (WBWG) of H (high priority), and hoary bat has the additional status listing designation of M (medium priority). These listings are conservation priorities based on available information on species distribution, status, ecology, and known threats. Additional information on these listings is provided in Section 3.3.1.2 *Environmental Setting*.

CNDDB = California Natural Diversity Database

Table 3.3-3. Special-Status Plants Known to Occur or that May Occur in the Project Corridor

Species	Status[a] Federal/State/ CRPR	California Distribution	Habitats	Blooming Period	Potential Occurrence in Project Corridor[b]
Acanthomintha duttonii San Mateo thornmint	E/E/1B.1	Central Coast, San Francisco Bay Area: two occurrences in San Mateo County.	Annual grassland and open areas in chaparral and coastal scrub, on serpentine vertisol clay soil, below 900 feet above mean sea level (MSL).	Apr–Jun	None—there is no suitable habitat present within project corridor.
Allium peninsulare var. *franciscanum* Franciscan onion	–/–/1B.2	Central Coast, San Francisco Bay region: Santa Clara, San Mateo, and Sonoma Counties.	Clay and often serpentine soils in cismontane woodland, valley and foothill grassland, below 1,000 feet above MSL.	May–Jun	Low—nine CNDDB occurrences within 5 miles of project corridor; low-quality suitable habitat present within project corridor.
Amsinckia lunaris Bent-flowered fiddleneck	–/–/1B.2	Inner North Coast Ranges, San Francisco Bay Area, west-southern Sacramento Valley, and west-northern San Joaquin Valley.	Coastal bluff scrub, valley and foothill grasslands, cismontane woodlands, 101,645 feet above MSL.	Mar–Jun	Low—three CNDDB occurrences within 5 miles of project corridor; low-quality suitable habitat present within project corridor.
Arctostaphylos franciscana Franciscan manzanita	P/–/1B.1	Historical occurrence in San Francisco; believed extinct in the wild.	Coastal scrub on serpentine soils, below 990 feet above MSL.	Feb–Apr	None—no suitable habitat within the project corridor.
Arctostaphylos imbricata San Bruno Mountain manzanita	–/E/1B.1	Western San Francisco Bay: San Bruno Mountain, San Mateo County.	Chaparral and coastal scrub on rocky outcrops.	Feb–May	None—no suitable habitat within the project corridor.
Arctostaphylos montana ssp. *ravenii* Presidio manzanita	E/E/1B.1	Presidio of San Francisco.	Chaparral, coastal prairie, coastal scrub, serpentine soils.	Feb–Mar	None—no suitable habitat within the project corridor.
Arctostaphylos montaraensis Montara manzanita	–/–/1B.2	Endemic to San Mateo County, San Bruno Mountain, Montara Mountains.	Maritime chaparral, coastal scrub, 650–1,640 feet above MSL.	Jan–Mar	None—no suitable habitat within the project corridor.

Table 3.3-3. Continued

Species	Status[a] Federal/State/ CRPR	California Distribution	Habitats	Blooming Period	Potential Occurrence in Project Corridor[b]
Arctostaphylos regismontana Kings Mountain manzanita	–/–/1B.2	Western San Francisco Bay region, northern Santa Cruz Mountains: Santa Cruz and San Mateo Counties.	Broadleaved upland forest, chaparral, North Coast coniferous forest, on granitic or sandstone soils.	Jan–Apr	None—no suitable habitat within the project corridor.
Arenaria paludicola Marsh sandwort	E/E/1B.1	Known only from three occurrence near Black Lake on Nipomo Mesa, San Luis Obispo County. Historically more wide ranging through Central and South Coast.	Boggy meadows, freshwater marshes, and swamps, below 1,000 feet above MSL.	May–Aug	None—no suitable habitat within the project corridor.
Astragalus tener var. *tener* Alkali milk-vetch	–/–/1B.2	Southern Sacramento Valley, northern San Joaquin Valley, east San Francisco Bay Area.	Playas, on adobe clay in valley and foothill grassland, vernal pools on alkaline soils, annual grassland on alkaline soil, seasonal wetlands; below 197 feet above MSL.	Mar–Jun	None—no suitable habitat within the project corridor.
Balsamorhiza macrolepis Big-scale balsamroot	–/–/1B.2	Scattered occurrences in the Coast Ranges and Sierra Nevada foothills.	Rocky annual grassland and fields, foothill woodland hillsides, sometimes serpentinite soils, below 4,600 feet above MSL.	Mar–Jun	None—no suitable habitat within the project corridor.
California macrophylla Round-leaved filaree	–/–/1B.1	Scattered occurrences in the Sacramento and San Joaquin Valleys, southern North Coast Ranges, San Francisco Bay Area, South Coast Ranges, Channel Islands, Transverse Ranges, and Peninsular Ranges.	Grasslands, on friable clay soils.	Mar–May	Low—one CNDDB occurrence within 5 miles of project corridor; low-quality suitable habitat present within project corridor.
Carex comosa Bristly sedge	–/–/2.1	Scattered occurrences throughout California, Oregon, and Washington.	Wet places and lake margins.	May–Sep	Low—one CNDDB occurrence within 5 miles of project corridor; low-quality suitable habitat present within project corridor.

Table 3.3-3. Continued

Species	Status[a] Federal/State/ CRPR	California Distribution	Habitats	Blooming Period	Potential Occurrence in Project Corridor[b]
Centromadia parryi ssp. *congdonii* Congdon's tarplant	–/–/1B.1	Eastern San Francisco Bay Area, Salinas Valley, and Los Osos Valley.	Alkaline soils in annual grassland, on lower slopes, flats, and swales, sometimes on saline soils, below 755 feet above MSL.	May–Oct (Nov)	Low—five CNDDB occurrences within 5 miles of project corridor; low-quality suitable habitat present within project corridor.
Centromadia parryi ssp. *parryi* Pappose tarplant	–/–/1B.2	Butte, Colusa, Glenn, Lake, Napa, San Luis Obispo, San Mateo, Solano, and Sonoma Counties.	Often alkaline soils, chaparral, coastal prairie, meadows and seeps, marshes and swamps (coastal salt), valley and foothill grassland (vernally mesic).	May–Nov	None—no suitable habitat within the project corridor.
Chloropyron maritimum ssp. *palustre* (*Cordylanthus maritimus* ssp. *palustris*) Point Reyes bird's-beak	–/–/1B.2	Coastal northern California from Humboldt to Santa Clara County.	Coastal salt marsh; below 33 feet above MSL.	Jun–Oct	None—no suitable habitat within the project corridor.
Chorizanthe robusta var. *robusta* Robust spineflower	E/–/1B.1	Coastal central California from San Mateo to Monterey County.	Coastal bluff scrub, coastal dunes openings in cismontane woodland, on sandy soil.	May–Sep	None—no suitable habitat within the project corridor.
Cirsium andrewsii Franciscan thistle	–/–/1B.2	Coastal California from Sonoma County to San Mateo County.	Moist areas in coastal prairie, coastal scrub, and mixed evergreen forest, sometimes on serpentine soils, 0–440 feet above MSL.	Mar–Jul	None—no suitable habitat within the project corridor.
Cirsium fontinale var. *campylon* Mt. Hamilton fountain thistle	–/–/1B.2	Mt. Hamilton Range, eastern San Francisco Bay Area: Alameda, Santa Clara, and Stanislaus Counties.	Freshwater seeps and streams on serpentine outcrops, chaparral, cismontaine woodland, valley and foothill grassland, 1,000–2,500 feet above MSL.	Apr–Oct	None—no suitable habitat within the project corridor.

Table 3.3-3. Continued

Species	Status[a] Federal/State/ CRPR	California Distribution	Habitats	Blooming Period	Potential Occurrence in Project Corridor[b]
Cirsium fontinale var. *fontinale* Fountain thistle	E/E/1B.1	Endemic to San Mateo County.	Seeps in chaparral and grassland, on serpentine soils.	Jun–Oct	None—no suitable habitat within the project corridor.
Cirsium occidentale var. *compactum* Compact cobwebby thistle	–/–/1B.2	San Francisco and San Luis Obispo Counties.	Chaparral, coastal dunes, coastal prairie, coastal scrub.	Apr–Jun	None—no suitable habitat within the project corridor.
Clarkia franciscana Presidio clarkia	E/E/1B.1	San Francisco Bay, Presidio, Oakland hills: Alameda and San Francisco Counties.	Serpentine grassland, coastal scrub.	May–Jul	None—no suitable habitat within the project corridor.
Collinsia corymbosa Round-headed Chinese-houses	–/–/1B.2	North Coast and northern Central Coast from Del Norte County to Marin County.	Coastal dunes, below 65 feet above MSL.	Apr–Jun	None—no suitable habitat within the project corridor.
Collinsia multicolor San Francisco collinsia	–/–/1B.2	Coastal California from San Francisco to Monterey County.	Closed-cone coniferous forest, coastal scrub.	Mar–May	None—no suitable habitat within the project corridor.
Dirca occidentalis Western leatherwood	–/–/1B.2	San Francisco Bay region: Alameda, Contra Costa, Marin, Santa Clara, San Mateo, and Sonoma Counties.	Moist areas in broadleaved upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, North Coast coniferous forest, riparian forest, riparian woodland, 82–1,394 feet above MSL.	Jan–Apr	None—no suitable habitat within the project corridor.
Dudleya abramsii ssp. *setchellii* Santa Clara Valley dudleya	E/–/1B.1	Endemic to Santa Clara County.	Cismontane woodland, valley and foothill grassland, on rocky serpentine sites.	May–Jun	Low—nine CNDDB occurrences within 5 miles of project corridor; low-quality suitable habitat present within project corridor.

Table 3.3-3. Continued

Species	Status[a] Federal/State/ CRPR	California Distribution	Habitats	Blooming Period	Potential Occurrence in Project Corridor[b]
Eriophyllum latilobum San Mateo woolly sunflower	E/E/1B.1	One known occurrence in San Mateo County.	Open areas in coast live oak woodland, often on roadsides, sometimes on serpentine soils, 150–500 feet above MSL.	May–Jun	None—no suitable habitat within the project corridor
Eryngium aristulatum var. *hooveri* Hoover's button-celery	–/–/1B.1	South San Francisco Bay Area, South Coast Ranges in Alameda, San Benito, Santa Clara, and San Luis Obispo Counties.	Vernal pool, 10–148 feet above MSL.	July	None—no suitable habitat within the project corridor.
Fritillaria biflora var. *ineziana* Hillsborough chocolate lily	–/–/1B.1	Endemic to Hillsborough area in San Mateo County.	Serpentine grassland.	Mar–Apr	None—no suitable habitat within the project corridor.
Fritillaria liliacea Fragrant fritillary	–/–/1B.2	Coast Ranges from Marin County to San Benito County.	Adobe soils of interior foothills, coastal prairie, coastal scrub, annual grassland, often on serpentine soils, below 1,350 feet.	Feb–Apr	None—no suitable habitat within the project corridor
Gilia capitata ssp. *chamissonis* Blue coast gilia	–/–/1B.1	Marin, San Francisco, and Sonoma Counties.	Coastal dunes and coastal scrub.	Apr–Jul	None—no suitable habitat within the project corridor.
Gilia millefoliata Dark-eyed gilia	–/–/1B.2	Coastal California from Del Norte to San Francisco County.	Coastal dunes; 10–65 feet above MSL.	Apr–Jul	None—no suitable habitat within the project corridor.
Helianthella castanea Diablo helianthella	–/–/1B.2	San Francisco Bay Area: Alameda, Contra Costa, Marin[c], San Francisco[c], and San Mateo Counties.	At chaparral/oak woodland ecotone, often in partial shade, on rocky soils, 80–3,800 feet above MSL.	Apr–Jun	None—no suitable habitat within the project corridor.

Table 3.3-3. Continued

Species	Status[a] Federal/State/CRPR	California Distribution	Habitats	Blooming Period	Potential Occurrence in Project Corridor[b]
Hemizonia congesta ssp. *congesta* White seaside tarplant	–/–/1B.2	Mendocino, Marin, San Francisco, San Mateo, and Sonoma Counties.	Valley and foothill grassland, sometimes roadsides.	Apr–Nov	Low—two CNDDB occurrences within 5 miles of project corridor; low-quality suitable habitat present within project corridor.
Hesperevax sparsiflora var. *brevifolia* Short-leaved evax	–/–/1B.2	Humboldt, Mendocino, Marin, Santa Cruz, San Francisco, and Sonoma Counties.	Coastal dunes, sandy soils in coastal bluff scrub, below 700 feet above MSL.	Apr–Jun	None—no suitable habitat within the project corridor.
Hesperolinon congestum Marin dwarf-flax (=western flax)	T/T/1B.1	Marin, San Francisco, and San Mateo Counties.	Chaparral, serpentine grassland.	Apr–Jul	None—no suitable habitat within the project corridor
Horkelia cuneata var. *sericea* Kellogg's horkelia	–/–/1B.1	Coastal California from Marin County to Santa Barbara County.	Openings in closed-cone coniferous forest, coastal scrub, maritime chaparral, on sandy or gravelly soils.	Apr–Sep	None—no suitable habitat within the project corridor.
Horkelia marinensis Point Reyes horkelia	–/–/1B.2	Scattered occurrences in North Coast and northern Central Coast: Mendocino, Marin, Santa Cruz, and San Mateo Counties.	Coastal dunes, coastal scrub, perennial grassland on sandy soils, 15–1,150 feet above MSL.	May–Sep	None—no suitable habitat within the project corridor.
Lasthenia conjugens Contra Costa goldfields	E/–/1B.1	Scattered occurrences in Coast Range valleys and southwest edge of Sacramento Valley: Alameda, Contra Costa, Mendocino, Monterey, Napa, Santa Barbara[c], Santa Clara[c], and Solano Counties.	Alkaline or saline vernal pools and swales, below 700 feet above MSL.	Mar–Jun	None—no suitable habitat within the project corridor
Layia carnosa Beach layia	E/E/1B.1	Scattered occurrences along coastal California from Humboldt County to Santa Barbara County.	Coastal dunes, coastal scrub on sandy soil.	Mar–Jul	None—no suitable habitat within the project corridor.
Leptosiphon rosaceus Rose leptosiphon	–/–/1B.1	Marin, San Francisco[c], San Mateo, and Sonoma* Counties.	Coastal bluff scrub.	Apr–Jul	None—no suitable habitat within the project corridor.

Table 3.3-3. Continued

Species	Status[a] Federal/State/ CRPR	California Distribution	Habitats	Blooming Period	Potential Occurrence in Project Corridor[b]
Lessingia arachnoidea Crystal Springs lessingia	–/–/1B.2	San Mateo County, one location reported in Sonoma County.	Serpentine grassland and open grassy areas in serpentine chaparral, cismontane woodland.	Apr–Jul	None—no suitable habitat within the project corridor.
Lessingia germanorum San Francisco lessingia	E/E/1B.1	San Francisco and San Mateo Counties.	Coastal scrub, on remnant dunes.	Jun–Nov	None—no suitable habitat within the project corridor.
Malacothamnus aboriginum Indian Valley bush mallow	–/–/1B.2	Inner South Coast Ranges: San Benito, Fresno, and Monterey Counties.	Rocky areas in chaparral and oak woodland, often in burned areas, 492–5,577 feet above MSL.	Apr–Oct	None—no suitable habitat within the project corridor.
Malacothamnus arcuatus Arcuate bush-mallow	–/–/1B.2	Santa Clara, Santa Cruz, and San Mateo Counties.	Chaparral, 49–1,165 feet above MSL.	Apr–Sep	None—no suitable habitat within the project corridor.
Malacothamnus davidsonii Davidson's bush-mallow	–/–/1B.2	Los Angeles, Monterey, and San Luis Obispo Counties.	Coastal scrub, chaparral, and riparian woodland in sandy washes, 900–2,800 feet above MSL.	Jun–Sep	None—no suitable habitat within the project corridor.
Malacothamnus hallii Hall's bush-mallow	–/–/1B.2	Alameda, Contra Costa, Merced, Santa Clara, and Stanislaus Counties.	Chaparral and coastal scrub, 30–2,500 feet above MSL.	May–Sep	None—no suitable habitat within the project corridor.
Microseris paludosa Marsh microseris	–/–/1B.2	Coastal California from Mendocino County to San Luis Obispo County.	Grassland, coastal scrub, closed-cone-coniferous forest, cismontane woodland.	Apr–Jul	Low—one CNDDB occurrence within 5 miles of project corridor; low-quality suitable habitat present within project corridor.
Monolopia gracilens Woodland woollythreads	–/–/1B.2	Contra Costa, Alameda (reported), Santa Clara, San Mateo, Santa Cruz, Monterey, San Luis Obispo Counties.	Cismontane woodland, openings in broadleaved forest, openings in north coast coniferous forest, openings in chaparral, and serpentine valley and foothill grassland, 328–3,937 feet above MSL.	Mar–Jun (Feb)	None—no suitable habitat within the project corridor.

Table 3.3-3. Continued

Species	Status[a] Federal/State/ CRPR	California Distribution	Habitats	Blooming Period	Potential Occurrence in Project Corridor[b]
Pentachaeta bellidiflora White-rayed pentachaeta	E/E/1B.1	One occurrence in San Mateo County, historically known also from Marin and Santa Cruz Counties.	Annual grassland, often on serpentine soils.	Mar–May	None—no suitable habitat within the project corridor
Plagiobothrys chorisianus var. *chorisianus* Choris' popcornflower	–/–/1B.2	Southwest San Francisco Bay Area, northern Central Coast: Santa Cruz, San Francisco and San Mateo Counties.	Chaparral, coastal prairie, coastal scrub, in mesic areas.	Mar–Jun	None—no suitable habitat within the project corridor.
Plagiobothrys diffusus San Francisco popcornflower	–/E/1B.1	Alameda and Santa Cruz County.	Coastal prairie, valley and foothill grassland.	Mar–Jun	None—not known to occur in the counties in which the project is located.
Polemonium carneum Oregon polemonium	–/–/2.2	Alameda, Del Norte, Humboldt, Marin, San Francisco, Siskiyou, San Mateo, and Sonoma Counties.	Coastal prairie, coastal scrub, and lower montane coniferous forest.	Apr–Sep	None—no suitable habitat within the project corridor.
Potentilla hickmanii Hickman's cinquefoil	E/E/1B.1	Monterey, San Mateo, and Sonoma[c] Counties.	Freshwater marshes, seeps, and small streams in open areas in coastal scrub or coniferous forest.	Apr–Aug	None—no suitable habitat within the project corridor.
Sanicula maritima Adobe sanicle	–/R/1B.1	Coastal Monterey and San Luis Obispo Counties. Historically known from the San Francisco Bay area: Alameda[c] and San Francisco[c] Counties.	Moist clay or ultramafic soils, in meadows and grassland.	Feb–May	None—no suitable habitat within the project corridor.
Silene verecunda ssp. *verecunda* San Francisco campion	–/–/1B.2	Northern Central Coast, San Francisco Bay Area: San Francisco, and San Mateo, Santa Cruz Counties; also Sutter County.	Coastal bluff scrub, chaparral, coastal prairie, coastal scrub, valley and foothill grassland, in sandy areas, 100–2,100 feet above MSL.	Mar–Aug	Low—six CNDDB occurrences within 5 miles of the project and limited suitable habitat is present within the project corridor.
Streptanthus albidus ssp. *albidus* Metcalf Canyon jewel-flower	E/–/1B.1	Endemic to Santa Clara County.	Valley and foothill grassland, on serpentine soils.	Apr–Jul	None—no suitable habitat within the project corridor.

Table 3.3-3. Continued

Species	Status[a] Federal/State/ CRPR	California Distribution	Habitats	Blooming Period	Potential Occurrence in Project Corridor[b]
Streptanthus albidus ssp. *peramoenus* Most beautiful jewel-flower	–/–/1B.2	Eastern San Francisco Bay area, Central south coastal outer ranges: Alameda, Contra Costa, Monterey, and Santa Clara Counties.	Chaparral, annual grassland, on ridges and slopes on serpentine outcrops, 450–3,200 feet above MSL.	Apr–Jun	None—no suitable habitat within the project corridor.
Stuckenia filiformis (*Potamogeton filiformis*) Slender-leaved pondweed	–/–/2.2	Scattered locations in Contra Costa, El Dorado, Lassen, Merced, Mono, Modoc, Mariposa, Placer, and Sierra Counties; presumed extirpated in Santa Clara County.	Freshwater marsh, shallow emergent wetlands and freshwater lakes, drainage channels; 984–7,054 feet above MSL.	May–July	None—no suitable habitat within the project corridor.
Sueda californica California seablite	E/–/1B.1	Morro Bay, San Luis Obispo County, historically found in south San Francisco Bay.	Margins of tidal salt marsh, below 49 feet above MSL.	Jul–Oct	None—no suitable habitat within the project corridor.
Trifolium amoenum Showy rancheria clover	E/–/1B.1	Coast Range foothills, San Francisco Bay region from Mendocino County to Santa Clara County.	Low elevation grasslands, including swales and disturbed areas, sometimes on serpentine soils.	Apr–Jun	Low—two CNDDB occurrences within 5 miles of project corridor; low-quality suitable habitat present within project corridor.
Trifolium hydrophilum Saline clover	–/–/1B.2	Sacramento Valley, central western California.	Salt marsh, mesic alkaline areas in grasslands, vernal pools.	Apr–Jun	None—no suitable habitat within the project corridor.
Triquetrella californica Coastal triquetrella	–/–/1B.2	Scattered localities in Coastal California: Contra Costa, Mendocino, San Diego, and San Francisco Counties.	On soil in coastal bluff scrub and coastal scrub, 33–328 feet above MSL.	N/A	None—no suitable habitat within the project corridor.

Table 3.3-3. Continued

[a] Status explanations:

Federal

E	=	listed as endangered under the Endangered Species Act (ESA)
P	=	proposed for listing under the ESA
–	=	no listing

State

E	=	listed as endangered under the California Endangered Species Act
–	=	no listing

California Rare Plant Rank (CRPR)

1B	=	List 1B species: rare, threatened, or endangered in California and elsewhere
2	=	List 2 species: rare, threatened, or endangered in California but more common elsewhere

CRPR Code Extensions:

0.1	=	seriously endangered in California (over 80% of occurrences threatened/high degree and immediacy of threat
0.2	=	fairly endangered in California (20–80% of occurrences threatened)

[b] Definitions of levels of potential occurrence:

Moderate:	Plant known to occur in the region from the CNDDB or other documents regarding the vicinity of the Proposed Project, or habitat conditions are of suitable quality.
Low:	Plant not known to occur in the region from the CNDDB or other documents regarding the vicinity of the Proposed Project; or habitat conditions are of poor quality.
None:	Plant not known to occur in the region from the CNDDB or other documents regarding the vicinity of the Proposed Project; or suitable habitat is not present in any condition.

[c] Species has not been observed here, but is expected to also occur at this location.

CNDDB = California Natural Diversity Database

Non-Listed Species Considered

Project effects on Cooper's hawk, great blue heron, snowy egret, and other nesting birds were considered in this analysis due to the protection of active nests under MBTA and California Department of Fish and Game Code Sections 3503 and 3503.5.

Project effects on monarch butterfly overwintering sites were also considered in this analysis because such sites are locally significant. No known monarch butterfly overwintering sites are known to occur within or near the project corridor.

Tree Survey

Trees in the Caltrain corridor consist of a variety of native and non-native species. The project arborist (HortScience), conducted multiple assessments along the project route to identify trees that maybe affected by the Proposed Project. HortScience assessed the tree canopy along the entire route using aerial photography and video photography shot from the front of a train. Using that information, HortScience identified the areas of highest tree density for targeted on-the-ground surveys in following listed below. Both sides of the ROW were surveyed unless otherwise noted.

- Burlingame, from milepost (MP) 15.1 to MP 16.3 (from Trousdale Drive to North Lane).
- Atherton, from MP 27.2 to MP 28.1 (the entire length of Atherton in the Caltrain ROW).
- Menlo Park, from MP 28.1 to MP 29.7 (the entire length of Menlo Park in the Caltrain ROW).
- Palo Alto, from MP 29.7 to MP 31.8 (from the northern city limit to Oregon Expressway).
- Sunnyvale, from MP 37.9 to MP 38.6 (both sides from N. Mary Avenue to N. Mathilda Avenue, and north side only from N. Mathilda to Sunnyvale city limit), and from MP 39.7 to MP 40.3 (from just north of N. Wolfe Road to a point 0.5 mile south of N. Wolfe Road, south side only)

These surveys were completed in summer 2013. In October 2013, HortScience supplemented the pedestrian surveys with a two-day survey from the Caltrain ROW of areas of lesser tree canopy density using a maintenance vehicle (a Hi-Rail Truck also called a Hy-Rail or a road-rail vehicle). Using the survey data, aerial photography and video photography, HortScience then prepared a tree inventory (Appendix F, *Tree Inventory and Canopy Assessment*) and assessed the potential effects of the Proposed Project on trees based on the needs for vegetation clearance to provide for electrical safety in the electrical safety zone (ESZ)[2].

Some trees stand within the Caltrain ROW while others are on adjacent public or private property. This vegetation, which provides visual screening between the railroad ROW and adjacent land uses, may encroach into vertical and horizontal clearances for installation and safe operations and maintenance of the OCS components. Potential project impacts on such vegetation were therefore considered. <u>A prior estimate of the number of trees along the entire Caltrain service corridor (San Francisco to Gilroy) is approximately 19,000 trees in and immediately adjacent to the ROW.</u>

Some of the trees within the tree study area are heritage trees as defined by local tree ordinances (see Appendix F). In addition, several locations contain trees with historic significance.

[2] The ESZ is the distance from the railway outside track centerlines to the outer edge of the vegetation clearance zone. This distance would be up to 24 feet (up to 12 feet to the OCS pole alignment + 2 feet for the width of the pole + 10 feet for the vegetation clearance).

- Burlingame Eucalyptus Row: The City of Burlingame has identified concern about the historic row of eucalyptus along the Caltrain ROW within the City (called the Jules Francard Grove). A separate row of eucalyptus (the Howard-Ralston Eucalyptus Tree Rows along El Camino Real) is on the National Register of Historic Places, but would not be affected by the Proposed Project.
- A landmark redwood tree, also known as "El Palo Alto," is identified by the City of Palo Alto as Heritage Tree #1 and is designated as California Historical Landmark No. 2. The tree trunk is located approximately 26 feet from the Caltrain ROW, with tree branches and foliage located within 5 feet of the ROW. The tree is estimated to be more than 110 feet high and more than 1,000 years old (San Jose Mercury News 2004).

3.3.2 Impact Analysis

An analysis of the effects on biological resources along the project corridor, its methods and significance criteria, and associated mitigation measures are described below.

3.3.2.1 Methods for Analysis

Potential adverse effects on special-status species in the study area were evaluated based on a review of the available literature regarding the status and known distribution of the special-status species within the study area, and data collected from a survey of the new facilities locations within the project area conducted by ICF biologists on June 26, 2013. Principle sources consulted during the analysis are listed here.

- USFWS list of endangered and threatened species that may occur in or be affected by projects in the U.S. Geological Survey's (USGS) 7.5-minute quadrangles of Mountain View, Cupertino, Palo Alto, Montara Mountain, San Jose West, San Jose East, Woodside, Redwood Point, San Francisco South, San Mateo, and San Francisco North, current as of June 7, 2013 (U.S. Fish and Wildlife Service 2013) (see Appendix G). The individual quadrangles in which the Proposed Project would be located were used because of the developed nature of the majority of the project corridor and the fact that the corridor occupies a relatively small portion of each quadrangle; therefore, a nine-quadrangle search was not conducted.
- CDFW's Natural Diversity Database (CNDDB) query results for the USGS's 7.5-minute quadrangles of Mountain View, Cupertino, Palo Alto, Montara Mountain, San Jose West, San Jose East, Woodside, Redwood Point, San Francisco South, San Mateo, and San Francisco North, current as of June 7, 2013 (California Department of Fish and Wildlife 2013) (see Appendix G). The rationale for using the individual quadrangle search for this query was the same as the USFWS query.
- CNPS's Electronic Inventory query results for the USGS's 7.5-minute quadrangles of Mountain View, Cupertino, Palo Alto, Montara Mountain, San Jose West, San Jose East, Woodside, Redwood Point, San Francisco South, San Mateo, and San Francisco North, current as of June 7, 2013 (California Native Plant Society 2013) (see Appendix G).
- The Proposed Project's *Tree Inventory and Canopy Assessment* prepared by HortScience, Inc. (Appendix F).
- The JPB's Caltrain Electrification Project (SF–San Jose) Biological Resources Report prepared by Garcia and Associates (2008a).

- The Peninsula Corridor Joint Powers Board's (JPB's) Caltrain Electrification Project Focused PS7 Biological Resources Report prepared by Garcia and Associates (2008b).
- The Peninsula Corridor JPB's Caltrain Electrification Project TPS1 Alternate Sites Biology Review prepared by Garcia and Associates (2008c).
- The Proposed Project's NES prepared by Parsons (2002a).
- The Proposed Project's Preliminary Wetland Delineation Report prepared by Parsons (2002b).
- The *Santa Clara Valley Habitat Plan* (ICF International 2012).

After review of all data sources, a final list of candidate, sensitive, and special-status species with potential to occur in the vicinity of the project corridor was compiled. Each of those species was evaluated for its potential to occur within the project corridor and to be affected by Project activities. In addition, the presence of suitable habitat was evaluated. Special-status plant species that might occur in the project corridor are presented in Table 3.3-3. Candidate, sensitive, and special-status wildlife species are presented in Table 3.3-2. For informational purposes, these tables also include species that have been determined to have no potential to occur within the study area. Special-status wildlife and plant species occurrences within 5 miles of the project corridor are respectively shown in Figures 3.3-1 and 3.3-2.

To refine the list of species potentially affected by construction of the Proposed Project, species in Tables 3.3-2 and 3.3-3 were evaluated for their potential to occur in the project corridor.

- Species rated as having "no potential to occur" have no suitable habitat in the study area, are not known to occur within 5 miles of the project corridor, or are thought to have been extirpated from the region.
- Species rated as having "low potential to occur" are those species whose known distribution does not include the project area; species for which little appropriate habitat or only marginal habitat is present in the study area; species for which no records occur within 5 miles of the project corridor, or species that have not been observed during recent surveys.
- Species rated as having "moderate or high potential to occur" are those species for which suitable habitat characteristics are present in the study area, even though the species was not detected during focused surveys.

Species rated as having "moderate or high potential to occur" or "known to occur" in the study area and migratory bird nests were considered in the impact analysis. Where impacts would be significant, mitigation measures were identified to reduce these impacts to a less-than-significant level.

Based on Tables 3.3-2 and 3.3-3, the following special-status species were determined to have potential to occur at certain locations within or along the project corridor.

- Plants:
    - Franciscan onion (*Allium peninsulare* var. *franciscanum*)
    - Bent-flowered fiddleneck (*Amsinckia lunaris*)
    - Round-leaved filaree (*California macrophylla*)
    - Bristly sedge (*Carex comosa*)

    - Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*)
    - Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*)
    - Marsh microseris (*Microseris paludosa*)
    - White-seaside tarplant (*Hemizonia congesta* ssp. *congesta*)
    - San Francisco campion (*Silene verecunda* ssp. *verecunda*)
    - Showy rancheria clover (*Trifolium amoenum*)
- Wildlife:
    - Central California coast steelhead (*Oncorhynchus mykiss*)
    - San Francisco garter snake (*Thamnophis sitralis tetrataenia*)
    - Western pond turtle (*Emys marmorata*)
    - California tiger salamander (*Ambystoma californiense*)
    - California red-legged frog (*Rana draytonii*)
    - Townsend's big-eared bat (*Corynorhinus townsendii*)
    - Pallid bat (*Antrozous pallidus*)
    - Hoary bat (*Lasiurus cinereus*)
    - Fringed myotis (*Myotis thysanodes*)
    - Western burrowing owl (*Athene cunicularia hypugaea*)
    - Northern harrier (*Circus cyaneus*)
    - White-tailed kite (*Elanus leucurus*)
    - American peregrine falcon (*Falco peregrines anatum*)
    - Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*)
    - Purple martin (*Progne subis*)

Therefore, Project construction has the potential to result in impacts on these 10 special-status plant species and 15 special-status wildlife species.

Appendix F, *Tree Inventory and Canopy Assessment*, prepared by HortScience, Inc. was referenced for the tree impact data and the tree impact analysis used in the preparation of this document.

3.3.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the Proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS [including bat species given "Red or High" and "Yellow or Medium" regional priority in the Western Bat Working Group's Regional Priority Matrix (Western Bat Working Group 2007)].

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by CDFW or USFWS.
- Have a substantial adverse effect on federally protected wetlands or waters as defined by CWA Section 404 or state protected wetlands or waters through direct removal, filling, hydrological interruption, or other means.
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.

3.3.2.3 Impacts and Mitigation Measures

<u>Changes resulting from Project Variant 1 are described below each impact analysis.</u>

Impact BIO-1a	Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service during Proposed Project construction
Level of Impact	Significant
Mitigation Measures	BIO-1a: Implement general biological impact avoidance measures BIO-1b: Implement special-status plant species avoidance and revegetation measures BIO-1c: Implement California red-legged frog and San Francisco garter snake avoidance measures BIO-1d: Implement western pond turtle avoidance measures BIO-1e: Implement Townsend's big-eared bat, pallid bat, hoary bat, and fringed myotis avoidance measures BIO-1f: Implement western burrowing owl avoidance measures BIO-1g: Implement northern harrier, white-tailed kite, American peregrine falcon, saltmarsh common yellowthroat, purple martin, and other nesting bird avoidance measures BIO-1h: Conduct biological resource survey of future contractor-determined staging areas BIO-1i: Minimize impacts on Monarch butterfly overwintering sites
Level of Impact after Mitigation	Less than significant

As discussed in Appendix G, *Biological Resources Information*, a limited number of special-status species have suitable habitat within or adjacent to the project corridor.

For the most part, the Proposed Project would disturb areas of a ruderal and previously disturbed character with limited potential for special-status species. The overall scale of potential disturbance would be very limited because the Proposed Project construction within the Caltrain ROW would primarily consist of installing OCS poles with a limited permanent footprint for pole foundations (the OCS poles would be 1 to 2 feet in diameter). For the TPFs within the ROW, the overall footprint would be only 1.1 acres. For the two TPSs outside the ROW, the overall footprint would be only 1.8 acres and both traction power substations would be in highly urbanized areas with limited habitat value.

Special-status plant species have the potential to occur in undeveloped areas with suitable habitat, namely areas that support natural land cover. As noted in Appendix G, such areas are only found in limited portion of the Caltrain ROW, which is dominated by disturbed and ruderal conditions. However, where suitable habitat occurs, project construction would have the potential to result in direct take of special-status plant species through crushing and indirect take of special-status plant species through habitat modification or loss, if they are actually present.

Project construction would not directly affect streams and thus would not directly affect aquatic species. However, the Proposed Project does have the potential to release pollutants into storm drain systems and directly into the drainages themselves. These pollutants would degrade the physical conditions of the water features and could result in direct or indirect mortality of Central California steelhead, other aquatic and partially aquatic species (i.e., San Francisco garter snake, western pond turtle, California tiger salamander, and California red-legged frog,), and species that depend on aquatic prey (i.e., great blue heron and snowy egret). Releases of pollutants could also result in habitat loss. Releases of contaminants from construction equipment and supplies could affect the creeks passing under the project corridor; however, implementation of the Storm Water Pollution Prevention Plan (SWPPP) for the Proposed Project and the mitigation measures specified below would avoid and reduce the amount of runoff into the creeks during construction as required by the CWA Section 401 Permit that would need to be obtained prior to Project initiation. Implementation of the Proposed Project's SWPPP is expected to avoid impacts on aquatic habitat in the drainages crossed by the Proposed Project and consequently, on central coast steelhead. Details of the Proposed Project's SWPPP are further explained in Section 3.9, *Hydrology and Water Quality*.

Although most of the project area is disturbed and ruderal and the potential for special-status terrestrial wildlife species to occur is low, there remains a small potential that these species might be encountered during construction. If and where species are present, ground disturbance activities could result in the direct or indirect mortality or injury of individuals belonging to special-status species through crushing, parental abandonment of young, reduced fitness, reduction in number of available prey, and degradation or loss of habitat. Where tree or other vegetation removal is necessary, the Proposed Project could disturb bat roosting and bird nesting habitat. Birds or bats that utilize bridge structures under or over the Caltrain ROW may be disturbed by the installation of overbridge protection. Other temporary impacts on special-status wildlife species resulting from construction activities would include air pollution from dust and construction equipment and construction noise and vibration. Although the potential to encounter special-status species is low, construction activities and related effects would still have potential to disturb habitat and individual San Francisco garter snake, western pond turtle, California tiger salamander, California red-legged frog, pallid bat, hoary bat, fringed myotis, western burrowing owl, northern harrier, white-tailed kite, American peregrine falcon, saltmarsh common yellow throat, purple martin, and other nesting birds.

Potential staging areas within the Caltrain ROW were assessed for sensitive biological resources. Trees are present at many of the potential staging areas in the ROW and could provide bird nesting or bat roosting sites; Mitigation Measures BIO-1e and BIO-1g would apply. In addition, a number of the staging areas in the ROW have wetlands or waters that may provide habitat for special-status species and that could be affected by construction; the relevant mitigation measures noted below for amphibian and fish special-status species would apply as appropriate. The locations of contractor-determined staging areas outside the ROW are not yet known and activities in these areas could affect special-status species, as well as other sensitive biological resources. Effects in these areas would be temporary as the boundaries of these staging areas would be moved to avoid sensitive resources pursuant to Mitigation Measure BIO-1h.

Although no known Monarch butterfly overwintering sites are found within the project area, if an overwintering site were to develop between 2014 and the time of construction and were to be disturbed, this would be considered a significant impact. Despite the low likelihood of this occurring, implementation of Mitigation Measure BIO-1i is recommended to avoid disrupting overwintering sites.

All sensitive habitat and wetland areas would be identified for avoidance during project design where feasible. With the implementation of such measures in Mitigation Measures BIO-1a, BIO-1b, BIO-1c, BIO-1d, BIO-1e, BIO-1f, BIO-1g, BIO-1h, BIO-1i and HYD-1 (refer to Section 3.9, *Hydrology and Water Quality*), construction of the Proposed Project is expected to have a less-than-significant impact on special-status species.

<u>Under Project Variant 1, as described in Chapter 2, *Project Description*, the Project's terminus and PS7 would be located approximately 1.2 miles farther north than currently proposed. This would avoid construction within the JPB ROW adjacent to Communication Hill, which is an area of special-status species occurrences. Because construction activities would occur in a slightly smaller area, project construction would have slightly less impact to special-status species. However, Mitigation Measures BIO-1a, BIO-1b, BIO-1c, BIO-1d, BIO-1e, BIO-1f, BIO-1g, BIO-1h, BIO-1i and HYD-1 would all still apply and this impact's significance determination would not change.</u>

Mitigation Measure BIO-1a: Implement general biological impact avoidance measures

The following practices will be implemented when each applies as determined by the construction schedule and specific construction activities.

- A Worker Environmental Awareness Training Program for construction personnel will be conducted by a qualified biologist retained by JPB. The program will provide workers with information on their responsibilities with regard to the special-status species, including central California steelhead, San Francisco garter snake, western pond turtle, California tiger salamander, California red-legged frog, Townsend's big-eared bat, pallid bat, hoary bat, fringed myotis, Cooper's hawk, great blue heron, western burrowing owl, northern harrier, white-tailed kite, American peregrine falcon, saltmarsh common yellow throat, and purple martin. The training will provide a physical description of the special-status species that have potential to occur and be affected by construction activities to each construction crew prior to the initiation of the crew's construction activities. The worker awareness training will also detail each species' habitat and legal protections, a photo of relevant species, and contact information for the primary biologist.
- Precautions to prevent pollution of streams, waterways, and other bodies of water during construction.
- Dust control through watering of appropriate surfaces.
- Clearing and grubbing procedures that specify that only trees and plants designated for removal will be removed.

- Excavation techniques to ensure the stability of subsurface materials as well as retention of excavated materials within the construction areas.
- Materials and fluids generated by construction activities will be placed at least 30 meters (100 feet) from wetland areas or drainages and covered until they are disposed of at a permitted site.
- All natural communities and wetland areas located outside the construction zone that could be affected by construction activities will be temporarily fenced off and designated Environmentally Sensitive Area(s) to prevent accidental intrusion by workers and equipment.
- Sensitive habitat and wetland (including other waters of the United States and waters of the state) areas will be identified during Project design and avoided during construction to the maximum extent feasible.

Mitigation Measure BIO-1b: Implement special-status plant species avoidance and revegetation measures

During the design phase, prior to construction, JPB will retain a qualified botanist to survey any areas of proposed construction disturbance that contain undeveloped habitat suitable to support Franciscan onion, bent-flowered fiddleneck, round-leaved fillaree, bristly sedge, Congdon's tarplant, Santa Clara Valley dudleya, marsh microseris, white seaside tarplant, San Francisco campion, or showy rancheria clover. The qualified botanist will survey appropriate areas of suitable habitat for these species during each species' blooming period (Table 3.3-3).

If no special-status plants are identified during the design-period surveys, then no further action is necessary. If one or more special-status species is found within areas proposed for disturbance in the project corridor, then the occurrence will be avoided, if feasible. If avoidance is not possible, then a revegetation and monitoring plan would be developed and executed by a qualified botanist retained by JPB that would consist of collection of seed prior to disturbance, reseeding and revegetation after disturbance, and monitoring. Most of the project construction consists of installing OCS poles and wires which have a minimal footprint and, thus, revegetation will be possible in areas where special-status plants may be disturbed. The plan will include revegetation success criteria of 80% of the reseeded target area, in perpetuity conservation of restoration areas, weed management, limiting human access, monitoring for at least 5 years and until success is demonstrated for 3 consecutive years, and remediation measures if success is not achieved by year 5. Monitoring will continue until the success criteria are completely satisfied.

Mitigation Measure BIO-1c: Implement California red-legged frog and San Francisco garter snake avoidance measures

- Implement the Worker Environmental Awareness Training Program described under Mitigation Measure BIO-1a: Implement general biological impact avoidance measures.
- All potential California red-legged frog and San Francisco garter snake habitat that can be avoided by construction activities will be flagged by a USFWS-approved biologist prior to grading or other construction activities. All California red-legged frog and San Francisco garter snake habitat will be protected by a 10-foot buffer with exclusionary fencing to make it easily avoided by construction crews.

- The construction site will be monitored by a qualified and federally permitted biologist during all phases of construction to remove any California red-legged frogs and San Francisco garter snakes found in the construction area. Individual frogs and snakes will be moved immediately to a site that is a minimum of 330 feet from the construction boundary. The relocation site will be determined prior to commencement of construction activities.
- Construction activities near drainages identified as potential migration corridors will take place between May 15 and October 31 when the California red-legged frog and San Francisco garter snake are least likely to be present in the project corridor.
- To discourage California red-legged frogs from entering the project impact areas via the freshwater ditches west of the impact areas, the ditches will be equipped with lightweight, one-way flow gates. These will be designed so that water can easily pass from the project site to the ditches, but small vertebrates such as the frog cannot move upstream from the ditches to the project site.

Mitigation Measure BIO-1d: Implement western pond turtle avoidance measures

Prior to the start of construction activities at sites that may support western pond turtle (defined as any undeveloped areas within 400 feet of creeks), JPB will retain a qualified biologist to conduct preconstruction surveys for pond turtles in all suitable habitats in the vicinity of the project corridor. Surveys will take place at each area of suitable habitat that will be disturbed no more than 7 days prior to the onset of site preparation and construction activities with the potential to disturb turtles or their habitat. If preconstruction surveys identify active nests, the biologist will establish no-disturbance buffer zones around each nest using temporary orange construction fencing. The demarcation should be permeable to allow young turtles to move away from the nest following hatching. The radius of the buffer zone and the duration of exclusion will be determined in consultation with the CDFW. The buffer zones and fencing will remain in place until the young have left the nest, as determined by the qualified biologist. If western pond turtles are found in the project corridor, a qualified biologist will remove and relocate them to suitable habitat outside of the project limits, consistent with CDFW protocols and permits. Relocation sites will be subject to agency approval.

Mitigation Measure BIO-1e: Implement Townsend's big-eared bat, pallid bat, hoary bat, and fringed myotis avoidance measures

Prior to the start of construction activities at sites offering suitable bat roosting habitat, JPB will retain a qualified biologist to conduct preconstruction surveys for Townsend's big-eared bat, pallid bat, hoary bat, and fringed myotis. Surveys will take place no more than 7 days prior to the onset of site preparation and construction activities with the potential to disturb bats or their habitat and will include close inspection of potential bat roosts, such as trees and any built features within the work footprint. If special-status bats are found in the project footprint and avoidance of roosting areas is not possible, a qualified wildlife biologist will consult with CDFW staff to identify the appropriate protection measures. JPB will be responsible to ensure that CDFW requirements are implemented. Multiple survey visits and survey methods may be required at a single site to determine presence or absence of roosting bats, specifically Townsend's big-eared bat, depending on season and roost type.

Mitigation Measure BIO-1f: Implement western burrowing owl avoidance measures

Prior to any construction activity planned to begin during the fall and winter non-nesting season (September 1 through January 31) during the survey or at any time during the construction process, JPB will retain a qualified wildlife biologist to conduct a preconstruction survey for burrowing owls. Surveys will be conducted at each area of suitable habitat that will be disturbed no more than 7 days prior to ground disturbing activities and will cover all suitable burrowing owl habitat subject to disturbance pursuant to the March 7, 2012 California Department of Fish and Game Staff Report on Burrowing Owl Mitigation (California Department of Fish and Game 2012). If any western burrowing owls are found within the disturbance area, JPB will notify CDFW and will proceed under CDFW direction.

If construction is planned to occur during the nesting season (February 1 through August 31), surveys for nesting owls will be conducted by a qualified wildlife biologist in the year prior to construction to determine if there is breeding pair within 150 meters (approximately 492 feet) of the construction footprint, unless the biologist determines that a smaller survey buffer around the construction footprint is called for based on preexisting background disturbance and conditions. This will provide the project team advance notice regarding nesting owls in the project area and allow ample time to discuss with CDFW regarding the appropriate course of action if nesting owls are found. In addition, same-year preconstruction surveys for nesting western burrowing owls will be conducted no more than 7 days prior to ground disturbance in all suitable burrowing owl habitat relative to the proposed date of disturbance. If the biologist identifies the presence of a burrowing owl nest in an area scheduled to be disturbed by construction, a 200-meter no-activity buffer will be established and maintained around the nest while it is active. Surveys and buffer establishment will be performed by qualified wildlife biologists, will be coordinated with CDFW, and will be subject to CDFW review and oversight.

Mitigation Measure BIO-1g: Implement northern harrier, white-tailed kite, American peregrine falcon, saltmarsh common yellowthroat, purple martin, and other nesting bird avoidance measures

- Implement the Worker Environmental Awareness Training Program described under Mitigation Measure BIO-1a: Implement general biological impact avoidance measures.
- Preconstruction surveys for nesting migratory birds, including raptors if construction will occur between February 1 and August 31. If active nests are found during the survey, no-disturbance species-specific buffer zones will be established by a qualified biologist and marked with high-visibility fencing, flagging, or pin flags. Typical active nest buffers for non-raptorial birds are 50 feet and 250 feet for raptors.
- Prior to construction activities, a USFWS-approved biologist will conduct a preconstruction survey of all potential nesting habitat for tree and ground-nesting raptors as well as purple martins and other swallow species that use cavities in human-made structures (i.e., overpasses) as nest sites or that construct nests that adhere to the aforementioned human-made structures to record the presence and location of nesting swallows.
- If construction during the breeding season cannot be avoided, then USFWS-approved exclusionary devices such as netting, panels, or metal projectors will be installed over the entrances to the identified cavities and/or nest sites prior to the swallows' arrival in mid-March. No exclusionary devices will be installed after the breeding season begins (i.e., March 15 through August 15), nor will the cavities or external nests be blocked if birds are

occupying them. All installation of exclusionary devices will be supervised by the USFWS-approved biologist.

- Alternatively, no preconstruction surveys for nesting swallows would be conducted; however, all drainage holes or other cavities, or suitable nest substrates associated with human-made structures within the project corridor that may be used by nesting swallows would be fitted with the exclusionary devices described above prior to the birds' arrival in mid-March.
- All exclusionary devices will be monitored and maintained throughout the breeding season to ensure that they are successful in preventing the birds from accessing the cavities or nest sites. Upon the project's completion, the exclusionary devices will be removed from the site unless otherwise authorized by USFWS.
- All proposed new facility sites are recommended for nesting bird surveys in advance of construction activities if trees are to be removed during the breeding season. Although the majority of the proposed facility sites are located within previously disturbed areas, potential exists for birds to nest within suitable habitat present on or adjacent to these sites.

Mitigation Measure BIO-1h: Conduct biological resource survey of future contractor-determined staging areas

JPB will retain a qualified biologist to conduct a survey of future contractor-determined staging areas prior to any project-related activities commencing in such locations. The biologist will identify any wetlands, other waters of the United States or state, sensitive habitat, and suitable habitat for special-status species. The biologist will work with the contractor, who will avoid such sensitive biological resources to the extent possible through the adjustment of the proposed staging area(s). For habitat where special-status species or other protected species could occur (e.g., occasional upland migration habitat) that could be affected by staging activities, other applicable mitigation measures (BIO-1a to BIO-1g, BIO-1i. BIO-2, BIO-3, BIO-5, BIO-6, and HYD-1) will be implemented for impacts that would occur at the contractor-proposed staging locations.

Mitigation Measure BIO-1i: Minimize impacts on Monarch butterfly overwintering sites

Prior to and during construction, a qualified biologist will periodically monitor the project ROW to evaluate whether Monarch butterfly overwintering sites have been established within areas that would be disturbed by the Proposed Project construction. If no overwintering sites are identified, then no further action is necessary. If overwintering sites become established, then project construction will avoid disturbing the sites during the overwintering period. Outside of the overwintering period, Proposed Project construction may proceed without constraint at the overwintering site.

Impact BIO-1b	Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service during Proposed Project operation
Level of Impact	Potentially significant
Mitigation Measure	BIO-1j: Avoid nesting birds and bats during vegetation maintenance
Level of Impact after Mitigation	Less than significant

As of mid-2013, Caltrain operates 92 trains per day between San Jose and San Francisco during the week (Monday through Friday). With the Proposed Project, Caltrain operation will increase to 114 trains per day, with most of the increase during peak hours. While increased train traffic would occur following construction of the Proposed Project, operational conditions along the ROW are not expected to be significantly different from pre-Project conditions with respect to special-status plant and wildlife species except in relation to the OCS vegetation maintenance and train emissions. For terrestrial or aquatic species other than birds and bats, project operations would not adversely change habitat conditions along the project route and no significant impacts on these species are likely to result from operation of the Proposed Project.

With the partial replacement of diesel trains with electrified trains to create a mixed fleet, there would be a substantial reduction of diesel emissions along the Caltrain ROW, which would benefit the health of rare and common species found on and adjacent to the railway. In addition, the Proposed Project would result in a substantial regional reduction in nitrogen oxide emissions, which have been found to have a substantial adverse impact on serpentine grassland communities due to nitrogen deposition having a fertilizing effect that favors growth of non-native annual grasslands over native serpentine species. In specific, this can have a notable effect on the host plant for the threatened Bay checkerspot butterfly, which is a key focal species for the new *Santa Clara Valley Habitat Plan*.

With the OCS, there would be a need for vegetation maintenance to ensure safe clearances are provided between vegetation and energized elements of the OCS in the ESZ. Vegetation clearance activities occur today under existing conditions to maintain a clear accessway for trains, but the level of vegetation clearance in the future would be larger given the OCS clearance needs. Thus, there would be an increased potential to disturb nesting birds and bats due to annual vegetation maintenance. Mitigation Measure Bio-1j would ensure that impacts on nesting birds and bats would be less than significant.

Under Project Variant 1, described in Chapter 2, *Project Description*, the Project's terminus and PS7 would be located approximately 1.2 miles farther north than currently proposed. Therefore, the geographic area in which vegetation clearance would be required would be slightly smaller and potential to disturb nesting birds and bats due to annual vegetation maintenance would be less. However, Mitigation Measure BIO-1j would all still apply and this impact's significance determination would not change.

Mitigation Measure BIO-1j: Avoid nesting birds and roosting bats during vegetation maintenance

- Implement the Worker Environmental Awareness Training Program described under Mitigation Measure BIO-1a: Implement general biological impact avoidance measures.

- Annual vegetation maintenance will be performed between September 1 and January 30, wherever feasible to avoid nesting and roosting seasons.
- If vegetation maintenance needs to occur between February 1 and August 31 in the ESZ, then JPB will retain a qualified biologist to conduct preclearance surveys for nesting migratory birds, including raptors, and roosting bats. If active nests or roosts are found during the survey, no-disturbance species-specific buffer zones will be established by a qualified biologist and marked with high-visibility fencing, flagging, or pin flags. If an active Townsend's big-eared bat roost is found, consultation with CDFW will be conducted to determine appropriate avoidance strategies. Vegetation clearance will then occur after the nesting or roosting activity has ended. If vegetation clearance is necessary due to an emergency, it may proceed as necessary.

Impact BIO-2a	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations during Proposed Project construction
Level of Impact	Significant
Mitigation Measures	BIO-1a: Implement general biological impact avoidance measures BIO-1b: Implement special-status plant species avoidance and revegetation measures BIO-1h: Conduct biological resource survey of future contractor-determined staging areas BIO-2: Implement serpentine bunchgrass avoidance and revegetation measures BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan
Level of Impact after Mitigation	Less than significant

No project features would be constructed within any stream or riparian areas. However, construction of the Proposed Project could result in removal of some riparian trees and other riparian vegetation where necessary for electrical safety clearances. The implementation of Mitigation Measure BIO-1a would further identify sensitive habitat during Project design and require avoiding such sensitive habitats during construction as feasible. However, removal of riparian vegetation may still be necessary in order to provide electrical safety clearances. This vegetation removal would be considered a significant impact. Mitigation Measure BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan (see discussion below) would require replacement of removed trees or other riparian vegetation as close to the source of impact as possible, which would result in replacement of riparian trees/vegetation along any areas of disturbed riparian habitat. With these measures, impacts on riparian trees and vegetation would be less than significant.

Impacts on wetlands and waters are discussed separately under Impact BIO-3 below.

There is a small area (0.2 mile) of the project alignment in San Jose south of the proposed location of PS7 at Communications Hill that the *Santa Clara Valley Habitat Plan* maps as serpentine bunchgrass grassland. Serpentine bunchgrass grassland is a sensitive natural community designated by CDFW because the community often supports rare plant and wildlife species. In this area, the only proposed Project activities would be installation of OCS poles and wires adjacent to the existing tracks. It is unknown whether or not there is actual serpentine bunchgrass grassland in the area adjacent to the existing tracks. If present, the total permanent disturbance would only consist of perhaps 10 OCS poles (5 on each side) with a permanent footprint of perhaps 125 square feet. Mitigation Measures BIO-1a and BIO-1b would apply to this area and would require minimization, avoidance, and revegetation if special-status plants are identified in this area, which would address rare plants that may occur within this vegetation community. Implementation of Mitigation Measures BIO-2 and BIO-1h would ensure that impacts to serpentine bunchgrass grassland would be less than significant.

If Project Variant 1, described in Chapter 2, *Project Description*, is implemented, then PS7 would be located farther north and no portion of the Project alignment, including the associated OCS, would be within serpentine bunchgrass grassland. Mitigation Measures BIO-2 would not be required due to avoidance of serpentine bunchgrass grassland. Therefore, with implementation of Project Variant 1, this impact's significance determination would not change.

Mitigation Measure BIO-2: Implement serpentine bunchgrass avoidance and revegetation measures

- The area of the alignment through Communications Hill in San Jose will be surveyed by a qualified botanist during the design phase.
- If serpentine bunchgrass grassland is identified, OCS pole placement will be designed to minimize permanent loss of this community.
- Where this community is temporarily disturbed by construction, the disturbed area will be revegetated with serpentine bunchgrass grassland.
- Where this community is permanently disturbed by permanent facilities, an area of equal size will be planted with serpentine bunchgrass grassland species and maintained and monitored until self-sufficient without intervention. Planting will occur at a location with suitable soils to support this community. The planting location will be as near as possible to the impact area within the Communications Hill area.

Impact BIO-2b	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations during Proposed Project operation
Level of Impact	Less than significant

While increased train traffic would occur following construction of the Proposed Project, operational conditions for sensitive habitats are not expected to be significantly different from pre-Project conditions and impacts on natural communities due to operation of the Proposed Project are expected to be less than significant.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any change to this impact analysis because it would not change normal train operations.

Impact BIO-3a	Have a substantial adverse effect on federally protected waters or wetlands as defined by Section 404 of the Clean Water Act or state waters or wetlands through direct removal, filling, hydrological interruption, or other means during Proposed Project construction
Level of Impact	Significant
Mitigation Measure	BIO-1a: Implement general biological impact avoidance measures BIO-1h: Conduct biological resource survey of future contractor-determined staging areas BIO-3: Avoid or compensate for impacts on wetlands and waters HYD-1: Implement construction dewatering treatment
Level of Impact after Mitigation	Less than significant

A few potentially jurisdictional state and federal waters and wetlands occur within the project corridor. If construction were to take place within those areas, construction could disturb or result in the loss of waters or wetlands.

For the OCS poles, there is sufficient project design flexibility in the placement of OCS poles to avoid impacts on all potentially jurisdictional waters that cross the Caltrain ROW, including all stream, creek, and ditch crossings along the entire length of the corridor. Potentially jurisdictional wetlands and waters of the United States that parallel the existing tracks occur sufficiently far outside of the Caltrain ROW that they would not be affected by Proposed Project construction. Detailed field surveys and measurements were conducted and reported in the prior NES to confirm that the line of poles can be constructed without encroaching into wetlands or waters that lie longitudinally along the edge of the Caltrain ROW. Mitigation Measures BIO-1a and BIO-1h would require JPB to identify wetlands and waters during Project design and avoid such sensitive habitats during construction, where feasible. It should be feasible to avoid all waters and wetlands along the entire Caltrain ROW for OCS pole installation, but if permanent loss any waters/wetlands is necessary, then Mitigation Measure BIO-3 would apply.

Regarding TPFs, wetlands or waters were found at only one location: TPS1 Option 3. Construction of a traction power substation at the TPS1 Option 3 site could result in an impact on 0.006-acre of a potential jurisdictional wetland. No wetlands or waters of the United States or state were identified at the TPS1 Option 1, ~~or~~ Option 2, or Option 4 sites. If the Option 1, ~~or~~ Option 2, or Option 4 sites were selected, then no impacts on waters or wetlands would occur in relation to TPS1. If the TPS1 Option 3 site is selected, then Mitigation Measure BIO-3 would be implemented, which would reduce impacts to a less-than-significant level.

For potential construction staging areas within the ROW, potential wetlands or waters were identified at nine different potential staging areas. Potential construction staging areas outside the ROW have not yet been identified but may contain waters or wetlands. Mitigation Measures BIO-1a: Implement general biological impact avoidance measures, BIO-1h: Conduct biological resource survey of future contractor-determined staging areas, and BIO-3: Avoid or compensate for impacts on wetlands and waters would apply to all staging areas containing waters or wetlands.

With the implementation of Mitigation Measures BIO-1a, BIO-1h, and BIO-3, direct impacts on waters and wetlands would be less than significant overall.

Regarding indirect effects, the JPB will develop and implement a SWPPP, as described in Section 3.9, *Hydrology and Water Quality*. In addition, Mitigation Measure HYD-1 will address any indirect water quality impacts on wetlands related to dewatering that may occur during construction.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would reduce the area of OCS construction potentially lowering impacts on waters and wetlands. No waters or wetland are apparent on the PS7 Variant locations. Thus, this variant would not change the impact determination of the Proposed Project.

Mitigation Measure BIO-3: Avoid or compensate for impacts on wetlands and waters

- Wetlands and waters will be avoided as required by Mitigation Measure BIO-1a, where feasible.
- If wetlands and waters cannot be avoided, then JPB will compensate for any permanent losses on a minimum 1:1 ratio (or at a greater ratio if determined to be required in permitting by the USACE or San Francisco Regional Water Quality Control Board [SFRWQCB]). Compensation will be provided by either creation of wetlands or waters to replace those losses and/or enhancement of existing waters or wetlands and/or purchase of adequate credits from a mitigation bank approved by USACE and SFRWQCB.

Impact BIO-3b	Have a substantial adverse effect on federally protected wetlands or waters as defined by Section 404 of the Clean Water Act or state protected wetlands or waters through direct removal, filling, hydrological interruption, or other means during Proposed Project operation
Level of Impact	Less than significant

While increased train traffic would occur following construction of the Proposed Project, operational conditions along the ROW are not expected to be significantly different from pre-Project conditions except that the amount of diesel particular deposition would be significantly reduced with the replacement of diesel trains with electric trains.

The additional permanent project facilities (traction power substations, switching station, and paralleling stations) would have limited areas of new impervious surfaces that would result in limited increases in stormwater generation potential. As discussed in Section 3.9, *Hydrology and Water Quality*, these facilities would be located in San Mateo County and Santa Clara County and would comply with the respective countywide stormwater programs, which would result in less-than-significant indirect impacts on the water quality and hydrology of waters and wetlands.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any change to this impact analysis because it would not change normal train operations.

Impact BIO-4a	Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites during Proposed Project construction
Level of Impact	Less than significant

Project construction would not modify any creek crossings or waterways; therefore, the Proposed Project would not result in any interference with fish or wildlife movement along creeks or waterways. No other contiguous natural areas or unique habitat types that support migration (e.g., grasslands) exist in the project corridor. Consequently, Proposed Project construction is not expected to disturb any existing migratory corridors and impacts would be less than significant.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any change to this impact analysis because it would not affect any additional corridors or nursery areas during construction.

Impact BIO-4b	Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites during Proposed Project operation
Level of Impact	Less than significant

While increased train traffic would occur following construction of the Proposed Project, operational conditions are not expected to be significantly different from pre-Project conditions relative to fish or wildlife movement along stream corridors. The Proposed Project would not block movement along stream corridors, which are the only intact movement corridors along the project corridor. Thus, Proposed Project operation would have less-than-significant impacts on fish or wildlife movement or nursery sites.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any change to this impact analysis because it would not change normal train operations.

Impact BIO-5a	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, during Proposed Project construction
Level of Impact	Significant
Mitigation Measure	BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan
Level of Impact after Mitigation	Less than significant

Trees that are located along or within 10 feet of the OCS alignment would need to be removed or pruned in order to provide adequate safety clearance from the energized elements of the OCS (see Figure 2-8 in Chapter 2, *Project Description*). It is ordinary JPB maintenance practice to comply with California Public Utility Commission requirements by pruning trees and other mature vegetation from adjacent properties that lean into or hang over the Caltrain ROW and pose a potential hazard to safe train operations. The tree maintenance program would need to be expanded to provide the new clearance around the OCS.

JPB engaged a certified arborist to assess the extent of tree pruning that would be required to comply with electrical safety clearances. An assessment was made of the density of tree canopy on both sides of the ROW and the potential need for removal or pruning of leaning trees or overhanging branches located within the future electrical safety zone. The arborist also assessed the condition and age of the trees, and has identified trees that are either dead, dying, or over-mature and recommended their removal. The analysis of potential tree removal was done using the worst-case assumption that the OCS design would include the use of side poles located on either side of the rails. The poles within the ESZ were assumed to be ~~up to 12~~ 9 to 11 feet from the centerline of the outermost rail, ~~the poles were assumed to be 1 to 2 feet in diameter,~~ and vegetation clearance was assumed out to 10 feet from the poles. Thus vegetation clearance was assumed to be required up to ~~24~~ 21 feet from the centerline of the outermost rail at any location on both sides of the ROW. In areas of multi-track (i.e., more than 2 tracks), the ESZ would be up to 18 feet from the centerline of the outer electrified track. This is the reasonable worst-case pole alignment scenario based on the Proposed Project's ~~35 percent~~ preliminary design.

The majority of the trees and vegetation that would require removal or pruning are eucalyptus, oleander, and other windrow species; some coast live oaks and other native and horticultural species would also need to be removed or pruned. Table 3.3-4 provides a profile of the estimated trees to be removed by city. As discussed in Appendix F, *Tree Inventory and Canopy Assessment*, some of the trees to be removed or pruned are designated heritage trees in local tree ordinances. Further details on specific tree impacts are provided in Appendix F. Appendix J provides maps of potential tree impacts in both surveyed areas (in which case tree by tree impacts are shown) and non-surveyed areas (in which case canopy impacts are shown.

The Proposed Project would affect the historic rows of eucalyptus trees in Burlingame (the Jules Francard Grove). It is estimated that approximately 30 trees would require pruning in this grove and one eucalyptus would require removal. The "El Palo Alto" redwood tree has its trunk located outside the electrical safety zone for the Proposed Project and would not be removed. Some of the tree branches are within the electrical safety zone. Minor pruning would be necessary to keep tree branches out of the San Francisquito bridge truss (which is similar to maintenance done presently) and to avoid vegetation contact with the OCS, but the pruning is not expected to compromise the health of the tree. Further details on impacts on "El Palo Alto" are provided in Appendix F.

JPB is exempt from local land use regulations within its ROW, including tree ordinances, because it is a federally-regulated rail carrier and, as a joint powers authority of City and County of San Francisco, the San Mateo County Transit District, and the Santa Clara Valley Transit Authority benefits from the exemption contained in Public Utilities Code Section 103200. Therefore, JPB is "co-equal" to the cities and counties located along the project route. Where Caltrain may acquire electrical safety easements outside of its current ROW, Caltrain would be exempt from local ordinances within the easement area as well. Thus, local tree ordinances would not legally apply to tree removal or pruning associated with the Proposed Project.

Pursuant to Mitigation Measure BIO-5, JPB will avoid and/or minimize impacts on trees along the ROW by locating OCS poles and alignment to minimize tree removal and pruning where consistent with safety, operations, and maintenance requirements. Options to reduce impact include removing trees only as necessary to provide adequate safety clearance; locating OCS poles and alignment to minimize tree removals; and use of center poles, two-track cantilever poles, portals, or offset insulator poles ~~where adequate separation exists between rail~~ lines and where consistent with operational and safety requirements.

As discussed in Chapter 2, *Project Description*, vegetation must be maintained so that at any time there is at least 4 feet of clearance between vegetation and energized elements of the OCS. Default assumptions for the amount of annual growth (3 feet) and potential tree sway in high winds (up to 3 feet) were used to identify the potential 10-foot areas of clearance for trees.

Table 3.3-4. Estimated Tree Removal and Pruning Estimates by Jurisdiction

		DEIR – 24' ESZ			FEIR – 21'/18' ESZ		
Jurisdiction	Milepost	Canopy in Electrical Safety Zone (Acres)	Tree Removal[a]	Tree Pruning	Canopy in Electrical Safety Zone (Acres)	Tree Removal[a]	Tree Pruning
San Francisco	0–5.2	0.23	51	9	0.16	35	22
Brisbane	5.2–7.9	0.18	14	22	0.10	8	18
South San Francisco	7.9–10.4	0.96	77	152	0.15	12	88
San Bruno	10.4–11.9	0.13	10	21	0.02	1	12
Unincorporated San Mateo County	11.9–12.5	0.61	49	98	0.51	41	90
Millbrae	12.5–13.8	0.29	23	46	0.24	19	42
Burlingame	13.8–16.7	2.52	85	154	1.92	38	150
San Mateo	16.7–21.1	1.76	141	279	0.67	53	106
Belmont	21.1–22.6	0.42	34	67	0.33	27	59
San Carlos	22.6–24.5	0.97	78	154	0.56	45	121
Redwood City	24.5–26.6	0.84	67	133	0.56	45	112
Unincorporated San Mateo County	26.4–27.5	0.68	50	144	0.33	14	131
Atherton	27.4–28.2	1.35	142	206	0.95	60	262
Menlo Park	28.1–29.7	2.33	188	441	1.49	58	527
Palo Alto	29.7–33.6	3.27	177	481	1.95	73	428
Mountain View	33.5–37.5	2.03	284	291	1.01	142	146
Sunnyvale	37.5–41.5	3.46	497	418	1.74	211	509
Santa Clara	40.8–45.3	1.20	96	191	0.73	58	154
San Jose	45.3–51.1 ~~52.0~~	1.95	157	311	0.68	55	210
~~Unincorporated Santa Clara County~~	~~51.4–52.0~~	~~0.00~~	~~0~~	~~0~~	~~0.00~~	~~0~~	~~0~~
Total		**25.18**	**2,220**	**3,616**	**14.09**	**995**	**3,186**
95% Confidence Interval[b]			*1,905–2,536*				

Source: Appendix F, *Tree Inventory and Canopy Assessment*

[a] Removal totals include some trees that are dead or dying and need to be removed for safety reasons. Such dead or dying trees would need to be removed with or without the Proposed Project.

[b] As discussed in Appendix F, a survey of 100 percent of the project corridor was not completed. Instead, the most dense areas of tree canopy were surveyed and trees in the other areas were estimated using a Hyrail survey, video, and aerial imagery. As a result, there is some uncertainty in the total removal estimates. A confidence interval was calculated for the total estimates and is presented as the range. There is 95 percent confidence that the total number of trees to be removed is contained within the range.

During the individual tree assessment required by Mitigation Measure BIO-5, some trees may be determined to have less annual growth or tree sway and thus may be allowable slightly closer than 10-feet to the OCS pole alignment.

Limited effects may also occur due to trenching and compaction which could affect tree roots of non-removed trees. Trees within 10 feet of the OCS will be required to be removed. Thus, OCS foundations may affect some tree roots from trees that are more than 10 feet from the OCS. However, tree roots in general grow radially out from the trunk and thus the area of effect for a single foundation would only be 3 to 4 square feet which is likely to be only a small portion of any trees roots and would not be expected to significantly affected. Where utilities must be undergrounded by trenching, the soil over the trench would be compacted. It should be noted that the portion of the ROW under and adjacent to the tracks has been graded and compacted over the years and thus any additional compactions at and immediately adjacent to the tracks would not be a substantial change in existing conditions. Compaction will also occur at the TPF sites for the transformer pads, but again trees will be removed within 10 feet of the TPF electrical equipment and thus any remaining trees will be less affected by compaction. Thus, tree effects due to trenching and compaction would only be in limited construction locations. Mitigation measure BIO-5, requires assessment of these limited areas and replacement of trees if root effects would substantially imperil tree health.

As noted below, Mitigation Measure BIO-5 requires the evaluation of different pole types, including center poles, two-track cantilever poles, offset insulator poles and portals to reduce the amount of tree removal and pruning along the line. Caltrain completed feasibility assessment of five test areas along the ROW to examine the potential effectiveness of this mitigation. The conclusions below are preliminary, further engineering evaluation would be necessary to confirm exactly what pole alignment designs are possible in all of these areas and to examine all construction, maintenance, access, safety, and operational requirements. Thus, the information below should be considered preliminary, but indicative of the potential to reduce tree removal in these test areas.

- North Fair Oaks area in San Mateo County (MP 26.4 to MP 27.4): A combination of portals and offset insulator poles[3] could be used in this area to reduce the ESZ from the DEIR worst-case 24 feet to 18 feet on both sides of the ROW. The Draft EIR identified tree impacts in this area as 50 trees removed and 174 trees pruned. A combination of portals and offset insulator poles could result in a reduction to 14 trees removed and 43 trees pruned. This alternative pole design could also reduce the ROW encroachment on private land from 32 to 15 parcels.

- City of Atherton (MP 27.4 to MP 28.1): A combination of portals, two-track cantilevers, center poles and offset insulator side poles could be used in this area to reduce the ESZ from the DEIR worst-case 24 feet to 18 feet on both sides of the ROW for this entire section with the section of center poles only requiring a 16 foot offset. The DEIR identified tree impacts in Atherton as 142 trees removed and 206 trees pruned. A combination of portals, two-track cantilevers, center poles and offset insulator side poles could potentially reduce tree impacts in this area to only 7 trees removed and 274 trees pruned. This alternative pole design could also eliminate (or

[3] Offset insulator poles include energized elements of the OCS on the trackside of the OCS poles, which thus reduces the ESZ area needed relative to poles that otherwise include energized elements of the OCS on the outer edge of the poles. A figure showing the offset insulator poles has been added to Section 3.3, Biological Resources, under discussion of Mitigation Measure BIO-5.

substantially reduce) the ROW encroachment on private land in Atherton and could also reduce the area of ROW encroachment for the ESZ in the Holbrook-Palmer Park.

- City of Menlo Park (MP 28.1 to MP 29.7): A combination of offset insulator side poles, center poles, two-track cantilevers, and portals could be used in this area to reduce the ESZ from the DEIR worst-case 24 feet to 18 feet on both sides of the ROW and in one short area with a center pole, the ESZ can be reduced to 16 feet. The DEIR identified tree impacts in Menlo Park as 188 trees removed and 441 trees pruned. A combination of offset insulator side poles, center poles, two-track cantilevers, and portals could reduce the tree removals to only 7 trees removed, but tree prunings may increase slightly (to 501 trees pruned). This alternative pole design could also eliminate or substantially reduce the ROW encroachment on private residential and could reduce the amount on ROW encroachment on once Commercial parcel in Menlo Park.
- A portion of the City of Sunnyvale (MP 39.8 to MP 40.5): This segment is all multi-track so portals would be used here and would reduce the ESZ from the Draft EIR worst-case 24 feet to 18 feet on both sides of the ROW. The Draft EIR identified tree impacts in this area as 55 trees removed and 94 trees pruned. The use of portals could reduce this impact to 5 trees removed and 225 trees pruned. The use of portals could also reduce the ROW encroachment on private land in this segment from 16 to 9 parcels.
- A portion of the City of Santa Clara (MP 45.3 to MP 45.8): This segment is all multi-track so portals would be used here and would reduce the ESZ from the DEIR worst-case 24 feet to 18 feet on both sides of the ROW. The DEIR identified tree impacts in this area as 9 trees removed and 17 trees pruned. The use of portals could eliminate all tree removal or pruning in this area The use of portals could also reduce the ROW encroachment on private land in this segment from 17 to 4 parcels.

Where tree removal is unavoidable after implementation of avoidance and minimization measures, then, in accordance with Mitigation Measure BIO-5, JPB will replace trees using the performance standards noted below.

If Project Variant 1, described in Chapter 2, *Project Description*, is implemented, fewer trees in San Jose would be removed because electrification would end closer to Tamien Station, approximately 1.2 miles north of the current terminus. However, Mitigation Measure BIO-5 would still be required and implementation of Project Variant 1 would not change this impact's level of significance determination.

Mitigation Measure BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan

A Tree Avoidance, Minimization, and Replacement Plan will be developed in consultation with a certified arborist and in consultation with cities, counties, and affected property owners along the project route. A complete field survey of the entire project area will be completed to support plan development by preparing a tree inventory for all affected areas. The plan will contain the following provisions.

- The definition of what is and is not a "tree" for the purposes of this mitigation shall be the same definition used in Appendix F, *Tree Inventory and Canopy Assessment*, which is based on the "tree" definition in each municipality.
- During the design phase, JPB will assess the potential to modify OCS pole alignment and other facility design to avoid and/or minimize the amount of tree removal or pruning

necessary consistent with maintenance, operational, and safety requirements. This may include changes in horizontal alignment of OCS poles, changes in pole design (such as use of center poles, two-track cantilevers, portals, or offset insulator poles and placement of energized elements on the trackside of OCS poles~~,~~ where consistent with construction maintenance, operational, and safety requirements)~~, or other measures~~. JPB will consult with each jurisdiction (including the jurisdictions' arborist as appropriate) along the route during the design phase to identify where tree removals can and ~~can't~~ cannot be avoided with project design measures and methods to minimize pruning.[4]

- Prior to construction, a professional arborist will assess the potential effects to non-removed individual tree roots, including root pruning due to trenching of underground utilities and soil compaction at TPFs, to determine if these activities may jeopardize the health of affected trees. If tree health for trees not planned for removal is compromised substantially such that the tree may die, mitigation would occur at the ratios specified in this measure.
- During construction, trees not scheduled for removal will be protected using barrier fencing.
- Tree pruning during construction will be done in accordance with arboricultural industry recommended practices. Pruning specifications will also follow American National Standards Institute (ANSI) A300 Standards and International Society of Arboriculture (ISA) Best Management Practices. Tree planting near walkways will be consistent with California Public Utilities Commission (CPUC) General Order 118.
- Special care will be taken to minimize construction period effects on El Palo Alto including minimization of any pruning. Pruning of El Palo Alto, if necessary, will be coordinated with the City of Palo Alto arborist, in advance.
- If pruning will result in the loss of 25 percent or more of an individual tree's canopy, then JPB will consider the tree removed and it will be replaced consistent with the replacement requirements described below.
    - For trees removed outside of the Caltrain ROW:
        - Where specific replacement ratios or specifications are provided in the local tree ordinance or guidance (in the Cities of South San Francisco, San Bruno, San Mateo, Belmont, San Carlos, Atherton, Menlo Park, Palo Alto , Sunnyvale and Santa Clara County), Caltrain will replace protected trees using the local requirements (as specifically described in Appendix F, Attachment 1).
        - Where specific replacement ratios or specifications are not provided in local tree ordinances (in the Cities of San Francisco, Brisbane, ~~South San Francisco~~, Millbrae, Burlingame, Redwood City, Mountain View, Santa Clara, and San Jose, and in San Mateo County, as specifically described in Appendix F, Attachment 1), Caltrain will replace protected trees on a 2:1 basis using 15-gallon trees (i.e., two 15-gallon trees would be planted to each protected tree removed).

[4] The JPB will work with the City of San Carlos to determine whether to include the trees to be planted at the Transit Village in replacement requirements. If the trees are not planted by the time of the PCEP construction or do not fall within the ESZ, then there would be no reason to include them in the tree count as these trees would not be removed or trimmed.

        - For non-protected trees in all locations outside the ROW, Caltrain will replace trees on a 1:1 basis using 15-gallon trees (i.e., one 15-gallon tree would be planted for each non-protected tree removed).
    - For trees within the Caltrain ROW, the following requirements will be followed:
        - Protected trees will be replaced on a 1:1 basis using 15-gallon trees (i.e., one 15-gallon tree would be planted to every tree removed), where feasible. Non-protected trees will be replaced on the same basis.~~, where feasible in non-industrial areas. Non-protected trees in industrial areas will not be replaced~~.
    - Trees will be replaced, wherever possible, to provide visual screening of the ROW at locations where tree removal or pruning occurs due to the project.
    - On-site replanting will be the first priority, where feasible and consistent with railroad operations, maintenance, and safety.
    - Trees will be replaced with a tree of the same species wherever possible, unless that species in a non-native invasive species (see discussion below). Alternative species to the tree removed may be planted with concurrence of the landowner and local municipality. Within the Jules Francard Grove in Burlingame any replanting will consist of blue gum trees to be consistent with the historic plantings. Replacement eucalyptus species, with the exception of red river gum, can be utilized as part of this mitigation.
    - If on-site tree replacement cannot occur on the Caltrain ROW (where trees are removed from the ROW) or on adjacent property (where trees are removed outside of the ROW), then tree replacement ~~may~~ will occur on other parts of the affected property (with concurrence of the land owner) or other parts of the local area (with concurrence of the local municipality). Alternatively, JPB ~~may~~ will pay into a local urban forestry fund to support local tree planting programs, provided JPB and local municipalities can agree on the appropriate fund and amount. The replacement requirements described above will apply in determining the equivalent funding amount.
- Consistent with Executive Order 13112 on invasive species, when JPB is replacing trees within its ROW, JPB will use native tree species insofar as it is practicable. Within the Caltrain ROW, JPB will not plant invasive tree species as defined by the Invasive Species Council of California (http://ice.ucdavis.edu/invasives/). For replacement of trees outside the Caltrain ROW, JPB will replant (or pay for others to replant) trees that are desired by the landowner or local municipality. Landowners may prefer that replacement trees be non-native trees to match non-native trees that were removed or to match surrounding vegetation.
- The JPB will be responsible to provide maintenance and monitoring of all replanted trees to assure their survival and/or remedial replanting in case they do not survive.
    - All replanted trees will be maintained for a minimum 5-year period and monitored on an annual basis by a professional arborist.
    - If at the end of 5 years, the tree is considered successfully established, then no further maintenance is required by the JPB. A professional arborist shall make the determination as to planting success.
    - The JPB will be directly responsible for maintaining all trees within the JPB ROW.

- For trees outside the JPB ROW, the JPB will be responsible for maintenance costs for the first five years. If individual tree plantings are determined to be unsuccessful after five years, then the JPB will be required to either replace the tree (and provide an additional 5 years of maintenance) and/or extend the maintenance period on a year to year basis until the tree is successfully established. If the tree planting is successfully established, then all further maintenance will be responsibility of the landowner.

Impact BIO-5b	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, during Proposed Project operation
Level of Impact	Less than significant

While increased train traffic would occur following construction of the Proposed Project, operational conditions are not expected to be significantly different from pre-Project conditions. Routine tree maintenance would be conducted along the project corridor, but these activities would be similar to existing maintenance practices. Further, tree maintenance pruning would take place after mitigation for construction-related tree impacts occurs (see discussion above); therefore, no conflicts with local ordinances are likely to result from operation of the Proposed Project.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any change to this impact analysis because it would not change project operation.

Impact BIO-6a	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan during Proposed Project construction
Level of Impact	Significant
Mitigation Measure	BIO-6: Pay *Santa Clara Valley Habitat Plan* land cover fee (if necessary)
Level of Impact after Mitigation	Less than significant

Construction activities are expected to result in only limited impacts on natural land cover, primarily at the locations of new facilities in undeveloped areas.

There are no adopted habitat conservation plans (HCPs) or natural community conservation plans (NCCPs) for the project area in San Francisco or San Mateo Counties.

There is an adopted HCP/NCCP in Santa Clara County (the *Santa Clara Valley Habitat Plan* or SCVHCP) that covers a portion of the project area from just south of the Santa Clara Station to the southern end of the project area several miles south of Tamien Station. The Proposed Project is not specifically a covered activity in the SCVHCP; thus, its requirements may not apply to the Proposed Project. Nevertheless, the SCVHCP requirements are reviewed below in the event that the SCVHCP is determined to be able to cover the Proposed Project.

Within the SCVHCP plan area, the only project facilities would be the OCS, TPS2, and PS7. The SCVHCP has a fee payment system to compensate for impacts on covered species habitat. All three TPS2 options and PS7 would be in areas mapped by the SCVHCP as urban land cover and, thus, development of these sites would be consistent with the SCVHCP and require no land cover fee payment. The TPS2 Option 1 site consists of a ruderal grass field surrounded by industrial development but is within the burrowing owl survey and fee zone of the SCVHCP. The TPS2 Options 2 and 3 sites are both in developed areas and would not be subject to any fee or compliance with the SCVHCP. A small portion (0.2 mile) of the project alignment south of PS7 is mapped as serpentine bunchgrass grassland and is within Landcover Fee Zone A and the Serpentine Fee zone. Another small portion (0.4 mile) immediately south of the grassland area is mapped as urban park land, although there is no park within the Caltrain ROW, and is within Land Cover Fee Zone B. The OCS poles would be placed along the railroad alignment, which is mostly previously disturbed and thus OCS pole construction would have very limited impacts on covered species habitat. It is unclear if the Proposed Project would or would not be subject to fees if the SCVHCP is determined to cover the Proposed Project.

Under Project Variant 1, described in Chapter 2, *Project Description*, PS7 would be located farther north than its current proposed location and the project would avoid serpentine bunchgrass grassland. Therefore, if Project Variant 1 is selected, no portion of the Project alignment would occur in the Landcover Fee Zone A or B or the Serpentine Fee zone.

Although limited development associated with the Proposed Project could affect small areas of covered species habitat within the SCVHCP area, the Proposed Project would not conflict with the SCVHCP because it does not propose development within any area proposed for permanent preservation. Consequently, because the Proposed Project would require compliance with ESA and CESA regardless of whether the SCVHCP does or does not apply, the Proposed Project would have a less-than-significant impact related to the SCVHCP.

At this time, it is unknown whether or not the Proposed Project is covered by the SCVHCP and thus whether JPB could obtain ESA coverage for the portions of the Proposed Project within the SCVHCP area. At this time, it would appear that JPB would obtain a separate authorization under ESA and CESA from USFWS and CDFW as necessary to address any potential take of federally or state-protected species and thus would mitigate for those effects separate from the SCVHCP. If separate authorization is obtained, then Mitigation Measure BIO-6 would not be required. If it is determined that JPB could address impacts within the SCVHCP area through the Plan, then Mitigation Measure BIO-6 would be required.

Mitigation Measure BIO-6: Pay *Santa Clara Valley Habitat Plan* land cover fee (if necessary)

If it is determined that the SCVHCP applies to the Proposed Project, JPB will pay any required compensation fees prior to construction. It is expected that fee payment will only be required in relation to TPS2, Option 1 (burrowing owl fee) and the area along the alignment disturbed for OCS installation south of PS7 (potential payment of land cover fee and serpentine fee).

Impact BIO-6b	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan during Proposed Project operation
Level of Impact	Less than significant

While increased train traffic would occur following construction of the Proposed Project, operational conditions are not expected to be significantly different from pre-Project conditions except that diesel emissions would be substantially lower with the increase in electrified service. The SCVHCP includes a fee for new development to help compensate for impacts on rare butterfly species habitat due to nitrogen deposition from fossil fuel emissions. Because the Proposed Project would lower emissions of nitrogen oxides substantially during operations compared with existing conditions (see discussion in Section 3.2, *Air Quality*), the Proposed Project would help improve conditions for rare butterfly species habitat and would be supportive of the goals of the SCVHCP.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis because it would not change project normal operations.

3.4 Cultural Resources

This section identifies and evaluates the potential for the Proposed Project to affect historical and archaeological resources in the project area. Reference is made to archaeological and historical architecture reports and findings of effect produced between 2000 and 2009 (principally Far Western Anthropological Research Group 2009, and JRP Historical Consulting Services 2001, 2002, 2008a, 2008b), as well as to both state and federal regulations applied during prior and current studies.

3.4.1 Existing Conditions

This section provides a discussion of the regulatory setting, as well as relevant pre-historical and historical conditions, related to cultural resources on the project site and the immediately surrounding project area.

3.4.1.1 Regulatory Setting

State

California Environmental Quality Act and Guidelines

CEQA states that if implementation of a project would result in significant effects on historical resources, then alternative plans or mitigation measures must be considered; however, only significant historical resources need to be addressed (14 CCR] Sections 15064.5, 15126.4). Therefore, before impacts and mitigation measures can be identified, the significance of historical resources must be determined.

The State CEQA Guidelines define three ways that a property may qualify as a historical resource for the purposes of CEQA review.

1. The resource is listed in or determined eligible for listing in the California Register of Historical Resources (CRHR).
2. The resource is included in a local register of historical resources, as defined in Section 5020.1[k] of the Public Resources Code (PRC) or identified as significant in a historical resource survey meeting the requirements of PRC Section 5024.1[g], unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. The lead agency determines the resource to be significant, as supported by substantial evidence in light of the whole record (CCR, Title 14, Division 6, Chapter 3, Section 15064.5[a]).

Properties that are listed in or eligible for listing in the National Register of Historic Place (NRHP) are considered eligible for listing in the CRHR and thus are significant historical resources for the purpose of CEQA (PRC Section 5024.1[d][1]).

California Public Resources Code

California PRC Section 5024.1, which established the CRHR, protects historical resources. PRC Section 5024 requires state agencies to identify and protect state-owned resources that meet NRHP listing criteria.

California PRC Section 5097.5 prohibits removing, destroying, injuring, or defacing any vertebrate paleontological site, including fossilized footprints, or any other paleontological feature as well as items of archeological and historic interest that are situated on public lands, except with permission of the public agency with jurisdiction.

California Health and Safety Code—Treatment of Human Remains

Under Section 8100 of the California Health and Safety Code, six or more human burials at one location constitute a cemetery. Disturbance of Native American cemeteries is a felony (Health and Safety Code Section 7052).

Section 7050.5 of the Health and Safety Code requires that construction or excavation be stopped in the vicinity of discovered human remains until the county coroner can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must then contact the Native American Heritage Commission (NAHC), which has jurisdiction pursuant to PRC Section 5097.

Local

The Proposed Project would extend outside of the Caltrain right-of-way (ROW) to accommodate two traction power substations (TPSs), one in South San Francisco and one in San Jose. The Proposed Project would also minimally extend outside of the Caltrain ROW in some locations for construction access, staging and storage, and to accommodate the overhead contact system (OCS) and vegetation maintenance where the OCS pole alignment is near the edge of the Caltrain ROW. This section identifies the general plan elements and ordinances of the City and County of San Francisco, City of South San Francisco, City of Menlo Park, City of Palo Alto, and the City of San Jose as they pertain to historic resources.

City and County of San Francisco

The City and County of San Francisco references historic resources in Article 10: Preservation of Historical, Architectural, and Aesthetic Landmarks**.** Article 10 protects structures, sites, and areas of special historical, architectural, or aesthetic interest or value for the enhancement of human life, education, and economic standing; prohibits unnecessary destruction or impairment of these structures and site; and outlines the procedure for application for proposed work on a landmark site; outlines the powers and duties of the planning department and historic preservation commission; describes the process in which landmarks and historic districts are nominated, initiated and designated; describes the process of decision making by the Historic Preservation Commission, and designation by the Board of Supervisors, as well as the appeal and amendment process and all other permitting and decision making regulations pertaining to landmarks and historic districts.

The following policies in the City of San Francisco General Plan are relevant to the Proposed Project.

Policy 2.4: Preserve notable landmarks and areas of historic, architectural or aesthetic value, and promote the preservation of other buildings and features that provide continuity with past development.

Policy 2.5: Use care in remodeling of older buildings, in order to enhance rather than weaken the original character of such buildings.

Policy 2.6: Respect the character of older development nearby in the design of new buildings.

Policy 2.7: Recognize and protect outstanding and unique areas that contribute in an extraordinary degree to San Francisco's visual form and character.

Policy 3.11: Ensure historic resources are protected in the aftermath of a disaster.

Policy 6.8: Preserve historically and/or architecturally important buildings or groups of buildings in neighborhood commercial districts.

Policy 11.9: Foster development that strengthens local culture sense of place and history.

Policy 11.7: Respect San Francisco's historic fabric, by preserving landmark buildings and ensuring consistency with historic districts.

City of South San Francisco

The city's general plan, adopted October 13, 1999, references historic resources in an Open Space and Conservation Element.

Policy 7.5-G-1: Conserve historic, cultural, and archaeological resources for the aesthetic, educational, economic, and scientific contribution they make to South San Francisco's identity and quality of life.

Policy 7.5-I-3: Explore mechanisms to incorporate South San Francisco's industrial heritage in historic and cultural preservation.

In addition, South San Francisco Municipal Code Title 2: Administration, Chapter 2.56.080-190 encourages the preservation of the community's historic resources and outlines the criteria for their preservation, including guidelines for the development and maintenance of surrounding settings and environments, in order to enhance property values and stabilize neighborhoods.

City of Menlo Park

The Land Use Section of the Menlo Park contains the following policy relevant to the Proposed Project.

Policy I-H-11: Buildings, objects, and sites of historic and/or cultural significance should be preserved.

City of Palo Alto

The Land Use and Community Design chapter of the Palo Alto Comprehensive Plan contains the following policy relevant to the Proposed Project.

Policy L-51: Encourage public and private upkeep and preservation of resources that have historic merit, including residences listed in the Historic Inventory.

City of San Jose

The Land Use and Transportation chapter of *Envision San Jose 2040 General Plan*, as adopted November 1, 2011, contains three goals and five policies relevant to the Proposed Project.

Goal LU-13: Landmarks and Districts. Preserve and enhance historic landmarks and districts in order to promote a greater sense of historic awareness and community identity and contribute toward a sense of place.

Policy LU-13.1. Preserve the integrity and fabric of candidate or designated Historic Districts.

Policy LU-13.2. Preserve candidate or designated landmark buildings, structures and historic objects, with first priority given to preserving and rehabilitating them for their historic use, second to preserving and rehabilitating them for a new use, or third to rehabilitation and relocation on-site. If the City concurs that no other option is feasible, candidate or designated landmark structures should be rehabilitated and relocated to a new site in an appropriate setting.

Policy LU-13.3. For landmark structures located within new development areas, incorporate the landmark structures within the new development as a means to create a sense of place, contribute to a vibrant economy, provide a connection to the past, and make more attractive employment, shopping, and residential areas.

Goal LU-14: Historic Structures of Lesser Significance. Preserve and enhance historic structures of lesser significance (i.e., Structures of Merit, Identified Structures, and particularly Historic Conservation Areas) as appropriate, so that they remain as a representation of San José's past and contribute to a positive identity for the City's future.

Policy LU-14.1. Preserve the integrity and enhance the fabric of areas or neighborhoods with a cohesive historic character as a means to maintain a connection between the various structures in the area.

Policy LU-14.3. Discourage demolition of any building or structure listed on or eligible for the Historic Resources Inventory as a Structure of Merit by pursuing the alternatives of rehabilitation, re-use on the subject site, and/or relocation of the resource.

Goal LU-16: Sustainable Practices. Preserve, conserve, and/or rehabilitate historic structures as a means to achieve the City of San José's environmental, economic, and fiscal sustainability goals.

Three of San Jose's city ordinances make reference to historic resources. Title 2, Chapter 2.08, Part 26 establishes the Historic Landmarks Commission. Title 13, Chapter 13.48 discusses the goals of historic preservation; outlines the procedures for historic designation; prohibits alteration, demolition or maintenance without a permit; and requires a public hearing should a historic resource be proposed for demolition. Title 17 references the application of the State Historical Building Code.

3.4.1.2 Environmental Setting

Prehistoric, Ethnographic, and Historic Conditions

The following prehistoric and ethnographic conditions are summarized from the *Data Recovery and Late Discovery Treatment Plan for the Caltrain Electrification Program Alternative: San Francisco, San Mateo, and Santa Clara Counties, California* (Far Western Anthropological Research Group 2009). The historic-era conditions are summarized from the *Addendum Inventory and Evaluation of Historic Resources for the Caltrain Electrification Program, San Francisco to San Jose (MP 0.0 to 52.0)* (JRP Historical Consulting Services 2008a). For more in-depth discussion on the environmental setting, please refer to these documents.

Prehistoric Context

The San Francisco Bay and Santa Clara Valley landscape has changed significantly during the 12,000 years since humans first occupied the region. Large drainages once flowed from Santa Clara Valley out through the Golden Gate during the late Pleistocene, but were inundated by rising ocean waters when continental glaciers began to melt with the onset of the Holocene. Sea level rise was quite rapid between 12,000 and 6000 calibrated years before the present (cal BP), which resulted in the development of the San Francisco Bay estuary. After 6000 cal BP, the rate of glacier melting slowed down, and Holocene terrestrial sedimentation outpaced the rate of sea level rise, resulting in the extensive tidal marshes and mudflats we see today at the south end of the bay (Rosenthal and Meyer 2004). As a result, prehistoric archaeological materials predating 4500 cal BP are relatively rare in the area. Numerous archaeological sites from after 4500 cal BP are available for study, revealing one of the most complex hunter-gatherer archaeological records in North America (Far Western Anthropological Research Group 2009).

Early Holocene (Lower Archaic), cal 8000–3500 B.C.

The Early Holocene is characterized by a mobile forager pattern throughout the Bay Area. The milling slab and handstone, as well as a variety of large, wide-stemmed and leaf-shaped projectile points, all emerged during this period (Milliken et al. 2007:114). Local Franciscan chert dominated the Early Holocene Santa Clara Valley components (Hylkema 2002:235). The Metcalf Creek Site (SCL-178), a deeply stratified deposit in the southern Santa Clara Valley, yielded cultural materials as deep as 9 meters below the surface (Hildebrandt 1983). Radiocarbon determinations from a feature and an *Olivella biplicata* spire-lopped bead indicate the presence of cultural materials dating as early as cal 7500 B.C. (Fitzgerald and Porcasi 2003; Fitzgerald et al. 2005). The Metcalf Creek Aspect (or Phase), the millingstone pattern cultural expression in the Santa Clara Valley and adjacent coast, was named for this site (Milliken et al. 2007:114). SCL-65, the Saratoga site, produced two flexed burials beneath cairns of millingstones, which date between cal 5400 and 4900 B.C. (Fitzgerald 1993).

Early Period (Middle Archaic), cal 3500–500 B.C.

Several technological and social developments characterize the Early Period. New groundstone technology and the first cut shell beads in mortuaries signal sedentism, regional symbolic integration, and increased regional trade in the Bay Area, beginning at cal 3500 B.C. The earliest cut bead horizon, the *Olivella* grooved rectangle (Vellanoweth 2001), bracketed cal 3400 to 2500 B.C., is represented by a single bead from the San Bruno Mound (Clark 1998:127, 156). Double-perforated *Haliotis* rectangle beads are first documented at the 5,590-year-old Sunnyvale Red Burial (SCL-832), which also contained red ocher and exhibited preinterment burning (Cartier 2002).

Lower Middle Period (Initial Upper Archaic), cal 500 B.C.–cal A.D. 430

Although it is unclear when the "major disruption in symbolic integration systems" originated, it is clear in the record around 500 B.C. and may have begun several hundred years earlier (Milliken et al. 2007:115). Bead Horizon M1 of the Middle Period (Upper Archaic, cal 200 B.C. to A.D. cal 430) brought more tiny *Olivella* saucer beads into the Bay Area, as well as new circular *Haliotis* ornaments. New bone tools, including barbless fish spears, elk femur spatula, tubes, and whistles, appeared for the first time during this period. Basketry awls (split cannon bones) with shouldered tips, indicating coiled basketry manufacture, appeared in the Central and North Bay (Bennyhoff

1986:70, Bieling 1998:218). In the South Bay, the pure millingslab/handstone-oriented forager economy continued along the Pacific Coast of San Mateo County (Hylkema 2002:261).

Upper Middle Period (Late Upper Archaic), A.D. cal 430–1050

Around 430 A.D., the *Olivella* saucer bead trade network of the Lower Middle Period collapsed. Over half of known M1 sites were abandoned, while in the remaining sites, the number of sea otter bones greatly increased (Bennyhoff 1994a, 1994c). These changes co-occurred with the inception of a series of *Olivella* saddle bead horizons (M2a and 2b; M3, and M4) that marked central California bead trade until A.D. cal 1000 (Groza 2002; Milliken et al. 2007:116). The Meganos mortuary complex spread during this horizon from inland areas almost to the San Francisco Bay at the current Fremont BART site (ALA-343) and into the Santa Clara Valley at Wade Ranch (SCL-302). Single-barbed bone fish spears, ear spools, and large mortars all appeared for the first time during this horizon (Milliken et al. 2007:116). The Santa Teresa Locality Mazzoni site (SCL-131), one of the few mortuary sites that can be dated to this time period, contained no grave accompaniments (Milliken et al. 2007:116).

Initial Late Period (Lower Emergent), A.D. CAL 1050–1550

Fredrickson (1973) coined the term Emergent to describe this period, in recognition of the appearance of a new level of sedentism, status ascription, and ceremonial integration in lowland central California. The Middle/Late Transition bead horizon, previously thought to have occurred around A.D. 300, is now largely believed to have occurred around A.D. cal 1000 (Milliken et al. 2007:116). During the Middle/Late Transition, burial objects became much more elaborate, and initial markers of the Augustine Pattern appeared in the form of multiperforated and bar-scored *Haliotis* ornaments, fully shaped show mortars, and new *Olivella* bead types in sites such as SCL-690 (Hylkema 2006). In the San José and Point Año Nuevo localities, local Franciscan chert remained the primary production material for debitage and casual tools, and Napa Valley obsidian remained the primary production material for projectile points (Bellifemine 1997:124-136, Clark and Reynolds 2003:8, Hylkema 2002:250).

Evidence for increased social stratification throughout the Bay Area after 1250 A.D. can be found in mortuary evidence. Although the quantity of shell beads contained in burials decreased, the quality of burial items increased in high-status burials and cremations (Fredrickson 1994:62). This development may have reflected a new regional ceremonial system that was the precursor of the ethnographic Kuksu cult, a ceremonial system that unified the many language groups around the Bay Area during Bead Horizon L1 (Fredrickson 1974:66; Bennyhoff 1994b:70, 72 in Milliken et al. 2007:117).

Terminal Late Period: Protohistoric Ambiguities

Changes in artifact types and mortuary objects characterized A.D. cal 1500–1650. The signature *Olivella* sequin and cup beads of the central California L1 Bead Horizon abruptly disappeared, and clamshell disk beads, markers of the L2 Bead Horizon, spread across the North Bay (Milliken et al. 2007:117). Desert side-notched points spread into the South Bay from the Central Coast (Hylkema 2002; Jackson 1986, 1989; Jurmain 1983).

Another upward cycle of regional integration was commencing when it was interrupted by Spanish settlement in the Bay Area beginning in 1776. Such regional integration was a continuing characteristic of the Augustine Pattern, most likely brought to the Bay Area by Patwin speakers from

Oregon, who introduced new tools (such as the bow) and traits (such as preinternment grave pit burning) into central California. Perhaps the Augustine Pattern, with its inferred shared regional religious and ceremonial organization, was developed as a means of overcoming insularity, not in the core area of one language group but in an area where many neighboring language groups were in contact (Milliken et al. 2007:118).

Ethnographic Context

The area covered by the Proposed Project passes through the aboriginal territory of the Costanoans (from the Spanish Costaños for "coastal people"), who are known today as the Ohlone (or Ohlone/Costanoan). Most of what we know about the Ohlone comes from the early work by Kroeber (1925), with a summary treatment by Levy (1978). Recent interpretations of Ohlone lifeways, sometimes contradictory with earlier studies, come from research with mission records conducted by Milliken (1995).

Costanoan is a linguistic subfamily of the Penutian language stock. According to early linguists, there are eight branches of the Costanoan language, each associated with a geographic location and the tribelet(s) that inhabited the locality; the project corridor passes through two linguistic territories (Ramaytush and Tamyen). The basic unit of political organization was a territory-holding group of one or more associated villages and smaller temporary encampments. Milliken (1995) defined these units as "tribes": independent, multifamily, landholding, religious congregations. Mission records indicated that there were six tribal regions within the project corridor (Yelamu, Urebure, Ssalson, Lamchin, Uichon and Tamien), each approximately 8 to 12 miles apart. Each tribe was an autonomous polity numbering 200 to 400 people and fell under the jurisdiction of a headman and council of elders who served as advisors to the villagers. Permanent villages were established near the coast and river drainages, while temporary camps were located in prime resource collecting areas.

Subsistence activities centered around the seasonal availability of gathered resources such as acorns and seeds; hunting deer, tule elk, sea mammals, and waterfowl; fishing; and collecting shellfish. The proliferation of shell middens throughout the Bay Area attests to a heavy reliance on marine food resources. The Ohlone practiced annual burning to ensure an abundance of seed-bearing annuals, forage for large game, and to facilitate the gathering of acorns.

Seven Spanish missions were founded in Ohlone territory between 1777 and 1797. While living within the mission system, the Ohlone commingled with other groups, including Esselen, Yokuts, Miwok, and Patwin. Mission lifeways were devastating to the Ohlone population. It has been estimated that the Native American population in the region numbered around 10,000 in 1770, when the first mission was established in Ohlone territory, and that population rapidly declined to fewer than 2,000 by 1832 because of introduced disease, harsh living conditions, and reduced birth rates. After the secularization of the missions, circa 1830, Native Americans gradually left the missions. Many went to work as wage laborers on the ranchos and mines, and others found domestic positions. There was a partial return to aboriginal religious practices and subsistence strategies, but for the most part the Ohlone culture was greatly diminished. Today, descendants of the Ohlone still live in the area, and many are active in maintaining their traditions and advocating Native American issues.

Historical Context

Spanish Period

The historic period for the Bay Area began in 1769, with the entry of the Spanish Portola expedition. Spanish colonial policy throughout the late 1700s and early 1800s was directed toward establishing missions, presidios, and secular towns known as pueblos, with all land being held by Spain. Three missions were established near the Archaeological Study Area (see Section 3.4.2.1, *Methods for Analysis*, for a description of the Archaeological Study Area). Mission San Francisco de Asis was established October 9, 1776, Mission Santa Clara de Asis on January 12, 1777, and Mission San Jose de Guadalupe on June 11, 1797. The location of Mission Santa Clara de Asis was moved five times due to flooding and earthquakes. The third site for Mission Santa Clara, destroyed by an earthquake, is located within the project corridor near the Santa Clara Caltrain Station.

Mexican Period (1821–1848)

The Spanish Period in this area lasted until 1821, when the Mexican government gained control over Alta California. During the 1820s, the mission system declined as Native Americans abandoned the missions, and land formerly held by Spain was divided into vast tracts owned by individuals. Secularization grew with the creation of land grants, the rise of a ranching class, and the growth of pueblo populations. These "ranchos," granted by the government, were used primarily for farming and raising cattle. The native people who had been laboring at the mission gardens and orchards moved to the ranchos, still working as manual laborers, and mixing with other tribes.

The American Period: Residential, Industrial, and Railroad Development

The region came under American control after the defeat of the Californio (Mexican) forces in 1847. Agriculture continued to be the major economic pursuit with the onset of the American Period, in particular to feed the gold miners from 1848 into the 1850s. American farmers then became commonplace in the region, and a series of court cases in the 1850s resulted in the loss of land for many Mexican land-grantees.

In the 1850s, land grants were subdivided for towns and eventually, in the 1860s, for the railroad ROW. The city of San Jose was incorporated in 1850, the town of Santa Clara in 1852, and San Francisco in 1856. Urban development in these cities moved at a swift pace during the 1860s. Tracts adjacent to the city limits were subdivided, including the lands originally part of the ranchos. Public works services were introduced in the 1860s, with gas mains, water companies, and formal sewers organized and constructed. During the 1850s, regional stage lines were established and these were replaced by the arrival of the streetcar lines in the 1860s, establishing the first urban transit lines.

Construction on the San Francisco and San Jose Railroad (SF&SJ RR) began in 1861, with passenger and freight service commencing in 1863, and reaching San Jose in 1865. This was the first Bay Area railroad, and it reduced travel time between San Francisco and San Jose from a 9-hour stage or 5-hour boat ride to a 3.5-hour rail journey. Other than the general alignment, this first single-track railroad had little in common with the modern system. At that time what stations existed were described as nothing more than sheds.

The railroad operated as the SF&SJ RR until 1870 when it was obtained by the Collis P. Huntington's Southern Pacific Railroad, which operated the SF&SJ RR as a passenger and freight line until 1980 when it was obtained by Caltrans and rebranded as Caltrain. Twenty-four of the twenty-five historic built resources identified in the project area are part of, or directly related to, the Southern Pacific Railroad, now Caltrain.

During the period from 1870 through 1900, the Peninsula route was the only freight and long distance passenger line that served San Francisco. The railroad contributed to the expansion of agriculture in Santa Clara Valley, and led to more innovative ways to ship and preserve food supplies, such as the transportation of fruit and meat in refrigerator cars developed in 1880. At the same time, undeveloped lands within San Jose city limits were being subdivided and filled with homes during the 1880s, and new suburban tracts were being subdivided.

The connection between San Francisco and the southern Bay Area encouraged suburban development and people started to commute to work, even during the nineteenth century. Many of the stations outside of San Francisco were merely stops in the rural landscape of San Mateo and Santa Clara Counties, and many of the more substantial stations served towns that were no more than villages. The city of South San Francisco, the town of Palo Alto, with Stanford University, and the city of San Jose were the exceptions. In the last quarter of the nineteenth century, much of the land in eastern San Mateo and Santa Clara Counties was still held in large tracts by wealthy individuals.

The Southern Pacific system was in relatively good condition and Huntington was in the process of modernizing and improving both rolling stock and infrastructure when he died in 1900. But when Edward Henry Harriman gained control of the line in 1901, he ushered in a new phase of development for the company. The subsequent system-wide improvements that Harriman introduced between 1901 and 1909, as well as the scale of the projects he directed, proved to be unprecedented.

Harriman ordered the installation of a second track between San Jose and San Bruno in preparation for the Bayshore Cutoff. The 39 miles of new line was ready by late 1903. Several new bridges and trestles along the Peninsula route were part of this improvement program; examples of these structures are the four small grade separations located in the city of San Mateo. Work on the Bayshore Cutoff began in 1904 and continued for 3 years, opening for traffic in December 1907. Company forces built the cuts, filling, bridges, tunnels, and trestles, with the exception of contractors hired to perform the grading and to build Tunnels No. 2 and No. 5. These brick and steel tunnels brought the tracks through the steep hills and bluffs that make up the rough coastline of the northeastern Peninsula while remaining at an even, low gradient that never reached an elevation of more than 20.3 feet above sea level. The double track alignment included 10,000 feet of tunnels, six iron bridges, six timber trestles, and a new hump yard created on the newly filled Visitacion Bay site.

The new Bayshore route had far fewer at-grade crossings than the old line and included new passenger stations at 23rd Street, Amy Street, Paul Avenue, Bayshore, Visitacion, and South San Francisco before joining the old alignment at San Bruno. This new route immediately improved passenger train times into San Francisco and helped establish the Peninsula commuter tradition that continues today. The Bayshore Cutoff also had an immediate and important effect on the industrialization of South San Francisco by bringing rail service to the area for the first time.

Southern Pacific Railroad undertook a massive improvement program in and around San Jose beginning in the late 1920s. The improvements included continued double tracking the main line, construction of a roughly six-mile bypass of congested downtown San Jose, and completion of a large new passenger station. The impressive Italian Renaissance-revival style Cahill Street Station (now known as the Diridon Station) was designed by John H. Christie and constructed by the C. N.

Swenson Company. It is a multilevel combination passenger and freight depot, and is on the NRHP. The bypass, completed in 1935, represented a significant alteration of the original railroad and a major railroading change for the region, relocating the Southern Pacific's depot from Market Street where it had been located since the 1860s for the SF&SJ RR.

While motor traffic grew exponentially on the roads and highways of the Peninsula, so did accidents, particularly at railroad at-grade crossings. Both railroads and motor vehicle supporters saw grade separations as the ideal method for eliminating the hazards of at-grade railroad crossings. The Peninsula Grade Crossing Association was formed and, in February 1931, its engineering subcommittee released a proposed $9 million two-phase plan to eliminate at-grade crossings on the 47 miles of track. Among the approximately 80 grade separations along the Caltrain line today, 27 were built before 1950, with more than half of those structures built or improved in the period between 1927 and 1941.

During World War II, other than track improvements to meet the constant demand for more capacity, very few construction projects were undertaken. By 1946 the railroad returned to its regular passenger service and even improved travel time. Modernization in the 1950s included replacing the timber trestle near Islais Creek and eliminating Tunnel No. 5, both part of the 1907-constructed Bayshore Cutoff. Tunnel No. 5 was closed to accommodate U.S. Highway 101's realignment and expansion to six lanes of automobile traffic. Massive freeway construction of the post-war period was in response to the ever-increasing dominance of the automobile over rail transit; grade separations were constructed as overpasses.

In 1974 the Southern Pacific applied to the California Public Utilities Commission to abandon the Peninsula commuter trains, which by then served fewer than 8,000 people a day. The State of California eventually stepped in and took over the commuter operations at a cost of $20 million paid by San Francisco, San Mateo, and Santa Clara Counties. The new commuter service operated by Caltrans was dubbed "Caltrain." In 1987 the three Peninsula counties formed the Peninsula Corridor Joint Powers Board (JPB) with the intent to have this newly created entity take over at the expiration of Caltrans' 10-year contract. JPB purchased the ROW from San Francisco to San Jose in late 1991 and has provided commuter operations ever since.

3.4.2 Impact Analysis

3.4.2.1 Methods for Analysis

Cultural resources assessment efforts have included records searches and literature reviews; consultation with the Native American Heritage Commission and local Native American groups, individuals, and historical interest groups; field surveys of the Area of Potential Effect (APE)[1] as it has progressed through a series of refinements; a geoarchaeological sensitivity study to assess the potential for buried archaeological resources; and the development of avoidance measures for built resources and archaeological sites within or potentially within the Archaeological Study Area and Historic Study Area (defined below under *Architectural History*).

[1] "APE" or "area of potential effects" is a term specific to Section 106 of the National Historic Preservation Act of 1966 (36 CFR Part 800.16(d)). When discussing past reports that were Section 106 documents, the term APE is used. For the purposes of this CEQA document, the geographic area included in the 2013 updated survey will be referred to as "Archaeological Study Area."

The following presents a chronological breakdown of previous efforts pertaining to the identification and evaluation of cultural resources in the project area:

- **1999:** An inventory of the original APE (encompassing San Francisco to Gilroy) was conducted (Carrico et al. 2000).
- **2001/2002**: Field surveys of the previously defined traction power facility sites and electrical connector routes were conducted (JRP Historical Consulting Services 2002; Far Western Anthropological Research Group 2002).
- **2002:** The State Historic Preservation Officer (SHPO) concurred with the Federal Transit Administration's (FTA's) determination that the Proposed Project, as described at the time, would have no adverse effect on historic properties.
- **2003:** SHPO concurred in the Finding of Effect Amended (FOEA).
- **2008**: Project changes reduced the length of the corridor from terminating in Gilroy to terminating in San Jose, and expanded the APE to include three new traction power substations at six potential locations. Field surveys of these expanded APE areas were conducted, and a supplemental records search was also undertaken (Far Western Anthropological Research Group 2008; JRP Historical Consulting Services 2008a).
- **2008:** A geoarchaeological assessment of the entire route (San Francisco to San Jose) was conducted.
- **2009**: A Programmatic Agreement (PA) regarding implementation of the project as it pertains to the potential discovery of archaeological sites was negotiated between the JPB, SHPO, and the FTA. The stipulations set forth in the PA are listed in this chapter's mitigation measures. The PA can also be found in Appendix E.
- **2009**: A data recovery and late discovery treatment plan (Far Western Anthropological Research Group 2009), a stipulation of the PA, was completed.
- **2013:** Surveys were conducted on June 3, 4, and 6 by a professionally qualified architectural historian. In addition to field verifying the condition of the 25 previously determined eligible and listed properties to ensure they have not been altered since the 2008 survey, 15 properties within the APE known to have been constructed in or prior to 1968 and not previously surveyed because they had not reached 45 years of age in 2008 were surveyed and subsequently evaluated in accordance with Section 15064.5(a)(2)-(3) of the CEQA Guidelines (ICF International 2013). None were found to be eligible for the CRHR. No new records search was conducted at this time because the 2013 Proposed Project updates did not include any new parcels beyond those covered in the 2008 supplemental records search conducted by Far Western Anthropological Research Group.
- **2013:** In 2013 it was determined that trees planted on private property adjacent to the Caltrain ROW may need to be pruned or removed for electrical safety for the OCS. 71 properties with buildings over 50 years old were identified as having potential to be impacted by this vegetation clearance. These properties were surveyed and evaluated for eligibility for the CRHR. All surveys took place from the public ROW. For those properties that could not adequately be seen from the public ROW, additional research was conducted to determine whether the properties had been significantly altered since their construction. Additionally, city registers of historic resources were reviewed to assess whether any of the 71 properties in question were locally listed (ICF International 2014).

Native American Consultation

Section 106 of the National Historic Preservation Act of 1966 provides federally recognized Native American tribes the opportunity to identify their concerns about cultural and heritage resources, advise on the identification and evaluation of such resources, articulate their views on the undertaking's effects on archaeological sites and traditional cultural properties, and participate in the resolution of adverse effects (36 CFR Section 800.2 (c)(3)(i)). JPB contacted NAHC on December 4, 2001, to advise them of the Proposed Project. The NAHC responded on December 12, 2001, stating that their record search revealed no indication of the presence of Native American cultural resources in the immediate project area; however, they also recommended that JPB contact other Native American individuals/organizations to verify the findings of the NAHC. JPB sent notification letters to these Native American tribes on December 18, 2001. The 30-day review period expired, and no additional comments were received from the Native American tribes or individuals.

JPB sent a second letter to NAHC in December of 2007, informing NAHC of the revisions to the project APE (with maps) and asking for any information on known resources or sensitive areas. In the January 16, 2008 reply, NAHC stated that the Sacred Lands File did not indicate any cultural resources within the project area, but cautioned that the absence of specific site information does not necessarily indicate the absence of cultural resources. Subsequently, JPB sent letters to all the Native American individuals and groups on the list provided by NAHC; in addition, phone calls or emails were sent to each contact.

Given the passage of time since the last project-related Native American correspondence, ICF contacted NAHC on October 24, 2013, in order to re-fresh the Sacred Lands File search and to obtain an updated Native American contact list for the project area. The NAHC responded on November 5, 2013, stating that its record search revealed no indication of the presence of Native American cultural resources in the immediate project area; however, NAHC also recommended that ICF contact other Native American individuals and organizations to verify the findings of the NAHC.

ICF sent notification letters to the Native American contacts on November 11, 2013. The 30-day review period expired, and no additional comments were received from the Native American tribes or individuals.

Archaeological Study Area

The Archaeological Study Area for this analysis contains the areas defined herein:

- The existing Caltrain ROW including all existing stations.
- Locations of potential locations for two traction power substations in South San Francisco (TPS1) and San Jose (TPS2) and the area of connecting underground duct banks. TPS1 Options 1 and 2 are off of Gateway Boulevard and Option 3 is off of Harbor Way; all three options are in South San Francisco. TPS2 Option 1 is off of Newhall Street; Option 2 is off of Stockton Avenue, and Option 3 is at the Central Equipment Maintenance Operations Facility (CEMOF); all three options are in San Jose.
- Certain areas outside the Caltrain ROW where OCS poles and wires would be placed partially outside the existing ROW. Based on current designs, Caltrain has identified approximately 20 locations with a total length of approximately 1.8 miles where the OCS alignment may be outside the existing Caltrain ROW. Most of these areas are within the existing rights-of-way for adjacent

roads and railroads, but some of these areas are on residential or commercial parcels. In general, these areas only extend a few feet off the existing Caltrain ROW.

- Certain areas outside the Caltrain ROW where vegetation maintenance would be required within 10 feet of the OCS pole alignment for electrical safety. Vegetation maintenance is the only proposed activity in these areas. Based on current designs, Caltrain has identified approximately 108 potential locations where the 10-foot vegetation maintenance zone would be outside the current ROW. The area of the maintenance zone outside of the current ROW would vary in width up to approximately 10 feet outside the ROW (where the OCS pole alignment would be within the Caltrain ROW) to a few feet more than 10 feet (where the OCS pole alignment would be outside the Caltrain ROW). Not all of these areas contain trees. The preliminary estimate of the area outside the Caltrain ROW within the 10-foot vegetation maintenance zone is 18 acres located on existing rights-of-way for adjacent roads and railroad, on residential and commercial parcels, and in several public parks.
- Caltrain has identified potential construction access, staging, and storage areas within its current ROW. Contractor construction staging and storage areas may be proposed in heretofore unidentified nearby locations that are outside the current ROW.

The archaeological records search included a 20-foot buffer beyond the Caltrain ROW and the architectural history assessment included the parcels adjacent to the Caltrain ROW, thereby including areas where the OCS must be placed outside of the ROW or where vegetation maintenance may be performed. The results of previous historic built resources and archaeological studies were taken into account when initiating the current analysis for the existence of and potential effects on historic resources within the project area.

Archaeology

The background records search and literature review conducted for the Proposed Project identified 21 prehistoric and historic-era archaeological sites in or potentially in the project Archaeological Study Area (see Table 3.4-1). Additional documentary research identified three additional archaeologically sensitive zones (Hamilton shell mound, the vicinity of the Third Mission Santa Clara [CA-SCL-30/H], and the Native American burial ground at Tamien Station [CA-SCL-690]). Previous investigations indicate that one site, CA-SCL-30/H, has been determined eligible for the NRHP, and CA-SCL-690 has been recommended eligible; neither has been listed.

Consequently, a PA regarding implementation of the Proposed Project as it pertains to the potential discovery of archaeological sites was negotiated between the JPB, SHPO, and the FTA (PCJPB, FTA, and SHPO 2009). The PA, executed December 17, 2009, in accordance with 36 CFR Section 800.6 (b)(1)(iv), has a termination date of 2019[2]. The stipulations set forth in the PA are included as mitigation commitments in this EIR for archaeological resources (see Section 3.4.2.3).

A data recovery and late discovery treatment plan (Far Western Anthropological Research Group 2009), a stipulation of the PA, was completed in April 2009 (see Appendix E for the PA).

[2] As construction may extend into 2020 or 2021, the PA may need to be extended accordingly.

Table 3.4-1. Prehistoric and Historic-Era Archaeological Sites In or Potentially In the Archaeological Study Area

Site Trinomial or Number	Site Description	Relation to Archaeological Study Area[a]
CA-SFR-15	Shell mound	Potentially in
CA-SMA-371	Shell midden capped by historic-era debris	Potentially in (buried)
P-41-498 Hamilton Shell Mound	Shell midden	Potentially in (buried)
CA-SMA-358/H	Prehistoric/protohistoric and historic-era artifact scatter	In
CA-SMA-343H	Historic trash dump	In
CA-SMA-102	Shell mound	In
CA-SMA-316	Shell midden	In
CA-SMA-317	Shell mound	In
CA-SMA-4	Large shell midden	In
CA-SMA-232	Shell midden	In
CA-SMA-318	Shell mound	Potentially in
CA-SMA-309 (C-767)	Shell mound	Potentially in
CA-SMA-233	Shell midden	Potentially in
CA-SCL-624	Shell midden	Potentially in
CA-SCL-707	Shell midden	Potentially in
CA-SCL-22	Dirt midden	In
CA-SCL-8	Large occupation site	Potentially in
CA-SCL-30/H	Habitation site w/burial	In
CA-SCL-690 Tamien Station	Large prehistoric cemetery	In
C-1	Reported burial	Potentially in
CA-SCL-448	Shell scatter	In

[a] Sites listed as potentially in the Archaeological Study Area are those whose full extent has not been determined.

In 2013, JPB identified potential construction access, staging, and storage areas within the Caltrain ROW. Additionally, JPB identified areas where OCS poles and wires would be placed partially outside the existing Caltrain ROW, and where vegetation maintenance would be required within 10 feet of the OCS pole alignment for electrical safety (as discussed in greater detail in Section 3.4.2.1, *Archaeological Study Area*, above).

All of these locations were compared with the areas of known archaeological sensitivity throughout the project area in order to determine if any are situated within sensitive areas. By comparing the maps, it was determined that the following archaeologically sensitive areas would be subject to vegetation clearance, the placement of OCS poles, or proposed staging areas:

- A proposed staging area around Railroad Avenue and 16th Avenue in San Mateo (MPs 17.1 to 18.3) overlaps with the Hamilton Shell Mound Sensitivity Zone (P-41-000498), of which the southern border is 9th Avenue. Additionally, there would be some vegetation removal in this area that is outside of the Caltrain ROW.
- Poles would be installed outside of the Caltrain ROW between MPs 44.4 and 45 in Santa Clara, which is within the Third Mission Sensitivity Zone (SCL-30/H); however the area of pole

installation is within the developed and disturbed UP ROW and thus installation is unlikely to disturb undisturbed resources, if present at this location.

- Poles would be installed outside of the Caltrain ROW, and there is a proposed staging area, at the Tamien Station, which is located within the recorded boundaries of CA-SCL-690.

Architectural History

A Historical Study Area for historical architectural resources was defined as the Caltrain ROW, the area directly affected by the Proposed Project, and the first row of parcels surrounding each of the proposed traction power facility sites. Within this Historical Study Area are all of the Caltrain railroad features, such as stations (modern and historic), signal bridges, tunnels, grade separations, culverts, bridges, viaducts, and overpasses.

Because of the passage of time, the 25 previously determined eligible and listed properties were field checked to ensure they have retained their historic integrity; none appears to have been altered since the 2008 survey. Also due to the passage of time, an additional 15 properties—14 bridges and culverts, and one commercial building—within the Caltrain ROW or adjacent to proposed traction power facilities were evaluated for historic significance; none appears to qualify as an historical resource for inclusion in the CRHR or for the purpose of CEQA (PRC Sections 5020.1[k], 5024.1, 5024.1[g]). Thus, none of the 15 is listed in Table 3.4-2.

Table 3.4-2. Properties within the Historical Study Area Listed, or Determined Eligible for Listing, in the NRHP and CRHP, or are Historic Properties for the Purposes of CEQA

Milepost	Resource Name (and Office of Historic Preservation status code)[a]	Property Type	City	County	Year Built
01.33	Tunnel No. 1[b] (3D)	Tunnel	San Francisco	San Francisco	1907
01.72	22nd Street Overpass (3D)	Overpass	San Francisco	San Francisco	1906
01.90	23rd Street Overpass (3D)	Overpass	San Francisco	San Francisco	1906
01.93	Tunnel No. 2[b] (3D)	Tunnel	San Francisco	San Francisco	1907/1936
03.19	Tunnel No. 3 (2)	Tunnel	San Francisco	San Francisco	1904–1907, 1999
04.27	Tunnel No. 4 (2)	Tunnel	San Francisco	San Francisco	1904–1907
04.95-A	Schlage Lock Factory (2)	Building	San Francisco	San Francisco	1926
09.59	Airport Boulevard Underpass (3S)	Underpass	South San Francisco	San Mateo	1927/1935
13.70	Millbrae Station/Building (1)	Station	Millbrae	San Mateo	1907
15.30 – 16.90	Jules Francard Grove (5S1)	Tree Grove	Burlingame	San Mateo	1876–1886
16.30	Burlingame Station (1)	Station	Burlingame	San Mateo	1894
17.20	East Poplar Avenue Underpass (2)[e]	Underpass	San Mateo	San Mateo	1903
17.34	East Santa Inez Avenue Underpass (2)[e]	Underpass	San Mateo	San Mateo	1903
17.45	Monte Diablo Avenue Underpass (2)[e]	Underpass	San Mateo	San Mateo	1903
17.53	Tilton Avenue Underpass (2)[e]	Underpass	San Mateo	San Mateo	1903
22.05	Craftsman residence not within Caltrain ROW(5S1)	Building	Belmont	San Mateo	1907
23.20	San Carlos Station (1)	Station	San Carlos	San Mateo	1888
27.63	51 Mount Vernon Lane (3CS)	Residence	Atherton	San Mateo	1964
27.67	45 Mount Vernon Lane (3CS)	Residence	Atherton	San Mateo	1903
27.80	Atherton Station[c](3D)	Station	Atherton	San Mateo	1913

Milepost	Resource Name (and Office of Historic Preservation status code)[a]	Property Type	City	County	Year Built
28.10	Holbrook-Palmer Park water tower and carriage house. (Not within Caltrain ROW). (3CS)	Buildings	Atherton	San Mateo	1875 (water tower), 1896 (carriage house)
28.90	Menlo Park Station (1)	Station	Menlo Park	San Mateo	1867, 1890s, 1917
29.69	San Francisquito Bridge (2)	Bridge	Palo Alto	Santa Clara	1902
29.69	El Palo Alto (7L)	Tree	Palo Alto	Santa Clara	<1000 (est. 949)
30.10	Palo Alto Station (1)	Station	Palo Alto	Santa Clara	1940
30.13	University Avenue Underpass (2)	Underpass	Palo Alto	Santa Clara	1941
30.70	Embarcadero Underpass (2)	Underpass	Palo Alto	Santa Clara	1936
N/A	Greenmeadow Neighborhood (near MP 33.6; not within Caltrain ROW) (1)	Building	Palo Alto	Santa Clara	1954–1955
N/A	100 Block of Castro Street (near Mountain View Station at MP 36.0; not within Caltrain ROW) (5S1)	Buildings	Mountain View	Santa Clara	1874–1906
N/A	The Mountain View Adobe (near MP 36.0; not within Caltrain ROW) (1)	Building	Mountain View	Santa Clara	1934–1950
44.60	Santa Clara Tower at Benton and Railroad Street (2)[d]	Station	Santa Clara	Santa Clara	1927
44.70	Santa Clara Station (1)	Station	Santa Clara	Santa Clara	1863–64, 1877, 1885
47.35	Santa Clara Street/Alameda Underpass (part of San Jose/Cahill Station) (1)	Underpass	San Jose	Santa Clara	1933
47.50	San Jose/Cahill Station (1)	Station	San Jose	Santa Clara	1935

[a] Office of Historic Preservation status codes:
- (1) Listed in the NRHP and/or CRHR.
- (2) Properties previously evaluated, found eligible, and received SHPO concurrence.
- (3D) SHPO concurrence of eligibility assumed as a contributor to a district.
- (3S) SHPO concurrence of eligibility assumed as individually eligible.
- (3CS) Property appears potentially eligible for CRHR as an individual property through survey evaluation. 45 and 51 Mount Vernon Lane, Atherton, are pending further evaluation to determine if they are potentially eligible for the CRHR.
- (5S1) Individual properties recognized as historically significant by local government.
- (7L) A California historical landmark designated prior to 1998 and, therefore, not evaluated for the NRHP or the CRHR.

[b] JRP Historical Consulting Services determined that Tunnels 1 and 2 (MP 01.33 and 01.93) appeared to have significance, but did not retain enough integrity to convey that significance under the criteria for listing in the NRHP and CRHR. SHPO concurred with this conclusion in a letter dated December 9, 2002. In 2002, the San Francisco Planning Department conducted an inventory and evaluation of resources located in the Central Waterfront area, including Tunnels 1 and 2. The Planning Department presented its evaluation of the tunnels to the San Francisco Landmarks Preservation Advisory Board on May 15, 2002, and the board agreed with planning staff that these two tunnels appeared to be eligible for the NRHP, and, therefore, appeared to be eligible for the CRHR. The Central Waterfront Historic District inventory is identified in the Historic Property Data File with Office of Historic Preservation status code 3 (appears eligible for listing in NRHP). Because they have been found eligible as contributors to the district, Tunnels 1 and 2 appear eligible for the NRHP and are considered to be historical resources for the purposes of CEQA. "Directory of Properties in the Historic Property Data File" for San Francisco County, as of December 2007; San Francisco Landmarks Preservation Advisory Board, 2002 Minutes, Minutes of Regular Meeting, May 15, 2002, http://www.sfgov.org/site/planning_page.asp?id=15882. See also Section 15064.5(a)(2)-(3) of the CEQA Guidelines and the criteria outlined in Section 5024.1 of the California PRC.

[c] The Atherton Station was previously found "potentially eligible for the National Register of Historic Places for its local significance as a contributor to a historic district if a historic district is established encompassing the neighborhood surrounding the depot."

~~[d] The tower is outside of the boundary of the NRHP-listed Santa Clara Station; it is locally recognized as a historic resource and therefore considered a historic property for the purposes of CEQA.~~

[e] In a separate project, the San Mateo Bridge Replacement Project, Caltrain, in cooperation with the city of San Mateo, is planning to replace these four bridges because they do not meet current seismic safety standards. The project is planned for completion by 2016.

For this analysis, five additional historic properties were added after the 2008 survey: the Jules Francard historic tree grove in Burlingame; El Palo Alto, an ancient redwood tree in Palo Alto; the Greenmeadow neighborhood in Palo Alto, 100 Block of Castro in Mountain View, and the Mountain View Adobe in Mountain View. These five properties plus the previously identified resources are listed in Table 3.4-2.

This analysis also examined the potential to affect historic architectural resources where OCS poles and wires would be placed partially outside the existing Caltrain ROW and where vegetation maintenance would be required within 10 feet of the OCS pole alignment outside the ROW for electrical safety. The locations were mapped by layering GIS information onto aerial photographs. The locations were carefully reviewed and it has been determined that 71 properties built in or prior to 1968 have vegetation within the vegetation clearance zone; no OCS poles are proposed to be located on properties with buildings constructed in or prior to 1968. These 71 properties consist of two commercial properties, two parks, and 67 residential properties and were evaluated to identify if any contain historic resources (as defined under CEQA) and if so, to determine if vegetation removal would or would not have an indirect effect on the historic significance of historic resources.

Of these 71 properties, one (1110 Old County Road, Belmont) is on the City of Belmont's Historical Resources Inventory, listed as a Historical Resource and is therefore considered a historical resource for the purposes of CEQA; it does not appear to be eligible for the CRHR. This 1907-built modest Craftsman residence is included in Table 3.4-2. One other property, the Holbrook-Palmer Park in Atherton, contains two built resources that appear to be individually eligible under Criteria 2 and 3, for their association with Charles Holbrook, one of the first San Francisco residents to establish a farming estate in Atherton, and for their noteworthy architecture. However, the park as a whole does not have adequate integrity to be considered a historic landscape.

Of the remaining 69 properties, research has indicated that none appears to have the potential to be significant under Criteria 1, 2, or 4. Six of these properties could not be adequately seen from the ROW to determine if they have the potential to be architecturally significant (Criterion 3). Research was conducted at the San Mateo County Assessor's Office and Atherton's Building Permit Center to ascertain if the properties had been altered since their construction dates. Between the results of this research and property photographs, it was determined that four had been significantly altered. The research results for two properties, 45 and 51 Mount Vernon Lane in Atherton, were inconclusive. Therefore, for the purposes of this Project, these two properties are assumed to be eligible under CRHR Criterion 3 for their architectural significance.

Of the remaining 67 properties, none appear to be significant under Criteria 1, 2, 3 or 4, and, therefore are not considered historic resources for the purposes of CEQA.

Two railroad bridges in San Jose, the Delmas Avenue and the Prevost Avenue Bridges, which are within the Historical Study Area, were evaluated for the Caltrain Electrification Program in 2002. They were determined ineligible for the CRHR and NRHP. SHPO concurred with this finding in a letter dated December 9, 2002 (California SHPO 2002). A review of their original evaluation by qualified architectural historians has not resulted in a change to the determination; the passage of time has not resulted in changing perceptions of their significance. Therefore, they are not historic resources for the purposes of CEQA.

3.4.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the Proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5.
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5.
- Disturb any human remains, including those interred outside of formal cemeteries.

3.4.2.3 Impacts and Mitigation Measures

<u>Changes resulting from Project Variant 1 are described below each impact analysis.</u>

Impact CUL-1	Cause a substantial adverse change in the significance of historic built resources pursuant to Section 15064.5
Level of Impact	Significant
Mitigation Measures	CUL-1a: Evaluate and minimize impacts on structural integrity of historic tunnels CUL-1b: Minimize impacts on historic decorative tunnel material CUL 1-c: Install project facilities in a way that minimizes impacts on historic tunnel interiors CUL-1d: Implement design commitments at historic railroad stations CUL-1e: Implement specific tree mitigation considerations at two potentially historic properties and landscape recordation, as necessary CUL-1f: Implement historic bridge and underpass design requirements BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan
Level of Impact after Mitigation	Less than significant for all resources except possibly significant and unavoidable at Tunnel 4 and possibly for two potential historic resources affected by tree removal

Construction and Operation

There is the potential that the Proposed Project could result in a change to the significance of archaeological and historic built resources (considered “historical resources” as defined under CEQA).

There are known historic built resources in the Historical Study Area, which includes the Caltrain ROW, one parcel on either side of the traction power facility sites and areas along the ROW needed for OCS poles and/or vegetation clearance for electrical safety. Table 3.4-2 presents the identified architectural or built resources—the majority of which are related to the railroad. Significant impact on a built historical resource occurs when the project results in substantial adverse change to the physical characteristics that convey its historical significance and that justifies its inclusion in, or eligibility for, inclusion in the CRHR, or in a local register of historic resources. Potentially significant impacts are identified to some of the historic properties prior to mitigation. As discussed below, with mitigation, all significant impacts could be mitigated to a less-than-significant level with the possible exception of impacts on Railroad Tunnel 4 in San Francisco.

The discussion below provides a profile of impacts and mitigation for the historic built resources potentially affected by the Proposed Project.

None of the proposed locations for the PS7 (Variant A or B), under Project Variant 1 described in Chapter 2, *Project Description*, would result in a change to the significance of historic built resources because no historic built resources are located on the potential PS7 sites.

Railroad Tunnels 1, 2, 3, and 4, San Francisco

There are ~~three~~ four different Proposed Project potential impacts on the tunnels: notching of the inside of tunnel to provide clearance for the OCS infrastructure above freight and passenger trains; removal of a portion of the decorative stone portals outside the tunnels when notching; ~~and~~ installation of OCS infrastructure in the tunnel lining; and track lowering for vertical clearance.

Tunnel Notching

The Proposed Project requires that the tunnels' lining be notched by crown mining to achieve the clearances needed to accommodate electrified train operations and existing freight trains[3]. These tunnels are listed on the CRHR as meeting Criteria 1 because the tunnels were key elements of the Bayshore Cutoff, which was an important development in Southern Pacific's system-wide modernization at the turn of the 20th century. They also meet Criteria 3 for their distinctive architectural and engineering qualities. The tunnels are important for their unusual drift-and-core bracing method of construction, as well as their use of decorative brick and masonry accents at each portal or tunnel entrance.

Structural integrity work in 2004 including placing of shotcrete along the interior of the tunnels, which covers the historic brick fabric. Tunnel notching will mostly affect the shotcrete which is not a contributing element to the tunnel's historic integrity, but where notching reaches the historic brick material, some brick material could be removed.

The removal of historic brick fabric along the length of the tunnels' interior crown could result in a change to the tunnels' historic integrity if removal results in the loss of structural integrity such that new, modern materials must be introduced to achieve structural stability. Mitigation Measure CUL-1a would require the minimization of any impacts on the tunnels' structural integrity.

Removal of Decorative Stone Portals

The Proposed Project requires that the tunnels' decorative stone portals also be notched by crown mining to achieve the clearances needed to accommodate electrified trains, existing diesel trains, and existing freight trains. Additionally, the removal of the historic fabric may affect the round-arch shape of the portal or remove enough stone material such that the massing of the feature is diminished to the point that it no longer retains its visual character. At the crown of the portals for Tunnels 1 and 3, between 0.10 and 0.25 feet (1 to 3 inches) would be removed. At the crown of Tunnel 4 portals, an estimated 0.50 to 1.75 feet (6 to 21 inches) would be removed. Mitigation Measure CUL-1b would require gradually "feathering" the removal of the historic fabric out from the notch to minimize the visual impact of the alteration for these portals. The greater the amount of historic material that is removed and the more the original design is altered, the greater the likelihood that the impact cannot be reduced to a less-than-significant level. At this time, impacts on

[3] As discussed in Chapter 2, *Project Description*, the Proposed Project is being designed to accommodate the existing passenger and freight heights and future EMU heights.

Tunnel 1 and 3 would be less than significant with mitigation, but, due to the extent of historic material removal required at Tunnel 4, it is possible that mitigation would not reduce the impact to a less-than-significant level at the Tunnel 4 portals.

Lowering the Elevation of Existing Track

One option to achieve needed vertical clearance to accommodate electrified trains, existing diesel trains, and existing freight trains would be by lowering the track elevation. Removal of the track material would be a less-than-significant impact because the track material has been continually replaced, repaired, and upgraded to accommodate rail service, therefore the materials and workmanship of the tracks do not retain historical integrity. For resources such as train tracks, the integrity of location, setting, feeling, and association are the most important aspects of integrity, which would be maintained if the tracks are lowered. Therefore, no mitigation is needed.

OCS Infrastructure Attachment to Tunnels

Power system supports, for the OCS, required for the Proposed Project would be installed within Tunnels 1, 2, 3, and 4.

As noted above, structural integrity work in 2004 including placing of shotcrete along the interior of the tunnels, which covers the historic brick fabric. The support brackets for the OCS will be placed within shotcrete; however in some locations, the shotcrete may not be sufficiently deep to anchor the supports. In those locations, historic brick fabric may need to be removed to allow placement of sufficiently deep shotcrete to support the OCS safely

The installation of the power system has the potential to remove historic fabric from the interior of the tunnels, alter the surface of the interior of the tunnels with the installation of support brackets, and cause visual impacts if the systems are visible from the exterior of the tunnels. The addition of these non-historic systems in conjunction with the crowning of Tunnels 1, 3, and 4 would result in a significant impact (Tunnel 2 would not require crowning). The implementation of specific design requirements contained in Mitigation Measure CUL-1c would reduce impacts to a less-than-significant level by avoiding impacts visible from the exterior of the tunnels.

The following mitigation is proposed.

Mitigation Measure CUL-1a: Evaluate and minimize impacts on structural integrity of historic tunnels

A structural investigation shall be conducted prior to the removal of any historic fabric to evaluate probable effects on each tunnel's structural integrity, followed by the development of a design approach and construction methods to avoid affecting structural integrity. While the notching would remove historic fabric, retained structural integrity will ensure that this historic method of construction will retain integrity.

Mitigation Measure CUL-1b: Minimize impacts on historic decorative tunnel material

Prior to any removal of decorative tunnel portal material during crown mining of historic Tunnels 1, 3, and 4, a structural investigation shall be conducted to evaluate the probable effects on the structural integrity of the tunnel portals. Also prior to the removal of the historic material, depending upon the extent of the material to be removed, the portal may be recorded to the Historic American Engineering Record (HAER) standards level III (refer to http//www.nps.gov/history/hdp/). Additionally, also depending upon the extent of the material to be removed, the Secretary of the Interior's standards (SOIS) for the rehabilitation of historic properties may be followed in the design and implementation of the adaptation of the tunnels to accommodate the larger rolling stock (refer to http//www.nps.gov/tps/standards.htm).

A structural investigation shall be conducted to identify construction disturbance to the decorative portals If it is determined that more than 4 inches of material must be removed from the portals of any of the tunnels, a visual simulation depicting the removal shall be prepared to assess the visual impacts and to determine if the portal(s) will need to be recorded according to HAER standards and if the SOIS need to be applied. If the maximum amount of material to be removed is 4 inches or less, removal of the decorative tunnel material shall be "feathered" from the maximum removal at the keystone to the sides of the tunnels, maintaining the round arch.

Mitigation Measure CUL-1c: Install project facilities in a way that minimizes impacts on historic tunnel interiors

The OCS design for the tunnels shall minimize the removal of historic brick fabric as much as is feasible. Power system supports for the Proposed Project inside Tunnels 1, 2, 3 and 4 shall be placed sufficiently far back to not be readily visible, and attached to the tunnels' interiors ~~using methods that are either removable or may be cut off at the tunnels' lining surface~~ in shotcrete instead of in historic brick.

At Tunnels No. 1, 2, and 3, the OCS shall be attached to the interior roof surface of the tunnel by brackets inserted into shotcrete ~~the brick lining~~. ~~Installation of the main support soffit plates would require the permanent installation of eight epoxy grouted stainless bolts at each support. These bolts shall be cut off at the tunnel lining, resulting in little evidence of any modification. The remainder of the tunnel-support arrangements and the parallel feeder cables shall be completely removable~~. In addition, pole sets shall be installed at the portals of each tunnel. For Tunnel Nos. 1–3, side poles at the portals shall be used with power systems over the individual tracks that the poles power. The brackets within the tunnel interiors shall be set inside the tunnel mouth sufficiently far back that they would not be readily visible to passers-by or to those standing on the passenger platforms.

At Tunnel No. 4, the system shall also be attached to the interior roof surface of the tunnel by brackets inserted into shotcrete ~~the brick lining. Installation of the main support soffit plates would require the permanent installation of eight epoxy grouted stainless bolts at each support. These bolts could be cut off at the tunnel lining, resulting in little evidence of any modification. The remainder of the tunnel support arrangements and the parallel feeder cables shall be completely removable.~~ In addition, pole sets shall be installed at the portals of each tunnel. ~~For Tunnel No. 4, the pole sets shall support a headspan to support the power system over multiple tracks.~~ The brackets within the tunnel interiors shall be set inside the tunnel mouth sufficiently far back that they will not be readily visible to passers-by or to those standing on the passenger platforms (particularly at Tunnel No. 4's southern portal, the Bayshore Station).

Railroad Stations

The Proposed Project would install OCS poles and wires adjacent to seven of eight historically significant railroad stations. Due to the location of poles and OCS in relation to seven of eight stations, impacts would be less than significant. At the eighth station, Diridon Station, the OCS would be placed on the passenger platforms and extend through the existing umbrella sheds used as passenger shelters. Because these shelters are a contributing feature of this NRHP-listed station, impacts at this location would be significant, but can be mitigated through mitigation identified below. Impacts by station are discussed below.

Millbrae Station, MP 13.70 (Built 1907)

The original Millbrae Station was located south of Millbrae Avenue whereas the current Millbrae Station is located north of Millbrae Avenue. The historic Millbrae Station was listed on the NRHP in 1978 at the local level of significance. The station is described as "typical of those built in the early 1900s" and is significant to the growth and prosperity of the community. Significant features are limited to the exterior of the building itself; no adjacent buildings, structures, or objects are included in its statement of significance. To avoid potentially significant impacts, Mitigation Measure CUL-1d includes specific design commitments. With mitigation, the installation of poles in this location would have no adverse impact on the attributes that made the Millbrae Station eligible for listing in the CRHR and the NRHP, or on those attributes listed in the preservation covenant. The station structure itself would not be altered at all. Because the operating Caltrain station itself was previously moved from its original location closer to Millbrae Avenue, and its setting has already been substantially altered by modern development and construction in its immediate vicinity.

Burlingame Station, MP 16.30 (Built 1894)

The Burlingame Station was listed on the NRHP and CRHR in 1978 at the state level of significance. The station, formed by three sections (baggage room, waiting room, and station master living quarters), was built in 1893 in the Mission Revival style and is located west of the current tracks. No other resources were listed as part of the station other than the station building itself. To avoid a potentially significant impact, Mitigation Measure CUL-1d includes specific design commitments. With mitigation, the installation of poles in this location would have no adverse impact on the attributes that made the Burlingame Station eligible for listing in the NRHP and the CRHR. The station would not be directly affected by construction, and its setting has already been substantially altered by modern development and construction in its immediate vicinity. None of the features listed in the preservation covenant would be affected by the Proposed Project.

San Carlos Station, MP 23.20 (Built 1888)

The San Carlos Station was listed on the NRHP and CRHR in 1984 at a state level of significance. It was described as a Richardsonian Romanesque building with a high level of integrity. The station was listed as eligible under NRHP/CRHR Criterion 1/A for its association with the development of the town of San Carlos and under Criterion 3/C "for the quality of its architecture and the rarity of the Richardsonian Romanesque style for California railroad buildings." No contributors were listed with the building. A 1999 grade separation raised the active line approximately 15 feet. The proposed design would be to install OCS poles on the modern elevated structure well above the historic structure such that the OCS pole and wires will be part of the modern grade separation structure and not associated with the historic station. The station would not be directly affected by construction and, as noted above, its setting has already been substantially altered by construction of the grade separation project embankment in 1999. None of the significant features listed in the preservation covenant would be affected by the Proposed Project. Thus, impacts at this location would be less than significant.

Atherton Station, MP 27.80 (Built 1913)

The Atherton Station was evaluated in 1983 as likely eligible as a contributor to a historic district, should one be identified. The station reflects the high architectural quality of the spacious contemporary homes on large lots surrounding it. Consequently, it is considered eligible under Criterion 3/C for its architectural quality, despite the 1954 additions that are reversible and do not detract from its original design. The historic station structure is located east of the tracks. The proposed design includes OCS poles and wires installed near the current location of the historic station. To avoid a potentially significant impact, Mitigation Measure CUL-1d includes specific design commitments. With mitigation, the installation of poles in this location would have no adverse impact on the attributes that make the Atherton Station appear to meet the criteria for listing in the NRHP and CRHR, and the station itself would not be directly affected by the Proposed Project construction.

Menlo Park Station, MP 28.90 (Built 1867, 1890s, 1917)

The Menlo Park Station was listed in the NRHP and CRHR in 1974 at a local level of significance. Built in 1867, it was modified in the 1880s and 1890s to its current condition, significant under Criterion 3/C for the “picturesque cottage style” of the original building and added decorative elements of the Shingle style in the subsequent modifications. Only the building was listed; no other associated resources were identified as contributors. The station is located east of the tracks. To avoid a potentially significant impact, Mitigation Measure CUL-1d includes specific design commitments. With mitigation, the installation of poles in this location would have no adverse impact on the attributes that make the Menlo Park Station eligible for listing in the NRHP and CRHR; the station would not be directly affected by construction, and modern previous improvements to the station area and in its immediate vicinity have already altered the original station setting. None of the significant features specified in the covenant agreement would be affected by the Proposed Project.

Palo Alto Station, MP 30.10 (Built 1940)

The 1996 NRHP and CRHR listing of the Palo Alto Station name two buildings and two objects as the historic property. The property is an example of the Streamline Modern style of architecture, listed under Criterion 3/C. The historic structures are both east and west of the tracks ~~(confirm)~~. Poles and OCS would be installed near the current location of the historic station. To avoid a potentially significant impact, Mitigation Measure CUL-1d includes specific design commitments. With mitigation, the installation of poles in these locations would have ~~no adverse~~ a less-than-significant impact on the attributes that make the Palo Alto Station eligible for listing in the NRHP and the CRHR, and none of the resources listed in the nomination would be directly affected by the installation of the poles. Only the setting of the tracks would be slightly affected, in that the poles would be installed between the sets of tracks, and would extend over them, at this location. This, however, is a less-than-significant impact.

Santa Clara Station and the Station Tower, MP 44.70 (Built 1863-4, 1877, 1885)

Placed on the NRHP and CRHR in 1985, this station was identified as the oldest continually operating passenger depot in California, dating back to 1863. It was moved in 1877 and a freight warehouse was added. It was rehabilitated in 1990 following the Secretary of the Interior’s guidelines. The nomination was expanded to include the depot and three related resources, including the control tower, the speeder shed, and utility shed, located approximately 400 feet north of the station. The property as a whole is listed as eligible under Criterion 1/A for its association with the original development of rail transportation in California; the tower is considered eligible under Criterion 3/C. The historic covenant includes the station and freight-house building. The station and contributing resources would not be directly affected by construction, and modern previous improvements to the station area and in its immediate vicinity have already, to a substantial degree, affected the original station setting. The original station was located adjacent to an active freight and passenger track in a relatively sparsely settled agricultural area east of the old Santa Clara mission; its current setting is a combination of industrial and commercial buildings, modern streets, and a large and active railroad freight yard.

Poles and OCS would be installed near the current location of the historic station and the contributing structures such as the control tower. To avoid a potentially significant impact, Mitigation Measure CUL-1d includes specific design commitments. With mitigation, the installation of poles in these locations would have no adverse impact on the attributes that made the Santa Clara Station, its tower or sheds eligible for listing in the NRHP and CRHR, nor would OCS installation affect features described in the preservation covenant.

San Jose Diridon Station (Built 1935)

The Proposed Project includes the installation of poles for headspans and OCS that would extend through the butterfly passenger shelters or “umbrella” sheds on the Caltrain platforms of the Diridon Station (formerly the Cahill Station). Figure 3.4-1 shows the butterfly passenger shelters. These shelters are contributing elements to the Cahill Station National Register Historic District and are a historic resource under CEQA. The district is composed of six related resources: the main terminal building, the passenger butterfly shelters, the tunnels connecting the terminal to the platforms, car-cleaner shed, water tank, and the Alameda Underpass (grade separation). The butterfly passenger shelters are the only historic district resource that would be directly impacted at the Diridon Station. The installation of poles and OCS at the Diridon Station could result in a change to the historic district. Mitigation Measure CUL-1e would reduce impacts to a less-than-significant level by requiring the OCS to be installed without significantly impacting the historic integrity of this district contributor.

The following mitigation measures were developed with the specific stations’ historic character-defining features and contributors considered, as defined in their eligibility statements or NRHP nominations, which vary. When proposing Historic American Building Surveys (HABS), the current setting for each station was considered, which varies with regard to how substantially the current setting has already been altered by modern development. Also, the JPB has committed to consulting with local jurisdictions during the design process and prior to final design regarding OCS arrangement. Consequently the proposed mitigation for each station varies as appropriate and is not uniform.

Mitigation Measure CUL-1d: Implement design commitments at historic railroad stations

Millbrae Station

Side poles shall not be placed in front of or within 40 feet of the historic station on the west side of the Caltrain ROW. In addition, to minimize the visual intrusion of the poles, one of the following arrangements will be used for areas along the alignment within 100 feet on either side of the historic station:

Source: ICF 2013.

Graphics ... 00606.12 (8-15-13)

Figure 3.4-1
Butterfly Passenger Shelters at Diridon Station
Peninsula Corridor Electrification Project

- center pole/two-track cantilevers between MT1 and MT2 with side poles for the Millbrae siding, or
- a two-track cantilevers east of MT2 covering MT2 and MT1 with side poles for Millbrae siding.

Additionally, prior to the installation of the OCS, the station will be recorded to HABS level III standards from the track side of the building, from the opposite platform.

Burlingame Station

Side poles shall not be placed in front of or within 40 feet of historic station on the west side of the Caltrain ROW. In addition, to minimize the visual intrusion of the poles, one of the following arrangements will be used for areas along the alignment within 100 feet on either side of the historic station:

- center pole/two–track cantilevers; or
- two-track cantilevers from the east side platform.

Additionally, prior to the installation of the OCS, the significant portions of the property (i.e., the baggage room, waiting room, and the station master living quarters which together make up the current station) will be recorded to HABS level III standards from the track side of the building, from the opposite platform.

Atherton Station

Side poles shall not be placed in front of or within 40 feet of historic station on the west side of the Caltrain ROW. In addition, to minimize the visual intrusion of the poles, within 100 feet on either side of the historic station, one of the following shall be used:

- center pole/two–track cantilevers; or
- single cantilevers in the median between the two tracks.

Additionally, prior to the installation of the OCS, the station will be recorded to HABS level III standards from the track side of the building, from the opposite platform.

Menlo Park Station

Side poles shall not be placed in front of or within 40 feet of historic station on the west side of the Caltrain ROW. In addition, to minimize the visual intrusion of the poles, one of the following arrangements will be used for areas along the alignment within 100 feet on either side of the historic station:

- center pole/two–track cantilevers; or
- two-track cantilevers from the east side platform.

Additionally, prior to the installation of the OCS, the station will be recorded to HABS level III standards from the track side of the building, from the opposite platform.

Palo Alto Station

Side poles shall not be placed in front of or within 40 feet of historic station on the west side of the Caltrain ROW. Given the separation between MT1 and MT2, single center poles are not feasible. Thus, to minimize visual impacts on the property, single pole/cantilevers will be placed in the median between MT1 and MT2.

Additionally, prior to the installation of the OCS, the station will be recorded to HABS level III standards from the track side of the building, from the opposite platform.

Santa Clara Station and the Station Tower

Side poles shall not be placed in front of or within 40 feet of historic station or the other historic structures (control tower, etc.) on the west side of the Caltrain ROW. Poles in front of the historic station should be center pole single cantilevers for MT2 and MT3 where parallel to the historic station. Side poles can be used for MT1 and placed on the modern center platform.

Side poles on the western side of the ROW shall be located near non-historic features, to the extent feasible as follows:

- A pole at the northern end of the station can be located near the modern steel and glass passenger waiting shelter.
- A pole at the southern end of the station can be sited east of the old set of tracks nearest the historic station (retained as an example of the relationship of the station to the original line and no longer operative) set in the modern poured concrete passenger platform and located among the modern electroliers on this platform.
- Poles shall not be located near the speeder shed or the utility shed.
- Poles can be located to each side of the control tower, one between the tower and the stub of Benton Street, the other more than 50 feet to the north.

Additionally, prior to the installation of the OCS, the station will be recorded to HABS level III standards from the track side of the building, from the opposite platform.

San Jose Diridon Station

At the San Jose Diridon Station the OCS design shall utilize a headspan. No poles shall be installed within the butterfly shelters between Tracks 2 and 3 and between Tracks 4 and 5.

Historic Properties along the Caltrain ROW Potentially Affected by Vegetation Clearance

To create safety clearance for the OCS, trees would be pruned or removed from potentially historic residential properties at 45 and 51 Mount Vernon Lane in Atherton. Because these two properties are 50 years old or more and were not visually accessible, for the purpose of this Project they are assumed to be historic resources eligible for their architectural significance. Research did not find that either is eligible for their association with historic events or persons of historic significance when applying Criteria 1 and 2 of the CRHR. Given that the potential historic resource nature of these two properties is unknown at this time, it was presumed that the mature trees near the Caltrain ROW might be part of the historic resource of these residential properties, if they are indeed historic resources. The Proposed Project would require removal of some of the trees within approximately 10 feet of the Caltrain ROW on these two properties. This is considered a potentially significant impact pending resolution of the historic resource nature of these two properties. Mitigation Measure BIO-5, in Section 3.3, *Biological Resources*, requires the JPB to implement a Tree Avoidance, Minimization, and Compensation Plan. Depending on the site-specific implementation of Mitigation Measure BIO-5, tree removal on these two properties may be avoided, minimized or compensated through replanting such that no significant effect would occur to these potentially historic properties. However, the feasibility of avoiding, minimizing, or replanting on these properties will not be known until detailed design of the OCS itself is completed. Mitigation Measure CUL-1e would also be required. At this time, it is unknown whether the properties are historic resources, whether the Proposed Project would have a significant impact on their historic character due to tree removal, and whether tree mitigation would avoid significant impacts; therefore, it is presumed that this impact is potentially significant and unavoidable.

Mitigation Measure CUL-1e: Implement specific tree mitigation considerations at two potentially historic properties and landscape recordation, as necessary

Access to properties at 45 and 51 Mount Vernon Lane in Atherton needs to be gained and historic resources evaluation completed prior to the removal of vegetation. If either of the residences proves to be CRHR-eligible, and the trees requiring removed for the project are character-defining features from the historic period of significance, or if the removal of the vegetation has the potential to visually impact the historic property, the preparation of specific tree avoidance, minimization, and/or compensation plans pursuant to Mitigation Measure BIO-5 shall take into account the historic character of the properties. If avoidance or minimization is not feasible, then replanting shall be conducted on the properties, if feasible. Regardless of the tree mitigation implemented, if the properties are determined to be CRHR-eligible, then the JPB shall have a qualified architectural historian record the landscape using Historic American Landscape Survey Standards level 3 prior to any project vegetation removal.

Other Built Resources

The Proposed Project's potential impacts on other historic built resources are discussed below.

22nd Street and 23rd Street Overpasses, San Francisco

The installation of OCS power supports and/or barrier enhancements would not require extensive physical changes to the historic properties, their use, nor their character defining features. These project activities would introduce some new materials to the overpasses and their setting, but the existing barriers on the bridges are modern additions and the setting has already been substantially altered since their original construction. Furthermore, the addition of these facilities would not cause a significant visual impact by the placement of additional infrastructural elements to a corridor already substantially altered, and would not diminish the integrity of the properties' significant historic features such that they would no longer contribute to the previously determined eligible Central Waterfront historic district. Thus the impacts on ~~the~~ these resources would be less than significant and no mitigation is identified.

Schlage Lock Factory Main Building, San Francisco

Poles and OCS would be installed in the Caltrain ROW running east of the building, the only extant plant building and the only plant building on the property to be determined to be a historical resource. The Main Building was one of a group of buildings interconnected with a modern warehouse; the other buildings have been previously demolished. The poles would be located along the railroad line at a substantial distance from the Main Building. The installation of poles in this location would have no adverse impacts on the attributes that make the Main Building appear to meet the criteria for listing in the CRHR, and the building would not be directly impacted by construction. Thus, the impacts on this resource would be less than significant and no mitigation is identified.

Airport Boulevard Underpass, South San Francisco

The California Division of Highways and the Southern Pacific Railroad completed the Airport Boulevard Underpass (also known as the South San Francisco Subway) in 1927 and later widened the structure in 1935. The construction and widening are elements in the history of Peninsula highway development and the early 20th-century grade-separation movement, and is representative of the architectural/engineering development of underpass design. The South San Francisco Subway is therefore historically significant and has been determined eligible for listing in the CRHR and NRHP under Criteria 1/A and 3/C.

The installation of the OCS power system supports on this historically significant bridge could result in significant adverse impacts. To avoid a potentially significant impact, Mitigation Measure CUL-1f includes specific design commitments. Because the cables would be suspended above and parallel to the existing line, there would be no impact on the characteristics of the bridge that make it appear to meet the criteria for listing in the CRHR and NRHP. Additionally, its immediate vicinity has already been altered, so the addition of the power system would not impact the bridge's setting. Thus, the impacts on this resource would be less than significant and no mitigation is identified.

Jules Francard Grove of Eucalyptus Trees, Burlingame

The Jules Francard Grove of blue gum (*Eucalpytus globulus*) eucalyptus trees is on the east side of California Drive, from Burlingame Avenue to Palm Drive in the city of Burlingame. The city of Burlingame Park Department designated the tree row as a heritage grove in 1976. The heritage designation form states that the trees were probably planted between 1876 and 1886, about the same time that the Howard-Ralston Eucalyptus Tree Rows along El Camino Real in Burlingame, recently listed on the NRHP, was planted. The designation form describes the Jules Francard Grove as a "densely planted double row along the railroad tracks" and says that it "provides a tall dramatic silhouette in [the] center of town." It further states that this tree row is the most densely planted of any in Burlingame (City of Burlingame 1976). A letter from the Burlingame City Clerk to Mr. B. B. Vodicka, Agent of the Southern Pacific Company, dated June 22nd, 1916, states that the grove was designated a public park and dedicated to the people of Burlingame in 1910, to be "forever held, maintained, kept and preserved" (Burlingame City Clerk 1916).

At present, pruning and vegetation maintenance is conducted to ensure no branches fall on the tracks. The OCS alignment would be placed between the trees and the tracks. Based on current design, one tree would need to be removed to accommodate the Proposed Project and approximately 30 trees would require some pruning, but not removal, within the electrical safety zone (see details in Appendix F, *Tree Inventory and Canopy Assessment*). The views of this grove along the adjacent streets in the City of Burlingame would be unchanged as the pruning would occur on the Caltrain ROW sides of the grove. A visual simulation in Section 3.1, *Aesthetics,* shows the effect of vegetation removal on part of the grove. The overall appearance of the grove would not be substantially changed and the vast majority of the trees would be retained. The pruning would be conducted by a qualified arborist or under the supervision of a qualified arborist to ensure that the pruning would not jeopardize the health of the trees.

Due to the limited amount of project disturbance to the grove, the insubstantial changes in appearance overall, no change in appearance from city streets, and no substantial observable change in views from the train to the adjacent grove, the grove would continue to contain its character-defining features as a historic grove. Thus, Proposed Project impacts are considered less than significant. No mitigation is necessary.

East Poplar Avenue Underpass, East Santa Inez Avenue Underpass, Monte Diablo Avenue Underpass, Tilton Avenue Underpass, San Mateo

These four essentially pre-automobile underpasses are significant at the local level, under CRHR and NRHP Criterion 3/C based upon their distinctive characteristics of type, period, and method of construction. The underpasses are rare examples of their type and period, and they illustrate an important phase in development of underpass design. They are the earliest grade separations along the former Southern Pacific Coast Line (now Caltrain) between San Francisco and San Jose, and they are among a small group of such structures within the state. These four bridges have been found to not meet current seismic safety requirements. In a separate project, Caltrain, in cooperation with the city of San Mateo, is planning to demolish and replace these bridges by 2016. Thus, this Proposed Project will have no effect on these historic bridges as the OCS will be installed on the new bridges.

1110 Old County Road, ~~Burlingame~~ Belmont

This modest Craftsman residence was built in 1907 and is listed on the City of Belmont's Historical Resources Inventory as a Historical Resource. The highest level of historical significance in Belmont is "landmark" so this building is considered moderately significant. Because it is locally listed as a historic resource, it is a historic resource for the purposes of CEQA.

This track-side residence, while outside of the ROW, is within the vegetation removal zone to accommodate OCS. Field review of the building has shown that it has been altered since it was constructed and that there are newer structures on the parcel that have also altered its setting. Because the setting appears to retain no historical integrity, the removal of trees along the parcel boundary and the Caltrain ROW, are considered less than significant. No mitigation is necessary.

Holbrook-Palmer Park, Atherton

The 22-acre Holbrook-Palmer Park, located on the east side of Watkins Avenue, in the city of Atherton was originally a farming estate established in 1875. Only two buildings, the 1875-built water tower, and the second carriage house, built in 1896, are extant from the historic period. Both appear to be individually eligible for the CRHR for their architecture (Criterion 3). Although the original parcel boundaries have not changed, due to the significant alterations that have taken place since 1963, when it was first established as a public park, the property as a whole does not contain adequate integrity to be considered a historic landscape.

This track-side property, while outside of the ROW, is within the vegetation removal zone to accommodate OCS. Because the property lacks integrity to be considered a historic landscape, further altering the setting of the two individual historic resources by the removal of trees along the parcel boundary and the Caltrain ROW, is considered less than significant. No mitigation is necessary.

San Francisquito Bridge, Palo Alto

The installation of the power system supports on this historically significant bridge could result in significant adverse impacts. San Francisquito Bridge, a steel through-truss bridge, is eligible under Criterion 1 for its association with the image and development of Palo Alto in the 20th century, and under Criterion 3 for being the only significant steel bridge in Palo Alto and a distinctive example of an important standard type of truss bridge. Substantial alteration of the bridge structure could be a significant impact. With implementation of Mitigation Measure CUL-1d, the historic resource would not be altered other than the small clearance holes, and the cables would be suspended above and parallel to the existing railroad line. Thus, with mitigation there would be no significant impact on the characteristics of the bridge that make it appear to meet the criteria for listing in the CRHR.

El Palo Alto, Palo Alto

A large ancient redwood tree, known as "El Palo Alto," is located adjacent to the Caltrain ROW in Palo Alto. The tree has been recognized through at least three historic preservation programs, both locally and statewide, and is identified as California State Historic Landmark #2, a State Point of Historic Interest, and City of Palo Alto Heritage Tree #1. The state landmark status (Landmark #2) was conferred in 1954. Because SHPO did not develop specific uniform standards for landmark designation until well after many resources had been identified, landmarks with a number lower than 770 and recognized as state historic landmarks prior to 1998 are not considered to have been evaluated for the CRHR. Nevertheless, the tree is described as follows in SHPO's published list of state landmarks: "Portola Journey's End. In 1769 the Portola expedition of 63 men and 200 horses and mules camped near El Palo Alto, the tall tree. They had traveled from San Diego in search of Monterey but discovered instead the Bay of San Francisco. In 1974, the tree was designated as State Point of Historic Interest #SCL-026, in recognition of its local significance" (Office of Historic Preservation 2014). A City of Palo Alto press release states that the tree is estimated to be more than 1,000 years old and more than 110 feet high (San Jose Mercury News 2004).

The tree trunk is located outside of the electrical safety zone, ~~would not be impacted by the Proposed Project because~~ and all power system supports would be attached to the adjacent San Francisquito Bridge. However, as described in Section 3.3, *Biological Resources*, minor pruning would be necessary to keep tree branches out of the San Francisquito Bridge truss which is similar to current tree maintenance practices. Mitigation Measure BIO-5, Section 3.3, *Biological Resources*, requires a Tree Avoidance, Minimization, and Replacement Plan (including specific attention to minimization of effects on El Palo Alto) will be developed by a certified arborist in consultation with each jurisdiction's arborist (e.g., the City of Palo Alto Urban Forester in this case). Thus, the impacts on this resource would be reduced to a less than significant level ~~and no mitigation is identified~~.

University Avenue Underpass, Embarcadero Underpass, Palo Alto

The University Avenue Underpass, built between 1939 and 1941, is significant under CRHR and NRHP Criterion 1/A for its association with the transformation of Palo Alto's transportation core, and is central to the redesign of University Avenue as it intersected two of the most historically important transportation corridors between San Francisco and San Jose: Southern Pacific's Coast Line and El Camino Real/U.S. Highway 101. The Embarcadero Underpass, constructed in 1939 as part of the government's grade separation program, is eligible under CRHR and NRHP Criterion 1/A. The installation of the power system supports on these historically significant bridges could result in significant adverse impacts. To avoid a potentially significant impact, Mitigation Measure CUL-1d includes specific design commitments. Under this mitigation measure, the cables would be suspended above and parallel to the existing line and there would be no impact on historic fabric of these bridges, nor would the placement of the poles alter the use of or character-defining features of these underpasses that make them appear to meet the criteria for listing in the CRHR and NRHP. Additionally, the immediate vicinities of the underpasses have already been altered, so the addition of the power systems would not impact the bridges' settings. ~~Thus, the impacts to these resources would be less than significant and no mitigation is identified.~~

Greenmeadow Neighborhood, Palo Alto

The Greenmeadow Neighborhood in Palo Alto is a residential district listed on the NRHP on July 28, 2005. Greenmeadow consists of 243 single-family homes and one community center complex of two buildings and one swimming pool. The subdivision was developed by Eichler Homes, Inc. between 1954 and 1955. The single-story homes, designed by architects A. Quincy Jones and Frederick Emmons, have three or four bedrooms, two bathrooms, and attached garages. The homes are designed in a mid-century modern style and were built with a slab-on-grade post-and-beam construction. The designs emphasize privacy on the relatively blank street facades and openness to the rear with floor-to-ceiling, wall-to-wall plate glass windows. The district was listed at the state level of significance under Criterion C in the area of architecture as an excellent example of Joseph Eichler's mid-century modern subdivision housing in California. Eichler made a significant contribution in the area of modern home design and innovative construction methods. Working closely (and alternately) with architects Anshen and Allen, and Jones and Emmons, Eichler wished to offer middle-class families high-quality, contemporary design in an affordable production house. Greenmeadow is an excellent example of Joseph Eichler's contribution to mid-century residential modernism and the California suburban environment. When Eichler developed Greenmeadow in 1953, he had already built hundreds of lower priced, architect-designed homes in more than a dozen subdivisions on the Peninsula. With Greenmeadow, Eichler decided to move up the price range and tap into the growing market for larger houses with more amenities (California Office of Historic Preservation). The community was designed with an inwardly oriented street pattern for security and to discourage through traffic. The district is bounded by Nelson Drive, El Capitan Place, Adobe Place, and Creekside Drive.

Paralleling Station 5 (PS-5), Option 1 is proposed between the railroad and Alma Avenue, outside of the district boundaries; it therefore it has no potential to directly impact the historic district.[4] The proposed PS5, Option 1 would be opposite the entrance to Greemeadow Way, which leads into the district; the residences on Alma Avenue, opposite the proposed PS5, Option 1, are not included in the NRHP district (the closest residences within the historic district are approximately 250 feet east of Alma Street). This paralleling station would not diminish the historic character-defining features of the historic district by introducing a visual change to the district. PS5, Option 1 would be visible only by individuals leaving the historic district by way of Greenmeadow Way. The closest homes in the district to the proposed paralleling station are oriented facing Creekside Drive, opposite from Alma Avenue; the homes on the second block of Creekside Drive face each other and not toward the proposed PS5, Option 1. Continuing northeast on Creekside Drive is the Thomas Church-designed park with its community center, a significant distance from the proposed PS-5, Option 1. This is not the main entrance to the center, but a footpath. The mature landscaping of this area of the community center further blocks any potential visual impact. Therefore the Proposed Project would have no impact on this historic resource.

PS5, Option 1B is approximately 500 feet south of the nearest part of the historic Greenmeadow neighborhood and would not be visible from within the neighborhood and would not affect views of any part of the historic neighborhood.

[4] PS5 Option 2 is located on the west side of the Caltrain ROW adjacent to commercial area and is not near the Greenmeadow neighborhood.

100 Block of Castro Street, Mountain View

Several buildings on the 100 block of Castro Street, southwest of the Mountain View Station, are on the Mountain View Register of Historic Resources Property List (City of Mountain View 2004). These include the Weilheimer Store, 124 Castro (built in 1874); the First National Bank, 142-156 Castro (built in 1913); the Ames Building, 169-171-175 Castro (built in 1903); and the Mockbee Building, 191 Castro (built c1906). The proposed addition of OCS power lines on the opposite side of the station, along the rail line, would not result in a visual impact to any of these buildings. All of the buildings on the 100 block of Castro Street face each other and are not oriented toward the Proposed Project. Additionally, because the area's setting already contains overhead power lines and has been altered by the addition of modern infrastructure and buildings, the Proposed Project would not diminish the integrity of the buildings' significant historic features or setting. Thus, the impacts on this resource would be less than significant and no mitigation is identified.

The Mountain View Adobe, 157 Moffett Boulevard, Mountain View

The Mountain View Adobe was listed on the CRHR and the NRHP in 2002; it is significant under Criteria 1/A and 3/C, and its period of significance is 1934–1950. Under Criterion 1/A, the Mountain View Adobe is significant for its continued role as a public building central to the development of the Mountain View community and as a building constructed under the Civil Works Administration. The building is also significant under Criterion C: Design/Construction, because it embodies the distinctive characteristics of a 1930s community building type, of adobe and concrete construction. The nomination is limited to the building itself. The nomination states that the "outlying peripheral areas of the property no longer retain integrity and do not contain any significant features." Because the setting is not a character-defining feature of this property, the introduction of additional power poles and lines in its vicinity would not diminish the integrity of the building's significant historic features. Furthermore, the Proposed Project's impacts would be on the opposite side of Central Expressway from the Mountain View Adobe and thus would be in previously altered areas not considered part of the historic resources. The impacts on this resource would be less than significant and no mitigation is identified.

Alameda Underpass, San Jose

The Alameda Underpass is a contributing element of the NRHP and CRHR listed Cahill/Diridon Station. The underpass is located about 500 feet to the north of the depot. Built between 1932 and 1935, the depot and its contributors, including the station, several vernacular sheds, a water tower, butterfly passenger shelters and the Alameda Underpass are listed under CRHR and NRHP Criterion 3/C, for their architectural values. The installation of the OCS supports on this historically significant bridge could result in significant adverse impacts. To avoid a potentially significant impact, Mitigation Measure CUL-1d includes specific design commitments. Because the cables would be suspended above and parallel to the existing line, there would be no impact on the characteristics of the bridge that make it appear to meet the criteria for listing in the CRHR. Additionally, its immediate vicinity has already been altered, so the addition of the power system would not impact the bridge's setting. Thus, the impacts on this resource would be less than significant and no mitigation is identified.

Mitigation Measure CUL-1f: Implement historic bridge/underpass design requirements

This mitigation measure addresses the approach to installing Proposed Project facilities at nine historic bridges/underpasses to ensure that the power system supports are not attached to the historic fabric of these bridges/underpasses and avoid adverse impacts on their historic integrity and visual appearance. All modifications will be completed following the Secretary of the Interior's standards for the treatment of historic properties.

Airport Boulevard Underpass or South San Francisco Subway

Rather than installing the power system directly onto the bridge, power cables shall be suspended parallel to and above it to ensure that the bridge will not be impacted. ~~The pole sets shall support a headspan that crosses the track at the same angle as the roadway beneath.~~

San Francisquito Bridge, Palo Alto

The OCS cables shall be suspended from the upper portions of the San Francisquito Creek Bridge truss. The power cables shall use fasteners and brackets to support the power lines. The brackets shall be attached to the existing structure, but no part of the existing structure shall be removed as a part of the Proposed Project. Installation of the main support brackets shall require no permanent modification to the bridge structure and shall be completely removable. Installation of the static wire grounding brackets will require site drilling of eight 5/8-inch-diameter clearance holes, with the brackets completely removable. No poles shall be set on the bridge itself.

University Avenue Underpass, Embarcadero Underpass, Palo Alto

Power cables shall be suspended parallel to and above the University Avenue Underpass. The poles in this configuration shall be set at the side of the track they power. No poles shall be set on the bridges themselves.

Alameda Underpass, San Jose

Power cables shall be suspended parallel to and above the Alameda Underpass. ~~Pole sets shall support a headspan that crosses the track at the same angle as the roadway beneath.~~ No poles shall be set on the bridge itself.

Impact CUL-2	Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5
Level of Impact	Significant
Mitigation Measures	CUL-2a: Conduct an archaeological resource survey and/or monitoring of the removal of pavement or other obstructions to determine if historical resources under CEQA or unique archaeological resources under PRC 21083.2 are present CUL-2b: Conduct exploratory trenching or coring of areas where subsurface project disturbance is planned in those areas with "high" or "very high" potential for buried site CUL-2c: Conduct limited subsurface testing before performing ground-disturbing work within 50 meters of a known archaeological site CUL-2d: Conduct exploratory trenching or coring of areas within the three zones of special sensitivity where subsurface project disturbance is planned CUL-2e: Stop work if cultural resources are encountered during ground-disturbing activities CUL-2f: Conduct archaeological monitoring of ground-disturbing activities in areas as determined by JPB and SHPO

Level of Impact after Mitigation	Less than significant

Construction and Operation

There is the potential that the Proposed Project could result in a change in the significance of historic or prehistoric archaeological resources (both considered "historical resources" as defined under CEQA) or unique archaeological resources. There are known archaeological resources in the Archaeological Study Area. Table 3.4-1 presented the 21 identified archaeological resources— 19 prehistoric, one multi-component, and one historic-era archaeological— in or potentially in the Archaeological Study Area.

Additionally, documentary research identified three archaeologically sensitive zones (the area between Easton Creek and the east bank of San Mateo Creek identified as the "Hamilton shell mound sensitive zone", see Far Western Anthropological Research Group 2009: 4); the vicinity of the Third Mission Santa Clara [CA-SCL-30/H]; and the Native American burial ground at Tamien Station [CA-SCL-690]). Previous investigations indicate that CA-SCL-30/H has been determined eligible to the NRHP, and CA-SCL-690 has been recommended eligible; however, neither has been listed.

Because all areas of potential ground disturbance have not been surveyed for cultural resources, some portions of the Archaeological Study Area, as well as some areas outside of the Archaeological Study Area where OCS poles and wires would be placed partially outside the existing Caltrain ROW, and where vegetation maintenance would be required within 10 feet of the OCS pole alignment for electrical safety, are sensitive for archaeological resources. Therefore, there is a potential to encounter heretofore unidentified buried cultural resources and potential ground disturbance from construction, which could result in a significant impact. If prehistoric, ethnographic, and/or historic archaeological resources are identified within the proposed disturbance areas as noted above, then the evaluation and treatment of such resources will be conducted according to the measures set forth in Mitigation Measures CUL-2a through CUL-2f. Implementing these measures would reduce this impact to a less-than-significant level.

<u>Under Project Variant 1, described in Chapter 2, *Project Description*, PS7 would be located farther north than its current proposed location. There are two proposed locations for PS7 under Project Variant 1: Variants A and B. The proposed location for PS7 Variant A would be on the north side of West Alma Street in San Jose. This location is in proximity to, but not within, archaeological site CA-SCL-690. If PS7 Variant A is selected, than Mitigation Measures CUL-2a through CUL-2f would still need to be implemented. The proposed location for PS7 Variant B would not be near any known archaeological resource. Therefore, Project Variant 1 would not change the significance determination of this impact.</u>

Mitigation Measure CUL-2a: Conduct an archaeological resource survey and/or monitoring of the removal of pavement or other obstructions to determine if historical resources under CEQA or unique archaeological resources under PRC 21083.2 are present

Prior to the start of construction or future construction activities, the JPB <u>and/or the construction contractor</u> shall retain qualified archaeologists to conduct a pedestrian archaeological survey to determine the prehistoric, ethnographic, and historic archaeological resources within areas proposed for disturbance within the Archaeological Study Area and within those areas outside of the Archaeological Study Area established for OCS pole placement and vegetation maintenance. In those areas covered with pavement or other obstructions, a qualified archaeologist shall monitor removal of the obstruction (and any underlying base, foundations, etc.) and inspect the ground for cultural materials.

Mitigation Measure CUL-2b: Conduct exploratory trenching or coring of areas where subsurface project disturbance is planned in those areas with "high" or "very high" potential for buried sites

In those areas with "high" or "very high" potential for buried sites, a qualified archaeologist shall conduct exploratory trenching or coring of areas where subsurface project disturbance is planned, prior to that disturbance. Any cultural resources discovered during exploratory trenching or coring shall be protected or evaluated. Evaluation shall follow the research design and recommendation presented in the *Data Recovery and Late Discoveries Treatment Plan for the Caltrain Electrification Program Alternative: San Francisco, San Mateo, and Santa Clara Counties, California* (Far Western Anthropological Research Group 2009).

Mitigation Measure CUL-2c: Conduct limited subsurface testing before performing ground-disturbing work within 50 meters of a known archaeological site

When avoidance of impacts is not feasible, a qualified professional archaeologist shall conduct limited subsurface testing before any ground-disturbing project work is done within 50 meters of a known archaeological site. The objectives of the testing shall be to delineate the extent and depth of the site within the Archaeological Study Area and within those areas outside of the Archaeological Study Area established for OCS pole placement and vegetation maintenance; determine whether human remains are present within the Archaeological Study Area; and assess the nature and potential significance of the archaeological deposit within the Archaeological Study Area. The work shall be guided by the *Data Recovery and Late Discoveries Treatment Plan for the Caltrain Electrification Program Alternative: San Francisco, San Mateo, and Santa Clara Counties, California* (Far Western Anthropological Research Group 2009). All testing within a prehistoric or ethnographic site (including Mission-era sites) shall include consultation with the local Native American community.

Mitigation Measure CUL-2d: Conduct exploratory trenching or coring of areas within the three zones of special sensitivity where subsurface project disturbance is planned

If any ground-disturbing project work is planned within the three zones of special sensitivity (the Hamilton shell mound zone, the vicinity of the Third Mission Santa Clara, and Tamien Station), a qualified archaeologist shall conduct exploratory trenching or coring of areas where subsurface project disturbance is planned, prior to that disturbance. Any cultural resources discovered during exploratory trenching or coring shall be protected or evaluated. Archaeological investigations in the vicinity of the archaeological preserve at the Third Mission (CA-SCL-30/H) should be guided by the recommendations presented by Allen et al. (2003) or by anticipated updates to that document. Archaeological investigations in the other two zones of special sensitivity shall be guided by the *Data Recovery and Late Discoveries Treatment Plan for the Caltrain Electrification Program Alternative: San Francisco, San Mateo, and Santa Clara Counties, California* (Far Western Anthropological Research Group 2009).

Mitigation Measure CUL-2e: Stop work if cultural resources are encountered during ground-disturbing activities

The JPB shall ensure the construction specifications include a stop work order if prehistoric or historic-period cultural materials are unearthed during ground-disturbing activities. All work within 50 feet of the find shall be stopped until a qualified archaeologist and Native American representative can assess the significance of the find. Prehistoric materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or tool making debris; culturally darkened soil ("midden") containing heat-affected rocks and artifacts; stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered-stone tools, such as hammerstones and pitted stones. Historic-period materials might include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse. If the find is determined to be potentially significant, the archaeologist, in consultation with the Native American representative, shall develop a treatment plan that could include site avoidance, capping, or data recovery.

Mitigation Measure CUL-2f: Conduct archaeological monitoring of ground-disturbing activities in areas as determined by JPB and SHPO

Even though data recovery would, in theory, collect all potentially significant materials and information from the impact zone, in practice it is not feasible to do archaeological excavation of the entire area. This is particularly true in highly urbanized areas such as this project corridor. Therefore, at the discretion of JPB and the SHPO, it may be necessary to monitor project operations within recorded site boundaries. Activities to be monitored would include, but are not necessarily limited to, brush clearing, grading for stations, pavement removal, placement of electrification poles and utilities, and any activity involving subsurface excavation. The monitor(s), in consultation with the construction supervisor, would have authority to halt construction activities temporarily in the immediate vicinity of an unanticipated find to assess the significance of the find. Whether or not a monitor is present, the construction supervisor and work crews should be alert to the possibility of additional cultural or human remains being unearthed. If this occurs, all work should stop temporarily within 50 feet of the find until a qualified professional archaeologist can be called in to assess the find and determine the proper course of action.

Impact CUL-3	Disturb any human remains, including those interred outside of formal cemeteries
Level of Impact	Significant
Mitigation Measure	CUL-3: Comply with state and county procedures for the treatment of human remains discoveries
Level of Impact after Mitigation	Less than significant

Construction and Operation

There is the potential that the Proposed Project could disturb human remains, including those interred outside of formal cemeteries.

There are two known archaeological resources that are known to contain human remains: the vicinity of the Third Mission Santa Clara [CA-SCL-30/H], and the Native American burial ground at Tamien Station [CA-SCL-690]). Previous investigations indicate that CA-SCL-30/H has been determined eligible to the NRHP, and CA-SCL-690 has been recommended eligible; neither has been listed.

Because all areas of potential ground disturbance have not been surveyed for cultural resources, some portions of the Archaeological Study Area, and within those areas outside of the Archaeological Study Area established for OCS pole placement and vegetation maintenance, are sensitive for archaeological resources, including human remains; and since there is a potential to encounter heretofore unidentified buried cultural resources, including human remains, potential ground disturbance from construction could result in a significant impact on such resources. Implementing Mitigation Measure CUL-~~2~~3 would reduce this impact to a less-than-significant level.

Under Project Variant 1, described in Chapter 2, *Project Description*, PS7 would be located farther north than its current proposed location. There are two proposed locations for PS7 under Project Variant 1: Variants A and B. The proposed location for PS7 Variant A would be on the north side of West Alma Street in San Jose. This location is in proximity to, but not within, CA-SCL-690. If PS7 Variant A is selected, than Mitigation Measure CUL-3 would still need to be implemented. The proposed location for PS7 Variant B would not be near any known archaeological resource. Therefore, Project Variant 1, would not change the significance determination of this impact.

Mitigation Measure CUL-3: Comply with state and county procedures for the treatment of human remains discoveries

Any human remains and related items discovered during the implementation of the terms of the PA prepared for this project shall be treated in accordance with the requirements of Section 7050.5(b) of the California Health and Safety Code. If, pursuant to Section 7050.5(c) of the California Health and Safety Code, the county coroner/medical examiner determines that the human remains are or may be of Native American origin, then the discovery shall be treated in accordance with the provisions of Section 5097.98(a)-(d) of the California Public Resources Code. The JPB shall ensure that the remains are not damaged or disturbed further until all stipulations in Section 7050.5 and Section 5097.98 have been met.

3.5 Electromagnetic Fields and Electromagnetic Interference

Electromagnetic fields (EMF) describe electromagnetic radiation that is on the lower frequency end of the electromagnetic spectrum.[1] The electromagnetic spectrum includes the various wave forms of energy, from electrical fields to radio waves to light to x-rays. Energy frequencies at the high end of the spectrum are termed ionizing because they break chemical bonds and thereby can damage living cells and deoxyribonucleic acid (DNA). Energy frequencies at the lower end are termed non-ionizing since they do not break chemical bonds and would not have the same biological effects as ionizing radiation. EMF can also result in electromagnetic interference (EMI), which can cause disruptions and possibly malfunctions in sensitive equipment.

EMF is both naturally occurring and human-made. Movement within the earth's molten core generates a substantial electromagnetic field. Stars and sunspot activity generate EMF, as do certain biological processes. Human-made sources have become increasingly prevalent in the last 100 or so years and prominent among these are electrical equipment, telecommunications, and electricity supply facilities. Human-made sources of EMF and EMF's environmental effects are the focus of this section because electrification of Caltrain service would require an electrified overhead system and supporting traction power facilities, thereby increasing sources of EMF in the study corridor.

3.5.1 Existing Conditions

3.5.1.1 Regulatory Setting

Neither the federal government nor the State of California has set emission standards for EMF or EMI.

The Federal Drug Administration, Federal Communications Commission, Department of Defense, and United States Environmental Protection Agency (EPA) at various times have considered EMF guidelines, but none has been adopted.

The California Energy Commission (CEC) recommends that transmission lines be designed so electric fields at the edge of rights-of-way (ROW) do not exceed 1.6 kilovolt (kV)/meter (m); no recommendation is provided for magnetic fields, however. The CEC's current position is that EMF exposure at utility ROW limits should not constitute a significant effect "if emissions have been mitigated to the extent achieved by engineering practice" (Exponent Health Group 2001). The California Department of Education has established a policy of "prudent avoidance" for the location of schools in the vicinity of high-voltage power lines.

[1] The frequency of electromagnetic radiation is the rate at which the electromagnetic field changes direction, expressed in terms of cycles per second, or Hertz (Hz). Frequencies of less than around 3,000 Hz are considered extremely low frequency (ELF) and include alternating current electrical fields that oscillate at 60 Hz.

3.5.1.2 Environmental Setting

Background on EMF

Electrical systems produce both electric and magnetic fields. Electric fields result from the strength of the electric charge, while magnetic fields are generated from the motion of the charge. Together these fields are referred to as EMF, which are invisible, non-ionizing, low-frequency radiation. Electric field strength is measured in units of kV/m and is greater the higher the voltage. Magnetic field strength is measured in units of milliGauss (mG), or magnetic flux density, and is greater the higher the current flow. ~~It is also higher for direct current (DC) than for alternating current (AC).~~ Another common unit of magnetic field strength is the microTesla (μT), with 10 mG equivalent to one μT.

Electric field strength deteriorates rapidly with distance from the source and is easily blocked by most objects, including household objects, buildings, and vegetation. Magnetic fields also decrease rapidly with increasing distance from the source but, unlike electric fields, are not easily blocked. Magnetic fields pass readily through most objects. Magnetic fields are usually the radiation of concern when evaluating EMF.

The strength of EMF levels from line sources such as the OCS are proportionate to the reciprocal of distance from the source (1/x, where x is the distance from the line).[2] For example, the field strength at 20 feet from the OCS line would be 50 percent and the field strength at 40 feet would be 25 percent of the field strength at 10 feet from the OCS line.

EMF Exposure and Health Effects

As noted above, EMF can result in EMI, which can cause disruptions and possibly malfunctions in sensitive equipment. In certain situations with sufficiently high exposure, EMF can also result in adverse effects on human health. Considerable research has been undertaken to determine whether EMF at the low frequencies associated with commercial power systems has any health effects. Although some findings conclude otherwise, the great majority of peer-reviewed and accepted studies have found that scientific evidence for any health risks from extremely low-frequency EMF is weak. Objective scientific reviews of animal data, from which some human health risks have been extrapolated, have also concluded that the data are inadequate to indicate a potential risk of cancer, which is the main human health risk assumed for EMF exposure (WHO 2007, IARC 2002, NIEHS 1999).

One area of continuing debate has been associations of two forms of cancer and extended exposures to EMF: childhood leukemia and, in occupationally exposed adults, chronic lymphocytic leukemia. The associations between cancer and EMF, however, have not been demonstrated in scientifically controlled mechanistic (cause-effect) studies or experimental studies of animals, but according to the World Health Organization (WHO), EMF remains a concern (WHO 2007a).

EMF from human-made sources is common and increasing in urban areas. Most people are exposed on a daily basis to a variety of sources and field strengths. The average home in North America has background AC magnetic field levels of approximately 1 mG (WHO 2007b). Background EMF and the

[2] EMF levels from point sources (such as a hair dryer) attenuate more rapidly than from a line source because the EMF field strength is proportional to the reciprocal of distance from the source squared ($1/x^2$). Thus, the EMF level 40 feet from a point source would be 6.25% of the strength of the field 10 feet from the same point source.

durations of EMF exposure at home or at work would be expected to increase in the future as electrical and electronic systems multiply.

Examples of magnetic field strengths of 60-Hz appliances commonly found in the home or office and of magnetic field strengths of electric transmission facilities found in many communities are listed in Table 3.5-1. For the first four appliances, exposure to the maximum field strength would be limited in duration due to the character of use of these appliances. The magnetic field strengths for the video display from a television or computer are for a range of models and represent the continuous level of exposure (appliance plus background) a person would experience while observing or working with the product over an extended period. As noted above, EMF levels from point sources such as these decline at a more rapid rate than from line sources such as transmission lines.

Table 3.5-1. Magnetic Field Strengths

Electrical Appliances in Home or Office	Magnetic Field Strengths
Dishwasher	30 mG (at 1 foot)
Vacuum Cleaner	200 mG (at 1 foot)
Hair Dryer	70 mG (at 1 foot)
Electric Shaver	100 mG (at 1 foot)
Video Display	6 mG (at 1 foot)
Other Environmental Sources	
Electric power distribution/subtransmission lines (4 to 24 kV)	
Within right-of-way	10 to 70 mG (at 1 foot)
Edge of right-of-way	NA
High-voltage transmission lines (115 kV to 500 kV)	
Within right-of-way	30 to 87 mG (at 1 foot)
Edge of right-of-way	7 to 29 mG (at 50 to 65 feet)

Source: NIEHS 2002.
kV = kilovolt
mG = milliGauss
NA = not available

Magnetic fields under and alongside the ROW of electric power transmission and distribution lines are also listed in Table 3.5-1. There is considerable range in levels. ~~which are a function of thevoltage (e.g., a 500-kV line would generate fields approximately four times as strong as a 115-kV line), the height of the power line, and the width of the ROW for exposures measured at the edge of ROW.~~

Magnetic field strength near an electric power line is primarily a function of the current carried by the line and the distance to the measurement location. Electric field strength is roughly equal to the voltage of the line divided by the distance to the measurement location.

The duration of EMF exposure could be quite short if, for example, one is simply driving by, or extended, if one is in a residence or other structure adjacent to the power line ROW. At a distance of 300 feet and at times of average electricity demand, the magnetic fields from many lines can be similar to typical background levels found in most homes (NIEHS 2002).

Caltrain Corridor

The Caltrain corridor proposed for electrification is approximately 51 miles long and passes through urban and suburban environments. Land uses within urbanized areas vary from industrial to commercial to residential. In May and June of 2010, electric and magnetic field measurements were collected at 15 sites along the project corridor from San Francisco to San Jose.[3]

These sites were selected to obtain a cross-section of typical emitters such as power lines and antenna towers, potentially sensitive facilities such as medical facilities and a university, and relatively quiet areas for comparison. The 15 sites, which are shown in Figure 3.5-1, are as follows:

1. **University of California San Francisco (UCSF)**: This location is near downtown San Francisco at the project corridor's closest location to UCSF, at 16th Street where I-280 crosses overhead. UCSF facilities close to the alignment are a potentially sensitive receptor location at the north end of the project corridor. University research facilities often have instrumentation that is susceptible to interference from magnetic field changes.
2. **Brisbane Fire and Police Departments**: This is a suburban location off of Bayshore Boulevard in Brisbane, adjacent to the proposed alignment near the Tunnel Avenue overpass.
3. **Brisbane quiet site**: Magnetic field measurements were recorded south of a small park-like area off of Bayshore Boulevard adjacent to the Brisbane Lagoon. This open area was selected as a potential quiet site.
4. **France Telecom Research &Development (R&D) facility, South San Francisco**: The France Telecom R&D facility is a potential commercial sensitive receptor site that is adjacent to a number of other bio-tech facilities, also sensitive receptors. Measurements were recorded adjacent to the Caltrain corridor on Executive Drive. This location has high-voltage transmission lines.
5. **Near San Francisco International Airport (SFO), South San Francisco**: Measurements were recorded on Madrone Avenue, a residential street in Millbrae situated between the airport and the Bay Area Rapid Transit (BART)/Caltrain alignment.
6. **Health Diagnostics and Burlingame Police Department, Burlingame**: Measurements were recorded at the intersection of Trousdale Drive and California Avenue. The Health Diagnostics Facility has magnetic resonance imaging (MRI) and computerized tomography (CT) imaging systems that are potentially sensitive.[4]
7. **San Carlos quiet site**: This is an open area on the west side of the Caltrain corridor off El Camino Real. Magnetic fields were measured on both sides of corridor, with the east side location along a residential street.
8. **Valley Radiological, Redwood City**: Measurements were recorded along Brewster Avenue in Redwood City near a potentially sensitive medical facility with MRI equipment.

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[3] The measurements were collected for the California High Speed Rail analysis of existing conditions along the corridor. The electric field measurements were within the 10 kilohertz (kHz) to gigahertz (GHz) frequency bands, which are well above the frequency bands applicable to Caltrain. Therefore, background electric fields measurements from the study are not applicable to the Proposed Project and are not discussed further. Information on background electric fields at 60 Hz within the project area is currently unavailable.

[4] The City of Burlingame noted that there are also facilities with potentially sensitive electrical equipment near Trousdale Drive and California Avenue in Burlingame as well.

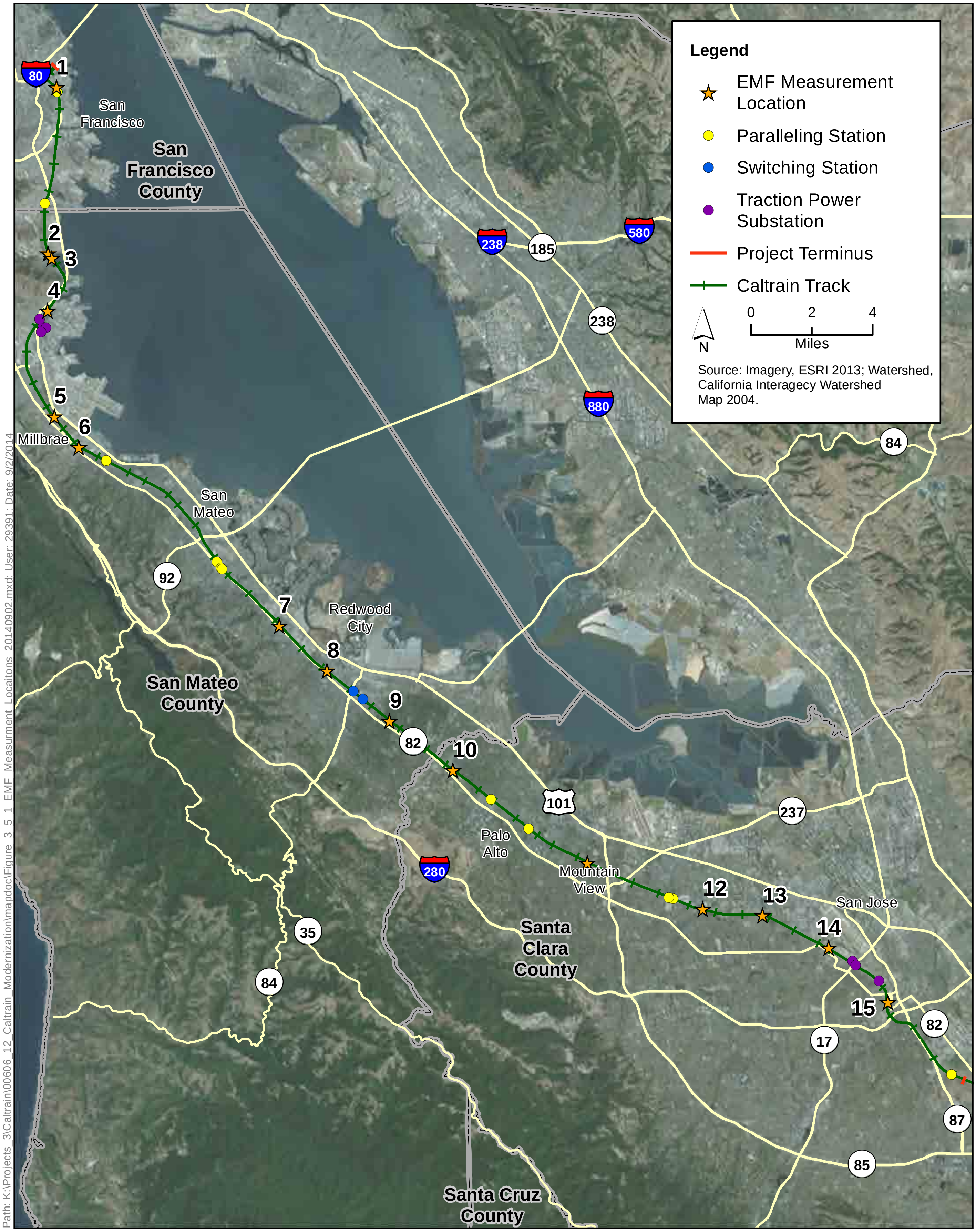

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Figure 3.5-1
EMF Measurement Locations
Peninsula Corridor Electrification Project

Note: This figure replaces Figure 3.5-1 from the Draft EIR

9. **Atherton Police Department**: The Atherton Police Facility, off Fair Oaks Lane in Atherton, is a potential emitter with Radio Frequency (RF) communication systems, adjacent to the Atherton Caltrain stop. Magnetic fields were recorded moving laterally from the Caltrain corridor in a southwest direction.
10. **Palo Alto Medical Center**: This facility is a potentially sensitive site with medical imaging systems. Measurements were recorded in the parking area near Urban Lane, and magnetic fields were recorded along the bike path behind the facility, closest to the Caltrain tracks.
11. **Mountain View Caltrain Station**: Magnetic field measurements were recorded along the Caltrain platform and stationary measurements were recorded next to the tracks to capture magnetic fields due to Caltrain and Santa Clara Valley Transportation Authority (VTA) operations.
12. **St. Jude Medical Center and Evans Analytical, Sunnyvale**: Both facilities near South Wolfe Avenue are potentially sensitive sites. Magnetic field measurements were recorded along both sides of the South Wolfe Avenue overpass, starting at Kifer Road.
13. **Motorola and Intel, Santa Clara**: These two sites are high-profile companies in Santa Clara that are potentially sensitive facilities. Magnetic field measurements were recorded around perimeter of one of the facilities on Walsh Avenue.
14. **Mineta San Jose International Airport:** Measurements were recorded at a site situated at the south end of Brokaw Road adjacent to the airport.
15. **PG&E substation, San Jose**: This measurement site is south of the San Jose Caltrain Diridon Station, at the end of Otterson Street, off South Montgomery Street.

Background DC Magnetic Fields

Table 3.5-2 summarizes the peak maximum, minimum, and range for static or DC magnetic fields at the measurement sites. The difference between the minimum and maximum measurements, referred to as the “shift,” affects the potential for interference with sensitive instrumentation requiring a stable magnetic field environment. The greater the shift, the greater the likelihood for the magnetic field source to disturb the sensitive equipment (Electric Research & Management Vibro-Acoustic Consultants 2010).

Table 3.5-2. DC Magnetic Field Data Summary

		DC Field (milliGauss)		
ID[a]	Description	Min	Max	Range
1	University of California SF campus adjacent to Interstate 280	357.1	367.9	10.8
2	Brisbane Fire and Police Departments	466.9	470.1	3.2
3	Brisbane quiet site	484.2	486.8	2.7
4	France Telecom research and development facility	457.8	463.8	6
5	Near San Francisco International Airport/BART	430.5	533.5	103
6	Health Diagnostics and Burlingame Police Department	506.3	526.4	20.1
7	San Carlos quiet site	492.5	493.1	0.6
8	Valley Radiological	528.1	533.5	5.4
9	Atherton Police Department	508.8	515.4	6.6
10	Palo Alto Medical Center	638.8	640.1	1.3
11	Mountain View VTA and Caltrain station	357.8	466.1	108.4
12	St. Jude Medical Center	540	552.8	12.8
13	Motorola and Intel	481.1	484.5	3.4
14	Near Mineta San Jose International Airport	472.2	474.3	2.1
15	PG&E substation	450.9	455.7	4.8

Source: Electric Research & Management Vibro-Acoustic Consultants 2010
[a] See Figure 3.5-1 for the site locations.

As shown in Table 3.5-2, the two locations showing the greatest DC magnetic field variation were the Mountain View Caltrain platform (see Site 11 in Figure 3.5-1) with a shift of 108.4 mG, and a neighborhood street near the San Francisco International Airport (Site 5) with a shift of 103.0 mG. For the Mountain View location, large DC magnetic field shifts were produced by operation of VTA electric trains. For the location near the San Francisco International Airport location, DC magnetic field shifts were produced by operation of BART electric trains. At a number of locations, DC shifts were typically produced by passing vehicles. At Site 13, the 3.4 mG shift is due exclusively to a passing freight train. The location with the least shift was the open space set back from El Camino Real in San Carlos (Site 7), and the next least shift was at Palo Alto Medical Center, which is beside a bike trail and the Caltrain corridor. The 1.3 mG shift at this location (Site 10) was produced by a passing northbound Caltrain[5] (Electric Research & Management Vibro-Acoustic Consultants 2010).

Background AC Magnetic Fields

Table 3.5-3 summarizes the AC magnetic fields measured along 10-foot intervals moving away from the Caltrain ROW. The largest 60 Hz magnetic fields were recorded at Site 4, near transmission lines crossing the Caltrain corridor in South San Francisco, and at Site 15, adjacent to a PG&E substation. A wide range of magnetic fields were recorded at both the fixed locations and along the spatial profiles. The lowest fields were found at Site 2 near the Brisbane Fire Department facility and at the fixed location for Site 14 adjacent to the Mineta San José International Airport (not close to any

[5] The existing diesel-powered Caltrain service has diesel-electric locomotives that generate an EMF through the electric motors powered by the diesel-engine. The EMF generated by the existing Caltrain service would be effectively replaced with EMF associated with the Proposed Project. The difference, or *delta*, in EMF between the existing service and the Proposed Project represents the net impact of the Proposed Project.

power lines). Because the AC magnetic fields vary markedly with position, the spatial profiles are especially useful for providing context to the fixed position measurements. Fixed position measurements provide a general characterization of temporal variation at the test location, and the profile measurements provide a view of spatial variation. The highest fields are associated with close proximity to power lines or power company utility equipment (Electric Research & Management Vibro-Acoustic Consultants 2010).

Table 3.5-3. AC Magnetic Fields Measured along the Project Corridor

		60 Hz AC Field (milliGauss)	
ID[a]	Description	Min	Max
1	University of California SF campus adjacent to Interstate 280	0.07	8.35
2	Brisbane Fire and Police Departments	0.03	0.36
3	Brisbane quiet site	0.14	1.38
4	France Telecom research and development facility	0.75	18.4
5	Near San Francisco International Airport/BART	0.58	1.92
6	Health Diagnostics and Burlingame Police Department	1.21	9.43
7	San Carlos quiet site	0.14	9.15
8	Valley Radiological	0.26	10.77
9	Atherton Police Department	0.22	3.12
10	Palo Alto Medical Center	1.28	11.82
11	Mountain View VTA and Caltrain station	0.12	1.14
12	St. Jude Medical Center	0.22	2.77
13	Motorola and Intel	0.05	3.75
14	Near Mineta San Jose International Airport	0.06	0.99
15	PG&E substation	1.81	17.64

Source: Electric Research & Management Vibro-Acoustic Consultants 2010
[a] See Figure 3.5-1 for the site locations.

The measurement results summarized in Tables 3.5-2 through 3.5-3 are typical of built environments (Electric Research & Management/Vibro-Acoustic Consultants 2010).

3.5.2 Impact Analysis

3.5.2.1 Methods for Analysis

Caltrain electrification would increase the electric and magnetic fields generated near the tracks above the background levels described in Tables 3.5-2 and 3.5-3 above. The proposed design for the system near major substations was incorporated into a model of two- and (existing) four-track electrified operations to calculate EMF fields at critical, maximum load points along the Caltrain corridor under electrification conditions. The system was simulated with peak and off-peak trains drawing power from the overhead contact system (OCS) and power supply network. EMF field strengths were estimated over an alignment cross-section extending 58 feet beyond the centerline of the outside track.[6] This yielded a profile of potential EMF exposures both within and alongside the railroad ROW. The maximum calculated EMF represents a worst case situation for EMF exposure.

Electric and magnetic field levels aboard passenger coaches and at track overpasses were not calculated for Caltrain as vehicle specifications have not yet been finalized. Average and maximum fields at these locations were estimated by examining the performance of ~~two other relevant systems:~~ Amtrak's electrified Northeast Corridor (NEC) service, which extends from Washington, D.C. to Boston~~, and France's Train A Grande Vitesse (TGV) system, which provides electrified high-speed intercity rail service~~.[7] ~~These systems were~~ The NEC's segment from Boston to New Haven is assumed to be representative of Caltrain due to similarities in system design (25 kVA 60 Hz OCS).

While equipment used to construct the Proposed Project could potentially generate EMF and EMI, the levels would not be substantially higher than those generated at a typical construction site. Consequently, construction of the Proposed Project would not cause significant EMF or EMI at nearby sensitive facilities. The following discussion therefore focuses on Proposed Project operations.

The impacts of Project Variant 1 and Project Variant 3 are discussed below the impact analysis of the Proposed Project.

3.5.2.2 Thresholds of Significance

While there are no formally adopted federal or state EMF thresholds applicable to the Proposed Project, several professional organizations have developed guidelines for EMF exposure, including the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the Institute of Electrical and Electronics Engineers (IEEE), and the American Conference of Governmental Industrial Hygienists (ACGIH). EMF standards suggested by these organizations address low-frequency (i.e., 60-hertz) EMF exposure to the general public and workers in an occupational setting as well as EMF exposure for workers with pacemakers and other electronic implants.

A recent 2014 study (Napp et al. 2014) of EMF sensitivity of implanted defibrillators (also referred to as Implantable Cardioverter-Defilibrators or ICDs) concludes that extremely low-frequency (as in 50 to 60 Hz power frequencies) daily-life electromagnetic fields do not disturb sensing capabilities of ICDs. The study of 15 different ICD models in 110 patients indicated no interference for all but one of the ICD models studies at levels below 10 kV/m electrical field or 5000 milligauss (mG) magnetic field at maximum sensitivity. The one outlier ICD model had no interference below 1 kV/m electrical field or 1,000 mG magnetic field. As discussed below, the PCEP EMF fields would be well below 1 kV/M for the electrical field and 1,000 mG for the magnetic field.

Based on the published professional standards and the ICD study described above, Table 3.5-4 summarizes the EMF thresholds used to define a significant impact with respect to public and occupational exposure for this EIR.

[6] This distance is roughly representative of the distance from the tracks to occupied structures. Distances vary and some occupied structures may be closer and others further from the tracks.

[7] Amtrak NEC from Boston to New Haven is a 25kV, 60 Hz AC system, the same as the proposed electrified Caltrain system. ~~The French TGV measurements apply 50 Hz AC powered segments, with power supply via a 24kV network.~~

Table 3.5-4. EMF Thresholds of Significance for Public and Occupational Exposure

Receptor	Electric Field (kV/m)	Magnetic Field (mG)
General Public[a]	4.2	833
Employees[b]	25	10,000
Individuals with pacemakers[c]	1	1,000
Individuals with implanted medical devices[d]	1	1,000

[a] These levels are based on the ICNIRP (1998), Maximum Permissible Exposure limits for the general public.

[b] These levels are based on the ACGIH (2013) recommended standards for occupational exposures.

[c] These levels are based on the ACGIH (2013) recommended standards for occupational exposures.

[d] These levels are based on the ACGIH (2013) recommended standards for occupational exposures and are consistent with interference thresholds determined in a recent study of implanted defibrillators (Napp et al. 2014).

kV/m = kilovolt per meter

mG = milliGauss

For evaluating interference levels for sensitive equipment, significant impacts would occur if the Proposed Project would substantially increase background magnetic field levels.

3.5.2.3 Impacts and Mitigation Measures

Impact EMF-1	Substantially increase electromagnetic fields along the Caltrain corridor
Level of Impact	Less than significant

Operation

Sources of EMF associated with the Proposed Project would be the TPFs (which are the traction power substations, paralleling stations and a switching station), the OCS, and train motors on the electrical multiple units (EMUs). Passengers and employees onboard the trains, as well as receptors adjacent to the Caltrain corridor (e.g., general public, maintenance workers) may be exposed to EMF generated by the Proposed Project.

Table 3.5-5 summarizes the calculated field strengths for electrified Caltrain service at five general locations: aboard coaches/passenger cars, at rail overpasses, within the Caltrain ROW, alongside the railroad ROW, and proximate to traction power substations. Traction power substations would generate the most substantial EMF of the TPFs). Amtrak's electrified NEC service ~~and France's TGV were~~ was used as a proxy ~~proxies~~ to define field strengths aboard passenger cars, near the traction power substations, and at overpasses. This approach was used because new Electric Multiple Unit (EMU) vehicle specifications for Caltrain are not yet finalized and it is likely that Caltrain EMF levels would be somewhat similar to these values (i.e., similarities of the proposed Caltrain power delivery system to that of the NEC system). EMF exposure levels outside the track ROW and at the edge of the ROW were estimated for Caltrain using the methodology described above.

Table 3.5-5. Estimated EMF Field Strength for Caltrain Operations (frequency of 60 Hz)

		Magnetic Field (mG)	
Location	Electric Field (kV/m)	Average/Off-Peak	Max
Passenger Coach [a]	~~1.5–2.0~~0.0015 – 0.002	52	305
Overpass [b]	N/A	11.6 – 15.1 ~~118~~	29.3 ~~467~~
Outside track right-of-way [c]	0.35	1.9–4.5	11.4
Edge of right-of-way [d]	0.48	4–11	35–41
Traction power substation [e]	~~0–22.2~~ 0.136 (avg.) 0.744 (max)	15	110
Threshold [f]	1/ 4.2/25	833–10,000	833–10,000

[a] Data are from Amtrak's Northeast Corridor (NEC) (Dietrich et al 1993 ~~Exponent Health Group 2001~~); because of the similarity of the proposed Caltrain power system to the NEC system, measurements of magnetic fields within NEC passenger cars can be used as estimates of field intensities in Caltrain passenger coaches. ~~For reference, average and maximum magnetic field levels measured for France's Train A Grande Vitesse (TGV) are 31 and 165 mG, respectively~~. It is assumed the NEC ~~and TGV~~ values would approximate ~~bracket~~ the Electromagnetic fields (EMF) field strengths generated in Caltrain passenger cars operating on an electrified system.

[b] Data are from overpasses on the NEC (FRA 2006). Electrical fields were below the detection levels of the electric field probe. ~~France's TGV (Federal Railroad Administration 1993).~~

[c] Calculations were made for 58 feet (four tracks) from the track centerline. This represents approximately where structures might be located or where there are public rights-of-way. Current distributions assumed in the analysis are higher than predicted under future service levels and therefore represent a worst case analysis (Exponent Health Group 2001).

[d] The calculated field strength at the right-of-way edge, approximately 15 feet from the track. Current distributions assumed in the analysis are higher than predicted under future service levels and therefore represent a worst case analysis (Exponent Health Group 2001).

[e] Data are from Amtrak's NEC (FRA 2006 ~~Exponent Health Group 2001~~) for EMF levels from 0 – 3,000 Hz frequency for 10 traction power station locations.

[f] Thresholds from Table 3.5-4.

Kv/m = kilovolt per meter

mG = milliGauss

The dominant magnetic field is the 60Hz field, with lesser amounts in other frequency ranges. This is demonstrated by field wayside monitoring of passbys by the electrified Acela and regional trains on the 25 kV 60 Hz portion of the NEC, which indicated levels from 5 to 15 meters for different frequency bands as follows: 7.2 to 0.2 mG (2 – 48 Hz), 53.1 to 4.8 mG (48 – 62 Hz), 3.8 to 0.4 mG (62 – 302 Hz), and 1.2 to 0.4 mG (302 – 3,000 Hz) (FRA 2006). The field is at its strongest during passbys.

The EMF fields from electrified Caltrain operations along the ROW would be highest during peak operations, lessening during lower volume periods to become nominal during the late night when Caltrain service is discontinued or only line maintenance is proceeding. As shown in Table 3.5-5, average EMF fields for the NEC were measured at 0.0015 to 0.002 ~~1.5 to 2~~ kV/m (electric) and 52 mG (magnetic). EMF fields within the passenger coaches were not estimated for Caltrain because new vehicle specifications are yet to be finalized. Maximum magnetic field strength, experienced when a vehicle is accelerating rapidly or operating a dense, multi-train track segment, was found to be several times the average EMF exposure, measured at 305 mG on NEC trains. It is assumed that

EMF field strengths generated in Caltrain passenger cars operating on an electrified system would be similar to these average and maximum values.

Wayside EMF exposure levels would vary by proximity to the outside track's centerline. The field strengths for Caltrain of 0.35 kV/m (electric) and 1.9 mG average and 11.4 mG maximum (magnetic) were estimated at approximately 58 feet from the track. This approximates where public access points and occupied structures would be located. Estimates for locations at the edge of the railroad ROW were 0.48 kV/m (electric) and ranged from 4 mG to 41 mG (magnetic). The higher values at the edge of ROW, which would be expected because that location is closer to the source of electric current (OCS), are about three times the field strength at 58 feet from centerline.

Additional information on expected EMF generated from the Proposed Project can be derived from the Federal Railroad Administration's 2006 report *EMF Monitoring on Amtrak's Northeast Corridor (NEC): Post-Electrification Measurements and Analysis* (FRA 2006). The dominant field from Amtrak's NEC is 25-kV from a 60-Hz ac system, the same as the Proposed Project; therefore, it is reasonable to assume that the measured effects of NEC's electrification would be similar to the potential effects of the Proposed Project. Table 3.5-6 summarizes the measured EMF field strengths for several systems, including detailed measurements taken within the Amtrak NEC. Measurements were taken in proximity to traction power stations, near the tracks during train pass-bys, and inside passenger compartments.

Table 3.5-6. Measured Magnetic and Electric Field Values - Amtrak Northeast Corridor [a]

Magnetic Field Measurements Proximate to Traction Power Stations [b]			
(frequency 0–3,000 Hz) magnetic field expressed in expressed in mG	**Minimum**	**Maximum**	**Average**
Pre-Electrification Measurements	0.0	12.9	~~1.6~~ 2.0
Post-Electrification Measurements	~~0.1~~ 0.2	110.3	14.7
Electric Field Measurements Proximate to Traction Power Stations [b]			
(frequency 0–3,000 Hz) electric field expressed in kV/m	**Minimum**	**Maximum**	**Average**
Pre-Electrification Measurements	0	~~3.16~~ 0.106	~~0.33~~ 0.020
Post-Electrification Measurements	0	~~22.2~~ 0.744	~~4.1~~ 0.136
Magnetic Field Measurements at Three Distances from Five Electrified Train Pass-Bys			
(frequency 0–3,000 Hz) magnetic field expressed in mG	**5 m (16.5 feet)**	**10 m (33.0 feet)**	**15 m (49.5 feet)**
Minimum	25	3	negligible
Maximum	84	25	7
Average	54.4	11.4	2.0
Magnetic Field Measurements within Passenger Compartments [c]			
(frequency 2–3,000 Hz) magnetic field expressed in mG	**Head**	**Waist**	**Ankle**
Average Values	19.2	18.4	19.1

[a] Data collected as part of Post-Electrification Measurement & Analysis study, for electrified portion of Northeast Corridor extending from New Haven, Connecticut to Boston, Massachusetts.

[b] Long-term measurements taken at 10 traction power station locations.

[c] Measurements averaged from seven train systems operating along Northeast Corridor.

Source: FRA 2006.

hZ = hertz

kV/m = kilovolt per meter

m = meter

mG = milliGauss

As shown in Table 3.5-6, post-electrification magnetic field measurements near traction power ~~substations~~ facilities were substantially higher than the pre-electrification values; the same is true for the electric field measurements. However, the measured post-electrification values were far below ~~established public health exposure limits~~ the EMF thresholds used for this EIR for the general public, workers, and individuals with pacemakers or implanted medical devices. Magnetic field measurements associated with train pass-bys and inside passenger compartments were an order of magnitude less than the TPF ~~TPS~~ values. Similar exposure levels are expected along the Caltrain ROW, which as shown in Table 3.5-5, would also well below ~~the EMF exposure limits for the general public and employees~~ thresholds used for this EIR, and which would be minor in comparison with the background levels (see Tables 3.5-2 and 3.5-3).

In addition to reducing the number of large primary substations, another advantage of the auto-transformer feed arrangement proposed for implementation along the Caltrain corridor is its potential to reduce EMF and EMI. These fields are reduced because the arrangement includes two parallel aerial feeders, one on each side of the alignment in which currents in the parallel feeders flow in the opposite direction to that in the main catenary conductors. This tends to cancel EMF and EMI effects created by current flow in the main OCS.

For the reasons discussed above, there would be no significant health risks from the electrified Caltrain operations. This impact would be less than significant.

With Project Variant 1, PS7 would be located along Alma Avenue instead of near Kurte Park. As noted above, EMF levels at the perimeter of the traction power facilities, including paralleling stations, would be below health levels of concerns and thus Project Variant 1 would not change the impact analysis of the Proposed Project. With Project Variant 3, there would be periodic use of electric locomotives as backup trains to EMUs when under repairs or maintenance. The EMF levels noted above for the NEC are representative of levels for electric locomotives (the Acela is an electric locomotive system) and thus use of electric locomotives would not meaningfully change the EMF levels and any associated health risks of the Proposed Project.

Impact EMF-2	Substantially increase electromagnetic interference along the Corridor
Level of Impact	Significant
Mitigation Measure	EMF-2: Minimize EMI effects during final design
Level of Impact after Mitigation	Less than significant

Operation

The main sources, or generators, of transient EMI disturbances from electrification would be switching currents produced by switching loads, relays, power controllers, and switch mode power supplies associated with operation of the OCS or the TPFs. High-current electronic switches and controls are capable of producing transient signals that can be transmitted along the power supply network to other electronic systems. Magnetic fields would also be generated by paralleling and switching stations, as well as traction power substations.

These fields could affect the signal systems of the freight rail, BART, SCVTA and/or affect highly sensitive electronic equipment, such as certain medical imaging equipment.

Potential EMI Concerns for Freight Signal Systems

As described in Chapter 2, Project Description, the Proposed Project will protect the existing railroad signal system, the grade crossing system, and the Positive Train Control system from electromagnetic interference created by the 25kv AC system by:

- designing the catenary system using proven solutions that minimize the effect of EMI;
- providing sufficient shielding for electronic equipment;
- installing specialized components, such as filters, capacitors, and inductors; and
- ensuring that the electric vehicles are designed with a frequency that does not interfere with the frequency of the grade crossing warning system.

The U.S. utility electric system covers the country with hundreds of thousands of miles of high voltage (>60 kV) transmission lines and millions of miles of distribution lines operating at voltages up to 25 kV, both three phase and single phase. Union Pacific operates their railroads every day in close proximity to these electric utility power systems and their distribution and transmission lines. The power system EMFs do not cause EMI that interferes with either the safe or dependable operation of the railroads. This is because the practices and steps necessary to achieve and demonstrate electromagnetic compatibility (“EMC”) between railways and electric utility power systems are conventional, fully understood, and routine, within the U.S. and around the world. The practices and steps necessary to achieve and demonstrate EMC between electrified and non-electrified railways are similar to those used for electric utility power systems, and are also conventional, fully understood, and routine.

In 2000, Amtrak commissioned a 25 kV 60 Hz extension to the Northeast Corridor (NEC) electrified network on the 160 miles of track between New Haven, Connecticut and Boston, Massachusetts. The NEC electrification system has supplied 25kV 60 Hz power to Amtrak’s Acela trains for operations up to 150 mph in a safe and efficient manner for over 13 years. The Amtrak route has demonstrated the viability and compatibility of 25kV electrification in areas where freight and diesel passenger operations share the 25kV electrified tracks in the states of Connecticut, Rhode Island and Massachusetts without impacts to their operations. The ability of 25kV electrification to be used for joint high-speed and commuter rail operations has led to the conversion of New Jersey Transit’s North Jersey Coast Line from lower voltage to 25kV in 2002.

Diesel locomotives run compatibly side-by-side and on shared tracks with electric trains on the NEC and its connected commuter railroads in areas of dense, critical rail service, presently up to 150 mph. The NEC electric trains have power systems that are similar to those planned for the PCEP. The NEC electric train traction voltage and current levels are similar to those planned for PCEP. The NEC electrified and non-electrified tracks have similar signal systems to those broadly and routinely used on electric rail transit lines across the U.S. The electrified and non-electrified commuter railroads connected to the NEC have grade crossing systems that are similar to those used on sections of the Union Pacific lines and to those broadly and routinely used on light rail and commuter rail lines across the U.S.

The Denver Rapid Transit District and its concessionaire Denver Transit Partners (DTP) are building the Eagle P3 Commuter Rail Project (EP3), a 37-mile 25 kV ac electrified railway that runs parallel to Union Pacific and the BNSF tracks for lengthy sections between downtown Denver and the airport. In some sections of significant length, the distance between an EP3 electrified track and the adjacent BNSF and Union Pacific track is 25 feet or less. The EP3 will have signal and grade crossing systems similar to those broadly and routinely used on light rail and commuter rail lines across the U.S. The 25kV electrification of the Denver EP3 will also be compatible with the adjacent freight railroad PTC signaling and grade crossing systems. For the EP3 project, DTP, BNSF, and Union Pacific exchanged technical information, performed joint engineering studies and analysis, and where needed took individual and joint action to ensure EMC of the two lines.

In short, there are numerous well-established and contemporary precedents for the straightforward integration of conventional railroads with electrified railroads like the PCEP.

The PCEP will follow AREMA, IEEE and standards used by AMTRAK on the NEC for 25 kV 60 Hz electrification. The present track circuits existing on the Caltrain corridor are, for the most part, General Electric Transportation System (GETS) Electrocode 4 (EC 4) track circuits between interlockings and DC track circuits within interlockings. The PCEP will convert the EC 4 track circuits to Electrified Electrocode track circuits and steady energy 200 Hz track circuits within interlockings. These products were developed specifically by the manufacturers for use on electrified railroads. They have been deployed and safely and reliably maintained in service for many years.

The PCEP will replace all track circuits that currently exist on the Caltrain corridor, including the Union Pacific-owned tracks MT-1 and the controlled siding with the track circuits mentioned above. This will be done to insure compatibility with the new 25 kV 60 Hz electrification. If Union Pacific owned tracks that are parallel to the Caltrain corridor are not electrified, they will be equipped with the same signal equipment used on the PCEP to ensure that no interference will take place from the 25 kV Hz electrical energy in close proximity to their operation.

The signal equipment to be implemented on this project is equipment that is currently operating on the NEC. There are both high speed passenger trains and slower speed freight trains operating over the same segment of tracks. There are also several areas where the freight tracks merge onto the corridor that are non-electrified. The PCEP will be employing engineering standards and equipment already in place and tested to FRA standards in the same environment as the NEC.

The track circuits mentioned will be replaced as stated above. The Constant Warning Time (CWT) devices that currently exist will not function when the electrification is energized and the impedance bonds are installed and will be removed. The grade crossing issues will be treated in two methods.

- The CBOSS PTC project is presently installing a solution for CBOSS equipped trains (both diesel and EMU) to activate the crossings with CWT. CBOSS will be communicating directly with the grade crossings through a Wayside Interface Unit (WIU) to initiate the crossing warning device.
- For non-Caltrain trains without CBOSS, the DEIR project description, Section 2.3.5, *At-Grade Warning Devices*, discusses the proposed solution. The technical solution identifies is to install audio frequency overlays (AFOs), also known as track circuits, at fixed locations along the Caltrain ROW, allowing the at-grade crossing gates to function safely through an audio frequency that can be used non-Caltrain equipment. An AFO is a sensor that activates the at-grade crossings when the train is approaching. The AFOs are also the backup system for Caltrain equipment in case there is a failure of the CBOSS system for any reason.

The PCEP will be employing Bonding and Grounding standards that are presently in place on the 25 kV 60 Hz section of the NEC. These methods have been proven and in place for many years and inspected under the authority of the FRA. Proper grounding and cross bonding of adjacent tracks will be designed and constructed so that return currents are properly channeled back to the substations. The PCEP final signal design will also be using signal standards in place on electric railroads for use of shielded cable and limited use of lightening arrestors to mitigate these issues.

The autotransformer based feeder system not only provides field cancelation due to close proximity between OCS conductors and negative feeder conductors, but also institutes the preferred path for return current to flow to the traction power substation. Most return current returns via the overhead autotransformer feeder than the running rail structure, so that leakage currents to ground can be minimized. Concerns related to induced voltages caused by magnetic fields are being addressed by instituting cross bonding cable connections to equalize the voltage potentials of all running rails of the electrified and adjacent non-electrified tracks that are in the vicinity of the overhead catenary system. These cross bond connections, in addition to incorporating industry recognized signal detection systems that were designed specifically for electrification, eliminate concerns of rail imbalance and compatibility of the signal detection system. It is a well-recognized fact that most leakage currents to ground occur “in-section” (within a feeding section where one or more trains are demand or generating power), before the autotransformers have a chance to rebalance the outgoing current in the OCS and the return current in the negative feeders. Quantifying the return current distribution through simulation studies based on the Caltrain system conditions will be part of the work of the system design team in final design stages.

Initial Traction Power system design efforts begins with developing a model to size OCS distribution components, input the available rail return structure (where track structures are set) and determining substation spacing purposely in the absence of any influences of return paths via earth/ground. This is to ensure that the electrical current carrying components are conservatively sized to allow for a safety and reliability with respect to OCS voltages for proper train operation and rail potential rise for those nearby the track area.

The amount of propulsion current entering the earth is mainly attributed to the bonding between rails and static/ground wires via impedance bonds, and to the leakage conductance between rails and ground. The static/ground wires are connected to the ground through distributed grounding systems including OCS pole foundations and concentrated grounding in substations (supply substations, autotransformer substations and switching station, etc.). This is mainly due to consideration of meeting safety requirements on accessible voltages during normal operations, and touch and step voltages during fault conditions. Ballast resistivity values that are suitable for the railroad signal system must be maintained for the correction function of the signal system, which limits the extent of direct leakage current from rails to ground. The overall grounding system to meet the safety requirements will be part of the system work of the system design team in final design stages.

The design approach to employ track circuit equipment compatible with AC traction power, in addition to cross bonding of running rails in the areas adjacent to the electrified tracks, will alleviate concerns related to EMF/EMI issues with the freight signal system. Additional ground resistivity measurements are necessary to perform final design calculations of accessible voltages, step and touch voltage along the line to establish any additional bonding/grounding interconnections.

The major system components of railroad signaling/communications and railroad traction power system have been developed over time based upon the manufacturer’s product lines, and have successfully operated on the identical power system proposed for Caltrain, namely Amtrak’s Northeast Corridor North End Electrification. Through careful system studies and designs in the design stages, comprehensive integration tests in the commissioning stages, close coordination with all concerned parties, any potential incompatibility between the Caltrain electrification system and other systems will be effectively addressed.

Potential EMI Effects to BART

BART operates a direct current-based system adjacent to and under the JPB ROW from Millbrae to San Bruno and has expressed concern about stray currents and other EMI effects from the PCEP on the BART system.

As noted above, the PCEP will be employing engineering standards and equipment already in place and tested to FRA standards in the same environment as the NEC. The NEC includes several segments of parallel third-rail commuter rail systems, such as the 750 VDC third rail for the Long Island Rail road trains in the East River Tunnels in New York City and the 650 VDC MBTA Orange Line in Boston for 4 miles between Back Bay and Forest Hills, including 8 MBTA Orange Line stations (FRA 2003). In Europe, there are several 25 kVA high-speed rail systems running parallel to 1,500 VDC overhead systems such as the HSL-Zuid in the Netherlands.

Similar to the conclusion above relative to freight signal systems, there are workable solutions to provide for electromagnetic compatibility of the two different system. Through careful system studies and designs in the design stages, comprehensive integration tests in the commissioning stages, close coordination with all concerned parties, any potential incompatibility between the Caltrain electrification system and the BART system will be effectively addressed.

Potential EMI Effects to Other Sensitive Electric Equipment

~~However,~~ The generation of new EMFs could potentially result in interference with sensitive equipment located adjacent to the Caltrain corridor (such as at the Palo Alto Medical Center) or could affect other equipment ~~such as adjacent BART train control and communication circuits~~.

However, as shown in Table 3.5-6, magnetic fields generated by the Proposed Project outside the Caltrain ROW would be minor in comparison with background concentrations and threshold levels. The intensity of these fields would dissipate as a function of distance. Accordingly, generated magnetic fields generated by the Proposed Project would decrease rapidly with distance and would be substantially lower at nearby sensitive receptors where sensitive equipment may be located. As noted above, the autotransformer power system proposed for use tends to reduce EMF and EMI effects because of the self-cancelling resulting from bi-directional current flows in the feeder and contact wires.

The auto-transformer system was chosen for the Proposed Project over the direct center feed system in large part because of the success of similar installed and operating systems in the United States, Europe and other parts of the world in minimizing the effects of both EMI and EMF. The Proposed Project’s spacing of the traction power substations, paralleling stations and switching station, and, hence, of the auto-transformers, is about 5 miles (10 facilities along 51 miles). The Amtrak NEC system has the auto-transformers spaced 6 to 8 miles apart. During the design of the NEC project, the assessment of potential longitudinal induced voltages showed that they should not be greater than what occurs with typical utility distribution systems of comparable voltage. In this respect, the NEC project was designed and tested to levels of less than 20 volts during actual trainload, and significantly less than the 430-volt design recommendation during fault conditions.

With Project Variant 1, PS7 would be located along Alma Avenue instead of near Kurte Park but EMF levels and the potential for EMI along the OCS or at the TPFs would be the same as for the Proposed

Project. With Project Variant 3, there would be periodic use of electric locomotives as backup trains to EMUs when under repairs or maintenance. The EMF levels and the potential for EMI would be approximately the same as for the Proposed Project.

Conclusion

However, despite the extremely low potential for adverse EMI effects, there remains the possibility of effects on sensitive equipment. Therefore, Mitigation Measure EMF-2 will require that EMI be further assessed on a site-specific basis during final project design to ensure avoidance of significant EMI effects above baseline conditions. With the current design and site-specific considerations included in Mitigation Measure EMF-2, EMI impacts would be less than significant.

Mitigation Measure EMF-2: Minimize EMI effects during final design, Monitor EMI effects during testing, commission and operations, and Remediate Substantial Disruption of Sensitive Electrical Equipment

The potential for EMI effects shall be minimized by ensuring that all electronic equipment is operated with a good electrical ground and that proper shielding is provided for electronic system cords, cables, and peripherals. Installing specialized components, such as filters, capacitors, and inductors, can also reduce EMI susceptibility of certain systems. The design of the system will consider and incorporate, where practicable, the latest standards relevant to minimizing the effects of EMI on other systems, including the Caltrain and BART signal systems.

During final design, detailed analyses shall be undertaken to determine the specific levels of any voltages that could be induced onto paralleling longitudinal conductors and, if significant voltages were to be identified, mitigation measures shall be developed in accordance with the relevant industry accepted IEEE and/or MIL (Military) standards. The final design shall utilize proven technologies for catenary system components, and the technical specifications shall be written to assure that damage during construction to the conductors or hardware will be minimized to the greatest extent practicable.

Proven design standards have been developed and shall be followed to mitigate any identified effects. For instance, the NEC installed 25 kV electrification system, counter poise ground wires were installed in some locations, and additional bonding between the aerial ground conductors was used as well. The specific design features shall be developed during final design, in accordance with the published standards.

Union Pacific, SCVTA and BART operate sensitive electric equipment in or adjacent to the right-of-way. The following are required to ensure that significant EMI effects to the freight and passenger rail signal systems and operations are avoided:

- The JPB shall work with Union Pacific, SCVTA, BART and other rail operators during project design to ensure that signal systems and other sensitive electric equipment for other freight or passenger rail facilities are not disrupted by EMI from the PCEP OCS. The JPB shall provide plans for controlling EMI levels near Union Pacific, SCVTA, and BART facilities for review and input.
- EMI levels shall be evaluated during testing and commissioning period for the Project and the JPB shall coordinate with Union Pacific SCVTA and BART to evaluate whether any interference effects occur to sensitive electric equipment. Where interference is detected

that disrupt operations of this equipment, the JPB shall remedy the disruption prior to revenue operations.

- After commissioning, EMI impacts shall be monitored during the first year of project operation on at least a quarterly and reporting shares with Union Pacific, SCVTA, and BART. Andy identified disruption of electric equipment shall be immediately remedied.
- If at any time, PCEP operation causes EMI interfering with signaling, automatic grade crossing warning devices, train control or other equipment necessary for safe and reliable operation of freight and passenger trains in the corridor, the JPB shall require shutdown and modification of the PCEP electrical system in the affected area and shall eliminate any disruption identified,
- The JPB shall be responsible for all costs to evaluate, design, monitor, and remediate any project-related EMI disruption of sensitive electric equipment of other passenger or freight rail systems.

~~during final design~~ For non-rail systems, the following will be required:

- The JPB will make a good faith effort to coordinate with local cities, ~~BART~~, UCSF, France Telecom, Health Diagnostics, Valley Radiological, Palo Alto Medical Foundation, St. Jude Medical Center, Evans Analytical, Motorola and Intel (and any other facilities located adjacent to the ROW with sensitive equipment and requesting such consultation) to determine whether their facilities would be susceptible to EMI effects.
- During final design, the JPB shall evaluate the specific EMI levels associated with the PCEP system at the identified sensitive facilities and determine the appropriate controls necessary to avoid disruption of sensitive equipment prior to testing and commissioning of the system.
- EMI levels shall be evaluated during testing and commissioning period for the Project and the JPB shall coordinate with the identified sensitive facilities to evaluate whether any substantial interference effects are occurring due to system operation. Where substantial interference is detected that disrupt operations of sensitive electric equipment, the JPB shall remedy the disruption prior to commissioning of electrified operations through EMF controls and/or shall provide shielding of sensitive equipment.
- After commissioning, EMI impacts shall be monitored during the first year of project operation and reporting shared with any of the identified sensitive facilities. Any identified disruption of sensitive electric equipment shall be immediately remedied.
- If the PCEP operations causes substantial EMI interference with sensitive electric equipment during, the JPB shall identify and eliminate the substantial interference through additional EMF control measures and/or provide shielding for the sensitive equipment.
- The JPB shall be responsible for all costs to evaluate, design, monitor, and remediate any project-related EMI disruption of sensitive electric equipment.

~~If substantial negative effects associated with the Proposed Project were to be identified above baseline conditions, specific design measures shall be developed by the JPB to address localized EMI effects of the Proposed Project.~~

3.6 Geology, Soils, and Seismicity

3.6.1 Existing Conditions

3.6.1.1 Regulatory Setting

Federal

There are no federal laws, regulations, or standards related to geology and soils that are applicable to the Proposed Project.

State

Alquist-Priolo Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. Under the Alquist-Priolo Act, the California state geologist identifies areas in the state that are at risk from surface fault rupture. The primary purpose of the Alquist-Priolo Act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. The law requires the state geologist to establish regulatory zones (known as Earthquake Fault Zones or Alquist-Priolo Zones) around the surface traces of active faults and issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. Local agencies can be more restrictive than state law requires (California Geological Survey 2005a.).

Before a project may be permitted, a geologic investigation is required to demonstrate that proposed buildings would not be constructed across active faults. An evaluation and written report of a specific site must be prepared by a licensed geologist. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault (generally 50 feet) (California Geological Survey 2005a).

Seismic Hazards Mapping Act of 1990

The California State Seismic Hazards Mapping Act of 1990 addresses earthquake hazards other than surface fault rupture, including liquefaction and seismically induced landslides. Through the act, the state establishes city, county, and state agency responsibilities for identifying and mapping seismic hazard zones and mitigating seismic hazards to protect public health and safety. The act requires the California Department of Conservation, Division of Mines and Geology, to map seismic hazards and establishes specific criteria for project approval that apply within seismic hazard zones, including the requirement for a geological technical report.

California Building Code

The California Code of Regulations, Title 24 (California Building Code) applies to all applications for building permits. The California Building Code (also called the California Building Standards Code) has incorporated the Uniform Building Code (UBC), which was first enacted by the International Conference of Building Officials in 1927 and which has been updated approximately every 3 years since that time. The current version of the California Building Code became effective in 2007.

Local agencies must ensure that development in their jurisdictions comply with guidelines contained in the California Building Code. Cities and counties can, however, adopt building standards beyond those provided in the code.

Local

City and County of San Francisco General Plan Community Safety Element

The Community Safety Element contains the following policies relevant to the proposed Project (City and County of San Francisco 2012).

> **Objective 1 Policy 1.5:** Support development and amendments to building code requirements that meet city seismic performance goals.
>
> **Objective 1 Policy 1.6:** Consider site soil conditions when reviewing projects in areas subject to liquefaction or slope instability.
>
> **Objective 1 Policy 1.7:** Consider information about geologic hazards whenever city decisions are made that will influence land use, building density, building configurations or infrastructure.

San Francisco Construction Site Runoff Pollution Prevention Procedures

The San Francisco Construction Site Runoff Pollution Prevention Procedures is a program intended to reduce the discharge of pollution to the local storm drain system (San Francisco Public Utilities Commission 2013). The requirements vary under different conditions, but can include the development of a stormwater pollution prevention plan (SWPPP), plan review, stormwater treatment measures, runoff monitoring, and increased site inspections. In addition to a SWPPP, the program calls for implementation of an Erosion and Sediment Control plan at the project site.

San Mateo County Seismic and Safety Element

The Seismic and Safety Element, adopted in 1976, contains policies that generally propose strategies for the reduction of the risk of geotechnical hazards to acceptable levels; and support the integration of data on geotechnical hazards into the development review process. The element was prepared as an inter-jurisdictional effort, evaluating seismic and safety issues for 14 of the county's cities and the unincorporated area. Most of the cities adopted the element as their own, with policy variations dependent on local conditions (San Mateo County 1985).

San Mateo County Conservation and Open Space Element General Plan Policy

The Conservation and Open Space Element, adopted in 1973, contains policies for the protection and enhancement of the County's natural resources. This document contains maps of hazard areas and designates much of the rural area for open space due to identified hazards of steep slopes and landslide susceptibility. The Conservation and Open Space Element also contains policies requiring the preparation of detailed geotechnical reports during preparation of environmental review for public and private projects to consider soil capabilities and potential erosion impacts (San Mateo County 1985).

San Mateo County Grading Ordinance

The San Mateo County Grading Ordinance includes regulatory provisions to reduce the adverse effects of grading, cut and fill operations, land clearing, water runoff, and soil erosion in an effort to conserve natural resources (such as topography and vegetation), as well as to protect health and safety, through the reduction or elimination of the hazards of earth slides, mud flows, rock falls, undue settlement, erosion, siltation, and flooding.

Santa Clara County Geologic Ordinance

This ordinance establishes requirements for geologic evaluation of projects based on proposed land use and adopted official County Geologic Hazard Maps. The ordinance establishes requirements, rules, and regulations for the development of land that is on or adjacent to known potentially hazardous areas. The geologic investigation would be reviewed and approved by the county geologist prior to any project approval (Santa Clara County 1994).

Santa Clara County Grading Ordinance

This ordinance establishes minimum standards for grading projects in order to control erosion and the production of sediment, as well as to control other related environmental damage such as de-stabilization and/or scarring of hillsides.

3.6.1.2 Environmental Setting

Regional Geology

San Francisco County

San Francisco is located in the Coast Ranges geomorphic province, which is a relatively young geologically and seismically active region on the western margin of the North American plate. The Coast Ranges province lies between the Pacific Ocean and the Great Valley province (Sacramento and San Joaquin Valleys) and stretches from the Oregon border to the Santa Ynez Mountains near Santa Barbara. Much of the Coast Ranges province is composed of marine sedimentary deposits and volcanic rocks that form northwest trending mountain ridges and valleys, running roughly parallel to the San Andreas Fault Zone. San Francisco rests on a foundation of Franciscan Formation bedrock in a northwest-trending band that cuts diagonally across the city. The Franciscan Formation is composed of greywacke, shale, greenstone, basalt, chert, and sandstone that originated as ancient sea floor sediments.

San Mateo County

San Mateo County is within the Coast Ranges geomorphic province. It is characterized by trending valleys and ridges. The valleys and ridges are controlled by a series of folds and faults that resulted from the collision of the Farallon and North American tectonic plates and subsequent strike-slip faulting along the San Andreas fault zone. According to the 1985 San Mateo County General Plan, soil types in San Mateo County have been classified according to eight major groups composed of 25 association types (San Mateo County 1985). Soils within each association have similar properties and characteristics. Approximately 80 percent of the county is covered with sandy loam, clay loam, and clay upland soils, generally on slopes of 30 percent or greater. The deepest and best drained soils occur on small alluvial fans and low terraces, especially along major stream channels. Other well-drained soils, originally formed primarily from marine sediments, occur on the high terraces of the coastal plain. Together, the areas of well-drained soils compose less than 20 percent of the county land area.

San Mateo County is also host to serpentine-based soils, a unique soil group due to the restricted range of plant species it supports. Serpentine soils occur infrequently and are sporadically distributed. Undisturbed habitats are quite rare, occurring primarily within the San Francisco Watershed, Jasper Ridge Biological Reserve, and Emerald Lake Hills area.

Santa Clara County

Santa Clara County is composed of folded and faulted sedimentary and volcanic rocks of the Central California Coast Ranges and more recent alluvial and Bay deposits in lower valley areas (Santa Clara County 1994).

The Santa Clara Valley is underlain by Quaternary-age alluvial deposits, which are up to several hundred feet deep. At the extreme northern end of the valley, recent bay deposits are present. South of the project area, the Santa Cruz Mountains are composed primarily of Franciscan Assemblage sandstone, shale, chert and serpentine with lesser amounts of Santa Clara, Purisima, San Lorenzo, Monterey and Vaqueros formations of Tertiary age also occurring. The active San Andreas Fault passes through the center of the Santa Cruz Mountains along their axis.

Project-Specific Geology and Soils

According to the Soil Survey of San Mateo County, Eastern Part, and San Francisco County, California and data found in the United States Department of Agriculture's Web Soil Survey, all TPFs would be located in soil areas classified as "Urban Land" with the exception of SWS1 <u>Option 1</u>, which would be located within an "Orthents, Cut and Fill" soil classification.

Urban Land is described as areas covered by asphalt, concrete, buildings, and other structures. Also included in this classification can be small areas of Orthents, Cut and Fill, and Orthents, Reclaimed (Orthents are described below). Urban Land units are typically used for home site, urban, and recreational development. The properties and characteristics of these soils are highly variable because of the differences in the kind and amount of fill material used. Runoff is slow, and the hazard of water erosion is low. If these units are used for urban and recreational development, the main limitations are the susceptibility of the soils to subsidence and the highly variable soil properties, including texture, permeability, and available water capacity. Areas of fill are not suitable for use as a base for structures until sufficient time has passed for compaction to take place naturally or unless the areas have been compacted mechanically so that the potential for subsidence is minimized.

Orthents are described as very shallow to very deep, very poorly drained to excessively drained soils on uplands, including hills and ridge tops; alluvial fans; coastal terraces; floodplains; and tidalflats. These soils formed in alluvium derived from various kinds of rock; sandy coastal deposits; hard and soft sandstone, shale, siltstone, serpentine, and volcanic rock; and various manmade fill materials. Also included in this unit can be deep, dark alluvial soils in areas that are loam or fine sandy loam throughout. The properties and characteristics of the soils in this unit can be highly variable because of the differences in the kind and amount of fill material used. Runoff is medium and the hazard of water erosion is moderate. Table 3.6-1 denotes soil composition at each TPS, PS and SWS location.

Table 3.6-1. Soil Classifications at Proposed Traction Power Facility Locations

TPF Location	Soil Classification	Soil Composition
PS1, TPS1 Option 4, PS2, PS4 Options 1 ~~and~~ 2, and 3, SWS1 Option 2	131—Urban land	Included here are small areas of Orthents, cut and fill, and Orthents, reclaimed.
PS3 Options 1 and 2, TPS1 Options 1, 2 and 3	134—Urban land-Orthents	Urban Land: 65 percent. Orthents, reclaimed: 30 percent. Reyes clay, Novato clay, and Orthents, cut and fill: 5 percent.
SWS1 Option 1	121—0rthents, cut and fill	Composition highly variable. Included in this unit are deep, dark alluvial soils, in areas adjacent to San Bruno Mountain that are loam o fine sandy loam.
PS5 Option 1	140—Urban land-Flaskan complex*	Urban land: 70 percent. Flaskan and similar soils: 20 percent. Minor components: 10 percent.
PS5 Option 1B	185 – Urban land – Bayshore complex	Urban land: 70 percent. Bayshore and similar soils: 20 percent. Minor components: 10 percent.
PS5 Option 2	160—Urbanland-Clear Lake complex[a]	Urban land: 65 percent. Clear Lake and similar soils: 25 percent. Minor components: 10 percent.
PS6 Options 1 and 2	102—Urban land	Urban land, basins: 98 percent. Minor components: 2 percent.
TPS2 Options 1, 2 and 3, PS7	145—Urban land-Hangerone complex[a]	Urban land: 70 percent. Hangerone, drained, and similar soils: 25 percent. Minor components: 5 percent.
PS7, Variant A and B	165 – Urbanland – Campbell complex	Urban land: 70 percent. Campbell and similar soils: 20 percent. Minor components: 10 percent.

[a] Flaskan Complex, Clear Lake Complex and Hangerone Complex; Alluvium derived from metamorphic and sedimentary rock and/or alluvium derived from metavolcanics.

Seismicity

The Caltrain corridor is located within the seismically active San Francisco Bay region and has been subjected to numerous earthquake events. The U.S. Geological Survey (USGS) has organized a working group, known as WG99, to study earthquakes in the Bay Area. The WG99 has estimated that there is a 70 percent chance of at least one magnitude 6.7 or greater earthquake affecting the San Francisco Bay region in the next 30 years. The major active fault that could impact the project corridor is the San Andreas Fault, which runs roughly north-south along the west coast of the San Francisco Peninsula. This fault is approximately 1.9 miles to 10 west of the corridor. The San Andreas Fault dominates the tectonics, geology, and physiography of the entire Project corridor. Other major active faults in the vicinity that could cause seismic events in the project corridor are the Hayward, Calaveras, and Seal Cove-San Gregorio Faults.

When an earthquake occurs, waves of energy are transmitted through the earth, resulting in a variety of seismic effects, including surface rupture, ground shaking, and ground failure such as liquefaction. Surface rupture is most common within the vicinity of a main fault trace and along other faults associated with the main fault. Ground shaking is the phenomenon most readily associated with earthquakes and may be experienced as a violent shuddering or rocking motion, or as a gentle nudge.

Soil Liquefaction

Soil liquefaction is a phenomenon in which saturated soils experience sudden and nearly complete loss of strength during seismic events. If not confined, the soil acquires sufficient mobility to allow for horizontal and vertical movements. Liquefaction can result in shallow foundation failures, boiling, severe settlement, and failure of fill supported on liquefiable soils. The magnitude of liquefaction-induced settlement depends on the thickness and relative density of the liquefiable soils and on the intensity of ground shaking. Soils most susceptible to liquefaction are loose, uniformly graded, fine-grained sands. Saturated silty and clayey sands may also liquefy during strong ground shaking, although clayey sands liquefy only if the clay content is quite low.

According to data obtained from the California Geological Survey Seismic Hazard Zones maps depicting the project area's susceptibility to liquefaction, all TPFs would be located within a "High" liquefaction susceptibility area with exception of PS1, PS2 and TPS1. PS1 and TPS1 (all options) would be located in areas of "Very High" liquefaction susceptibility. PS2 is the only TPF that would be located in an area of "Low" susceptibility. Due to the geographical area covered, the Caltrain ROW encompasses areas of all susceptibility ratings (Low, Moderate, High and Very High).

Landslides

Landslides are movements of relatively large landmasses, either as nearly intact bedrock blocks or as jumbled mixes of bedrock blocks, fragments, debris, and soil. Landslides are common near major fault zones where the rock has been weakened by fracturing, shearing, and crushing. Landslides may result from seismic shaking, local climatic conditions, or human-made modifications to the slide mass.

Data for areas susceptible to landslides was obtained from the California Geological Survey Seismic Hazard Zones maps. According to the California Geological Survey all TPFs would be located in areas of "Low" landslide susceptibility. The Caltrain ROW encompasses areas of all landslide susceptibility ratings (Low, Moderate, High and Very High).

Subsidence

Subsidence is the phenomenon in which the soils and other earth materials underlying a site settle or compress, resulting in a lower ground surface elevation. Fill and native materials beneath a site can be water saturated, and a net decrease in the pore pressure and contained water will allow the soil grains to pack closer together. This closer grain packing results in less volume and the lowering of the ground surface.

As mentioned in the *Project-Specific Geology and Soils* section, the majority of the soil composition underlying TPF locations are areas of fill and other highly variable soil designated as Urban Land (and Orthents). Also as mentioned, the main limitations of these types of soil are susceptibility to subsidence and their highly variable soil properties, including texture, permeability, and available water capacity. Areas of fill are not suitable for use as a base for structures until properly compacted so that the potential for subsidence is reduced.

Expansive Soils

Expansive soils generally result from specific clay minerals that expand when saturated and shrink in volume when dry. Clay minerals in geologic units found underlying proposed project locations (such as TPS1 and PS3) could have expansive characteristics.

3.6.2 Impact Analysis

3.6.2.1 Methods for Analysis

In this document, geological impacts are evaluated in two ways: 1) impacts of the proposed Project or alternative on the local geologic environment and 2) impacts of geological hazards on components of the proposed Project or alternative that may result in substantial damage to structures or infrastructure or expose people to substantial risk of injury.

3.6.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.
  - Strong seismic ground shaking.
  - Seismic-related ground failure, including liquefaction.
  - Landslides and debris flows.
- Result in substantial soil erosion or the loss of topsoil.
- Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the Proposed Project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse.
- Be located on expansive soil, as defined in Table 18-1-B of the UBC (1994), creating substantial risks to life or property.
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater.
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

3.6.2.3 Impacts and Mitigation Measures

None of the Project Variants described in Chapter 2, *Project Description*, would result in any changes to the impact analyses presented below because the geological and soil conditions for the project facilities would not be substantially different than that described for the Proposed Project.

Impact GEO-1	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death, involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides
Level of Impact	Significant
Mitigation Measure	GEO-1: Perform a site-specific geotechnical study for traction power facilities
Level of Impact after Mitigation	Less than significant

Construction and Operation

Fault rupture along the project alignment is unlikely because no known faults cross the project corridor. Strong ground shaking would, however, be experienced during an earthquake. During an earthquake, TPFs and OCS poles could be subject to liquefaction effects (such as foundation failure or settlement), if they are constructed on liquefiable soils.

The Proposed Project would be located in a seismically active area and must, therefore, comply with the California Building Code. The California Building Code provides standards intended to permit structures to withstand seismic hazards. To this end, the code sets standards for excavation, grading, earthwork construction, fill embankments, expansive soils, foundation investigations, liquefaction potential, and soil strength loss.

Additionally, Mitigation Measure GEO-1 would require the JPB to conduct site-specific geotechnical investigations for TPFs. Adherence to applicable building code requirements and implementation of Mitigation Measure GEO-1 would minimize potential construction and operational impacts of the proposed Project due to seismic ground shaking, seismic-related ground failure (including liquefaction), and landslides. Therefore, with implementation of Mitigation Measure GEO-1, this impact would be less than significant.

Mitigation Measure GEO-1: Perform a site-specific geotechnical study for traction power facilities

Prior to final design, the JPB will ensure that a qualified geologist will prepare a design-level geotechnical investigation for all TPFs. The investigation will include subsurface soil sampling, laboratory analysis of samples collected to determine soil characteristics (including identifying and defining the limits of unstable, compressible, and collapsible soils), and an evaluation of the laboratory testing results by a geotechnical engineer. Recommendations based on the results will be used in the design specifications for the proposed TPF structures. The report will include recommendations typical to avoid potential risks associated with seismic groundshaking and liquefaction, in accordance with the specifications of California Geological Survey's Special Publication 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, and the requirements of the Seismic Hazards Mapping Act. This report will also identify thickness and distribution of compressible materials, anticipated amounts of total and differential settlement, and tolerance of the structure(s) for displacement of soils. Following identification and delineation of compressible and collapsible soils, the JPB and qualified geologists will identify recommendations for building on compressible soils, which may include the following measures.

- Surcharging of compressible fine-grained soils prior to construction to reduce anticipated post-construction settlements to acceptable levels or use of deep foundations to support improvements in non-compressible soil strata.
- Removal and/or compaction of collapsible granular soils and non-compacted fills before placing fill to reduce anticipated post-construction settlements to acceptable levels.
- Deep-dynamic compaction, rapid impact compaction, vibro-compaction or stone columns.

Impact GEO-2	Result in substantial soil erosion or the loss of topsoil
Level of Impact	Less than significant

Construction and Operation

Erosion is a condition that could significantly and adversely affect development on any site. Construction could exacerbate erosion conditions by exposing soils and adding water to the soil from irrigation and runoff from new impervious surfaces.

Construction activities would adhere to National Pollutant Discharge Elimination System (NPDES) requirements under the Construction General Permit (CGP). The CGP requires development of a SWPPP (refer to Section 3.9, *Hydrology and Water Quality*). Erosion and sediment control features included in the SWPPP would include the following provisions.

- Minimize sediment transport during construction. Development located on slopes or at the base of slopes would use standard best management practices—such as dust control, impoundment dikes, interceptor ditches, desilting basins, erosion control, and revegetation or similar methods—to minimize potential for increases in sediment transport and soil erosion during construction. Such measures would be subject to approval of a notice of intent and preparation of a SWPPP consistent with State Water Resources Control Board requirements for construction sites.
- Minimize slope erosion during construction. If manufactured slopes were incorporated into project construction, the slopes would be designed in consultation with a qualified geologist to include erosion control measures. As determined by the geologist, erosion control measures may include establishment of protective vegetation, mulching to slow the flow of water across the slope, installation of rock faces, rock-filled galvanized wire cages (gabions), or building blocks with open spaces for plantings on the slope faces.

The existing at-grade alignment in the project corridor does not have a high potential for erosion. The Proposed Project would not result in an increase in pervious areas and would maintain the existing topography along the Caltrain corridor. Because the Proposed Project would adhere to the NPDES requirements, impacts related to soil erosion or loss of topsoil would be less than significant. No mitigation is required.

Impact GEO-3	Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the Proposed Project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse.
Level of Impact	Significant
Mitigation Measure	GEO-1: Perform a Site-Specific Geotechnical Study for Traction Power Facilities
Level of Impact after Mitigation	Less than significant

Construction and Operation

As discussed in Section 3.6.1.2, *Environmental Setting*, the Caltrain corridor is located within the seismically active San Francisco Bay region. Additionally, underlying soils at the various TPF locations are prone to geologic hazards such as liquefaction and subsidence.

Where construction of proposed TPFs and OCS poles is planned within areas with compressible and collapsible soils (as mentioned above), the structures would be susceptible to damage due to ground settlement from the weight of the structures or the addition of water in the form of irrigation or concentrated runoff.

Consequently, all the factors mentioned could contribute to potential impacts related to soil instability during construction and operation of the proposed Project. Implementation of Mitigation Measure GEO-1 and compliance with the California Building Code during project construction would reduce potential impacts related to unstable soils to a less-than-significant level.

Impact GEO-4	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property
Level of Impact	Significant
Mitigation Measures	GEO-4a: Identification of expansive soils GEO-4b: Mitigation of expansive soils
Level of Impact after Mitigation	Less than significant

Construction and Operation

Expansive soils are typically composed of clays and can undergo a volume change with changes in moisture content. They have tendencies to expand and soften when wet and to harden when dry. If not properly considered prior to the construction of structures, this expansive behavior can damage foundations and other building components. ~~For example~~ as discussed in Section 3.6.1.2, *Environmental Setting*, TPS1 (~~all options~~ Options 1, 2, and 3) and PS3 (Options 1 and 2) would be located in areas ~~known to~~ that may contain clay soil composition and could, therefore, create a risk related to expansive soils. It is possible that other facilities may also occur in areas with expansive soils as well, since the analysis in this section is based on soil mapping, not site specific soil sampling. Mitigation Measures GEO-4a and GEO-4b would be implemented ~~in such aforementioned areas~~ where construction of proposed TPFs and OCS poles are planned atop of soils composed of clay or silty clays, which are expansive soils with high shrink-swell potential. Implementation of these mitigation measures would reduce impact of constructing and operating the project in areas with expansive soils to a less-than-significant level.

Mitigation Measure GEO-4a: Identification of expansive soils

Before submission of final grading plans, the JPB will retain a qualified geotechnical engineer and engineering geologist. The geologist/engineer will conduct field observations and testing of onsite soils and formations to identify and define the limits of expansive materials. A final report will be prepared and submitted to all appropriate agencies. This report will include identification of thickness and distribution of the expansive materials, anticipated depth of moisture variation, expansiveness of the earth materials, structure tolerance for displacement, and confirmation or modification of mitigation measures for expansive materials.

Mitigation Measure GEO-4b: Mitigation of expansive soils

Following identification and delineation of expansive materials, the geologist/engineer will identify the most appropriate methods of mitigation. Mitigation measures can include the following measures.

- Excavation and replacement with non-expansive fill materials.
- Design building foundations to limit foundation deflections from expansive soil movement. This could include heavy conventional mat or post-tensioned slab foundations, heavy reinforced grid footings, or pier and grade beam foundations.

Impact GEO-5	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater
Level of Impact	No impact

Construction and Operation

There are no features in the Proposed Project that would require the use of septic tanks or any alternative wastewater disposal system where sewers are not available. Therefore, there would be no impacts related to soils that are incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems.

Impact GEO-6	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature
Level of Impact	No impact

Construction and Operation

Proposed TPFs and OCS poles would be constructed in mostly developed, urban areas that are disturbed and are not likely to contain unique geologic features. Additionally, it is highly unlikely that the construction of the proposed TPFs would result in the discovery or destruction of a unique paleontological resource because construction and ground disturbance is expected to be limited to shallow depths at proposed locations. In the case of the OCS pole placement, the excavation diameter is expected to be of approximately 3 feet, and, therefore, soil disturbance is expected to be minimal. Therefore, there are no impacts related to the destruction of a unique paleontological resource or site or unique geologic feature during Project construction or operation.

3.7 Greenhouse Gas Emissions and Climate Change

This section addresses the greenhouse gas (GHG) and climate change impacts of the Proposed Project. The study area for GHGs is much broader than for the air quality analysis (see Section 3.2, *Air Quality*) due to the global nature of climate change. While the GHG analysis focuses along the project corridor, the analysis considers potential regional and global GHG effects. Primary GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and sulfur hexafluoride (SF_6). This section reports the type and quantity of emissions that would be generated by the operation of the Proposed Project.

Potential effects of sea level rise on the Proposed Project are addressed in Section, 3.9, *Hydrology and Water Quality*.

3.7.1 Existing Conditions

3.7.1.1 Regulatory Setting

This section summarizes federal, state, and local regulations related to GHG emissions and climate change that are applicable to the Proposed Project.

Federal

Environmental Protection Agency Endangerment and Cause or Contribute Findings (2009)

On December 7, 2009, the U.S. Environmental Protection Agency (EPA) signed the Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act (CAA). Under the Endangerment Finding, EPA finds that the current and projected concentrations of the six key well-mixed GHGs—CO_2, CH_4, N_2O, SF_6, perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs)—in the atmosphere threaten the public health and welfare of current and future generations. Under the Cause or Contribute Finding, EPA finds that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare.

These findings do not themselves impose any requirements on industry or other entities. However, this action was a prerequisite to finalizing EPA's proposed new corporate average fuel economy standards for light-duty vehicles, which EPA proposed in a joint proposal including the Department of Transportation's proposed corporate average fuel-economy standards.

United States Environmental Protection Agency Regulation of GHG Emissions under the Clean Air Act (ongoing)

Under the authority of the CAA, EPA is beginning to regulate GHG emissions, starting with large stationary sources. In 2010, EPA set GHG thresholds to define when permits under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs are required for new and existing industrial facilities. In 2012, EPA proposed a carbon pollution standard for new power plants.

State

Executive Order S-3-05 (2005)

Executive Order (EO) S-3-05 asserts that California is vulnerable to the effects of climate change. To combat this concern, EO S-3-05 established the following GHG emissions reduction targets for state agencies.

- By 2010, reduce GHG emissions to 2000 levels.
- By 2020, reduce GHG emissions to 1990 levels.
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

Executive orders are binding only on state agencies. Accordingly, EO S-03-05 guides state agencies' efforts to control and regulate GHG emissions but has no direct binding effect on local government or private actions. The secretary of the California Environmental Protection Agency (CalEPA) is required to report to the governor and state legislature biannually on the impacts of global warming on California, mitigation and adaptation plans, and progress made toward reducing GHG emissions to meet the targets established in this EO.

Senate Bills 1078/107/X 1-2 — Renewable Portfolio Standard and Renewable Energy Resources Act (2002, 2006, 2011)

Senate Bills (SBs) 1078 and 107, California's Renewables Portfolio Standard (RPS), obligated investor-owned utilities (IOUs), energy service providers (ESPs), and Community Choice Aggregations (CCAs) to procure an additional 1 percent of retail sales per year from eligible renewable sources until 20 percent is reached by 2010. The California Public Utilities Commission (CPUC) and California Energy Commission (CEC) are jointly responsible for implementing the program. SB X 1-2, called the California Renewable Energy Resources Act, obligates all California electricity providers to obtain at least 33 percent of their energy from renewable resources by 2020.

Assembly Bill 32, California Global Warming Solutions Act (2006)

AB 32 codified the state's GHG emissions target by requiring that the state's global warming emissions be reduced to 1990 levels by 2020. Since being adopted, the California Air Resources Board (ARB), CEC, CPUC, and the Building Standards Commission have been developing regulations that will help meet the goals of AB 32. The Scoping Plan for AB 32 identifies specific measures to reduce GHG emissions to 1990 levels by 2020, and requires ARB and other state agencies to develop and enforce regulations and other initiatives for reducing GHGs. Specifically, the Scoping Plan articulates a key role for local governments, recommending they establish GHG reduction goals for both their municipal operations and the community consistent with those of the state.

On December 11, 2008, pursuant to AB 32, ARB adopted the AB 32 Scoping Plan. This plan outlines how emissions reductions from significant sources of GHGs will be achieved via regulations, market mechanisms, and other actions. The Scoping Plan also describes recommended measures that were developed to reduce GHG emissions from key sources and activities while improving public health, promoting a cleaner environment, preserving our natural resources, and ensuring that the impacts of the reductions are equitable and do not disproportionately affect low-income and minority communities.

Executive Order S-01-07, Low Carbon Fuel Standard (2007)

EO S-01-07 mandates (1) that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020, and (2) that a low carbon fuel standard for transportation fuels be established in California. The EO initiates a research and regulatory process at ARB.

Senate Bill 375—Sustainable Communities Strategy (2008)

SB 375 provides for a new planning process that coordinates land use planning, regional transportation plans, and funding priorities in order to help California meet the GHG reduction goals established in AB 32. SB 375 requires regional transportation plans, developed by metropolitan planning organizations (MPOs) to incorporate a "sustainable communities strategy" (SCS) in their Regional Transportation Plans (RTPs). The goal of the SCS is to reduce regional vehicle miles traveled (VMT) through land use planning and consequent transportation patterns in combination with the RTP that provide for needed transportation investments, including transit. The Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG) adopted the Sustainable Communities Strategy and the 2040 Regional Transportation Plan, titled *Plan Bay Area*, on July 18, 2013. Along with other transit improvements, the Peninsula Corridor Electrification Project is identified as a key element in *Plan Bay Area*.

State CEQA Guidelines (2010)

The State CEQA Guidelines require lead agencies to describe, calculate, or estimate the amount of GHG emissions that would result from a project. Moreover, the State CEQA Guidelines emphasize the necessity to determine potential climate change effects of a project and propose mitigation as necessary. The State CEQA Guidelines confirm the discretion of lead agencies to determine appropriate significance thresholds, but require the preparation of an environmental impact report (EIR) if "there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with adopted regulations or requirements" (Section 15064.4).

State CEQA Guidelines Section 15126.4 includes considerations for lead agencies related to feasible mitigation measures to reduce GHG emissions, which may include, among others, measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision; implementation of project features, project design, or other measures that are incorporated into the project to substantially reduce energy consumption or GHG emissions; offsite measures, including offsets that are not otherwise required, to mitigate a project's emissions; and measures that sequester carbon or carbon-equivalent emissions.

Greenhouse Gas Cap-and-Trade Program (2010/2011)

On October 20, 2011, ARB adopted the final cap-and-trade program for California. The California cap-and-trade program will create a market-based system with an overall emissions limit for affected sectors. The program is currently proposed to regulate more than 85 percent of California's emissions and will stagger compliance requirements according to the following schedule: (1) electricity generation and large industrial sources (2012) and (2) fuel combustion and transportation (2015).

Regional

The Bay Area Air Quality Management District CEQA Guidelines (BAAQMD CEQA Guidelines) adopted in 2011 outline advisory thresholds for stationary source and land use development projects. The mass emissions threshold for stationary source projects is 10,000 metric tons (MT) per year of carbon dioxide equivalent (CO_2e). For non-stationary source projects, such as land use development projects, the guidelines establish three potential analysis criteria for determining project significance: compliance with a qualified Climate Action Plan, a mass emissions threshold of 1,100 MT per year of CO_2e, and a GHG efficiency threshold of 4.6 MT CO_2e per service population (project jobs + projected residents).

The BAAQMD CEQA Guidelines do not identify a GHG emission threshold for construction-related emissions. However, BAAQMD recommends that GHG emissions from construction be quantified and disclosed, and that a determination regarding the significance of these GHG emissions be made along with consideration of best management practices (BMPs).

The guidelines do not identify a GHG emissions threshold specific to transportation projects.

The BAAQMD CEQA Guidelines were challenged in court by the Building Industry Association. While a lower court ruling put the adoption of the guidelines on hold with a ruling that BAAQMD had to complete a CEQA analysis to adopt the guidelines, the lower court ruling was overturned by the appellate court. BAAQMD at present has no recommendation to local lead agencies on the use of the 2011 guidelines, but there is no court order constraining their use.

Local

Local Climate Action Plans/Greenhouse Gas Reduction Plans

A number of cities in the project area have adopted or are in the process of developing climate action plans, greenhouse gas reduction plans or equivalent documents aimed at reducing local GHG emissions. Cities with adopted or in development climate action plans or greenhouse gas reduction plans for either municipal operations, community activities, or both include the cities of San Francisco, South San Francisco, Burlingame, Millbrae, San Mateo, Belmont, San Carlos, Redwood City, Atherton, Menlo Park, Palo Alto, Mountain View, Sunnyvale, Santa Clara and San Jose as well as San Mateo County and Santa Clara County (OPR 2012; Sustainable San Mateo 2013). These plans all call for reductions in GHG emissions below current levels and all call for actions to reduce vehicle miles travelled and associated transportation emissions. All include increased transit service as a key strategy in reducing local GHG emissions.

3.7.1.2 Environmental Setting

This section provides a discussion of global climate change and GHG emissions as they relate to the project area.

Climate Change

The phenomenon known as the *greenhouse effect* keeps the atmosphere near Earth's surface warm enough for the successful habitation of humans and other life forms. The greenhouse effect is created by sunlight that passes through the atmosphere. Some of the sunlight striking Earth is absorbed and converted to heat, which warms the surface. The surface emits a portion of this heat as infrared radiation, some of which is re-emitted toward the surface by GHGs. Human activities that generate GHGs increase the amount of infrared radiation absorbed by the atmosphere, thus enhancing the greenhouse effect and amplifying the warming of Earth (Center for Climate and Energy Solutions n.d.).

Increases in fossil fuel combustion and deforestation have exponentially increased concentrations of GHGs in the atmosphere since the Industrial Revolution. Rising atmospheric concentrations of GHGs in excess of natural levels result in increasing global surface temperatures—a phenomenon commonly referred to as *global warming*. Higher global surface temperatures in turn result in changes to Earth's climate system, including increased ocean temperature and acidity, reduced sea ice, variable precipitation, and increased frequency and intensity of extreme weather events (Solomon et al. 2007). Large-scale changes to Earth's system are collectively referred to as *climate change.*

The Intergovernmental Panel on Climate Change (IPCC) has been established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation. The IPCC estimates that the average global temperature rise by 0.3° to 4.8° Celsius during the twenty-first century (Intergovernmental Panel on Climate Change 2013). Large increases in global temperatures could have substantial adverse effects on the natural and human environments on the planet and in California.

Greenhouse Gases Emissions and Reporting

The primary GHGs generated by the Proposed Project would be CO_2, CH_4, N_2O, and SF_6. CO_2 is the most important anthropogenic GHG and accounts for more than 75 percent of all GHG emissions caused by humans. The primary sources of anthropogenic CO_2 in the atmosphere include the burning of fossil fuels, gas flaring, cement production, and land use changes. CH_4 and N_2O are not as abundant as CO_2, but are significantly more powerful. Sources of CH_4 include growing rice, raising cattle, using natural gas, landfill outgassing, and mining coal. Source of N_2O include agricultural processes, nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions. SF_6 is one of the most powerful GHGs and is primarily generated through electricity transmission.

To simplify reporting and analysis, methods have been set forth to describe emissions of GHGs in terms of a single gas. The most commonly accepted method to compare GHG emissions is the global warming potential (GWP) methodology defined in the IPCC reference documents (Intergovernmental Panel on Climate Change 1996, 2001, 2007). The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of CO_2e, which compares the gas in question to that of the same mass of CO_2 (CO_2 has a global warming potential of 1 by definition).

Table 3.7-1 lists the global warming potential of CO_2, CH_4, N_2O, and SF_6, their lifetimes, and abundances in the atmosphere.

Table 3.7-1. Lifetimes and Global Warming Potentials of Several Greenhouse Gases

Greenhouse Gases	Global Warming Potential (100 years)	Lifetime (years)	Current Atmospheric Abundance
CO_2 (ppm)	1	50–200	391
CH_4 (ppb)	25	9–15	1,871
N_2O (ppb)	298	120	323
SF_6 (ppt)	22,800	3,200	7.4

Source: Solomon et al. 2007.
CH_4 = methane
CO_2 = carbon dioxide
N_2O = nitrous oxide
ppb = parts per billion
ppt = parts per trillion
SF_6 = sulfur hexafluoride

Greenhouse Gas Emissions Inventories

A GHG inventory is a quantification of all GHG emissions and sinks within a selected physical and/or economic boundary. GHG inventories can be performed on a large scale (i.e., for global and national entities) or on a small scale (i.e., for a particular building or person). Although many processes are difficult to evaluate, several agencies have developed tools to quantify emissions from certain sources.

Table 3.7-2 outlines the most recent national, statewide, and regional GHG inventories to help contextualize the magnitude of potential Project-related emissions.

Table 3.7-2. National, State, and Regional GHG Emissions Inventories

Emissions Inventory	CO_2e (metric tons)[a]
2012 EPA National GHG Emissions Inventory	6,526,800,000
2012 ARB State GHG Emissions Inventory	458,680,000
2007 SFBAAB GHG Emissions Inventory	95,800,000

Sources:
U.S. Environmental Protection Agency 2014; California Air Resources Board 2014; Bay Area Air Quality Management District 2010
[a] CO_2e = carbon dioxide equivalent

Potential Effects of Climate Change in California and in the Project Area

Even with the efforts of the municipalities along the San Francisco Peninsula, in the greater San Francisco Bay Area and in California as a whole, a certain amount of climate change is unavoidable due to existing and unavoidable future GHG emissions.

With respect to central western California, including the project corridor, climate change effects will be similar to California-wide impacts, and are expected to include the following conditions (PRBO Conservation Science 2011).

- Hotter and drier climate, with average annual temperatures increasing 1.6–1.9°F by 2070 and mean annual rainfall decreasing by 61–188 millimeters.

- More frequent and intense wildfires, with the area burned projected to increase by an estimated 10–50 percent by 2070–2090.
- Decreases in chaparral/coastal scrub (19–43 percent by 2070) and blue oak woodland/foothill pine (44–55 percent by 2070); increases in grassland (85–140 percent by 2070).
- Increased salinity in San Francisco Bay, with salinity increasing by 1–3 practical salinity units during dry years.
- Increase in estuarine flows into the San Francisco Bay estuary, with winter gains approximately balancing spring-summer losses.
- Increased heat and decreased air quality, with the result that public health will be placed at risk, and native plant and animal species may be lost.

In addition, as described in Section 3.9, *Hydrology and Water Quality*, sea level rise is expected to range from up to 24 inches by 2050 and 66 inches by 2100 (compared with 2000 conditions). As described in Section 3.9, parts of the Caltrain corridor are subject to coastal flooding at present and with expected sea level rise in the future. This impact is assessed in Section 3.9.

3.7.2 Impact Analysis

3.7.2.1 Methods for Analysis

GHG emissions associated with construction and operation of the Proposed Project were quantified using standard and accepted software tools, techniques, and emission factors. A summary of the methodology is provided below. A full list of assumptions can be found in Appendix B, *Air Quality and Greenhouse Gas Analysis Technical Data*.

Construction

Proposed Project construction would generate short-term emissions of CO_2, CH_4, and N_2O. Emissions would originate from mobile and stationary construction equipment exhaust, as well as employee haul truck vehicle exhaust. Mass emissions generated by these sources were estimated using CalEEMod, (version 2013.2.2), the ARB's EMFAC2011 model, and the methods summarized in the *Regulatory Setting* section of Section 3.2, *Air Quality*.

Operation

Proposed Project operation would generate long-term emissions of CO_2, CH_4, N_2O, and SF_6. Primary sources of emissions include vehicle exhaust (locomotive and onroad) and electricity usage. In addition, the Proposed Project would reduce passenger vehicle miles traveled and associated emissions due to forecasted increased ridership. As disused in Section 3.2, *Air Quality*, the difference in operational emissions between the existing Caltrain service and the Proposed Project represents the change with the Proposed Project over existing conditions. The change with the Proposed Project in 2020 and 2040 compared with No Project scenarios represents the Proposed Project's impact analyzed in this document. Because the Proposed Project would not affect operational emissions from existing transit stations or maintenance activities, these sources are not discussed further.

Emissions generated under existing (2013), No Project scenarios (2020 and 2040) and the Proposed Project (2020 and 2040) from locomotive diesel consumption were calculated using fuel consumption data provided by Caltrain operations (Cocke pers. comm.) and emission factors from the Climate Registry (2013). Emissions generated by changes in onroad fuel consumption were estimated using regional VMT provided by the Santa Clara Valley Transportation Authority travel forecasting model (Naylor pers. comm.) and the ARB's EMFAC2011 model. Emissions associated with electricity generation and transmission were calculated based on expected energy demand and utility emission factors published by Pacific Gas and Electric Company (2013) and CalEEMod. Please refer to Appendix B for additional information on modeling assumptions and calculation methods.

3.7.2.2 Thresholds of Significance

Greenhouse Gas Emissions

In accordance with Appendix G of the State CEQA Guidelines, the Proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

There are currently no adopted quantitative GHG thresholds relevant to the Proposed Project.

The BAAQMD CEQA Guidelines do not identify a GHG emission threshold for construction-related emissions. Instead BAAQMD recommends that GHG emissions from construction be quantified and disclosed, and that a determination regarding the significance of these GHG emissions be made with respect to whether a project is consistent with the AB 32 GHG emission reduction goals. The BAAQMD further recommends incorporation of BMPs to reduce GHG emissions during construction, as feasible and applicable. BMPs may include use of alternative-fueled (e.g., biodiesel, electric) construction vehicles and equipment for at least 15 percent of the fleet, use of at least 10 percent of local building materials, and recycling or reusing at least 50 percent of construction waste or demolition materials.

BAAQMD has adopted 1,100 MT and 10,000 MT as significance thresholds to evaluate operational emissions from non-stationary and stationary source projects, respectively. The Proposed Project is a transportation project that does not fit into the land use development or stationary source project categories. Despite the lack of a truly relevant threshold, for purposes of this analysis only, direct and indirect GHG emissions from the Proposed Project are discussed with respect to both BAAQMD 1,100 and 10,000 MT thresholds.

Note that GHGs and climate change are exclusively cumulative impacts and there are no non-cumulative emission impacts from a climate change perspective. Therefore, in accordance with scientific consensus regarding the cumulative nature of GHGs[1], the analysis herein analyzes the cumulative contribution of project-related GHG emissions.

[1] Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors), which are primarily pollutants of regional and local concern. Given their long atmospheric lifetimes (see Table 3.7.1), GHGs emitted by countless sources worldwide accumulate in the atmosphere. No single emitter of GHGs is large enough to trigger global climate change on its own. Rather, climate change is the result of the individual contributions of countless past, present, and future sources. Therefore, GHG impacts are inherently cumulative.

Impacts of Climate Change on the Proposed Project

The California Second District Court of Appeals has held that while an EIR must analyze the environmental effects that may result from a project, an EIR is not required to examine the effects of the environment, such as sea level rise (SLR), on a project (see *Ballona Wetlands Land Trust v. City of Los Angeles* (2011), 201 Cal. App. 4th 455). In its decision, the Court called into question the validity of portions of the State CEQA Guidelines that require consideration of impacts of the environment on a project. The *Ballona* decision potentially eliminates the need for lead agencies in the second appellate district to consider the impacts of climate change on proposed projects. The *Ballona* decision did not, however, call into question the State CEQA Guidelines amendments enacted in 2010 that establish how GHG emissions are to be analyzed and mitigated under CEQA.

Unless binding legislation that overturns the *Ballona* decision is adopted,[2] this decision is expected to be argued as precedent in CEQA cases throughout the state for the premise that CEQA does not need to examine the impacts of the environment on a project. Nonetheless, courts outside of the second appellate district will have the discretion to differ in their interpretation of the State CEQA Guidelines and may find that an analysis of the effects of climate change on proposed projects is required. Accordingly, a qualitative discussion of the issue has been provided below (except for impacts related to sea level rise, which are discussed separately in Section 3.9, *Hydrology and Water Quality*) using the following criteria: Would the project place people or structures at substantial risk of harm due to predicted climate change effects?

3.7.2.3 Impacts and Mitigation Measures

Changes resulting from Project Variants 1 and 2 are described below each impact analysis.

Impact GHG-1	Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment
Level of Impact	Less than significant (beneficial)

Construction of the Proposed Project would generate direct emissions of CO_2, CH_4, and N_2O from mobile and stationary construction equipment exhaust, as well as employee haul truck vehicle exhaust. Estimated construction emissions associated with the Proposed Project are summarized in Table 3.7-~~2~~3. Annual and total emissions are presented for each construction phase. GHG emissions for loss of carbon stock tree removal are shown as well as indirect GHG emissions from concrete manufacture and transport. Data for these calculations may be found in Appendix B, *Air Quality and Greenhouse Gas Analysis Technical Data*.

As shown in Table 3.7-3~~2~~, Proposed Project construction would generate a total of 5,216 MT of CO_2e during the construction period excluding indirect emissions associated with concrete manufacture and transport. Including indirect emissions associated with concrete manufacture and transport, construction would result in a total of 8,700 to 11,000 MT CO2e. This is equivalent to adding 1,800 to 2,400 to ~~1,050~~ typical passenger vehicles for 1 year (U.S. Environmental Protection Agency 2011). The construction emissions would primarily be the result of carbon stock loss due to tree removal the indirect emissions associated with concrete manufacture and transport, and the operation of diesel powered construction equipment and heavy-duty haul trucks. Because construction emissions would cease once construction is complete, they are considered short-term.

[2] On March 21, 2012, the California Supreme Court denied case review and depublication requests submitted by several environmental organizations.

~~**Table 3.7-3. Estimated Operational Emissions (metric tons CO_2e per year)**~~

~~Condition~~	~~CO_2e~~
~~**Existing (2013)**~~	
~~Caltrain Diesel Consumption~~	~~45,899~~
~~Caltrain Electricity Consumption~~	~~785~~
~~Total Caltrain System Emissions~~ [a]	~~46,684~~
~~**No Project (2020)**~~	
~~Caltrain Diesel Consumption~~	~~45,899~~
~~Caltrain Electricity Consumption~~	~~531~~
~~Total Caltrain System Emissions~~ [a]	~~46,430~~
~~**Project (2020)**~~	
~~Caltrain Diesel Consumption~~	~~11,586~~
~~Caltrain Electricity Consumption~~	~~11,192~~
~~Total Caltrain System Emissions~~ [a]	~~22,778~~
~~Change in VMT from Increased Ridership~~	~~*-44,317*~~
~~Emissions Due to Loss in Carbon Sequestration Resulting From Tree Removal~~[b]	~~260~~
~~Total Project Emissions~~[c]	~~-21,279~~
~~**Cumulative No Build (2040)**~~	
~~Caltrain Diesel Consumption~~	~~45,899~~
~~Caltrain Electricity Consumption~~	~~531~~
~~Total Caltrain System Emissions~~ [a]	~~46,430~~
~~**Cumulative Project (2040)**~~[d]	
~~Caltrain Diesel Consumption~~	~~1,511~~
~~Caltrain Electricity Consumption~~	~~14,117~~
~~Total Caltrain System Emissions~~ [a]	~~15,628~~
~~Change in VMT from Increased Ridership~~	~~-146,241~~
~~Emissions Due to Loss in Carbon Sequestration Resulting From Tree Removal~~[b]	~~*260*~~
~~Total Project Emissions~~ [b]	~~-130,353~~
~~2020 Caltrain System vs. Existing (2013)~~[e]	~~-23,906~~
~~2040 Caltrain System with Full Electrification vs. Existing (2013)~~ [d,e]	~~-31,056~~
~~2020 Project vs. 2020 No Project~~[f]	~~-67,709~~
~~2040 Project with Full Electrification vs. 2020 No Project~~ [d,f]	~~-176,783~~
~~Thresholds~~	~~1,100/10,000~~

[a] ~~Includes diesel and electricity emissions; VMT-related reductions due to increased ridership are not included.~~

[b] ~~Does not include increase in carbon sequestration resulting from tree replanting. Assuming a 1:1 minimum tree replanting ratio (see Section 3.3, *Biological Resources*, for proposed mitigation), the increase in carbon sequestration would result in lowering project emissions by 3 metric tons in 2020 (assumed 1 year after planting) and 216 metric tons in 2040 (21 years after planting).~~

[c] ~~Includes the net change in VMT from No Project to Project Conditions associated with increased ridership.~~

[d] ~~The Proposed Project includes 75% electrified service from San Jose to San Francisco. Fully electrified service from San Jose to San Francisco is presumed by 2040, but is not presently fully funded.~~

[e] ~~Comparison of Caltrain system emissions only. Changes in VMT emissions and in carbon sequestration not included.~~

[f] ~~Includes changes in Caltrain system emissions, VMT emissions, and carbon sequestration.~~

~~CO_2e = carbon dioxide equivalent~~

~~VMT = vehicle miles traveled~~

Table 3.7-3~~2~~. Construction GHG Emissions (metric tons CO_2e)

Construction Phase	2015	2016	2017	2018	2019[1]	Phase Total
Utilities	105	42	0	0	0	146
Traction Power Substation Installation	0	157	211	153	67	589
Overhead Contact System	0	105	601	434	38	1178
Signal and At-Grade Crossings	0	19	31	56	34	140
Communications	0	0	0	83	33	115
Integration / Commissioning	0	0	0	0	13	13
Construction Subtotal	**105**	**323**	**844**	**726**	**184**	**2,181**
Loss of Carbon Stock Due to Tree Removal (one-time loss)						*3,035*
Indirect CO_2 emissions from Concrete Manufacture and Transport[3]						*3,406 to 6,084*[2]
Construction Total	**105**	**323**	**844**	**726**	**184**	**~~5,216~~ 8,702 to 11,300**

Notes:

[1] The analysis assumes construction completion by 2019 which is faster than current expected in that construction will likely be completed in 2020 or 2021. However, GHG emissions are estimated based on total activity and thus would not change with a more elongated schedule.

[2] Range for concrete is for different strengths of concrete (compressible strengths of 3,000 to 5,000 PSI).

[3] It is not standard professional practice for CEQA greenhouse gas inventories to include indirect emissions due to building materials. The CAPCOA white paper on CEQA and Climate Change (http://www.capcoa.org/wp-content/uploads/2012/03/CAPCOA-White-Paper.pdf) notes that "In many cases, only direct and indirect emissions may be addressed, rather than life-cycle emissions. A project applicant has traditionally been expected to only address emissions that are closely related and within the capacity of the project to control and/or influence." The BAAQMD CEQA guidelines (http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20CEQA%20Guidelines_Final_May%202012.ashx?la=en) do not require inclusion of such life-cycle emissions in project GHG emissions estimates. Thus, the inclusion of such indirect emissions is for informational purposes only.

With Project Variant 1, the Caltrain corridor would only be electrified to just south of the Tamien Station and there would be approximately 1.2 fewer miles of construction activities and, thus, fewer construction emissions. Under Project Variant 2, the electrification of the storage tracks at the 4th and King Station in San Francisco would be deferred. Thus these two variants would result in less construction emissions than the Proposed Project.

Proposed Project operation has the potential to generate long-term GHG emissions from transit operations and changes in regional traffic patterns. Transit operations would generate GHG through diesel fuel and electricity consumption required to power the diesel and electric locomotives, respectively. Changes in regional traffic would primarily affect emissions levels through changes in gasoline consumption associated with the diversion of private automobile trips to public transit. Emissions generated by the existing Caltrain service, including fuel consumption by the locomotives and electrical emissions for idling of trains (at which point they are plugged into the grid), represent existing conditions, against which the Proposed Project is evaluated.

Estimated operational emissions in 2020 (opening year) and 2040 (design) under both the No Project and Proposed Project scenarios are summarized in Table 3.7-4~~3~~. Existing (2013) operational emissions currently generated by Caltrain are also presented for reference. The difference in operational emissions between the Proposed Project and the existing Caltrain service represents the change of emissions over existing conditions with the Proposed Project. The comparison between the No Project scenarios and Proposed Project scenarios represents the Proposed Project's impact.

Table 3.7-4. Estimated Operational GHG Emissions (metric tons CO_2e per year)

2020 GHG Emissions	Existing	No Project	Proposed Project
Caltrain Diesel Consumption	45,899	57,720	11,067
Caltrain Electricity Consumption	*839*	*567*	*11,958*
Total Caltrain System Emissions[a]	46,738	58,287	23,025
Change in VMT[b]	*NA*	*NA*	*-44,317*
Tree Sequestration GHG Loss[c]	NA	NA	260
Total 2020 Emissions	46,738	58,287	-21,032
PCEP 2020 vs. 2020 No Project			*-79,319*
2040 GHG Emissions	Existing	No Project	Proposed Project
Caltrain Diesel Consumption	45,899	59,011	1,511
Caltrain Electricity Consumption	839	567	15,100
Total Caltrain System Emissions[a]	46,738	59,579	16,611
Change in VMT[b]	*NA*	*NA*	*-146,241*
Tree Sequestration GHG Loss[c]	NA	NA	260
Total 2040 Emissions	**46,738**	**58,287**	**-129,370**
PCEP 2040 vs. 2020 No Project			*-188,949*

[a] Includes diesel and electricity emissions but not VMT-related reductions due to increased ridership.

[b] Change in VMT emissions relative to No Project conditions.

[c] Includes annual change in carbon sequestration due to tree loss but does not include increase in carbon sequestration with tree replanting required as mitigation. Assuming a minimum 1:1 tree replacement ratio (actual ratios described in Section 3.3, Biological Resources), carbon sequestration would also increase due to replanting by 3 metric tons of CO_2 in 2020 (1 year after assumed replanting) and by 216 metric tons of CO_2 in 2040 (21 years after replanting) and thus, in time, the mitigation replanting would offset the loss in annual sequestration due to tree removal. As discussed above, there would also be a one-time carbon stock loss due to tree removal during construction, but these one-time emissions would be offset by the Proposed Project within the first year of operation.

As shown in Table 3.7-~~3~~4, implementation of the Proposed Project would substantially reduce operational Caltrain system GHG emissions relative to the existing Caltrain service by 24,000 $MTC0_2e$ (in 2020) to 30,000 ~~31,000~~ $MTCO_2e$ (2040), excluding VMT emissions reductions associated with increased service. Relative to the No Project scenario, the Proposed Project would reduce emissions by 79,000 ~~68,000~~ $MTCO_2e$ (2020) to 189,000 ~~177,000~~ $MTCO_2e$, including reductions of VMT-related emissions from increased service. GHG benefits achieved through operation of the Proposed Project would offset the short-term construction emissions in ~~far~~ less than one year. Emissions savings achieved thereafter would contribute to reductions in GHG emissions. This would be an environmental benefit. Accordingly, this impact would be less than significant.

With Project Variant 1, the Caltrain corridor would only be electrified to just south of the Tamien Station but there would be no changes to normal train operations, so there would be no changes to operational emissions. Under Project Variant 2, the electrification of the storage tracks at the 4th and King Station in San Francisco would be deferred and there would be slightly higher operational GHG emissions because a diesel train would be required to push or pull EMUs onto the storage tracks for maintenance or repair and to return the EMUs back to the electrified tracks. However, under No Project conditions, such moves would be done with diesel locomotives or diesel yard haulers and thus Variant 2 would not represent an increase over No Project conditions.

Impact GHG-2	Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs
Level of Impact	Less than significant

California adopted AB 32 in 2006, which codified the state's GHG emissions reduction targets for the future. In addition, several jurisdictions in the study area have adopted or are currently preparing climate action plans to reduce community GHG emissions. Consistency with these documents is evaluated in this impact.

The ARB adopted the AB 32 Scoping Plan as a framework for achieving AB 32. The Scoping Plan outlines a series of technologically feasible and cost-effective measures to reduce statewide GHG emissions. Some reductions will need to come in the form of changes pertaining to vehicle emissions and mileage standards. Some will come from changes pertaining to sources of electricity and increased energy efficiency at existing facilities. The remainder will need to come from state and local plans, policies, or regulations that will lower carbon emissions, relative to business as usual conditions. The local climate and energy action plans in the study area (see Section 3.7.1.1, *Regulatory Setting*), which identify strategies to reduce GHG emissions are examples of such plans.

Implementation of the Proposed Project would electrify the Caltrain system and help accommodate increased ridership through improved system operations. The AB 32 Scoping Plan and local climate action plans include strategies to reduce single occupancy vehicle usage and to increase alternative transportation. These benefits of the Proposed Project would also support implementation of the MTC's SCS, which was adopted pursuant to SB 375. Accordingly, implementation of the Proposed Project would facilitate attainment of regional and statewide GHG polices and reduction targets. Therefore, this impact would be less than significant.

Project Variants 1 and 2 described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis.

Impact GHG-3	Place people or structures at substantial risk of harm due to predicted climate change effects (other than sea level rise)
Level of Impact	Less than significant

The Proposed Project is the electrification of an existing rail system with no new rail extensions or new stations. The Proposed Project would include new electrical infrastructure in the form of traction power facilities and overhead contact system improvements. The Proposed Project would also facilitate a service increase that would support increased ridership.

Unavoidable climate change may result in a range of potential impacts on the Caltrain corridor and adjacent areas, such as increased temperatures, increased heat events, worsened air quality, increased storm intensity, increased wildland fire frequency or intensity, changes in disease and pest vectors, and changes in water supply. Apart from sea level rise, and increased storm intensity and wildland fire, the Proposed Project has no potential to subject additional people or structures to harm from these potential effects of climate change. The Proposed Project would increase Caltrain ridership, but those riders would be present in the Bay Area with or without the Proposed Project and, thus, would be subject to general climate change effects regardless of the Proposed Project.

There are only three potential climate change effects for which the Proposed Project could potentially place people or structures at risk due to those effects: sea level rise, potential increased storm intensity and increased wildland fire. Sea level rise is addressed separately in Section 3.9, *Hydrology and Water Quality*. While inland flooding might change with potential increase in storm intensity, there is insufficient data at this time to reasonably predict what future inland flooding risks may occur due to changes in storm intensity resultant from climate change. As to wildland fires, as discussed in Section 3.8, *Hazards and Hazardous Materials*, the Proposed Project is not located within a wildland area and, therefore, not considered to be a high fire risk.

Thus, separate from sea level rise, the Proposed Project would not result in significant increased risk to people or structures from climate change. The impact would be less than significant.

Project Variants 1 and 2 described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis because they would not introduce any new facilities susceptible to sea level rise inundation or that would be more at risk to other potential effects of climate change.

3.8 Hazards and Hazardous Materials

3.8.1 Existing Conditions

3.8.1.1 Regulatory Setting

Federal

Resource Conservation and Recovery Act

Hazardous waste in California is regulated primarily under the authority of the federal Resource Conservation and Recovery Act (RCRA), 42 United States Code (U.S.C.) Section 6901 et seq. RCRA was established in 1976 to protect human health and the environment, reduce waste, conserve energy and natural resources, and minimize the generation of hazardous waste. Under the authority of RCRA, the regulatory framework for managing hazardous waste, including requirements for entities that generate, store, transport, treat, and dispose of hazardous waste, is found in 40 Code of Federal Regulations (CFR) Sections 260–299. Other applicable federal laws and regulations include the following.

- 49 CFR Parts 172 and 173: These regulations establish standards for the transport of hazardous materials and hazardous wastes. The standards include requirements for labeling, packaging, and shipping hazardous materials and hazardous wastes, as well as training requirements for personnel completing shipping papers and manifests.
- 40 CFR Subchapter I—Solid Wastes: These regulations implement the provisions of the Solid Waste Act and RCRA. These regulations also establish the criteria for the classification of solid waste disposal facilities (landfills), hazardous waste characteristic criteria and regulatory thresholds, hazardous waste generator requirements, and requirements for management of used oil and universal wastes.
- 40 CFR 355 Appendix A—The List of Extremely Hazardous Substances and Their Threshold Planning Quantities: This list is part of a regulation that establishes requirements for a facility to provide information necessary for developing and implementing State and local chemical emergency response plans, and requirements for emergency notification of chemical releases, including releases of Extremely Hazardous Substances as defined by the Comprehensive Environmental Response, Compensation, and Liability Act.

Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendments and Reauthorization Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as "Superfund," was enacted by Congress on December 11, 1980. This law (42 U.S.C. Chapter 103) provides broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA establishes requirements concerning closed and abandoned hazardous waste sites, provides for liability of persons responsible for releases of hazardous waste at these sites, and establishes a trust fund for cleanup when no responsible party can be identified. CERCLA also enabled the revision of the National Contingency Plan (NCP). The NCP (40 CFR Part 300) provides the guidelines and procedures needed to respond to releases and threatened releases of hazardous substances, pollutants, and/or contaminants. The NCP also established the National Priorities List (NPL). CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986.

Department of Transportation Hazardous Materials Regulations

U.S. Department of Transportation (DOT) Hazardous Materials Regulations (49 CFR Parts 100–185) cover all aspects of hazardous materials packaging, handling, and transportation. Parts 107 (Hazard Materials Program), 130 (Oil Spill Prevention and Response), 172 (Emergency Response), 173 (Packaging Requirements), 174 (Rail Transportation), 176 (Vessel Transportation), 177 (Highway Transportation), 178 (Packaging Specifications), and 180 (Packaging Maintenance) would all apply to the proposed Project and surrounding uses.

Occupational Safety and Health Administration

The Occupational Safety and Health Administration's (OSHA's) mission is to ensure the safety and health of American workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health. OSHA establishes and enforces protective standards, and it provides technical assistance and consultation programs for employers and employees. OSHA standards are listed in 29 CFR Section 1910.

Federal Aviation Regulation, Part 77—Objects Affecting Navigable Airspace

Federal Aviation Regulations (FAR), Part 77 allows the Federal Aviation Administration (FAA) to identify potential aeronautical hazards (in advance of a project's construction) in an effort to prevent or minimize adverse impacts to the safe use of navigable airspace via:

- Requirements to provide notice to the FAA of certain proposed construction, or the alteration of existing structures.
- Standards used to determine obstructions to air navigation, and navigational and communication facilities.
- A process for aeronautical studies of obstructions to air navigation or navigational facilities to determine the effect on the safe and efficient use of navigable airspace, air navigation facilities or equipment.
- A process to petition the FAA for discretionary review of determinations, revisions, and extensions of determinations.

State

California Environmental Protection Agency

The California Environmental Protection Agency (Cal/EPA) was created in 1991. It unified California's environmental authority in a single cabinet-level agency and brought California Air Resources Board, State Water Resources Control Board, Regional Water Quality Control Board (RWQCB), Department of Resources Recycling and Recovery, the Department of Toxic Substances Control (DTSC), the Office of Environmental Health Hazard Assessment, and the Department of Pesticide Regulation under one agency. These agencies were placed within the Cal/EPA "umbrella" for the protection of human health and the environment and to ensure the coordinated deployment of state resources. Cal/EPA's mission is to restore, protect, and enhance the environment and ensure public health, environmental quality, and economic vitality.

Hazardous Waste Control Act

DTSC is responsible for the enforcement of the Hazardous Waste Control Act (California Health and Safety Code Section 25100 et seq.), which creates the framework under which hazardous wastes are managed in California. The law provides for the development of a State of California hazardous waste program that administers and implements the provisions of the federal RCRA cradle-to-grave waste management system in California. It also provides for the designation of California-only hazardous waste and development of standards that are equal to or, in some cases, more stringent than federal requirements.

California Code of Regulations, Title 8—Industrial Relations

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the workplace. The California Division of Occupational Safety and Health (Cal OSHA) and the federal OSHA are the agencies responsible for assuring worker safety in the workplace. Cal OSHA assumes primary responsibility for developing and enforcing standards for safe workplaces and work practices. These standards would be applicable to construction activities of the proposed Project.

California Labor Code (Division 5, Parts 1, 6, 7, and 7.5)

The California Labor Code is a collection of regulations that includes the regulation of the workplace to assure appropriate training on the use and handling of hazardous materials and the operation of equipment and machines that use, store, transport, or dispose of hazardous materials. Labor Code Division 5, Part 1, Chapter 2.5 ensures employees that are in charge of the handling of hazardous materials are appropriately trained on, and informed of, the materials they are handling. Division 5, Part 6 governs the operation and care of hazardous material storage tanks and boilers. Division 5, Part 7 ensures employees who work with volatile flammable liquids are outfitted in appropriate safety gear and clothing. Division 5, Part 7.5, otherwise referred to as the California Refinery and Chemical Plant Worker Safety Act of 1990, was enacted to prevent or minimize the consequences of catastrophic releases of toxic, flammable, or explosive chemicals. The establishment of process safety management standards is intended to eliminate, to a substantial degree, the risks to which workers are exposed in petroleum refineries, chemical plants, and other related manufacturing facilities.

Local

San Francisco Department of Public Health, Environmental Health–Hazardous Materials and Waste Program

The Hazardous Materials and Waste Program is the state-designated enforcement program in San Francisco for the Hazardous Materials Unified Program Agency (City and County of San Francisco 2013). Enforcement includes inspections of regulated businesses at least once every three years. San Francisco also regulates hazardous materials storage and use, hazardous waste treatment, and underground storage tanks under this program.

City and County of San Francisco Solid Waste Management Program

Private industry manages hazardous waste, collecting, handling, transporting, treating, storing, and disposing of hazardous waste generated in San Francisco (City and County of San Francisco 2004). The City and County of San Francisco under the Chief Administrative Officer, Solid Waste Management Program, administers the local hazardous waste management process.

County of San Mateo Hazardous Materials Business Plan Program

The San Mateo County Health System implements this program for the safe storage and use of chemicals (San Mateo County 2012a). All businesses that handle hazardous materials in specified quantities are required to complete a Hazardous Materials Business Plan (Business Plan), which is used to prevent or lessen damage to the health and safety of humans and the environment when a hazardous material is released. A Business Plan must include a summary of business activities, emergency contact information, type and quantity of the reportable hazardous material, emergency response procedures, employee training on proper handling and a site map.

County of San Mateo Hazardous Materials Management Program

According to the *County of San Mateo General Plan*, the San Mateo County Health Department proposed a Hazardous Materials Management Program aimed at monitoring hazardous waste generators, prevention of illegal dumping, improved emergency spill response and preparation of a hazardous waste management plan (San Mateo County 1985).

County of Santa Clara Hazardous Waste Management Plan

All cities in Santa Clara County address hazardous waste management planning by implementation of the County Hazardous Waste Management Plan (CHWMP). The CHWMP's main objective is to protect the health, safety, and economic well-being of Santa Clara County citizens and the surrounding environment (Santa Clara County 1994).

County of Santa Clara Hazardous Material Storage Ordinance and Uniform Fire Code

These regulations address safe use, handling, and storage of hazardous materials to prevent injury, releases, or potential contamination. Also, the regulations require specific protocol for storage and labeling of hazardous materials (Santa Clara County 1994).

3.8.1.2 Environmental Setting

The following section describes the existing conditions within the project sites. Issues discussed include potential hazardous materials generally along the Caltrain right-of-way (ROW) and surrounding the proposed traction power facility (TPF) sites, proximity to schools, distance from airports and airstrips, adopted emergency response plans, and exposure of people or structures to a significant risk of loss, injury or death involving wildland fires.

General Conditions along the Caltrain ROW

The Caltrain corridor is located within a developed urbanized context that varies from industrial to commercial to residential to open space. Contaminants of concern along the Caltrain ROW due to prior railway operations include arsenic, lead, and total petroleum hydrocarbons. Some portions of the corridor could also be affected by adjacent industrial or commercial activities as well.

Proximity to Schools

There are ~~three~~ several schools within 0.25 mile of ~~two~~ some of the proposed TPF locations. Sunshine Family Child Care and Coolidge Grammar School are located approximately 0.125 mile west of the proposed Paralleling Station (PS) 3 Option 1 and 0.21 mile west of PS3 Option 2. The Crescent Park Preschool is located 0.17 mile southeast of PS5, Option 1 and 0.20 mile northwest of PS5, Option 1B. The ~~third school is~~ Trio-School of Music Dance and Language~~, and~~ is located approximately 0.175 mile south of the proposed PS6, Option 2. There are no existing or proposed schools within 0.25 mile of any other proposed TPF.

Schools located within 0.25 mile of the Caltrain ROW were not included in the analysis due to the minimal amount of soil disturbance expected during installation of overhead contact system (OCS) poles. Furthermore, hazardous materials are not expected to be handled or stored along the ROW.

Hazardous Materials Database Results

The Caltrain ROW has been an active rail corridor for more than 100 years. In addition to rail operations being a potential source of contamination along the entire project corridor, construction of proposed TPFs would be surrounded by numerous sites noted in various environmental databases as having been or as being currently contaminated.

A historical environmental database search conducted by ICF International personnel via Environmental Data Resources (EDR) in June of 2013 found a total of 107 sites as sources of potential contamination within a 0.25-mile radius of each of the proposed TPF sites. The sites were found in various environmental databases and were listed as either open sites undergoing assessment and/or remediation or closed case sites. Table 3.8-1 lists these sites, along with their current status, the environmental databases in which they are found, and a level of concern designation that describes the site's likelihood of impacting the Proposed Project. EDR reports were combined for some of the potential TPF sites because of their close proximity to one another. In such cases, a point of equal distance between potential sites was chosen as the center of the EDR analysis. The radius analyzed was then expanded to allow for the analysis of all sites within 0.25 mile of all TPF locations. Additional search of several environmental databases was conducted for PS5, Option 1B and PS7 Variant A and B in November 2014.

Level of concern categories were assigned to these current or previously contaminated sites dependent on their likelihood to impact the proposed Project. Site status, contaminated media (e.g., soil or groundwater), and distance from the proposed TPF locations were the primary factors of concern. In some cases (dependent on site characteristics) concern levels were combined.

The following are descriptions of the level of concern categories.

- High level concern sites are sites that are open/active and undergoing contamination characterization and/or remediation. These sites have the potential to be substantially contaminated and are located immediately adjacent to (with soil and/or groundwater contamination) or within 0.125 mile of (with groundwater contamination) the proposed locations.

Table 3.8-1. Known Hazardous Materials/Wastes Sites with Potential to Affect Proposed Traction Power Facility Sites

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
PS1	Bay Area Super Shuttle 700 16th Street 0.16-mile N of PS1	HIST Cortese, LUST, CA FID UST, SWEEPS UST, RCRAGEN-SGN, FINDS	Gasoline impacted groundwater. Case closed status granted in 1987. Location at a lower elevation than project site.	Low
	Direct Mail Service 209 Mississippi Street 0.07-mile SW of PS1	LUST	Gasoline impacted soil only. The case was closed in 2000. Location within 0.125 of a mile from project site.	Low
	L and H Paint Products/Company 150 Mississippi Street 0.07-mile NW of PS1	HIST Cortese, LUST, UST, CA FID UST, SWEEPS UST	Gasoline impacted soil only. The case was closed in 1993. Location within 0.125 of a mile from project site.	Low
	Louie Property 200 Mississippi Street 0.07-mile SW of PS1	HIST Cortese, LUST	Gasoline impacted groundwater. Case closed status granted in 2006. Location at a higher elevation than project site.	Low / Medium
	Macor, Inc. 1200 17th Street 0.14-mile NW of PS1	HIST Cortese, LUST	Gasoline impacted groundwater. Case closed status granted in 2009. Location at a lower elevation than project site.	Low
	Mariposa Street and Interstate 280 880 Miraposa Street vicinity 0.07-mile SE of PS1	LUST	Contaminated soil only. Contaminants included stoddard solvents, mineral spirits, and distillates. Case closed status granted in 1998. Location within 0.125 of a mile of project site.	Low
	Mission Bay P10 1600 Owens Street 0.25-mile N of PS1	US Brownfields	Site consists of former rail yards and parking lots. 300 acre site to be re-developed in area. According to the database, contaminated soil has been remediated. Groundwater contamination is unknown. Contaminants have included asbestos, lead, PCBs, petroleum products and VOCs.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
PS2	Bayshore Buyback Sanitary Fill SWETS 501 Tunnel Avenue 0.16-mile S of PS2	FINDS, SWRCY, UST, HIST UST, LUST, RCRAGEN-SGN, SWEEPS UST, AST	SWETS (three separate events): First occurrence, contaminated soil. Contaminants of concern included waste oil, motor, hydraulic, and lubricating fluids. Case closed status granted in 1995. Second occurrence, diesel impacted groundwater. Case closed status granted in 1999. Third occurrence, gasoline impacted groundwater. Case closed status granted in 2009. Bayshore Buyback: contaminated groundwater. Contaminants of concern included waste oil, motor, hydraulic, and lubricating fluids. Case closed status granted in 2009. Sanitary Fill: low priority site. Groundwater impacted by waste oil. Site undergoing post remedial monitoring. Location at a lower elevation than project site.	Low / Medium
	Bayshore Gas and Service 2260 Bayshore Boulevard 0.09-mile WNW of PS2	UST, LUST, HIST Cortese	Gasoline impacted groundwater. Status is open and eligible for closure. Location at a higher elevation than project site.	Medium
	Blanken Avenue Parking Lot for the former Schlage Lock Factory 2201 Bayshore Boulevard 0.04-mile N of PS2	Envirostor	Site evaluated per DTSC. DTSC activities complete. Contaminants (diesel, molybdenum, and arsenic) above screening levels in soil. Further investigation needed for characterization of contamination.	Medium / High
	Ceco Corporation 401 Tunnel Avenue 0.12-mile S of PS2	LUST, RCRAGEN-SGN, UST, FINDS, HIST Cortese	Diesel impacted groundwater. Case closed status granted in 2003. Location at a lower elevation than project site.	Low
	P&F Distributors 5111 Tunnel Avenue 0.24-mile S of PS2	LUST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 2004. Location at a lower elevation than project site.	Low
	Schlage Lock Company Bayshore Boulevard and Sunnydale Avenue 2401 Bayshore Boulevard 0.15-mile SW of PS2	HIST Cal-Sites, Cortese, Response, Envirostor, RCRAGEN-SGN, FTTS, HIST FTTS, FINDS, HIST Cortese, EMI, UST, SWEEPS UST, CA FID UST	Active DTSC Site Cleanup Program site. VOCs, including TCE and PCE contamination in both groundwater and soil in 1997. Vapor extraction (SVE) begun in 1999. Operation and maintenance plan approved for SVE system in 2000. Location at a lower elevation than project site.	Medium / High

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	T.W. Automotive 2500 Bayshore Boulevard 0.19-mile WSW of PS2	LUST, HIST Cortese, CA FID UST, SWEEPS UST	Gasoline impacted groundwater. Case closed status granted in 1997. Location at a lower elevation than project site.	Low
TPS1 (Options 1 through ~~3~~4)	Airborne Express Corp. OYS/Monroe Schnieder Assoc. 274 Wattis Way 0.36-mile S from center point between TPS1 Options 1 through 3; 0.64-mile S from TPS1 Option 4	UST, LUST	Xylene impacted groundwater. Case closed status granted in 1992. Site is located at a lower elevation than all TPS1 locations.	Low
	Airport Olympic 100 Baden 0.36-mile NW from center point between TPS1 Options 1 through 3; 0.29-mile SW from TPS1 Option 4	UST, LUST	Gasoline impacted groundwater. Case closed status granted in 2001. Site is located at a higher elevation than all TPS1 locations.	Low
	Alan Baker Company 160 Sylvester Road 0.15-miles SE from center point between TPS1 Options 1 through 3; 0.27-mile S from TPS 1 Option 4	LUST, RCRAGEN-LGN, FINDS, CA FID UST, HIST UST, HIST Cortese, WDS, San Mateo Co. Bl	Gasoline impacted soil only. Case was closed in 2000. Two active USTs onsite. Site approximately 0.09 mi west of TPS1 Option 1.	Low / Medium
	Associated Road Parcel Sylvester Road/East Grand Avenue 0.20-mile NW from center point between TPS1 Options 1 through 3; 0.31-mile S from TPS 1 Option 4	SLIC	Contaminated groundwater (solvents). As of 2007, site undergoing assessment and is listed as open. Site located 0.18 mile west from TPS1 Option 1 and is at a higher elevation.	Low / Medium
	Avis Rent A Car System 230 Harbor Way 0.15-miles SE from center point between TPS1 Options 1 through 3; 0.51-mile SE from TPS1 Option 4	RCRAGEN-SGN, HIST UST, LUST, FINDS, HIST Cortese, San Mateo Co. Bl.	Impacted groundwater. Contaminants included gasoline, waste oil, and motor, hydraulic, and lubricating fluids. Site was granted case closed status in 2010 for gasoline leak. Waste oil leak case closed in 2003. Site at a lower elevation than proposed TPS1 locations.	Low
	Bell Electric Supply 208 E. Grand Avenue 0.27-mile NE from center point between TPS1 Options 1 through 3; 0.33-mile SE from TPS1 Option 4	UST, LUST	Gasoline impacted groundwater. Case closed status granted in 1995. Site is located at a lower elevation than all TPS1 locations.	Low
	Britannia Developments 115–185 Harbor Way 0.22-mile NE from center point between TPS1 Options 1 through 3; 0.33-mile SE from TPS1 Option 4	SLIC, LUST	Petroleum hydrocarbon impacted soil and groundwater. Verification monitoring underway. Soil sampling was conducted during the removal of two onsite USTs in 1999. Site is located at a lower elevation than all TPS1 locations.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Budget Rent A Car Hertz Corporation 177 S. Airport Boulevard 0.21-miles NE from center point between TPS1 Options 1 through 3; 0.40-mile S from TPS1 Option 4	LUST, HIST UST, RCRAGEN – SGN, FINDS, HIST Cortese, CA FID UST, Sacramento Co. CS, SWEEPS UST	Impacted groundwater with automotive fluids such as gasoline and additives. Case closed by San Mateo County LUST in 2002. Site located approximately 0.10 mile SW of TPS1 Option 1 and at a higher elevation.	Low / Medium
	Caltrans District 4 Maintenance Station 166 Harbor Way 0.15-mile NE from center point between TPS1 Options 1 through 3; 0.37-mile SE from TPS1 Option 4	RCRAGEN-SGN, FINDS, HIST Cortese, RESPONSE, ENVIROSTOR	Site is under the DTSC Site Cleanup Program for contaminated soil. As of 2006, the site was part of the Voluntary Cleanup Program. Site is located approximately 0.04 mile east of TPS1 Option 2 and is at a lower elevation than all TPS1 locations.	Low / Medium
	Color Craft 255 S. Airport Boulevard 0.32-miles SW from center point between TPS1 Options 1 through 3; 0.65-mile SE from TPS1 Option 4	LUST, HIST Cortese	Gasoline impacted groundwater. Case closed status granted in 2001. Site at a lower elevation than proposed TPS1 locations.	Low
	CTC Food International/Oriental Trading Company 131 W. Harris Avenue 0.07-miles SW from center point between TPS1 Options 1 through 3; 0.43-mile S from TPS1 Option 4	LUST, HIST Cortese, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted as of 2000. Site is approximately .06 mile NE from TPS1 Option 2 and at a lower elevation. Site at a higher elevation than TPS1 Option 1 and TPS1 Option 2.	Low / Medium
	Don's Auto Wreckers 137 Harbor Way 0.16-mile NE of TPS1 Option 1; 0.43-mile SE from TPS1 Option 4	LUST, HIST Cortese	Gasoline contaminated media (media type not reported). Case closed in 1997. Site is approximately .09 mile NE from TPS1 Option 3 and is at a lower elevation than TPS1 locations.	Low
	East Grand Olympic Cardto/Flyers LLC 190 E. Grand Avenue 0.21-mile N from center point between TPS1 Options 1 through 3; 0.28-mile SE from TPS1 Option 4	SWEEPS UST, LUST, San Mateo Co. Bl, HIST Cortese, CA FID UST	Gasoline impacted groundwater. Case closed status granted in 2009. Site at a lower elevation than proposed TPS1 locations.	Low
	Exelixis, Inc. 169 Harbor Way 0.15-miles NE from center point between TPS1 Options 1 through 3; 0.42-mile S from TPS1 Option 4	RCRAGEN – LGN, San Mateo Co. Bl, FINDS, CHMIRS	Large quantity generator with pre-transport violations. Violations were reported in 2005 and 2008 as written informal notices by the EPA. Site is located approximately 0.04 mile east of TPS1 Option 3.	Low
	Former gas station/Airport Boulevard service station 190 Airport Boulevard 0.35-miles NW from center point between TPS1 Options 1 through 3; 0.28-mile SW from TPS1 Option 4	HIST Cortese, LUST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 1997. Site at a higher elevation than proposed TPS1 locations.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Godar and Hossenlopp Printing Co/Bay Bridge Hardware Supply 151 Mitchell Avenue 0.15 mile from center point between TPS1 Options 1 through 3; 0.52-mile SE from TPS1 Option 4	RCRAGEN SGN, LUST, HIST Cortese, SWEEPS UST, San Mateo Co. Bl, FINDS HAZNET, EMI	Gasoline impacted groundwater. Case closed status granted in 1995. Site at a lower elevation than proposed TPS1 locations.	Low
	Golden Gate Petroleum 114–126 Harbor Way 0.22-miles NE from center point between TPS1 Options 1 through 3; 0.31-mile SE from TPS1 Option 4	LUST	Gasoline impacted groundwater. Case closed status granted in 2013. Site at a lower elevation than proposed TPS1 locations.	Low
	Hamptons Service Inc 248 Airport Boulevard 0.28-miles SW from center point between TPS1 Options 1 through 3; 0.26-mile SW from TPS1 Option 4	LUST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 2006. Site located approximately 0.125 mile SW of TPS1 Option 2. Site at a higher elevation than proposed TPS1 locations.	Low / Medium
	Harmon Schragge & Co 280 Wattis 0.37-miles S from center point between TPS1 Options 1 through 3; 0.71-mile S from TPS1 Option 4	LUST, HIST Cortese, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 1996. Site at a lower elevation than proposed TPS1 locations.	Low
	Ken Funk Property 264 Airport Boulevard 0.30-miles from center point between TPS1 Options 1 through 3; 0.26-mile SW from TPS1 Option 4	LUST, HIST Cortese	Gasoline impacted groundwater. Case closed status granted in 1998 Site at a lower elevation than proposed TPS1 locations.	Low
	MG Truck Wash Nella Oil 219 Texaco 176 Gateway Boulevard 0.15-miles from center point between TPS1 Options 1 through 3; 0.34-mile SE from TPS1 Option 4	RCRAGEN – VGN, LUST, San Mateo Co.	Gasoline impacted groundwater. Case closed status granted in 2004.	Low / Medium
	Olympian/Ryder Truck Rental 186 E. Grand Avenue 0.21-mile N from center point between TPS1 Options 1 through 3; 0.29-mile SE from TPS1 Option 4	LUST, FINDS, RCRAGEN-SGN	Gasoline impacted groundwater. Case closed status granted in 1996. Site at a lower elevation than proposed TPS1 locations.	Low
	Produce Shell/Equilon Enterprises 140 Produce Avenue 0.33-miles SW from center point between TPS1 Options 1 through 3; 0.63-mile S from TPS1 Option 4	LUST, San Mateo Co. Bl, FINDS	Diesel impacted groundwater. Case closed status granted in 2005. Site located approximately 0.18 mile SW of TPS1 Option 2. Site at a higher elevation than proposed TPS1 locations	Low
	Sewage Pump Station 4 Fire Station #2 249 Harbor Way 0.21-miles from center point between TPS1 Options 1 through 3; 0.60-mile SE from TPS1 Option 4	LUST, HIST UST, San Mateo Co. Bl, HIST Cortese	Gasoline impacted groundwater. Case closed status granted in 2003. Site at a lower elevation than proposed TPS1 locations.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Shell Service Station 248 S. Airport Boulevard 0.30-miles SW from center point between TPS1 Options 1 through 3; 0.62-mile S from TPS1 Option 4	LUST, RCRAGEN – SGN, FINDS, HAZNET	Case closed status. Contaminated media unknown. Site approximately 0.15 mile SW of TPS1 Option 2. Site at a lower elevation than all proposed TPS1 locations.	Low
	Somerset Studios 108 Sylvester Road 0.18-mile NW from center point between TPS1 Options 1 through 3; 0.17-mile S from TPS1 Option 4	HIST Cortese, LUST, San Mateo Co. Bl	Gasoline impacted soil only. Case closed status was granted in 2000. Site located approximately 0.10 mile west of TPS1 Option 1.	Low
	South City Ford 315 Airport Boulevard 0.38-mile NE from center point between TPS1 Options 1 through 3; 0.20-mile SW from TPS1 Option 4	HIST Cortese, LUST, San Mateo Co. Bl, SWEEPS UST, CA FID UST	Gasoline impacted groundwater. Site was granted case closed status in 2003. Site at a lower elevation than proposed TPS1 locations.	Low
	So. San Francisco Tire Service 114 Harbor Way 0.22-mile NE from center point between TPS1 Options 1 through 3; 0.31-mile SE from TPS1 Option 4	HIST Cortese, HIST UST, LUST, San Mateo Co. Bl	Gasoline impacted groundwater. Site was granted case closed status in 2003. Site at a lower elevation than proposed TPS1 locations.	Low
	Traditional Wood Works/HAAS Woodworking 184 Harbor Way 0.14-miles NE from center point between TPS1 Options 1 through 3; 0.41-mile SE from TPS1 Option 4	LUST, CA FIDUST, RCRAGEN-SGN, FINDS, HIST Cortese, San Mateo Co. Bl, HAZNET	Gasoline impacted groundwater. Site was granted case closed status in 2001. Site at a lower elevation than proposed TPS1 locations.	Low
	Troyer Automatic Doors, Inc 162 W. Harris Avenue 0.07-miles from center point between TPS1 Options 1 through 3; 0.50-mile SE from TPS1 Option 4	LUST	Impacted groundwater. Contaminants included stoddard solvents, mineral spirits and distillates. Case closed status granted in 2012.	Low / Medium
	UST Site 175 Sylvester 0.14-miles NW from center point between TPS1 Options 1 through 3; 0.31-mile S from TPS1 Option 4	LUST, San Mateo Co. Bl	Diesel impacted groundwater. Case closed status granted in 2010. Site located approximately 0.10 mile west of TPS1 Option 2. Site at a higher elevation than proposed locations.	Low / Medium
PS3 (Options 1 and 2)	ARC Electric Company Cameron Ashley Building 1330 Marsten Road 0.17-mile NE of PS3 Option 1; 0.18-mile NE from PS3 Option 2	HIST Cortese, LUST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 1998. Location at a lower elevation than project site.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	ARCO 0508 Prestige Stations, Inc. 1000 Broadway 0.17-mile E of PS3 Option 1; 0.10-mile E from PS3 Option 2	CA FID UST, SWEEPS UST, San Mateo Co. Bl, LUST, HIST UST, RCRAGEN-SGN, FINDS, CHMIRS	Site is an active LUST site and is undergoing remediation activities. Gasoline impacted groundwater. Benzene, toluene, xylenes, MTBE, TBA all considered contaminants of concern. In late 2001, three USTs were removed from the site. Separate phase product (SPPH) was observed in groundwater during the removal of the USTs. Over excavation of impacted soil and removal of SPPH has occurred onsite. Location at a higher elevation than project site.	Medium
	Auto Pride Car Wash 1095 Carolan Avenue 0.23-mile SE of PS3 Option 1; 0.10-mile E from PS3 Option 2	HIST Cortese, LUST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 2011. Location at a higher elevation than project site.	Low
	Chevron Station 1101 Broadway 0.15-mile SE of PS3 Option 1; 0.12-mile SE from PS3 Option 2	LUST, HIST UST, San Mateo Co. Bl RCRAGEN-SGN, FINDS, HAZNET	Gasoline impacted groundwater. Case closed status granted in 2005. Location at a higher elevation than project site.	Low
	Bekins Storage Mark Harvey Acura 1070 Broadway 0.15-mile SE of PS3 Option 1; 0.08-mile SE from PS3 Option 2	HIST Cortese, LUST, EMI, HIST LUST, San Mateo Co. Bl	Impacted media unknown. Case closed status granted by San Mateo County LUST. Location at a higher elevation than project site.	Low
	Biscays Auto Repair 1215 California Drive 0.11-mile SE of PS3 Option 1; 0.08-mile SE from PS3 Option 2	LUST, UST	Gasoline impacted groundwater. Case closed status granted in 2000. Location at a higher elevation than project site and within 0.125 of a mile of project footprint.	Low / Medium
	Burlingame Fire Department Station 3 1399 Rollins Road 0.21-mile NW of PS3 Option 1; 0.22-mile NW from PS3 Option 2	LUST, HIST UST, HIST Cortese, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 2000. Location at a lower elevation than project site.	Low
	Caulking Waterproofing, Inc. vacant warehouse 1333 Marsten Road 0.16-mile NE of PS3 Option 1; 0.15-mile N from PS3 Option 2	LUST, HIST Cortese, San Mateo Co. Bl, CA FID UST, SWEEPS UST	Gasoline impacted groundwater. Case closed status granted in 1993. Location at a lower elevation than project site.	Low
	City of Burlingame 1391 Rollins 0.20-mile NW of PS3 Option 1; 0.21-mile NW from PS3 Option 2	LUST	Gasoline impacted groundwater. Case closed status granted in 2004. Location at a lower elevation than project site.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Autohaus Schmid Inc. D and M Towing and Auto 1213 Rollins Road 0.15-mile NE of PS3 Option 1; 0.09-mile NE from PS3 Option 2	UST, LUST, San Mateo Co. Bl, RCRAGEN-SGN, CA FID UST, SWEEPS UST	Groundwater impacted by unknown contaminant. Site stores fuels and waste oil. Case closed status granted in 2001. Location at a higher elevation than project site	Low
	PK Auto Service L&S Auto Repair Desert Petroleum Fred Koo Service Station 1100 Broadway Avenue 0.14-mile SE of PS3 Option 1; 0.09-mile SE from PS3 Option 2	LUST, SWEEPS UST, HIST Cortese, SLIC HIST UST, San Mateo Co. Bl, UST	Gasoline impacted groundwater. Case closed status granted in 2002. Location at a higher elevation than project site.	Low
	Encore Theater 1159 California Drive 0.20-mile SE of PS3 Option 1; 0.10-mile SE from PS3 Option 2	LUST, SWEEPS UST, HIST Cortese, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 1997. Location at a higher elevation than project site.	Low
	Horn Investment and Realty Hornung Trucking Service Eva Person 1344 Marsten Road 0.16-mile NE of PS3 Option 1 and Option 2	LUST, HIST UST, San Mateo Co. Bl	Diesel impacted groundwater. Case closed status granted in 1995. Location at a lower elevation than project site.	Low
	John Sutti and Associates, Inc. Warehouse II 1327 Carolan Avenue 0.08-mile N of PS3 Option 1; 0.10-mile SE from PS3 Option 2	HIST Cortese, LUST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 1996. Location at a lower elevation than project site.	Low
	Burlington Auto Center 1368 Rollins Road 0.15-mile NW of PS3 Option 1; 0.18-mile NW from PS3 Option 2	LUST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 2002. Location at a lower elevation than project site.	Low
	Mike Harvey Chrysler Plymouth 1049 Broadway 0.16-mile SE of PS3 Option 1; 0.11-mile E from PS3 Option 2	HIST Cortese, LUST, UST, SWEEPS UST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 1997. Location at a higher elevation than project site.	Low
	Mosquito Abatement Office San Mateo County 1351 Rollins Road 0.14-mile N of PS3 Option 1; 0.12-miles SE from PS3 Option 2	LUST, ENF, San Mateo Co. Bl, CA FID UST, HIST Cortese, SWEEPS UST, HIST UST	Gasoline impacted groundwater. Case closed status granted in 1997. Location at a lower elevation than project site.	Low
	Mr. Detail 1405 N. Carolan Avenue 0.18-mile NW of PS3 Option 1; 0.24-mile NW from PS3 Option 2	HIST Cortese, LUST,	Gasoline impacted groundwater. Case closed status granted in 1999. Location at a lower elevation than project site.	Low
	Myers Air Conditioning 1395 Marsten Road 0.16-mile NE of PS3 Option 1; 0.23-mile NW from PS3 Option 2	HIST Cortese, LUST, HIST UST	Gasoline impacted groundwater. Case closed status granted in 1996. Location at a lower elevation than project site.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Nicolet Property 1348 Rollins Road 0.13-mile N of PS3 Option 1; 0.25-mile NW from PS3 Option 2	HIST Cortese, LUST,	Gasoline impacted groundwater. Case closed status granted in 2001. Location at a lower elevation than project site.	Low
	Pacific Construction Berk-Ware Products Inc. 1369 N. Carolan Avenue 0.07-mile NW of PS3 Option 1; 0.19-mile NW from PS3 Option 2	LUST, UST	Gasoline impacted groundwater. Case closed status granted in 1997. Location at a lower elevation than project site.	Low
	Warehouse I 1337 N. Carolan Avenue 0.08-mile N of PS3 Option 1; 0.12-mile NW from PS3 Option 2	LUST, HIST Cortese	Gasoline impacted groundwater. Case closed status granted in 1999. Location at a lower elevation than project site.	Low
	United Transmission Inc. 1131 California Drive 0.23-mile SE of PS4 Option 1; 0.18-mile SE from PS3 Option 2	HIST Cortese, SWEEPS UST, LUST, San Mateo Co. Bl	Contaminated groundwater. Contaminants included stoddard solvents, distillates, and mineral spirits. Case closed status granted in 1996. Location at a higher elevation than project site.	Low
PS4 ~~(Options 1 and 2)~~ (Options 1, 2, and 3)	Chevron 9-4224 Hillside Chevron 2950 El Camino Real 0.19-mile NW of center point between PS4 Options 1 and 2; 0.25-mile NW from PS4 Option 3	LUST, San Mateo Co. Bl, HIST Cortese,	Gasoline impacted groundwater. Case closed status granted in 2005. Location at a higher elevation than the center point between PS4 Option 1 and Option 2.	Low / Medium
	C&P Service Twenty-Eighth Avenue Car Wash 2777 El Camino Real 0.31-mile NW of center point between PS4 Options 1 and 2; 0.46-mile NW from PS4 Option 3	LUST, San Mateo Co. Bl, HIST Cortese,	Site is an active LUST site and is undergoing assessment. Gasoline impacted groundwater. Contaminants of concern include MTBE, TBA, and other oxygenates. Location at a lower elevation than the center point between PS4 Option 1 and Option 2. Site approximately 0.21 mile NW of Option 1.	Low / Medium
	Hillside Auto Wash 3651 El Camino Real 0.35-mile NW of center point between PS4 Options 1 and 2; 0.20-mile SE from PS4 Option 3	LUST, HIST UST, SWEEPS UST, San Mateo Co. Bl, HIST Cortese,	Gasoline impacted groundwater. Case closed status granted in 2000. Location at a higher elevation than the center point between PS4 Option 1 and Option 2.	Low
	Mobil 40-FVW 3600 South El Camino Real 0.32-mile SE of center point between PS4 Options 1 and 2; 0.19-mile SE from PS4 Option 3	HIST Cortese, LUST	Contaminated groundwater. Contaminants included waste oil and motor, hydraulic, and lubricating fluids. Case closed status granted in 1998. Location at a higher elevation than the center point between PS4 Option 1 and Option 2.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Olympic San Mateo 2790 El Camino Real 0.31-mile NW of center point between PS4 Options 1 and 2; 0.46-mile NW from PS4 Option 3	HIST Cortese, SWEEPS UST, LUST, Notify 65, San Mateo Co. Bl, CA FID UST	Diesel impacted groundwater. Case closed status granted in 2001. Location at a lower elevation than the center point between PS4 Option 1 and Option 2.	Low
	Commercial property 2745 El Camino Real 0.34-mile NW of center point between PS4 Options 1 and 2; 0.46-mile NW from PS4 Option 3	HIST Cortese, LUST, SWEEPS UST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 2001. Location at a lower elevation than the center point between PS4 Option 1 and Option 2.	Low
	Unocal Union Oil Service Station 2661 2800 El Camino Real 0.29-mile NW of center point between PS4 Options 1 and 2; 0.30-mile NW from PS4 Option 3	HIST Cortese, LUST, SWEEPS UST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 2000. Location at a lower elevation than the center point between PS4 Option 1 and Option 2.	Low
SWS1 (Options 1 and 2)	Beach Cleaners Clean N Press 2537 El Camino Real 0.25-mile SW of SWS1 Option 1; 0.39-mile SE from SWS1 Option 2	LUST, SLIC, EMI	Leak discovered during a tank closure (1996). PCE released into soil and groundwater. Groundwater was extracted and soil was over excavated. Some soil left in place due to its proximity to building foundations. Case closed status granted in 2009.	Low
	C&B Construction Co. 438 Stanford Avenue 0.23-mile NE of SWS1 Option 1; 0.53-mile E from SWS1 Option 2	HIST Cortese, LUST, SWEEPS UST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 2012. Location at a lower elevation than project site.	Low
	CBL Technologies Inc. 2682 Middlefield Road 0.17-mile NE of SWS1 Option 1; 0.40-mile SE from SWS1 Option 2	HIST Cortese, LUST, San Mateo Co. Bl	Gasoline impacted groundwater. Case closed status granted in 1998. Location at a lower elevation than project site.	Low
	Fire Station #1 (former) 1036 Middlefield Road 0.20-mile N of SWS1 Option 1; 0.57-mile NW from SWS1 Option 2	HIST Cortese, LUST, SLIC	Diesel impacted groundwater. Two separate events. Case closed status granted in 2000 and 2009, respectively. Location at a lower elevation than project site.	Low
PS5 (Option 1)	No sites were reported within 0.25-miles of PS5 Option 1	NA	NA	NA
PS5 (Option 1B)[b]	San Antonio Cleaners 225 San Antonio Road #8 0.25 mile S of PS5 Option 1B	RCRA	Dry cleaner facility small quantity generator	Low
	Alps Photo 225 San Antonio Road 0.25 mile S of PS5 Option 1B	RCRA	Photo shop small quantity generator	Low
	Franciscan Glass Co. 100 San Antonio Circle 0.14 mile SE of PS5, Option 1B	LUST	LUST cleanup site. Case Closed 1991	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Old Mill Tierra Property. 255 San Antonio Road 0.20 mile S of PS5, Option 1B	LUST	LUST cleanup site. Case Closed 2003	Low
	Coast Casey Pump Station 101 N. San Antonio Road 0.18 mile S of PS5, Option 1B	LUST	LUST cleanup site. Case Closed 1990	Low
	Victor's Goodyear 298 San Antonio Road 0.24 mile S of PS5, Option 1B	LUST	LUST cleanup site. Case Closed 1991	Low
	J.C. Penney San Antonio Road at Alma Street 0.22 mile E of PS5, Option 1B	LUST	LUST cleanup site. Case Closed 2013	Low
PS5 (Option 2)	Blieber Iron Works 3101 Park Boulevard 0.24-mile SW of PS5 Option 2	HIST Cortese, LUST, HIST LUST, CA FID UST, SWEEPS UST	Gasoline impacted groundwater. Case closed status granted in 1995. Location at a higher elevation than project site.	Low
	Hewlett Packard 620-640 Page Mill Road 0.00-mile from PS5 Option 2	NPL, CERCLIS, US ENG Controls, US INST Controls, ROD, HIST Cortese, SLIC, ENF, LUST, SWEEPS UST, San Mateo Co. Bl	NPL Superfund site. 300 gallons of waste solvents leaked from a buried storage tank in 1981. Sampling conducted in 1986 detected high concentration of contaminants in groundwater under the tank. Municipal drinking water wells located within 3 miles of the site. HP has conducted excavation of contaminated soil on several occasions. Pump and treat system on site. The most recent 5-year review occurred in September of 2010.	High
	Hewlett Packard MFG DIV 395 Page Mill Road 0.22-mile SW of PS5 Option 2	CERC-NFRAP, CORRACTS, RCRAGEN-SGN, FINDS, HIST LUST, CUPA Listings, HIST Cortese, Cortese, SLIC, ENF, LUST, Envirostor	Impacted soil under LUST. Case closed in 1999. SLIC status active. Site is listed as undergoing remediation for contaminated soil and groundwater. Part of a study area that includes the HP facility at 640 Page Mill Road. Location at a higher elevation than project site.	Medium / High
	Lockheed Missiles & Space Co. 3101 Park Boulevard 0.10-mile SE of PS5 Option 2	RCRA NonGen, HIST Cortese, LUST, HIST LUST, HAZNET, FINDS	Diesel impacted groundwater. Case closed status granted in 1997. Location at a higher elevation than project site.	Low / Medium
	Hohbach 200 Page Mill Road 0.11-mile W of PS5 Option 2	HIST Cortese, LUST, HIST LUST,	Active LUST site (previously a gasoline station). Gasoline impacted groundwater. Undergoing site assessment activities. Location at a lower elevation than project site.	Medium

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Oregon Expressway Underpass Oregon Expressway & Alma Street 0.22-mile NW of PS5 Option 2	Envirostor	Dewatering system for roadway maintenance located at this site. Contamination has migrated from nearby HP facility (and others). EPA has recommended no further action under CERCLIS. State has recommended site screening. Location at a lower elevation than project site.	Low
	Vance Brown & Sons 2747 Park Boulevard 0.14-mile W of PS5 Option 2	HIST Cortese, LUST, HIST LUST, SLIC, HIST UST, CA FID UST, SWEEPS UST	Gasoline impacted groundwater. Case closed status granted in 1997. As of 2009, site active in the SLIC database as a Cleanup Program Site. Contaminated media is under investigation. Location at a lower elevation than project site.	Low / Medium
PS6 (Options 1 and 2)	Hill Fred 111 N. Sunnyvale Avenue 0.14-mile E of center point between PS6 Options 1 and 2	CA LUST, CA HIST LUST, CA EMI	Gasoline impacted groundwater and soil. As of 2001, site active under LUST and undergoing remediation activities. Site has been occupied by a gasoline service station since 1966. Location at a lower elevation than project site and is approximately 0.08 mile east of PS6 Option 1.	Medium
	Northrup Grumman Marine Systems/Westinghouse Electric Corp. 401 East Hendy Avenue 400 feet E of PS6 Option 1	NPL, CERCLIS, RCRAGEN LGN, US ENG Controls, US INST Control, ROD, PADS, FINDS, US AIRS, PRP	NPL site. Westinghouse Electric Corp. manufactured electrical transformers on 75-acre site. Contamination is believed to have originated from a leaking PCB UST and localized spills. Contamination includes PCBs and dichloro, trichloro and tetrachlorobenzene. Leaking UST was removed and soil and groundwater contamination was characterized. Most recent 5-year review conducted on September of 2011.	High
	City of Sunnyvale Sunnyvale Fire Station 171 Mathilda Avenue 0.22-mile NW of center point between PS6 Options 1 and 2	CA LUST, CA HIST LUST, CA SLIC	Two events involved gasoline impacted groundwater. Event 1 was granted case closed status in 1986. Event 2 was granted case closed status in 1995. Location at a lower elevation than project site.	Low
	Sunnyvale Town Center 2502 Town Center Lane 0.37-mile SW of center point between PS6 Options 1 and 2	CA NPDES, CA SLIC	As of 2009, an active SLIC site. Remediation under way. PCE, diesel and gasoline impacted groundwater. Location at a higher elevation than project site.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
TPS2 (Options 1 and 2)	San Jose Airport 1101 Airport Boulevard 0.20-mile NE of TPS2 Option 1	CA LUST, CA HIST Cortese	Aviation and diesel fuel contaminated groundwater. Case closed status granted in 2009. Location at a lower elevation than project site.	Low
	Bay Area/Golden Gate/Diablo Petroleum 905 Stockton Avenue 0.17-mile SE of TPS2 Option 2	CA LUST, CA NPDES, CA HIST Cortese, CA SLIC, CA HIST LUST, CA CUPA Listings, CA ENF, CA WDS	Contaminated groundwater and soil. Contaminants of concern include diesel, gasoline, waste oil, and motor, hydraulic, and lubricating fluids. 15 USTs have been removed or abandoned in situ. 60 cubic yards of soil were excavated during UST removal activities. Location at a higher elevation than project site.	Medium
	Central Concrete 928 Stockton Avenue 0.13-mile SE of TPS2 Option 2	LUST, CA LUST, CA HIST LUST	Diesel impacted groundwater. Case closed status granted in 1995. Location at a higher elevation than project site.	Low
	Eagle Painting 645 Hamline Street 0.12-mile NE of TPS2 Option 2	CA LUST, CA HIST LUST, CA HIST Cortese	Gasoline impacted groundwater. Case closed status granted in 2001. Location at a lower elevation than project site.	Low
	Ferron, Inc. 645 W. Hedding Street 0.22-mile SE of TPS2 Option 2	LUST	Gasoline impacted groundwater. Case closed status granted in 1995. Location at a higher elevation than project site.	Low
	John Colendich Automotive 950 Hedding Street 0.24-mile SE of TPS2 Option 2	LUST, CA HIST Cortese, CA HIST LUST, CA CUPA Listings, CA San Jose HAZMAT, CA SWEEPS UST	Gasoline impacted groundwater. Contaminants of concern include benzene, toluene, and xylenes. Status open, remediation under way. Location at a lower elevation than project site.	Low
	McNab Enterprises 1098 Stockton Avenue 0.07-mile NE of TPS2 Option 1; 0.10-mile NW of TPS2 Option 2	CA LUST, CA HIST Cortese, CA HIST LUST, CA CUPA Listings	Gasoline impacted soil only. Contaminated soil was removed and case closed status was granted in 1993.	Low
	Wattis Construction 964 Stockton Avenue 0.07-mile NE of TPS2 Option 2	CA HIST UST, CA LUST, CA CUPA Listings, CA San Jose HAZMAT, CA SWEEPS UST	Gasoline impacted groundwater. Case closed status granted in 2001. The facility has four permitted USTs on site. Site is at a lower elevation than proposed project locations.	Low
TPS2 (Option 3)	Air Systems 381 Stockton Avenue 0.22-mile SW of TPS2 Option 3	LUST, HIST UST, HIST Cortese	Gasoline impacted groundwater. Case closed status granted in 1997. Location at a higher elevation than project site.	Low
	Don Bocci Mobil Service 395 Stockton Avenue 0.21-mile SW of TPS2 Option 3	LUST, SLIC, HIST LUST, HIST Cortese	Gasoline impacted groundwater. Case closed status granted in 2009. Location at a higher elevation than project site.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Farmer's Sheet Metal 725 Lenzen Avenue 0.17-mile SW of TPS2 Option 3	LUST, HIST Cortese, HIST LUST, CUPA Listings, San Jose HAZMAT	Gasoline impacted groundwater. Case closed status granted in 2003. Location at a higher elevation than project site.	Low
	Montgomery Street Property 341 Montgomery Street 0.20-mile SE of TPS2 Option 3	LUST, RCRAGEN-SGN, HIST LUST, EMI, CUPA Listings, San Jose HAZMAT, FINDS, HIST Cortese, HAZNET	Gasoline impacted groundwater. Case closed status granted in 2001. Location at a higher elevation than project site.	Low
	PG&E 650 Lenzen Avenue 0.08-mile SW of TPS2 Option 3	SPILLS, NFRAP	A preliminary assessment was conducted in January of 1987. No further action required status granted in February 1987.	Low
	PG&E 655 Lenzen Avenue 0.09-mile SW of TPS2 Option 3	LUST, HIST Cortese, HIST LUST	Gasoline impacted groundwater. Case closed status granted in 1999. Site is at a higher elevation than project site.	Low / Medium
	Serpa Property 435 Stockton Avenue 0.16-mile SW of TPS2 Option 3	LUST, HIST LUST	Gasoline impacted groundwater. Case closed status granted in 2002. Location at a higher elevation than project site.	Low
	Southern Pacific Transport Company 595 Lenzen Avenue 0.05-mile SW of TPS2 Option 3	LUST, RCRAGEN-SGN, HIST LUST	Gasoline impacted soil only. Case closed status granted in 1997. Location at a higher elevation than project site.	Low / Medium
	Tim's Auto Trim 369 Stockton Avenue 0.23-mile SE of TPS2 Option 3	LUST, HIST LUST	Gasoline impacted groundwater. Case closed status granted in 2001. Location at a higher elevation than project site.	Low
	Unocal 500 Stockton Avenue 0.17-mile SW of TPS2 Option 3	LUST, HIST LUST, HIST Cortese, CUPA Listings, San Jose HAZMAT	Gasoline impacted groundwater. Case closed status granted in 1998. Site is at a higher elevation than proposed project site.	Low
PS7	No sites were reported within 0.25-mile of PS7	NA	NA	NA
PS7 Variant A and B[b]	Almaden Property 1545 Almaden Road 0.20 mile SE of PS7 Variant A/B	RWQCB	Former USTs for volatile organic compound storage. Case closed in 1997 after soil remediation.	Low
	Smith Properties 1545 Almaden Avenue 0.24 mile SE of PS7 Variant A/B	RWQCB	Cleanup program site. Case closed in 1993.	Low
	Mids X-Ray/Louis Used Fixer 150 Goble Lane 0.23 mile SE of PS7 Variant A/B	DTSC	Site formerly stored silver in photographic solution. Case closed 1999.	Low
	Sprig Electric 1303 Lick Avenue 0.08 mile N of PS7 Variant A/B	RWQCB	LUST Cleanup site. Case Closed in 1994.	Low

TPF No.	Sites Within 0.25-Mile of TPF Locations	Reported Databases[a]	Reported Contamination	Level of Concern
	Arco Facility 545 W. Alma Avenue 0.21 mile SW. of PS7 Variant A/B	RCRA/RWQCB	Gasoline Station/ LUST cleanup site. Removal actions. Ongoing monitoring and remediation with monitoring wells between site and PS7 Variant Locations.	Medium
	Lee's Diesel Service 1125 Lelong Street 0.11 mile W of PS7 Variant A/B	RCRA	General Automotive Repair Facility.	Low

[a] Reported Databases:

CERCLIS	=	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Listing
CUPA Listings	=	Listing of sites included in the County's Certified Unified Program Agency database
ENVIROSTOR	=	Department of Toxic Substances Control's Site Mitigation and Brownsfield Reuse Program's database of sites with known contamination or that may require additional investigation
ERNS	=	Emergency Response Notification System
HIST Cal-Sites	=	Listing containing known and potential hazardous substance sites
HIST Cortese	=	Sites designated by the State Water Resource Control Board and the Department of Toxic Substances Control
HIST LUST	=	Listing of open and closed LUST sites
LUST	=	Leaking Underground Storage Tank
NFRAP	=	No Further Remedial Action Plan
NPL	=	National Priorities List
PS	=	Paralleling Station
RCRACOR	=	Resource Conservation and Recovery Act - Corrective Action
RCRAGEN-LGN	=	Resource Conservation and Recovery Act - Large Quantity Generator
RCRAGEN-SGN	=	Resource Conservation and Recovery Act - Small Quantity Generator
RCRAGEN-VGN	=	Resource Conservation and Recovery Act - Conditionally Exempt Generator
RCRANLR	=	Resource Conservation and Recovery Act - No Longer Reporting
RCRA–Transporter	=	Resource Conservation and Recovery Act - Transporter of RCRA materials
RCRA-TSD	=	Resource Conservation and Recovery Act - Treatment, Storage and Disposal Facilities
San Jose HAZMAT	=	San Jose hazmat facilities
San Mateo County Bl	=	San Mateo County database for hazardous materials business plans, hazardous waste generators, and Underground Storage Tanks
SLIC	=	Spills, Leaks, Investigations and Cleanup
SPILLS	=	California Regional Water Quality Control Board sites that have had spills, leaks, investigations, and cleanups.
STATE	=	Sites listed in the Department of Toxic Substance Control database
SWEEPS UST	=	Statewide Environmental Evaluation and Planning System
SWL	=	Solid Waste and Landfill
SWS	=	Switching Station
TPF	=	Traction Power Facility
TPS	=	Traction Power Substation
UST	=	Underground Storage Tank
VCP	=	Voluntary Cleanup Program

[b] Search done using DTSC Envirostor search, USEPA Enviromapper search, and SWRCB Geotracker search instead of EDR database search.

- Medium level concern sites are sites that are open with soil contamination and located within 0.125 mile of the proposed TPF locations (not immediately adjacent or within the project footprint). This designation was also given to higher elevation (to proposed project locations) sites with closed case groundwater contamination within a 0.125 mile from proposed TPF locations.
- Low level concern sites are sites with a low likelihood of impacting the proposed Project. These include closed contaminated soil sites within 0.125 mile or case closed groundwater sites located between 0.125 mile and 0.25 mile from proposed TPF locations.

Closed soil contamination sites located beyond 0.125 miles from proposed project locations were not included in the analysis due to their negligible probability of impacting construction of proposed TPF.

OCS pole locations are not analyzed in Table 3.8-1 but, as noted above, those locations may be affected by soil or groundwater that has been affected by historic train operations or by hazardous material or petroleum products from adjacent commercial or industrial activity.

Proximity to Airports and Airstrips

~~None of the~~ Several of the proposed traction power facilities and some portions of the OCS pole alignment would be located within an airport land use plan or Airport Influence Area (AIA) ~~with the exception of~~ including potential sites for TPS2 and OCS poles along the ROW near the Norman Y. Mineta San Jose International Airport (SJIA) and potential sites for TPS1 and PS3 and OCS poles along the ROW near the San Francisco International Airport (SFO).

TPS2 Options 1 and 2, ~~which~~ would be located approximately 700 feet south of SJIA ~~the Norman Y. Mineta San Jose International Airport (1701 Airport Boulevard, San Jose)~~. TPS2 Option 3 is located approximately 1 mile southeast of the same airport. All three proposed locations, their connections to the PG&E substation, duct banks and OCS poles nearby along the ROW are located within the airport's AIA (City of San Jose 2013).

TPS1 would be located approximately 1.3 miles north of San Francisco International Airport and PS3 would be located approximately 1.5 miles south of the airport. ~~Although~~ TPS1 and PS3 and the OCS alignment from the northern part of South San Francisco to the northern part of San Mateo would be located ~~within 2 miles of a public airport, none would be~~ within the airport's AIA.

Other airports in the vicinity of the proposed Project, but not located within 2 miles of any proposed TPF, are listed below.

- Moffett Federal Airfield – 158 Cody Road, Mountain View.
- San Carlos Airport – 620 Airport Drive, San Carlos.
- Palo Alto Airport – 1925 Embarcadero Road, Palo Alto.

Emergency Response Plans

San Francisco County

The City and County of San Francisco Department of Emergency Management develops, administers and maintains the *Emergency Response Plan* for the City and County of San Francisco and assists other city departments in the development and execution of their emergency response and recovery plans (City and County of San Francisco 2013).

San Mateo County

The Sherriff's Office of Emergency Services (OES) provides planning and training services to all cities in San Mateo County (San Mateo County 2012b). The OES oversees compliance with the Standardized Emergency Management System (SEMS) and provides ongoing training programs to all cities using the SEMS. Additionally, the OES implements the *San Mateo County Emergency Operations Plan* (EOP). The EOP implements a four phase approach to emergency management involving mitigation, preparedness, response, and recovery.

Santa Clara County

The Santa Clara County Emergency Services Department (ESD) is responsible for coordinating and planning for disaster response (Santa Clara County 1994). According to the Santa Clara County General Plan DEIR (1994), Public Services chapter, the County counts on an Emergency Operations Center (EOC) that serves as the agency coordination center during times of disaster. The ESD's goal is to establish crisis management and return to normalcy as quickly as possible. The ESD is in contact with all county agencies and is constantly updating its preparedness based upon changes in demographics.

Caltrain Passenger Train Emergency Preparedness Plan

In accordance with federal regulations (49 CFR Part 238, Passenger Train Emergency Preparedness), Caltrain prepares and periodically updates an emergency preparedness plan, most recently in February 2013. The plan covers the following topics related to emergencies: communications, employee training and qualifications, joint operations, special circumstances, liaison with emergency responders, on-board emergency equipment, passenger safety information, handling passengers with disabilities, passenger train emergency simulations, debriefing and critiques, emergency exists, and operation (efficiency) tests.

Because the Caltrain ROW does not currently contain an OCS, the plan does not address any OCS issues. As part of the Proposed Project, the preparedness plan would be updated as necessary to address any potential electrical safety emergency requirements.

BART Emergency Response Plan for Millbrae Transit Center

Similar to Caltrain, BART also prepares emergency preparedness plans in accordance with federal regulations that cover the same topics as those articulated above for Caltrain.

Wildland Areas

The proposed project is not located within a wildland area and, therefore, not considered to be a high fire risk (California Department of Forestry and Fire Protection 2012).

3.8.2 Impact Analysis

3.8.2.1 Methods for Analysis

The following impact analysis is based on an evaluation of onsite and adjacent land conditions and the likelihood or ability of these conditions to affect components of the proposed Project. Based upon the existing conditions described above, the impact analysis assesses the direct and indirect impacts related to hazards and hazardous materials and determines whether the proposed Project would exceed a threshold listed below.

3.8.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.
- Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment.
- Implementation of the proposed Project would—for a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport, public use airport, or private airstrip—result in a safety hazard for people residing or working in the project corridor.
- Implementation of the proposed Project would impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.
- Implementation of the proposed Project would expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

3.8.2.3 Impacts and Mitigation Measures

Due to the highly industrialized and commercial nature of portions of the project area, it is possible that soil and/or groundwater contamination exists in various locations throughout the project corridor. Consequently, construction activities related to the proposed Project could encounter contaminated soil and/or groundwater. Additionally, it is expected that existing conditions at most contaminated sites encountered during implementation of the proposed Project would be typical of properties in urbanized areas where there is a history of industrial use. Low levels of pesticides/herbicides could be present due to past weed and pest control activities. The presence of low-level contamination of this nature could warrant worker health and safety and material management.

As mentioned in the Section 3.8.1.2, *Environmental Setting*, rail operations are a potential source of contamination and can be a concern along the entire 51-mile corridor. Hence, the Caltrain ROW is considered an area where there is a probability of encountering hazardous wastes. Consequently, mitigation measures have been developed to address possible contamination encountered during implementation of the proposed Project and are discussed under the appropriate thresholds below.

None of the Project Variants described in Chapter 2, *Project Description*, would result in any changes to the impact analyses presented below because they would not introduce new facilities in new areas not already analyzed for hazard impacts of the Proposed Project and would not result in additional handling of hazardous materials compared to No Project conditions. Project Variant 1 would have less construction overall than the Proposed Project and thus less potential for hazard impacts associated with construction.

Impact HAZ-1	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials
Level of Impact	Less than significant

Construction

Project construction would involve routine transport, use, and disposal of hazardous materials such as fuels, solvents, paints, oils, grease, and caulking. Such transport, use, and disposal must be compliant with applicable regulations such as the RCRA, DOT Hazardous Materials Regulations, and the local Certified Unified Program Agency regulations. Although small amounts of fuels solvents, paints, oils, grease, and caulking would be transported, used, and/or disposed of during the construction phase, these materials are typically used in construction projects and would not represent the transport, use, and disposal of acutely hazardous materials.

Also, it is expected that handling and storage of fuels and other flammable materials during construction would follow Cal OSHA and local standards for fire protection and prevention. These measures include appropriate storage of flammable liquids and prohibition of open flames within 50 feet of flammable storage areas.

Consequently, no significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials during construction of the proposed Project is anticipated.

Operations

Maintenance activities conducted during Proposed Project operations could result in operational impacts; however, because Proposed Project implementation would consist of replacement of diesel trains with electrically powered trains, spills of hazardous materials and/or petroleum products are less likely to occur than under current conditions. EMUs do contain batteries containing hazardous materials, which are self-contained and would only be handled in maintenance areas. However, hazardous materials releases could occur during routine track maintenance.

Hazardous materials such as battery acids in the transformers or sulfa-hexafluoride gas insulation materials would be stored in TPFs. These materials would be a hazard if a spill or an equipment chamber rupture were to occur. While many of these materials are commonly used, they are considered hazardous materials (fuels, for example, are flammable) based on their physical properties, and improper handling could endanger workers and the public or result in contamination of soil and/or water.

As mentioned above, operational activities would generate hazardous material waste due to the use of lubricants, solvents, and other materials. Hazardous waste generated by the operations of the Proposed Project would be managed according to all applicable regulatory requirements, which would minimize the exposure risk to all Caltrain personnel and the surrounding environment. Therefore, the proposed Project operation would not result in a significant hazard to the public or to the environment through the routine transport, use, or disposal of hazardous materials. This impact would be less than significant and no mitigation is required.

Impact HAZ-2	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment
Level of Impact	Significant
Mitigation Measures	HAZ-2a: Conduct a Phase II Environmental Site Assessment prior to construction HAZ-2b: Implement engineering controls and best management practices during construction
Level of Impact after Mitigation	Less than significant

Construction

As described under Impact HAZ-1, typical construction-related hazardous materials would be used during construction of the proposed Project, including gasoline, diesel, oil, other vehicle-related fluids, paints, solvents, and metals. It is possible that any of these substances could be released during construction activities. However, as described previously, compliance with federal, state, and local regulations, in combination with construction best management practices (BMPs) and implementation of a Stormwater Pollution Prevention Plan (described further in Section 3.9, *Hydrology and Water Quality*), would ensure that all hazardous materials are used, stored, and disposed properly, which would minimize potential impacts related to a hazardous materials release during construction activities.

The proposed Project TPF locations lie within areas that are highly industrialized and commercial in nature. Contaminants of concern along the Caltrain ROW include arsenic, lead, and total petroleum hydrocarbons. Consequently, construction activities could encounter soil and/or groundwater contamination. Construction of TPF for the proposed Project would not require deep excavations or disturbance of large amounts of soil. Although support structures for the larger TPFs (i.e., primary substation) would cover an approximate horizontal area of 150 by 200 feet, excavations for proposed Project facilities would remain relatively shallow. OCS pole foundations would be placed 15 feet below ground surface (bgs), and pole foundation excavations would be 3 feet in diameter. With implementation of appropriate mitigation measures, the potential for large-scale releases of contaminants is unlikely. As mentioned in Section 3.9, *Hydrology and Water Quality*, groundwater is shallow (generally ranging from 10 to 20 feet bgs) in various locations along the Caltrain corridor and, thus, encountering contaminated groundwater would be a concern during construction of the proposed Project. Dewatering within existing contaminated areas could increase the migration of contaminants to surface water and other groundwater zones along the alignment.

As mentioned below in Mitigation Measures HAZ-2a and HAZ-2b, prior to construction, the potential presence of contaminants in soil and groundwater will be investigated using conventional drilling, sampling, and chemical testing methods. Based on the chemical test results, a mitigation plan will be developed to establish guidelines for the disposal of contaminated soil and discharge of contaminated dewatering effluent, and to generate data to address human health and safety issues that may arise as a result of contact with contaminated soil or groundwater during construction. JPB will be required to provide a copy of this plan to the DTSC for review and approval prior to starting work on the Proposed Project.

Operations

As mentioned in Impact HAZ-1, operational activities would generate hazardous material waste due to the use of lubricants, solvents, and other materials. Hazardous waste generated by Proposed Project operations would be managed according to all applicable regulatory requirements, which would minimize the exposure risk to all Caltrain personnel and the surrounding environment. Additionally, it is expected that proposed Project infrastructure would be constructed with engineering controls to limit and contain releases and spills, thus further minimizing the potential for operational impacts.

Mitigation Measure HAZ-2a: Conduct a Phase II Environmental Site Assessment prior to construction

Prior to construction, a Phase II Environmental Site Assessment (ESA) will be prepared for portions of the proposed Project located within areas with a high likelihood of contaminated media by a qualified environmental consultant. The Phase II ESA will include but not be limited to the following.

- A scope of work consisting of Pre-Field Activities, such as preparation of a Health and Safety Plan (HASP), marking boring locations and obtaining utility clearance, and Field Activities, such as identifying appropriate sampling procedures, health and safety measures, chemical testing methods, and quality assurance/quality control (QA/QC) procedures in accordance with the ASTM Standard.
    - The HASP will include, but is not limited to;
        - Potential project hazards analysis
        - Personal Protective Equipment (PPE) discussion
        - Exposure monitoring
        - Emergency response actions
        - Hospital route directions
- Necessary permits for well installation and/or boring advancement.
- A Sampling and Analysis Plan (SAP) in accordance with the scope of work.
- Completion of a Risk Assessment if deemed necessary.
- Laboratory analyses conducted by a State-certified laboratory.
- Disposal process including transport by a State-certified hazardous material hauler to a State-certified disposal or recycling facility licensed to accept and treat hazardous waste.

Mitigation Measure HAZ-2b: Implement engineering controls and best management practices during construction

During construction the contractor will employ use of engineering controls and BMPs to minimize human exposure to potential contaminants. Engineering controls and construction BMPs will include but not be limited to the following.

- Contractor employees working on site will be certified in OSHA's 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training.
- Contractor will monitor area around construction site for fugitive vapor emissions with appropriate field screening instrumentation.
- Contractor will water/mist soil as its being excavated and loaded onto transportation trucks.
- Contractor will place any stockpiled soil in areas shielded from prevailing winds.
- Contractor will cover the bottom of excavated areas with sheeting when work is not being performed.

Impact HAZ-3	Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school
Level of Impact	Less than significant

As mentioned in Section 3.8.1.2, *Environmental Setting*, there are three schools within 0.25 mile of ~~two~~ three of the proposed TPF locations. Two are located approximately 0.125 mile west of the proposed PS3 Option 1 location and 0.21 mile west of the PS3 Option 2 location. The third school is located approximately 0.175 mile south of the proposed PS6 Option 2 location.

Construction

Although the implementation of the proposed Project would involve hazardous materials typical of a construction project (as discussed above under Impact HAZ-1), the proposed Project would be constructed in compliance with federal, state, and local regulations described in Section 3.8.1.1. Additionally, any potential construction-related hazardous releases or emissions would be from commonly used materials such as fossil fuels, solvents, and paints and would not include substances listed in 40 CFR 355 Appendix A: Extremely Hazardous Substances and Their Threshold Planning Quantities. Any such spills would be localized and immediately contained and cleaned. Therefore, construction of the proposed Project would not affect land uses outside of the project footprint, including schools located within one-quarter mile.

Operation

The proposed Project involves the modification of current railroad infrastructure to allow for the electrification of diesel trains. It is not anticipated that the modifications to the current railroad system would alter operational activities in a way that would cause the release any hazardous materials. Similar to the construction impacts above, operational activities are not expected to include substances listed in 40 CFR 355 Appendix A: Extremely Hazardous Substances and Their Threshold Planning Quantities, and any hazardous material used is expected to be in the form of a commonly used material such as fossil fuels, solvents, and paints. Additionally, implementation of the Proposed Project would reduce diesel fuel use in train propulsion, making fuel spills smaller, less frequent and easier to contain and remediate. Furthermore, dielectric fluid used at TPS facilities in electrical transformers for cooling and electrical insulation would be fully enclosed in the electrical equipment, making spills and accidental releases highly unlikely. Therefore, operation of the proposed Project would not affect land uses outside of the project footprint, including schools located within 0.25 mile.

Impact HAZ-4	Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.
Level of Impact	Significant
Mitigation Measures	HAZ-2a: Conduct a Phase II Environmental Site Assessment prior to construction HAZ-2b: Implement engineering controls and best management practices during construction
Level of Impact	Less than significant

Construction and Operation

Due to the extent of the project corridor, construction of TPF would be surrounded by numerous sites found in various environmental databases. Table 3.8-1 above summarizes sites located within a 0.25 mile radius of all proposed TPF locations and assigns them a ranking based on their likelihood to impact the proposed Project. It is expected that most industrial, commercial and agricultural facilities that deal with storage, use, and disposal of hazardous materials within all proposed construction areas comply with all appropriate federal, state and local regulations, such as the regulations discussed Section 3.8.1.1, *Regulatory Setting*, to ensure safety of the surrounding public and environment. Additionally, implementation of Mitigation Measures HAZ-2a and HAZ-2b, would further minimize potential impacts from sites included in hazardous materials databases.

Therefore, construction of the proposed project would not create any significant impacts associated with being included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. Impacts would be less than significant.

Impact HAZ-5	Result in an airport-related safety hazard for people residing or working in the project area
Level of Impact	Less than significant

Construction and Operation

San Jose International Airport

The potential locations for TPS2 and portions of the Proposed Project in the Caltrain ROW would be located within 2 miles of Mineta San Jose International Airport and within its AIA. The County of Santa Clara Airport Land Use Commission has set specific height restrictions within Mineta San Jose International Airport AIA. The project area within the AIA is from Scott Boulevard (MP 42.9) in Santa Clara to The Alameda in San Jose just north of the San Jose Diridon Station (MP 47.35). Project facilities in this area include the OCS and the TPS2 substation.

Option 1 and Option 2 for TPS2 would be located in an area with ground elevation of 67 to 72 feet above MSL and the TPS structures would have a maximum height above ground of up to 25 feet for the structures and up to 81 feet for the utility take-off pole (thus a top elevation range of 92 to 153 feet above MSL) which is less than the ~~that has a~~ maximum structure height restriction of 212 feet above mean sea level (MSL) for this part of the AIA. ~~Option 2 and~~ Option 3 would be located in an area~~s~~ with a maximum structure height restriction of 162 feet above MSL. TPS2 Option 3 would be in a location with ground elevation of 79 feet above MSL, and the TPS structures/take-off pole would have a top elevation of 104 to 159 feet above MSL which would be less than the structure height restriction for this location. ~~The maximum height for the TPS structure would be 15 to 18 feet above MSL, which would be within the allowable heights limit.~~

OCS poles near the SJIA would also located within the AIA. Within the portion of the AIA crossed by the OCS, the ground elevations range from 56 to 94 feet above MSL and the OCS poles ~~and within the Caltrain ROW~~ would range from 30 to 50 feet in height above ground for a top elevation of 84 to 144 feet above MSL which is less than the maximum height for most of the project area which ranges from 162 to 212 feet above MSL. There is a small portion of the OCS alignment adjacent to the CEMOF, where the elevation restrictions are approximately 132 feet to 162 feet. In this area, the ground elevation is approximately 80 feet above MSL and thus OCS poles (which range from 30 to 50 feet in height) should be less than the elevation restriction. These would be within the allowable height restrictions for their portion of the AIA and, therefore, would not interfere with any air traffic flight paths or other airport activities. During design, OCS poles for this area will be selected to ensure that the poles comply with all airport safety requirements.

San Francisco International Airport

TPS1 and its alternatives along with PS3 and OCS poles along the ROW from South San Francisco through northern San Mateo would be within the SFO AIA. ~~would be located less than 2 miles from the San Francisco International Airport, but would not be located within this airport's AIA~~. According to the compatibility plan for the airport (City/County Association of Governments of San Mateo County 2012), portions of the Caltrain ROW are located within airport safety compatibility zones. Height restrictions in these zones ~~vary from160 feet~~ are 163 feet above MSL or more in most project areas within the AIA. There are several short areas along the Caltrain ROW where the height restriction is ~~to~~ 100 feet to 150 feet above MSL.

The TPS1 Options 1, 2 and 3 would have ground elevations of 12 to 14 feet above MSL and thus structural/utility take-off pole top heights would reach 37 to 94 feet and the AIA height restriction for these sites is 163 feet above MSL. TPS1, Option 4 would have ground elevation of 17 feet and thus structural/utility take-off pile top heights would reach 42 to 97 feet and the AIA height restriction at this site is 200 feet above MSL The PS3, Option1 and 2 sites are at a ground elevation of 14 feet above MSL, structures at the paralleling stations would be up to 20 feet high with a gantry up to 40 feet high, thus top elevations would range from 34 to 54 feet above MSL, and the AIA height restriction at this site is 163 feet above MSL.

As mentioned above, the maximum OCS poles would range from 30 to 50 feet in height above ground. The AIA height restriction for most of the ROW between the northern part of South San Francisco (MP 8.2) and the northern part of San Mateo (MP 16.9) is 163 feet above MSL or higher. Near I-380, a very small portion of the Caltrain ROW is within an area with a height restriction of 150 feet above MSL. Near the Millbrae Station, a short segment of the Caltrain ROW is within an area with height restrictions of 100 and 150 feet about MSL. OCS poles within the SFO AIA would have ground elevations of 13 to 40 feet above MSL and thus top elevations of 43 to 90 feet above MSL. The OCS near the Millbrae Station would be at a ground elevation of approximately 14 feet above

MSL, with a top elevation of 44 to 64 feet above MSL. Thus all poles ~~and~~ would be within the height restrictions for the SFO AIA. Therefore, OCS poles would not interfere with any air traffic flight paths or other airport activities.

Conclusion

~~The proposed Project consists of electrification of diesel powered trains and construction of the electrical infrastructure to support this conversion. Although construction of electrical infrastructure would occur in areas within 2 miles of public airports, project activities would occur outside of the airport areas. The OCS poles within the Caltrain ROW would range from 30 to 50 feet in height, and would not interfere with any air traffic flight paths or other airport activities.~~

As discussed above, the project features within the Airport Influence Area of SFO and SJIA would not exceed the maximum height restrictions for airport operational safety. Additionally, Caltrain will comply with the notification requirements of appropriate FARs, including FAR Part 77. Therefore, implementation of the Proposed Project would not result in a safety hazard for people residing or working in the project area.

Impact HAZ-6	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan
Level of Impact	Significant.
Mitigation Measures	TRA-1a: Implement construction road Traffic Control Plan
Level of Impact after Mitigation	Less than significant

The proposed Project covers a 51-mile corridor from San Francisco to San Jose and is located within three counties: San Francisco, San Mateo and Santa Clara County. Section 3.8.1.1, *Regulatory Setting*, discusses each county and the various entities assigned to oversee emergency response and evacuation programs. It is expected that implementation of the proposed Project would follow any and all emergency program requirements set forth by the three counties.

Construction

During project construction, it is expected that traffic control plans would be implemented to minimize obstruction, which would help to ensure continued emergency access to the various TPF project sites and nearby properties. The traffic plans would include construction truck marshaling to prevent construction traffic congestion to and from the project sites. Construction activities at grade crossings could potentially interfere with an adopted emergency response plan or emergency evacuation plan by increasing traffic congestion and vehicle wait time. In such cases, implementation of a Traffic Control Plan (Mitigation Measure TRA-1a) discussed in Section 3.14, *Transportation and Traffic*, would reduce impacts to a less-than-significant level. Impacts during construction would be less than significant.

Operations

As mentioned in Chapter 2, *Project Description*, OCS overhead wire heights would vary from approximately 16 feet (in constrained areas) to 23 feet (in unconstrained areas) depending upon clearance requirements of the areas in which wires would be located. According to San Francisco Fire Department vehicle specifications, typical fire engines and fire trucks measure at 11 and 12 feet in height, respectively. Therefore, OCS overhead wires are not anticipated to interfere with emergency vehicle access across the Caltrain ROW.

As discussed in Section 3.14, *Transportation and Traffic*, the Proposed Project would result in significant increases in traffic delays at a number of at-grade crossings along the Peninsula corridor due to increased gate-down time during peak hours, as well as impacts on traffic near some of the Caltrain stations. ~~At these locations, the Proposed Project would implement the Traffic Control Plan (Mitigation Measure TRA-1a). This mitigation measure would reduce traffic impacts at many locations and would include requirements for coordination with local emergency providers to minimize increase in response times as feasible, but the mitigation measure would not reduce all traffic delays to a less-than-significant level.~~ Emergency response times are a function of the conditions between the responder base location and the incident location overall, not only a function of conditions at any one point along the response path. As discussed in Section 3.14, *Transportation and Traffic*, the Proposed Project would substantially reduce overall vehicle miles traveled in the Peninsula corridor by approximately 235,000 miles per day in 2020 and 619,000 miles per day in 2040 (compared with No Project Conditions), which would substantially improve congestion on a broad general basis. Most of the vehicle miles traveled reductions would be during peak hours, which is especially important in reducing congestion. This broad-based congestion improvement is expected to more than offset the localized effects on at-grade crossings and near Caltrain stations and result in a net improvement (compared with No Project Conditions) in the emergency response times and in the ability to evacuate constrained areas by vehicle. Thus the Proposed Project would have a less-than-significant impact overall on emergency response times.

<u>The Project operation would not affect fire department access through the access doors located in the wall between the BART and Caltrain tracks, between San Bruno and Millbrae. Access for the fire department would be maintained as is currently.</u>

Regarding transit station emergency evacuation, as discussed in Section 3.14, *Transportation and Traffic*, the Proposed Project is not expected to substantially increase the ridership of other transit systems on the Peninsula. In specific, relative to No Project conditions, the Proposed Project is projected to result in a slight decrease in BART ridership, a slight increase in Muni Metro (rail) ridership in 2020 but a slight decline in 2040, and a slight increase in VTA light rail ridership. Station evacuation would be primarily a concern for controlled access BART stations and underground Muni Metro stations. There is less concern for evacuation from at-grade Muni Metro and VTA light rail stations and all bus stations and stops given the open architecture of such facilities. While some BART and underground Muni Metro stations may reach capacity due to cumulative transit ridership, the Proposed Project would not result in a significant impact related to evacuation capacity at these locations because the Proposed Project's long-term effect on these systems (e.g., in 2040) would be a slight reduction in ridership.

Impact HAZ-7	Expose people or structures to a significant risk of loss, injury or death involving wildland fires
Level of Impact	Less than significant

Construction and Operations

According to figures "Fire Hazard Severity Zones in SRA" and "Very High Fire Hazard Severity Zones in LRA" for San Francisco, San Mateo and Santa Clara Counties of the Fire and Resource Assessment Program, California Department of Forestry and Fire Protection, the proposed project is not located within a High Fire Risk Area (California Department of Forestry and Fire Protection 2012) as it runs through highly developed areas of San Francisco, Santa Clara and San Mateo counties. An electrical safety zone by for line clearance, including a minimum of 10 feet of vegetation clearance around electrical conductors, would be implemented. Therefore, construction of the Proposed Project would not be located within a high fire risk area and would not expose people or structures to a significant risk of loss, injury, or death involving wildland fires. Consequently, construction and operations related impacts related to wildland fires would not occur.

3.9 Hydrology and Water Quality

3.9.1 Existing Conditions

3.9.1.1 Regulatory Setting

Federal, state, and local regulations related to hydrology and water quality and applicable to the Proposed Project are summarized below.

Federal

This section describes the primary federal regulations related to hydrology and water quality that are applicable to the Proposed Project.

Clean Water Act

The primary federal law governing water quality is the Clean Water Act (CWA) of 1972. The CWA provides for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. The CWA emphasizes technology-based (end-of-pipe) control strategies and requires discharge permits to allow use of public resources for waste discharge. The CWA also limits the amount of pollutants that may be discharged and requires wastewater to be treated with the best treatment technology economically achievable regardless of receiving water conditions. The control of pollutant discharges is established through National Pollutant Discharge Elimination System (NPDES) permits that contain effluent limitations and standards. The U.S. Environmental Protection Agency (EPA) has delegated responsibility for implementation of portions of the CWA, such as Sections 303, 401, and 402 (discussed below), to the State Water Resources Control Board (State Water Board) and the associated nine Regional Water Quality Control Boards (Regional Water Boards).

Section 303(d) and Total Maximum Daily Loads

The State of California adopts water quality standards to protect beneficial uses of waters of the state as required by Section 303(d) of the CWA and the Porter-Cologne Water Quality Control Act of 1969 (Porter-Cologne Act). Section 303(d) of the CWA established the total maximum daily load (TMDL) process to guide the application of state water quality standards (see the discussion of state water quality standards below). In order to identify candidate water bodies for TMDL analysis, a list of water quality–impaired segments is generated by the State Water Board. These stream or river segments are impaired by the presence of pollutants such as sediment and are more sensitive to disturbance because of this impairment.

In addition to the impaired waterbody list required by CWA Section 303(d), CWA section 305(b) requires states to develop a report assessing statewide surface water quality. Both CWA requirements are being addressed through the development of a 303(d)/305(b) Integrated Report, which will address both an update to the 303(d) list and a 305(b) assessment of statewide water quality. The State Water Board developed a statewide 2010 California Integrated Report based on the Integrated Reports from each of the nine Regional Water Boards. The 2010 California Integrated Report was approved by the State Water Board on August 4, 2010, and approved by the EPA on

November 12, 2010. A 2012 California Integrated Report with 303(d) listings is currently in development.

The following impaired water bodies will be crossed by the Proposed Project alignment: San Francisco Bay, Colma Creek, Lower San Mateo Creek, Laurel Creek, San Francisquito Creek, Matadero Creek, Permanente Creek, Stevens Creek, Saratoga Creek, Calabazas Creek, and the Guadalupe River. Section 3.9.1.2, *Environmental Setting*, describes water quality impairments for these water bodies.

Section 401—Water Quality Certification

Section 401 of the CWA requires that an applicant pursuing a federal permit to conduct an activity that may result in a discharge of a pollutant obtain a Water Quality Certification (or waiver). A Water Quality Certification requires the evaluation of water quality considerations associated with dredging or placement of fill materials into waters of the United States. Water Quality Certifications are issued by one of the nine geographically separated Regional Water Boards in California. Under the CWA, the Regional Water Board must issue or waive a Section 401 Water Quality Certification for a project to be permitted under CWA Section 404.

As shown in Table 2-14 in Chapter 2, *Project Description*, the Proposed Project may be required to obtain a Water Quality Certification if permanent facilities or construction disturbance is proposed within state jurisdictional waters.

Section 402—National Pollutant Discharge Elimination System

The 1972 amendments to the Federal Water Pollution Control Act established the NPDES permit program to control discharges of pollutants from point sources (Section 402). The 1987 amendments to the CWA created a new section of the CWA devoted to stormwater permitting (Section 402[p]). EPA has granted the State of California (the State Water Board and Regional Water Boards) primacy in administering and enforcing the provisions of CWA and NPDES. NPDES is the primary federal program that regulates point-source and nonpoint-source discharges to waters of the United States.

NPDES General Permit for Construction Activities

The General NPDES Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ) (Construction General Permit) regulates stormwater discharges for construction activities under CWA Section 402. Dischargers whose projects disturb 1 or more acres of soil, or whose projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 or more acres, are required to obtain coverage under the Construction General Permit. The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP).

As shown in Table 2-14 in Chapter 2, *Project Description*, the Proposed Project will be required to obtain a Construction General Permit for Linear Underground/Overhead Projects (LUPs) because total land disturbance would be greater than 1 acre. Permanent land disturbance for the Proposed Project would include overhead contact system (OCS) poles and traction power facilities and would cover approximately up to 3 acres (2.8 acres).

NPDES General Municipal Stormwater Permit

CWA Section 402 mandates programmatic permits for municipalities to address stormwater discharges, which are regulated under the NPDES General Permit for Municipal Separate Storm Sewer Systems (MS4) (MS4 Permit). Phase I MS4 regulations cover municipalities with populations greater than 100,000, certain industrial processes, or construction activities disturbing an area of 5 acres or more. Phase II (Small MS4) regulations require that stormwater management plans be developed by municipalities with populations smaller than 100,000 and construction activities disturbing 1 or more acres of land area.

The State Water Board is advancing Low Impact Development (LID) in California as a means of complying with municipal stormwater permits. LID incorporates site design, including among other things the use of vegetated swales and retention basins and minimizing impermeable surfaces, to manage stormwater to maintain a site's predevelopment runoff rates and volumes.

The Proposed Project area is located entirely within urban areas from San Francisco south to San Jose, and therefore will be subject to the requirements of San Francisco Bay Region Municipal Regional Stormwater NPDES Permit No. CAS029718 (Order No. R2-2009-0074-DWQ) (SF Bay MS4 Permit) with the San Francisco Bay Regional Water Board, most recently issued on October 14, 2009. Provision C.3 of the SF Bay MS4 Permit is for New Development and Redevelopment projects authorities to include appropriate source control, site design, and stormwater treatment measures in new development and redevelopment projects to address both soluble and insoluble stormwater runoff pollutant discharges and prevent increases in runoff flows from new development and redevelopment projects. This goal is to be accomplished primarily through the implementation of LID techniques including infiltration and biotreatment. The provision also states that "all projects regardless of size should consider incorporating appropriate source control and site design measures that minimize stormwater pollutant discharges to the maximum extent practicable [MEP]…". Regardless of a project's need to comply with Provision C.3, municipalities apply the MEP standard, including standard stormwater conditions of approval for projects that receive development permits.

Waste Discharge Requirements for Dewatering and Other Low Threat Discharges to Surface Waters

CWA Section 402 also includes waste discharge requirements (WDRs) for dewatering activities. While small amounts of construction-related dewatering are covered under the Construction General Permit, the San Francisco Bay Regional Water Board has regulations specific to dewatering activities that typically involve reporting and monitoring requirements.

If dewatering is required as part of the Proposed Project, then the contractor will comply with the San Francisco Bay Regional Water Board dewatering requirements.

Section 404—Dredge/Fill Permitting

The discharge of dredged or fill material into waters of the United States is subject to permitting specified under Title IV (Permits and Licenses) of this act and specifically under Section 404 (Discharges of Dredge or Fill Material) of the CWA. Section 404 of the CWA regulates placement of fill materials into the waters of the United States. Section 404 permits are administered by the U.S. Army Corps of Engineers (USACE).

As shown in Table 2-14 in Chapter 2, *Project Description*, the Proposed Project may be required to obtain a Section 404 Permit if power pole foundations or other permanent project features or construction occurs within federal jurisdictional waters.

National Flood Insurance Program

In response to increasing costs of disaster relief, Congress passed the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The intent of these acts was to reduce the need for large, publicly funded, flood control structures and disaster relief by restricting development on floodplains. The National Flood Insurance Program (NFIP) was created as a result of the passage of the National Flood Insurance Act of 1968. The Federal Emergency Management Agency (FEMA) administers the NFIP to provide subsidized flood insurance to communities that comply with FEMA regulations limiting development in floodplains. FEMA issues Flood Insurance Rate Maps (FIRMs) for communities participating in the NFIP. These maps delineate flood hazard zones in the community. A FIRM is the official map of a community prepared by FEMA to delineate both the special flood hazard areas and the flood risk premium zones applicable to the community.

The NFIP applies to the Proposed Project because portions of the alignment are located within a FEMA-designated 100-year floodplain, as discussed in Section 3.9.1.2, *Environmental Setting.*

State

This section describes the primary state regulations related to hydrology and water quality that are applicable to the Proposed Project.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Act is the basic water quality control law for California. The Porter-Cologne Act authorizes the state to implement the provisions of the CWA. The Porter-Cologne Act establishes a regulatory program to protect the water quality of the state and the beneficial uses of state waters.

The Porter-Cologne Act requires project proponents whose projects would result in discharging, or proposing to discharge, wastes that could affect the quality of the state's water to file a Report of Waste Discharge (RWD) with the appropriate Regional Water Board. The Porter-Cologne Act also requires that State Water Board or a Regional Water Board adopt basin plans for the protection of water quality. Basin plans are updated and reviewed every 3 years and provide the technical basis for determining Waste Discharge Requirements (WDRs), taking enforcement actions, and evaluating clean water grant proposals. A basin plan must include the following sections (San Francisco Bay Regional Water Quality Control Board 2011).

- A statement of beneficial water uses that the Regional Water Board will protect.
- Water quality objectives needed to protect the designated beneficial water uses.
- Strategies and time schedules for achieving the water quality objectives.

The proposed project lies within the jurisdiction of the San Francisco Bay Regional Water Board. The board is responsible for the protection of beneficial uses of water resources in the San Francisco Bay Area, which includes Alameda, Contra Costa, San Francisco, Santa Clara (north of Morgan Hill), San Mateo, Marin, Sonoma, Napa, and Solano Counties. The San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan) was last updated in 2011 (San Francisco Bay Regional Water Quality Control Board 2011).

Regional Water Boards designate beneficial uses for all water body segments in their jurisdictions, and then set criteria necessary to protect these uses. Consequently, the water quality objectives developed for particular water segments are based on the designated use and vary depending on such use. The *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)* specifies region-wide and water body-specific beneficial uses; and has set numeric and narrative water quality objectives for several substances and parameters in numerous surface waters in its region. Specific objectives for concentrations of chemical constituents are applied to bodies of water based on their designated beneficial uses (San Francisco Bay Regional Water Quality Control Board 2011). In addition, the State Water Board identifies waters failing to meet standards for specific pollutants, which are then state-listed in accordance with CWA Section 303(d). If it is determined that waters of the state are impaired for one or more constituents and the standards cannot be met through point-source or non-point source controls (NPDES permits or WDRs), the CWA requires the establishment of TMDLs.

California Department of Fish and Game 1602 Streambed Alteration Agreement

Under Chapter 6 of the California Fish and Game Code, the California Department of Fish and Wildlife (CDFW) is responsible for the protection and conservation of the state's fish and wildlife resources. Section 1602 et seq. of the code defines the responsibilities of CDFW and requires that public and private applicants obtain an agreement to "divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake designated by the CDFW in which there is at any time an existing fish or wildlife resource or from which those resources derive benefit, or will use material from the streambeds designated by the department." A streambed alteration agreement is required under Section 1602 of the California Fish and Game Code for all activities that involve temporary or permanent activities within state jurisdictional waters.

As shown in Table 2-14 in Chapter 2, *Project Description*, the Proposed Project may be required to obtain a Streambed Alteration Agreement if the project permanently or temporarily disturbs the bed or bank of any state streams or other jurisdictional water bodies.

California Department of Pesticides Regulation

California Department of Pesticides Regulation (DPR) is the lead agency for regulating the registration, sale, and use of pesticides in California. It is required by law to protect the environment, including surface waters, from adverse effects of pesticides by prohibiting, regulating, or controlling the use of such pesticides. DPR has surface water and groundwater protection programs that address sources of pesticide residues in surface waters and has preventive and response components that reduce the presence of pesticides in surface and groundwaters. The preventive component includes local outreach and promotion of management practices that reduce pesticide runoff and prevent continued movement of pesticides to groundwater in contaminated areas. In order to promote cooperation to protect water quality from the adverse effects of pesticides, DPR and the State Water Board signed a Management Agency Agreement (MAA). The MAA, and its companion document, *The California Pesticide Management Plan for Water Quality*, are intended to coordinate interaction, facilitate communication, promote problem solving, and ultimately assure the protection of water quality.

Caltrain uses pesticides as part of current operations and maintenance to maintain and clear vegetation from the right of way (ROW). This practice would not change under the Proposed Project. The current and future use of pesticides for vegetation removal near the track alignment and other facilities as part of operation and maintenance activities would be required to comply with DPR regulations.

Coastal and Ocean Working Group of the California Climate Action Team

The Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT) developed the *State of California Sea-Level Rise Guidance Document* for state agencies to incorporate sea level rise (SLR) into planning and decision making for projects in California. The document was developed in response to Governor Schwarzenegger's Executive Order S-13-08, issued on November 14, 2008, which directed state agencies to plan for SLR and coastal impacts. That executive order also requested the National Research Council (NRC) to issue a report on SLR to advise California on planning efforts. The final report from the NRC, *Sea-Level Rise for the Coasts of California, Oregon, and Washington*, was released in June 2012. The *State of California Sea-Level Rise Guidance Document* was last updated in March 2013 with the scientific findings of the 2012 NRC report.

In the CO-CAT SLR guidance document (Coastal and Ocean Working Group of the California Climate Action Team 2013), three SLR projections based on time periods (2030, 2050, and 2100) were selected for south of Cape Mendocino using year 2000 as the baseline. SLR projections based on the *State of California Sea-Level Rise Guidance Document* are described later in this section.

The JPB will use the CO-CAT SLR guidance document for project planning and decision making.

Local

Pursuant to the San Mateo County Transit District's (SamTrans') enabling legislation (Public Utilities Code Section 103200 et seq.) and the 1991 Interstate Commerce Commission's approval of the Joint Powers Board (JPB) acquisition of the Caltrain line, JPB activities within the Caltrain ROW are exempt from local building and zoning codes and other land use ordinances. Nonetheless, the JPB will cooperate with local government agencies in performing improvements within its ROW and protecting local water quality. As such, the description of local water quality regulations is provided for contextual purposes only. Where local implementation of a state or federal regulation is provided (such as relative to the MS4 permits), that guidance is relative to compliance with state or federal regulations.

This section describes local requirements related to hydrology and water quality in the project area. The Proposed Project is located within the counties of San Francisco, San Mateo and Santa Clara. There are also several cities and municipalities with general plan goals and policies, ordinances, and other programs and requirements that are not discussed here.

San Francisco Stormwater Management Program

The San Francisco Public Utilities Commission (SFPUC) has developed stormwater design guidelines that introduce the stormwater performance measures that must be achieved for project approval and provide detailed instructions for developing a Stormwater Control Plan (SCP), a document which will allow city staff to assess compliance.

Approximately 90 percent of San Francisco is served by a combined sewer system that conveys both sewage and stormwater for treatment to three sewage treatment plants before being discharged to receiving water. Discharges from the treatment plants are subject to the requirements of individual NPDES permits for wastewater discharges. The remaining 10 percent of the system consists of stormwater discharges into the San Francisco Bay, Pacific Ocean, Lake Merced or smaller water bodies within the city limits. The stormwater system is regulated by SFPUC, The Port of San Francisco, or various owners of redevelopment areas.

The northernmost portion of the project alignment borders the stormwater system area under the jurisdiction of the Port of San Francisco and a redevelopment area.

San Mateo Countywide Water Pollution Prevention Program

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) is a partnership of the City/County Association of Governments (C/CAG), each incorporated city and town in the county, and the County of San Mateo, which share a common MS4 permit. Each municipality in San Mateo County is responsible for complying with the MS4 permit requirements for stormwater runoff from its streets and local storm drain system. The permit prescribes how each municipality will regulate development and redevelopment projects, conduct its municipal maintenance activities, eliminate non-stormwater discharges, inspect businesses to control stormwater pollutants, and encourage the public's help in preventing pollution.

In order to meet local municipal requirements and requirements in the San Francisco Bay MS4 Permit, the County of San Mateo has developed a *Provision C.3 Stormwater Technical Guidance Handbook* (San Mateo County 2013) to help developers, builders, and project sponsors include post-construction stormwater controls in their projects. The municipalities must require post-construction stormwater controls as part of their obligations under Provision C.3 of the MS4 Permit. The Countywide Program has also prepared a *Sustainable Green Streets and Parking Lots Design Guidebook* to specifically assist municipalities and project applicants with designing street and parking lot projects that treat stormwater runoff in landscape-based treatment measures.

The SMCWPPP Hydromodification Management Plan (HMP) complies with the San Francisco Bay Region MS4 permit. The HMP delineates areas where increases in runoff are most likely to affect channel health and water quality and provides management options to maintain pre-project runoff patterns. As indicated in the HMP, none of the Proposed Project area in San Mateo County is subject to the HMP because it consists of areas that are already extensively impervious (more than 65 percent), low gradient areas, and/or drain to existing hardened channels.

The Proposed Project would be partially located within San Mateo County, and, therefore, the SMCWPPP stormwater requirements and guidelines are relevant to MS4 compliance in San Mateo County (other than the HMP requirements which do not apply).

Santa Clara Valley Urban Runoff Pollution Prevention Program

The Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) is an association of 13 cities and towns in the Santa Clara Valley, Santa Clara County, and the Santa Clara Valley Water District that share a common NPDES permit (Permit No. CAS612008) pertaining to the discharge stormwater to south San Francisco Bay.

The SCVURPPP HMP complies with the San Francisco Bay Region MS4 permit. As indicated in the HMP, none of the Proposed Project area in Santa Clara County is subject to the HMP because it consists of areas that are already extensively impervious (more than 65 percent), drain to tidal areas or existing hardened channels, or are extensively built out (90 to 100 percent, in which a 50-acre threshold applies instead of a 1 acre threshold, which the Proposed Project is well under).

The Proposed Project is partially located within Santa Clara County, and therefore the SCVURPP stormwater requirements and guidelines are relevant to MS4 compliance in San Mateo County (other than the HMP requirements which do not apply).

San Francisco Bay Conservation and Development Commission

The Bay Conservation and Development Commission (BCDC) has regulatory responsibility over development in San Francisco Bay and along the Bay's nine-county shoreline (within 100 feet of the designated Bay). BCDC is guided in its decisions by its law, the McAteer-Petris Act, the *San Francisco Bay Plan*, and other plans for specific areas around the Bay. It is necessary to obtain a BCDC permit prior to undertaking most work in or immediately adjacent the jurisdictional Bay, including tidal portions of waterbodies that flow into San Francisco Bay.

In a BCDC report on SLR (San Francisco Bay Conservation and Development Commission 2011), two SLR projections were presented as the basis for inundation vulnerability assessment: a 16-inch (40-centimeter [cm]) SLR by mid-century and a 55-inch (140-cm) rise in sea level by the end of the century. These projections are relevant because BCDC has jurisdiction within portions of the project area. However, statewide projections presented by CO-CAT are more recent, and, therefore, were used for the purposes of this analysis. More detail is provided in Section 3.9.1.2, *Environmental Setting, Current Flooding Risk.*

Because the project area includes several areas within the 100-foot shoreline band (i.e., at Brisbane Lagoon), a permit from BCDC may be required for portions of the Proposed Project.

3.9.1.2 Environmental Setting

Information for the hydrological setting was obtained from the NES for the Proposed Project (Parsons 2002), the EIS/EIR for the BART to San Francisco International Airport Project, general plans from communities along the project alignment, 100-year floodplain data from FEMA/ESRI Project Hazard website, and BCDC 16- and 55-inch SLR maps for the San Francisco Bay.

Surface Water

Hydrology

The Proposed Project is within the larger San Francisco Bay Hydrologic Region, which includes watersheds that drain directly into the San Francisco Bay, and coastal creek watersheds in San Francisco, San Mateo, and Santa Clara Counties that drain directly to the Pacific Ocean. As shown in Figure 3.9-1, the project area is within the South Bay and Santa Clara watersheds (or California Department of Water Resources [DWR] hydrologic units), both of which ultimately drain to the San Francisco Bay (California Department of Water Resources 2009). Figures 3.9-2a–c shows hydrological features crossed by the Proposed Project alignment and in the surrounding vicinity.

The hydrology in the San Francisco portion of the project alignment is substantially altered from its natural environment, and drainage is accomplished through a network of urban storm drains that flow into San Francisco Bay. There are two surface water features in the vicinity of the Caltrain alignment: China Basin (Mission Creek) and Islais Creek Channel.

In northern San Mateo County, the alignment passes through the Colma Creek drainage basin, which is a narrow alluvial valley, 2–3 miles wide, situated between San Bruno Mountain and the coastal hills. In South San Francisco, the project alignment runs parallel to Colma Creek and then crosses the

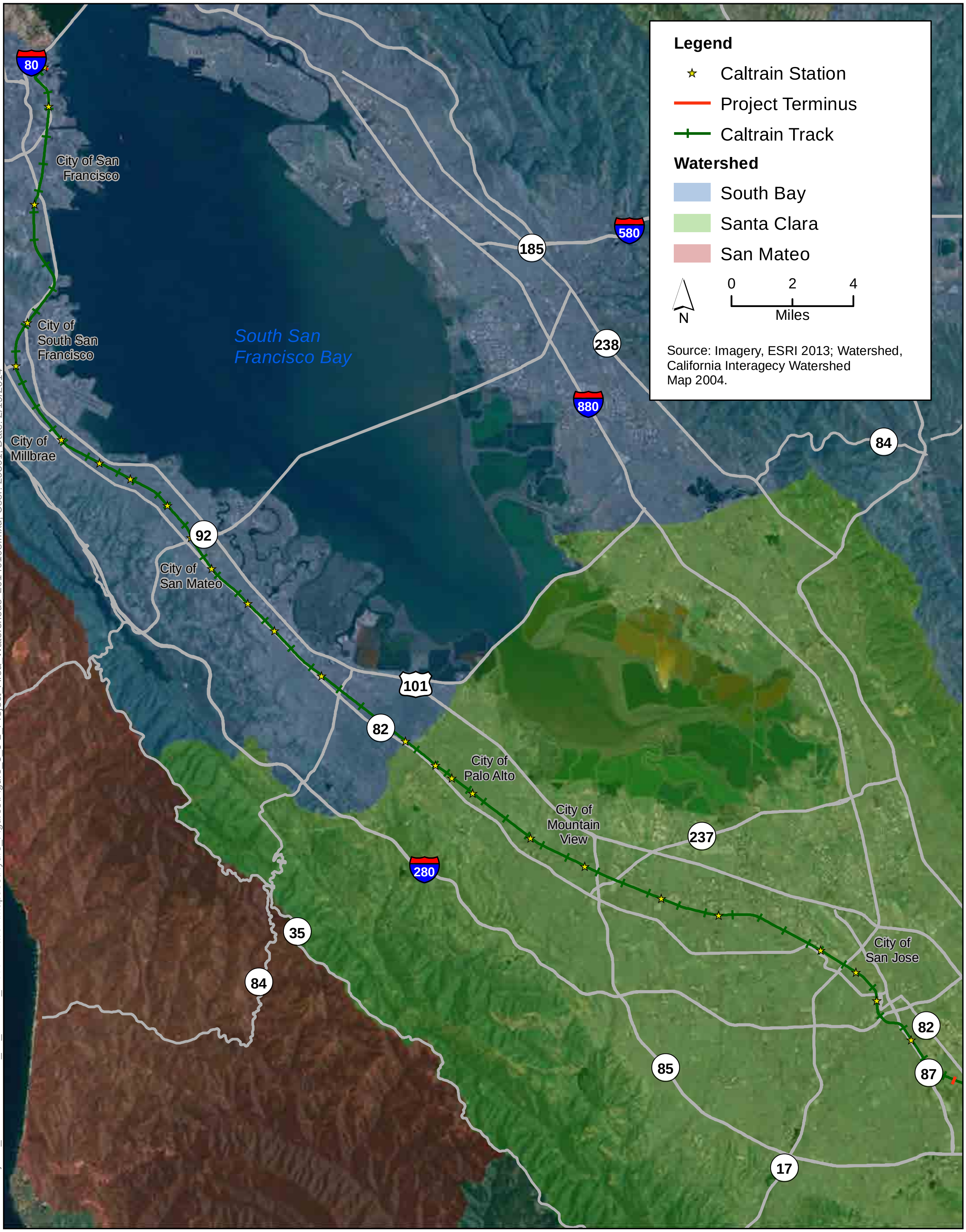

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Figure 3.9-1
Project Area Watersheds
Peninsula Corridor Electrification Project

creek north of Westborough Boulevard in South San Francisco. South of the Colma Creek drainage basin, the alignment passes through heavily urbanized San Francisco Bay flatlands, bounded by San Francisco Bay to the east and mountainous terrain to the west. The alignment runs generally northwest-southeast and parallel to the San Francisco Bay shoreline. The hydrology can be characterized as a series of creeks, channels, and storm drains running generally east-west, allowing water from the mountains' eastern slopes to drain eastward to the Bay. This drainage system has been largely altered from its natural condition and is controlled by a system of storm drains and lined creek beds.

As shown in Figure 3.9-2a–c, the Proposed Project alignment crosses 30 major hydrological features. The alignment also crosses or runs adjacent to inlets of the San Francisco Bay and the Brisbane Lagoon. The streams and rivers crossed by the alignment, from north to south, are listed in Table 3.9-1.

Table 3.9-1. Hydrological Features in the Project Area from North to South

San Francisco 4th and King Station to Burlingame Station	Burlingame Station to Palo Alto Station	Palo Alto Station to Tamien Station
Mission Creek	San Mateo Creek	Matadero Creek
Islais Creek	Unnamed Drainage 5	Barron Creek
Unnamed Drainage 1	Laurel Creek	Adobe Creek
Brisbane Lagoon	Belmont Creek	Permanente Creek
Colma Creek	Pulgas Creek	Stevens Creek
Unnamed Drainage 2	Unnamed Drainage 6	Calabazas Creek
Unnamed Drainage 3	Cordilleras Creek	Saratoga Creek
Unnamed Drainage 4	Arrojo Ojo De Agua	San Tomas Aquinas Creek
Mills Creek	Unnamed Drainage 7	Los Gatos Creek
Easton Creek	San Francisquito Creek	Guadalupe River
Sanchez Creek		

Surface Water Quality

The San Francisco Bay Basin Plan specifies beneficial uses that apply to water bodies within the project area, as shown in Table 3.9-2 (San Francisco Bay Regional Water Quality Control Board 2011).

Table 3.9-2. Beneficial Uses for Surface Waters within the Project Area

Water Body	Designated Beneficial Uses
Central, Lower, and South San Francisco Bay	IND; PROC (Central San Francisco Bay only); COMM; SHELL; EST; MIGR; RARE; SPWN[a]; WILD; REC1; REC2; NAV
San Mateo Creek	FRSH; COLD[a]; RARE; SPWN; WILD; REC1[a]; REC2[a]
San Francisquito Creek	COLD; MIGR; SPWN; WARM; WILD; REC1[a]; REC2[a]
Matadero Creek	COLD; MIGR; SPWN; WARM; WILD; REC1; REC2
Permanente Creek	COLD; SPWN; WILD; REC1; REC2
Saratoga Creek	AGR; FRSH; GWR; COLD; WARM; WILD; REC1; REC2

KEY:
AGR: Agricultural Supply
COLD: Cold Freshwater Habitat
COMM: Ocean, Commercial, and Sport Fishing
EST: Estuarine Habitat
FRSH: Freshwater Replenishment
GWR: Groundwater Recharge
WILD: Wildlife Habitat
WARM: Warm Freshwater Habitat
IND: Industrial Service Supply
MIGR: Fish Migration
NAV: Navigation
RARE: Preservation of Rare and Endangered Species
Supply
REC1: Water Contact Recreation
REC2: Noncontact Water Recreation
SHELL: Shell Fish Harvesting
SPWN: Fish Spawning
PROC: Industrial Process Water Supply

Notes:
[a] Indicates a potential (rather than existing) beneficial use.

The 303(d)-listed impairments for the San Francisco Bay are shown in Table 3.9-3 and are based on the 2010 California Integrated Report (California State Water Resources Control Board 2011).

Table 3.9-3. Water Quality Impairments within the Project Alignment

Water Body	Listed Impairments Per 2006 303(d) List	Potential Sources	EPA TMDL Completion
San Francisco Bay	Chlordane	Nonpoint source	Est. 2013
	DDT (dichlorodiphenyltrichlorothane)	Nonpoint source	Est. 2013
	Dieldrin	Nonpoint source	Est. 2013
	Dioxin compounds (including 2,3,7,8-TCDD (tetrachlorodibenzodioxin)	Atmospheric deposition	Est. 2019
	Furan compounds	Atmospheric deposition	Est. 2019
	Invasive Species	Ballast water	Est. 2019
	Mercury	Atmospheric deposition, industrial point sources, municipal point sources, natural source, nonpoint source, resource extraction	2008
	PCBs and Dioxin-Like PCBs (polychlorinated biphenyls)	Unknown nonpoint source	2008
	Selenium[a]	Industrial point sources, exotic species, and natural sources	2010
	Trash	Illegal dumping, urban runoff/storm sewers	Est. 2021
Colma Creek	Trash	Illegal dumping, urban runoff/storm sewers	Est. 2021
Lower San Mateo Creek	Sediment Toxicity	Unknown	Est. 2021

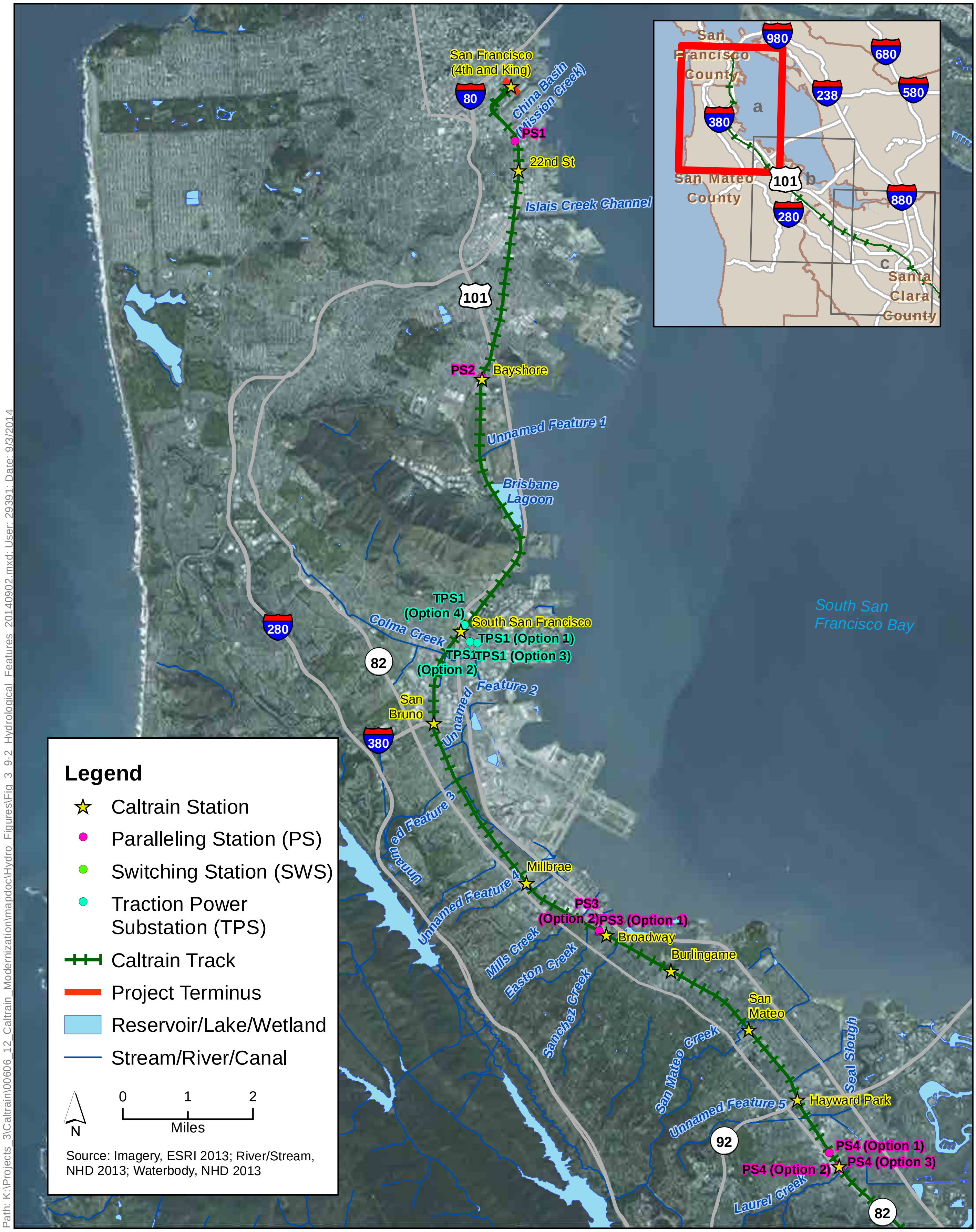

Figure 3.9-2a
Hydrological Features within the Project Area
Peninsula Corridor Electrification Project

Note: This figure replaces Figure 3.9-2a from the Draft EIR

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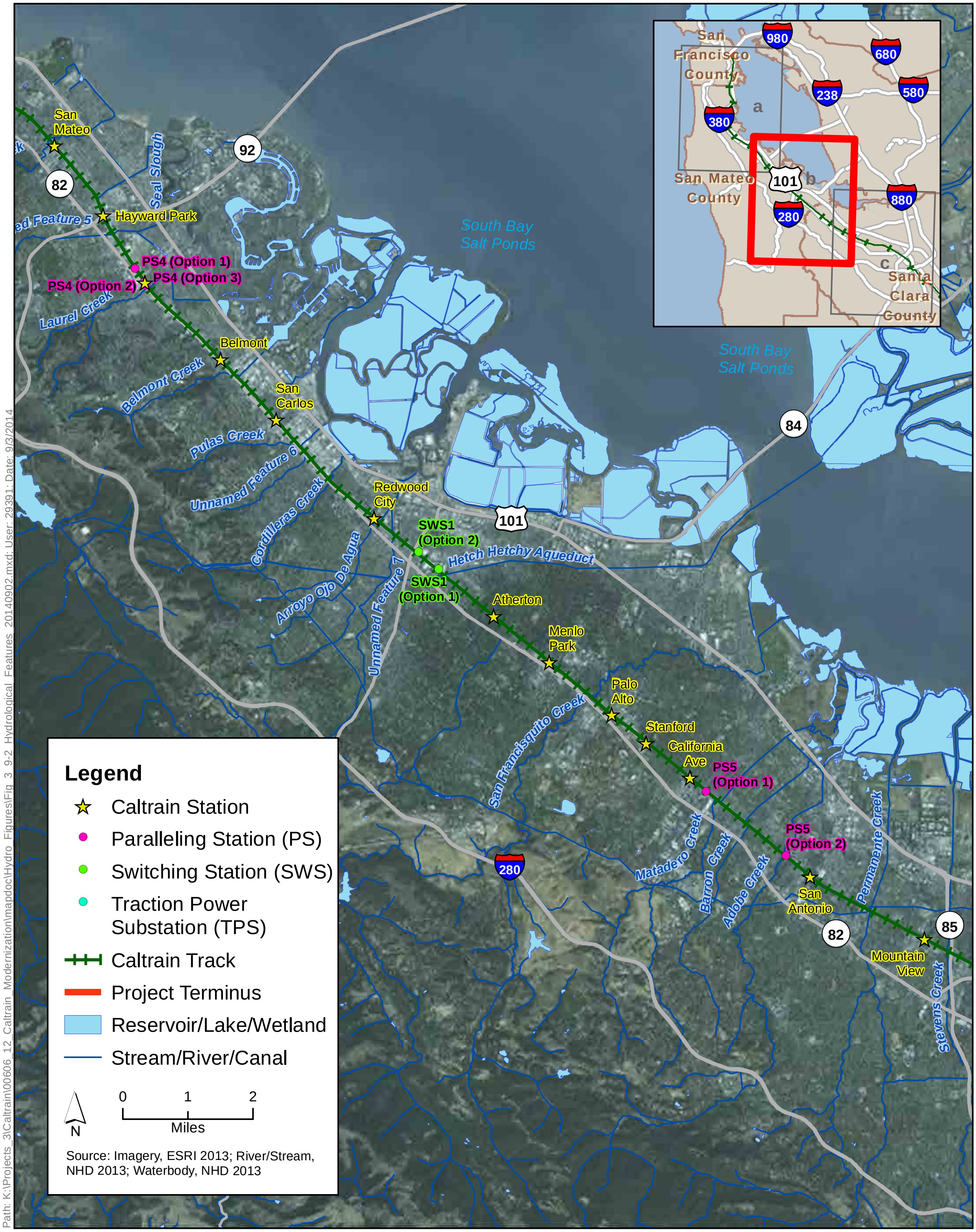

Figure 3.9-2b
Hydological Features within the Project Area
Peninsula Corridor Electrification Project

Note: This figure replaces Figure 3.9-2b from the Draft EIR

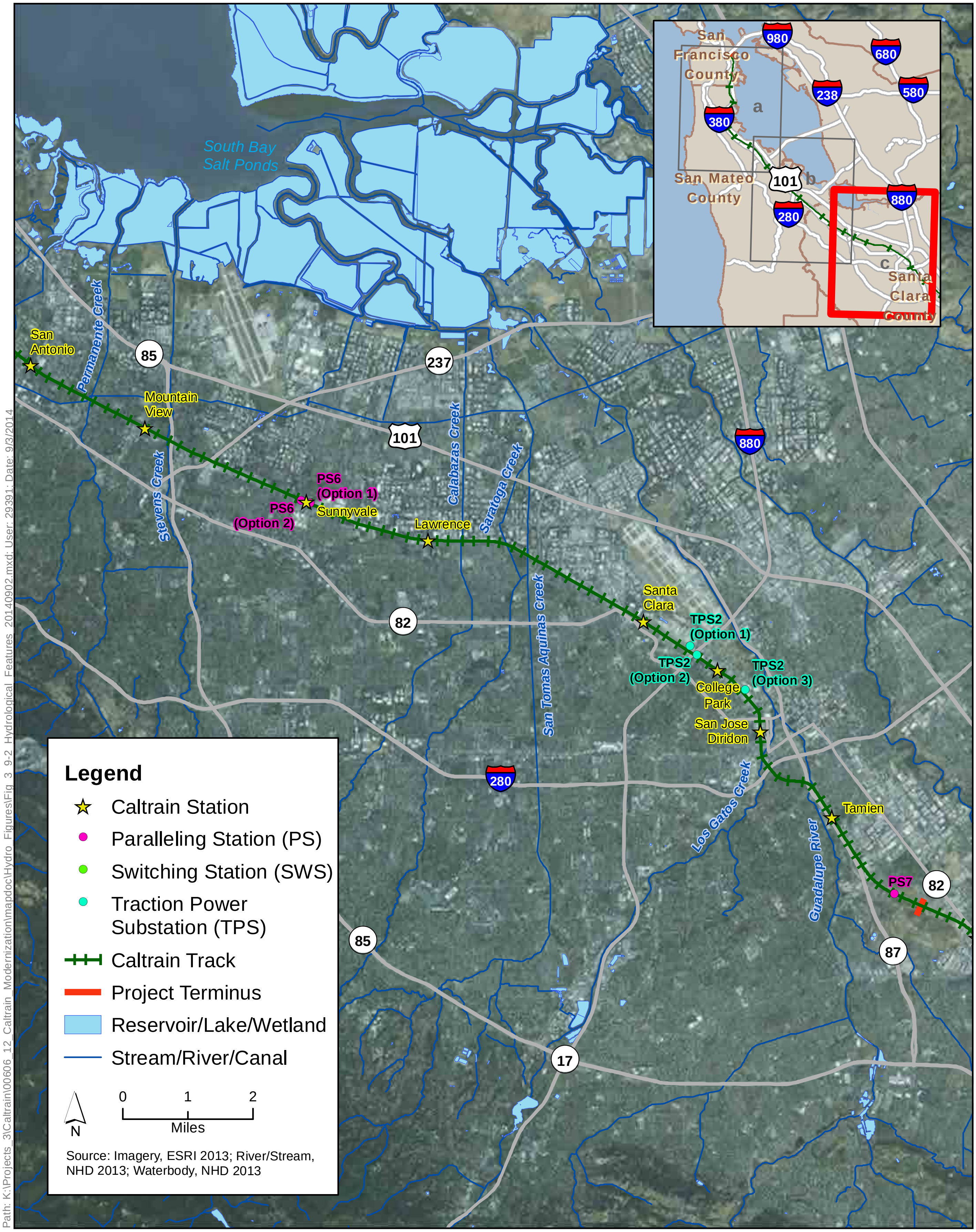

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Figure 3.9-2c
Hydological Features within the Project Area
Peninsula Corridor Electrification Project

Note: This figure replaces Figure 3.9-2c from the Draft EIR

Water Body	Listed Impairments Per 2006 303(d) List	Potential Sources	EPA TMDL Completion
Laurel Creek	Diazinon	Urban runoff/storm sewers	2007
San Francisquito Creek	Diazinon	Urban runoff/storm sewers	2007
	Sedimentation/siltation	Nonpoint source	Est. 2013
	Trash	Illegal dumping, urban runoff/storm sewers	Est. 2021
Matadero Creek	Diazinon	Urban runoff/storm sewers	2007
	Trash	Illegal dumping, urban runoff/storm sewers	Est. 2021
Permanente Creek	Diazinon	Urban runoff/storm sewers	2007
	Total Selenium	Unknown	Est. 2021
	Toxicity	Unknown	Est. 2021
	Trash	Illegal dumping, urban runoff/storm sewers	Est. 2021
Stevens Creek	Diazinon	Urban runoff/storm sewers	2007
	Water Temperature	Channelization, habitat modification, removal of riparian vegetation	Est. 2021
	Toxicity	Unknown	Est. 2021
	Trash	Illegal dumping, urban runoff/storm sewers	Est. 2021
Saratoga Creek	Diazinon	Urban runoff/storm sewers	2007
	Trash	Illegal dumping, urban runoff/storm sewers	Est. 2021
Calabazas Creek	Diazinon	Urban runoff/storm sewers	2007
Guadalupe River	Diazinon	Urban runoff/storm sewers	2007
	Mercury	Mine tailings	2008
	Trash	Illegal dumping, urban runoff/storm sewers	Est. 2021

Source: California State Water Resources Control Board 2011
[a] Limited to the Central and South San Francisco Bay
Est. = estimated completion date

The project area is located entirely within urban areas from San Francisco south to San Jose along the San Francisco Bay, and a majority of the ground surface is covered by pavement (roads and parking lots) and structures (residential and commercial buildings).

Street surfaces are the primary source of pollutants in stormwater runoff in urban areas. Constituents or pollutants in stormwater runoff (e.g., oil and grease, particulates, pesticides, herbicides, animal waste) vary with surrounding land uses, impervious surface area, and topography, as well as with the intensity and frequency of rainfall or irrigation. Stormwater runoff generated at the onset of the wet season, or the *first-flush* typically contains the highest pollutant concentrations. Other common sources of stormwater pollution in urban areas include construction sites, parking lots, large landscaped areas, and household and industrial sites (i.e., pollutants dumped into storm drains). Grading and earthmoving activities associated with new construction can accelerate soil erosion. Grease, oil, hydrocarbons, and metals deposited by vehicles and heavy equipment can accumulate on streets and paved parking lots and are carried into storm drains by runoff. In urban areas, trash and litter can collect in storm drain inlets and ultimately be discharged into nearby waterways. Trash can threaten aquatic life and recreational beneficial uses designated by the Basin Plan. Trash is listed as a 303(d) impairment in the San Francisco Bay (Table 3.9-3). Pesticides, herbicides, fungicides, and fertilizers used for landscape maintenance are washed into storm drains when irrigation exceeds the rate of soil infiltration and plant uptake, or when these chemicals are applied in excess. As shown in Table 3.9-3, chlordane, DDT (no longer permitted for use), and dieldrin are listed as 303(d) impairments in the San Francisco Bay. Paints, solvents, soap products, and other toxic materials may be inadvertently or deliberately deposited in storm drains in residential and industrial areas.

Groundwater

Hydrogeology

The Proposed Project would be located within the San Francisco Bay Hydrologic Region and spans six groundwater basins: Downtown San Francisco; Islais Valley; South San Francisco; Visitacion Valley; Westside; and Santa Clara Valley (California Department of Water Resources 2003) (Figure 3.9-3). Within the Santa Clara Valley basin, the Proposed Project lies within the San Mateo Plain and Santa Clara sub-basins. In general, the freshwater-bearing aquifers in the hydrologic region are relatively thin in the smaller basins, such as Downtown San Francisco, South San Francisco and Visitacion Valley, and moderately thick in the more heavily utilized basins, such as the Santa Clara Valley groundwater basins.

Groundwater use in the San Francisco Bay Hydrologic Region is not a large source of water supply. It accounts for approximately 5 percent (68,000 acre-feet) of the region's estimated average water supply for agricultural and urban uses, and accounts for less than 1 percent of statewide groundwater uses (California Department of Water Resources 2003). Groundwater levels within the project area are typically shallow due to the proximity to the San Francisco Bay.

Groundwater near the Caltrain corridor generally flows eastward toward San Francisco Bay. In the southern portions of South San Francisco and in San Bruno, groundwater is found throughout the year just a few feet below ground surface (bgs); during the rainy season, the level rises above the ground surface in many local depressions, leaving standing water in drainage ditches that can remain for months.

The hydrogeology between San Bruno and Menlo Park is controlled by the distribution of aquifers and aquitards within the alluvium, most of which are continuations of those of Santa Clara Valley. The depth of groundwater along this stretch of the corridor ranges between 10 and 20 feet bgs, although the water table below much of Atherton and Menlo Park is greater than 20 feet bgs.

Two regional aquifer zones have been noted in Santa Clara Valley: an upper aquifer zone and a lower aquifer zone. The upper aquifer zone is divided into several unconfined and confined aquifer systems that are separated by leaky or tight aquitards. For much of the baylands in the vicinity of the corridor, there is a leaky cap of clay approximately 20 feet thick, and the depth to first (shallowest) groundwater is approximately 10 feet bgs. The direction of groundwater flow is northerly and toward the Bay. The primary recharge for the aquifers occurs at the forebay area, located in the Santa Cruz Mountains along the western edge of the groundwater basin, by deep infiltration of stream flows and by artificial recharge from percolation ponds.

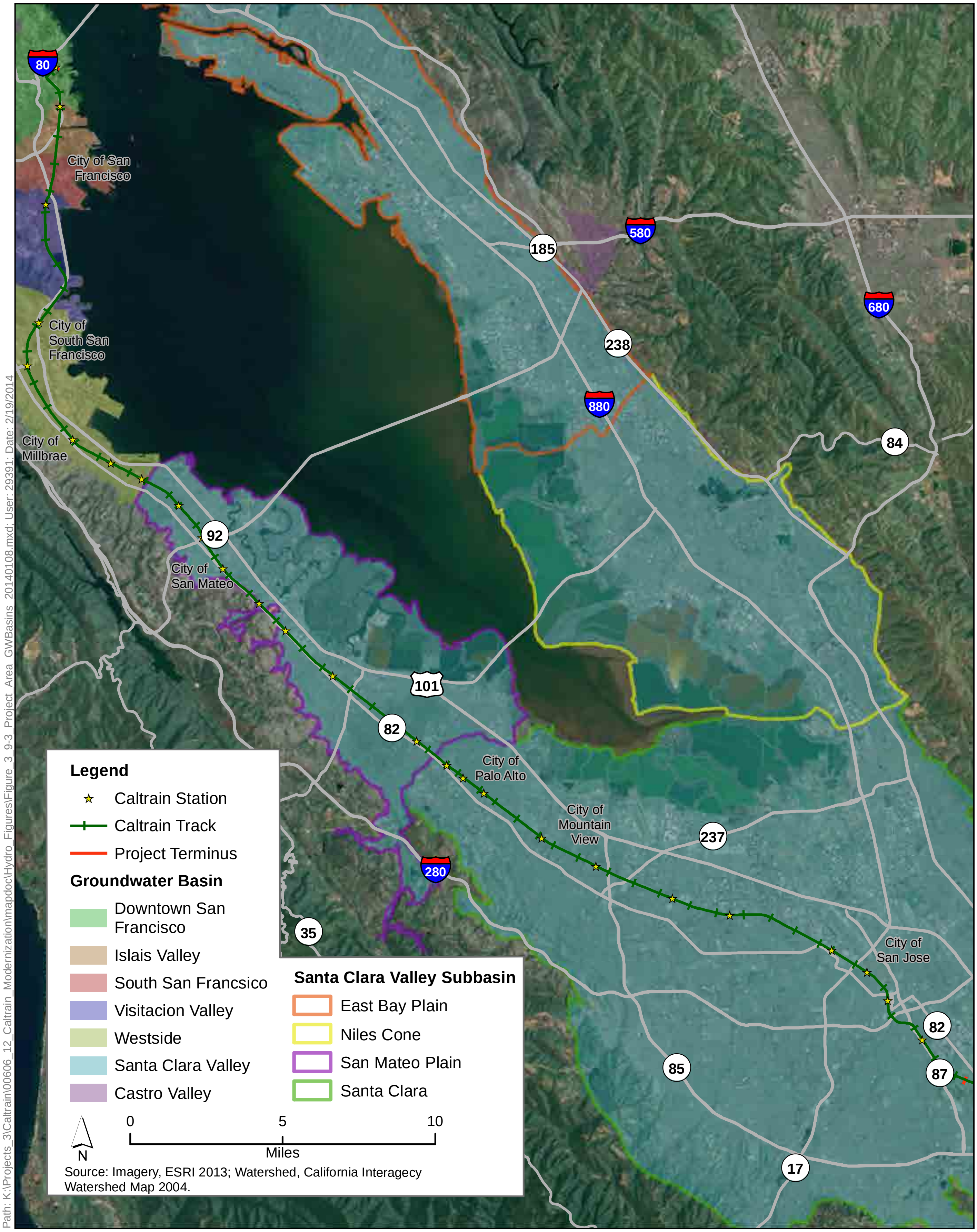

Figure 3.9-3
Groundwater Basins within the Project Area
Peninsula Corridor Electrification Project

Groundwater Quality

In general, groundwater quality throughout most of the San Francisco Bay Hydrologic Region is suitable for most urban and agricultural uses with only local impairments (California Department of Water Resources 2003). The primary constituents of concern in the six groundwater basins within which the project area is located are high total dissolved solids (TDS), chloride, nitrate, and organic compounds.

According to DWR's Groundwater Bulletin 118 (California Department of Water Resources 2003), the areas of high TDS and chloride concentrations are typically found in the San Francisco Bay Hydrologic Region's groundwater basins that are situated close to the San Francisco Bay, such as the northern Santa Clara Valley, Downtown San Francisco, and South San Francisco. Elevated nitrates are found in the Downtown San Francisco, South San Francisco, Visitacion Valley, Westside, and Santa Clara Valley basins. Releases of fuel hydrocarbons from leaking underground storage tanks and spills/leaks of organic solvents at industrial sites have caused minor to significant groundwater impacts in many basins throughout the region. Methyl tertiary-butyl ether and chlorinated solvent releases to soil and groundwater continue to be problematic (California Department of Water Resources 2003). Environmental oversight for many of these sites is performed either by local city and county enforcement agencies, the Regional Water Board, the Department of Toxic Substances Control, and/or the EPA. Table 3.9-4 identifies the designated beneficial uses identified for the six groundwater basins within which the project area is located.

Table 3.9-4. Designated Beneficial Uses for Groundwater in the Project Area

		Designated Beneficial Use[a, b]			
Groundwater Basin	County	MUN	PROC	IND	AGR
Downtown San Francisco	San Francisco	E	P	P	E
Islais Valley A [c]	San Francisco	P	E	E	P
South San Francisco	San Francisco	P	E	E	P
Visitacion Valley	San Francisco and San Mateo	P	E	E	P
Westside A[c]	San Francisco and San Mateo	E	P	P	E
Westside B[c]	San Francisco	P	P	P	E
Westside C[c]	San Mateo	E	P	P	E
Westside D[c]	San Mateo	E	E	E	P
Santa Clara Valley–San Mateo Plain subbasin	San Mateo	E	E	E	P
Santa Clara Valley–Santa Clara subbasin	San Mateo and Santa Clara	E	E	E	E

Source: San Francisco Bay Regional Water Quality Control Board 2011

[a] MUN = Municipal and domestic water supply; PROC = Industrial process water supply; IND = Industrial service water supply; and AGR = Agricultural water supply.

[b] E = Existing beneficial use; P = Potential beneficial use

[c] The existing and potential beneficial uses for groundwater basins listed in the 1995 Basin Plan were assigned to the new groundwater basins based on the geographic location of the old basins compared to the new basins. The basin names, such as Westside A, Westside B, etc., are informal names assigned by the State Water Board to preserve the beneficial use designations in the 1995 Basin Plan and do not represent sub-basins identified by the California Department of Water Resources.

Groundwater objectives consist primarily of narrative objectives combined with a limited number of numerical objectives. The primary groundwater objective is the maintenance of existing high quality groundwater. At a minimum, groundwater shall not contain concentrations of bacteria, chemical constituents, radioactivity, or substances producing taste and odor in excess of the objectives described below unless naturally occurring background concentrations are greater. Under existing law, the San Francisco Bay Regional Water Board regulates waste discharges to land that could affect water quality, including both groundwater and surface water quality. Waste discharges that reach groundwater are regulated to protect both groundwater and any surface water in continuity with groundwater.

Current Flooding Risk

FIRMs prepared by FEMA and interim floodplain maps from the City of San Francisco (City of San Francisco 2008) were reviewed to identify the locations of current 100-year floodplains.

As shown in Figure 3.9-4 and Table 3.9-5, there are a number of areas along the track alignment that are subject to current risk of flooding in a 100-year flood event. In some cases, the tracks are elevated via berms, bridges or other structures, and therefore may not be prone to flood risk although immediately adjacent areas may be subject to flooding. Track elevations were used to determine whether 100-year base flood elevations (BFEs) would be high enough to reach the alignment. BFEs are not provided for some flood zones. Therefore, a method for inferring BFEs was used where BFES were not available. Although some elevated track segments within a 100-year flood zone were determined not to be prone to flood risk, areas surrounding the tracks could be flooded, and therefore access to the tracks may be compromised in these areas.

Potential Inundation due to Tsunami

Portions of lands adjacent to the San Francisco Bay are also at risk due to inundation from a Pacific tsunami. For the most part, the project area runs adjacent to the border of the San Francisco Bay and, as such, portions of the project area adjacent to San Francisco Bay are adjacent to or within a tsunami inundation area. Tsunami inundation maps of San Francisco, San Mateo, and Santa Clara Counties indicate that the portion of the project area most likely to be affected by tsunami inundation would be the northern portion in the following areas: where the track alignment parallels 7th Street, southwest of China Basin in San Francisco; at the land's end of the Islais Creek Channel; and southwest of the Brisbane Marina near Veterans Boulevard in South San Francisco (California Department of Conservation 2013); these areas fall within tsunami inundation areas.

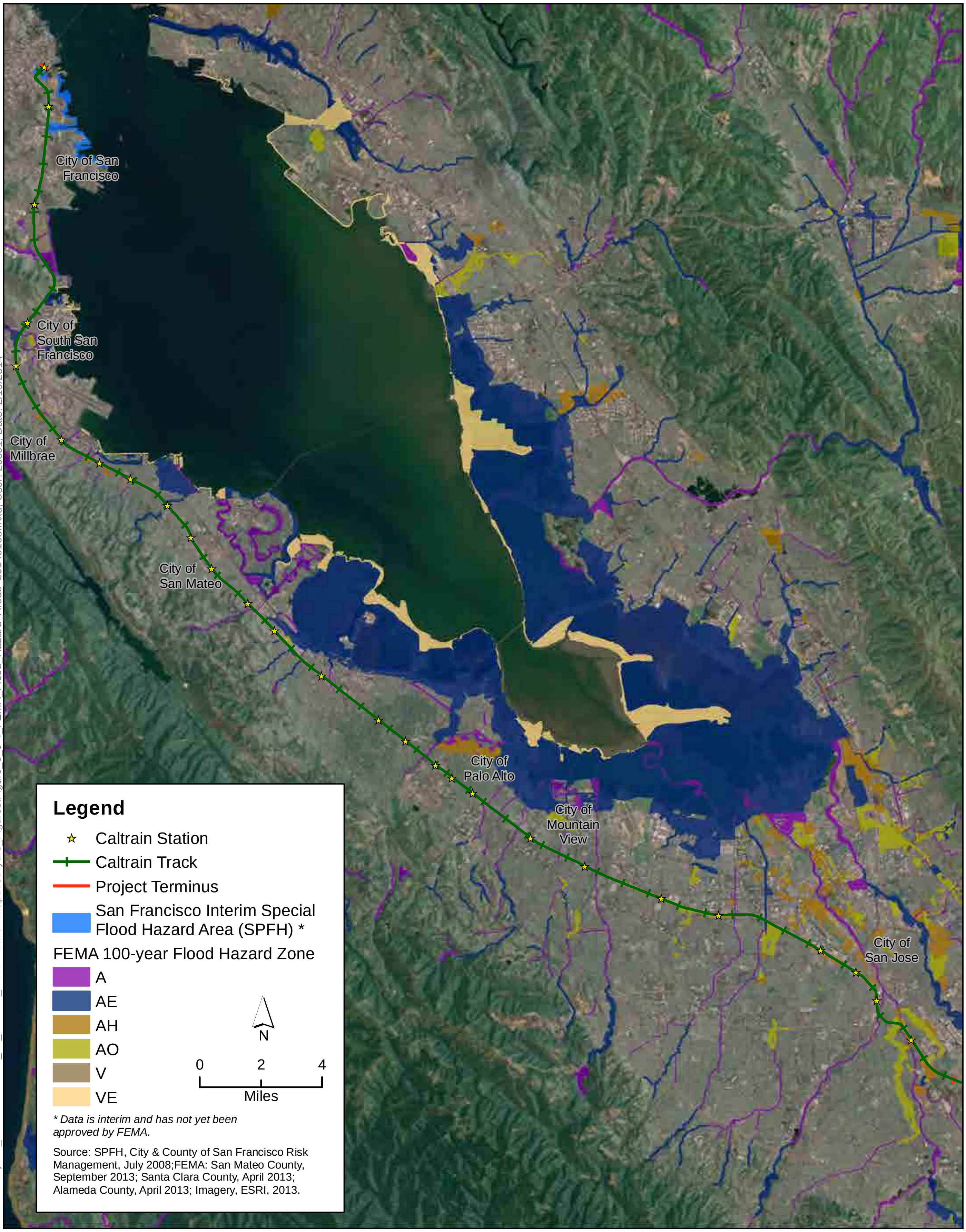

Figure 3.9-4
Flood Hazard Areas within the Project Area
Peninsula Corridor Electrification Project

1 **Table 3.9-5. Current Portions of Caltrain ROW within FEMA-Designated 100-Year Floodplain**

Location	Start MP	End MP	Track Elevation range (feet)[a]	Trackbed Elevation range (feet)[b]	Length of ROW vulnerable to Flooding (miles)	Estimated 100-year flood level(feet)	Potential Flood Risk? (Yes/No)[c]
San Francisco 4th and King Station	0.3	0.6	7.7–12.8	5.5–10.6	0.3	10 feet[d]	Yes
South San Francisco (Colma Creek to north of S. Linden Avenue)	9.8	10.1	12.8–14.5	10.6–12.3	0.3	12 feet	Yes
San Bruno	11.9	12.2	15.0–17.0	12.8–5.8	0.3	17	Yes
Millbrae	12.6	12.8	14.4–17.8	12.2–15.6	0.2	17	Yes
Burlingame (north of Broadway Avenue)	14.5	15.0	15.0–16.0	12.8–13.8	0.5	14	Yes
Sunnyvale[e] (S. Mary Avenue to Calabazas Creek)	37.8	41.3	56.0–97.0	53.8–94.8	3.5	57 to 97	Yes
Santa Clara (San Tomas Aquino Creek to south of Railroad Avenue)	42.3	43.1	55.5–58.0	53.3–55.8	0.8	54 to 55	Yes
Santa Clara/San Jose (South of De La Cruz Boulevard. to near Interstate 880)	44.6	45.3	64.0–67.3	61.8–65.1	0.7	63 to 65	Yes
San Jose (just south of Almaden Expressway)	50.1	50.2	132.9–133.3	130.7–131.1	0.1	131	Yes
TOTAL					**6.7**		
Subtotal (Riverine Flooding)					6.5		
Subtotal (Coastal Flooding)					0.2		

Source: Federal Emergency Management Agency Flood Insurance Rate Maps (areas other than San Francisco); City and County of San Francisco 2008.

[a] Tracks are elevated via berms, bridges and other structures in some locations and, therefore, may not be prone to flood risk even though adjacent areas are in 100-year flood zones. Track elevation ranges were approximated based on PCJPB 2012 Caltrain Trackcharts and Rail Corridor Infrastructure Assets. Vertical datum based on NAVD 88.

[b] Trackbed elevations assumed to be 2.2 feet less than track elevations.

[c] Potential flood risk identified if presumed trackbed elevation is less than flood elevation.

[d] There are no published FEMA maps for San Francisco, so San Francisco preliminary flooding maps (City and County of San Francisco 2008) were used. Flood elevations are the 100-year tide level identified for San Francisco Bay adjacent to the city and do not include wave runup.

[e] Shallow flooding along the Caltrain ROW and adjacent street

Potential Inundation due to Levee or Dam Failure

Based on FEMA mapping, some portions of the Caltrain ROW have the potential for flooding to be reduced because levees are present.

There are a number of dams located in Peninsula watersheds upstream of the Caltrain alignment with the potential to inundate portions of the Caltrain ROW. The primary risk of dam failure is due to seismic activity. All dam owners are required to manage their facilities in line with potential seismic risks by the California Department of Safety and Dams (DSOD). The potential inundation areas (per ABAG 1995) are as follows:

- Burlingame Dam and Crocker Dam: These two dams are in Hillsborough approximately 1.5–1.8 miles southwest of the Caltrain ROW. The potential inundation area along the Caltrain ROW due to failure of these dams would be in the city of Burlingame for several blocks south of Broadway.
- Crystal Springs Dam: This dam is approximately 3.3 miles southwest of the Caltrain ROW. The potential inundation area due to failure of this dam along the Caltrain ROW would be a large portion of the city of San Mateo as well as a small portion of Belmont.
- Laurel Creek Dam: This dam is approximately 1.5 miles southwest of the Caltrain ROW. The potential inundation area due to failure of this dam along the Caltrain ROW would be a small area in the southern part of San Mateo.
- Lower Emerald Dam: This dam is approximately 2.0 miles southwest of the Caltrain ROW. The potential inundation area due to failure of this dam would be a portion of Redwood City (between Woodside and Whipple Ave).
- Searsville, Felt, and Lagunita Dams: These dams are 4.5 miles, 3.2 miles, and 1.5 miles southwest of the Caltrain ROW, respectively. The Lagunita Dam previously held water for Lake Lagunita at Stanford for recreational and water supply purposes; however the lake area is only used to retain water for habitat purposes and thus contains far less water than it used to, on average. The potential inundation area due to failure of the Searsville, Felt, and Lagunita dams includes a southern portion of Menlo Park and a northern portion of Palo Alto.
- Lexington, Elsman, and Anderson Dams: These dams are 10 miles southwest, 12 miles southwest, and 2.2 miles east of the Caltrain ROW, respectively. The Anderson Dam is only 2.2 miles east of the Caltrain ROW in Morgan Hill but is approximately 15 miles from the nearest point of the Proposed Project in San Jose. The potential inundation area due to failure of these dams includes large portions south of and in downtown San Jose.

Future Flooding Risk with Sea Level Rise

Projected SLR as an effect of climate change will increase the areas of coastal flooding along the San Francisco Bay beyond that at present. Table 3.9-6 provides a summary of the SLR projections provided by state and BCDC guidance.

Table 3.9-6. State and Local Sea Level Rise Projections for areas within the Project Vicinity

	CO-CAT SLR guidance document (South of Cape Mendocino)			BCDC Report on Sea Level Rise		
Time Period	Feet[a]	Inches	Centimeters[a]	Feet	Inches[a]	Centimeters[a]
2000–2030	0.13 to 0.98	1.56 to 11.76	4 to 30	--	--	--
2000–2050 (mid-century)	0.39 to 2.00	4.68 to 24.00	12 to 61	1.30	16	40
2000–2100 (end of century)	1.38 to 5.48	16.56 to 65.76	42 to 167	4.58	55	140

Sources: CO-CAT 2013 for South of Cape Mendocino; San Francisco Bay Conservation and Development Commission 2011.

[a] Official projections reported in these units.

Table 3.9-7 shows the portion of the Caltrain ROW that would be subject to 100-year event coastal flooding based on approximately 50 cm and 150 cm SLR, respectively. Future flooding elevations for areas subject to coastal flooding were calculated using the current 100-year tide with the addition of the projected sea level rise in feet. Figure 3.9-5 also shows vulnerability along the corridor to inundation by averaging 100-high water levels at differing levels (0 cm, 50 cm, 100 cm, and 150 cm) of projected future SLR relative to the mean sea level in year 2000 (U.S. Geological Survey 2013). The 50 cm and 150 cm SLR scenarios shown in Figure 3.9-5 and Table 3.9-7 would be slightly less than the high end of the 2050 state projection range (61 cm) and the 2100 state projection range (167 cm) but slightly higher than the BCDC report on SLR projections for 2050 (50 cm) and 2100 (140 cm).

1 **Table 3.9-7. Potential Vulnerability to Coastal Flooding with Sea Level Rise along the Caltrain Alignment (2050/2100)**

Location	Start MP	End MP	Track Elevation (feet)[a]	Trackbed Elevation (feet)[b]	Distance (miles)	100-year tide (feet)[c]	Inferred Flood Risk[d]
Potential Vulnerability to Coastal Flooding with Mid-Century (2050) Sea Level Rise along the Caltrain Alignment (100-year tide, 50 cm SLR)							
San Francisco (4th and King and south)	0.2	0.9	7.7–13.9	5.5–11.7	0.6	11.7	Yes
Brisbane (north of Brisbane Lagoon)	5.8	5.9	13.5–13.9	11.3–11.7	0.1	11.7	Yes
South San Francisco (south of Colma Creek)	9.9	10.1	12.8–13.9	10.6–11.7	0.2	11.7	Yes
San Mateo (19th to 22nd Avenues)	19.2	19.5	13.3–13.9	11.1–11.7	0.6	11.7	Yes
TOTAL (for 2050 Scenario)					**1.5**		
Potential Vulnerability to Coastal Flooding with End of-Century (2100) Sea Level Rise along the Caltrain Alignment (100-year tide, 150 cm SLR)							
San Francisco (4th and King and south)	0.2	1.4	7.7–17.1	5.5–14.9	1.2	14.9	Yes
Brisbane (north of Brisbane Lagoon)	5.5	6.2	13.5–17.1	11.3–14.9	0.7	14.9	Yes
Brisbane/South San Francisco (Brisbane Lagoon to South San Francisco)	6.4	8.9	15.3–17.1	13.1–14.9	2.5	14.9	Yes
South San Francisco (Colma Creek and south)	9.8	10.3	12.8–17.1	12.6–14.9	0.5	14.9	Yes
San Bruno/Millbrae (near SFO)	11.7	12.8	15.2–17.1	13.0–14.9	1.1	14.9	Yes
Millbrae/Burlingame (Millbrae to south of Broadway)	13.4	15.7	14.4–17.1	12.2–14.9	2.3	14.9	Yes
San Mateo (12th Avenue to south of 25th Avenue)	18.6	19.8	13.3–17.1	11.1–14.7	1.2	14.9	Yes
Redwood City (Brewster Ave to south of Broadway)	25.2	25.6	15.9–17.1	13.7–14.9	0.4	14.9	Yes
TOTAL (for 2100 Scenario)					**9.9**		

[a] Track elevations determined per Table 3.9-5. As noted therein, there are many areas where the Caltrain tracks are elevated above adjacent ground and thus tracks may not be subject to flooding that will affect adjacent areas. However, access to tracks may be impeded in adjacent areas.

[b] Trackbed elevations assumed to be 0.8 feet less than track elevations.

[c] Future 100-year tide levels determined by adding 50 cm (20 inches) for the 2050 scenario and by adding 150 cm (59 inches) for the 2100 scenario to the current 100-year tide levels of approximately 10 feet for adjacent area of San Francisco Bay. Wave runup is not included.

[d] Potential flood risk determined by comparison of coastal flooding elevation to trackbed to estimate flood risk to track bed.

cm = centimeters

MP = milepost

SFO = San Francisco International Airport

SLR = sea level rise

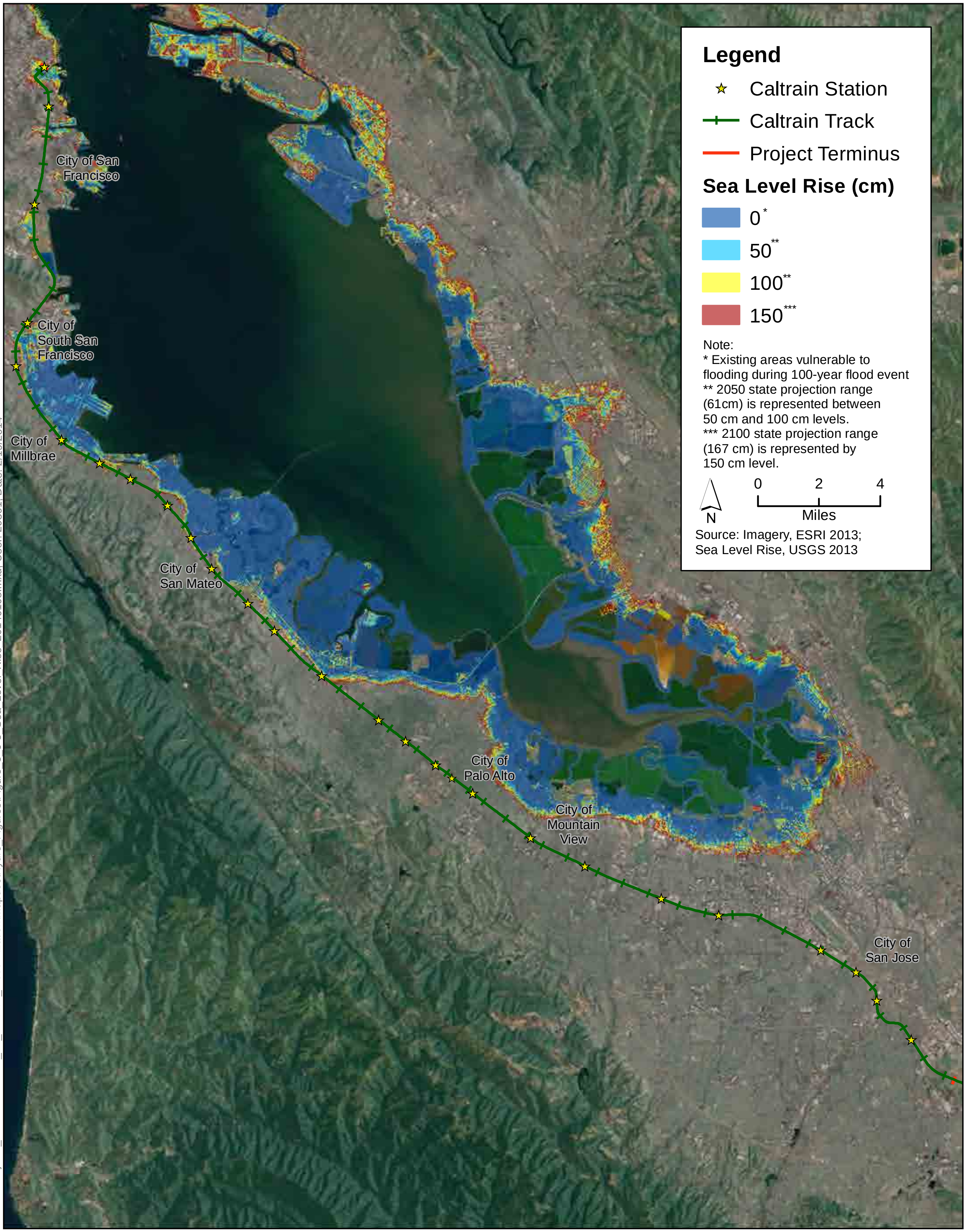

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Figure 3.9-5
Vulnerability to inundation from a 100-year flood event at differing levels of projected future sea level rise
Peninsula Corridor Electrification Project

3.9.2 Impact Analysis

3.9.2.1 Methods for Analysis

Potential impacts resulting from implementing the Proposed Project were analyzed by comparing existing conditions, as described in the Environmental Setting, to conditions during construction and/or operation and maintenance of the Proposed Project. The analysis assesses the direct and indirect, short- and long-term impacts related to surface hydrology, flood hazards, groundwater recharge, and surface and groundwater quality as described below.

Surface Water Hydrology: The surface water hydrology impact analysis considered potential changes in the physical characteristics of water bodies, impervious surfaces, and drainage patterns throughout the project area as a result of project implementation.

Flood Hazards: The impact analysis for current flood risk was conducted using FEMA FIRMS (for areas other than San Francisco) and San Francisco Interim Floodplain Maps (for San Francisco) to determine whether the project area overlaps with existing current designated 100-year floodplains. In addition, USGS SLR mapping was consulted to determine whether the project area would be inundated by 100-year flood levels predicted taking into account potential mid- and end-of-century SLR (2050 and 2100, respectively). Because the USGS SLR mapping is more recent than those of BCDC, it was used for the purposes of the SLR vulnerability assessment.

Groundwater Recharge: Impacts on groundwater recharge were assessed by comparing existing sources of recharge versus recharge capabilities following project implementation. Recharge is determined by the ability of water to infiltrate into the soil. Although the precise extent of the groundwater aquifer is unknown within specific locations along the project area due to lack of data from DWR, this analysis assumes that groundwater exists within the entire project area.

Surface and Groundwater Quality: Impacts of the Proposed Project on surface water and groundwater quality were analyzed using existing information on existing water quality conditions. These conditions were then compared to conditions under the Proposed Project for potential project-related sources of water contaminants generated or inadvertently released during project construction (e.g., sediments, fuel, oil, concrete) and project operation. The potential for water quality objectives to be exceeded and beneficial uses to be compromised as a result of the Proposed Project is also considered.

3.9.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the Proposed Project would be considered to have a significant impact if it would result in any of the conditions listed below.

- Violate any water quality standards or WDRs, or otherwise substantially degrade water quality.
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted).
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of

surface runoff, in a manner that would result in substantial erosion or siltation onsite or offsite. Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.

- Place housing within a 100-year flood hazard area, or place structures that would impede or redirect flood flows within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or FIRM or other flood hazard delineation map.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.
- Contribute to inundation by seiche, tsunami, or mudflow.

The State CEQA Guidelines do not currently provide any guidance concerning the evaluation of potential impacts related to SLR. As discussed in Section 3.7, *Greenhouse Gas Emissions and Climate Change*, the Proposed Project would result in a reduction of GHG emissions compared with existing emissions and to emissions under the No Project scenario and, thus, would help to reduce potential future effects of climate change. However, with prior and projected GHG emissions (regardless of efforts to control those emissions), substantial SLR is still expected due to projected global warming. Although the Proposed Project would not contribute to rising sea levels, the Caltrain alignment and new Proposed Project facilities could be affected by flooding associated with rising sea levels. Due to a number of recent appellate court rulings (most prominently *Ballona Wetlands Land Trust et al. v. City of Los Angeles* (2011) 201 Cal.App.4th 455 [*Ballona Wetlands*]), there is presently a question as to whether CEQA requires analysis of impacts of the environment (such as rising sea levels) on a project or not (as opposed to the impacts of a project on the environment, which is clearly required). This EIR errs on the side of caution in providing such an analysis of the potential impact of SLR on the Caltrain alignment and the Proposed Project. However, absent contrary appellate court rulings or California Supreme Court rulings, at this time such an analysis may not be strictly legally required.

3.9.2.3 Impacts and Mitigation Measures

Construction and operation of the Proposed Project may affect the existing water quality conditions of the hydrological features within the project alignment. The Proposed Project alignment crosses and runs alongside several creeks, rivers, and wetlands near the San Francisco Bay shoreline. The installation of OCS poles and overbridge protection barriers, as well as the construction of traction power substations, switching stations, and paralleling stations near these water bodies would have both direct impacts through exposure of surface and groundwater resources to additional pollutants, such as sediments, as well as indirect impacts from discharges into storm drains leading to surface water bodies, if measures are not taken to minimize these impacts.

<u>Changes resulting from Project Variant 1 are described below each impact analysis.</u>

Impact HYD-1a	Violate any water quality standards or WDRs, or otherwise substantially degrade water quality during project construction
Level of Impact	Significant
Mitigation Measure	HYD-1: Implement construction dewatering treatment, if necessary
Level of Impact after Mitigation	Less than significant

Construction grading and utility excavations at proposed traction power facility (TPF) sites could result in a short-term increase in the sediment load in stormwater during rainfall events. Although sediment from erosion is the pollutant most frequently associated with construction activity, other pollutants of concern are toxic chemicals from heavy equipment or construction-related materials. A typical construction site uses many chemicals or compounds including gasoline, oils, grease, solvents, lubricants, and other petroleum products. Many petroleum products contain a variety of toxic compounds and impurities and tend to form oily films on the water surface altering oxygen diffusion rates. Concrete, soap, trash, and sanitary wastes are other common sources of potentially harmful materials on construction sites. Washwater from equipment and tools and other waste dumped or spilled on the construction site can lead to seepage of pollutants into watercourses. Non-potable water sprayed for dust control and soil stability during construction can contain contaminants that infiltrate into soil and groundwater. Also, construction chemicals may be accidentally spilled into watercourses. The impact of toxic construction-related materials on water quality varies depending on the duration and timing of activities.

Installation of OCS poles would require soil excavation, which would potentially result in substantial soil disturbance, and could also increase sediment loads into nearby waterways. Additional sediment sources created during construction include soil stockpiles and soil tracked across construction areas, debris resulting from the installation of OCS pole foundations, erosion in areas where vegetation is cleared for OCS pole and catenary system placement, and soil transported by wind (from dry, exposed excavated areas). Surface waters could be affected by sediment and construction debris in stormwater runoff during construction at TPF locations and associated construction staging areas.

Because the Proposed Project would disturb more than 1 acre of land, a SWPPP would be required as part of compliance with the NPDES Construction General Permit. The purpose of a SWPPP is to reduce the amount of construction-related pollutants that are transported by stormwater runoff to surface waters. The SWPPP would emphasize standard temporary erosion control measures to reduce sedimentation and turbidity of surface runoff from disturbed areas with the project area and other BMPs to prevent and minimize the potential for other pollutants of concern to enter waterways. Use of non-potable water (i.e., from wastewater reclamation facilities and permitted groundwater wells) for dust control would not present a health or safety hazard if used in accordance with applicable State Department of Health, State Water Board Regional Water Board, and City Departments of Health and Public Works orders, standards and regulations (City of San Francisco 2008).

Construction dewatering in areas of shallow groundwater could be required during excavation required to install OCS poles and possibly during utility relocations and installation. In the event groundwater is encountered during construction, dewatering would be conducted locally, and according to methods described in Mitigation Measure HYD-1. Coverage under the Construction General Permit typically includes dewatering activities as authorized non-stormwater discharges provided that dischargers prove the quality of water to be sufficient and not affect beneficial uses.

However, the San Francisco Bay Regional Water Board will need to be notified if dewatering will occur and the contractor may be subject to dewatering requirements in addition to what's outlined in the Construction General Permit, including discharge sampling and reporting.

In addition to state dewatering requirements, discharges of non-sewage wastewater to the combined sewer system, including construction-related stormwater and groundwater produced during construction dewatering, are subject to City and County of San Francisco (CCSF) Industrial Waste Ordinance 199-77. The SFPUC Collection System Division must be notified of projects that require dewatering. Installation or modification of construction dewatering wells and soil borings, if required, will also be subject to CCSF Soil Boring and Well Regulation Ordinance, adopted as Article 12B of the San Francisco Health Code. The installation and use of soil borings and wells may affect the beneficial uses of San Francisco's aquifers, and shall be reviewed and approved by the San Francisco.

The Proposed Project would comply with the Construction General Permit, local stormwater ordinances, and other related requirements. In addition, if dewatering is required, Mitigation Measure HYD-1 would be implemented to comply with dewatering requirements. Therefore, potential water quality impacts, such as violations of water quality objectives or WDRs from construction activities, would be less than significant with implementation of Mitigation Measure HYD-1, if necessary.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis because it would have less construction overall than the Proposed Project.

Mitigation Measure HYD-1: Implement construction dewatering treatment, if necessary

If groundwater is encountered during excavation and trenching activities, then dewatering may be required. If dewatering activities require discharges to the storm drain system or other water bodies, the water shall be treated as necessary prior to discharge so that all applicable water quality objectives are met. As a performance standard, water treatment methods shall be selected to achieve the maximum removal of contaminants found in the groundwater and that represent the Best Available Technology (BAT) that is economically achievable. Implemented measures may include the retention of dewatering effluent until particulate matter has settled before it is discharged, the use of infiltration areas, filtration, or other means. The contractor shall perform routine inspections of the construction area to verify that the water quality control measures are properly implemented and maintained, conduct visual observations of the water (i.e., check for odors, discoloration, or an oily sheen on groundwater) and any other sampling and reporting activities prior to discharge. The final selection of water quality control measures shall be submitted to the Regional Water Board for approval prior to construction. If the groundwater is found to not meet water quality standards and the identified water treatment measures cannot ensure treatment to meet all receiving water quality standards, the water shall then be hauled offsite instead for treatment and disposal at an appropriate waste treatment facility permitted to receive such water.

Impact HYD-1b	Violate any water quality standards or WDRs, or otherwise substantially degrade water quality during project operation
Level of Impact	Less than significant

From a water quality perspective, the long-term effect of the Proposed Project would be beneficial compared to the existing system. Replacing existing diesel-powered locomotives with electric vehicles would eliminate a major diesel exhaust source, which otherwise results in dry deposition of pollutants that are later washed into the regional stormwater system. Additionally, with electric trains, there would not be the possibility of contamination while filling fuel tanks or from leaking diesel locomotive fuel tanks.

Because the new Electric Multiple Units (EMUs) would be electrically powered, the track runoff would carry less pollutants than at present and the operation of electrified trains and tracks would not be expected to introduce significant new pollutant sources. Additional sources, such as residual debris from track wear and trash, would be minimal and would be treated with good housekeeping practices, such as trash pick-up and sweeping at TPFs and along the tracks. Although approximately 25 percent of San Jose—San Francisco trains would still be diesel-locomotives, the Proposed Project would result in approximately 75 percent reduction in diesel pollutant loading to the corridor and the resultant benefits to receiving water bodies as well as the reduction in potential for diesel fuel spillage.

The TPFs would require maintenance activities and the storage of oil and other materials for equipment maintenance. For example, oil-filled transformers require the storage of chemicals, such as cleaning liquids and transformer oil for proper maintenance. The storage of such materials is regulated by existing state and federal law.

In addition, routine vegetation removal along the tracks and associated infrastructure may require the use of pesticides. As with Caltrain's current pesticide application practices, pesticides would be properly applied according to DPR regulations to ensure that waterways are not exposed. Hazardous materials, such as pesticides, wetting agents, and other chemicals would be stored in maintenance areas with secondary containment so as to prevent from potential spills in compliance with good housekeeping practices.

Stormwater management measures involve minimizing the alteration of existing drainage conditions and minimizing new sources of pollutants introduced to stormwater via implementation of good housekeeping practices. Stormwater runoff conditions would be similar to pre-project conditions due to the relatively minor land disturbance and increase in new impervious area. Therefore, overall drainage patterns would not be largely altered as part of the Proposed Project. The Project will continue to allow for infiltration of runoff due to the minimal area of new impervious surface from new infrastructure, such as TPF facilities and OCS pole pads. Ground surrounding new infrastructure will be left un-disturbed when possible. In addition, ~~A~~as discussed above, the Proposed Project would be located in areas that are exempt from local MS4 HMP requirements and, thus, the minor changes in impervious area are not expected to result in significant changes in flow in local waterways that would result in additional sediment loading.

The Proposed Project would comply with the municipal stormwater requirements, good housekeeping practices, and related requirements. Therefore, potential water quality impacts, such as violations of water quality objectives or WDRs from operation and maintenance activities, would be less than significant.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis because the only difference operationally with the Proposed Project is that it would have slightly less impervious space due to less foundations for OCS poles. The impervious area of PS7 would be the same as for the Proposed Project and the management of stormwater would be the same.

Impact HYD-2	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level
Level of Impact	Significant
Mitigation Measure	HYD-1: Implement construction dewatering treatment, if necessary
Level of Impact after Mitigation	Less than significant

Construction

As the OCS poles would have foundations 15–20 feet bgs, groundwater would be encountered in areas where the groundwater table is less than 15 feet bgs. In addition, utility relocation and installation may also encounter shallow groundwater. Shallow groundwater may be encountered in the vicinity of San Francisco Bay in San Francisco, San Mateo, and Santa Clara Counties. Impacts on groundwater would be limited to areas with high groundwater tables where construction-related dewatering would occur on a temporary, short~~-time~~ term (during construction) basis. There would also be potential to encounter groundwater during excavation in areas where depth to groundwater is unknown. In the event groundwater is encountered during construction, temporary dewatering would be conducted locally.

In areas where subsurface structures exist adjacent to or underneath the Caltrain ROW (i.e., BART alignment from San Bruno and Burlingame), groundwater intrusion effects during foundation drilling will be temporary and minimal because: 1) dewatering will be conducted where groundwater is encountered thus removing the potential for substantial intrusion in the open hole; 2) the foundation would be sealed once the pole is installed, thus removing the potential for intrusion following construction and 3) the areas where excavation would occur are very small (diameter of 3 feet for OCS poles) and thus any effect such as increased hydraulic pressure, on groundwater aquifers would be minimal.

Given the limited area of construction activity associated with the OCS foundation augering and potential utility relocations/installations, potential groundwater dewatering volumes would be limited and, thus, the Proposed Project would not substantially deplete groundwater supplies. In addition, groundwater within the project area is not a large source of water supply, one reason which is that much of it is saline due to the proximity to the San Francisco Bay. The Proposed Project would comply with the Construction General Permit and other related requirements, and would also implement Mitigation Measure HYD-1 concerning dewatering (see description above), if necessary. Therefore, potential impacts on groundwater resources would be less than significant with implementation of Mitigation Measure HYD-1, if necessary.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis because the only difference with the Proposed Project is that it would have slightly less construction due to 1.2 miles less of OCS poles.

Operations

Overall groundwater recharge in the vicinity would not be largely altered as part of the Proposed Project. The new TPFs would result in a range of 3,200 to 30,000 square feet of impervious surface surrounded by compacted ground and gravel. Although these areas may have minor local effects on groundwater recharge, overall groundwater recharge would be relatively unaffected by these new impervious surface areas. The OCS pole pads would result in very small new impervious areas (approximately 3 to 4 square feet each). Any new access roads required for the TPFs would be formed from compacted crushed rock or gravel overlaying a compacted sub-grade, there would be a minimal increase in impervious surface and negligible effects on groundwater recharge. Because these roads would be used infrequently and only by railroad workers for routine maintenance and inspection of the traction power substations, there would be no measurable increases in contaminant loads that would percolate into groundwater. The underground portions of the OCS poles and utilities would cover a small area (overall and locally) relative to other underground structures, would be sealed and thus are not expected to cause groundwater intrusion into BART facilities from shallow groundwater aquifers. In addition, the Proposed Project would not require the use of groundwater for project water supply.

The Proposed Project would not result in large areas of impervious surface and would not involve the use of groundwater for project operation and maintenance. Therefore, potential impacts on groundwater resources would be less than significant.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis because the only difference operationally with the Proposed Project is that it would have slightly less impervious space due to less foundations for OCS poles. The impervious area of PS7 would be the same as for the Proposed Project.

Impact HYD-3	Substantially alter the existing drainage pattern of the site or area, or substantially increase the rate or amount of surface runoff, in a manner that would cause substantial erosion or siltation onsite or offsite, exceed the capacity of existing or planned stormwater drainage systems, or provide substantial additional sources of polluted runoff
Level of Impact	Less than significant

Construction

Proposed Project construction activities would not involve the alteration of the course of a stream or river. No project construction activities would require in-water work. Overbridge protection barriers constructed at creek crossings would be installed on bridges. OCS poles and new TPFs would be constructed on land outside of waterways. In addition, drainage patterns would not be significantly altered during construction activities. Temporary alterations in terrain during the construction grading for TPFs would be minor, and negligible for all other project infrastructure. As described in Impact HYD-1a, any potential additional sources of polluted runoff would be addressed through compliance with the Construction General Permit, local stormwater ordinances, and other related requirements.

The Proposed Project would not involve in-water work, and potential alterations in drainage patterns would be temporary and minimal. Therefore, potential impacts on drainage patterns and stormwater runoff during project construction would be less than significant.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis because the only difference with the Proposed Project is that it would have slightly less construction due to 1.2 miles less of OCS poles. The variant locations of PS7 are not within any existing drainages that would be disturbed during construction.

Operations

Overall drainage patterns in the project area would not be largely altered as part of the Proposed Project. The additional impervious surface areas at the new TPFs and OCS pole pads would not significantly increase the rate or volume of surface runoff. Apart from the new TPFs and OCS pole pads, there would be no other new impervious area along the alignment. Drainage analyses would be conducted as part of Proposed Project design and measures would be implemented so as not to exceed existing storm system capacities.

The Proposed Project would not result in large areas of impervious surface and would be designed so as not to introduce large volumes of stormwater runoff into the storm sewer system. San Francisco has a combined sewer system, which is particularly sensitive to increases in storm flows. However, the Caltrain alignment is located along the bay shoreline, where storm drains lead directly to the bay as opposed to the combined sewer system. This factor, combined with minimal new impervious area and expected negligible increases in resulting storm flows, is not expected to affect storm water flow capacities. Therefore, stormwater flow capacities are not expected to be affected. As described in Impact HYD-1b, any potential additional sources of polluted runoff generated by project operation would be addressed through compliance with municipal stormwater requirements, good housekeeping practices, and related requirements. Therefore, potential impacts on drainage patterns and stormwater runoff during project operation and maintenance would be less than significant.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis because the only difference operationally with the Proposed Project is that it would have slightly less impervious space due to less foundations for OCS poles and the location of PS7 would be different. The variant locations of PS7 are not within any existing drainages.

Impact HYD-4	Place housing within a 100-year flood hazard area, or place structures that would impede or redirect flood flows within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or FIRM or other flood hazard delineation map
Level of Impact	Significant
Mitigation Measure	HYD-4: Minimize floodplain impacts by minimizing new impervious areas for TPFs or relocating these facilities
Level of Impact after Mitigation	Less than significant

Construction

Construction would result in only temporary occupancy of the Caltrain ROW and the two off-ROW traction power substation locations and would not redirect or increase flood flows. Short-term construction impacts would be minimized by scheduling activities in the floodplain during the dry season and by implementing erosion and other pollution control measures, as part of compliance with the Construction General Permit. Thus construction impacts related to flooding would be less than significant.

There would be no changes to this analysis with Project Variant 1 as the Construction General Permit would equally apply.

Operation

The floodplain areas that would be affected by the Proposed Project are already occupied by active rail facilities or, in the case of the new traction power substations, are in areas of existing commercial and industrial development.

The potential TPF locations (including potential options) within the current FEMA designated 100-year flood zone are as follows:

- PS3 Option 1, in Burlingame near Broadway Avenue.
- PS6 Options 1 and 2, in Sunnyvale.
- TPS2, Option 3, in San Jose at the Central Equipment Maintenance Operations Facility (CEMOF).

PS3 Option 1 is located in a part of Burlingame subject to flooding, likely because of backwater effects from Mills Creek and/or Easton Creek which are located north of PS3 Option 1. PS3 Option 1 would be located about 1,000 feet south of Easton Creek and 2,500 feet south of Mills Creek. Easton Creek is deficient in capacity and results in flooding of residential and industrial areas during a moderate rainstorm and medium to high tides (City of Burlingame, n.d.). Mills Creek experiences frequent flooding during moderate rain storms due to undersized box culverts under Rollins Road and U.S. Highway 101. In addition, the low elevation of the Mills Creek embankment causes overtopping of the creek during moderate rain storm events (City of Burlingame, n.d.). The PS3 area is within the southern edge of the inundation area along the Caltrain ROW due to these two creeks and thus would not redirect flood flows. PS3 Option 1 would be approximately 40 feet by 80 feet (3,200 square feet, or <0.1 acre) and would be located in a previously cleared and graded area. As a result, the amount of infiltration at PS3 Option 1 is likely minimal. Given the small size of PS3 Option 1, and its location on the edge of the inundation zone on a previously graded area with limited existing infiltration, it is considered unlikely that PS3 Option 1 would contribute significantly to flooding. Nevertheless, Mitigation Measure HYD-4 would apply to this location in order to minimize the potential to contribute to flooding potential.

PS6 (both options) are located in an area shown as within the current 100-year floodplain. The area of flooding is shown as an elongated area of flooding along the Caltrain ROW itself. PS6 (Option 2) is located in an existing paved area; placement at this location would have no impact on flooding. PS6 (Option 1) is located in an unpaved area and thus, as discussed above for PS3, the addition of a small amount of impervious space is unlikely to contribute significantly to flooding, but Mitigation Measure HYD-4 would apply to the PS6 (Option 2) location to minimize the potential to contribute to flooding.

TPS2, Option 3 would be located at CEMOF in an area that is partially a parking lot and partially a graded dirt lot that is surrounded entirely by developed buildings and pavement. Flooding in this area appears to be local flooding, possibly due to a lack of adequate drainage to the Guadalupe River or issues with the Howard Street outfall (the river is approximately 1,500 feet to the east of the potential TPS2 location). TPS2, Option 3 would be approximately 150 feet by 200 feet (30,000 square feet, or 0.7 acre) and would be located in a previously cleared and graded and partially paved area. As a result, the amount of infiltration at this potential location for TPS2 is likely minimal. In addition, as a backwater area, TPS2 would not redirect or block flood flows. Nevertheless, the increase in impervious space could contribute to expanded localized flooding. Mitigation Measure HYD-4 would apply to this location in order to minimize the potential to contribute to flooding potential.

Under Project Variant 1, described in Chapter 2, *Project Description*, there would be two potential locations for PS7 (Variant A and B), both of which are located within the mapped 100-year floodplain. However, both of the sites have ground elevations greater than 120 feet above MSL and the identified 100 year flood level is 115 to 117 feet above MSL and thus the sites are actually outside of the 100 year floodplain. Therefore, Project Variant 1 would not change the significance determination of this impact.

As shown in Figure 3.9-4, some of the alignment containing the new OCS poles would also be in the 100-year flood zone including near the Brisbane Lagoon, and at certain locations in South San Francisco, Millbrae, Burlingame, San Carlos, Sunnyvale, Santa Clara, and San Jose. The introduction of OCS poles would not affect flood storage capacity due to their limited size. For example, in a 1-mile two-track segment of the project route, there would be approximately 53 poles, each with an approximately 3 to 4-square-foot foundation for a total footprint of 178 square feet (~0.004 acre). In 1-mile of four-track segments, even assuming one OCS pole alignment per track (4-track areas are more likely to have headspans or portals), the total area of foundations would be only 356 square feet (~0.008 acre) As such, where OCS poles would be located within 100-year floodplains, they would constitute only minimal encroachment. Further, the poles would not redirect or divert flows. Therefore, the probability of substantial changes in flooding attributable to the encroachment of the poles is considered very low and less than significant.

Apart from physical encroachment of the floodplain at certain areas, the Proposed Project would not affect floodplain values. The majority of OCS poles would be located within existing railroad ROW; TPFs would be either within or in the immediate vicinity of existing railroad ROW or in commercial or industrial areas disconnected from their floodplains. No long-term impact on natural beauty, outdoor recreation, aquaculture, natural moderation of floods, or water quality is anticipated. The Proposed Project would electrify an existing rail line, which passes through or adjacent to several areas of 100-year floodplain and serves existing rail stations, each of which is located in an urban environment. Although the project alignment passes through floodplains, it is unlikely that the Proposed Project would induce any development in those floodplains. The Proposed Project would require only two traction power substations. All potential traction power substation locations are next to existing roadways and, thus, the provision of access would result in minimal increase in impervious surfaces and minimal reductions in flood capacity.

Overall, potential significant impacts are only expected at the TPFs located within 100-year floodplains. Mitigation Measure HYD-4 would reduce impacts at these locations to a less-than-significant level by further reducing the potential of these TPFs to contribute to localized flooding. Mitigation Measure HYD-4 is also recommended at TPFs not located within 100-year floodplains to minimize downstream flooding impacts, but is not required due to less- than- significant impacts relative to impacts on downstream flooding for these locations.

Mitigation Measure HYD-4: Minimize floodplain impacts by minimizing new impervious areas for TPFs or relocating these facilities

At PS3 (Option 1), PS6 (Option 1) and TPS2 (Option 3, at CEMOF), the design will minimize the amount of new impervious areas by using graveled or pervious pavement for all facility areas other than the foundations for new electric equipment and any other weight–bearing facilities. Currently unpaved areas not used to house new equipment shall remain unpaved or if paved shall use pervious pavement. At other paralleling stations, TPS1, and the switching station, the same measure is recommended, but not required.

~~As an option, PS3 could be moved slightly to the south~~ The JPB could select PS3 Option 2 (to the northeast) which would remove this facility from the 100-year floodplain and PS6 could be placed at the Option 2 ~~1~~, which is currently paved and then the requirements above would not apply. For TPS2, Caltrain could select one of the other options (Option 1 or Option 2), both of which are currently outside the 100-year floodplain.

Impact HYD-5	Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam
Level of Impact	Significant
Mitigation Measure	HYD-5: Provide for electrical safety at TPFs subject to periodic or potential flooding
Level of Impact after Mitigation	Less than significant

Construction

Construction activities would be temporary and would not increase the potential for flooding.

Operation

Potential Flooding Impacts Related to New Electrical Infrastructure

As described above, several of the new TPFs are proposed within 100-year floodplains. Given the electrical equipment contained in new paralleling stations and traction power substations, flooding would pose electrical safety risks to these facilities and to any people near the facilities if flooding were to contact energized equipment. This is considered a significant impact. If these facilities are not relocated outside of the 100-year floodplain or at previously paved areas (pursuant to options in Mitigation Measures HYD-4), then Mitigation Measure HYD-5 is recommended to provide for safety of these new facilities and/or shutdown in the event of unavoidable flooding events.

Since under Project Variant 1, PS7 (Variant A and B) are located in the 100-year floodplain but at elevations above the 100-year flood level (as noted above), Project Variant 1 would not have any different impacts relative to the Proposed Project.

The OCS poles are energized, but the energized elements would be at least 15 feet above the ground. As such, even with potential periodic flooding of the tracks at certain locations, the energized elements would be elevated and would not be subject to flooding themselves.

Potential Flooding Impacts Related to Levee Failure

Numerous levees are located along the San Francisco Bay shoreline and along certain creeks to protect various residential, commercial and industrial areas from coastal and riverine flooding. Levees can fail due to earthquakes or storm events, if not properly maintained or reinforced to withstand potential stresses. In the event of levee failure, there could be flooding of several areas of the existing Caltrain alignment beyond those included in the current 100-year floodplain. This existing flooding potential due to levee failure would not be changed by the Proposed Project; however, the Proposed Project would introduce new electrical facilities that could be damaged or result in electrical safety risks in the event of flooding.

As described above, OCS energized elements would be elevated and thus would not be subject to flooding risks related to electrical safety and the OCS foundations would be sufficiently deep and strong to withstand flooding effects. Based on available FEMA mapping, PS6 (both options) are in areas protected by levees that might be subject to flooding in the event of levee failure (these locations are also in the current floodplain). It is possible that other facilities might be subject to flooding due to levee failure that are not shown in available FEMA mapping. Mitigation Measure HYD-5 is recommended to provide for safety of these new facilities and/or shutdown in the event of unavoidable flooding events. With this measure, electrical safety risks would be managed and new impacts due to the Proposed Project beyond current conditions would be less than significant in the event of flooding due to levee failure.

PS7 (Variant A and B) are not protected by levees and thus this impact determination would not change with Project Variant 1.

Potential Flooding Impacts Related to Dam Failure

As described above, there are a number of dams located in Peninsula watersheds upstream of the Caltrain alignment. The primary risk of dam failure is due to seismic activity. All dam owners are required to manage their facilities in line with potential seismic risks by the California Department of Safety and Dams (DSOD). For example, the Anderson Dam, south of San Jose, is presently managed by the Santa Clara Valley Water District (SCVWD) at lower reservoir levels due to recently identified seismic risks. Implementation of DSOD regulations reduce the likelihood of dam failure resulting in flooding of downstream areas. All of the dams in the area survived the 1989 Loma Prieta earthquake without failure; however the Elsmer Dam south of San Jose (also called the Austrain Dam) settled by 2.8 feet and its end moved 1.2 feet and the dam suffered a crack at its spillway. Although dam failure has not resulted from prior seismic events (the Crystal Springs dam also survived the much larger 1906 earthquake), there remains a possibility of local dam failure given the seismic character of the project alignment.

In the event of dam failure, portions of the existing Caltrain ROW could be inundated. This existing flooding potential due to dam failure would not be changed by the Proposed Project; however, the Proposed Project would introduce new facilities that could be damaged or result in electrical safety risks in the event of flooding.

As described above, OCS energized elements are elevated and thus would not be likely be subject to flooding risks as the OCS foundations are sufficiently deep and strong to withstand flooding effects. However, some of the new TPFs could be subject to flooding in the event of dam failure including PS5 (Option 2), TPS2 (all options) and possibly PS7. The likelihood of a dam failure resulting in actual inundation of the Caltrain ROW is low.

Mitigation Measure HYD-5 is recommended to provide for safety of these new facilities and/or shutdown in the event of unavoidable flooding events. With this measure, electrical safety risks would be managed and impacts would be less than significant in the event of flooding due to dam failure.

Both the potential locations for the PS7 Variant are in an area subject to dam failure flooding. If Project Variant 1 is selected, then Mitigation Measure HYD-5 would still need to be implemented and applied to the selected location for PS7. Therefore, Project Variant 1 would not change the significance determination of this impact.

Mitigation Measure HYD-5: Provide for electrical safety at TPFs subject to periodic or potential flooding

For new TPFs within the current 100-year floodplain (PS3 Option 1, TPS-2 Option 3, and PS6 – both options), the preferred method of avoiding damage would be to place all new electrical equipment on elevated pads above expected flood depths and/or protect such equipment with flood barriers. If equipment cannot be designed so that flood waters cannot contact the equipment, then sealed or capped moisture-resistant components are required. Ground Fault Circuit Interrupters (GCFIs) shall be utilized for all electrical circuits below the base flood elevation for the 100-year flood.

For all new traction power facilities subject to current flooding (for the current 100-year event), or with a potential for flooding due to levee or dam failure (PS3 [Option 1], PS5 [Option 2], PS6 [both options], TPS2 [all options] and possibly PS7 and PS7 Variant A and B, if selected), Caltrain shall develop emergency response procedures to provide electrical safety including system shutdown during projected flood events. Due to the potential for gaps in current FEMA mapping of areas subject to flooding due to levee failures, Caltrain shall also investigate potential flooding risks due to levee failures for all new TPFs and apply emergency shutdown requirements to all additional facilities identified as at risk of flooding due to potential levee failures.

Impact HYD-6	Contribute to inundation by seiche, tsunami, or mudflow
Level of Impact	Less than significant

Tsunami inundation maps of San Francisco, San Mateo, and Santa Clara Counties indicate that the portion of the project area most likely to be affected by tsunami inundation would be the northern portion of the alignment, as described in Section 3.9.1.2, *Environmental Setting, Current Flooding Risk*. The new Proposed Project infrastructure would be minimal in size and would not contribute to the effects of a tsunami event on the surrounding area and would not change or redirect flooding during a tsunami event. Thus, impacts related to contribution to tsunami inundation would be less than significant.

Seiches occur in an enclosed or partially enclosed body of water. The San Francisco Bay is a large and open body of water with no immediate risk of seiches—there would be minimal to no risk of damages associated with a seiche event in the project area. The project alignment is primarily in flat or gently sloping areas except where it is adjacent to San Bruno Mountain. At San Bruno Mountain, there is no known active landslide immediately adjacent to the project route. Further, the Proposed Project would not affect potential seiche or mudflow events in any way. Therefore, the Proposed Project would not contribute to any inundation impacts associated with seiche waves or mudflows.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis.

Impact HYD-7	Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of SLR
Level of Impact	Significant
Mitigation Measure	HYD-7: Implement sea level rise vulnerability assessment and adaptation plan
Level of Impact after Mitigation	Potentially Significant and Unavoidable

SLR is a concern for the future, particularly in combination with future storm events and coastal flooding. A scenario with 100-year flood flows coincident with high tides taking into account SLR over a 50-year or 100-year horizon would dramatically increase the risk of flooding in the vicinity of the project area. The Proposed Project, the tracks, and associated facilities, are minimal in size relative to their surrounding areas and would not divert or increase flood risks relative to other adjacent areas associated with these events.

However, future SLR may result in worsened coastal flooding events that could affect new project facilities (i.e., traction power substations, switching station, and paralleling stations), existing facilities (tracks and stations), and service and riders on Caltrain. The concern is the impact of SLR on the Proposed Project (and existing facilities) as opposed to the impact of the Proposed Project on SLR (the project would help to reduce GHG emissions which would help to reduce the potential amount of SLR in combination with other global efforts to reduce such emissions). Given recent court rulings (including *Ballona Wetlands*), it is uncertain whether analysis of such "impacts of the environment on the project" are or are not required by CEQA. Caltrain is providing this analysis as if such analysis is required under CEQA as a conservative approach and for the purposes of public disclosure.

While the Proposed Project would not change the potential localized impacts of flooding associated with SLR when they would occur, the Proposed Project would introduce electrical infrastructure at risk of flooding impact and electrical safety risks associated with water contact. The OCS wires and energized elements would be at least 15 feet above the ground surface and, thus, would not be at risk of flooding, even with projected SLR ranges in the higher part of the range for 2100 (+ 5.5 feet). However, the TPFs would be at ground surface and thus those TPFs in areas subject to future coastal flooding may be exposed to mid-century (2050) and/or end-of-century (2100) SLR projections.

Based on USGS SLR mapping, coastal flooding exacerbated by SLR could affect PS3 after 2050 and TPS1 (all locations) between 2050 and 2100). Table 3.9-8 shows the potential for flooding (100-year event) with potential SLR at the new TPF locations. The majority of the City of Belmont is within FEMA-designated 500-year flood zone (Flood Zone X - an area with reduced flood risk due to levee). As shown in Figure 3.9-5, The JPB ROW crossing of Belmont Creek is the only portion of the JPB ROW within the City that is within FEMA-designed 100-year flood zone areas (Flood Zone A).

In addition, as shown in Table 3.9-7 and Figure 3.9-5, there are also approximately 1.5 miles of the Caltrain alignment trackbed (including the San Francisco 4th and King Station) that would be vulnerable to future flooding with 50 cm SLR. A total of 9.9 miles of the alignment (including the stations at 4th and King in San Francisco, Millbrae, Broadway station in Burlingame, Hayward Park and Redwood City) would be vulnerable to future flooding with 150 cm SLR. Both estimates are for 100-year tide events. The risk to existing Caltrain facilities is part of the environmental baseline and is not caused by the Proposed Project. The Proposed Project would reduce GHG emissions and would help to reduce the effects of climate change (including SLR). However, new electrical facilities would be constructed in areas that could flood in the future when taking into account SLR that may occur regardless of the efforts of Caltrain and others to reduce GHG emissions in the long term.

Table 3.9-8. Potential Vulnerability for TPFs Subject to Mid-Century (2050) or End-of-Century (2100) Sea Level Rise Inundation

		Potential for Inundation in 100-year storm event			
Facility[a]	Location	Existing Conditions	50 cm SLR (~2050)[b]	150 cm SLR (2100)[c]	Description
PS1	San Francisco				No coastal flooding projected to occur.
PS2	San Francisco				No coastal flooding projected to occur.
TPS1	South San Francisco ~~(all options)~~ (Options 1, 2, and 3)			X	Potential coastal flooding between 2050 and 2100.
TPS1	South San Francisco (Option 4)				No coastal flooding projected to occur.
PS3	Burlingame (Option 1)	X	X	X	Within existing 100-year floodplain due to riverine flooding; coastal flooding expected to affect the site after 2050.
PS3	Burlingame (Option 2)		X	X	Not within existing 100-year floodplain; coastal flooding expected to affect the site after 2050.
PS4	San Mateo (~~both~~ all Options)				No coastal flooding projected to occur.
SWS1	San Mateo County (Option 1) Redwood City (Option 2)				No coastal flooding projected to occur.
PS5	Palo Alto (both options)				No coastal flooding projected to occur.
PS6	Sunnyvale (both options)	X	N/A	N/A	Within existing 100-year floodplain (non-coastal); would not be affected by future coastal flooding.
TPS2	San Jose (Option 1 & 2) San Jose (Option 3)	 X	 N/A	 N/A	No coastal flooding projected to occur but Option 3 is located within existing 100-year floodplain due to localized drainage/flooding.
PS7	San Jose				No coastal flooding projected to occur.

Sources: U.S. Geological Survey 2013, FEMA Firms (for existing flooding).
cm = centimeters
PS = Paralleling Station
SLR = sea level rise
SWS = Switching Station
TPS = Traction Power Substation
[a] Locations of proposed facilities are shown in Chapter 2, *Project Description*, Figure 2-2.
[b] Area subject to a rise in sea level equal to or greater than 50 cm (20 inches) (CA-CAT) with a 100-year storm event.
[c] Area subject to a rise in sea level greater than 150 cm (59 inches) with a 100-year storm event.[a]

Such inundation could result in damage to Caltrain facilities resulting in structural damage and service interruptions. To address these potential impacts, Mitigation Measure HYD-7, Implement sea level rise vulnerability assessment and adaptation plan, is recommended. With this measure, Caltrain will assess its vulnerability to future flooding with SLR and will partner with adjacent municipalities, flood districts, regional agencies, state agencies, and federal agencies in doing its fair share to help adapt to changing flood conditions over time. In most areas of the Caltrain alignment, the ROW is located inland of extensive developed areas closer to San Francisco Bay that contain residential, commercial, industrial, and infrastructure development that is even more vulnerable to SLR than the Caltrain ROW. As a result, it is expected that there will be combined efforts to protect such development and adapt over time to rising sea levels. In many cases, the actions taken to protect such development closer to the Bay will also protect the Caltrain alignment. However, in some locations, the optimal solution for protecting other development may not also provide flood protection for Caltrain facilities. Thus, Caltrain will need to partner with other entities to develop flood protection solutions that work optimally for multiple parties, while at the same time, Caltrain may need to provide individual solutions that work for its facilities. For example, the Caltrain alignment is directly adjacent to Mission Creek and Islais Creek in San Francisco as well as Brisbane Lagoon in Brisbane and a portion of San Francisco Bay in South San Francisco. In these areas, Caltrain may need to consider seawalls, elevated tracks, or other solutions to protect the alignment, depending on the actual extent of SLR and associated flooding.

Under CEQA, Mitigation Measure HYD-7 can only be required where new Proposed Project facilities would result in new safety risks in combination with sea level rise. However, given that sea level rise flooding could affect Caltrain system safety and operations, Mitigation Measure HYD-7 is recommended for all locations subject to coastal flooding now and in the future.

Potential adaptation solutions could include flood levees, seawalls, elevated tracks, and/or minor track realignment. In most locations, new levees or seawalls would be optimally placed closer to the Bay or along tidal channels rather than directly along the Caltrain alignment, given the need to protect other development subject to flooding between the Caltrain alignment and the Bay. At this time, the feasibility of implementing all measures necessary to avoid future inundation associated with 100-year floods influenced by SLR is not known given that assessment of such solutions will be an ongoing, long-term, and multi-agency process. As such, this impact is considered potentially significant and unavoidable at this time.

In addition, the construction of flood improvements necessary to protect the Caltrain alignment could result in secondary impacts on the environment. For the new electrification facilities potentially affected by coastal flooding in the future (PS3 (both options), TPS1 – ~~all~~ Options 1, 2, and 3), additional flood protection improvements are likely to be limited in character and have only limited secondary impacts. For example, PS3 is a small area (3,200 sf) adjacent to the existing railroad tracks that could be protected with floodwalls around new electrical equipment and/or new equipment could be elevated over time to above potential flood depths. TPS1 would be a larger facility (30,000 sf), but is located in a developed industrial/commercial area. Construction of a levee or flood walls or equipment elevation would result in some construction impacts, but operationally would have few impacts on the environment once completed.

Potential improvements to address flooding along the Caltrain ROW itself or to address regional flooding impacts (including adjacent residential, commercial, and industrial areas along with the Caltrain ROW) could be more extensive than that needed to just protect new Proposed Project electrical equipment. Because the specific solutions have not been identified, the following is a general summary of potential impacts that could result from new levees, seawalls, elevated tracks, and/or track realignment needed to address flooding along the Caltrain ROW and in adjacent areas.

- Aesthetics—New flood protection facilities such as levees or seawalls could change existing visual aesthetics, require removal of vegetation or other aesthetic features and/or block existing views. Elevation of tracks or track realignment could also increase impacts on aesthetic by making the train more visible from adjacent areas.
- Air Quality—Construction of new flood protection facilities would result in criteria pollutant emissions but there would be no operational emissions except for maintenance activities.
- Biological Resources—Construction of new flood protection facilities could affect biological resources found within project footprints and/or require diversion of water flows which could affect stream or coastal habitats.
- Cultural and Paleontological Resources—Construction of new flood protection facilities could disturb cultural or paleontological resources if found at construction sites. No effects from operation would be expected.
- EMI/EMF—No impacts related to EMI/EMF would be expected.
- Geology, Soils and Seismicity—New facilities may be placed in areas subject to seismic shaking, liquefaction or expansive soils, but design measures exist to protect flood protection facilities from such risk.
- GHG Emissions—Construction of new flood protection facilities would result in additional GHG emissions.
- Hazards and Hazardous Materials—Construction of new flood protection facilities would encounter existing contaminated soils or groundwater which would have to be properly contained and disposed of at appropriate facilities. Construction use of fuels and other materials would also need to be controlled.
- Hydrology and Water Quality—Construction of new flood protection facilities could divert flood flows and would need to be designed to avoid diverting floodwaters from one location only to increase flooding at other adjacent areas. Construction would need to be managed to address erosion, sedimentation, and other water quality effects.
- Land Use and Recreation—Construction of new flood protection facilities could require displacement of existing uses and/or directly or indirectly affect recreational facilities.
- Noise and Vibration—Construction of new flood protection facilities would result in noise and vibration during construction activities. There would be no operational noise impacts of levees for floodwalls unless such facilities would redirect other sources of noise by reflection to sensitive receptors. If elevating of tracks were proposed, train noise could affect larger areas containing sensitive receptors.
- Population and Housing—Construction of new flood protection facilities may require displacement of existing homes.
- Public Services and Utilities—Construction of new flood protection facilities would need to safely identify, avoid and/or relocate existing utilities.

- Transportation and Traffic—Construction of new flood protection facilities could result in temporary impacts on traffic and transportation systems during construction. New facilities may also require roadway or access changes which could affect local circulation.

While flood protection measures for regional protection including the Caltrain ROW itself could have potentially significant secondary environmental impacts, such improvements are not related to the Proposed Project. The secondary environmental impacts of flood protection measures for PS3 (both options) and TPS1 (Options 1, 2, and 3), which are the only new Proposed Project facilities that would be newly affected by coastal flooding resultant from sea level rise, would be limited to the PS3 and TPS1 sites. The secondary environmental effects of construction of additional flood facilities would likely be similar to that disclosed in this EIR for the initial site construction. However, it would be premature to predict the exact character of such secondary effects until such a time as designs are proposed. Thus, it would be speculative to make any conclusions about the significance of such potential secondary environmental effects at this time.

Implementation of Project Variant 1, described in Chapter 2, *Project Description*, would not result in any changes to this impact analysis because it would introduce no new facilities subject to flooding associated with sea level rise.

Mitigation Measure HYD-7: Implement sea level rise vulnerability assessment and adaptation plan

The JPB will use State of California Sea Level Rise guidance (CO-CAT 2013), the California Adaptation strategy, as well as guidance from other agencies [i.e., BCDC]), for the development of the vulnerability assessment and adaptation plan. Under CEQA, this assessment and plan is only mandatory for the new facilities associated with the Proposed Project However, it is recommended that the JPB include analysis of all existing and new facilities subject to potential coastal flooding with predicted sea level rise.

Sea Level Rise Vulnerability Assessment

The analysis in the EIR considers potential vulnerability based on broad USGS mapping of potential inundation areas using specific SLR increments. This preliminary assessment shall be supplemented by a more detailed evaluation of future flood risks taking into account the following.

- The range of SLR predictions based on current state guidance.
- The specific elevations of Caltrain facilities.
- Hydraulic connection of Caltrain facilities to San Francisco Bay and tidal channels.
- Protectiveness of other structures (levees, seawalls, other development) between Caltrain facilities and San Francisco Bay and tidal channels.

The vulnerability assessment shall describe the scenarios under which Caltrain facilities could become subject to flooding, the estimated duration of such flooding, and the potential damage that may result from such flooding scenarios.

The JPB shall complete the vulnerability assessment within 5 years of project approval (nominally early 2020 ~~end of 2019~~, assuming project approval in early 2015 ~~late 2014~~). The JPB shall share the results of its vulnerability assessment with other local agencies potentially affected by sea level rise along the Caltrain corridor.

Sea Level Rise Adaptation Plan

Based on the vulnerabilities identified, the JPB shall prepare an SLR Adaptation Plan identifying measures that will be taken to protect the new project facilities as well as the existing Caltrain facilities from potential damage due to future flooding from SLR. The JPB will coordinate with other entities with facilities close to the San Francisco Bay with an equal or greater SLR vulnerability, such as cities along the northern portion of the route (San Francisco, Brisbane, South San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos and Redwood City), the San Francisco International Airport, the California Department of Transportation (U.S. Highway 101 and Interstate 380), the Bay Area Rapid Transit District, VTA, SFMTA, and other agencies.

The requirements for development and implementation of this plan and updating over time are as follows.

- 2016: The JPB shall complete the first SLR Adaptation Plan within 2 years of project approval (nominally end of 2016, assuming project approval in late 2014) including the following.
    - Review available scientific information on SLR data and projections for the subsequent 50 years. Where data and projections indicate different rates of SLR than previously applied, the JPB will adjust the vulnerability assessment and flood design criteria to reflect a median-point of then-current projections.
    - Review JPB system vulnerability for the subsequent 50 years in light of available data at that time and the adjusted flood design criteria.
    - Prepare a plan identifying improvements to meet the flood design criteria, as feasible and unconstrained by surrounding development not owned by JPB. The plan of improvements will be designed to meet the flood design criteria as predicted for the next 10 years and updated every 10 years thereafter.
    - The plan may include projects that the JPB implements on its own or in concert with other parties. The plan may also rely on flood improvements implemented separate from the JPB but that will also provide flooding benefits for Caltrain facilities provided such plans have a realistic funding and implementation schedule.
    - Where the JPB is a lead for improvements needed to address flooding risks expected within the next 10 years, the JPB shall complete all necessary environmental clearances and shall adopt such improvements as part of JPB's capital funding plans and identify funding sources for their implementation.
    - The goal for all improvements is to provide 100-year flood protection for Caltrain facilities from coastal flooding at all times, wherever feasible. Where that is not feasible, the JPB shall identify alternative means to provide for safe system operations in the event of flooding.
    - Identify opportunities for partnership with other local and regional parties for SLR adaptation or where regional efforts will address flooding risks to Caltrain facilities.
- 2021 (and every 5 years thereafter): The JPB shall update the Adaptation Plan meeting the requirements described above.

- Ongoing: Where JPB's adaptation options are constrained because of adjacent infrastructure (such as adjacent roadways and structures not owned by JPB), JPB will work with adjacent landowners and infrastructure managers to identify opportunities to improve rail system protection in concert with other local or regional parties.

3.10 Land Use and Recreation

This section characterizes potential project impacts on existing land use and recreation. For the purposes of this section, the analysis generally considers land uses within 0.25 miles of the project corridor from San Francisco to San Jose (2 miles south of Tamien Station). However, the focus of the impact analysis is on existing land uses and recreational facilities directly adjacent to the Caltrain right-of-way (ROW) or that cross the Caltrain ROW, such as bike paths.

The project corridor traverses the counties of San Francisco, San Mateo, and Santa Clara, extending from downtown San Francisco to south of downtown San Jose. This corridor encompasses portions of the following cities: San Francisco, Brisbane, South San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos, Redwood City, Atherton, Menlo Park, Palo Alto, Mountain View, Sunnyvale, Santa Clara and San Jose. Land uses in the corridor comprise the full range of urban development, with a diverse mix of uses adjacent to the Caltrain corridor in some locations, and more homogeneous industrial and commercial uses in others. The corridor includes numerous areas of single- or multi-family residential uses, as well as a variety of recreational land uses, that are directly adjacent to the Caltrain ROW.

As described in Section 2.5, *Required Permits and Approvals*, pursuant to SamTrans' enabling legislation (Public Utilities Code Section 103200 et seq.) and the 1991 Interstate Commerce Commission's approval of the JPB acquisition of the Caltrain line, JPB activities within the Caltrain ROW are exempt from local building and zoning codes and other land use ordinances. Thus, within the Caltrain ROW, no impacts on land use or recreation are expected. Consequently, the focus of analysis in this section is locations where project activities would occur outside the current Caltrain ROW.

The project areas with permanent facilities outside the Caltrain ROW are as follows:

- The two traction power substations (TPSs) in South San Francisco and San Jose could be outside of the ROW along with underground duct banks connecting them to the Caltrain ROW and overhead or underground duct banks connecting the TPS to the nearest PG&E substation. Each of the TPSs would have three options. ~~All~~ Three of the four options in South San Francisco would be outside of the ROW while two of the three options in San Jose would be outside of the ROW.
- The poles for the overhead contact system (OCS) alignment would be installed slightly (perhaps several feet) outside of the current ROW in an estimated 27 ~~20~~ locations for a total length of approximately 10,200 ~~9,300~~ feet. These areas would be acquired in fee (if on private land) or an easement would be acquired (if on public land) for the OCS.
- The electrical safety zone of 10 feet around the OCS alignment would extend outside of the current ROW ~~in an estimated 108 locations~~.
  - The Draft EIR presumed a worst-case electrical safety zone up to 24 feet from the outer track centerline.
  - The Final EIR describes that the electrical safety zone is more likely to be 21 feet in most two-track areas and 18 feet in most multi-track areas. Using a range between the Draft EIR and Final EIR safety zone assumptions, it is estimated that approximately 5 to 8 acres of new easement would be required on adjacent public road and rail ROW, 2 to 10 acres on private

residential, commercial, or industrial property, and 0.1 to 0.3 acres on parklands for a total of approximately 7 to 18 acres.

- The JPB would acquire electrical safety easements from private landowners and public agencies to allow vegetation safety maintenance and to maintain minimum clearances from buildings to the OCS.

Analysis of potential cumulative land use impacts on future projects proposed along the Caltrain ROW or within the ROW are discussed in Chapter 4, *Other CEQA-Related Analysis*.

3.10.1 Existing Conditions

3.10.1.1 Regulatory Setting

Land Use

This section presents relevant applicable land use and transportation plans. Please refer to Appendix H, *Land Use Information*, for a list and discussion of all applicable plans for lands adjacent to the project corridor.

MTC Transportation 2035 Plan

The MTC's *Transportation 2035 Plan for the San Francisco Bay Area* (2035 Plan) specifies how anticipated federal, state, and local transportation funds will be spent in the nine-county Bay Area during the next 25 years. The vision for Transportation 2035 is to support a prosperous and globally competitive Bay Area economy, provide for a healthy and safe environment, and promote equitable mobility opportunities to all residents. Among the cornerstones of the new plan are a joint regional planning initiative known as FOCUS, which provides incentives for cities and counties to promote future growth near transit in already urbanized portions of the Bay Area. Caltrain transit operating and capital improvements are included in the 2035 Plan. Improvements to San Mateo County and Santa Clara County stations, such as upgrades/relocation of platforms, pedestrian tunnels, and parking improvements, are also included (Metropolitan Transportation Commission 2009).

General Plans

California Government Code Section 65301 requires every city and county to adopt a general plan. General plans lay out the pattern of future residential, commercial, industrial, agricultural, open space, public, and recreational land uses within a community. Local jurisdictions implement their general plans by adopting zoning, subdivision, grading, and other ordinances. Zoning identifies the specific types of land uses or forms of development that may be allowed on a given site and establishes the standards that are be imposed on new development. Zoning regulations vary from jurisdiction to jurisdiction. Typical zoning standards address the density and size of structures, the siting of structures relative to parcel boundaries, architectural design, and the percentage of building coverage allowed relative to the overall square footage of a parcel.

As noted above, the permanent facilities outside the ROW would be in various cities along the project corridor. Appendix H includes a description of all the applicable general plans for these cities.

Specific, Area, and Precise Plans

A specific plan is a tool for the systematic implementation of a city or county general plan. A specific plan effectively establishes a link between implementing policies of the general plan and the individual development proposals in a defined area. Precise plans are flexible documents adopted by some California cities to facilitate the use of innovative or unconventional urban planning techniques. Area plans are plans that cover specific subareas of a community. Within these plans, general policies contained in the general plan elements are made more precise as the policies relate to specific parts of the city.

The area of analysis overlaps with, or runs adjacent to, several adopted specific, area, or precise plans that address land development in defined geographic areas within a jurisdiction. The plans adjacent to the project corridor are listed in Appendix H. In addition, several plans that are adjacent to the ROW are currently under review but not adopted, including the *South San Francisco Downtown Specific Plan*, the *San Antonio Precise Plan* (Mountain View), the *Lawrence Station Area Plan* (Sunnyvale), and the *Peery Park Specific Plan* (Sunnyvale). The *Millbrae Station Area Specific Plan*, which includes the project corridor, was originally adopted in 1998 and is in the process of being updated.

All options of TPS1 would be located in the South San Francisco *East of 101 Area Plan*, which covers approximately 1,700 acres bounded by San Francisco Bay to the east, U.S. Highway 101 and the Caltrain corridor to the west, the City of Brisbane to the north, and San Francisco International Airport to the south (South San Francisco 1994). The overall goal is to recognize the unique character of the East of 101 Area and to guide and relate development in a manner that protects and enhances the area's physical, economic, and natural resources, while also encouraging appropriate development in the area. TPS1 Options 1 and 3, would be within areas with Planned Commercial land use designations in the area plan. TPS1 Option 2 would be within an area designated as Planned Industrial.

None of the options for TPS2 in the City of San Jose would be within an area covered by a specific, area, or precise plan. There are no proposed specific, area, or precise plans adjacent to or encompassing the options for TPS1 or TPS2.

Habitat Conservation Plans

Habitat conservation plans (HCPs) are voluntarily developed for ecologically sensitive areas in order to fulfill the requirements of the Endangered Species Act and the California Natural Community Conservation Planning (NCCP) Act. These plans address impact mitigation and contribute to the recovery of endangered species while enhancing and restoring habitats and natural systems.

The Caltrain corridor runs adjacent to the *San Bruno Mountain Habitat Conservation Plan* in San Mateo County, as described in Appendix H. In addition, the corridor bisects the northern portion of the *Santa Clara Valley Habitat Plan*. The *Santa Clara Valley Habitat Plan* provides a framework for promoting the protection and recovery of natural resources, including endangered species, while streamlining the permitting process for development, infrastructure, and maintenance activities. The *Santa Clara Valley Habitat Plan* allows Santa Clara County, the Santa Clara Valley Water District, the Santa Clara Valley Transportation Authority (VTA) and the cities of Gilroy, Morgan Hill, and San José (collectively, the local partners or permittees) to receive endangered species "take" permits for activities and projects they conduct and under their jurisdiction (ICF International 2012). The TPS2 options, Paralleling Station (PS) 7, and the Caltrain ROW from Santa Clara to south of Tamien Station are within the *Santa Clara Valley Habitat Plan* area.

3.10.1.2 Environmental Setting

Existing Land Uses in the Vicinity of the Caltrain Corridor

The primary land use in the Proposed Project area is the rail ROW itself, portions of which have existed since the 1860s. Surrounding land uses include commercial, industrial, open space, mixed use, and residential uses. Land uses in the vicinity of the proposed paralleling and switching stations and traction power substations are primarily industrial and commercial; however, at a few locations, residential properties are adjacent to the existing ROW.

Land uses in the downtown San Francisco area of the Caltrain corridor are primarily urban and industrial, with some retail, live/work loft, residential, and commercial uses. Between the 22nd Street and Bayshore Station areas, land uses are primarily light industrial and warehouse with some residential north of Paul Avenue. South of Paul Avenue to the Bayshore Station, there is a shift to a more even distribution of light industrial and residential through Visitacion Valley, south of which the primary use is light industrial.

There is primarily vacant land through the Brisbane lagoon area, with mainly light industrial and warehouse uses and some residential and commercial uses through South San Francisco. San Bruno presents a mixture of park/open space and low-density residential housing with some commercial and light industrial uses. In Millbrae, the area to the west of the corridor is primarily commercial and contains low-density businesses and residential uses. Industrial uses lie east of the ROW in Millbrae. Transit-oriented development (TOD) uses surround the multi-modal Millbrae Caltrain/BART station.

Land uses in the Burlingame segment of the corridor include commercial, residential, and industrial. The tracks pass directly adjacent to Burlingame High School and Washington Park. Land use adjacent to the Caltrain corridor within the City of San Mateo (from north to south) are commercial, multi-family residential, neighborhood commercial, central business, office, service commercial, manufacturing, and commercial. South of State Route (SR) 92 is the San Mateo County Event Center and the under-construction Bay Meadows TOD project. Located on the other side of the tracks and to the west of El Camino Real is Hillsdale Shopping Center.

The primary adjacent land uses within the City of Belmont are single-family residential and commercial along the El Camino Real corridor. East and west[1] of the San Carlos segment are single-family residential, local retail, and service/convenience commercial uses. Further to the east is U.S. Highway 101 and predominantly industrial uses. The Redwood City segment provides a relatively equal mix of residential, commercial, and industrial uses.

The land uses in the Town of Atherton along the corridor are low-density, single-family residential and one park. Holbrook-Palmer Park is adjacent to the corridor, to the east. The land uses in Menlo Park are general commercial and varying types of residential from medium-density apartment to single-family suburban. Burgess Park is adjacent to the corridor in the vicinity of downtown Menlo

[1] Note that the Caltrain corridor generally runs in a north-south direction. Although some segments are oriented in a northwest-southeast direction, for sake of consistency, this section assumes that the corridor is north-south in all segments.

Park. El Palo Alto Park and El Camino Park are located adjacent to the Caltrain ROW as it enters Palo Alto, beyond which is the Stanford Shopping Center and Stanford University to the west. Palo Alto High School is located adjacent to the railroad corridor. The majority of the area within 0.25 miles of the corridor in Palo Alto contains single-family residential units.

The City of Mountain View has general industrial, residential, public facility, office, and arterial commercial uses adjacent to the project corridor. Rengstorff Park is located adjacent to ROW. The eastern section of the corridor within the City of Sunnyvale is primarily industrial with low- to medium-density residential interspersed. Neighborhood shopping, general business, high-density residential, and industrial residential uses are located to the west. Through the City of Santa Clara, the adjacent uses consist of mixed use, moderate-density residential, and office/research and development. Heavy industrial uses are located east of the railroad tracks, with light industrial, research and development, and office uses located to the west. The San Jose International Airport is located northeast of Santa Clara Station.

The College Park Station in San Jose is located near Bellarmine College Preparatory High School. The SAP Center is adjacent to the Caltrain alignment just north of the San Jose Diridon Station. The primary adjacent land uses in the City of San Jose are combined industrial/commercial, public park, medium-low density to medium-density residential, light industrial, private recreation, campus industrial, and the Coyote Valley Urban Reserve. Near Tamien Station is the Tamien Planned Community, and farther to the south between the Capitol and Blossom Hill Stations is the Communications Hill Planned Community. The main land uses in this planned community are single-family detached and attached residential, parks/play fields, heavy industrial, and combined industrial/commercial.

Table 3.10-1, below summarizes the predominant land uses adjacent to the Caltrain corridor.

Existing Land Uses Adjacent to Paralleling Stations, Switching Station, and Traction Power Substations

The Proposed Project would involve constructing seven PSs, one switching station (SWS), and two TPSs. The existing land uses in the vicinity of these project features are summarized below.

- **PS1** would be within the Caltrain corridor on the northeast corner of Mariposa Street and Pennsylvania Street in San Francisco. The site is surrounded by industrial land uses. Although this empty parcel of land is not included as part of an area plan, it is adjacent to areas included within the *Showplace Square/Potrero Hill Area Plan* to the south and west and areas included in the *Central Waterfront Area Plan* to the southeast.
- **PS2** would be within the Caltrain corridor to the southwest of the Tunnel Avenue/Blanken Avenue intersection in San Francisco. The site is surrounded by industrial land uses. The empty parcel of land is not within an existing specific, area, or precise plan.

1 **Table 3.10-1. Predominant Land Uses within 0.25 Miles of the Caltrain Corridor**

City/Segment	East/West of Corridor	Predominant Land Uses[a,b]
San Francisco		
San Francisco 4th and King Station to 22nd Street Station	East	Mixed use, residential, commercial, parks/open space, education/public/semi-public, industrial, commercial
	West	Mixed use, industrial, residential
22nd Street Station to Bayshore Station	East	Industrial, residential, education/public/semi-public
	West	Industrial, residential
Brisbane	East	Commercial, parks/open space
	West	Commercial, parks/open space, residential
South San Francisco	East	Commercial/industrial
	West	Residential, commercial, industrial, mixed use
San Bruno	East	Industrial, residential, commercial
	West	Residential, commercial
Millbrae	East	Parks/open space, industrial, residential, mixed use
	West	Residential, commercial, mixed-use
Burlingame		
North Burlingame border to Broadway Station	East	Mixed use (commercial/industrial)
	West	Commercial, residential, parks/open space, education
Broadway Station to south Burlingame border	East	Commercial, residential, mixed use
	West	Commercial, residential
San Mateo		
North San Mateo border to San Mateo Station	East	Residential, education
	West	Residential, commercial, mixed use
San Mateo Station to Hayward Park Station	East	Commercial, residential, industrial, education
	West	Commercial, residential, mixed use, parks/open space
Hayward Park Station to Hillsdale Station	East	Mixed use, commercial, residential, public space
	West	Commercial, residential, mixed use
Hillsdale Station to South San Mateo border	East	Residential, commercial, education
	West	Commercial, mixed use, residential
Belmont	East	Residential, commercial, education
	West	Residential, commercial, mixed use, education
San Carlos	East	Industrial, residential, commercial
	West	Residential, commercial

City/Segment	East/West of Corridor	Predominant Land Uses[a,b]
Redwood City	East	Residential, education/public/semi-public, mixed use, industrial, commercial
	West	Residential, education, commercial
North Fair Oaks (unincorporated)	East	Industrial, residential, commercial
	West	Residential, commercial
Atherton	East	Residential, parks/open space
	West	Residential, public/semi-public space
Menlo Park	East	Residential, commercial, public/semi-public space, parks/open space
	West	Commercial, residential
Palo Alto	East	Residential, mixed use, commercial
	West	Residential, education/public/semi-public spaces, commercial
Mountain View		
San Antonio Station to Mountain View Station	East	Residential, office ~~industrial, mixed use~~
	West	Residential, office, ~~commercial,~~ parks/open space~~, industrial~~
Mountain View Station to South Mountain View border	East	Residential, industrial/office
	West	Residential, ~~Commercial,~~ industrial/office, ~~residential~~ commercial
Sunnyvale		
North Sunnyvale border to Sunnyvale Station	East	Residential, industrial
	West	Residential, education/public/semi-public space, commercial, industrial
Sunnyvale Station to Lawrence Station	East	Mixed use (residential/industrial), residential, industrial
	West	Commercial, residential, mixed use (residential/ industrial)
Santa Clara	East	Industrial
	West	Residential, education/public/semi-public spaces, commercial
San Jose		
North San Jose border to College Park Station	East	Commercial/industrial, industrial
	West	Residential, industrial, education/public/semi-public spaces
College Park Station to Diridon Station	East	Commercial/industrial, industrial, commercial, mixed use, parks/open space
	West	Residential, mixed use, commercial, industrial
Diridon Station to Tamien Station	East	Residential, mixed use, commercial/industrial, commercial, parks/open space
	West	Residential, mixed use, mixed use, parks/open space
Tamien Station to Project terminus	East	Residential, industrial, parks/open space
	West	Residential, industrial, parks/open space

Source: Metropolitan Transportation Commission 2012.
[a] Includes prominent, large-scale land uses. Most segments include small parks/open spaces, commercial blocks, and small educational facilities.
[b] Unless otherwise specified, "mixed use" refers to residential/commercial mixed use.

- **TPS1** is proposed in South San Francisco. Three potential sites are being considered that are outside the Caltrain ROW. Option 1 is located south of Grand Avenue along the west side of Gateway Boulevard in a parking lot (under lease from PG&E) adjacent to industrial/ commercial/office uses, including a PG&E facility. Option 2 consists of vacant land south of Grand Avenue and west of Harbor Way adjacent to R&D/office uses. Option 3 is located to the south along Gateway Boulevard on vacant land west of West Harris Avenue adjacent to hotel/R&D/office uses (but for which there is a pending application with the City of South San Francisco for a 128-room hotel expansion). One potential site is being considered inside the Caltrain ROW. Option 4 is located adjacent to the Caltrain tracks next to the South San Francisco Caltrain Station. The potential sites for TPS1 are surrounded by industrial and commercial and office uses and are within the *East of 101 Area Plan*. Specific land uses in the area include rental car parking lots, storage facilities, distribution centers, truck storage areas, and an electrical substation. Some smaller office buildings are located within the area.

- **PS3** is proposed to be located north of Broadway in Burlingame, adjacent to areas covered by the *North Burlingame/Rollins Road Specific Plan*. PS3 Option 1 would be within an existing storage area in the Caltrain corridor, just north of the Broadway Station parking lot. The site is separated from residential development to the west by a major arterial route, California Drive, which fronts along the Caltrain ROW. PS3 Option 2 would be within the Caltrain ROW at the end of Star Way. This site would be adjacent to existing parking associated with commercial and commercial/industrial uses ~~are~~ adjacent to the corridor.

- **PS4** has ~~two~~ three potential sites, ~~both~~ all of which are within the Hillsdale Station parking lot in San Mateo. Surrounding areas include commercial uses along El Camino Real. ~~Both~~ All potential sites for PS4 are located adjacent to areas covered by the *Rail Corridor Transit-Oriented Development Plan*, the *Bay Meadows Phase II Specific Plan*, and the *El Camino Real Master Plan*. All potential sites are located within the area covered by the *Hillsdale Station Area Plan*.

- **SWS1** Option 1 is proposed to be located on land owned by SamTrans adjacent to the Caltrain ROW. This site is separated from residences on the west side by both the Caltrain ROW and Westmoreland Avenue, a local arterial route. This location is within a triangular area bound by railroad tracks on all three sides and is within an industrial area. SWS1 Option 1 would be located adjacent to areas covered by the *North Fair Oaks Community Plan*. Although SWS1 Option 1 would not be located within the Caltrain ROW, since the land is owned by SamTrans and is vacant, no additional land would need to be acquired and no existing land use would be displaced. SWS1 Option 2 would be located within the Caltrain ROW in an existing storage yard adjacent to the Caltrain tracks. This site is adjacent to the Orchard Supply Hardware and Costco on Middlefield Road in Redwood City and would not be immediately adjacent to the area covered by the *North Fair Oaks Community Plan*.

- **PS5** has ~~two~~ three potential sites, ~~both~~ all of which would be within the Caltrain corridor in Palo Alto. Option 1 is located east of the tracks and west of Alma Street at the intersection of Alma and Greenmeadow Way which is across the street from the Greenmeadow residential neighborhood.[2] Option 1B is located east of the tracks and west of Alma Street just south of the intersection of Alma Street and Ferne Avenue and across the street from residences on Ferne Avenue backing onto Alma Street and a Jehovah's Witness Kingdom Hall. Option 2 is south of

[2] As described in Section 3.4, Cultural Resources, the historic portion of the Greenmeadow neighborhood is not adjacent to Alma St. and is separated from Alma St. by approximately 250 feet of other non-historic development.

Page Mill Road west of the tracks and is immediately adjacent to a mixed residential/ commercial development (195 Page Mill Road) under construction and near other commercial areas. ~~surrounded by industrial uses. The closest residential uses relative to Option 2 are located approximately 0.05 mile to the east, across the Caltrain tracks and Alma Street.~~

- **PS6** has two potential sites, both of which would be within the Caltrain corridor in Sunnyvale. Option 1 is located to the east of the tracks and west of East Hendy Avenue, which separates the area from the residential neighborhoods to east. Option 2 is located to the southwest of Mathilda Avenue and West Evelyn Avenue within the northern portion of the Sunnyvale Station parking lot. This area consists of commercial uses and a City park (Plaza del Sol) across West Evelyn Avenue from the Caltrain parking lot. Option 2 is ~~directly adjacent to~~ within the area~~s~~ covered by the *Downtown Specific Plan* ~~to the east~~.
- **TPS2** is proposed in San Jose. Two out of the three potential sites outside of the Caltrain corridor are being considered. Option 1 is located on VTA property on Newhall Street. A PG&E substation is located directly across Newhall Street, north of Interstate 880 (I-880). Surrounding uses at this location are mostly industrial, with residential uses to the east. Option 2 is located west of Stockton Avenue and south of I-880. This site and its surroundings have industrial uses. Option 3 is on JPB property near the Caltrain Centralized Equipment Maintenance and Operations Facility (CEMOF) and is surrounded by industrial uses. All TPS2 options are located within the *Santa Clara Valley Habitat Plan* area.
- **PS7** is proposed to be constructed near Communications Hill in South San Jose. This site is located in the Caltrain ROW, south of Communications Hill Boulevard. The land use adjacent to the proposed location is parks (Kurte Park)/open space with new residential development located on Communications Hill. The site is adjacent to areas covered by the *Communications Hill Specific Plan*, as summarized in Appendix H, *Land Use Information*. Under Project Variant 1, PS7 would be located on vacant land south of the Tamien Station along Alma Avenue between the Caltrain tracks and State Route 87. Variant A is on land owned by Caltrans. Variant B is partially within the JPB ROW and partially on land owned by Caltrans. Both sites would be across the railroad tracks from an apartment high-rise apartment building north of Alma Avenue and a townhouse development located south of Alma Avenue.

Existing Land Uses Where OCS Alignment or OCS Electrical Safety Zone Would Be Outside Caltrain ROW

The OCS alignment would be installed slightly (perhaps several feet) outside of the current ROW in an estimated 27 ~~20~~ locations for a total length of approximately 10,200 ~~9,300 feet~~. Approximately 8,700 ~~7,100~~ feet of the OCS alignment would be installed several feet outside of the current ROW in ~~9 locations~~ in adjacent road or rail rights of way in San Francisco, South San Francisco, Millbrae, Burlingame, Belmont, Redwood City, Mountain View, ~~Santa Clara~~ and San Jose. In addition, approximately 1,400 ~~2,200~~ feet of OCS alignment in 8 ~~11~~ locations would be installed several feet outside of the current ROW on adjacent commercial property ~~in nine locations~~ in South San Francisco, ~~Brisbane~~, Sunnyvale and San Jose.

The exact amount of electrical safety zone encroachment of private land would depend on the width of the zone, the width of the ROW, and the proximity of private land to the ROW. In the Draft EIR, a worst-case assumption for the width of the safety zone of 24 feet was used. In the Final EIR, as described in Chapter 2, *Project Description*, the more likely width of the safety zone from the outer track centerline would be 21 feet (in two-track areas) and 18 feet (in multi-track areas). Thus, this EIR discloses a range of potentially effects.

- Worst-case estimates (using a 24-foot electrical safety zone):
  - The electrical safety zone of 10 feet around the OCS alignment would extend outside of the current ROW in adjacent road or rail rights of way ~~in 46 locations~~ in San Francisco, South San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos, Redwood City, San Mateo County (North Fair Oaks area), Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose.
  - The electrical safety zone of 10 feet around the OCS alignment would extend outside of the current ROW in adjacent residential property (~~11 locations~~ approximately 98 parcels[3] in San Francisco, Belmont, San Mateo County (North Fair Oaks area) ~~Redwood City~~, Atherton, Menlo Park, Palo Alto, ~~Mountain View~~, Sunnyvale, Santa Clara and San Jose); commercial property (~~47 locations~~ approximately 84 parcels in San Francisco, Brisbane, South San Francisco, ~~San Bruno, Millbrae, Burlingame~~, San Mateo, Belmont, Redwood City, San Mateo County (North Fair Oaks area), Menlo Park, Sunnyvale, Santa Clara, and San Jose) and park areas (four locations in Redwood City, Atherton, Palo Alto, and Santa Clara). The four park locations are: Broadway-Arguello Park (Redwood City); Holbrook-Palmer Park (Atherton); Peers Park (Palo Alto); and Reed Street Dog Park (Santa Clara).
- Likely estimates (using 21 foot electrical safety zone in two-track areas and 18-foot zone in multi-track areas):
  - The electrical safety zone of 10 feet around the OCS alignment would extend outside of the current ROW in adjacent road or rail rights of way in San Francisco, South San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos, Redwood City, San Mateo County (North Fair Oaks area), Atherton, Menlo Park, Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose.[4]
  - The electrical safety zone of 10 feet around the OCS alignment would extend outside of the current ROW in adjacent residential property (approximately 34 parcels in San Francisco, Belmont, San Mateo County (North Fair Oaks area), Atherton, Menlo Park, and Sunnyvale); commercial property (approximately 47 parcels in Brisbane, San Mateo, Belmont, Redwood City, Menlo Park, Sunnyvale, Santa Clara, and San Jose) and park areas (four locations in Redwood City, Atherton, Palo Alto, and Santa Clara). The four park locations are: Broadway-Arguello Park (Redwood City); Holbrook-Palmer Park (Atherton); Peers Park (Palo Alto); and Reed Street Dog Park (Santa Clara).

Recreation Facilities

Parks, recreation, and open space facilities are generally overseen by the parks and recreation departments of the cities through which the Caltrain corridor passes. These municipalities generally use planning documents, such as park master plans, to oversee the acquisition, preservation, improvement, maintenance, and expansion of local parklands and trail networks. Additionally, as

[3] Note that the DEIR used "locations" in terms of areas of encroachment which could include multiple parcels. This was updated in the FEIR to use actual property parcels.

[4] Some of the differences with the revised estimates for the Final EIR have to do with updates to the preliminary engineering, not the change in the electrical safety zone widths and thus there are some additional estimate areas of encroachment in road or rail ROWs.

described above, general plans of each jurisdiction include goals and policies addressing parks and recreational facilities. Other organizations, such as the San Francisco Bay Conservation and Development Commission and the Mid-Peninsula Open Space District, oversee parks, recreation and open space lands on a regional level and provide guidance on issues that transcend the authority of local jurisdictions.

Table 3.10-2 summarizes the park and open space facilities adjacent to the corridor with no separation by existing streets or freeways and Appendix H include a comprehensive list of all parks within 0.25 mile of the ROW. In addition to the existing parks, several parks are proposed adjacent to the ROW in the cities of San Mateo, Redwood City, Santa Clara, and San Jose.

Table 3.10-2. Publicly Owned Parks and Recreational Resources Directly Adjacent to the Caltrain Corridor

Facility Name	Location
Lions Park	1st Avenue, San Bruno
Lomita Park	San Anselmo Avenue/San Juan Avenue, San Bruno
Trinta Park	150 19th Avenue, San Mateo
John S Roselli Memorial Park	1044 Middlefield Road, Redwood City
Main Street Park	Main Street/Beech Street, Redwood City
Broadway Arguello Park	Broadway Avenue, Redwood City
Holbrook-Palmer Park	150 Watkins Avenue, Atherton
El Camino Park	100 El Camino Real, Palo Alto
El Palo Alto Park	117 Palo Alto Avenue, Palo Alto
Embarcadero Bike Path	Parallel to Caltrain corridor, Palo Alto
Peers Park	1899 Park Boulevard, Palo Alto
Rengstorff Park and Pool	201 South Rengstorff Avenue, Mountain View
Resident Park	North of Chiquita Avenue/Villa Street, Mountain View
Bracher Park	2700 Chromite Drive, Santa Clara
Reed Street Dog Park	888 Reed Street, Santa Clara
Fuller Park	Fuller Avenue, San Jose
Kurte Park[a]	Communication Hills Boulevard, San Jose

Source: ICF International 2013.

[a] PS7 facility would be adjacent to Kurte Park. <u>With Project Variant 1, PS7 would not be located adjacent to Kurte Park.</u>

3.10.2 Impact Analysis

3.10.2.1 Methods for Analysis

Land Use

This analysis considers existing uses and the existing general plans, specific plans, area plans, and precise plans along the Caltrain ROW, as well as applicable regional plans. In addition, GIS maps documenting existing land uses were created and site reconnaissance has been conducted.

Recreation

In determining whether the Proposed Project would have a significant impact on parks and open spaces, this analysis considers recreational facilities within 0.25 mile of the Caltrain corridor. This assessment considers potential Project impacts on park design and physical conditions, existing vegetation, and how a park would be used while the Proposed Project is under construction and in operation.

3.10.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the Proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Physically divide an established community.
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.
- Conflict with any applicable habitat conservation plan or natural community conservation plan.
- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

As noted above, local land use plans are not applicable within the Caltrain ROW. Consequently, project activities that remain within the Caltrain ROW would not conflict with local land use plans, policies, or regulations.

3.10.2.3 Impacts and Mitigation Measures

<u>Project Variant 1 is addressed wherever applicable in the analysis below.</u>

Impact LUR-1	Physically divide an established community
Level of Impact	Less than significant

Construction

Community cohesion addresses the degree to which residents have a sense of belonging to their neighborhood or experience attachment to community groups and institutions as a result of continued association over time. Possible community cohesion impacts of a project include effects on interactions among persons and groups, whether certain people would be isolated from others, and the perceived impact on community quality of life.

The construction of OCS poles and wires within the existing ROW could involve short-term, temporary detours or street closures, which could separate an established community. However, these detours and closures would be temporary and would not significantly impact access to or from surrounding areas. In addition, the paralleling and switching stations and the traction power substations would be located either within or adjacent to the corridor, which would not divide an established community during construction. Consequently, construction impacts would be less than significant.

Operation

The Proposed Project would primarily place new OCS poles and wires within the Caltrain ROW, with some portions of the OCS alignment located outside the Caltrain ROW. These facilities would be included within or adjacent to an existing, active commuter and freight rail corridor. Therefore, their operation would not constitute any new physical or psychological barriers that would divide, disrupt, or isolate neighborhoods, individuals, or community focal points in the corridor. Access across the ROW at existing roads and bike paths would be maintained under the Proposed Project. Although there would be some temporary delays to crossing the ROW during peak hours due to increased gate-down time at select at-grade crossings, which may result in a potential traffic impact (see Section 3.14, *Transportation and Traffic*), the increase in gate-down time during peak hours would not create an actual barrier between communities on either side of the Caltrain ROW.

The Proposed Project would place up to 10 traction power facilities (TPFs), consisting of two traction power substations, one switching station, and seven paralleling stations, along the corridor from San Francisco to San Jose. With the exception of ~~the~~ three <u>of the four</u> TPS options in South San Francisco and two of the three TPS options in San Jose, these facilities would be within the Caltrain ROW. The two traction power substations would be located in areas of existing commercial and industrial development. Due to their relatively small size, and location within similar land uses, none of these facilities would have the potential to divide or disrupt an existing residential neighborhood or community. Therefore, operation of the Proposed Project would not divide an established community beyond existing conditions. The impact would be less than significant.

<u>Under Project Variant 1, described in Chapter 2, *Project Description*, PS7 would be located between the Caltrain tracks and State Route 87 adjacent to Alma Avenue and the proposed use would not divide or disrupt an existing neighborhood or community. Therefore, Project Variant 1 would not change the significance determination of this impact.</u>

Impact LUR-2	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Proposed Project adopted for the purpose of avoiding or mitigating an environmental effect and compatibility with existing surrounding land uses
Level of Impact	Less than significant

Construction and Operation

The Proposed Project would involve construction of OCS poles and wires primarily within the Caltrain ROW (with some OCS poles and wires outside the Caltrain ROW), 10 TPFs along the corridor, and new or improved bridge barriers.

The proposed TPFs would be constructed primarily within the Caltrain corridor and would be placed adjacent to areas zoned for industrial or commercial/office use, except for a few locations near residential areas. ~~All~~ Three <u>out</u> of the <u>four</u> proposed TPSs in South San Francisco and two out of the three proposed TPSs in San Jose would be constructed outside of the ROW. However, in general, these facilities would be consistent with land use designations for each local jurisdiction and would not substantially impact surrounding land uses, as discussed in more detail below.

The OCS facilities would be primary constructed within the existing, active commuter and freight rail corridor. However, in some cases, the OCS alignment would be located just outside the Caltrain ROW on commercial property or in existing road and rail rights-of-way. While the OCS facilities would slightly encroach on adjacent property in a number of locations, as discussed below, the placement of OCS facilities in these areas would not require a change in existing land uses, nor substantially hinder future site development.

Most of the electrical safety zone needed around the OCS facilities would be within the Caltrain ROW. However, in a number of areas, the electrical safety zone would be located in part or in whole outside the Caltrain ROW on residential or commercial property or in existing road and rail rights-of-way. The primary effect of placement of the electrical safety zone in these areas outside the Caltrain ROW would be the removal of existing vegetation and maintenance of an area clear of vegetation within 10 feet of the OCS alignment. In addition, establishment of the electrical safety would prevent future structural improvements within 6 feet of the OCS alignment. As discussed further below, the removal of vegetation would, in some cases, be a significant biological and aesthetic impact and mitigation is recommended to address these biological and aesthetics impacts. However, due to the limited area of effect on any particular parcel, the placement of the electrical safety zone and the land use constraints required for the zone would not be considered a significant land use impact because they would not result in displacement of current land use or substantial restrictions on future land uses.

Compatibility with Existing Land Uses

As shown in Table 3.10-3, construction and operation of the TPFs would be consistent with existing site and surrounding land uses.

For the placement of OCS poles and establishment of an electrical safety zone, the current analysis has not identified any locations where the Proposed Project would displace existing structures or facilities. Vegetation clearance would be necessary on certain residential, commercial/industrial, and road/rail ROW parcels but would not actually displace existing residential, commercial, industrial, road or rail uses. Impacts on parks due to vegetation clearance are discussed separately under Impact LUR-3 below.

Consistency with Local General Plans, Specific Plans, Area Plans, and Precise Plans

The Proposed Project would generally be consistent with the local plans and policies, including land use designations and zoning, except for the TPS sites and PS4 discussed below. The majority of the Proposed Project, including OCS poles and wires, the paralleling stations, and the switching station, would be located within the existing Caltrain ROW and would, therefore, not impact the adjacent land use plans (PS7 Variant A and B would be located partially or entirely on vacant land owned by Caltrans). Bridge barriers would be constructed or enhanced on existing roadway bridges across the Caltrain alignment. Overbridge protection barriers would be 6.5 feet high above sidewalk or pavement level and placed along the parapet of the bridge at least 10 feet from the closest energized conductors crossing underneath. Although these barriers could result in visual impacts (as discussed in Section 3.1, *Aesthetics*), they would be within existing transportation infrastructure and would not conflict with local plans.

Table 3.10-3. Traction Power Facility Compatibility with Existing Land Uses

Traction Power Facility	City/ Jurisdiction	Location and Existing Land Uses	Land Use Compatibility
Paralleling Station 1	San Francisco	Within Caltrain corridor to the west of the tracks. Vacant lot that is surrounded by industrial land uses.	Compatible. PS1 would be approximately 80 feet by 40 feet. Would be within ROW and consistent with the existing Caltrain operations and surrounding land uses.
Paralleling Station 2	San Francisco	Within Caltrain corridor to the west of the tracks. Vacant lot that is surrounded by industrial land uses.	Compatible. PS2 would be approximately 80 feet by 40 feet. Would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Traction Power Substation 1, Option 1	South San Francisco	Outside of the Caltrain corridor to the east of the tracks, and to the west of Gateway Boulevard. Parking lot that is surrounded by commercial/industrial land uses. The ductbank from the ROW to this site would be placed on an existing rail spur. The connection to the PG&E substation would be directly to the north where there an existing PG&E substation.	Compatible. TPS1 would be approximately 150 feet by 200 feet. Although it would be outside of the existing ROW, TPS1 would be consistent with the height and bulk of the surrounding warehouse and light industrial buildings and consistent with the adjacent PG&E substation.
Traction Power Substation 1, Option 2	South San Francisco	Outside of the Caltrain corridor to the east of the tracks, and to the east of Gateway Boulevard. Vacant parcel that is surrounded by commercial/ industrial/office land uses. The ductbank from the ROW to this site would be placed on an existing rail spur. The connection to the PG&E substation would be to the northwest where there an existing PG&E substation and require an underground or overhead crossing on Gateway Boulevard.	Compatible. TPS1 would be approximately 150 feet by 200 feet. Although it would be outside of the existing ROW, TPS1 would be consistent with the height, bulk and characteristics of the surrounding office, R&D, warehouse and light industrial buildings and the PG&E substation located across Gateway Boulevard. The addition of overhead connection to the PG&E substation (if underground ductbanks are not used) would be consistent with existing overhead transmission lines in the area.
Traction Power Substation 1, Option 3	South San Francisco	Outside of the Caltrain corridor to the east of the tracks, and to the south of Gateway Boulevard. Vacant parcel that is surrounded by commercial/ industrial land uses. The ductbank from the ROW to this site would be placed under Gateway Boulevard and an existing parking lot, and along an existing rail spur. The connection to the PG&E substation would be to the north where there an existing PG&E substation and would require either an underground ductbank or overhead transmission line along Gateway Boulevard.	Compatible. TPS1 would be approximately 150 feet by 200 feet. Although it would be outside of the existing ROW, TPS1 would be consistent with the height and bulk of the surrounding warehouse and light industrial buildings. The addition of overhead connection to the PG&E substation along Gateway Boulevard (if underground ductbanks are not used) would be consistent with existing overhead transmission lines in the area.

Traction Power Facility	City/ Jurisdiction	Location and Existing Land Uses	Land Use Compatibility
			There is a pending application for a 128-room hotel on the Option 3 site with the City of South San Francisco. If this hotel were built on the site, a substation would not be a compatible use.
Traction Power Substation 1, Option 4	South San Francisco	Within Caltrain corridor to the west of the tracks. Existing parking lot for South San Francisco Caltrain Station. Adjacent to commercial uses and associated parking. The ductbank or overhead transmission line would cross the Caltrain ROW, a parking lot in commercial areas east of the ROW, and Grand Avenue.	Compatible. TPS1 would be approximately 150 feet by 200 feet. Would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses. The buried duct bank or overhead transmission line would be compatible with and would not substantially hinder railway, commercial parking, and roadway uses.
Paralleling Station 3, Option 1	Burlingame	Within the Caltrain corridor to the west of the tracks. Adjacent to the Broadway parking lot within a storage area. Surrounded by residential land uses to the north and west and commercial land uses to the south.	Compatible. PS3 would be approximately 80 feet by 40 feet. Would be within 100 feet of residences to the west, but would be buffered by California Drive. PS3 would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Paralleling Station 3, Option 2	Burlingame	Within the Caltrain corridor to the east of the tracks. Adjacent to a parking lot for commercial/industrial uses.	Compatible. PS3 would be approximately 80 feet by 40 feet. PS3 would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Paralleling Station 4, Option 1	San Mateo	Within the northern portion of the Hillsdale Station parking lot to the west of the corridor. Surrounded by commercial land uses.	Compatible with existing uses. PS4 would be approximately 80 feet by 40 feet. Would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses. See discussion of cumulative impacts with planned future uses in the Hillsdale Station Area Plan.
Paralleling Station 4, Option 2	San Mateo	Within the southern portion of the Hillsdale Station parking lot to the west of the corridor. Surrounded by commercial land uses.	Compatible with existing uses. PS4 would be approximately 80 feet by 40 feet. Would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses. See discussion of cumulative impacts with planned future uses in the Hillsdale Station Area Plan.

Traction Power Facility	City/ Jurisdiction	Location and Existing Land Uses	Land Use Compatibility
Paralleling Station 4, Option 3	San Mateo	Within the southern portion of the Hillsdale Station parking lot to the west of the corridor, to the south of Hillsdale Boulevard. Surrounded by commercial land uses.	Compatible. PS4 would be approximately 80 feet by 40 feet. Would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Switching Station 1, Option 1	San Mateo County (North Fair Oaks)	Within the Caltrain corridor to the east of the tracks. Parcel used as a storage facility. Surrounded by industrial land uses.	Compatible. SWS1 would be approximately 80 feet by 120 feet. Would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Switching Station 1, Option 2	Redwood City	Within the Caltrain corridor to the east of the tracks. Parcel used as a storage facility. Surrounded by industrial land uses.	Compatible. SWS1 would be approximately 80 feet by 120 feet. Would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Paralleling Station 5, Option 1	Palo Alto	Within the Caltrain corridor to the east of the tracks. Vacant parcel. Railroad ROW to the west. Alma Street to the east. ~~Surrounded by~~ Residential land uses across Alma Street.	Compatible. PS5 would be approximately 80 feet by 40 feet. Would be within 100 feet of residences to the east, but would be buffered by Alma Street. PS5 would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Paralleling Station 5, Option 1B	Palo Alto	Within the Caltrain corridor to the east of the tracks. Vacant parcel. Railroad ROW to the west. Alma Street to the east. Residential land uses and Jehovah's Witness Kingdom Hall across Alma Street.	Compatible. PS5 would be approximately 80 feet by 40 feet. Would be within 100 feet of residences to the east, but would be buffered by Alma Street. PS5 would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Paralleling Station 5, Option 2	Palo Alto	Within the Caltrain corridor to the west of the tracks. Vacant parcel adjacent to existing communications building. Adjacent to ~~industrial and~~ mixed residential/commercial development under construction. Commercial uses in vicinity. ~~land uses. Residential uses are separated from site by the Caltrain ROW and Alma Street.~~	Compatible. PS5 would be approximately 80 feet by 40 feet. ~~Would be within 150 feet of residences to the east, but would be buffered by the ROW and Alma Street.~~ PS5 would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses. New development is oriented inward to courtyard and not eastward toward the ROW. Mitigation Measure AES-2b would help to buffer new development to the west in terms of visual aesthetics.

Traction Power Facility	City/ Jurisdiction	Location and Existing Land Uses	Land Use Compatibility
Paralleling Station 6, Option 1	Sunnyvale	Within the Caltrain corridor to the east of the tracks. Vacant parcel. Residential land uses to the east.	Compatible. PS6 would be approximately 80 feet by 40 feet. Would be within 100 feet of residences to the east, but would be buffered by East Hendy Avenue. PS6 would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Paralleling Station 6, Option 2	Sunnyvale	Within the northern portion of the Sunnyvale Station parking lot to the west of the Caltrain corridor. Adjacent to commercial land uses.	Compatible. PS6 would be approximately 80 feet by 40 feet. Would be within 120 feet of residences to the east, but would be buffered by the Caltrain ROW. PS6 would be within the Caltrain station parking lot and consistent with the existing Caltrain operations and surrounding land uses.
Traction Power Substation 2, Option 1	San Jose	Outside of the Caltrain corridor to the east. Within an empty large industrial parcel. Surrounded by industrial and industrial/commercial land uses with PG&E substation (the PG&E substation is between Newhall Street and I-880). Route of ductbank to the Caltrain ROW would cross industrial/vacant land. Route of transmission line from PG&E substation would be directly across Newhall Street as site is adjacent to PG&E substation.	Compatible. TPS2 would be approximately 150 feet by 200 feet. Although it would be outside of the existing ROW, TPS2 would be consistent with the height and bulk of the surrounding warehouse buildings and existing land uses, including the PG&E substation. The addition of overhead connection to the PG&E station (if underground ductbanks are not used) would be consistent with existing overhead transmission lines in the area.
Traction Power Substation 2, Option 2	San Jose	Outside of the Caltrain corridor to the east. Within an industrial parcel in current use. Surrounded by industrial land uses. Route of ductbank to the Caltrain ROW would cross industrial land. Route of transmission line from PG&E substation would be across I-880.	Compatible. TPS2 would be approximately 150 feet by 200 feet. Although it would be outside of the existing ROW, TPS2 would be consistent with the height and bulk of the surrounding warehouse buildings and existing land uses, including the nearby PG&E substation. Site is located on south side of an industrial parcel and is used for parking at present. Addition of TPS2 may displace existing industrial use on parcel.
Traction Power Substation 2, Option 3	San Jose	Outside of the Caltrain corridor to the east. Within parking lot and vacant lot used by Caltrain as part of CEMOF. Surrounded by industrial land uses and railway lines.	Compatible. TPS2 would be approximately 150 feet by 200 feet. Would be within land owned by Caltrain. The building would be consistent with the height and bulk of the surrounding buildings. May displace some existing parking and use of the empty lot for temporary staging, but parking and staging can be accommodated on other parts of the facility.

Traction Power Facility	City/ Jurisdiction	Location and Existing Land Uses	Land Use Compatibility
Paralleling Station 7	San Jose	Within the Caltrain corridor to the east of the tracks. Vacant parcel adjacent to Kurte Park. Surrounded by parks/open space land uses.	Compatible. PS7 would be approximately 80 feet by 40 feet. Would be within the ROW and consistent with the existing Caltrain operations and surrounding land uses.
Variant 1 Paralleling Station 7 (Variants A and B)	San Jose	On a vacant lot along Alma Avenue between Caltrain tracks and State Route 87, near Tamien Station owned by Caltrans (Variant A) or Caltrans/JPB (Variant B). Residential areas are located across the railroad tracks from the PS7 variant locations.	Compatible. The variants would be adjacent to the existing train tracks, SR87, and the VTA light rail tracks and consistent with existing Caltrain and freeway transportation uses. Although located across the tracks from several residential areas, given the limited size of the facility and the separation and context, the new facility would not result in any fundamental incompatibility with adjacent uses.

Source for adjacent land use identification*:* Metropolitan Transportation Commission 2012.

It is important to note that while CEQA requires an EIR to disclose potential inconsistencies with local plans, an inconsistency on its own is not considered a significant impact under CEQA unless it were to result in a significant physical impact on the environment. Thus, the analysis below focuses on two things: 1) is the Proposed Project consistent with local land use plans; and 2) if there is an inconsistency, would it result in a significant physical impact on the environment, if for example, it were to displace planned development to an alternative location that might result in secondary significant impacts.

The TPS facilities would be constructed outside of the ROW in locations addressed by the *South San Francisco General Plan*, the *East of 101 Area Plan*, and the *Envision San Jose 2040 General Plan*. No plans that are currently being developed, but which are not yet adopted, would apply to the TPS facilities.

TPS1

~~The~~ Three of the four TPS1 options (Options 1, 2, and 3) in South San Francisco would be located outside of the ROW in areas with land use designations under the *South San Francisco General Plan* of Business Commercial (Options 1 and 3) and Business and Technology Park (Option 2) (City of South San Francisco 1999). ~~These~~ Options 1, 2 and 3 ~~areas~~ are zoned Business Commercial (BC), Business Technology Park (BTP), and Freeway Commercial (FC), respectively (City of South San Francisco 2011). Permitted uses in the Business Commercial land use designation include administrative, financial, business, professional, medical and public offices, research and development facilities, and visitor-oriented and regional commercial activities. This designation accommodates campus-like environments for corporate headquarters, research and development facilities, and offices. Permitted uses within the Business and Technology Park designation include incubator-research facilities, testing, repairing, packaging, publishing and printing, marinas, shoreline-oriented recreation, offices, and research and development facilities. Warehousing and distribution facilities and retail are permitted as ancillary uses only. Although the proposed TPS would not be compatible with the Business and Technology Park designation, the existing land uses to the south and west ~~are more~~ feature parcels that are light-industrial and warehouse in nature. These uses include rental car parking lots, storage facilities, distribution centers, truck storage areas, and an electrical substation. ~~Some smaller~~ However, immediately adjacent, to the north, and across Harbor Way to the east and northeast, is a large Research and Development (R&D)/Office campus. ~~office buildings are located within the area.~~

The TPS1 ~~facility~~ Options 1, 2, and 3 are in areas addressed by the *East of 101 Area Plan*. Options 1 and 3 would be within areas designated as Planned Commercial and Option 2 would be in an area designated as Light Industrial. Planned Commercial is intended to accommodate retail developments, office parks, hotels, restaurants, and high-end offices. New development is controlled through development standards and design guidelines to ensure compatibility between the allowed uses and the adjacent industrial areas. The Light Industrial land use category is intended to accommodate existing industrial land uses and allow for a wide range of light industrial uses (City of South San Francisco 1994).

BC and BTP zoning districts in South San Francisco conditionally permit major utilities; however, FC (Option ~~2~~3) does not allow such uses. Under all TPS 1 options, the TPS would be constructed on either vacant parcels or on existing surface parking lots within areas that are surrounded by industrial or commercial uses. With the exception of TPS1 Option ~~2~~3, all sites are zoned to allow utilities and power generation facilities with conditional use permits. For TPS1 Option ~~2~~3, JPB would need to seek a zoning amendment for a traction power substation. While the proposed use would be in conflict with existing zoning restrictions, the traction power substation would not be incompatible with the surrounding uses and would not displace any existing land use. Placement of a traction power substation at this location would preclude designated FC uses; however, regionally, the minimal loss of developable commercial land (30,000 square feet) is not considered substantial enough to place additional commercial development pressure on areas outside of urban areas that would otherwise result in secondary environmental impacts.

PS 4

All three of the proposed sites for PS4 would be located within the Caltrain ROW, and also within San Mateo's *Hillsdale Station Area Plan* (HSAP). The HSAP calls for future relocation of the Hillsdale Caltrain Station approximately 1,000 feet to the north, between 28th and 31st Avenues and the development of a new expanded multi-modal Station and parking garage, as well as modifications to the Station's surrounding land uses including transit oriented residential and commercial development in the areas between the rail ROW and El Camino Ave.

All three PS4 Options are on Caltrain-owned land which is currently designated in the HSAP land use map for "Transportation Corridor" use which is defined as follows:

> "This designation is intended for freeways and fixed transit lines which provide mass transportation. Portions of the railroad corridor not required for transportation purposes may be considered for other uses."

A paralleling station to support electrified commuter rail for mass transportation is consistent with the current designation. Furthermore, as described in Chapter 2, Caltrain is not legally subject to local land use regulations within its ROW.

The HSAP recommends this relative to the Caltrain-owned property, outside the rail ROW and the relocated station area:

> "The existing Caltrain Station is located on a parcel that is designated Transportation Corridor and owned by Caltrain. Located north of Hillsdale Boulevard and bounded by El Camino Real and the railway tracks, this parcel is designated Transportation Corridor, which prohibits residential uses. However, only the portion immediately adjacent to the train tracks is necessary to support the tracks and associated right-of-way. Once the Caltrain Station relocates north, the parcel's designation as Transportation Corridor would make it difficult to construct housing or mixed-use consistent with this Plan's vision for the area. For this reason, this Plan recommends that Caltrain or a future property owner consider applying to the City to redesignate the portion of this parcel not needed for Caltrain tracks and right-of-way to TOD. This would allow development on the parcel that would incorporate it into the greater network of transit-oriented uses."

Caltrain has not applied for such a redesignation to date and thus the currently applicable land use designation of "Transportation Corridor" in the plan is the appropriate basis to be considered for consistency analysis. The paralleling station options are all consistent with the current plan and no significant physical impact is identified relative to consistency with the HSAP.

The discussion below addresses the potential inconsistency in the event that Caltrain requests redesignation in the future. This is an analysis of cumulative conditions, as Caltrain has not made such a request, and the Proposed Project does not require making of such a request.

While PS4, Options 1 and 2 would each require approximately 3,200 SF of space, the placement of a paralleling station at either of these locations would not hinder the ability to develop most of the

HSAP area for TOD and would not hinder the ability to relocate the Caltrain station or install supporting infrastructure, as discussed below:

- PS4, Option 1 would be located in an area envisioned in the HSAP for a landscaped area along the railroad tracks in an area adjacent to the Transit Center associated with the relocated station. Option 1 would result in a loss of some plaza space, but this would not displace land use to an area outside the HSAP. Furthermore, a Transit Center, which includes areas for bus and shuttle loading and unloading, passenger drop, and parking at surface or in a structure is not a particularly sensitive land use that would somehow create a substantial conflict to use of a 3,200 SF area for a paralleling station next to an active railroad. Thus, although it may be desirable to have the paralleling station outside of the HSAP, PS4, Option 1 would not displace any planned land use outside of the HSAP without the need for major additional structures or reconfiguration. Thus, PS4 Option 1 would not result in a significant land use impact under CEQA in relation to the HSAP.
- PS4, Option 2 would be in a location envisioned for landscaping adjacent to a future residential building at the corner of El Camino Real and Hillsdale Blvd. with a larger area designated for parking immediately to the north of the proposed residential building location. Given the relative size of the residential building, it could easily be relocated to the north of its proposed location in the area of surface parking and the landscaping at the corner of El Camino Real and Hillsdale Blvd. would be relocated to between the residential area and the Option 2 paralleling station. Parking could be placed around the paralleling station. As noted in the DEIR, the paralleling station at the Option 2 location would displace perhaps 10 parking spaces, which is a minor loss of parking. As a result, with a minor reconfiguration, the intended residential use and landscaping could be readily accommodated nearly in the same location as the current plan, without any displacement of residential use outside of the HSAP area. Thus, while it may be desirable to have the paralleling station outside the HSAP, PS4, Option 2 would not result in a significant land use impact under CEQA in relation to the HSAP.
- PS4, Option 3 would be to the south of Option 2 and Hillsdale Boulevard. This option would still be within the HSAP area, but there are no plans for substantial development in this area due to its size and irregular shape. Thus, PS4, Option 3 would not result in a significant land use impact under CEQA in relation to the HSAP.

TPS2

The locations for all three TPS2 options in San Jose are currently zoned Heavy Industrial (HI) with land use designations of Combined Industrial Commercial (Option 1) and Transit Employment Center (Options 2 and 3)(City of San Jose 2013a and 2013b). The *Envision San Jose 2040 General Plan* designates the TPS2 sites as Combined Industrial Commercial (Option 1) and Transit Employment Center (Options 2 and 3) (City of San Jose 2013b). Combined Industrial Commercial allows flexibility for the development of a varied mixture of compatible commercial and industrial uses. The Transit Employment Center designation is applied to areas planned for intensive job growth because of their importance as employment districts and high degree of access to transit and other facilities and services. Uses allowed in the Industrial Park designation are appropriate in the Transit Employment Center designation, but with a focus on public transportation (City of San Jose 2011). Power generation facilities are permitted with a conditional use permit in areas zoned as Heavy Industrial (City of San Jose 2010).

Under all TPS2 options, the TPS would be constructed on either vacant parcels or on existing surface parking lots within areas that are surrounded by industrial or commercial uses. All sites are zoned to allow utilities and power generation facilities with conditional use permits.

OCS Poles and Electrical Safety Zone

The land use designations for the areas of OCS pole alignment and/or electrical safety zone outside the ROW were reviewed and are presented in Appendix H, *Land Use Information*. As described therein, the placement of these project facilities outside the ROW would be inconsistent in some cases with designated land uses in local plans and policies.

The use of existing rail and road rights-of-way for OCS poles or the electrical safety zone would not result in any inconsistency with land use policies and plans because these areas are designated to support transportation purposes. The use of small portions of residential, commercial, and industrial parcels for the OCS pole alignment or the electrical safety zone would be inconsistent in areas designated for residential use, and possibly in some commercial and industrial areas. Thus, OCS pole alignment or electrical safety zone encroachment would conflict in certain locations with local land use plans and policies where rail or utility uses are prohibited.

Because OCS pole alignment would encroach only an estimated 2 to 4 feet outside the Caltrain ROW in most locations, OCS poles would not result in displacing current land uses. While these poles would preclude the ability to build out some commercial and industrial parcels to the Caltrain ROW property line, given the limited encroachment and the ability to use land under the wires for parking, walkways, low-lying landscaping and other ancillary uses, the limitations on land use due to the OCS pole alignment would not be expected to displace commercial/industrial uses at all. Thus, although the OCS pole alignment may be inconsistent with current land use plans or policies at certain locations, OCS poles would not be expected to result in secondary environmental impacts related to plan or policy inconsistency.

As noted above, the electrical safety zone encroachment outside the Caltrain ROW (usually less than 10 feet but in some cases up to 14 feet), would not result in displacement of current land uses. In residential, commercial and industrial parcels, the electrical safety zone requirements would preclude the ability to build out to the Caltrain ROW property line. The land within the electrical safety zone will still be useable for parking, walkways, access, low-lying landscaping and other ancillary uses. The limitations on land use within the safety zone would result in a limited loss of land available for residential, commercial, or industrial structures and associated landscaping. As evidenced by the Proposed Project's effect on existing uses (i.e., no loss of structures or facilities), development on affected parcels would remain largely feasible. Residential, commercial, or industrial structures and facilities could be built with minor constraints on site development directly adjacent to the Caltrain ROW. Given that the electrical safety zone encroachment is not expected to substantially change the ability to use parcels for their designated residential, commercial, or industrial uses in local plans and policies, the Proposed Project is not expected to result in secondary environmental impacts related to the plan or policy inconsistency.

Impacts on parks due to vegetation clearance are discussed separately under Impact LUR-4 below.

Consistency with the MTC Transportation 2035 Plan

The Proposed Project is a key element in the MTC Transportation 2035 Plan by providing efficient transit options to existing developed areas along the Peninsula. Caltrain has been supportive of TOD development near its stations, such as the proposed San Carlos Transit Village.

Because OCS poles and the electrical safety zone would require very limited areas of land and would not disrupt planned residential or mixed use developments, the Proposed Project would not hinder future development of areas adjacent to Caltrain stations. Rather, by reducing noise and improving air quality, the Proposed Project would create a more conducive environment for development of land at or near Caltrain stations. As called for in Caltrain's Strategic Plan, Caltrain plans to work closely with adjoining communities as part of a partnership to improve coordination of land use and transportation planning to increase Caltrain ridership. The Proposed Project is not expected to increase development on the Peninsula and in the South Bay; however, reducing noise and enhancing the transit experience may help to encourage planned transit-oriented development around station locations.

Overall Consistency with Applicable Local Plans and Policies

CEQA requires that an EIR consider whether a proposed project may conflict with any applicable land use plan, policy, or regulation that was adopted for the purpose of avoiding or mitigating an environmental impact. This environmental determination under CEQA differs from the policy determination of whether a proposed project is consistent with a jurisdiction's general plan, specific plan, area plan, or precise plan.

Conflicts of a project with land use policies do not, in and of themselves, constitute significant environmental impacts. Policy conflicts are considered environmental impacts only when they would result in direct environmental effects. As discussed above, the Proposed Project would result in several inconsistencies with local plans and policies, specifically, at the location of TPS1 Option 2, and at certain locations of the OCS alignment and electrical safety zone outside rail or road ROW. However, as evaluated above, the Proposed Project is not expected to displace existing or potential future development and, thus, would not result in significant secondary environmental impacts as a result of the inconsistencies with local land use plans and policies. Consequently, the Proposed Project would have less-than-significant impacts related to consistency with local land use plans and policies.

Impact LUR-3	Conflict with any applicable habitat conservation plan or natural community conservation plan
Level of Impact	Less than significant

Construction

The Caltrain ROW is adjacent to the east of the *San Bruno Mountain Habitat Conservation Plan* (San Bruno Mountain HCP). This plan promotes preservation of the existing diverse ecological values of the mountain and limits habitat manipulation. Under the Proposed Project, OCS poles and wires would be constructed adjacent to but not in the San Bruno Mountain HCP area. Construction would occur within the Caltrain corridor and would not encroach on areas included in the San Bruno Mountain HCP. Therefore, the construction of the Proposed Project features would not conflict with the San Bruno Mountain HCP.

Proposed Project features within the City of San Jose would be located within the *Santa Clara Valley Habitat Plan*. As explained above, this plan provides a framework for promoting the protection and recovery of natural resources, including endangered species, while streamlining the permitting process for planned development, infrastructure, and maintenance activities. OCS poles and wires, TPS2, and PS7 would be constructed in areas covered by the *Santa Clara Valley Habitat Plan*. Construction activities would occur within the Caltrain corridor, with the exception of TPS2 construction. However, the three proposed locations for TPS2 are located in urbanized, industrial areas with limited habitat and no natural communities. None of the project area in Santa Clara County is designated as preservation area in the *Santa Clara Valley Habitat Plan*. Consequently, the construction of the Proposed Project features would not conflict with the *Santa Clara Valley Habitat Plan*, resulting in a less-than-significant impact.

Operation

The Proposed Project would operate within the existing Caltrain corridor, which is highly developed with little to no existing habitat. As described in Section 3.3, *Biological Resources*, the Proposed Project would actually be a benefit to rare butterfly habitats protected by the San Bruno Mountain HCP and the *Santa Clara Habitat Plan* because the Proposed Project would reduce nitrogen pollution that has been having a deleterious effect on native plant habitats that support rare butterflies. As discussed in Section 3.2, *Air Quality*, the use of electrified trains and the Proposed Project's increased ridership would reduce nitrogen emissions associated with existing diesel trains and passenger vehicles compared with both existing conditions and with future No Project conditions.

Consequently, operation of the Proposed Project would have a beneficial impact on the San Bruno Mountain HCP and the *Santa Clara Valley Habitat Plan*.

Impact LUR-4	Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated
Level of Impact	Potentially significant
Mitigation Measures	AES-2b: ~~Apply aesthetic surface treatments to new infrastructure to and provide screening vegetation at TPFs in sensitive visual locations~~ Aesthetic treatments for OCS poles, TPFs in sensitive visual locations, and Overbridge Protection Barriers BIO-5: Implement Tree Avoidance, Minimization, and Replacement Plan
Level of Impact with Mitigation	Less than significant

Construction

As shown in Table 3.10-2, a number of parks and open spaces are adjacent to the Caltrain ROW.

The proposed locations of the TPFs have been selected because they are mainly in industrial and commercial areas, and generally away from parks and open spaces. No park or recreational facility properties would need to be acquired for the placement of TPFs. Construction of TPFs and ancillary facilities would not affect the accessibility of existing public parks or recreation facilities. The only TPF directly adjacent to a park would be PS7, which would be located next to Kurte Park in San Jose. However, the paralleling station would be within the project corridor and construction would not affect users of the park or accessibility.

Several of these parks have existing trees and vegetation that may encroach onto the Caltrain ROW. Currently, the JPB maintenance practice is to comply with California Public Utility Commission requirements by pruning trees and other mature vegetation in adjacent parks that lean or hang over into the Caltrain ROW and pose a potential safety hazard to train operations. Under the Proposed Project, additional vegetation clearance may be necessary at four park locations where the electrical safety zone would extend outside the current Caltrain ROW and one location where the park is partially on the Caltrain ROW. This vegetation removal could have an effect on park uses, park lands and park aesthetics.

- **Broadway-Arguello Park (Redwood City):** This is a small parklet between Broadway Avenue and the Redwood City Station. The only facilities in this park are two park benches and a limited grassy area. There are several small trees on the edge of the park that do not presently block the views of the Caltrain station and ROW. These trees that may need to be removed to accommodate the Proposed Project's electrical safety zone. As required by Mitigation Measure BIO-5, JPB will provide on-site tree replacement (where feasible) for removed trees. Given the limited facilities and use of this park, it should be feasible to plant additional trees slightly farther away from the Caltrain station while allowing for park use. The area adjacent to the park within the electrical safety zone could still be used for turf and park benches.
- **Holbrook-Palmer Park (Atherton):** This park contains a variety of facilities and uses. A baseball field, tennis courts, a paved walkway and vegetation are located near the Caltrain ROW. Based on the current Proposed Project's design, there would be a need to remove vegetation outside the ROW, perhaps up to approximately 10 feet in the park itself. The vegetation removal would not require any change in the adjacent trail, baseball field or tennis court facilities. If during final design, tree removal is determined to be unavoidable, Caltrain will work with the Town of Atherton on tree replacement options. It appears feasible to plant additional trees outside the electrical safety zone between the edge of the baseball field (on both sides of the walkway) and the zone and between the tennis courts and the zone. Planting in this area would replace visual screening that is provided by existing trees today without limiting park uses.
- **Peers Park (Palo Alto):** This park contains a variety of facilities including tennis courts, a children's playground, picnic tables, and a basketball court along with a grassy open field. There are trees along the perimeter of the park, including along the rail line. The park also includes the "Challenger Grove," which is a small grove of trees grown from seeds carried into space and planted in the park as a commemoration honoring the crew of the Challenger Space Shuttle disaster. Based on the current project design, there would be a need to remove vegetation outside the ROW, perhaps up to approximately 10 feet in the park itself. The vegetation removal would not require any change in any park facilities and the Challenger Grove would not be affected. If during final project design tree removal is determined to be unavoidable, Caltrain will work with the City of Palo Alto on tree replacement options. It appears feasible to plant additional trees outside the electrical safety zone between the edge of the tennis court and the rail line and outside the grassy area. Planting in this area would replace visual screening that is provided by existing trees today without limiting park uses.
- **Reed Street Dog Park (Sunnyvale):** This park is the only off-leash dog park in Sunnyvale and provides several fenced areas for dogs. The electrical safety zone would be along the southern edge of this park, which is barren and does not contain any facilities. The dog run areas are well north of the Caltrain ROW and would be unaffected. No trees would need to be removed at this park. If the southern part of the park within the electrical safety zone were proposed for park

use in the future, it could be used for a grassy area or walkways for human or canine use as long as no elevated structures or vegetation were proposed.

- **Fuller Park (San Jose):** This is a small park between the Caltrain Tracks and Fuller Avenue. The facilities in this park include game tables, bocce ball court, a horseshoe pit and a limited grassy area. The portion of the park between a row of trees and the railroad berm is owned by the JPB which has leased it for park purposes. Tree removal should not necessary in the park but some pruning may be necessary for the electrical safety zone.

While Rengstorff Park in Mountain View is near the ROW, it is actually separated from the ROW by a frontage road and thus no removal of trees in this park would occur due to the project.

Loss of vegetation at several of the parks noted above, if unmitigated, could result in loss of park use areas, which could result in increased use of other park areas. However, as described above, Mitigation Measure BIO-5 would require replacement of any removed trees, and it is feasible to replace the visual screening function of frees that exists today in a way that is compatible with Proposed Project design. Thus, with mitigation, the loss of vegetation would be a less-than-significant impact.

Operation

Operationally, the Proposed Project would only affect adjacent parks in relation to aesthetics, air quality, noise, and vegetation maintenance.

PS7 would be adjacent to Kurte Park in San Jose. At this location, the prevailing views northward from the park are of the grasslands on Communications Hill, a few scattered trees and the railroad ROW. Although the PS7 facility would be small (40 by 80 feet), it would be an anomalous industrial facility in a view largely dominated by grassland features (see Figure 3.1-17). As discussed in Section 3.1, *Aesthetics*, this is considered a significant aesthetic impact. Mitigation Measure AES-2b would require planting of trees between the park and PS7 to visually screen the lower portions of the new paralleling station and require aesthetic treatment to help the facility blend in with surroundings. With this mitigation, aesthetic impacts at this location would be less than significant. With Project Variant 1, PS7 would be located farther north than its current proposed location and would not be visible from Kurte Park and there are no other parks in the close vicinity to the PS7 variant locations. The new overhead OCS facilities would be visible from parks adjacent to the Caltrain ROW unless intervening vegetation is particularly dense. In urbanized areas, the addition of overhead wires similar to existing telephone and power lines would not change the visual character of areas adjacent to urban parks. Further, the OCS system would be installed along the existing ROW, which already has a transportation and industrial character.

As discussed in Section 3.2, *Air Quality*, the Proposed Project would lower overall air pollutant emissions as well as diesel particulate matter emissions along the Caltrain ROW. This would improve the ambient health conditions at adjacent parks for all park users.

As discussed in Section 3.11, *Noise and Vibration*, at most locations, the Proposed Project would have less-than-significant noise impacts when taking into account the net effect of quieter train engines combined with a slight increase in train horn noise with increased train service. At several areas with existing high noise levels and nearby at-grade crossings (where horn noise would increase) there would be moderate noise impacts. At some of the locations farther away from at-grade crossings, overall noise levels should slightly decrease. Given that the existing conditions for parks located along the Caltrain ROW include train noise, a minor increase in noise where it occurs would not substantially change park use such that users would be diverted to other park areas and result in degradation of those other park facilities due to higher use.

As discussed above, vegetation maintenance inside the Caltrain ROW is an existing activity. While the area of vegetation maintenance would move outward to the edge of the ROW, after initial vegetation removal for construction, the maintenance activity should be roughly similar to existing vegetation maintenance. Thus, temporary noise of vegetation maintenance inside the Caltrain ROW would have less-than-significant impacts on adjacent or nearby parks. Where vegetation maintenance is required within the electrical safety zone in the four parks described above, it would be more intrusive than vegetation maintenance than on the Caltrain ROW itself. Because the areas of maintenance would be outside the areas of active park use and maintenance would occur for a limited period of time in any one year, vegetation maintenance would have a less-than-significant impact on park lands and park uses.

Thus, Proposed Project operations would not have a significant impact on parks and recreational facilities related to physical deterioration of parklands.

Impact LUR-5	Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment
Level of Impact	No Impact

Construction and Operation

The Proposed Project would not involve the construction or expansion of recreational facilities. As discussed above, the Proposed Project would not result in the physical degradation of park or recreational facilities that would displace recreational use that might result in the demand for new recreational facilities. Therefore, the Proposed Project would have no impact on the physical environment as a result of new recreational facilities.

3.11 Noise and Vibration

The noise and vibration environment in the Caltrain corridor is described to establish the baseline for analyzing changes resulting from construction and operation of the Proposed Project. This discussion focuses on land uses and sensitive receptors along the existing railroad corridor that would be exposed to potential increases in noise and vibration levels that may result from the Proposed Project.

3.11.1 Existing Conditions

3.11.1.1 Regulatory Setting

State

California requires each local government entity to implement a noise element as part of its general plan. The State of California General Plan Guidelines (California Governor's Office of Planning and Research 2003) provides guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. Based on these guidelines, cities along the Caltrain corridor have adopted noise compatibility standards as part of their noise elements. Cities' standards are addressed below.

Local

As described in Chapter 2, *Project Description*, pursuant to SamTrans' enabling legislation (Public Utilities Code Section 103200 et seq.) and the 1991 Interstate Commerce Commission's approval of the JPB acquisition of the Caltrain line, JPB activities within the Caltrain right-of-way (ROW) are exempt from local building and zoning codes and other land use ordinances. Nonetheless, the JPB will cooperate with local government agencies in performing improvements within the Caltrain ROW and will comply with local regulations affecting any of its activities within other jurisdictions.

General Plan Noise Elements

The noise elements in the general plans for all the cities and counties along the Caltrain corridor identify the average noise standard for the Community Noise Equivalent Level (CNEL) to be 65 A-weighted decibels (dBA). This is usually illustrated by 65 dBA CNEL noise contours overlaid over a map of the jurisdiction. These contours consistently follow railroad tracks, freeways, and major connector roads, indicating that these are the major sources of existing noise exposure. Brisbane, South San Francisco, San Bruno, Millbrae, Burlingame, San Carlos, Menlo Park, Palo Alto, Sunnyvale, Santa Clara, and San Jose also indicate that airports contribute to the existing noise levels.

Municipal Codes

The property line noise level restrictions in the municipal codes for the various cities along the Caltrain corridor can be grouped into following four general methods.

- The municipal codes for San Francisco, Brisbane, San Bruno, San Carlos, Redwood City, and Palo Alto regulate the property line noise levels based on the dBA level above local ambient, with the local ambient defined in each city's code.

- South San Francisco, San Mateo, Belmont, North Fair Oaks (San Mateo County), Menlo Park, Atherton, Sunnyvale, and Santa Clara all provide maximum allowable noise levels for daytime and nighttime hours. Some of these jurisdictions further delineate the maximum allowable noise level for each land use type, while others include additional regulations regarding tonal noises.
- The San Jose municipal code specifies maximum allowable noise levels at residential and commercial property lines but does not provide further detail with regard to time periods or local ambient noise levels.
- Millbrae and Burlingame do not include any quantitative noise limits in their municipal codes.

Most of the cities along this corridor limit construction noise to particular time periods during weekday, weekend and holiday daytime hours. Nighttime construction is prohibited. Some of the municipal codes restrict construction noise based on the maximum noise levels allowable at property lines or at a specified distance from construction equipment.

Of all the cities along the Caltrain corridor, only Sunnyvale, Santa Clara, and San Jose specify limits on ground-borne vibration. Santa Clara's municipal code sets the vibration perception threshold at a motion velocity of 0.01 inch/second over the range of 1 to 100 Hertz. This threshold cannot be exceeded at the property lines. Construction activities are exempt from both noise and vibration limits during allowed hours under the Santa Clara municipal code. Sunnyvale and San Jose limit ground vibration at the property line to activity that is imperceptible without instrumentation.

Table 3.11-1 summarizes the local ordinances along the Caltrain corridor.

Table 3.11-1. Summary of Local Noise and Vibration Ordinances

Jurisdiction	Noise/ Vibration Source	Maximum Allowable Levels or Exemption
San Francisco	Construction	7:00 a.m. to 8:00 p.m.: 80 dBA measured at a distance of 100 feet from construction equipment. 8:00 p.m. to 7:00 a.m.: no more than 5 dBA above the ambient at any point outside of the property plane.
	Fixed	Residential Interior Noise: 45 dBA from 10:00 p.m. to 7:00 a.m., 55 dBA from 7:00 a.m. to 10:00 p.m. with windows open except where building ventilation is achieved through mechanical means that allow windows to remain closed.
	General	Not more than 5 dBA above the ambient at any point beyond residential property plane; not more than 8 dBA above the ambient at any point beyond commercial and industrial property plane. Minimum ambient is defined as: 35 dBA for interior residential noise, and 45 dBA in all other locations.
Brisbane	Construction	83 dBA at 25 feet from individual equipment; 86 dBA at any point outside the property plane of the project. Construction permitted weekdays from 7:00 a.m. to 7:00 p.m.; weekends and holidays from 9:00 a.m. to 7:00 p.m.
	General	Not more than 10 dB over ambient for more than 15 minutes per hour, or not more than 20 dB over ambient for more than 3 minutes per hour. Minimum ambient is defined as: 35 dBA for interior residential noise, and 45 dBA in all other locations.

Jurisdiction	Noise/ Vibration Source	Maximum Allowable Levels or Exemption
South San Francisco	Construction	90 dBA at 25 feet from individual equipment; 90 dBA at any point outside the property plane of the project. Construction permitted weekdays from 8:00 a.m. to 8:00 p.m.; Saturdays from 9:00 a.m. to 8:00 p.m.; Sundays and holidays from 10:00 a.m. to 6:00 p.m.
	General	Not more than the noise level standard per land use for more than 30 minutes per hour. Not more than the noise level standard per land use plus 5 dBA for more than 15 minutes per hour. Not more than the noise level standard per land use plus 10 dBA for more than 5 minutes per hour. Not more than the noise level standard per land use plus 15 dBA for more than 1 minute per hour. Not more than the noise level standard per land use or the maximum measured ambient, plus 20 dBA for any period of time. If the measured ambient level for any area is higher than the standard, then the ambient shall be the base noise level. In such cases, the permitted noise levels shall be increased in 5 dBA increments above the ambient. Noise level standards for single-family residential land use zones: 50 dBA from 10:00 p.m.to 7:00 a.m.; 60 dBA from 7:00 a.m. to 10:00 p.m. Noise level standards for multi-family residential land use zones: 55 dBA from 10:00 p.m. to 7:00 a.m.; 60 dBA from 7:00 a.m. to 10:00 p.m.
San Bruno	Construction	85 dBA at 100 feet from equipment or project between 7:00 a.m. and 10:00 p.m.; 60 dBA at 100 feet from equipment or project between 10:00 p.m. and 7:00 a.m.
	General	Not more than 10 dBA above the zone ambient base level. Minimum ambient is defined as: 45 dBA from 10:00 p.m. and 7:00 a.m.; 60 dBA from 7:00 a.m. and 10:00 p.m. From 7:00 a.m. to 10:00 p.m., the ambient may be exceeded by 20 dBA for a period of no more than 30 minutes in a 24-hour period.
Millbrae	Construction	Construction permitted weekdays from 7:30 a.m. to 7:00 p.m.; Saturday from 8:00 a.m. to 6:00 p.m.; Sundays and holidays from 9:00 a.m. to 6:00 p.m.
Burlingame	Construction	Construction permitted weekdays from 7:00 a.m. to 7:00 p.m.; Saturday from 9:00 a.m. to 6:00 p.m.; Sundays and holidays from 10:00 a.m. to 6:00 p.m.
	Powered Equipment	Permitted Monday through Saturday from 8:00 a.m. to 7:00 p.m.; Sundays and holidays from 10:00 a.m. to 6:00 p.m.
San Mateo	Construction	90 dBA at 25 feet from individual equipment; 90 dBA at any point outside the property plane of the project. Construction permitted weekdays from 7:00 a.m. to 7:00 p.m.; Saturdays from 8:00 a.m. to 5:00 p.m.; Sundays and holidays from 12:00 p.m.to 4:00 p.m.

Jurisdiction	Noise/ Vibration Source	Maximum Allowable Levels or Exemption
	General	Not more than the noise level standard per land use for more than 30 minutes per hour. Not more than the noise level standard per land use plus 5 dBA for more than 15 minutes per hour. Not more than the noise level standard per land use plus 10 dBA for more than 5 minutes per hour. Not more than the noise level standard per land use plus 15 dBA for more than 1 minute per hour. Not more than the noise level standard per land use or the maximum measured ambient, plus 20 dBA for any period of time. If the measured ambient level for any area is higher than the standard, then the ambient shall be the base noise level. In such cases, the permitted noise levels increase in 5 dBA increments above the ambient. Noise level standards for single-family residential land use zones: 50 dBA from 10:00 p.m.to 7:00 a.m.; 60 dBA from 7:00 a.m. to 10:00 p.m. Noise level standards for multi-family residential land use zones: 55 dBA from 10:00 p.m.to 7:00 a.m.; 60 dBA from 7:00 a.m. to 10:00 p.m.
Belmont	Construction	Construction permitted weekdays from 8:00 a.m. and 5:00 p.m.; Saturdays from 10:00 a.m. to 5:00 p.m.; prohibited on Sundays and holidays.
	General	Single-family residential zones: 55 dBA nighttime; 65 dBA daytime Daytime defined as weekdays from 7:00 a.m. to 9:00 p.m., and weekends and holidays from 9:00 a.m. to 7:00 p.m. Nighttime defined as any hour outside of daytime hours.
San Carlos	Construction	Construction permitted weekdays from 7:00 a.m. to 6:00 p.m.; weekends and holidays from 9:00 a.m. to 5:00 p.m.
	General	Not more than 10 dBA above ambient at a distance of 49 feet beyond the property line. Minimum allowable ambient is 35 dBA.
Redwood City	Construction	110 dBA at 25 feet from individual equipment; 110 dBA at any point outside the property plane of the project. Construction permitted weekdays from 7:00 a.m. to 8:00 p.m.; prohibited on weekends and holidays.
	General	Not more than 6 dBA above ambient outside the property line from 8:00 p.m. to 8:00 a.m. Minimum ambient is defined as 30 dBA for interior residential noise and 40 dBA in all other locations.

Jurisdiction	Noise/ Vibration Source	Maximum Allowable Levels or Exemption
North Fair Oaks (San Mateo County)	Construction	Construction permitted weekdays from 7:00 a.m. to 6:00 p.m.; Saturdays from 9:00 a.m. to 5:00 p.m.; prohibited on Sundays and holidays.
	General	Exterior noise: Not more than 55 dBA daytime and 50 dBA nighttime for 30 minutes per hour. Not more than 60 dBA daytime and 55 dBA nighttime for 15 minutes per hour. Not more than 65 dBA daytime and 60 dBA nighttime for 5 minutes per hour. Not more than 70 dBA daytime and 65 dBA nighttime for 1 minute per hour. Not more than 75 dBA daytime and 70 dBA nighttime for any length of time. If the measured ambient level for any area is higher than the standard, then the ambient shall be the base noise level. In such cases, the permitted noise levels increase in 5 dBA increments above the ambient. Interior noise: Not more than 45 dBA daytime and 40 dBA nighttime for 5 minutes per hour. Not more than 50 dBA daytime and 45 dBA nighttime for 1 minute per hour. Not more than 55 dBA daytime and 50 dBA nighttime for any length of time. If the measured ambient level for any area is higher than the standard, then the ambient shall be the base noise level. In such cases, the permitted noise levels increase in 5 dBA increments above the ambient. Daytime is defined as 7:00 a.m. to 10:00 p.m.; nighttime is 10:00 p.m. to 7:00 a.m.
Atherton	Construction	Construction permitted weekdays from 8:00 a.m. to 5:00 p.m.; prohibited on weekends and holidays.
	General	Not more than 60 dBA from 7:00 a.m. to 10:00 p.m. and 50 dBA from 10:00 p.m.to 7:00 a.m. beyond the property line. If the measured ambient equals or exceeds the noise limit, then the noise limit is 5 dB over ambient.
Menlo Park	Construction	85 dBA at 50 feet from equipment. Construction permitted weekdays between 8:00 a.m. and 6:00 p.m.; prohibited on weekends and holidays.
	General	Not more than 60 dBA from 7:00 a.m. to 10:00 p.m. and 50 dBA from 10:00 p.m. to 7:00 a.m. beyond the property line.
Palo Alto	Construction	110 dBA at 25 feet from individual equipment; 110 dBA at any point outside the property plane of the project. Construction permitted weekdays from 8:00 a.m. to 6:00 p.m.; Saturdays from 9:00 a.m. to 6:00 p.m.; prohibited Sundays and holidays.
	General	Not more than 6 dBA above ambient beyond residential property plane; not more than 8 dBA above ambient beyond commercial or industrial property plane. Minimum ambient is defined as 30 dBA for interior residential noise and 40 dBA in all other locations.
Mountain View	Construction	Construction permitted weekdays from 7:00 a.m. to 6:00 p.m.; prohibited weekends and holidays.
	Stationary	Not more than 55 dBA from 7:00 a.m. to 10:00 p.m.; not more than 50 dBA from 10:00 p.m. to 7:00 a.m. Levels as measured at any location on any receiving residential property.
Sunnyvale	Construction	Construction permitted weekdays from 7:00 a.m. to 6:00 p.m.; Saturdays from 8:00 a.m. to 5:00 p.m.; prohibited on Sundays and national holidays.
	Vibration	Ground vibration not to be perceptible at any point on the property line of the premises without the use of special measuring instrument.

Jurisdiction	Noise/ Vibration Source	Maximum Allowable Levels or Exemption
	General	Not more than 75 dBA at any point on the property line of the premises upon which the noise or sound is generated or produced; not more than 50 dBA during nighttime or 60 dBA during daytime hours at any point on adjacent residentially zoned property. If the noise occurs during nighttime hours and the enforcing officer has determined that the noise involves a steady, audible tone such as a whine, screech or hum, or is a staccato or intermittent noise (e.g., hammering) or includes music or speech, the allowable noise or sound level shall not exceed 45 dBA.
Santa Clara	Construction	Construction permitted weekdays from 7:00 a.m. to 6:00 p.m.; Saturdays from 9:00 a.m. to 6:00 p.m.; prohibited Sundays and holidays. Construction activities are exempt from both noise and vibration limits during allowed hours.
	Vibration	Not to be above the vibration perception threshold of an individual at the closest property line point to the vibration source on the affected property. Vibration perception threshold defined as a motion velocity of 0.01 inch/second over the range of 1 to 100 Hertz.
	Fixed	Single-family residential zone: 50 dBA from 10:00 p.m. to 7:00 a.m.; 55 dBA from 7:00 a.m. to 10:00 p.m. Multi-family residential zone: 50 dBA from 10:00 p.m. to 7:00 a.m.; 55 dBA from 7:00 a.m. to 10:00 p.m. If the measured ambient level for any area is higher than the standard, then the ambient shall be the base noise level. In such cases, the permitted noise levels increase in 5 dBA increments above the ambient.
San Jose	Construction	Construction activities within 500 feet of a residential unit are limited to 7:00 a.m. to 7:00 p.m.
	Vibration	Ground vibration not to be perceptible without the use instruments at the property line of the site.
	General	Not more than 55 dBA at residential property lines; not more than 60 dBA at commercial property lines

3.11.1.2 Environmental Setting

Fundamentals of Environmental Noise and Vibration

Noise and Vibration Terminology

A brief description of noise and vibration concepts and terminology used in this assessment is provided below.

- Sound. A vibratory disturbance transmitted by pressure waves through a medium such as air or water and capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- Noise. Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- Decibel (dB). A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.

- A-Weighted Decibel (dBA). An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear. The dBA scale is the most widely used for environmental noise assessments.
- Maximum Sound Levels (L_{max}). The maximum sound level measured during the measurement period.
- Minimum Sound Levels (L_{min}). The minimum sound level measured during the measurement period.
- Equivalent Sound Level (L_{eq}). The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy. The 1-hour A-weighted equivalent sound level (L_{eq} 1h) is the energy average of A-weighted sound levels occurring during a 1-hour period.
- Day-Night Level (L_{dn}). The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring between 10 p.m. and 7 a.m.
- Community Noise Equivalent Level (CNEL). The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the sound levels occurring during the period from 7 p.m. to 10 p.m. and 10 dB added to the sound levels occurring during the period from 10 p.m. to 7 a.m.
- Vibration Velocity Level (or Vibration Decibel Level, VdB). The root mean square velocity amplitude for measured ground motion expressed in VdB.
- Peak Particle Velocity (PPV). A measurement of ground vibration defined as the maximum speed at which a particle in the ground is moving, expressed in inches per second (in/sec).

Overview of Sound and Noise

Noise is typically described as unwanted sound. Sound is caused by transmission of mechanical energy that propagates as waves of alternating pressure through a medium (fluids, solids, or gases such as the air) to a hearing organ, such as a human ear. Sound (or noise) is commonly discussed in terms of a source, a receiver, and the propagation path between the two. Figure 3.11-1 illustrates a typical source-path-receiver scenario for airborne sound from rail transit. Several factors affect the quality of sound as perceived by the human ear. Sound can be further described in terms of intensity, pitch, and time variation.

The intensity of a sound is determined by the fluctuation in air pressure above and below the atmospheric pressure at equilibrium by sound waves. Sound intensity is usually expressed in terms of the sound pressure level (L_p) in decibel (dB) units. Decibels are logarithmic values of the ratio of the pressure produced by the sound wave to a reference pressure, calculated as:

$$L_p = 20 \text{ x } \log_{10}(p/p_{ref}), \text{ dB}$$

where “p” is the root-mean-square (RMS) pressure and “p_{ref}” is the reference pressure[1].

Decibels are used instead of actual pressure units to account for the extremely large range of sound pressure values that the human ear is capable of perceiving. For example, a train horn noise of 100

[1] The standard reference sound pressure is 20 micro-Pascal as indicated in ANSI S1.8-1969, *Preferred Reference Quantities for Acoustical Levels*.

dB has about 5,600 times greater pressure than a very low sound of 35 dB typically found in a rural environment.

Sound attenuates as a function of the distance between the source and the receiver due to geometric spreading. Geometric spreading loss is due to energy dissipation into three dimensions as sound travels through the air and the wave energy is spread out over an increasingly large area. For point sources, such as stationary equipment or other closely grouped sources, the sound level attenuates at a rate of 6 dB per doubling of distance. For line sources, the sound level will attenuate at 3 dB per doubling of distance. The time-averaged sound level from train vehicles passing along a track will attenuate at a rate of 3 dB per doubling of distance because of the linear nature of the moving source when averaged over time.

In addition to geometric spreading due to distance, sound levels are further attenuated due to ground effects, shielding by structures, or atmospheric absorption. Other atmospheric conditions, such as wind and temperature gradients, can influence the direction of the sound waves as they travel through the air. Atmospheric effects are not normally included in the modeling of rail transit noise because the effects are generally significant only at long distances beyond the potential noise impact areas for rail transit corridors.

The pitch describes the character and frequency content of noise. It is expressed in terms of the rate of fluctuation of the air pressure in cycles per second or Hertz (Hz). The average human ear is sensitive to noise frequencies between 20 Hz and 20,000 Hz. However, the human hearing system does not respond equally to all frequencies, and it is more sensitive to midband frequencies (e.g., 500 to 2,000 Hz). Thus, the A-weighting system de-emphasizes the low and very high frequency components of the sound in a manner similar to the response of the average human ear. The A-weighted sound level (dBA) is commonly used to quantify environmental noise because it correlates well with human response and is expressed in terms of a single number. Figure 3.11-2 provides a comparison of noise levels of transit and non-transit sources. This figure also provides typical noise levels found in urban settings.

Environmental noise commonly varies with time. There are several descriptors to characterize environmental noise according to their duration. The equivalent noise level (L_{eq}) is the logarithmic (or energy) summation over a period of interest, and it is widely used as a single-number descriptor of environmental noise. Common usages of the L_{eq} are the Day-Night Sound Level (L_{dn}) and community noise equivalent level (CNEL). Many studies have shown that the L_{dn} is well-correlated with human annoyance for community noise. The noise metrics CNEL and L_{dn} are typically equal or differ by no more than 1 decibel. The L_{dn} descriptor will be used in this report to assess 24-hour noise, except where CNEL is used in local ordinances.

Overview of Ground-Borne Noise and Vibration

Ground vibration is an oscillatory motion of the soil with respect to the equilibrium position and can be quantified in terms of displacement, velocity, or acceleration. Vibration can be described by its peak or RMS amplitudes. The RMS amplitude is useful for assessing human annoyance, while peak vibration is most often used for assessing the potential for damage to building structures. Construction vibration is assessed in terms of peak velocity, or peak particle velocity (PPV).

Although vibration velocity can be quantified in units of inches per second, it is common to use the velocity level to quantify vibration to cover the wide range of magnitudes that can be encountered. The vibration is expressed in terms of the velocity level (L_v) in decibel units, defined as:

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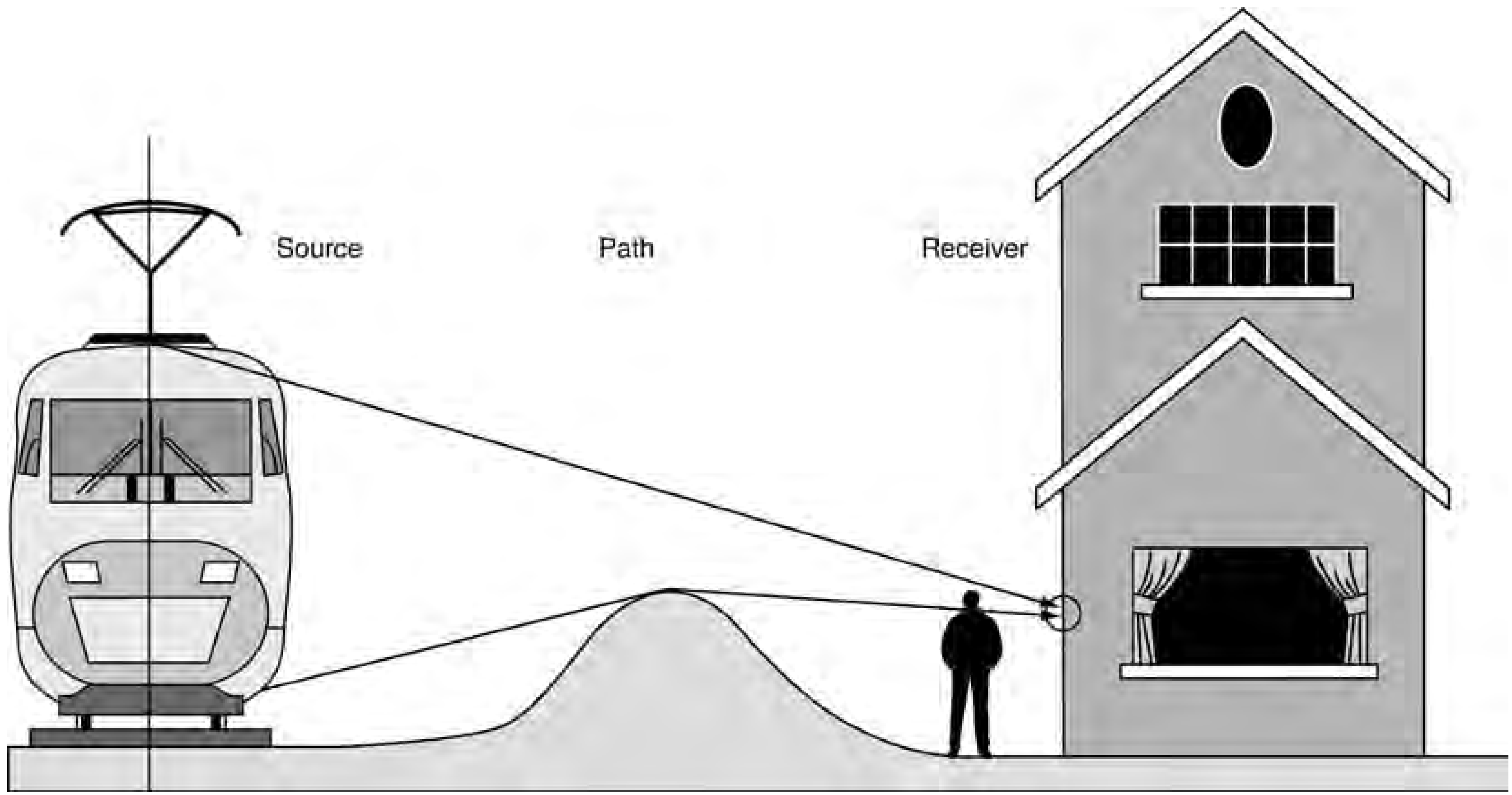
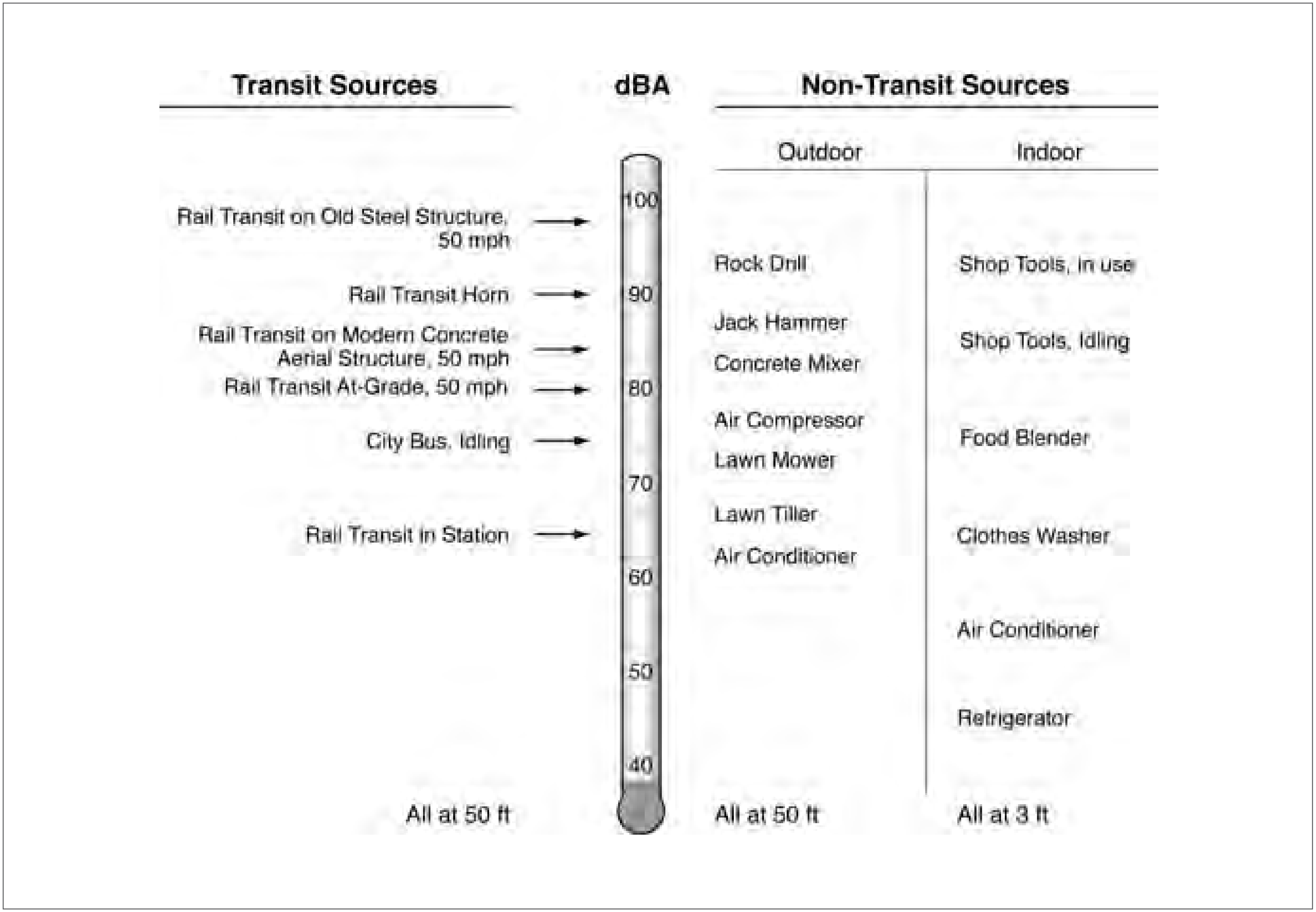


Source: Federal Railroad Administration 2012.

Figure 3.11-1
Source-Path-Receiver Framework for Airborne Wayside Noise
Peninsula Corridor Electrification Project



Source: Federal Transit Administration 2006.

Figure 3.11-2
Typical A-Weighted Sound Levels from Transit and Non-Transit Sources
Peninsula Corridor Electrification Project

$$L_v = 20 \times \log_{10}(v/v_{ref}), \text{VdB}$$

where "v" is the RMS velocity amplitude and "v_{ref}" is the reference velocity amplitude[2].

Thus, the descriptor used in this report to assess ground-borne vibration for human annoyance is the L_v in decibels or VdB. Vibration is a function of the frequency of motion measured in cycles/second or Hz. Ground vibration of concern for transportation sources generally spans from 4 Hz to 60 Hz. The overall vibration is the combined energy of ground motion at all frequencies, and this overall vibration level is used in this analysis.

Vibration attenuates as a function of the distance between the source and the receiver due to geometric spreading and inherent damping in the soil that absorbs energy of the ground motion. Ground-borne vibration from rail transit systems is caused by dynamic forces at the wheel/rail interface. It is influenced by many factors, which include the rail and wheel roughness, out-of-round wheel conditions, the mass and stiffness of the rail vehicle truck, the mass and stiffness characteristics of the track support system, and the local soil conditions.

Vibration caused by the transit structure, such as at-grade ballast and tie track, radiates energy into the adjacent soil in the form of different types of waves[3] that propagate through the various soil and rock strata to the foundation of nearby buildings. Buildings respond differently to ground vibration depending on the type of foundation, the mass of the building, and the building interaction with the soil. Once inside the building, vibration propagates throughout the building with some attenuation with distance from the foundation, but often with amplification due to floor resonances. The basic concepts for ground vibration generated by a rail system are illustrated in Figure 3.11-3.

Figure 3.11-4 illustrates the typical levels of human response and, at much higher levels, the structural response to ground-borne vibration. The figure shows that the threshold of human perception is about 65 VdB, while the threshold for "cosmetic" structural damage is about 100 VdB (re: 1 micro-in/sec). However, the latter threshold, building damage, is directly related to the condition of the structure. It is very rare that transportation-generated ground vibration approaches building damage levels.

Ground-borne noise is a secondary phenomenon of ground-borne vibration. When a building structure vibrates, noise is radiated into the interior of the building. Typically, this is a low frequency sound that would be perceived as a low rumble. The magnitude of the sound depends on the frequency characteristic of the vibration and the manner in which the room surfaces in the building radiate sound. Ground-borne noise is quantified by the A-weighted sound level inside the building.

Existing Ambient Noise

The study area included the Caltrain ROW and the adjacent areas in which noise sensitive receptors may be located ~~locations~~. Noise sensitive receptors in the study area include residential areas,

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[2] The standard reference quantity for vibration velocity used by FTA is 1×10^{-6} inches/second, or 1 micro-inch/second.

[3] These waves include shear (also known as S, secondary or transverse) in which the ground moves perpendicularly with respect to the direction of vibration movement, and Rayleigh (also known as ground roll) surface waves which move primarily along the surface of the ground, similar in appearance to ripples on the water surface.

schools, and hospitals. Noise sensitive receptors are located at distances that are as close as 40 feet from the Caltrain ROW

The existing ambient noise in the Caltrain corridor primarily comes from noise from the Caltrain rail and freight rail service, BART, traffic on main highways and major arterials, and from aircraft flyover noise while aircraft land at and take off from nearby airports, specifically, San Francisco International Airport (SFO), San Carlos Airport, Palo Alto Airport, and Mineta San Jose International Airport.

In areas of the corridor that have grade crossings, the existing ambient noise is influenced to a large degree by Caltrain and freight train warning horn noise. Horn noise can be heard at great distances from the rail alignment, depending on geographical characteristics, meteorological conditions and other factors. However, the area over which train horn noise generally has an impact is normally limited to 0.25-mile in each direction from the grade crossing.

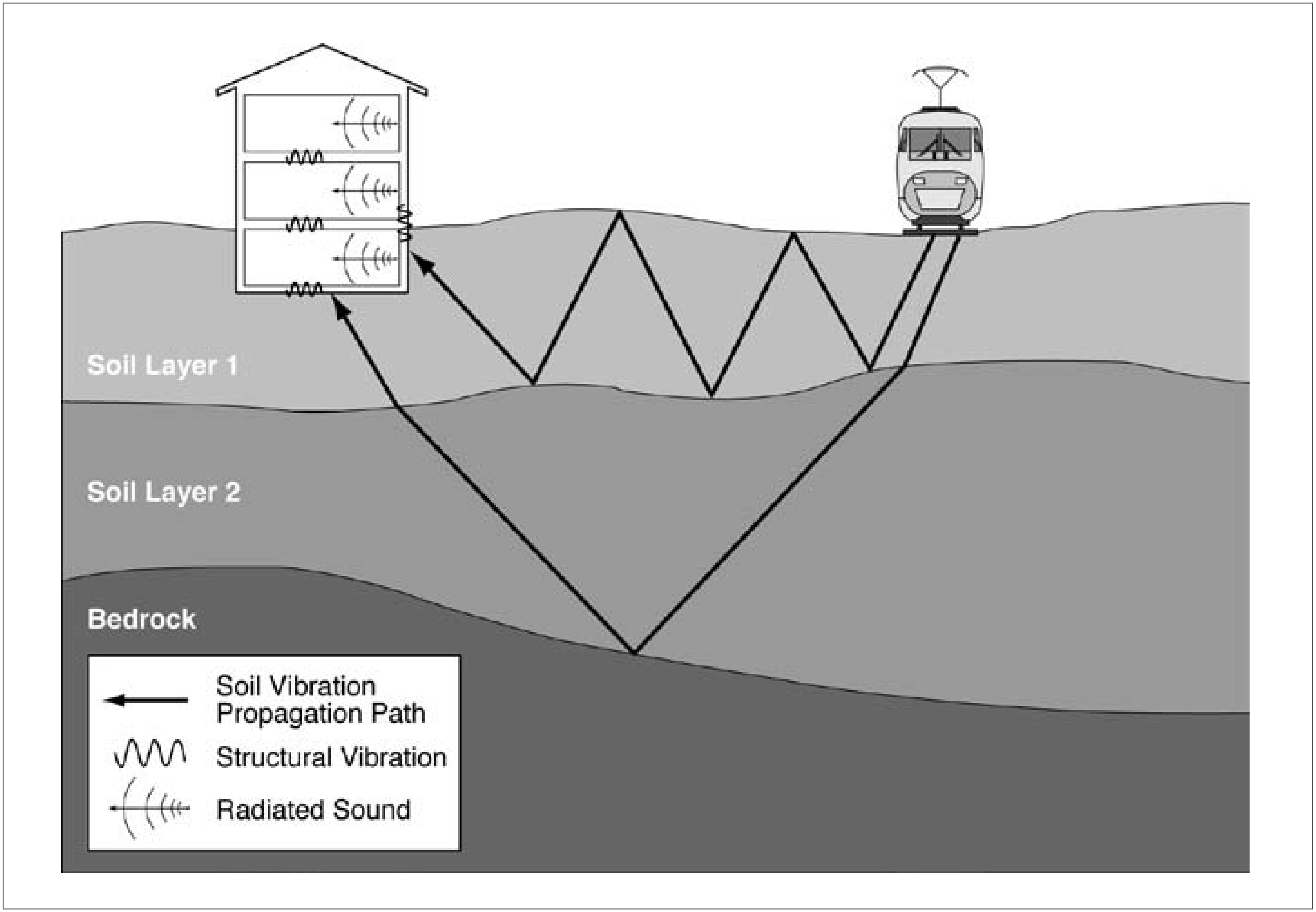
Field Measurements

To characterize the existing ambient noise along the Caltrain alignment, Wilson, Ihrig and Associates (WIA) conducted long-term noise measurements from May 17, 2013 to May 27, 2013 at 12 sites and updated the 2001 and 2002 measurement data conducted for the prior Project EIR/EA for Caltrain Electrification (JPB 2009). The 2013 noise measurement results are summarized in Table 3.11-2.

In addition, WIA previously conducted an extensive noise survey along the Caltrain alignment for the California high-speed rail (HSR) project (Wilson, Ihrig and Associates 2010). The survey included long-term noise measurements of 1 to 3 days at 35 sites from October 16, 2009 to December 2, 2009 and at additional 19 locations from March 4, 2010 to March 12, 2010. These measurements were taken within the Caltrain corridor and are relatively recent, and, thus, are suitable for this analysis. The measurement results for the HSR project are summarized in Table 3.11-3.

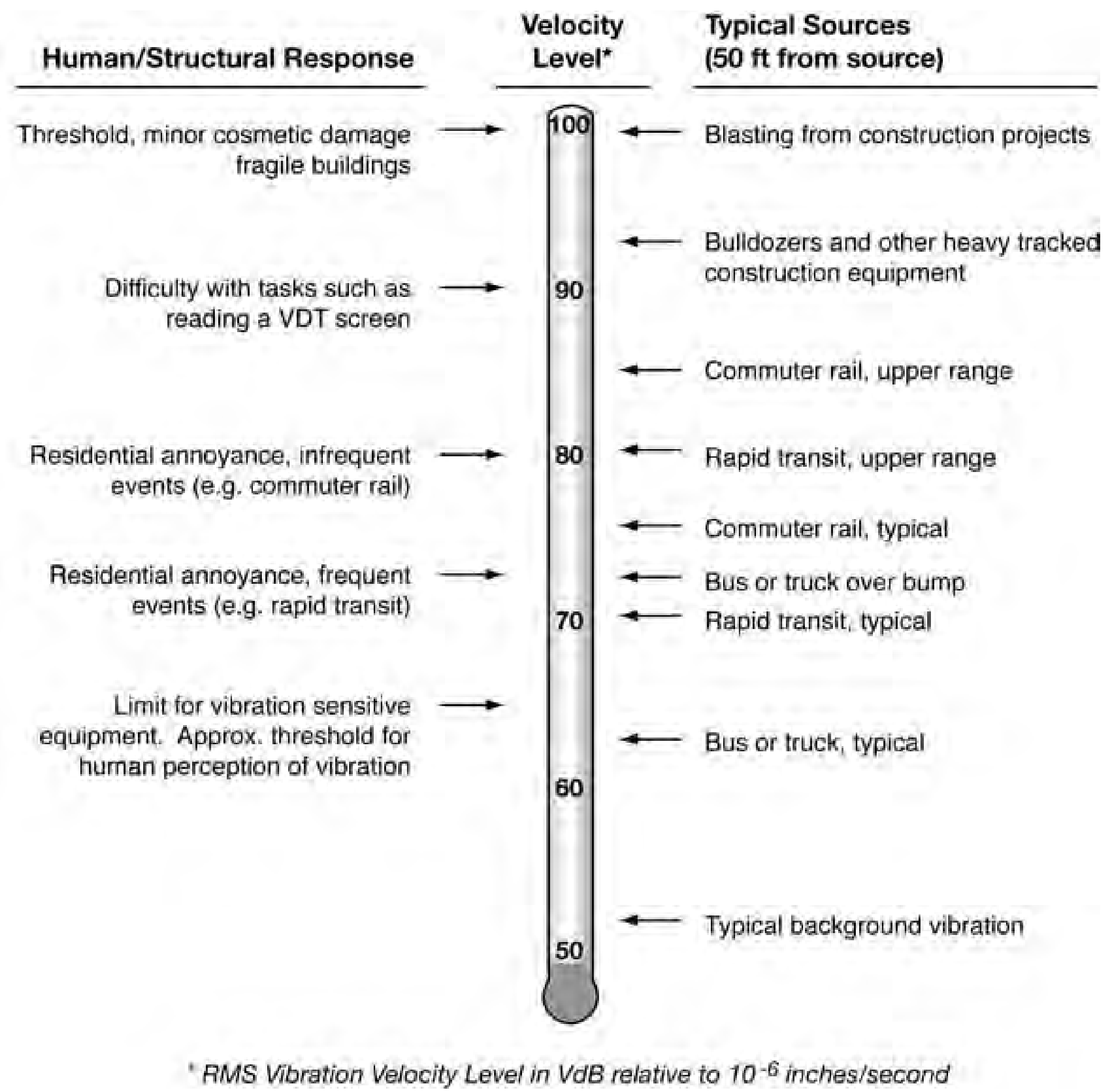
The long-term noise measurements collected the ambient noise levels for consecutive 1-hour intervals. The L_{max}, L_{min}, and L_{eq} were obtained for each 1-hour interval. The L_{eq} levels were used to calculate the L_{dn} over each 24-hour period measured. The L_{dn} describes the energy averaged noise exposure over a 24-hour period and it is the noise metric used for residential land uses. The hourly L_{eq} is based on the daytime hour with the loudest L_{eq}. This hour is generally referred to as the peak hour, which could occur at different times of the day depending on whether the noise source is from train operations or automobile traffic. The L_{eq} is used as the metric for evaluating noise impacts on institutional land uses with primarily daytime use.

The results of the existing ambient noise surveys are discussed in the following section. Tables 3.11-2 and 3.11-3 show the noise measurement results for the 2013 and 2009–2010 noise surveys, respectively. Figure 3.11-5 depicts measurement locations.



Source: Federal Railroad Administration 2012.

Figure 3.11-3
Propagation of Ground-Borne Vibration into Buildings
Peninsula Corridor Electrification Project



Source: Federal Transit Administration 2006.

Figure 3.11-4
Typical Levels of Ground-Borne Vibration
Peninsula Corridor Electrification Project

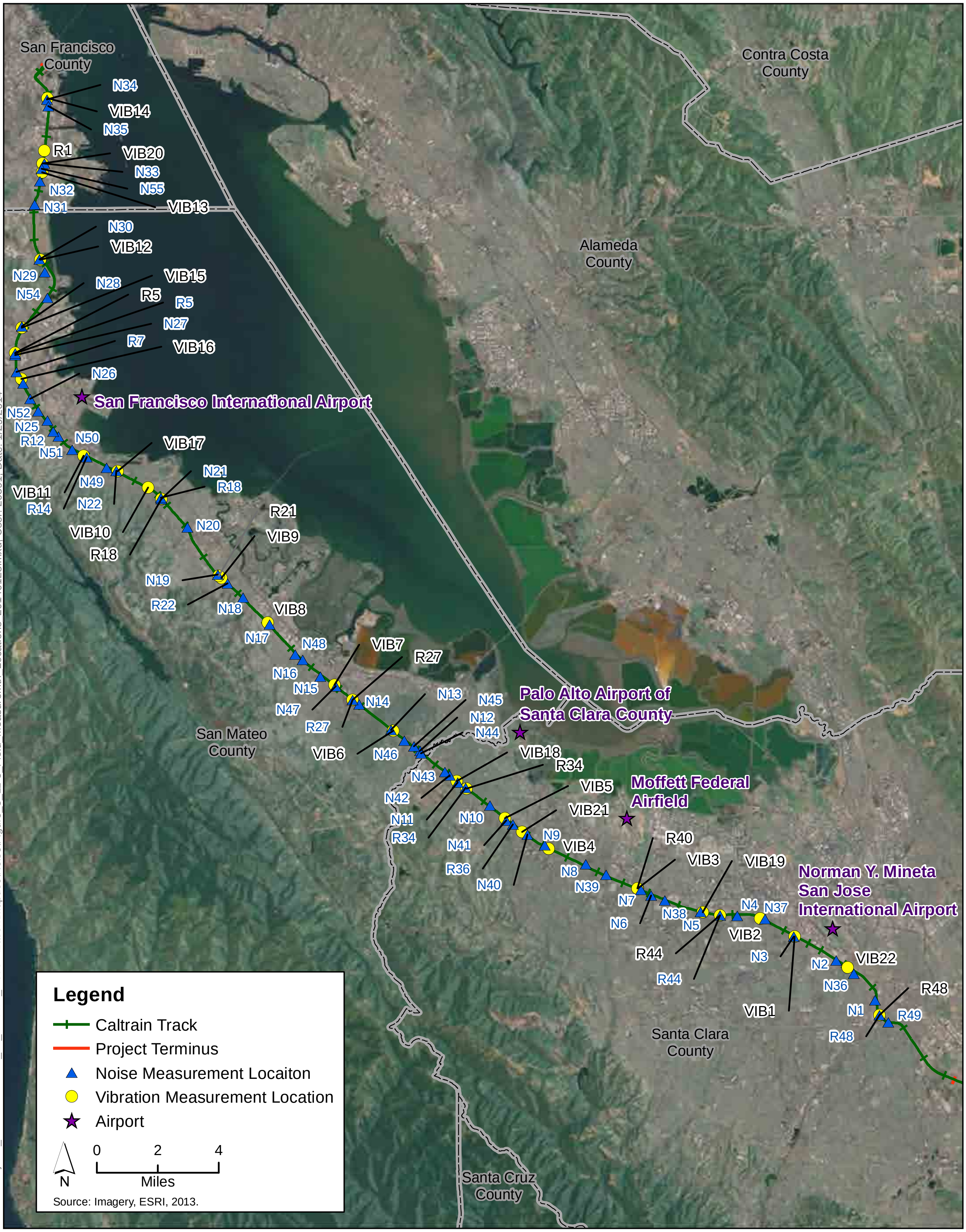


Figure 3.11-5
Overview Map of All Field Measurement Locations
Peninsula Corridor Electrification Project

Table 3.11-2. Summary of 2013 Ambient Noise Measurement Locations and Noise Levels

County	Site No.	Address	Land Use	Distance[a] (feet)	Date Surveyed	Average L_{eq}[b] (dBA)	Average L_{dn}[c] (dBA)
San Mateo	R5 [d]	1289 Herman Street, San Bruno	Residential	85	5/17/13 – 5/24/13	78	78
	R7 [d]	847 Huntington Avenue, San Bruno	Residential	100	5/17/13 – 5/24/13	75	74
	R12	20 Hillcrest Boulevard, Millbrae	Residential	244	5/17/13 – 5/27/13	65	63
	R14	1457 California Drive, Burlingame	Residential	155	5/17/13 – 5/27/13	72	71
	R18 [e]	142 N. Railroad Avenue, San Mateo	Residential	40	5/17/13 – 5/27/13	76	74
	R22	102 Blossom Circle, San Mateo	Residential	128	5/17/13 – 5/27/13	71	70
	R27	198 Buckingham Avenue, Redwood City	Residential	50–70	5/17/13 – 5/25/13	72	71
Santa Clara	R34	Peers Park, Palo Alto	Residential	40	5/17/13 – 5/25/13	73	71
	R36 [d]	4201 Park Boulevard, Palo Alto	Residential	35	5/17/13 – 5/25/13	81	80
	R44 [e]	3585 Agate Street, Santa Clara	Residential	130	5/17/13 – 5/27/13	69	69
	R48 [d]	782 Auzerais Avenue, San Jose	Residential	45	5/17/13 – 5/27/13	83	82
	R49	748 Illinois Avenue, San Jose	Residential	50	5/17/13 – 5/27/13	71	71

[a] Approximate distance from near track.
[b] Arithmetic average of weekday peak hour L_{eq} levels for 5 days: Monday (5/20/13) through Friday (5/24/13).
[c] Arithmetic average of weekday L_{dn} levels for 5 days: Monday (5/20/13) through Friday (5/24/13).
[d] R5, R7, R36 and R48 are within 0.25 mile of at-grade crossings.
[e] R18 and R44 are near stations.
Source: Wilson, Ihrig and Associates 2013.

1 **Table 3.11-3. Summary of 2009–2010 Ambient Noise Measurement Locations and Noise Levels**

County	Site No.	Address	Land Use	Distance[a] (feet)	Date Surveyed	Average L_{eq}[b] (dBA)	Average L_{dn}[c] (dBA)
San Francisco	N34[d, e]	431 Pennsylvania Avenue, San Francisco	Residential	160	11/06/09 – 11/10/09	71	65
	N35[e]	1174 22nd Street, San Francisco	Residential	75	11/30/09 – 12/02/09	74	74
	N33[d]	48 Reddy Street, San Francisco	Residential	170	11/06/09 – 11/10/09	64	64
	N55[d]	88 Kalmanovitz, San Francisco	Residential	165	06/14/10 – 06/15/10	62	64
	N32	48 Gould Street, San Francisco	Residential	135	06/14/10 – 06/15/10	69	68
	N31[e]	327 Tunnel Avenue, San Francisco	Residential / Church	70	11/06/09 – 11/10/09	72	71
San Mateo	N30	42 San Francisco Avenue, Brisbane	Residential	410	11/06/09 – 11/10/09	77	75
	N29	50 Joy Avenue, Brisbane	Residential	930	11/03/09 – 11/05/09	71	76
	N54	1300 Veterans Boulevard, South San Francisco	Hotel	100	03/09/10 – 03/10/10	72	77
	N28[d]	242 Village Way, South San Francisco	Residential	400	11/03/09 – 11/05/09	79	77
	N27[f]	1209 Herman Street, San Bruno	Residential	80	11/03/09 – 11/05/09	75	76
	N53[f]	576 First Avenue, San Bruno	Residential	80	03/09/10 – 03/12/10	69	75
	N26[e]	265 San Luis Avenue, San Bruno	Residential	180	11/03/09 – 11/05/09	68	68
	N52	1036 San Antonio Avenue, Millbrae	School	115	03/09/10 – 03/12/10	64	70
	N25[f]	254 Monterey Street, Millbrae	Residential	150	11/03/09 – 11/05/09	71	71
	N51[e]	150 Serra Avenue, Millbrae	Hospital	70	03/09/10 – 03/12/10	68	73
	N50	1710 California Drive, Burlingame	Hospital / Residential	140	03/09/10 – 03/12/10	63	68
	N49[e, f]	966 California Drive, Burlingame	School	145	03/09/10 – 03/12/10	71	74
	N22[e]	815 Carolan Avenue, Burlingame	Residential	145	10/30/09 – 11/02/09	74	71
	N21[e, f]	396 Catalpa Street, San Mateo	Residential	50	10/30/09 – 11/02/09	71	69
	N20	1416 South Railroad Ave, San Mateo	Residential	95	10/30/09 – 11/02/09	71	67

County	Site No.	Address	Land Use	Distance[a] (feet)	Date Surveyed	Average L_{eq}[b] (dBA)	Average L_{dn}[c] (dBA)
San Mateo (Cont)	N19	8 Antioch Drive, San Mateo	Residential	90	10/28/09 – 10/29/09	73	73
	N18[d, e]	792 Old Country Road, Belmont	Residential	120	10/28/09 – 10/29/09	74	73
	N17[e]	1088 Sylvan Drive, San Carlos	Residential	85	10/28/09 – 10/29/09	69	70
	N48	1552 West el Camino Real, San Carlos	Hotel	175	03/09/10 – 03/12/10	70	73
	N16[f]	1840 Stafford Street, San Carlos	Residential	80	10/28/09 – 10/29/09	75	73
	N15[e, f]	100-198 Winklebleck Street, Redwood City	Commercial	245	10/28/09 – 10/29/09	69	69
	N47[f]	631 Pennsylvania Ave, Redwood City	Residential	40	03/09/10 – 03/12/10	73	77
	N14	200 Berkshire Avenue, Redwood City	Residential	40 – 55	10/23/09 – 10/27/09	70	72
	N13[f]	1601 Stone Pine Lane, Menlo Park	Residential	35	10/23/09 – 10/27/09	76	70
	N46[e, f]	1128 Merrill Street, Menlo Park	Commercial	105	03/09/10 – 03/12/10	66	72
	N45[f]	638 Alma Street, Menlo Park	Park	130	03/05/10 – 03/08/10	65	68
	N12	248 Alma Street, Menlo Park	Residential	135	10/23/09 – 10/27/09	71	66
	N44[f]	118 West El Camino Real, Menlo Park	Hotel	60	03/05/10 – 03/08/10	66	70
Santa Clara	N43	Lucas Lane and Encina Avenue, Palo Alto	Hospital	35	03/05/10 – 03/08/10	67	72
	N42	Lucas Lane and Embarcadero Road, Palo Alto	School	35	03/05/10 – 03/08/10	70	74
	N11[d, f]	1528 Mariposa Avenue, Palo Alto	Residential	180	10/23/09 – 10/27/09	62	61
	N10	3040 Alma Street, Palo Alto	Residential	120	10/23/09 – 10/27/09	78	77
	N41[d, f]	4116 Park Boulevard, Palo Alto	Residential	190	03/05/10 – 03/08/10	57	62
	N40[e]	4243 Alma Street, Palo Alto	Church	125	03/09/10 – 03/12/10	72	75
	N9[f]	2358 Central Expressway, Mountain View	Residential	135	10/20/09 – 10/21/09	76	75

County	Site No.	Address	Land Use	Distance[a] (feet)	Date Surveyed	Average L_{eq}[b] (dBA)	Average L_{dn}[c] (dBA)
Santa Clara (Cont)	N8[e, f]	112 Horizon Avenue, Mountain View	Residential	285	10/20/09 – 10/21/09	71	71
	N39	Central Expressway and Whisman Station Drive, Mountain View	Residential	185	03/05/10 – 03/08/10	69	71
	N7[d, f]	981 Asilomar Terrace, Sunnyvale	Residential	90	10/20/09 – 10/21/09	69	66
	N6	110 Waverly Street, Sunnyvale	Residential	100	10/20/09 – 10/21/09	71	70
	N38[e, f]	111 West Evelyn Avenue, Sunnyvale	Commercial	85	03/05/10 – 03/08/10	72	76
	N5	Evelyn Terrace, Santa Clara	Residential	35 – 50	10/16/09 – 10/19/09	72	72
	N4[d]	2790 Agate Drive, Santa Clara	Residential	160 – 175	10/16/09 – 10/19/09	64	63
	N37	2400 Walsh Avenue, Santa Clara	School	220	03/05/10 – 03/08/10	60	64
	N3[d]	2079 Main Street, Santa Clara	Residential	140	10/16/09 – 10/19/09	64	63
	N2	1315 De Altura Commons, San Jose	Residential	95 – 115	10/16/09 – 10/19/09	67	65
	N36[e]	726 Emory Street, San Jose	School	430 – 450	03/05/10 – 03/08/10	61	64
	N1[e]	102 Laurel Grove Lane, San Jose.	Residential	125	10/20/09 – 10/21/09	70	72

[a] Approximate distance from near track. Range of distance shown where there are more than 2 tracks.
[b] Arithmetic average of weekday peak hour L_{eq} levels (2 days).
[c] Arithmetic average of weekday L_{dn} levels (2 days).
[d] N34, N33, N55, N28, N18, N11, N41, N7 (partially), N4, and N3 acoustically shielded from direct Caltrain noise exposure.
[e] N34, N35, N31, N26, N51, N49, N21, N18, N17, N15, N46, N40, N8, N38, N36, and N1 near stations.
[f] N27, N53, N25, N49, N22, N21, N16, N15, N47, N13, N46, N45, N44, N11, N41, N9, N8, N7, and N38 within 0.25 mile of at-grade crossings.
Source: Wilson, Ihrig and Associates 2010.

Existing Noise Levels

San Francisco

Existing noise levels were characterized at six locations in the vicinity of the Caltrain corridor as part of the 2009–2010 survey: N34, N35, N33, N55, N32, and N31 for the HSR project. The ambient condition corresponds to that of an urban setting. Sources of ambient noise are Caltrain trains, freight trains, vehicles on I-280 and U.S. 101, and local motor vehicle traffic. The average L_{dn} ranged from 64 dBA to 74 dBA depending on the location. The peak hour L_{eq} levels ranged from 62 dBA to 74 dBA.

At location N33, the peak hour L_{eq} was relatively low at 64 dBA primarily due to the existing intervening structures between the Caltrain ROW and homes that provides noise shielding and the distance from main arterials or freeways. A similar situation was observed for receptors near N55 because of the shielding provided by storage buildings located next to the rail alignment.

No noise measurements were conducted during 2013 in San Francisco.

San Mateo County

Noise levels were measured near four receptor sites in 2013 from San Bruno to Burlingame: R5, R7, R12, and R14. The average L_{dn} noise levels ranged from 63 dBA to 78 dBA. The peak hour L_{eq} levels ranged from 65 dBA and 78 dBA. Relatively lower levels (63 dBA L_{dn} and 65 dBA peak hour L_{eq}) were obtained at location R12, which is approximately 245 feet west of the southbound Caltrain track and situated behind the first row of homes along Hemlock Avenue.

From San Mateo to Redwood City, noise levels were measured near three receptor sites in 2013: R18, R22, and R27. The average L_{dn} noise levels ranged from 70 dBA to 74 dBA and the peak hour L_{eq} levels ranged from 71 dBA to 76 dBA.

Noise measurements were obtained at 28 locations within San Mateo County as part of the 2009–2010 survey: N30, N29, N54, N28, N27, N53, N26, N52, N25, N51, N50, N49, N22, N21, N20, N19, N18, N17, N48, N16, N15, N47, N14, N13, N46, N45, N12, and N44. The average L_{dn} varied from 66 dBA to 77 dBA depending on location, distance from the alignment, proximity to grade crossings and other noise sources. Peak hour L_{eq} levels ranged from 64 dBA to 79 dBA.

N54 and N28 are near U.S. 101 in South San Francisco and is where the highest L_{dn} level of 77 dBA was recorded. Similarly, 77 dBA L_{dn} level was measured at location N47. The higher noise levels at N47 are attributed to the proximity of the location to the Chestnut Street at-grade rail crossing and, therefore, to train horn and roadway noise at this location.

Airport noise from SFO is also a dominant contributor to the existing ambient noise environment in areas of South San Francisco, San Bruno, and Millbrae, particularly in the areas within the flight path of aircraft departing from runways 28L and 28R (heading northwest). According to the SFO noise contour map contained in the *San Bruno General Plan* (City of San Bruno 2009), noise sensitive receptors located within the 65 dBA CNEL contour (near the airport and flight path) are currently exposed to noise levels from railroad and other sources that exceed 65 dBA CNEL. For example, measurements taken at N27 and N53 resulted in L_{dn} levels of 76 dBA and 75 dBA, respectively. The noise metrics CNEL and L_{dn} are typically equal or differ by no more than 1 dB. Receptors located in Millbrae and within the Caltrain corridor are located outside the 65 dB CNEL contour, but within the area that is exposed to noise from SFO operations between 55 and 60 dB CNEL.

Santa Clara County

Noise levels were measured near five receptor sites in 2013 from Palo Alto to San Jose: R34, R36, R44, R48, and R49. The average L_{dn} noise level ranged from 69 dBA to 82 dBA and peak hour L_{eq} noise levels ranged from 69 to 83 dBA. R36 and R48 are near at-grade rail crossings and the noise levels in excess of 80 dBA for both the L_{dn} and peak hour L_{eq} are attributed to the influence of noise from train warning horns and crossing bells.

Noise measurements were obtained at nineteen locations within Santa Clara County as part of the 2009–2010 survey: N43, N42, N11, N10, N41, N40, N9, N8, N39, N7, N6, N38, N5, N4, N37, N3, N2, N36, and N1. The average L_{dn} varied from 61 dBA to 77 dBA depending on location, distance from the alignment, proximity to at-grade crossings and other noise sources. Peak hour L_{eq} levels ranged from 60 dBA to 78 dBA. The average L_{dn} levels obtained at N11 and N41 were 61 dBA and 62 dBA, respectively. The average L_{dn} obtained at both N4 and N3 was 63 dBA. N11, N41, N4, and N3 measurement locations are representative of the existing ambient noise for single-family residences located on the western side of the Caltrain alignment. However, because noise measurements were obtained in front of the homes (whereas Caltrain noise affects the back of homes) adjustments to the measured noise level are applied in this analysis to determine the noise exposure at the back of the properties.

Existing Ambient Vibration

The existing ambient vibration in the corridor is largely the result of vibration from the Caltrain rail and freight rail service, and, to a much lesser extent, from traffic on nearby streets. Currently, freight trains operate approximately between 8 p.m. and 5 a.m.[4] with very limited frequency. The effect of these infrequent freight operations on the ambient vibration is relatively insignificant in comparison with the effect of 92 Caltrain trains per day serving the corridor.

Field Measurements

To address the existing ambient vibration levels in the Caltrain corridor, WIA conducted measurements of the prevailing ground-borne vibration at numerous locations along the corridor. Measurements of the existing vibration levels were performed at nine sites along the Caltrain alignment. The nine chosen sites are roughly the same sites where vibration measurements were performed for the prior Caltrain electrification Project EIR/EA in 2001 and 2002 (JPB 2009). Because Caltrain trains are the dominant source of ground vibration, the vibration survey focused on obtaining ground vibration during Caltrain passbys at a typical setback distance between sensitive receptors and the nearest track. Measurements of at least 12 Caltrain train passbys were recorded at different locations. For each site, train vibration was measured at various distances from the rail alignment. Table 3.11-4 summarizes vibration measurement locations and ground-borne vibration levels at theses measurement locations.

In addition, WIA previously conducted an extensive vibration survey along the Caltrain alignment for the HSR project (Wilson, Ihrig and Associates 2010). The 2010 vibration survey included measurements at 22 sites along the Caltrain alignment from October 2009 to March 2010. At each site, measurements of at least three Caltrain train passbys were recorded at two varying distances from the rail alignment. The results of this survey are summarized in Table 3.11-5. Figure 3.11-5 depicts measurement locations.

Results of the ambient vibration survey provide not only an indicator of the existing overall vibration levels throughout the Caltrain corridor. Also, because the vibration source (Caltrain) is similar throughout the corridor, the results also indicate the degree of variability in soil vibration characteristics along the alignment. The results of the existing ambient vibration surveys are discussed in the following section.

[4] Occasionally, freight trains may operate during off-peak hours in the middle of the day, but routine operations are usually between 8 p.m. and 5 a.m. at present.

Table 3.11-4. Summary of 2013 Vibration Measurement Locations and Ground-Borne Vibration Levels

County	Site No.	Address	Date	Distance from outermost track centerline[a] (feet)	Vibration Velocity[b] (VdB)	Source[c]	Train speed (mph)
San Francisco	R1	1831 Palou Avenue, San Francisco	5/30/13	0[d]	68	Caltrain	63–71
				14	71	Caltrain	61–79
				35	71	Caltrain	63–73
				49	73	Caltrain	61–79
				75	71	Caltrain	63–73
				89	72	Caltrain	61–79
				150	71	Caltrain	61–73
				164	72	Caltrain	61–79
San Mateo	R5	1289 Herman Street, San Bruno	5/23/13	40	75	Caltrain	56–77
				55	74	Caltrain	57–65
				100	70	Caltrain	56–77
				115	71	Caltrain	57–65
				150	65	Caltrain	56–77
				165	68	Caltrain	57–65
				200	65	Caltrain	56–77
				215	65	Caltrain	57–65
	R18	140 N. Railroad Avenue, San Mateo	5/24/13	35	83	Caltrain	75–77
					79		35–48
				50	76-77	Caltrain	75–77
					73	Caltrain	25
					67	BB only	24–25
				55	73	Caltrain	76
					71		35–48
				70	70	Caltrain	75
					66	Caltrain	25
					62	BB only	24–25
				100	70	Caltrain	75–77
					64		35–48
				115	67	Caltrain	75
					62	Caltrain	25
					58	BB only	24–25
				200	60-61	Caltrain	75–77
					52		35–48
				215	58	Caltrain	75
					50	Caltrain	25
					49	BB only	24–25
	R21	2 Antioch Drive, San Mateo	5/28/13	35	80	Caltrain	74–76
					78	Caltrain	42–54
					72	BB only	50–55
				49	77	Caltrain	70
					74	Caltrain	40–45
					70	BB only	41–45
				75	74	Caltrain	74–76
					70	Caltrain	42–54
					67	BB only	50–55

County	Site No.	Address	Date	Distance from outermost track centerline[a] (feet)	Vibration Velocity[b] (VdB)	Source[c]	Train speed (mph)
San Mateo (Cont)				89	67 66 61	Caltrain Caltrain BB only	70 40–45 41–45
				150	61 58 57	Caltrain Caltrain BB only	74–76 42–54 50–55
				164	61 56 54	Caltrain Caltrain BB only	70 40–42 41–45
				200	60 54 54	Caltrain Caltrain BB only	74–76 42–54 50–55
				214	58 52 52	Caltrain Caltrain BB only	70 40–42 41–45
	R27	198 Buckingham Avenue, Redwood City	5/24/13	23	83 80	Caltrain	73–79 60–65
				52	77	Caltrain	73–79
				53	74 71	Caltrain	73–79 60–65
				82	71	Caltrain	73–79
				93	68 65	Caltrain	73–79 60–65
				122	67	Caltrain	73–79
				193	60 57	Caltrain	73–79 60–65
				222	59	Caltrain	73–79
Santa Clara	R34	Peers Park, Palo Alto	5/30/13	28	77 76 73	Caltrain	72 41–48 58
				42	77 72	Caltrain	72 32–36
				53	74 73 72	Caltrain	72 41–48 58
				67	73 66	Caltrain	72 32–36
				103	66 65 63	Caltrain	72 58 41

County	Site No.	Address	Date	Distance from outermost track centerline[a] (feet)	Vibration Velocity[b] (VdB)	Source[c]	Train speed (mph)
Santa Clara (Cont)				117	67 60	Caltrain	72 32
				203	63 62 60	Caltrain	58 72 41
				217	56	Caltrain	32
	R40	125 N Mary Avenue, Sunnyvale	6/5/13	50	77 74 73	Caltrain Caltrain BB only	77–80 51–56 69–75
				65	74	Caltrain	65–70
				100	72 70 67	Caltrain BB only Caltrain	77–80 6975 51-56
				115	70 69	BB only Caltrain	75 65–70
				150	70 68 63	Caltrain BB only Caltrain	77–80 69–75 51–56
				165	69 67	BB only Caltrain	75 65–70
				200	68 67 62	Caltrain BB only Caltrain	77–80 69–75 51–56
				215	68 65	BB only Caltrain	75 65–70
	R44	3529 Agate Street, Santa Clara	5/28/13	27	82	Caltrain	79
				41	79	Caltrain	74–81
				53	79	Caltrain	74–81
				63	77	Caltrain	77–82
				85	75	Caltrain	78–82
				111	73	Caltrain	74–81
				133	73	Caltrain	75–82
				185	67	Caltrain	74–82
	R48	782 Auzerais Avenue, San Jose	5/29/13	25	89	Caltrain	25–39
				39	80 68	Caltrain BB only	15–25 14–20
				50	76	Caltrain	25–39
				64	71 62	Caltrain BB only	15–25 14–20
				100	69	Caltrain	25–39
				114	65 58	Caltrain BB only	15–25 14–20
				200	61	Caltrain	25–39
				214	58	Caltrain	15–25

[a] Approximate horizontal distance to the outermost respective track centerline for each group of passbys.
[b] Vibration levels with respect to 1 μ-inch/sec.
[c] "Caltrain" is non-Baby Bullet and Baby Bullet trains; "BB only" is only Baby Bullet trains
[d] Location is over the top of one of the San Francisco tunnels.
Source: WIA 2013.

Table 3.11-5. Summary of 2009-2010 Vibration Measurement Locations and Ground-Borne Vibration Levels

County	Site No.	Address	Date	Distance from outermost track centerline[a] (feet)	Vibration Velocity[b] (VdB)	Source
San Francisco	VIB14	391 Pennsylvania Avenue, San Francisco	11/24/09	120	52	Caltrain
				220	48	Caltrain
	VIB20	Diana Street, San Francisco	2/24/10	105 to 155	62–67	Caltrain
	VIB13	1700 Egbert Avenue, San Francisco	11/03/09	140	74	Caltrain
				240	63	Caltrain
San Mateo	VIB12	29 San Francisco Avenue, Brisbane	11/03/09	300	43	Caltrain
				400	38	Caltrain
	VIB15	257 Village Way, South San Francisco	11/24/09	275	41	Caltrain
				325	40	Caltrain
	VIB16	228 Pine Street, San Bruno	11/24/09	100	74	Caltrain
				150	68	Caltrain
	VIB11	1101 Oxford Road, Burlingame	10/30/09	100	69	Caltrain
				150	64	Caltrain
	VIB17	1051 Park Avenue, Burlingame	11/24/09	150	61	Caltrain
				200	58	Caltrain
	VIB10	360–398 Villa Terrace, San Mateo	10/02/09	50	75	Caltrain
				100	67	Caltrain
	VIB9	1 East 40th Avenue, San Mateo	10/27/09	80	72	Caltrain
				160	61	Caltrain
	VIB8	1090 Riverton Drive, San Carlos	10/27/09	100	58	Caltrain
				200	54	Caltrain
	VIB7	307 Beech Street, Redwood City	10/27/09	50	75	Caltrain
				150	64	Caltrain
	VIB6	418 Encinal Avenue, Menlo Park	10/23/09	50	70	Caltrain
				100	66	Caltrain
Santa Clara	VIB18	96 Churchill Avenue, Palo Alto	11/25/09	50	74	Caltrain
				100	68	Caltrain
	VIB5	100–139 West Meadow Drive, Palo Alto	10/23/09	70	69	Caltrain
				140	50	Caltrain
	VIB21	240 Monroe Drive, Mountain View	3/08/10	100 to 115	70	Caltrain
				100	75 to 81	Freight
	VIB4	40 South Rengstorff Avenue, Mountain View	10/23/09	50	77	Caltrain
				100	70	Caltrain
	VIB3	200–216 North Mary Avenue, Sunnyvale	10/20/09	62	78	Caltrain
				132	70	Caltrain
	VIB19	West Evelyn Terrace, Sunnyvale	12/02/09	45	80	Caltrain
				110	70	Caltrain
	VIB2	2419–2429 South Drive, Santa Clara	10/20/09	140	72	Caltrain
				180	69	Caltrain
	VIB1	2075 Main Street, Santa Clara	10/20/09	80	78	Caltrain
				125	73	Caltrain
	VIB22	855 McKendrie Street, San Jose	3/10/10	70 to 195	70 to 77	Caltrain
				83 to 258	68 to 77	Amtrak
				100 to 270	64 to 73	Freight

Note:
[a] Approximate horizontal distance to the respective track for each group of passbys.
[b] Vibration levels with respect to 1 μ-inch/sec.
Source: WIA 2010.

Existing Vibration Levels

San Francisco

Vibration levels in this section were measured in 2013 near Caltrain receptor site R1, a location near the north portal of Tunnel No. 3 between Oakdale Avenue and Palou Avenue. Ground vibration level during Caltrain passbys was measured up to 73 VdB at a distance of approximately 50 feet from track centerline. Vibration levels did not exhibit much attenuation with distance, a distinctive feature of the data set from R1 that may be due to effects of the tunnel structure. Passbys vibration level measured 72 VdB at a distance of 164 feet. Observed speeds were up to 79 mph.

For measurements taken previously for the HSR studies, Caltrain vibration levels were measured at the following sites:

- HST VIB20: 62–67 VdB at 105–155 feet. The site is near R2 on the opposite side of the alignment by the south portal of tunnel No. 3.
- HST VIB13: 74 VdB at 140 feet. The site is in an open cut area between R2 and R3.

San Mateo County

In San Bruno, vibration levels were measured in 2013 near receptor site R5, along Herman Street at the intersection of Tanforan Avenue. Ground vibration during near track (southbound) Caltrain passbys measured up to 75 VdB at a distance of approximately 40 feet from the near track centerline and 70 VdB at 100 feet. Far track (northbound) trains produced comparatively higher vibration levels, presumably due to the presence of a crossover near and opposite the measurement site. Far track trains measured 74 VdB at 55 feet and 71 VdB at 115 feet. Observed speeds were up to 77 mph for near track (southbound) trains and up to 65 mph for far track (northbound) trains.

For the HSR project, Caltrain vibration levels were measured at the following HSR sites:

- HST VIB16: 74 VdB at 100 feet and 68 VdB at 150 feet. The site is south of R5 at 228 Pine Street in San Bruno and is closest to R8 on the northbound side of the at-grade alignment near the corner of 1st Avenue and Pine Street.
- HST VIB11: 69 VdB at 100 feet and 64 VdB at 150 feet. The site is near the intersection of Oxford Road and California Drive in Burlingame, on the southbound side of the at-grade alignment and close to R14.
- HST VIB17: 61 VdB at 150 feet and 58 VdB at 200 feet. The location is near the intersection of Park Avenue and Carolan Avenue in Burlingame, on the northbound side of the at-grade alignment.
- HST VIB10: 75 VdB at 50 feet and 67 VdB at 100 feet. The location abuts the tracks on the northbound side.

In San Mateo, vibration levels were measured in 2013 near receptor site R18, at 140 N. Railroad Avenue. Ground vibration during Caltrain passbys measured up to 83 VdB at a distance of approximately 35 feet from track centerline; up to 77 VdB at 50 feet; and up to 70 VdB at 100 feet. Observed speeds were up to 77 mph for these events. Vibration levels were also measured near receptor site R21 at 2 Antioch Drive. Ground vibration during Caltrain passbys measured up to 80 VdB at 35 feet for observed speeds up to 76 mph and up to 77 VdB at 50 feet for observed speeds of 70 mph.

For the HSR project, Caltrain vibration levels were measured at the following HSR sites:

- HST VIB9: 72 VdB at 80 feet and 61 VdB at 160 feet.
- HST VIB8: 58 VdB at 100 feet and 54 VdB at 200 feet.
- HST VIB7: 75 VdB at 50 feet and 64 VdB at 150 feet.

In Redwood City, vibration levels were measured in 2013 near receptor site R27, at 198 Buckingham Avenue. The location is on the southbound side of the alignment opposite four active tracks at-grade. Ground vibration from Caltrain passbys measured up to 83 VdB at approximately 25 feet from track centerline; up to 77 VdB at approximately 50 feet; and up to 68 VdB at 93 feet. Observed speeds for these passbys were up to 79 mph.

For the HSR project, Caltrain passby vibration levels measured 70 VdB at 50 feet and 66 VdB at 100 feet at HSR VIB6 located at 418 Encinal Avenue in Menlo Park. The site is near and just south of the receptor site R30 and similarly on the northbound side of the alignment.

Santa Clara County

In Palo Alto, vibration levels were measured in 2013 at receptor site R34 at Peers Park. Ground vibration from Caltrain passbys measured up to 77 VdB at 28 feet, up to 74 VdB at 53 feet and up to 66 VdB at 103 feet. Observed speeds for these events were in the low 70 mph.

For the HSR project, Caltrain vibration levels were measured at the following HSR sites:

- HST VIB18: 74 VdB at 50 feet and 68 VdB at 100 feet. The location is in Palo Alto, about three blocks north of R34 and similarly on the southbound side of the alignment.
- HST VIB5: 69 VdB at 70 feet and 50 VdB at 140 feet. The location is in Palo Alto, north of and relatively close to R36 and similarly on the southbound side of the alignment.
- HST VIB21: 70 VdB at 100 feet. The location is in Mountain View, south of and relatively close to R36 and similarly on the southbound side of the alignment.
- HST VIB4: 77 VdB at 50 feet and 70 VdB at 100 feet. The location is in Mountain View, near R34 though on the southbound side of the alignment.
- HST VIB3: 78 VdB at 62 feet and 70 VdB at 132 feet. The location is in Sunnyvale at R40 and also on the northbound side of the alignment.

In Sunnyvale, vibration levels were measured in 2013 at receptor site R40 at 125 N. Mary Avenue. Ground vibration from Caltrain passbys measured up to 77 VdB at 50 feet, up to 72 VdB at 100 feet, up to 70 VdB at 150 feet, and up to 68 VdB at 200 feet. Observed speeds for these events were up to 79 mph. For the HSR project, Caltrain passby vibration levels measured 80 VdB at 45 feet and 70 VdB at 100 feet at HST VIB19. The location is roughly equidistance between receptor sites R43 and R44 and opposite four active tracks.

In Santa Clara, vibration levels were measured in 2013 at receptor site R44 at 3529 Agate Street. Ground vibration from Caltrain passbys measured up to 82 VdB at 27 feet, 79 VdB at 53 feet, 75 VdB at 85 feet, and 73 VdB at 133 feet. Observed speeds were up to 82 mph. For the HSR project, Caltrain vibration levels were measured at the following HSR sites:

- HST VIB2: 72 VdB at 140 feet and 69 VdB at 180 feet. The location is in Santa Clara between R45 and R46.

- HST VIB1: 78 VdB at 80 feet and 73 VdB at 125 feet. The location is in Santa Clara, near and just south of R47.
- HST VIB22: 77 VdB at 70 feet and 70 VdB at 195 feet. The location is in San Jose between R47 and R48.

In San Jose, vibration levels were measured at receptor site R48 at 782 Auzerais Avenue. Ground vibration from Caltrain passbys measured up to 89 VdB at 25 feet, 76 VdB at 50 feet, and 69 VdB at 100 feet. Observed speeds were only up to 39 mph.

3.11.2 Impact Analysis

Activities associated with construction and operation of the Proposed Project that would cause noise and vibration impacts are described in this section, along with mitigation measures to address significant impacts.

3.11.2.1 Methods for Analysis

Noise Analysis

The noise analysis follows standard methodological guidelines established by the Federal Transit Administration. The noise model includes the following: train horn noise, noise from the wheel/rail interaction, locomotive engine or propulsion noise and aerodynamic effects. The latter include noise at the train noise, around the wheels and at the pantograph (catenary). At speeds below 150 mph, the aerodynamic noises do not contribute to the overall train noise, and thus they have not been explicitly calculated for this analysis.

Existing Noise Exposures

To determine the potential noise level increase from the Proposed Project, existing noise exposures at noise sensitive receptors along the Caltrain corridor were developed to separate noise from Caltrain operations, freight train operations, and non-railroad ambient sources. The noise exposures resulting from Proposed Project operations were then calculated by adding the noise level from proposed future train operations to the existing non-railroad ambient noise level. Table 3.11-6 summarizes the existing noise exposures from Caltrain, freight, and non-railroad ambient sources at representative analysis sites. Locations of the representative receptor sites are listed in Table 3.11-6 and are also shown in Attachment C of Appendix C, Noise Study (WIA 2013). The methods for determining existing ambient noise levels for these sources are described below.

Adjustments to the Measured Ambient Noise Levels

Existing ambient noise levels were established for each representative site using the nearest representative measurement either from Table 3.11-2 or Table 3.11-3. The measured noise levels were adjusted for distance, acoustical shielding, and proximity to other noise sources where the conditions of the measurement location differed from the conditions of the receptor position for each representative site. For example, at locations where noise measurements were obtained in front of the homes and Caltrain is directly exposed to the back of homes, the data were adjusted to determine the noise exposure at the back of the properties. The noise surveys ranged over multiple days. The average L_{dn} values were used, except in some cases where the minimum or maximum measured L_{dn} values were more consistent with the noise model. Appendix C includes the discussions of the adjustments to the measured noise levels and how each of the existing ambient noise levels were established for each representative site.

Existing Caltrain Operations

Existing Caltrain diesel trains were modeled using sound exposure level (SEL) references for diesel locomotives and commuter rail cars provided in the FTA guidelines (Federal Transit Administration 2006). The calculations assume each Caltrain train consists of one locomotive and five passenger cars at the existing service level of 92 trains per day (and 5 trains per peak hour per direction) and maximum train speeds up to 79 mph. The FTA model levels were compared to measurements conducted in 2013, and the results confirmed the FTA model values.

The noise model assumed flat terrain and acoustically "soft" (i.e., absorptive) ground conditions at locations where terrain consisted mostly of railroad ROW, yards, and other non-paved surfaces. The ground factor (G) values for the distance attenuation calculations were 0.6 for noise sources located lower on the train, and 0.7 for sources located higher on the train. Where intervening terrain is mostly roadways or parking lots, then a ground factor of zero was used.

The horn noise prediction model is based on a reference level of 96 dBA L_{max} at 100 feet. The model takes into account the receptor distance from the grade crossing and the track and adjusts the SEL to account for horn usage (non-continuous horn blowing). It was assumed that horn usage is less when approaching stations than grade crossings. At receptor sites within 0.25 mile of grade crossings, a horn usage factor of 0.3 was assumed. At locations within 0.25 mile of stations, a horn usage factor of 0.15 was assumed. Further, based on the existing noise measurement results, modified horn usage factors were used, ranging from 0.04 to 0.7, to adjust the horn noise model to the measured noise values. At a few locations, a 2 dBA adjustment was applied to account for the effect of horn noise reflecting off buildings close to the railroad ROW.

Existing Freight Train Operations

The freight trains normally operate between 8 p.m. and 5 a.m.[5] The noise measurement results show clear peaks in the hourly noise levels between 10 p.m. and 5 a.m., and these peaks were attributed to freight activity. The influence of freight activity on L_{dn} levels was investigated by comparing the measured L_{dn} levels (including all hours) with equivalent "non-freight" L_{dn} levels (excluding data between 10 p.m. and 5 a.m.). The "non-freight" L_{dn} levels are 1 to 4 dBA lower than the measured L_{dn} levels, depending on location, and 2 dBA lower on average. This suggests that freight activity has the effect of increasing the total L_{dn} levels by 1 to 4 dBA, and that the freight noise level is generally within 2 dBA (+ or –) of the Caltrain noise level. In situations where non-rail noise sources dominate, the freight noise contribution is much less.

[5] Freight operates in the JPB-owned Caltrain corridor under a Trackage Rights Agreement (TRA) between UPRR and the JPB. This TRA provides that between midnight and 5 a.m., at least one main track will always be in service for freight. In addition, the TRA requires the JPB to provide the ability to operate freight service on the corridor whenever there is at least 30 minutes headway between passenger trains. Between 10 a.m. and 3 p.m., the TRA requires the JPB to provide at least one 30-minute headway window for freight service capable of operating at commuter service speeds. In practice today, freight commonly runs between 8 p.m. and 5 a.m., with occasional daytime service. Freight service hours are not limited by the TRA on the UP-owned MT-1 track between CP Coast and CP Lick (Santa Clara to south of Tamien Station).

Table 3.11-6. Existing Caltrain/Freight/Non-Railroad Ambient Noise at Representative Sites

Receptor Site No.	City	Location	Side of Alignment	Land Use	Distance to Receptor (feet)	Measurement Site ID	Distance to Measurement Site (feet)	Adjusted Total Ambient Noise Exposure at Receptor[a] L_{dn} (dBA)	Caltrain Diesel Locomotive Train Noise[b] L_{dn} (dBA)	Freight Train Noise L_{dn} (dBA)	Residual Noise Exposure from Non-railroad Sources[c] L_{dn} (dBA)
1	San Francisco	Oakdale Ave and Quint Ave	W	MFR	110	N32	135	69	63	65	65
2	San Francisco	Reddy St and Williams Ave	E	SFR	80	N33	170	70	65	65	66
3	San Francisco	Carr St and Paul Ave	E	SFR	90	N32	135	70	64	66	66
4	San Francisco	Tunnel Ave and Lathrop Ave	E	SFR	120	N31	70	69	66	65	60
5	San Bruno	Herman St and Tanforan Ave	W	SFR	110	R05	85	76	71	73	69
6	San Bruno	Huntington Ave and San Bruno Ave	E	MFR	50	R07	100	77	74	73	67
7	San Bruno	Montgomery Ave and Walnut St	W	SFR	120	R07	100	74	70	71	64
8	San Bruno	1st Ave and Pine St	E	SFR	100	N53	80	74	71	70	64
9	San Bruno	Huntington Ave and Sylvan Ave	W	SFR	150	N53	80	72	69	68	62
10	San Bruno	San Antonio Ave and San Benito Ave	W	SFR	170	N26	180	67	60	62	64
11	Millbrae	Monterey St and Santa Paula Ave	E	MFR	160	N25	150	71	66	66	67
12	Millbrae	Hemlock Ave and Hillcrest Blvd.	W	SFR	90	R12	244	72	68	69	61
13	Burlingame	California Dr and Dufferin Ave	W	SFR	150	N50	140	68	61	63	65
14	Burlingame	California Dr and Mills Ave	W	SFR	160	R14	155	70	66	64	66
15	Burlingame	California Dr and Palm Dr	W	SFR	190	N22	145	70	64	66	66
16	Burlingame	Park Ave and Carolan Ave	E	SFR	160	N22	145	71	66	66	67
17	San Mateo	Grand Blvd and San Mateo Blvd	W	SFR	40	R18	40	76	73	73	60
18	San Mateo	Railroad Ave and Monte Diablo	E	SFR	70	R18	40	72	69	68	56
19	San Mateo	B St and 9th Ave	W	MFR	110	N47	40	73	68	68	69
20	San Mateo	South Blvd and 16th Ave	W	SFR	85	N20	95	67	64	62	60
21	San Mateo	Pacific Blvd and Otay Ave	E	SFR	100	N19	90	72	68	68	65
22	San Mateo	Country Rd and Dale View Ave	E	MFR	120	R22	128	70	65	64	67
23	Belmont	Country Rd and Marine View	E	MFR	120	N18	120	73	68	68	69
24	San Carlos	Country Rd and Springfield Ave	E	SFR	100	N17	85	70	67	66	60
25	Redwood City	D St and Stafford St	E	SFR	90	N16	80	73	70	70	61
26	Redwood City	Cedar St and Main St	E	SFR	50	N47	40	76	73	72	66

Receptor Site No.	City	Location	Side of Alignment	Land Use	Distance to Receptor (feet)	Measurement Site ID	Distance to Measurement Site (feet)	Adjusted Total Ambient Noise Exposure at Receptor[a] L_{dn} (dBA)	Caltrain Diesel Locomotive Train Noise[b] L_{dn} (dBA)	Freight Train Noise L_{dn} (dBA)	Residual Noise Exposure from Non-railroad Sources[c] L_{dn} (dBA)
27	Redwood City	198 Buckingham Ave	W	MFR	110	R27	70	69	65	65	62
28	San Mateo County	Arrowhead Lane and 5th Ave	E	SFR	50	N14	55	72	68	68	65
29	Atherton	Lloyden Dr and Fair Oaks Lane	W	SFR	60	N13	45	70	68	66	51
30	Atherton	Felton Dr and Encinal Ave	E	SFR	65	N13	45	70	68	66	51
31	Menlo Park	Burgess Dr and Alma St	E	MFR	175	N45	130	67	60	60	65
32	Palo Alto	Mitchell Lane and University Ave	W	MFR	100	N44	60	68	65	64	60
33	Palo Alto	Alma St and Lincoln Ave	E	SFR	120	N42	35	69	65	63	65
34	Palo Alto	Residences near Peers Park	W	SFR	40	R34	40	72	70	67	62
35	Palo Alto	Alma St and El Dorado Ave	E	MFR	160	N10	120	76	70	70	73
36	Palo Alto	4237 Park Blvd	W	SFR	50	R36	35	78	74	75	68
37	Mountain View	Central Exp and Thompson Ave	E	SFR	150	N9	135	75	68	70	71
38	Mountain View	Evelyn Ave and Bryant St	W	MFR	110	N8	285	73	69	69	66
39	Mountain View	Central Exp and Whisman Ave	E	SFR	150	N39	185	72	61	61	71
40	Mountain View	S. Bernardo Ave and Evelyn Ave	E	SFR	75	N7	90	68	65	63	60
41	Sunnyvale	Asilomar Ave and Mary Ave	E	MFR	80	N7	90	70	66	66	61
42	Sunnyvale	332 Angel Ave	E	SFR	80	N6	100	71	67	65	66
43	Sunnyvale	Fair Oaks Ave and Evelyn Ave	W	MFR	75	N6	100	71	65	65	68
44	Santa Clara	Agate St and Lawrence Exp	W	MFR	85	R44	130	71	66	66	67
45	Santa Clara	Agate Dr and Bowers Ave	W	SFR	110	N4	160	68	62	63	64
46	Santa Clara	Alvarado Dr and San Thomas Exp	W	SFR	95	N37	220	68	64	62	64
47	Santa Clara	2109 Main St	W	SFR	95	N3	140	68	64	62	64
48	San Jose	782 Auzerais Ave	W	SFR	60	R48	45	81	77	78	65
49	San Jose	456 Jerome St	E	SFR	50	R49	50	71	68	67	61

Note:
[a] Total ambient noise exposure is based on representative noise measurement data.
[b] Noise from existing Caltrain diesel-locomotive trains as determined by FTA model.
[c] Noise from existing diesel-locomotive trains was removed from total ambient noise level by decibel subtraction (energy basis).
SFR = single-family residence.
MFR = multi-family residence.
Locations of the representative receptor sites are shown in Attachment C of Appendix C, Noise Study (WIA 2013).
Source: WIA 2013.

Non-Railroad Ambient Noise Estimates

Once the effects of Caltrain and freight trains were determined, the remaining noise level represents the existing noise exposure due to all other noise sources (residual). The existing noise contributions calculated for Caltrain operations and estimated for existing freight activity, as discussed above, were mathematically subtracted from the total existing noise level established for each site.

The non-railroad ambient noise levels along the Caltrain corridor are typically between 60 and 70 dBA. Non-railroad ambient noise levels less than 60 dBA were in "quiet" residential areas with backyards abutting the right of way and no large roadways or other noise sources contributing. Non-railroad ambient noise levels above 70 dBA indicate sites exposed to major non-rail noise sources, such as large arterial roads and highways or airplane traffic.

Proposed Train Operations

The proposed project would replace approximately 75 percent of the locomotive and passenger car fleet for San Francisco to San Jose service with EMU technology with a catenary system in <u>2020</u> ~~2019~~. The EMU trains were assumed to be six cars long, with three motor cars (powered cars) and three non-powered trailer cars. The Proposed Project assumes maximum train speeds would not change; however, there would be a greater number of total trains per day. The analysis also assumes EMU cars would be roughly the same length as the existing Caltrain rail cars.

The FTA guidelines give no specific reference SEL for EMU trains. The Federal Railroad Administration (FRA) guidance (FRA 2012) includes more recent data on train systems, including data on high-speed and very high-speed steel-wheeled EMU trains. The high-speed category refers to trains less than 150 mph where aerodynamic noise sources are not a significant factor. The FRA reference levels at 50 feet for the high-speed EMU train (with a length of 634 feet) are 86 dBA SEL for propulsion noise and 91 dBA SEL for wheel-rail noise from a train travelling at a speed of 90 mph (which is faster than the maximum for the Proposed Project, which would be 79 mph). Train length and speed adjustments were applied to the FRA SEL values to normalize to the FTA reference SEL conditions (i.e., 1 car at 50 mph). With the adjustments, the equivalent reference SELs are 80.2 dBA at 50 feet for a single power car running at 50 mph and 77.2 dBA at 50 feet for a single non-powered car running at 50 mph. Specific adjustment factors and procedures are discussed in Appendix C.

It was assumed that 100 percent of the trains running from San Francisco to San Jose would use EMU technology with a catenary system in 2040, with the same configuration and parameters discussed above.[6] From Gilroy to San Jose, the same diesel train configuration would continue as it does today with six trains per day (three trains per direction per average weekday day).

<u>As described in Chapter 2, *Project Description*, Caltrain presumes that temporal separation between EMUs and freight trains will not ultimately be required for the Project and thus that freight operational windows would not substantially change with the Project.</u>

[6] The PCEP only has funding for 75 percent replacement of diesel service between San Francisco and San Jose. Over time, Caltrain plans to replace diesels with EMUs such that by 2040 it is a reasonable assumption that 100 percent of service would be with EMUs. In addition, when high-speed rail service is "blended" with Caltrain service (presently assumed to be sometime between 2026 and 2029), all Caltrain service from San Francisco to San Jose would need to with EMUs, so full electrification may occur long before 2040.

Train Horns and Crossing Bells

Train horns and crossing bells are major noise sources associated with train operations. Trains sound their horns before roadway crossings and when approaching a passenger station. The location and number of roadway crossings and stations would not be changed as a result of the Proposed Project.

The horn noise prediction model and horn usage factors are described above under the *Existing Caltrain Operations*. The number of train operations would slightly increase for the proposed operations. The effect of increasing the total number of daytime trains (7 a.m. to 10 p.m.) from 77 to 98 trains would equate to 0.9 dB relative increase in the daytime equivalent noise level (L_{eq}). The effect of increasing the total number of nighttime trains (10 p.m. to 7 a.m.) from 15 to 16 (or peak hour trains from 5 to 6) would equate to 0.8 dB relative increase in the nighttime L_{eq}.

Special Track Work

Special track work includes turnouts and crossovers. Airborne noise from train passage over special track work contributes to wayside noise and can increase the wayside noise level with the introduction of an impulsive source noise. It is assumed the location and number of turnouts and crossovers would not be changed as a result of the Proposed Project.

L_{eq} noise levels due to special track work would slightly increase due to the increased number of trains (similar to the train horns and crossing bells discussed above). However, special track work is not expected to have any substantial effect on the total noise level and, therefore, is not considered in this analysis.

Curving Noise (Wheel Squeal)

Wheel squeal occurs on curves with small radii where the tendency to squeal increases as the curve radius become smaller. For curves with radius greater than 1,000 feet, no wheel squeal should occur. For curves with a smaller radius, wheel squeal may or may not occur depending on several factors, including bogie/wheel dynamics, lubrication, rail gage and wear, and whether the wheels are resilient wheels, among other things. Two types of curving noise exist; one is conventional wheel squeal produced by un-damped solid steel wheels, and the other is flanging noise. Wheel squeal is most likely produced by the low rail leading wheel. Flanging noise may occur with damped wheels and resilient wheels, as well as solid steel wheels. Flanging noise is usually associated with high rail leading wheel flanging.

It is assumed track curves would not change as a result of the Proposed Project. Therefore, there would be no potential for increase in wheel squeal, which is not included in this analysis.

Ancillary Facilities

The area of study for the ancillary facilities was selected based on the screening distances recommended by FTA. Specifically, for power substations the screening distance for a condition of unobstructed sound path between source and receiver is 250 feet. Where intervening buildings obstruct the sound path from the substation to the receptor, the screening distance is 125 feet.

The FTA reference SEL for substations is 99 dBA at 50 feet, which equates to an L_{dn} of 74 dBA at the same reference distance (assuming 24-hour continuous usage). These FTA reference values for SEL and L_{dn} were used to calculate the total project noise levels at noise sensitive receivers within the screening distances from each electrical facility site.

Train Station

No substantial changes to the existing stations would occur as part of the Proposed Project.

However, there would be an increase in passenger activity at stations due to the proposed increased rail service that would result in increased automobile traffic in the immediate vicinity of the station itself. The increased Caltrain service would occur primarily during peak hours, which is a less sensitive time for noise. Roadways near Caltrain stations already experience automobile traffic noise due to passenger train riders traveling to and from the stations and from train noise with a peak of activity in the time before and after train arrival.

Although traffic would increase around stations due to the Proposed Project, the level of traffic noise is not expected to substantially increase above the current noise along roadways near Caltrain stations. In addition, as discussed in Section 3.14, *Transportation and Traffic*, the project would result in a substantial reduction in regional vehicle miles travelled and, thus, overall lower traffic noise regionally.

Construction

As noted in the 2008 noise and vibration study (Parsons 2008), construction noise varies greatly depending on the construction process, type, and condition of the equipment used, and layout of the construction site. Many of these factors are traditionally left to the contractor's discretion, which makes it difficult to accurately estimate levels of construction noise. Overall, construction noise levels are governed primarily by the noisiest pieces of equipment. The engine, which is usually diesel, is the dominant noise source for most construction equipment. The actual sequence of construction tasks and their respective time durations would vary, depending on the tasks and the local conditions. Because of ROW constraints, some tasks such as railroad traffic detouring and utility relocations might be undertaken more than once.

Joint use of the corridor for construction and operation of trains would place major logistical constraints on both. On the construction side, operation would restrict working room and working hours and interruptions from passing trains would reduce efficiencies. On the train operation side, the joint use of the corridor would require single-tracking, service interruptions, speed restrictions, and work zone enforcement.

The FTA method and noise data were used to determine construction noise exposure for each piece of equipment. The noise data include the maximum noise level (L_{max}) of construction equipment operating at full power at a reference distance of 50 feet and the usage factors for the equipment. The usage factor is the percentage of time each piece of construction equipment is typically operated at full power over the specified time period and is used to estimate L_{eq} values from L_{max} values. For example, the L_{eq} value for a piece of equipment that operates at full power over 50% of the time is 3 dB less than the L_{max} value.

The 2008 study estimated the 8-hour L_{eq} levels for the construction equipment at 50 and 100 feet based on respective usage factors. The usage factors account for the total time during an 8-hour day and were estimated based on experience with other similar construction projects. Table 3.11-7 (reproduced from the 2008 study) summarizes typical L_{max} of the construction equipment at 50 feet and the corresponding 8-hour L_{eq} levels at 50 and 100 feet. The usage factors have not been changed from the 2008 analysis. Note that the noise levels in Table 3.11-7 are typical values, and there can be wide fluctuations in the noise emissions of similar equipment based factors such as the operating condition of the equipment and the technique used by the equipment operator.

The following three construction activities have been identified for the purpose of determining construction noise exposure (each activity includes a number of different phases):

- Overhead Contact System Installation.
- Overbridge Protection Barriers Installation.
- Substations, Switching, and Paralleling Stations Construction.

Each stage would involve multiple activities that could create high noise levels. The noise levels for major pieces of construction equipment within a given stage are shown in Table 3.11-7. Total construction noise exposure was determined by first calculating the noise exposure for each piece of equipment, and then combining the noise exposures for all equipment to be used during a construction stage. The equipment noise levels within a particular stage were combined together to obtain a total noise exposure for each stage (listed as bolded entries in Table 3.11-7). Noise levels of different stages were not combined because the different stages would not occur at the same time in a given area.

Table 3.11-7. Typical Construction Equipment Noise Emission Levels

Equipment	Maximum Noise Level L_{max}, dBA, 50 feet from Source	Equipment Usage Factor	Total 8-Hour L_{eq} Exposure, dBA, at Various Distances[a] 50 feet	100 feet
Overhead Contact System Installation				
Foundation Installation without Casing			**76**	**70**
Auger/drill rigs	73	67	82	76
Concrete truck	70	64	79	73
Telescoping boom bucket trucks	62	56	71	65
Front loader	66	60	75	69
Dump truck	54	48	63	57
Generator to vibrate the concrete	65	59	74	68
Foundation Installation with Casing			**77**	**70**
Auger/drill rigs	70	64	79	73
Concrete truck	67	61	76	70
Telescoping boom bucket trucks	65	59	74	68
Front Loader	66	60	75	69
Vibratory hammer	73	67	82	76
Dump truck	54	48	63	57
Generator to vibrate the concrete	65	59	74	68
OCS Pole Installation			**73**	**67**
Diesel construction train (stationary)	58	52	58	52
Diesel construction train (in transit)	45	39	45	39
Telescoping boom bucket trucks	69	63	69	63
Generator (nighttime lighting)	70	64	70	64
OCS Wiring			**74**	**68**
Diesel construction train (stationary)	60	54	60	54
Diesel construction train (in transit)	56	50	56	50

Equipment	Maximum Noise Level L_{max}, dBA, 50 feet from Source	Equipment Usage Factor	Total 8-Hour L_{eq} Exposure, dBA, at Various Distances[a] 50 feet	100 feet
Telescoping boom bucket trucks	71	65	71	65
Generator (nighttime lighting)	72	66	72	66
Overbridge Protection Barriers				
Installation of Barriers to Roadway Bridges			**81**	**75**
Pneumatic drill (in concrete)	85	0.30	80	74
Utility truck (with crane)	81	0.30	76	70
Flatbed truck	78	0.10	68	62
Substation, Switching, and Paralleling Stations				
Ground Clearing Stage – one site only			**83**	**77**
Dozer	85	0.50	82	76
Front loader	80	0.30	75	69
Dump truck	71	0.25	65	59
Compactor	81	0.25	75	69
Ground Grade			**81**	**75**
Backhoe	80	0.30	75	69
Hammer to drive rods (small vibrator)	86	0.25	80	74
Concrete Foundations			**84**	**78**
Flatbed truck	78	0.10	68	62
Wood saw to construct forms	88	0.25	82	76
Concrete truck	82	0.25	76	70
Utility truck (with crane)	81	0.30	76	70
Generator to vibrate the concrete	82	0.15	74	68
Electrical Equipment Installation			**83**	**77**
Flatbed truck	78	0.15	70	64
Forklift	80	0.27	74	69
Large crane	85	0.50	82	76

[a] Distances are measured from the center of the noise producing activities associated with the construction phase.

Source: Parsons 2008.

Vibration Analysis

Train Operations

To assess the potential for vibration impact of the Proposed Project, WIA evaluated factors that would have the potential to increase vibration levels. Factors that would potentially cause changes to the wayside vibration levels are vehicle vibration characteristics, train speed, distance between receptor and track centerline, and track structure type.

The factors would remain the same with the Proposed Project as under the existing condition with the one exception that the EMU vehicle may have different vibration characteristics than the existing locomotive powered trains. Therefore, for any given receptor, all factors remain the same with the exception of the EMU vehicle.

The vibration characteristics attributable to the change in vehicle would be a function of truck (bogie) design, unsprung mass of the vehicle, type of primary suspension, wheel type, and other factors. These details would be reviewed during final design for comparison with the existing Caltrain vehicles to confirm the vibration analysis assumptions. This analysis assumes that the unsprung weight of the future EMU vehicle would not substantially exceed that of the existing Caltrain gallery car.

Construction

Two types of construction vibration impacts were analyzed: (1) human annoyance, and (2) building damage. Human annoyance occurs when construction vibration rises significantly above the threshold of human perception for extended periods of time. Building damage can be cosmetic or structural. Fragile buildings such as historical structures or ancient ruins are generally more susceptible to damage from ground vibration. Normal buildings that are not particularly fragile would not experience any cosmetic damage (e.g., plaster cracks) at distances beyond 20 feet based on topical construction equipment vibration levels. This distance can vary substantially depending on the soil composition and underground geological layer between vibration source and receiver. In addition, not all buildings respond similarly to vibration generated by construction equipment. The potential for vibration annoyance and building damage was analyzed for major vibration-producing construction equipment that would be used for the Proposed Project. The vibration levels produced by construction equipment are estimated using FTA vibration data and from field measurements, as shown in Table 3.11-8.

Table 3.11-8. Vibration Source Levels for Construction Equipment

Equipment	PPV[a] at 25 ft (in/sec)	Approximate Velocity Level[b] at 25 ft (VdB)
Large bulldozer	0.089	87
Loaded trucks	0.076	86
Small bulldozer	0.003	58
Auger/drill rigs	0.089	87
Vibratory hammer	0.07[c]	85[c]
Vibratory compactor/roller	0.55[d]	103[d]

[a] Peak particle ground velocity measured at 25 feet unless noted otherwise.
[b] Route mean square amplitude ground velocity in decibels (VdB) referenced to 1 micro-inch/second.
[c] Measured at 88 feet by Parsons.
[d] Measured at 15 feet by Parsons.
Source: Federal Transit Administration 2006; Parsons 2008.

3.11.2.2 Thresholds of Significance

The Proposed Project would be considered to have a significant impact if it would result in any of the conditions listed below.

- Expose persons to or generate noise levels in excess of FTA thresholds.

- Expose persons to or generate groundborne vibration or groundborne noise levels in excess of FTA thresholds.
- Be located within an airport land use plan area, or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport and expose people residing or working in the project area to excessive noise levels.
- Be located in the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels.

The Proposed Project is a surface transit project and would not permanently locate people to reside or work in the project area. Therefore, aircraft noise is not analyzed further.

The FTA noise and vibration criteria used to identify the significant impacts of the project during operation and construction are discussed in sections below. Although local jurisdictions have their own noise and vibration standards (as discussed above), these criteria are generally designed to assess the impacts of land use development projects. The FTA noise and vibration criteria are specifically designed to assess the impacts of rail projects and provide a uniform set of criteria to apply to the entire 52-mile project corridor, instead of varying the criteria of individual jurisdictions. This approach allows for a more consistent basis by which to identify where the Proposed Project would have significant impacts.

FTA Noise Criteria

Operation Noise Criteria

The FTA guidelines provide impact assessment procedures and criteria for noise (FTA 2006). The impact criteria are based on maintaining a noise environment considered acceptable for land uses where noise may have an effect on sensitive receptors. Land use also factors into the determination of impact; industrial uses are assumed to not have sensitive receptors and therefore are not considered, while places where people sleep or where quiet is an integral component of the land use (i.e., Categories 1 and 2) get an additional 5 dB protection beyond other land uses containing sensitive receptors. Descriptions of the three land use categories that are subject to noise criteria are shown in Table 3.11-9. The noise exposure is measured in terms of L_{dn} for residential land uses and in terms of $L_{eq}(h)$ for other land uses as defined in the table.

The FTA noise impact criteria are based on comparison of the existing outdoor noise levels with the future outdoor noise levels from the Proposed Project in combination with the existing noise. The impact criteria for increases in project noise exposure are presented in Figures 3.11-6 and 3.11-7. Noise level increases are categorized as *no impact*, *moderate impact*, or *severe impact*, where the two levels of noise impact are characterized as explained below.

Moderate impact: In this range of noise impact, the change in cumulative noise level is noticeable to most people, but may not be sufficient to cause strong, adverse reactions from the community. In this transitional range, other project-specific factors must be considered to determine the magnitude of impact and the need for mitigation. Factors to consider are the number of noise-sensitive sites that are affected and the existing level of noise exposure. If existing noise exposure is greater than L_{dn} 65 dBA, then there would be a stronger need for mitigation.

Severe impact: Project-generated noise in the severe impact range can be expected to cause a significant percentage of people to be highly annoyed by the new noise levels and represents the most compelling need for mitigation. Noise mitigation will normally be specified for sensitive receptors where a severe impact occurs unless there are truly extenuating circumstances that prevent implementation of mitigation.

Table 3.11-9. Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric, dBA	Description of Land Use Category
1	Outdoor L_{eq} (h)[a]	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor L_{eq} (h)[a]	Institutional land uses with primarily daytime and evening use. This category includes land uses where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material, such as schools, libraries and churches. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls fall into this category. Places for meditation or study associated with cemeteries, monuments, and museums, and certain historical sites, parks, and recreational facilities are also included.

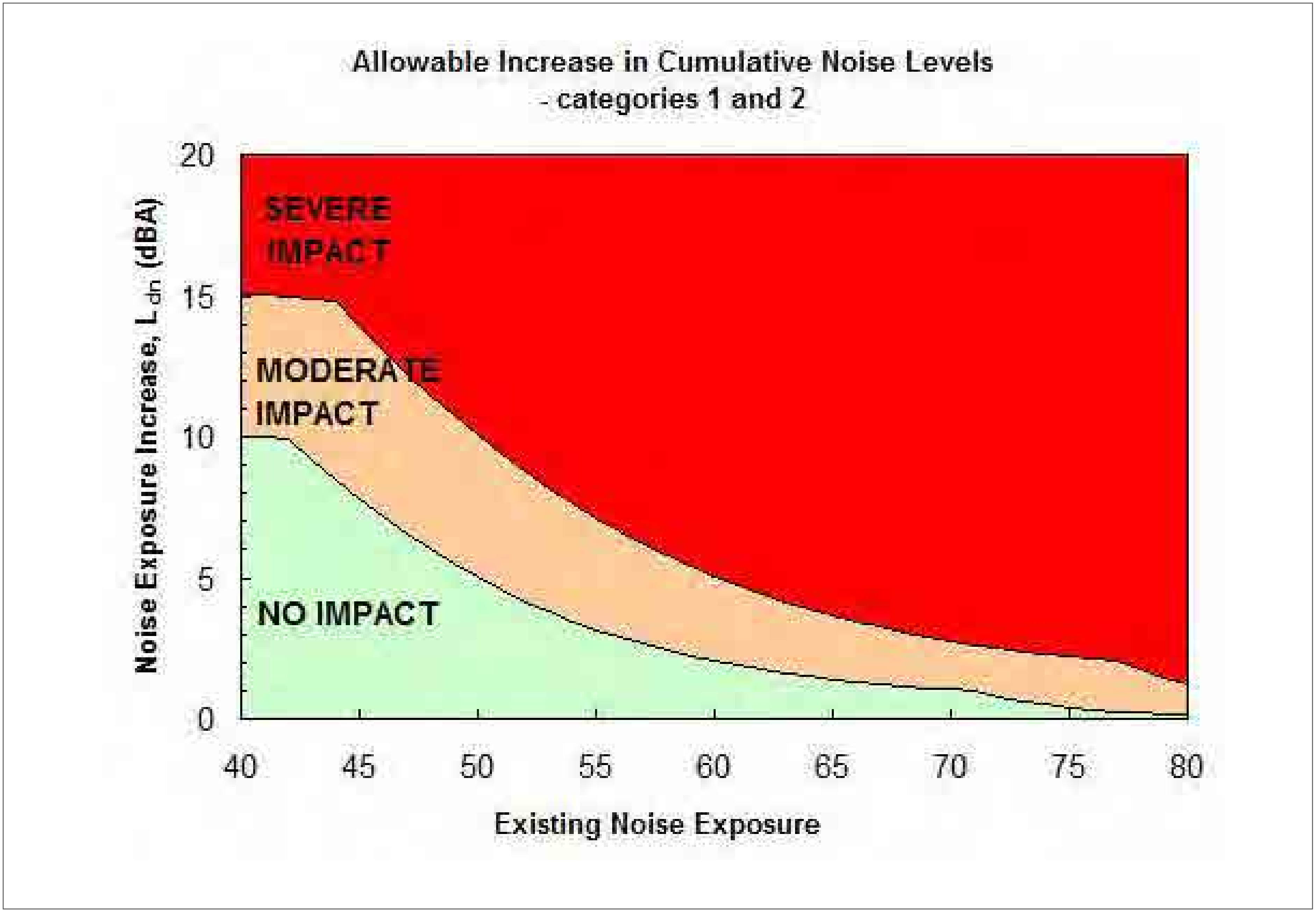
[a] L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.
Source: FTA 2006.

The thresholds for these three levels of impact, as indicated in Figures 3.11-6 and 3.11-7, are based on the projected increase of the existing ambient noise level associated with operation of the Proposed Project. The thresholds also may be used to evaluate the Proposed Project in combination with other new planned projects to determine cumulative impacts.

The process of determining impact severity begins with a determination of land use with reference to the land use categories defined in Table 3.11-9. Once the land use category has been determined, an appropriate noise metric is selected to determine the projected noise level and the severity of impact. The next steps are to determine the existing exterior noise exposure for each receptor or group of similar receptors, and then to determine the total noise exposure associated with the Proposed Project combined with the existing ambient noise level and, in the case of a cumulative noise analysis, other projects. The severity of impact is then determined using the thresholds depicted in Figures 3.11-6 and 3.11-7.

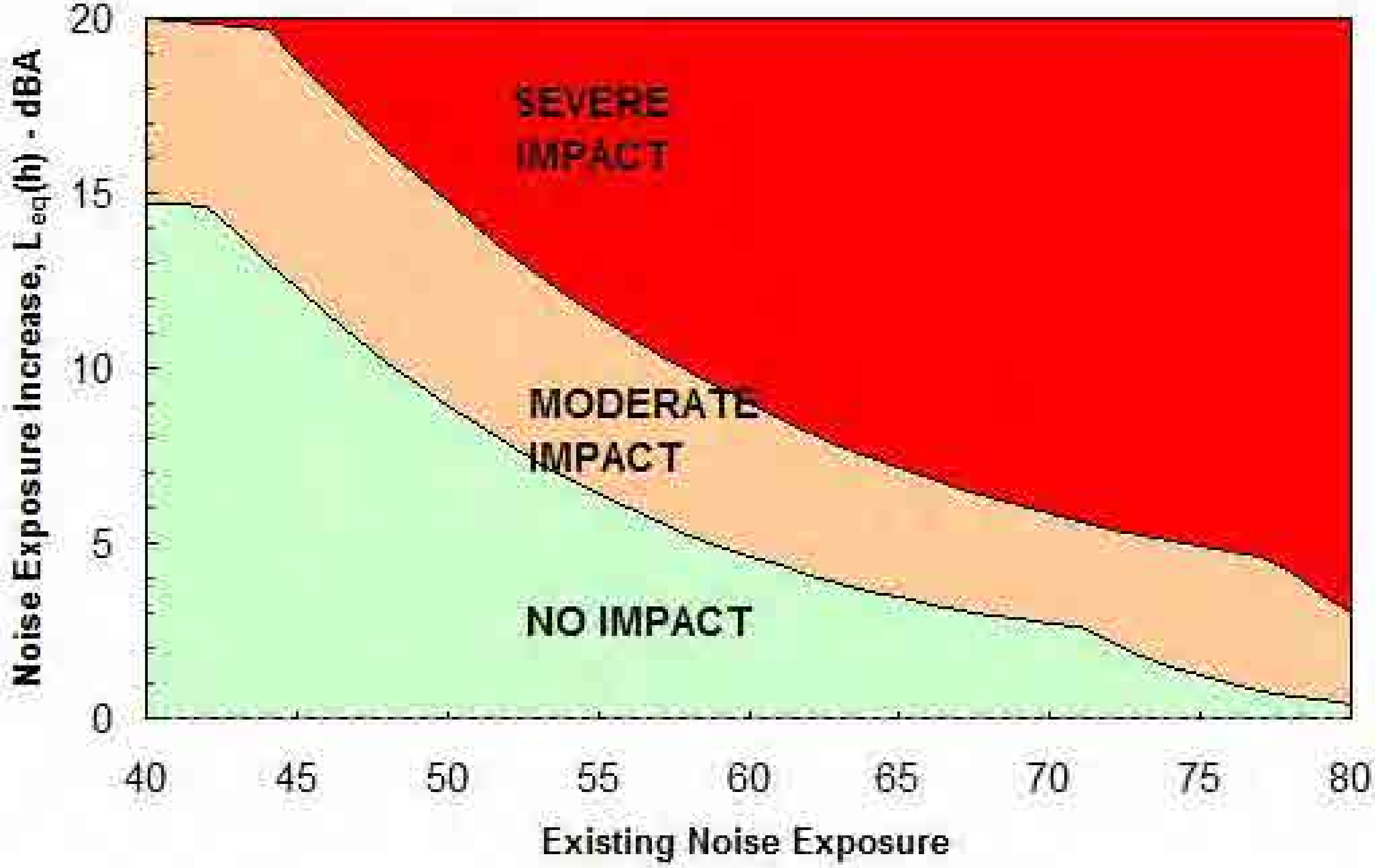
A hypothetical example would be a residential property that has an existing L_{dn} exposure of 60 dBA. The noise exposure resulting from the Proposed Project, regional growth, and other planned projects could result in an L_{dn} exposure of 65 dBA. Adding (on a logarithmic basis) an L_{dn} of 65 dBA to the existing noise level would result in a total L_{dn} exposure of 66 dBA. This represents a potential increase of 6 dBA over the existing noise level. Using Figure 3.11-6 a line would be drawn vertically at 60 dBA and another line drawn horizontally at 6 dBA from left-hand axis. The intersection of these two lines determines the severity of impact. In this example, the resulting noise increase would be considered a severe impact on the residential property.

The FTA criteria can also be presented in terms of absolute levels for evaluating noise from the transit project alone. However, the absolute criteria is only applicable to new transit sources where



Source: Federal Transit Administration 2006.

Figure 3.11-6
Noise Impact Thresholds for FTA Category 1 and 2
Peninsula Corridor Electrification Project



Source: Federal Transit Administration 2006.

Figure 3.11-7
Noise Impact Thresholds for FTA Category 3
Peninsula Corridor Electrification Project

the existing noise levels generated by existing transit systems, roadway, and other sources will not change as a result of the project. The absolute criteria assume the project noise can be added to the existing noise to calculate a new total noise level. If the existing noise was dominated by a source that changed due to the project, it would be incorrect to add the project noise to the existing noise. Therefore, the relative form of the noise criteria must be used for projects involving proposed changes to an existing transit system.

Stationary Source Criteria

The noise criteria for stationary sources, such as traction power substations, switching stations, and paralleling stations, were established by the FTA methods described above. The noise from these facilities is evaluated as part of the entire project noise, and the impact is based on comparing the project noise with the existing conditions. Most local codes within the Caltrain corridor limit noise levels from continuous operations (such as those generated from stationary sources) to the same as the existing ambient. In some cases, codes allow a 5 to 10 dBA increase above the existing ambient background, which would result in a net increase of 3 to 6 dBA over the existing ambient condition. For existing noise environments on the order of 65 to 70 L_{dn}, the FTA noise criteria for land use category 1 and 2 typically defines a moderate noise impact as a noise increase of approximately 1 to 2 dBA and a severe impact as a noise increase of at least 3 dBA, which is consistent with or more restrictive than local codes.

Construction Noise Criteria

The FTA construction noise criteria were used for identifying construction noise impacts, as presented in Table 3.11-10. The criteria are based on the L_{eq} level from all equipment operating during a given 8-hour period. Noise impacts for long-term construction projects, with daily variations in construction activities, are based on a 30-day average L_{dn} or L_{eq}.

Noise levels generated by construction equipment would vary depending on several factors including the type of equipment, the condition of the equipment, and the specific operation being performed. Furthermore, noise levels within a given time period will vary depending on the combined quantities of equipment being used and the length of time that each piece of equipment is operated. The L_{eq} metric is useful for evaluating noise for entire phases of construction because it can represent combined noise levels generated by all equipment and take into account the temporal nature of the construction operations.

Table 3.11-10. FTA Construction Noise Assessments Criteria

	8-hour L_{eq} (dBA)		
Land Use	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)	Daily Noise Level (dBA) 30-day Average
Residential	80	70	75 (L_{dn})[a]
Commercial	85	85	80 (24-hour L_{eq})
Industrial	90	90	85 (24-hour L_{eq})

[a] In urban areas with very high ambient noise levels (L_{dn} > 65 dB), L_{dn} from construction operations should not exceed existing ambient + 10 dB.
Source: Federal Transit Administration 2006.

The local noise ordinances for the cities and counties along the Caltrain corridor generally limit construction noise to particular time periods during weekday, weekend, and holiday daytime hours. Nighttime construction work is generally prohibited, but some jurisdictions allow for a variance.

Some of the municipal codes specify the maximum noise levels allowable at property lines or at a specified distance from construction equipment. In jurisdictions with construction noise level limits, the allowable maximum noise levels at property lines range from 86 to 110 dBA. Because the local codes specify construction noise limits in terms of maximum levels, and noise is not assessed using an energy-averaged sound level, it is difficult to compare local noise limits directly to the FTA criteria. If one assumes that all the construction equipment that would be used for the Proposed Project generates 86 dBA continuously over an 8-hour period, the corresponding L_{eq} value would also be 86 dBA L_{eq}. Typically, the energy averaged noise level would be less, because each piece of equipment is operated non-continuously, and therefore generates its specific maximum noise level for only a portion of every hour and a portion of every workday.

FTA Vibration Criteria

The FTA guidance document (FTA 2006) is used to evaluate vibration impacts from Caltrain operations and construction. The evaluation of vibration impacts can be divided into two categories: (1) human annoyance, and (2) building damage. As described below, the human annoyance criteria are used to evaluate vibration impacts resulting from Proposed Project operations, and the building damage criteria are used to evaluate vibration impacts resulting from construction activities.

Operation Vibration Criteria

Vibration impacts are based on the receptor land use category and how frequent the vibration events would occur. The impact level also depends on the type of analysis being conducted (i.e., ground-borne vibration or ground-borne noise).

The FTA guidance document provides ground-borne vibration criteria to assess the human response to different frequencies of ground-borne vibration events from a new project, as shown in Table 3.11-11. In addition, the guideline provides criteria for special buildings that are very sensitive to ground-borne vibration generated from a new project. The impact criteria for these special buildings are shown in Table 3.11-12.

Because the Proposed Project would involve an existing operational railroad corridor, the vibration impact of Proposed Project operation is determined by comparing the potential increase in vibration levels with the existing condition.

The FTA guidance document provides impact criteria for increases in vibrations levels as a result of a rail project based on the use of an existing rail corridor. The Proposed Project is considered a "heavily-used rail corridor," which is defined as a corridor with more than 12 trains per day. For a heavily-used rail corridor, a significant impact would occur if the existing train vibration already exceeds the criteria given in Tables 3.11-11 and 3.11-12 and the Proposed Project would result in a significant increase in the vibration events (defined as doubling the number of existing events), or if the Proposed Project would result in an increase of existing vibration level by 3 VdB or more. As shown in *Existing Ambient Vibration* and Tables 3.11-4 and 3.11-5 in Section 3.11.1.2, existing vibration levels exceed the criteria in Tables 3.11-11 and 3.11-12. Therefore, the criteria of a 3 VdB increase or a doubling of existing train vibration events are applied for determining a significant impact.

Ground-borne noise impacts are evaluated for only subway projects or in the cases where a special use building has been isolated for noise but not vibration. Because the existing conditions include vibration from surface commuter and freight railroad activities, no further discussion of ground-borne noise is considered in this analysis.

Table 3.11-11. Ground-Borne Vibration Impact Criteria for Human Annoyance

	Ground-Borne Vibration Impact Levels (VdB relative to 1 micro-inch/sec)		
Land Use Category	Frequent Events[a]	Occasional Events[b]	Infrequent Events[c]
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB[4]	65 VdB[d]	65 VdB[d]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

[a] Frequent is defined as more than 70 vibration events of the same source per day.

[b] Occasional is defined as between 30 and 70 vibration events of the same source per day.

[c] Infrequent is defined as fewer than 30 vibration events of the same source per day.

[d] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

Source: FTA 2006.

Table 3.11-12. Ground-Borne Vibration Impact Criteria for Special Buildings

	Ground-Borne Vibration Impact Levels (VdB relative to 1 micro-inch/sec)	
Type of Building or Room	Frequent Events[a]	Occasional or Infrequent Events[b]
Concert Halls	65 VdB	65 VdB
TV Studios	65 VdB	65 VdB
Recording Studios	65 VdB	65 VdB
Auditoriums	72 VdB	80 VdB
Theaters	72 VdB	80 VdB

[a] Frequent is defined as more than 70 vibration events per day.

[b] Occasional or infrequent is defined as fewer than 70 vibration events per day.

Source: FTA 2006

Construction Vibration Criteria

Normally, vibration resulting from a train passby would not cause building damage. However, damage to fragile historic buildings located near the ROW can be a concern if vibration levels approach or exceed 90 VdB. As documented under *Existing Ambient Vibration*, vibration from existing passenger and freight operations on the Caltrain corridor do not reach this level.

Construction activities can result in varying degrees of ground vibration, depending on the equipment and method employed and proximity to receptors. The vibration associated with typical transit construction is not likely to damage building structures, but it could cause cosmetic building damage under unusual circumstances.

Vibrations generated by surface transportation and construction activities are mainly in the form of surface or Raleigh waves. Studies have shown that the vertical component of transportation-generated vibrations is the strongest, and that PPV correlates best with building damage and complaints. Table 3.11-13 summarizes the construction vibration limits shown in FTA guidelines for structures located near the ROW of a transit project.

Table 3.11-13. Construction Vibration Damage Criteria

Building Category	PPV (in/sec)	Approximate L_v[a]
I. Reinforced-concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

[a] RMS velocity in decibels (VdB) relative to 1 micro-inch per second
Source: FTA 2006.

3.11.2.3 Impacts and Mitigation Measures

Impact NOI-1a	Expose sensitive receptors to substantial increase in noise levels during construction
Level of Impact	Significant
Mitigation Measures	NOI-1a: Implement Construction Noise Control Plan
Level of Impact after Mitigation	Significant and unavoidable

Noise exposures for all equipment being used in each construction stage were combined together to determine the total noise impact, as shown in Table 3.11-7.

To assess impacts on noise sensitive receptors, a calculation was performed to determine the distances from the construction activities where an 80-dBA exposure would occur over an 8-hour period[7]. The 80-dBA exposure level represents the noise limit for daytime construction at residential land uses. The significance criteria described in Table 3.11-10 for different land uses (residential, commercial, industrial) would apply as well as the different (and lower) criteria for nighttime work. The 80-dBA level was used for the purposes of identifying where daytime impacts would occur on residential receptors only. Impacts at nighttime are considered separately below.

Table 3.11-14 summarizes the distances at which sensitive residential receptors could be potentially exposed to substantial increases in construction noise during daytime. As shown in Table 3.11-6, noise sensitive receptors along the project corridor are located as close as 35 feet from the near track. Impact areas would typically extend beyond this distance.

[7] Construction activities will generally be limited to an 8-hour workday, however there may be periods in which construction activities may require work for periods longer than a typical 8-hour workday.

Table 3.11-14. Exposure to Construction Noise

Construction Stage	Distance to L_{eq} of 80 dBA Based on 8-Hours/Day of Exposure to Construction Noise[a] (feet)
Overhead Contact System Installation	
Foundation installation without casing	30
Foundation installation with casing	35
OCS pole installation	25
OCS wiring	30
Overbridge Protection Barriers	
Installation of barriers to roadway bridges	60
Traction Power Substations, Switching Station, and Paralleling Stations	
Ground Clearing Stage – one site only	75
Ground grade	55
Concrete foundations	80
Electrical equipment installation	70

Note:

[a] Distances are measured from the center of the noise producing activities associated with the construction phase. Construction activities will generally be limited to an 8-hour workday, however there may be periods in which construction activities may require work for periods longer than a typical 8-hour workday.

Source: Parsons 2008.

Noise sensitive land uses adjacent to construction lay-down or staging areas could also experience construction noise impacts. These are areas where construction equipment and materials are stored and accessed during the construction period. At the time of this study, specific locations and details of the lay-down areas were unknown. If lay-down areas are selected within 90 feet of a residential area, noise impacts could result.

Because commercial and industrial land uses are less sensitive to noise, daytime construction impacts would likely only occur when construction is immediately adjacent to commercial land uses. Daytime impacts are not likely to occur on adjacent industrial land uses.

Nighttime construction near residential uses would have larger impacts than daytime construction would have. The distance to the 70 dBA residential nighttime criteria would be less than shown in Table 3.11-14. The number of residences affected by nighttime construction would be greater than the number of residences impacted by daytime construction noise with the same noise level.

Although the measures specified in Mitigation Measure NOI-1a would generally reduce the construction noise levels, the measures would not necessarily guarantee that sensitive residential receptors would not be exposed to noise levels exceeding the 80 dBA limit during the day or the 70 dBA limit at night. In specific, given the active railroad, it is probable that construction near some residential areas will have to be conducted at night to avoid disruption of passenger rail operations and to complete the project on schedule. Furthermore, at TPFs, a temporary sound wall may be effective, but in many cases (such as OCS pole installation) the nature of the construction work makes use of such sound walls infeasible.

Construction-related noise would be short-term and would cease after the construction is completed. Still, even with mitigation, the impact of temporary construction-related noise on nearby noise sensitive receptors would remain a significant and unavoidable impact, in particular where heavy construction would occur immediately adjacent to residences and where construction would occur at night near residences.

<u>Project Variant 1 would result in less OCS construction south of the Tamien Station but would shift the PS7 location from near Kurte Park to adjacent to Alma Avenue. The PS7 location would be separated from residential areas by the active railroad tracks and thus construction would not result in a change in overall impacts compared to that of the Proposed Project.</u>

Mitigation Measure NOI-1a: Implement Construction Noise Control Plan

A noise control plan that incorporates, at a minimum, the following best practices into the construction scope of work and specifications to reduce the impact of temporary construction-related noise on nearby noise sensitive receptors shall be prepared and implemented.

- An active community liaison program shall be established. The community liaison program will keep residents informed about construction plans so residents may plan around noise or vibration impacts and will provide a conduit for residents to express any concerns or complaints. <u>Construction contact information shall be provided to local residents and posted on construction sites adjacent to residential areas. Residents within 300 feet of upcoming construction shall be notified 10-days in advance of the start of construction in an area wherever possible.</u>
- Contractors shall be required to use newer equipment fitted with the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. Newer equipment will generally be quieter in operation than older equipment. All construction equipment shall be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding). Electric or "quiet" equipment shall be used for generators, compressors, and other construction equipment where feasible.
- Contractors shall employ construction methods or equipment that will provide the lowest level of noise and ground vibration impact near residences and consider alternative methods that are suitable for the soil condition. The contractor shall be required to select construction processes and techniques that create the lowest noise levels.
- Truck loading, unloading, and hauling operations shall be conducted so that noise and vibration are kept to a minimum by carefully selecting routes to avoid going through residential neighborhoods to the greatest possible extent. <u>Deliveries of materials and equipment shall be prioritized for daytime hours whenever feasible.</u>
- Ingress and egress to and from the staging area shall be on collector streets or higher street designations (preferred), and through routes for trucks will be designed to the extent feasible to minimize the frequency of backup alarm sound.
- Idling equipment shall be turned off whenever feasible.
- When practicable, temporary noise barriers will be used to protect sensitive receptors against excessive noise from construction activities. Partial enclosures around continuously

operating equipment or temporary barriers along construction boundaries will be considered.

- Construction activities within residential areas will be minimized during evening, nighttime, weekend, and holiday periods to the extent feasible.
- Noise and vibration monitoring shall be conducted to verify compliance with the noise limits. Independent monitoring should be performed to check compliance in particularly sensitive areas. Contractors will be required to modify and/or reschedule their construction activities if monitoring determines that maximum limits are exceeded at residential land uses.

Impact NOI-1b	Expose sensitive receptors to substantial increase in noise levels from Proposed Project operations
Level of Impact	Significant
Mitigation Measures	NOI-1b: Conduct site-specific acoustical analysis of ancillary facilities based on the final mechanical equipment and site design and implement noise control treatments where required
Level of Impact after Mitigation	Less than significant

Train Operations

Operational noise impact from proposed EMU train operations is evaluated based on the FTA guidelines and noise impact criteria described in Section 3.11.2.2, *Thresholds of Significance*. The FTA noise impact criteria are based on comparison of the existing outdoor noise levels and the future outdoor noise levels from the Proposed Project operations in combination with the existing ambient noise. The existing ambient noise levels at representative analysis sites are described in Section 3.11.2.1, *Methods for Analysis*, and summarized in Table 3.11-6. These noise levels include existing Caltrain, freight rail, other tenant railroads and non-railroad ambient noise sources. The projected future train noise levels resulting from the Proposed Project were added to the existing ambient noise level to calculate a total future noise level and determine the Proposed Project's noise increase. The applicable FTA impact criteria, as shown in Figures 3.11-6 and 3.11-7, were determined for each receptor based on the total existing noise level calculated for each site.

Operational train noise impacts would include both a decrease in train noise, because EMUs are quieter than corresponding diesel locomotives, and an increase in train noise, primarily during peak hours due to the Proposed Project's increase in Caltrain service. Operational train noise projections and impacts at each of the representative sites are presented in Table 3.11-15 and can be summarized as follows:

- ~~In~~ At 41 ~~33~~ study locations, the positive effect of quieter EMUs would outweigh the influence of increased horn noise based on comparing No Project with Proposed Project conditions.
- At eight locations, the adverse effects of increased horn noise would outweigh the positive effect of quieter EMUs, and future noise levels under the Proposed Project would be slightly higher than ~~existing~~ No Project noise levels ~~but less than the FTA thresholds~~.
- ~~At eight locations, the positive effect of quieter EMUs would be offset by the increase in horn noise such that noise conditions would not change.~~

Compared to existing noise levels, the project would have the following effects:

- decrease in noise levels: 36 study locations;
- no change in noise levels: 9 study locations; and
- increase in noise levels of 0.1 dB (less than FTA threshold impact level): 4 study locations.

The stationary corona noise that can be heard from power transmission lines is very low. It is on the order of 25 dBA at the edge of the right-of-way for a 250 KV system (CPUC 1999). The low hum from these transmission lines can be enhanced during periods of high humidity, but the overall noise level is well below that caused by the existing Caltrain system, and thus, does not contribute to the overall train noise.

Tree removal required by the ESZ would not result in any meaningful increase in noise. Dense tree zones can provide noise control, but only in specific cases, where the zone is particularly wide (FTA guidance states that a tree buffer should be at least 100 feet deep to include attenuation),[8] blocking the line of sight between the receiver and the source, and extending above the source and laterally beyond the source length. If one or two rows of trees are being removed (5 to 20 feet deep), it should not have any meaningful effect on the A-weighted noise level from trains. While it is possible that humans can detect a change in the timbre or frequency content of the sound, those changes would not appreciably affect the A-weighted noise level. A related effect involves the ground type; the change from a deep tree zone to a hard concrete surface would affect how sound travels, but the effect of one or two rows of trees is insubstantial compared to the rest of the ground. The PCEP does not propose any new hard concrete surfaces along the ROW as part of the overhead contact system and the only hard concrete surfaces would be for the traction power facilities.

The conclusion above on tree removal on noise is backed up by research on the effect of tree buffers. For example, the State of Virginia commissioned a study in 2007 to research the effect of a dense conifer stand as a noise barrier for highway noise reduction (Lee et al. 2007). In this paper, they summarized prior literature findings that greatest reductions were found with vegetation belts of between 20 and 30 meters (66 to 99 feet) but that some studies concluded that the noise attenuation was so small it would not be perceived by humans. The literature review also concluded in order for vegetation to reduce noise, it needed to be densely planted with no gaps to let noise through. The Lee 2007 study used tree depth of 20 meters (66 feet) consisting of conifers and evaluated 15 different locations but found that there was minimal noise attenuation due to the tree buffer. No matter how the sites were examined analytically, there was no measurable difference in road noise relative to tree characteristic and all the differences at the more distant measurement locations were due simply to the distance effect rather than to any additional mitigating effects of trees. Most differences in noise levels from the studied tree buffers were on the order of plus or minus 1.0 dB (Lee et al. 2007).

[8] For example, the Federal Highway Administration (FHWA) describes that, in general, plantings do not provide much sound attenuation adjacent to roadways, but they recommend buffers of up to 100 feet where proposed for noise reduction. See: http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/audible_landscape/al04.cfm.
Also the FTA Transit Noise and Vibration Impact Assessment (FTA 2006) specifies that the attenuation effect of trees should only be included where there are at least 100 feet of trees between source and receiver. See: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf.

Based on the evidence described above, the removal of trees along the Caltrain ROW should not have a substantial effect on noise levels.[9]

As shown in Table 3.11-15, there are no study locations where noise increase would exceed the FTA moderate impact or severe impact level.

Therefore, Proposed Project operations would have a less-than-significant impact along the Caltrain corridor.

As discussed in Section 4.1, *Cumulative Impacts*, due to future cumulative train service increases along the corridor, future cumulative train operational noise level increases would be greater than the project-level increases discussed in this section and are considered significant. See Section 4.1 for discussion of cumulative impacts.

Project Variant 1 (Electrification to just south of the Tamien Station) would not change train operations and thus would not change train noise. Project Variant 2 (Deferral of electrification of storage tracks at the San Francisco 4th and King Station) would result in slightly more diesel train noise at the 4th and King station due to use of diesel locomotives or diesel yard haulers to periodically move EMUs to storage tracks as necessary for maintenance or repair. However, the use of diesel trains for movement to storage tracks would be the same as under No Project conditions and thus this would not be a new impact compared to No Project conditions.

Traction Power Facilities

In addition to the noise generated by the proposed Caltrain passenger rail operations, the electrical traction power substations and facilities (ancillary facilities) would generate stationary noise. Noise sensitive receptors that may be potentially impacted by these new stationary noise sources were identified using the screening distance of 250 feet. As explained in Section 3.11.2.1, *Methods for Analysis*, FTA reference levels were used to calculate the total project noise level at the receptors identified within the screening distance.

Operational noise levels were calculated in order to predict the total Proposed Project noise levels with the ambient noise at the receptors, accounting for both changes resulting from EMU train operations (where TPFs are located near the Caltrain ROW) and the new ancillary facility stationary noise sources. The noise impact predictions for ancillary facilities are shown in Table 3.11-16. Noise impacts would depend on facility layout. This analysis is conservative because distances were calculated using the outer footprint of that facility that is the minimum distance to the nearest sensitive receptor, even though the actual distance from the noise generating sources to the sensitive receptor would be greater in many cases. Before mitigation, ~~T~~the noise analysis results indicate that the operation of the following ancillary facilities would result in an increase in ambient noise levels exceeding FTA moderate impact criteria at noise sensitive receptors ~~only~~ at the following ~~facility~~ facilities:

[9] Tree removal impacts will also be reduced with revised project design assumptions as well as the impacts of Mitigation Measure BIO-5 which will include alternative pole design/alignments where feasible and replanting of trees where unavoidable. Some of the replacement trees per Mitigation Measure BIO-5 may be placed outside the electrical safety zone between the rails and noise receptors, where feasible and where property owners allow (if on private property), which will help to offset the loss of trees at some locations.

Table 3.11-15. Noise Levels and Impacts from Train Operation

							Existing	Proposed Project Operation		FTA Impact Criteria		
Receptor Site No	City	Location	Side of Alignment	Land Use[a]	Distance to Receptor (feet)	Measurement Site ID	Total Ambient Noise Exposure at Receptor[b] L_{dn} (dBA)	Total Ambient Noise Exposure at Receptor[c] L_{dn} (dBA)	Increase (Proposed minus Existing) Noise (dBA)	Moderate (dBA)	Severe (dBA)	Exceed Criteria
1	San Francisco	Oakdale Ave and Quint Ave	W	MFR	110	N32	69	68.8	-0.2	1.1	2.9	No
2	San Francisco	Reddy St and Williams Ave	E	SFR	80	N33	70	69.7	-0.3	1.0	2.8	No
3	San Francisco	Carr St and Paul Ave	E	SFR	90	N32	70	69.7	-0.3	1.0	2.8	No
4	San Francisco	Tunnel Ave and Lathrop Ave	E	SFR	120	N31	69	68.9	-0.1	1.1	2.9	No
5	San Bruno	Herman St and Tanforan Ave	W	SFR	110	R05	76	75.4	-0.6	0.3	2.1	No
6[d]	San Bruno	Huntington Ave and San Bruno Ave	E	MFR	50	R07	77	74.6	-2.4	0.3	2.0	No
7[d]	San Bruno	Montgomery Ave and Walnut St	W	SFR	120	R07	74	72.3	-1.7	0.5	2.3	No
8[d]	San Bruno	1st Ave and Pine St	E	SFR	100	N53	74	71.6	-2.4	0.5	2.3	No
9[d]	San Bruno	Huntington Ave and Sylvan Ave	W	SFR	150	N53	72	69.5	-2.5	0.8	2.5	No
10	San Bruno	San Antonio Ave and San Benito Ave	W	SFR	170	N26	67	66.8	-0.2	1.2	3.2	No
11	Millbrae	Monterey St and Santa Paula Ave	E	MFR	160	N25	71	71.0	0.0	1.0	2.6	No
12	Millbrae	Hemlock Ave and Hillcrest Blvd.	W	SFR	90	R12	72	72.0	0.0	0.8	2.5	No
13	Burlingame	California Dr and Dufferin Ave	W	SFR	150	N50	68	67.8	-0.2	1.2	3.1	No
14	Burlingame	California Dr and Mills Ave	W	SFR	160	R14	70	70.1	0.1	1.0	2.8	No
15	Burlingame	California Dr and Palm Dr	W	SFR	190	N22	70	70.0	0.0	1.0	2.8	No
16	Burlingame	Park Ave and Carolan Ave	E	SFR	160	N22	71	71.0	0.0	1.0	2.6	No
17	San Mateo	Grand Blvd and San Mateo Blvd	W	SFR	40	R18	76	76.0	0.0	0.3	2.1	No
18	San Mateo	Railroad Ave and Monte Diablo	E	SFR	70	R18	72	71.9	-0.1	0.8	2.5	No
19	San Mateo	B St and 9th Ave	W	MFR	110	N47	73	73.1	0.1	0.6	2.4	No
20	San Mateo	South Blvd and 16th Ave	W	SFR	85	N20	67	66.5	-0.5	1.2	3.2	No
21	San Mateo	Pacific Blvd and Otay Ave	E	SFR	100	N19	72	71.9	-0.1	0.8	2.5	No
22	San Mateo	Country Rd and Dale View Ave	E	MFR	120	R22	70	69.7	-0.3	1.0	2.8	No
23	Belmont	Country Rd and Marine View	E	MFR	120	N18	73	72.9	-0.1	0.6	2.4	No
24	San Carlos	Country Rd and Springfield Ave	E	SFR	100	N17	70	70.0	0.0	1.0	2.8	No
25	Redwood City	D St and Stafford St	E	SFR	90	N16	73	73.1	0.1	0.6	2.4	No
26	Redwood City	Cedar St and Main St	E	SFR	50	N47	76	76.0	0.0	0.3	2.1	No
27	Redwood City	198 Buckingham Ave	W	MFR	110	R27	69	68.6	-0.4	1.1	2.9	No
28	San Mateo County	Arrowhead Lane and 5th Ave	E	SFR	50	N14	72	71.6	-0.4	0.8	2.5	No
29	Atherton	Lloyden Dr and Fair Oaks Lane	W	SFR	60	N13	70	69.7	-0.3	1.0	2.8	No
30	Atherton	Felton Dr and Encinal Ave	E	SFR	65	N13	70	69.7	-0.3	1.0	2.8	No

Receptor Site No	City	Location	Side of Alignment	Land Use[a]	Distance to Receptor (feet)	Measurement Site ID	Existing: Total Ambient Noise Exposure at Receptor[b] L_{dn} (dBA)	Proposed Project Operation: Total Ambient Noise Exposure at Receptor[c] L_{dn} (dBA)	Proposed Project Operation: Increase (Proposed minus Existing) Noise (dBA)	FTA Impact Criteria: Moderate (dBA)	FTA Impact Criteria: Severe (dBA)	FTA Impact Criteria: Exceed Criteria
31	Menlo Park	Burgess Dr and Alma St	E	MFR	175	N45	67	66.8	-0.2	1.2	3.2	No
32	Palo Alto	Mitchell Lane and University Ave	W	MFR	100	N44	68	67.7	-0.3	1.2	3.1	No
33	Palo Alto	Alma St and Lincoln Ave	E	SFR	120	N42	69	68.6	-0.4	1.1	2.9	No
34	Palo Alto	Residences near Peers Park	W	SFR	40	R34	72	71.5	-0.5	0.8	2.5	No
35	Palo Alto	Alma St and El Dorado Ave	E	MFR	160	N10	76	75.6	-0.4	0.3	2.1	No
36	Palo Alto	4237 Park Blvd	W	SFR	50	R36	78	78.1	0.1	0.2	1.8	No
37	Mountain View	Central Exp and Thompson Ave	E	SFR	150	N9	75	74.7	-0.3	0.4	2.2	No
38	Mountain View	Evelyn Ave and Bryant St	W	MFR	110	N8	73	72.7	-0.3	0.6	2.4	No
39	Mountain View	Central Exp and Whisman Ave	E	SFR	150	N39	72	71.9	-0.1	0.8	2.5	No
40	Mountain View	S. Bernardo Ave and Evelyn Ave	E	SFR	75	N7	68	67.4	-0.6	1.2	3.1	No
41	Sunnyvale	Asilomar Ave and Mary Ave	E	MFR	80	N7	70	69.8	-0.2	1.0	2.8	No
42	Sunnyvale	332 Angel Ave	E	SFR	80	N6	71	70.9	-0.1	1.0	2.6	No
43	Sunnyvale	Fair Oaks Ave and Evelyn Ave	W	MFR	75	N6	71	70.8	-0.2	1.0	2.6	No
44	Santa Clara	Agate St and Lawrence Exp	W	MFR	85	R44	71	71.0	0.0	1.0	2.6	No
45	Santa Clara	Agate Dr and Bowers Ave	W	SFR	110	N4	68	67.7	-0.3	1.2	3.1	No
46	Santa Clara	Alvarado Dr and San Thomas Exp	W	SFR	95	N37	68	67.6	-0.4	1.2	3.1	No
47	Santa Clara	2109 Main St	W	SFR	95	N3	68	67.6	-0.4	1.2	3.1	No
48	San Jose	782 Auzerais Ave	W	SFR	60	R48	81	81.0	0.0	0.1	1.0	No
49	San Jose	456 Jerome St	E	SFR	50	R49	71	70.1	-0.9	1.0	2.6	No

Notes:

[a] SFR: Single-Family Residence; MFR: Multi-Family Residence

[b] Existing total noise exposure is based on representative noise measurement data, as prescribed for Table 3.11-6.

[c] Proposed total noise exposure is the result of combining future Caltrain noise with existing non-railroad noise and freight train noise, as prescribed for Table 3.11-6.

[d] R6 and R7 are near San Bruno Avenue grade crossing in San Bruno. R8 and R9 are near Angus Avenue. The San Bruno Grade Separation project will eliminate the at-grade crossings at San Bruno, San Mateo and Angus Avenues and, thus, the need for routine horn soundings at this location will be less than under existing conditions. Train operators will still sound train horns when there are safety reasons for doing so, but without the at-grade crossings there will not be a need to sound at the crossings themselves, which will be an improvement over existing conditions.

Locations of the representative receptor sites are shown in Attachment C of Appendix C, Noise Study (WIA 2014).

Source: WIA 2014 ~~2013~~.

- **TPS1 Option 3**: Traction Power Supply Substation TPS1 Option 3 is located on vacant land adjacent to commercial property on West Harris Avenue in South San Francisco. The Motel 6, at 111 Mitchell Avenue, South San Francisco, is within 125 feet. The projected noise increase would be 1.2 dBA, at a distance of 70 feet, exceeding the FTA Moderate Impact threshold.
- **PS5, Option 2:** Paralleling Station PS5, Option 2 would be located within the JPB ROW adjacent to a mixed residential/commercial project that is presently in construction at 195 Page Mill Road in Palo Alto. The projected noise increase would exceed the FTA Severe Impact threshold without mitigation.

Table 3.11-16. Noise Levels and Impacts from Ancillary Facility Operation

						With Project					FTA Impact Criteria		
			Receptor Distance to Ancillary Facility	Receptor Distance to Caltrain Near Track	Existing Total Noise Exposure[d]	Freight + All Other Ambient Noise	Project Train Noise[e]	Substation Noise	Total Noise Exposure[f]	Increase	Moderate	Severe	
Facility[a]	Receptor Address[b]	Land Use[c]	feet	feet	L_{dn}, dBA						Noise Exposure Increase		Impact Type (number of impacts)[g]
PS1	211 Pennsylvania Street, San Francisco	MFR	120	255	69	69	55	62	70	0.8	1.1	2.9	--
PS2	110 Blanken Ave. / 233 Tunnel Ave., San Francisco	MFR / SFR	150	120	69	66	66	60	70	0.5	1.1	2.9	--
	2189 Bayshore Blvd., San Francisco	SFR	180	150	68	67	58	59	68	0.3	1.2	3.1	--
	100 Lathrop Avenue, San Francisco	SFR	240	120	69	66	66	56	69	0.2	1.1	2.9	--
TPS1-Opt.1	[none]	--	--	--	--	--	--	--	--	--	--	--	--
TPS1-Opt. 2	[none]	--	--	--	--	--	--	--	--	--	--	--	--
TPS1-Opt. 3	111 Mitchel Avenue, South San Francisco	Hotel	70	1400	72	72	44	67	73	1.2	0.8	2.5	MI (1)
TPS1-Opt. 4	[none]	--	--	--	--	--	--	--	--	--	--	--	--
PS3-Opt. 1 & Opt. 2[h]	1283 California Drive, Burlingame ~~San Francisco~~	SFR	120	165	73	71	66	62	73	-0.1	0.6	2.4	--
PS4-Opt. 1	[none]	--	--	--	--	--	--	--	--	--	--	--	--
PS4-Opt. 2	[none]	--	--	--	--	--	--	--	--	--	--	--	--
PS4-Opt. 3	[none]	--	--	--	--	--	--	--	--	--	--	--	--
SWS1-Opt. 1	2690 Westmoreland Ave., Redwood	SFR	180	110	69	67	62	59	68	-0.7	1.1	2.9	--

						With Project					FTA Impact Criteria		
Facility[a]	Receptor Address[b]	Land Use[c]	Receptor Distance to Ancillary Facility	Receptor Distance to Caltrain Near Track	Existing Total Noise Exposure[d]	Freight + All Other Ambient Noise	Project Train Noise[e]	Substation Noise	Total Noise Exposure[f]	Increase	Moderate	Severe	Impact Type (number of impacts)[g]
			feet	feet	L_{dn}, dBA						Noise Exposure Increase		
	City												
SWS1-Opt. 2	[none]	--	--	--	--	--	--	--	--	--	--	--	--
PS5-Opt. 2	2617 Alma Street, Palo Alto	MFR	180	160	76	75	66	59	75	-0.7	0.3	2.1	--
	195 Page Mill Road, Palo Alto	MFR /Mixed	5	62	72	68	70	77 - 85	79 - 86	6.5-13.6	0.8	2.5	SI (1)
PS5-Opt. 1	102 Greenmeadow Way, Palo Alto	SFR	100	140	74	73	67	64	74	0.4	0.5	2.3	--
	256 Monroe Dr., Palo Alto	SFR	130	100	75	74	69	62	75	0.2	0.4	2.2	--
PS5-Option 1B	Location not modelled, but results would be similar to those for 102 Greenmeadow Way for PS5, Option 1 since distance to nearest residence at PS5, Option 1B would be similar.												
PS6-Opt. 2	105 N Taaffe Street, Sunnyvale	SFR	100	80	71	68	67	64	72	0.6	1.0	2.6	--
PS6-Opt. 1	100 N Murphy Ave, Sunnyvale	SFR	70	110	75	73	68	67	75	0.1	0.4	2.2	--
TPS2-Opt. 1	[none]	--	--	--	--	--	--	--	--	--	--	--	--
TPS2-Opt. 2	[none]	--	--	--	--	--	--	--	--	--	--	--	--
TPS2-Opt. 3	[none]	--	--	--	--	--	--	--	--	--	--	--	--
PS7	[none]	--	--	--	--	--	--	--	--	--	--	--	--
PS7 Variant A	Alma Avenue, San Jose	SFR	145	75	70	70	54	61	70	0.0	1.0	2.7	--
PS7 Variant A and B	Alma Avenue, San Jose	SFR	150	115	67	66	56	60	67	0.6	1.3	3.3	--

[a] PS: Paralleling Station; TPS: Traction Power Supply Substation; SWS: Switching Station

[b] Use of [none] indicates no noise sensitive receivers within 250 feet of the facility.

[c] SFR: Single-Family Residence; MFR: Multi-Family Residence

[d] Existing Total Noise Exposure is based on representative noise measurement data as discussed in Appendix C.

[e] Project Train Noise levels shown are for year 2020 schedule.

[f] Future Total Noise Exposure is result of combining substation noise with future total noise levels (i.e., ambient + Project train noise + Freight train noise) calculated for the receptor based on methodology discussed in Appendix C.

[g] SI: Severe Impact; MI: Moderate Impact; Indicated in parentheses is the total number of similarly exposed land uses within the screening distance that are impacted. Based on FTA criteria.

[h] PS3, Option 2 would be located within 250 feet of single-family residential land uses on California Drive in Burlingame. Option 2 would be located farther from these sensitive receptors than Option 1. There would be no noise operational noise impacts from Option 1; therefore, due to the greater distance, it was concluded that there would be no noise impacts from Option 2 and operational noise levels for Option 2 were not calculated.

Source: WIA 2014 (Appendix C).

Because the operation of two ~~one~~ of ancillary facilities would cause an increase in ambient noise levels that exceed the FTA moderate or severe impact criteria, operational noise impact from ancillary facilities is considered a significant impact. With the implementation of Mitigation Measure NOI-1b, impacts related to ~~the~~ one TPF facility (TPS1, Option 3) and one PS facility (PS5, Option 2) would be reduced to a less-than-significant level.

Mitigation Measure NOI-1b: Conduct site-specific acoustical analysis of ancillary facilities based on the final mechanical equipment and site design and implement noise control treatments where required

A qualified acoustical consultant shall review final mechanical equipment and site design and calculate expected exterior noise levels at adjacent noise sensitive receptors to limit the substation noise at the TPS1, Option 3 site if selected for a substation site and at the PS5, Option 2 site if selected as a paralleling station site. If TPS1, Option 1, ~~or~~ TPS1, Option 2, or TPS1, Option 4 sites are selected instead, then this mitigation will not be required for TPS1, Option 3. If PS5, Option 1 or Option1B were selected in instead, then this mitigation will not be required for PS5, Option 2.

A moderate noise impact has been identified at TPS1 Option 3 based on the FTA methodology and reference data. If the projected noise contribution from the substation is reduced by at least 2.8 dBA the impact will be eliminated. A performance criterion which limits the substation noise to a maximum noise level of 60 dBA at 50 feet, or no more than 63 dBA L_{dn} at the closest nearby noise sensitive receptor (111 Mitchel Avenue) would be sufficient to eliminate the moderate noise impact.

A severe noise impact has been identified at PS5, Option 2 before mitigation and using FTA methodology and reference data. If the projected transformer noise level at the fenceline of the adjacent mixed use project could be reduced to 58 dBA (or 64.4 L_{dn}) the impact would be less than the FTA moderate impact level and the noise impact at this location would be less than significant.

TPS1, Option 3, and PS5, Option 2 noise levels shall comply with IEEE national standards and guidelines for electrical power facilities. Station layouts and specific noise control measures will be developed during the design phase to minimize noise impacts resulting from the TPFs. Such noise control measures may include the following:

- Locate electrical noise-generating equipment farther away from the property lines of noise sensitive sites, if at all possible.
- Consider the use of special enclosures for all transformers to mitigate the associated low frequency noise impacts.
- Reduce potential noise impacts from the ventilation system for switchgear by using acoustical louvers, line duct silencers, and hoods on the vent openings, and/or by locating vents at the side of the building that is not facing residences.
- At PS5, Option 2, compliance with the performance criteria may require relocation of the facility southward to place the transformer at least 25 feet (for an oil-filled transformer type) to 55 feet (for a dry-type transformer) from the mixed use location. The areas to the south of the mixed use project are commercial buildings set back farther from the JPB ROW than the mixed use project and would be considered non-sensitive receptors. As shown in

Figure 3.11-8, there are two potentially feasible locations south of PS5, Option 2 (referred to as PS5, Option 2B and PS5, Option 2C) that would be more than the required distances from the mixed use development and would avoid a significant noise impact.

Since one of the options for mitigation at PS5, Option 2 includes alternative locations (Options 2B and 2C), a brief analysis of potential secondary environmental effects of the alternative locations was conducted to ensure that no new significant impacts would occur with potential relocation. CEQA allows that the secondary effects of mitigation can be analyzed at a lesser level of detail than the proposed project. All applicable mitigation for the Proposed Project would apply to Option 2B or 2C if adopted as part of mitigation. What follows is a summary analysis by environmental resource area in this EIR:

- Aesthetics – Option 2B and 2C would be within the western portion of JPB ROW adjacent to commercial facilities along Park Boulevard. Overall, these options would have less effect on visual aesthetics than Option 2.
  - Option 2B would be adjacent to commercial uses at 3045 Park Boulevard which is currently used as a body shop and rental car facility, and there would be views of the paralleling station from these uses. Another commercial facility (3101 Park Boulevard) would be slightly east of Option 2B and is currently used by an internet company (Groupon) and the parking lot of this facility is visually screened from the JPB ROW by fenceline vegetation. The commercial uses are not considered to have visually sensitive receptors. Because Option 2B would be at least 90 feet away from the mixed use development it would have far less visual aesthetic effect on the residential facility than Option 2. Option 2B would have the same effect to residences on the east side of Alma Street as PS5 Option 2.
  - Option 2C would be adjacent to commercial uses at 3197 Park Boulevard which is currently used as a building contractor office and adjacent to a City of Palo Alto substation; there would be views of the paralleling station from these uses. The commercial uses are not considered to have visually sensitive receptors. Because Option 2C would be approximately 800 feet away from the mixed use development it would have no visual aesthetic effect on the residential facility. Option 2C would have the same effect to residences on the east side of Alma Street as PS5 Option 2.
- Air Quality – Options 2B and 2C would have the same construction effects as Option 2 because the same amount of construction would be required. Options 2B and 2C would not change operational emissions.
- Biological Resources – Both Options 2B and 2C would be in areas of disturbed JPB ROW. There is no vegetation at Option 2B. There is limited planted vegetation at Option 2C. Option 2C is adjacent to Matadero Creek, but the creek is a concrete flood channel at this location and thus does not contain biological habitat. Thus these options would have no additional impact on biological resources.
- Cultural Resources – There are no known cultural resources at the Option 2B or 2C locations.
- EMF/EMI – As explained in Section 3.5, the EMF levels outside the perimeter of the paralleling stations are well below health reference levels. The commercial facilities adjacent to Options 2B or 2C do not appear to be facilities (like hospitals, medical imaging facilities, or emergency communications facilities) that would have highly sensitive equipment that would be a concern for EMI. Option 2C is adjacent to a City of Palo Alto substation and the site would need to be assessed to ensure no EMI from the substation on the paralleling stations and vice versa. In

accordance with mitigation in Section 3.5, the JPB would examine adjacent areas along the electrification route for sensitive facilities and follow proper design controls as necessary to abate EMI (including the City of Palo Alto substation location, as appropriate).

- Geology, Soils, and Seismicity – Options 2B and 2C have the same general geological, soil, and seismic setting as Option 2 and thus impacts would be the same as Option 2.
- Greenhouse Gas Emissions and Climate Change - Options 2B and 2C would have the same construction effects as Option 2 because the same amount of construction would be required. Options 2B and 2C would not change operational emissions.
- Hazards and Hazardous Materials – The records search for PS5, Option 2 discloses the potential hazardous material sites within 0.25 mile which would include the area surrounding Options 2B and 2C. Thus these sites would have similar hazardous material impacts as Option 2.
- Hydrology and Water Quality – Options 2B and 2C would have the same construction and operational effects as Option 2 as they would require the same amount of construction and would have the same amount of impervious space. Like Option 2 neither Option 2B or 2C are in the 100-year flood plain, but both would have potential for flooding due to dam failure.
- Land Use and Recreation – As noted above, Options 2B and 2C would be adjacent to existing commercial and/or utility uses which would be more compatible with adjacent land uses compared with Option 2 which would be adjacent to a mixed residential/commercial development. Option 2C would be adjacent to the City of Palo Alto substation but well away from related transmission wires connected to the substation.
- Noise and Vibration – As noted above, Options 2B and 2C would have lower noise impacts than Option 2 because they would be adjacent to commercial uses instead of residential uses. Provided the sites are at least 25 to 55 feet (depending on transformer type) from the mixed use development, noise impacts would be less than significant and no site design mitigation would be necessary.
- Population and Housing – Like Option 2, Options 2B and 2C would have no significant effects on population or housing.
- Public Services and Utilities – Similar to Option 2, at or near Options 2B and 2C, there are aerial fiber-optic cables, underground fiber-optic cables, distribution power aerial, and City storm water system facility. Mitigation for utilities in Section 3.13 would apply to these facilities like it would apply to Option 2.
- Transportation and Traffic – Options 2B and 2C would not change operational traffic effects of the project. For construction, access to Options 2B and 2C would be from Page Mill Road like the access to Option 2 unless access is negotiated with the adjacent commercial property owners.
- Cumulative Impacts – Since the impacts for Options 2B and 2C would be the same or less than Option 2, there would be no change to the cumulative impact contributions of the Proposed Project.

Based on the analysis above, if the adopted mitigation for noise impacts at PS5, Option 2 were to be relocation of the facility to Option 2B or 2C, no new significant impacts or substantially more severe impacts would occur compared with those disclosed for Proposed Project paralleling stations. No impacts would be worse than at the Option 2 location.

Source: Imagery, ESRI 2013

Note: This is a new figure for the Final EIR

Figure 3.11-8
Proposed Paralleling Station (PS) 5, Option 2 and Potential Mitigation Options 2b and 2c
Peninsula Corridor Electrification Project

Impact NOI-2a	Expose sensitive receptors to substantial increase in ground-borne vibration levels during construction.
Level of Impact	Significant
Mitigation Measure	NOI-2a: Implement Construction Vibration Control Plan
Level of Impact after Mitigation	Less than significant

Two types of construction vibration impact were analyzed: 1) Human annoyance and 2) building damage. Human annoyance occurs when construction vibration rises significantly above the threshold of human perception for extended periods of time. Building damage can be cosmetic or structural. Ordinary buildings that are not particularly fragile would not experience any cosmetic damage (e.g., plaster cracks) at distances beyond 30 feet. This distance can vary substantially depending on the soil composition and underground geological layer between vibration source and receiver. In addition, not all buildings respond similarly to vibration generated by construction equipment. The potential for vibration annoyance and building damage was analyzed for major vibration-producing construction equipment that would be used for the Proposed Project.

To assess vibration impacts, calculations were performed to determine the distances at which vibration impacts would occur according to the criteria discussed in Section 3.11.2.2, *Thresholds of Significance*, and the FTA procedures. The distances shown in Table 3.11-17 are the maximum distances at which short-term construction vibration impacts may occur. As shown in Table 3.11-6, some sensitive receptors are located as close as 35 feet from the near track and could be exposed to elevated vibration levels from various construction activities within the existing Caltrain ROW. Damage to wood framed buildings (those most susceptible to vibration damage) could occur if construction equipment were to operate within the distances shown in Table 3.11-17.

It is expected that ground-borne vibration from construction activities would cause only intermittent localized disturbance along the rail corridor. Although processes such as earth moving with bulldozers or the use of vibratory compaction rollers can create annoying vibration, there should be only isolated cases where it is necessary to use this type of equipment in close proximity to residential buildings.

Table 3.11-17. Construction Equipment Vibration Impact Distances

Equipment	Distance to Vibration Annoyance[a] in feet	Distance to Vibration Potential Building Damage[b] in feet
Large bulldozer	45	<10
Loaded trucks	40	<10
Small bulldozer	--	<10
Auger/drill rigs	45	<10
Vibratory hammer	130	25
Vibratory compactor/roller	85	15

[a] This is the distance at which the RMS amplitude velocity level is 80 VdB or less at the inside of the building structure (see Section 3.11.2.2). When propagating from the ground surface to the building structure foundation, there is a vibratory coupling loss of approximately 5 dB; however, this loss is offset by the building amplification in light-frame construction. Thus, no additional adjustments are applied.

[b] This is the distance at which the peak particle velocity is 0.50 inch/sec or less.

Source: Parsons 2008.

Given that the closest structures are less than 25 feet from the Caltrain ROW, it is possible that construction activities involving vibratory hammer or vibratory compactor/roller operations occurring at the edge of or slightly outside of the current ROW could result in vibration damage. If vibratory pile piling is conducted less than 25 feet from buildings or vibratory rolling/compacting conducted less than 15 feet from buildings, then damage from construction vibration may occur which would be a significant impact. Other sources of construction vibration are not expected to generate high enough vibration levels for damage to occur. A particular area of concern would be pile driving near historic station structures along the Caltrain ROW. With implementation of Mitigation Measure NOI-2a, vibration impacts would be avoided or minimized; if building damage occurs due to construction then repairs would be made or compensation provided. With implementation of Mitigation Measure NOI-2a, impacts resulting from construction vibration structural damage would be less than significant.

Residents and other sensitive receptors are also located within the annoyance distances in Table 3.11-17 and, thus, could be significantly annoyed due to construction vibration. The effect would be more acute with equipment with high vibration potential, such as vibratory hammers or vibratory compactor/rollers. With implementation of Mitigation Measure NOI-2a, impacts resulting from construction vibration annoyance would be less than significant.

Project Variant 1 (Electrification to just south of the Tamien Station) would have less OCS construction than the Proposed Project. PS7 would be relocated from near Kurte Park to adjacent to Alma Avenue, but construction vibration impacts at this location would not be substantially different than overall construction impacts disclosed for the Proposed Project. Mitigation Measure NOI-2a would apply to vibration impacts associated with the PS7 Variant location. Project Variant 2 (Deferral of electrification of storage tracks at the San Francisco 4th and King Station) would result in less construction than the Proposed Project.

Mitigation Measure NOI-2a: Implement Construction Vibration Control Plan

A Construction Vibration Control Plan that includes, at a minimum, the following procedures to minimize the potential for building damage from construction vibration shall be prepared:

- Where feasible, avoid placing OCS poles within 25 feet of structures or use alternative construction methods for pile driving (such as augurs) to minimize potential vibration damage.
- Where vibratory compacting/rolling is proposed within 15 feet of structures, utilize alternative equipment (such as non-vibratory rollers) to minimize potential vibration damage.
- Where pile driving is proposed within 50 feet of structures or vibratory compacting/rolling within 25 feet, preconstruction surveys shall be conducted to document the existing condition of buildings in case damage is reported during or after construction.
- Damaged buildings due to project construction shall be repaired or compensation paid.

The Construction Vibration Control Plan shall also include, at a minimum, the following procedures to minimize the potential for annoyance from construction vibration:

- When possible, limit the use of construction equipment that creates high vibration levels near residential structures.
- Require vibration monitoring during vibration-intensive activities.

- Where feasible, plan the hours of vibration-intensive equipment, such as vibratory pile drivers or vibratory rollers, so that impacts on residents are minimal (e.g., weekdays during daytime hours only, when as many residents as possible are away from home).

The JPB and/or the Design-Build contractor will coordinate with Caltrans during development of the construction vibration plan concerning construction vibration that may occur near Caltrans facilities.

Impact NOI-2b	Expose sensitive receptors to substantial increase in ground-borne vibration levels from Proposed Project operation
Level of Impact	Less than significant

As presented in Table 3.11-4, existing vibration levels for Caltrain's diesel service at 50 feet from the outermost track vary from 72 to 80 VdB, depending on local site conditions and speed. As presented in Table 3.11-5, existing vibration levels for freight at 100 feet from the outermost track vary from 73 to 81 VdB. These existing levels exceed FTA annoyance thresholds of 72 VdB for immediately adjacent residences and of 75 VdB for immediately adjacent institutional buildings, but these levels do not approach structural damage thresholds.

As discussed above, the impact criteria for vibration are an increase of existing vibration levels by at least 3 VdB or a doubling of existing train vibration events.

To assess the potential for vibration impact of the Proposed Project, factors that would have the potential to increase vibration levels were reviewed. Factors that would potentially cause changes to the wayside vibration levels include vehicle vibration characteristics, train speed, distance between receptor and track centerline, and track structure type. The factors above would remain the same as existing conditions with the one exception that the EMU vehicles may have different vibration characteristics than the existing locomotive powered trains. Therefore, for any given receptor, all factors would remain the same with the exception of the EMU vehicle.

Using FTA vibration reference levels (FTA 2006) for rapid transit trains (which FTA guidance recommends for electric commuter trains), vibration levels with Caltrain EMUs could be 73 Vdb at 50 feet from the outermost track at 50 mph. Adjusting to the 79 mph speed, the vibration levels for the new Caltrain EMUs could be 77 VdB. This level is within the range of existing vibration levels along the Caltrain corridor noted above.

Although the exact unsprung weight of the EMU vehicles isn't known at this time, it would not be significantly greater than the weight of the existing Caltrain vehicles. Therefore, the EMU vehicles would not result in greater vibration levels than the existing train consists. Furthermore, because there would be no diesel locomotives associated with EMU trains, vibration caused by existing locomotives would be reduced.

The Proposed Project would add 22 trains per day to the San Francisco to San Jose Diridon segment and 8 trains per day to the San Jose Diridon to Tamien segment, which would not result in a doubling of existing train vibration events.

New traction power facilities would not generate significant vibrations.

Thus, operational vibration impacts would be less than significant.

Project Variant 1 (Electrification to just south of the Tamien Station) would not change train operations and thus would not change train vibration. Project Variant 2 (Deferral of electrification of storage tracks at the San Francisco 4th and King Station) would result in slightly more diesel train vibration at the 4th and King station due to use of diesel locomotives or diesel yard haulers to periodically move EMUs to storage tracks as necessary for maintenance or repair. However, the use of diesel trains for movement to storage tracks would be the same as under No Project conditions and thus this would not be a new impact compared to No Project conditions.

3.12 Population and Housing

3.12.1 Existing Conditions

3.12.1.1 Regulatory Setting

This section summarizes regulations that apply to population and housing.

Federal

There are no federal regulations related to population and housing.

State

Under CEQA, a project's likelihood to induce growth beyond planned levels must be taken into consideration. There are no other state regulations related to population and housing.

Local

The two traction power substations (TPS) included in the Proposed Project would be located outside of the Caltrain right-of-way (ROW) in South San Francisco <u>(except for TPS1, Option 4 and TPS 2, Option 3, both which are located within the Caltrain ROW)</u> and San Jose; all other traction power facilities would be located in the Caltrain ROW. There may some land acquisition for several overhead contact system (OCS) pole locations or alignments, and electrical safety easements will need to be acquired in various areas along the ROW that are occupied by residential, commercial, and industrial development. However, the Proposed Project would not displace any housing and would not directly or indirectly induce population or housing growth. Therefore, there are no relevant local policies that would apply to the Proposed Project. Land use impacts are discussed separately in Section 3.10, *Land Use and Recreation*.

3.12.1.2 Environmental Setting

For purposes of this population and housing analysis, the project area is defined as the three counties that contain the Proposed Project: San Francisco County, San Mateo County, and Santa Clara County. The Proposed Project would be located mostly within the Caltrain ROW. Commercial, industrial, open space, and residential land uses are directly adjacent to the project alignment. Land uses adjacent to the proposed traction power facilities are primarily industrial.

Population

Table 3.12-1 presents existing (2010) and projected future (2040) population numbers. Santa Clara County is expected the experience a 35 percent increase in population from 2010 to 2040. San Francisco County and San Mateo County are projected to experience 34 percent and 25 percent increases in population by 2040, respectively.

1 **Table 3.12-1. 2010–2040 Population, Housing and Employment Growth in the Counties of the Caltrain Corridor**

	Total Population				Occupied Housing Units				Employment (Total Jobs)			
Area	2010	2040	Absolute Change	% Diff	2010	2040	Absolute Change	% Diff.	2010	2040	Absolute Change	% Diff.
San Francisco County	805,235	1,076,305	271,070	34	345,811	447,248	101,437	29	568,730	760,230	191,500	34
San Mateo County	718,451	899,169	180,718	25	257,837	316,868	59,031	23	346,320	462,870	116,550	34
Santa Clara County	1,781,642	2,411,704	630,062	35	604,204	819,607	215,403	36	906,270	1,263,834	357,564	40

Sources: Metropolitan Transportation Commission and the Association of Bay Area Governments *2010*; Appendix I (for 2040 estimates)

2

Housing

Table 3.12-1 provides existing (2010) and projected future (2040) housing unit numbers. Consistent with the expectations for population growth, the greatest increase in occupied housing units is expected to occur in Santa Clara County (approximately 36 percent). Santa Clara County possesses the largest amount of available space for housing development of the three counties where the Proposed Project would be located. San Francisco County and San Mateo County are projected to experience approximately 29 percent and 23 percent increases in occupied housing units by 2040, respectively.

Employment

Table 3.12-1 provides existing (2010) and projected future (2040) employment numbers. The greatest increase in employment between 2010 and 2040 is also anticipated to occur in Santa Clara County, with an approximate increase of 40 percent in total jobs. San Francisco County and San Mateo County are both projected to experience an approximately 34 percent increase in total jobs by 2040.

3.12.2 Impact Analysis

3.12.2.1 Methods for Analysis

Demographic characteristics of the Caltrain corridor were derived from the 2010 U.S. Census (Metropolitan Transportation Commission and the Association of Bay Area Governments 2010) and the *ABAG Projections 2013: Forecasts for the San Francisco Bay Area to the Year 2040*.

3.12.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the Proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure).
- Displace a substantial number of existing housing units, necessitating the construction of replacement housing elsewhere.
- Displace a substantial number of people, necessitating the construction of replacement housing elsewhere.

3.12.2.3 Impacts and Mitigation Measures

None of the Project Variants described in Chapter 2, *Project Description*, would result in any changes to the impact analyses presented below because they would not change population or housing conditions.

Impact POP-1	Induce substantial population growth, either directly or indirectly
Level of Impact	Less than Significant

Construction

Proposed Project improvements would be constructed primarily within the existing, active commuter and freight rail corridor. The Proposed Project would temporarily increase employment along the San Francisco Peninsula during the 4 years of construction. Construction would likely draw on both local and non-local labor. Given the widespread population base in the Bay Area and access via transit and roadways, this temporary employment increase is not expected to result in a substantial amount of population growth.

Operation

Electrified service would not be extended into new or presently underserved areas.

As described in Section 3.12.1.2, *Environmental Setting*, population, housing, and employment growth is expected in San Francisco, San Mateo, and Santa Clara Counties through 2040. Although the Caltrain corridor experiences various growth pressures, the proposed improvements would have limited to no effect on regional growth and growth is anticipated with or without the Proposed Project. The Proposed Project would increase service and ridership on the Caltrain system. However, this increased service would not materially increase the overall growth pressure in the communities served by Caltrain because Caltrain presently serves only developed areas and the Proposed Project would not provide new access to undeveloped areas.

The project area is fully urbanized; hence, while the improvements in service are expected to increase Caltrain ridership, these improvements are not expected to produce significant changes in population or housing distribution. By reducing train operating noise and improving air quality, electrification would improve the environment for development, including more intensive housing development, around Caltrain stations; see Section 3.10, *Land Use and Recreation*, for a discussion of development opportunities near Caltrain stations.

The Proposed Project would not induce substantial population growth either directly or indirectly; therefore, the impact would be less than significant.

Impact POP-2	Displace a substantial number of existing housing units, necessitating the construction of replacement housing elsewhere
Level of Impact	No Impact

Construction and Operation

Construction of the Proposed Project would occur mostly within the existing Caltrain ROW. Approximately 1 acre of additional ROW would be required for the two proposed traction power substations—one in South San Francisco and one in San Jose. Any ROW acquired would be in areas with transportation, commercial/office, or industrial zoning or uses, and ROW acquisition would not require displacement of residents. ROW acquired for any OCS poles or OCS alignments is expected to be limited and would not result in any residential displacements. The electrical safety zone would be acquired in some residential areas but is not expected to require displacement of any residences. Some properties may have a slight reduction in the buildable footprint when the electrical safety zone extends onto residential property; however, given that the structural buffer zone would extend only 6 feet from the OCS alignment (the OCS alignment would in nearly all instances be on the Caltrain ROW), the amount of land where residential uses could not be constructed is expected to be limited to none. In most cases, residences do not build to the absolute property line.

The Proposed Project would not displace any existing housing units, necessitating the construction of replacement housing elsewhere; therefore no impacts are expected to result and no mitigation is required. Section 3.10, *Land Use and Recreation*, discusses the effects of the Proposed Project on neighborhoods and communities.

Impact POP-3	Displace a substantial number of people, necessitating the construction of replacement housing elsewhere
Level of Impact	No Impact

Construction and Operation

As discussed under Impact POP-2, no persons would be displaced; therefore, the Proposed Project would not necessitate the construction of replacement housing elsewhere. There would be no impact.

3.13 Public Services and Utilities

This section describes the environmental and regulatory setting for public services (schools, fire protection and emergency medical services, police protection, and libraries) and utilities (water, wastewater, storm drainage, solid waste, and electricity). It also describes impacts on public services and utilities that would result from implementation of the Proposed Project, and mitigation measures for significant impacts where feasible and appropriate.

3.13.1 Existing Conditions

3.13.1.1 Regulatory Setting

This section summarizes the state and local regulations relevant to public services and utilities as applicable to the Proposed Project. There are no pertinent federal regulations.

State

California Public Utilities Commission

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all transit agencies in California. The CPUC's Rail Transit Safety Section (RTSS) focuses on verification of the system safety and security plans of each rail transit agency to ensure these plans meet all state and federal rules and regulations.

Rules established by the CPUC are called General Orders (GOs). The following GOs are related to rail transit safety and security (California Public Utilities Commission 2007).

- **GO 26-D:** Clearances on Railroads and Street Railroads as to Side and Overhead Structures, Parallel Tracks and Crossings. This order is relevant to providing physical clearances around railroad tracks and operations.
- **GO 95:** Overhead Electric Line Construction. This order is relevant to providing electrical clearances around overhead lines. However, this order does not provide any specific guidance for 25 kVA systems proposed for use for the Proposed Project.
- **GO 118-A:** Construction, Reconstruction and Maintenance of Walkways, and Control of Vegetation adjacent to Railroad Tracks. This order is relevant to providing safe access and vegetation control but does not discuss electrical safety.
- **GO 164-D:** Rules and Regulations Governing State Safety Oversight of Rail Fixed Guideway Systems. This order is relevant to providing system safety oversight.

The CPUC initiated new rule-making (13-03-009) in 2013 pursuant to Petition 12-10-011 concerning a new GO governing safety standards for the use of 25 kVA electrical lines to power high speed trains. The rules are intended to establish uniform safety requirements governing the design, construction, operation, and maintenance of 25 kVA overhead contact systems (OCSs), which are to be constructed for the operation of high-speed trains in California. CPUC meetings on the draft GO has resulted in discussions about the GO being specific to a fully grade-separated dedicated high-speed rail system. The draft GO addresses performance requirements, clearances and protection against electric shock, grounding and bonding, strength requirements, safe working practices, and reporting requirements. Because the OCS to be constructed for the Proposed Project would be used in the future by both Caltrain and high-speed rail, some of the issues addressed in the draft GO may apply to the Proposed Project's OCS. It also appears additional CPUC rule-making proceedings will be needed for the Proposed Project because it would not be a fully grade-separated shared system. As the draft GO proceeds through rule-making, JPB will coordinate with CPUC concerning the applicability of the GO to the Proposed Project and will apply any requirements in the adopted order (as well as additional requirements to be determined) during the final design of the Proposed Project.

Local

As described in Section 2.5, *Required Permits and Approvals*, pursuant to SamTrans' enabling legislation (Public Utilities Code Section 103200 et seq.) and the 1991 Interstate Commerce Commission's approval of the JPB acquisition of the Caltrain line, JPB activities within the Caltrain ROW are exempt from local building and zoning codes and other land use ordinances.

The local policies described below provide a context for the analysis of potential impacts on public services and utilities serving areas adjacent to the Caltrain ROW.

City and County of San Francisco

No relevant public services and utilities policies applicable to the Proposed Project were identified in the Community Facilities Element. The following other local requirements are relevant to solid waste.

Ordinance No. 27-06

The City adopted an ordinance (No. 27-06) effective on July 1, 2006, that creates a mandatory program to maximize the recycling of mixed construction and demolition (C&D) debris. The Ordinance requires that mixed C&D debris must be transported off-site by a Registered Transporter and taken to a Registered Facility that can process and divert from landfill a minimum of 65 percent of the material generated from construction, demolition or remodeling projects. The SFGBO would require a 75 percent diversion of C&D material for some projects.

Mandatory Recycling and Composting Ordinance

Adopted in 2009, this ordinance amended the San Francisco Environment Code by adding Chapter 19, entitled "Mandatory Recycling and Composting Ordinance" and amending the San Francisco Public Works Code and the San Francisco Health Code. The purpose of the ordinance is to: 1) require all persons located in San Francisco to separate recyclables, compostables and landfilled trash and participate in recycling and composting programs; 2) provide enforcement mechanisms and penalties for violations; 3) ensure that all properties subscribe to refuse collection service; and 4) authorize a Department of Public Health inspection fee of $167 per hour.

Zero Waste Goal

The City has adopted goals of 75 percent landfill diversion by 2010 and zero waste by 2020.20 Currently, San Francisco recovers 72 percent of the materials it discards. The City is well on its way to meeting its diversion goals. Ultimately, the City will need to look beyond recycling and composting to get to zero waste, including passing legislation to increase producer and consumer responsibility.

County of San Mateo

The *San Mateo County General Plan* includes the following relevant policies:

Solid Waste Policy 13.1 Management of Solid Waste Disposal: Provide management of solid waste in the most efficient and economical manner which will provide adequate services, protect the public health, prevent the creation of nuisances, reduce waste generation and provide for maximum resource recovery.

Solid Waste Policy 13.22: Efforts by the Private Sector: Encourage resource recovery efforts by the private sector including: (1) separation of materials at the source and at transfer facilities; (2) methane recovery at landfills; and (3) energy recovery through waste conversion

City of Brisbane

The following policy within the Community Health and Safety element of the *City of Brisbane 1994 General Plan* is relevant to the Proposed Project.

Policy 161: Continue to ensure a 3 minute emergency response average and a 10 minute average response to other calls for service.

City of South San Francisco

The *South San Francisco General Plan* contains the following relevant policies:

Policy 8.3-G-1: Reduce the generation of solid waste, including hazardous waste, and recycle those materials that are used, to slow the filling of local and regional landfills, in accord with the California Integrated Waste Management Act of 1989.

Policy 8.3-G-2: Minimize the risk to life and property from the generation, storage, and transportation of hazardous materials and waste in South San Francisco. Comply with all applicable regulations and provisions for the storage, use and handling of hazardous substances as established by federal (EPA), State (DTSC, RWQCB, Cal OSHA, Cal EPA), and local (County of San Mateo, City of South San Francisco) regulations

City of San Bruno

The following policies within the Public Facilities and Services element of the *San Bruno General Plan* are relevant to the Proposed Project.

Policy PFS-E: Ensure that the City's solid waste collection agency provides clean and convenient garbage and recycling service.

Policy PFS-F: Provide adequate public safety services for all San Bruno properties—including police protection, fire suppression, emergency medical care and emergency management.

City of Millbrae

The following policy from the Safety element of the *City of Millbrae General Plan* is relevant to the Proposed Project.

Policy S2.4: Adequate police and fire services. The City shall continue to maintain police and fire departments adequate manpower, equipment and resources to respond to any fire or other localized emergency within the City. Use of supplemental volunteers should be considered.

City of Burlingame

A review of the *City of Burlingame General Plan* did not identify any relevant policies concerning public services and utilities that are applicable to the Proposed Project.

City of San Mateo

The Land Use Element of the General Plan contains the following goals and policies related to utilities:

Goal 1e: Provide adequate transportation, utilities, cultural, educational, recreational, and public facilities, and ensure their availability to all members of the community. Establish San Mateo as the cultural center of San Mateo County.

Goal 4a: Facilities. Seek to provide a safe and predictable supply of water, and provide storm drainage, sewer and flood control facilities adequate to serve existing needs, the projected population and employment growth and to reduce the associated life safety and health risks to acceptable levels.

Goal 4b: Public Facilities. Support the provision and maintenance of adequate sites and public facilities owned and/or operated by the City or other government agencies to meet existing needs and the projected 2030 population and employment including, schools, post office facilities, recreation facilities, libraries, art centers, museums, and offices. Encourage joint use and public-private partnerships where feasible.

Policy LU 4.31: Solid Waste Disposal. Continue to support programs to reduce solid waste materials in landfill areas in accordance with State requirements.

The *San Mateo General Plan*, Safety Element contains the following relevant policy:

Policy S 4.2: Evacuation Routes. Maintain adequate evacuation routes as identified by arterial streets shown in the Circulation Element, Figure C-1.

City of Belmont

A review of the City of San Belmont's General Plan did not identify any relevant policies concerning public services and utilities that are applicable to the Proposed Project.

City of San Carlos

The following goal and policies within the Community Safety and Services element of the *San Carlos 2030 General Plan* are relevant to the Proposed Project.

Goal CSS-7: Ensure adequate public services and high quality design of public facilities to make San Carlos a safe, enjoyable and quality community in which to live, work and shop.

Policy CSS-7.4: Establish and regularly monitor levels of service of San Carlos' public facilities and services.

Policy CSS-7.12: Support the dedication and preservation of rights-of-way for future transit service along the rail corridor.

City of Redwood City

The following goal and policies within the Public Safety element of the *Redwood City General Plan* are relevant to the Proposed Project.

Goal PS-11: Provide a high level of public safety services.

Policy PS-11.1: Work with the Police Department to determine and meet community needs for law enforcement services.

Policy PS-11.2: Work with the Fire Department to determine and meet community needs for fire protection and related emergency services.

Town of Atherton

The following policy within the Safety element of the *Town of Atherton General Plan* is relevant to the Proposed Project.

Policy 6.330: Minimum road widths and clearances around structures shall be in accordance with generally recognized minimums consistent with fire protection.

City of Menlo Park

The following policies within the Safety element of the *City of Menlo Park General Plan* is relevant to the Proposed Project.

Policy S1.9: Community safety services and facilities. In coordination with other agencies, maintain adequate and cost-effective levels of safety services, facilities and programs to address safety concerns in Menlo Park.

Policy S1.29: Fire equipment and personnel access. Require adequate access and clearance, to the maximum extent practical, for fire equipment, fire suppression personnel and evacuation for high occupancy structures in coordination with the Menlo Park Fire Protection District.

Policy S1.38: Emergency vehicle access. Require that all private roads be designed to allow access for emergency vehicles as a prerequisite to the granting of permits and approvals for construction.

City of Palo Alto

Revised in 2007, the City of Palo Alto Comprehensive Plan Natural Environment Element contains policies related to utilities and service systems. Relevant policies are as follows.

Policy N-23: Reduce the discharge of toxic materials into the City's sanitary sewer collection system by promoting the use of Best Management Practices.

Policy N-24: Improve storm drainage performance by constructing new system improvements where necessary and replacing undersized or otherwise inadequate lines with larger lines or parallel lines.

Policy N-34: Reduce the amount of solid waste disposed in the City's landfill by reducing the amount of waste generated and promoting the cost-effective reuse of materials that would otherwise be placed in a landfill.

Policy N-35: Reduce solid waste generation through salvage and reuse of building materials, including architecturally and historically significant materials.

Policy N-37: Ensure the environmentally sound disposal of solid waste.

City of Mountain View

The following goal and policies within the Infrastructure and Conservation element of the *Mountain View 2030 General Plan 2030* are relevant to the Proposed Project.

Goal INC-1: Citywide infrastructure to support existing development and future growth.

Policy INC 1.6: Utility service. Coordinate with all utility providers to ensure safe and adequate utility services.

City of Sunnyvale

The following goal within the Safety and Noise element of the *City of Sunnyvale General Plan* is relevant to the Proposed Project.

Goal SN-3: Safe and secure City. Ensure a safe and secure environment for people and property in the community by providing effective public safety response and prevention and education services.

The following goals and policies from the Environmental Management element of the *City of Sunnyvale General Plan* are relevant to the Proposed Project.

Goal EM-1: Adequate water supplies. Acquire and manage water supplies so that existing and future reasonable demands for water, as projected in the 20-year forecast, are reliably met.

Goal EM-6: Effective wastewater collection system. Continue to operate and maintain the wastewater collection system so that all sewage and industrial wastes generated within the City are collected and conveyed under safe and sanitary conditions to the water pollution control plant.

Policy EM 8.3: Ensure that storm water measures and best management practices (BMPs) are implemented to reduce discharge of pollutants in storm water to the maximum extent practicable.

City of Santa Clara

The following policies within the Land Use element of the *City of Santa Clara 2010–2035 General Plan* are relevant to the Proposed Project.

Policy 5.3.1-P17: Promote economic vitality by maintaining the City's level of service for public facilities and infrastructure, including affordable utilities and high quality telecommunications

Policy 5.3.1-P27: Encourage screening of above-ground utility equipment to minimize visual impacts.

City of San Jose

The following policy within the Thriving Community element of the *Envision San Jose 2040 General Plan* is relevant to the Proposed Project.

Policy FS-5.6: When reviewing major land use or policy changes, consider the availability of police and fire protection, parks and recreation and library services to the affected area as well as potential impacts of the project on existing service levels.

The following policy within the Environmental Leadership element of the *Envision San Jose 2040 General Plan* is relevant to the Proposed Project.

Policy MS-7.2: Collaborate with providers of solid waste collection, recycling, and disposal services to ensure a level of service that promotes a clean environment.

State and Local Regulations and Ordinances Regarding Construction and Demolition Debris

In addition to the above listed goals and policies, in order to comply with Assembly Bill (AB) 939 and Senate Bill (SB) 1016, most of the cities and towns that intersect with the Caltrain corridor have developed local ordinances regulating construction and demolition debris. These ordinances require construction and/or demolition projects to divert 50–100 percent of construction debris from entering the waste stream.

3.13.1.2 Environmental Setting

Public Services

Public services located in the Caltrain corridor include police, fire, medical, educational, and other public facilities like libraries.

Public Facilities Adjacent to the Caltrain ROW

Only those public facilities that abut or are adjacent to the Caltrain right-of-way (ROW) or proposed traction power facilities (TPFs) are included in this impacts analysis. Therefore, only the public facilities within 0.25 mile of the Caltrain corridor are included in the table and discussion. These are summarized in Table 3.13-1. Recreational facilities are discussed separately in Section 3.10, *Land Use and Recreation*.

Table 3.13-1. Public Facilities within 0.25 Mile of the Caltrain Corridor

City	Facility Name	Address
San Francisco	Bayview Branch Library	5075 3rd Street
	Daniel Webster Elementary School	465 Missouri Street
	Charles R. Drew Elementary	50 Pomona Street
	San Francisco Fire Station 44	1298 Girard Street
	Kipp Bayview Academy	1060 Key Avenue
	San Francisco Fire Station 8	36 Bluxome Street
	San Francisco Police Department – Bayview Station	201 Williams Avenue

City	Facility Name	Address
	San Francisco Public Defender	555 7th Street
	UCSF Medical Center at Mission Hill (Opening 2/1/15)	600 16th Street
	U.S. Post Office	68 Leland Avenue
	U.S. Post Office	2111 Lane Street
	U.S. Post Office	460 Brannan Street
	Visitacion Valley Branch Library	201 Leland Avenue
Brisbane	Brisbane City Hall	50 Park Place
	Brisbane Fire Department	3445 Bayshore Boulevard
	Brisbane Police Department	50 Park Place
South San Francisco	State Lottery	820 Dubuque Avenue
	U.S. Post Office	1070 San Mateo Avenue
	U.S. Post Office	322 Linden Avenue
	U.S. Post Office	844 Dubuque Avenue
San Bruno	Belle Air Elementary School	450 3rd Avenue
	Lomita Park Elementary School	200 St. Helena Avenue
	San Bruno Police Station	1177 Huntington Avenue
Millbrae	Millbrae City Fire Department	511 Magnolia Avenue
	U.S. Post Office	501 Broadway
Burlingame	Burlingame City Hall	501 Primrose Road
	Burlingame Fire Station 34	799 California Drive
	Burlingame High School	1 Mangini Way
	Burlingame Police Department	1111 Trousdale Drive
	Burlingame Public Library	480 Primrose Road
	Central County Fire Department	1399 Rollins Road
	U.S. Post Office	220 Park Road
	Washington Elementary School	801 Howard Avenue
San Mateo	Women Infants & Children (WIC) Food Program	32 W 25th Avenue, Suite 203a
	County Fairgrounds	2495 South Delaware Street
	San Mateo Fire Station 21	120 S. Ellsworth Avenue
	San Mateo Fire Station 23	31 27th Avenue
	San Mateo Police Department	2000 S Delaware Street
	San Mateo Union High School	506 N Delaware Street
	Sunnybrae Elementary School	1031 S Delaware Street
	U.S. Post Office	1630 S Delaware Street
	U.S. Post Office	210 S Ellsworth Avenue

City	Facility Name	Address
Belmont	Belmont City Hall	1 Twin Pines Lane
	Belmont Fire Station 14	911 Granada Street
	Belmont Police Department	1 Twin Pines Lane
	Central Elementary School	525 Middle Road
	Mae Nesbit Elementary School	500 Biddulph Way
	U.S. Post Office	640 Masonic Way
San Carlos	Proposed South Community School	1390 El Camino Real
	San Carlos City Hall	600 Elm Street
	San Carlos Fire Department	1250 San Carlos Avenue
	San Carlos Fire Department	525 Laurel Street
	U.S. Post Office	809 Laurel Street
Redwood City	Fair Oaks Branch Library	2510 Middlefield Road
	Orion Elementary School	815 Allerton Street
	Redwood City City Hall	1017 Middlefield Road
	Redwood City Library	1044 Middlefield Road
	Redwood High School	1968 Old County Road
	San Mateo County Courthouse	400 County Center
	San Mateo County Courthouse/Health Department	800 N Humboldt Street
	San Mateo County Law Library	710 Hamilton Street
	U.S. Post Office	855 Jefferson Avenue
North Fair Oaks (San Mateo county	Fair Oaks Community Center	2600 Middlefield Road
	Garfield Charter Elementary School	3600 Middlefield Road
Atherton	Atherton Library	2 Dinkelspiel Station Lane
	Atherton Police Department	83 Ashfield Road
	Atherton Town Hall	3 Ashfield Road
	US Post Office	91 Ashfield Road
Menlo Park	Menlo Park Fire Protection District Station 6	700 Oak Grove Avenue
	Menlo Park City Hall	701 Laurel Street
	Menlo Park Library	800 Alma Street
	Menlo Park Police Department	701 Laurel Street
	U.S. Post Office	655 Oak Grove Avenue
Palo Alto	Santa Clara County Courthouse and Jail	270 Grant Avenue
	El Carmelo Elementary School	3024 Bryant Street
	Heffalump Preschool	3990 Ventura Court
	Palo Alto Downtown Library	270 Forest Avenue
	Palo Alto Fire Department & Fire Station 1	250 Hamilton Avenue
	Palo Alto High School	50 Embarcadero Road
	Palo Alto Police Department	275 Hamilton Avenue
	U.S. Post Office	265 Cambridge Avenue
Mountain View	Edith Landels Elementary School	115 W Dana Street

City	Facility Name	Address
	Mountain View Fire/Policy Department	1000 Villa Street
	Mountain View Teen Center	298 Escuela Avenue
	Mountain View Senior Center Community Garden	Escuela Avenue (between Crisanto Avenue and Villa Street)
	Slater School	325 Gladys Avenue
	U.S. Post Office	211 Hope Street
Sunnyvale	U.S. Post Office	155 S Taaffe Street
	Vargas Elementary School	1054 Carson Drive
Santa Clara	Adrian Wilcox High School	3250 Monroe Street
	Bracher Elementary School	2700 Chromite Drive
	Institute For Business & Tech	2400 Walsh Avenue
	Santa Clara Fire Department	777 Benton Street
	Santa Clara Police Station	601 El Camino Real
	Scott Lane Elementary School	1925 Scott Boulevard
San Jose	Foundry Community Day School	258 Sunol Street
	Gardner Community Center	520 W Virginia Street
	Gardner Elementary School	502 Illinois avenue
	San Jose Fire Department, Station 7	800 Emory Street
	San Jose Unified School District	855 Lenzen Avenue

Source: Compiled by ICF from Google Earth and web searches of areas adjacent to the Caltrain ROW.

Police and Fire Protection Services

Police protection and traffic enforcement in the Caltrain corridor are provided by the cities of San Francisco, South San Francisco, Brisbane, Millbrae, San Bruno, Burlingame, San Mateo, Belmont, San Carlos, Redwood City, Menlo Park, Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose; the Town of Atherton; the sheriff's departments of the counties of San Mateo and Santa Clara; and the California Highway Patrol. There are 11 police stations and/or departments and 16 fire stations and/or departments within 0.25 mile of the Caltrain corridor.

Hospitals and Emergency Medical Services

No hospitals or other major medical facilities other than the Palo Alto Medical Foundation (795 El Camino Real in Palo Alto) are within 0.25 mile of the Caltrain corridor. However, the future University of California, San Francisco (UCSF) Medical Center at Mission Hill is scheduled to open on February 1, 2015 (University of California, San Francisco 2013), and this facility is within 0.25 mile of the Caltrain corridor.

Schools

Seven high schools, seventeen elementary schools, two intermediate schools, and one school district office are within 0.25 mile of the Caltrain corridor.

Libraries and Other Public Facilities

There are 10 libraries and 36 other public facilities within 0.25 mile of the Caltrain corridor. For purposes of this analysis, "other public facilities" include government facilities (e.g., U.S. Post Offices, city and town halls, social services, and other government facilities), community centers, and fairgrounds.

Solid Waste Landfills

As explained in the EIR for Plan Bay Area (MTC/ABAG 2013), 12 of the current 17 major landfills in the Bay Area will still be open through <u>2020</u> ~~2019~~, including the Guadalupe Sanitary landfill and Kirby Canyon Landfill (both in Santa Clara County) but all but four of those 17 landfills in the San Francisco Bay Area have an estimated closure date before the year 2040.

Utilities

The utilities within the Caltrain corridor include storm drain and sanitary sewer systems, water service, gas and electric service, and telecommunications services. These utility systems frequently cross the Caltrain ROW, and some telecommunication services are located along the Caltrain ROW, using it as a primary transmission corridor on the Peninsula.

Table 3.13-2 provides a general summary of the utilities by city, defining the utility provider and the approximate number of locations of interest. Table 3.13-3 summarizes the utilities at the proposed traction power substation (TPS) locations. It is acknowledged that the information on utilities presented in Tables 3.13-2 and 3.13-3 may be incomplete; however, as part of the Proposed Project's final design, Caltrain will coordinate with all appropriate local jurisdictions and utility providers to ensure that all utilities that cross or run longitudinally along the Caltrain ROW are identified. The following paragraphs discuss the utility setting, describing storm drain and sanitary sewer systems, water service, gas and electric service, and telecommunications services.

Table 3.13-2. Summary of Existing Utilities within the Caltrain Corridor Right-of-Way

ID	Utility Type and Locations	Owner
1	Underground fiber-optic cable. They typically run parallel to the ROW.	MCI, Sprint, AT&T, Qwest, and Brook Fiber, Level 3
2	Cable service. Provides cable service throughout the Peninsula corridor, excluding the cities of San Bruno, San Carlos, Palo Alto, and San Jose.	AT&T Cable
3	Telephone service. Aerial fiber-optic cables are parallel and cross the Caltrain ROW within numerous cities.	Pacific Bell, AT&T, local city cable TV, traffic control
4	Gas and electricity. Excluding the cities of Palo Alto and Santa Clara, Pacific Gas and Electric Company (PG&E) provides electricity to all Peninsula corridor cities. Gas is provided to all cities. Underground gas lines and overhead electrical wires cross and are parallel to the Caltrain ROW at numerous locations.	PG&E
5	Jet fuel. Pipe crosses ROW near San Francisco/San Mateo County line. This facility also follows the ROW in South San Francisco. It is carried on the Caltrain bridge over Colma Creek and goes underground on both approaches on the east side of the tracks.	Kinder Morgan

ID	Utility Type and Locations	Owner
6	Water service. Provides water service for South San Francisco, San Mateo, San Carlos, unincorporated areas of Redwood City, and Sunnyvale. Water mains vary from 6 to 24 inches and run parallel with streets that cross the Caltrain ROW.	California Water Service Company (CWSC)
7	Combined storm drain and sanitary system. This system crosses the ROW at approximately 21 locations. The system parallels the ROW near Townsend Street, Pennsylvania Avenue, and Tunnel Avenue.	San Francisco Department of Public Works
8	Water service. Provides retail water service to San Francisco and wholesale water service to ~~28 suburban~~ 26 water agencies in Alameda, Santa Clara, and San Mateo Counties.	San Francisco Water Department
9	Sanitary sewers. Maintains sanitary sewers in Redwood City. Sanitary sewers cross the ROW at approximately four locations. An abandoned sewer line is parallel to the ROW at one location.	County of San Mateo Public Works Department
10	The City provides water service and maintains storm drains and sewers.	City of Brisbane
11	CWSC provides water service.	City of South San Francisco
12	The City maintains water and cable service. In 2001, as a result of the BART to SFX extension project, sewers and storm drains have been installed parallel to the right-of-way between I-380 and Angus Avenue. NEXTLINK, Williams Communications, Level III, and Pacific Bell fiber-optic cables cross the ROW at Euclid Avenue.	City of San Bruno
13	The City provides water service.	City of Millbrae
14	The City provides water service.	City of Burlingame
15	The City maintains sewer system. California Water Service Company (CWSC) provides water service. The City and CWSC will provide locations of sewer and water mains that cross the Caltrain ROW, respectively.	City of San Mateo
16	City provides water service and maintains sewer system.	City of Belmont
17	CWSC provides water service. The City maintains storm drains and sewer system.	City of San Carlos
18	CWSC provides water service in unincorporated Redwood City. City provides water service for remaining areas.	City of Redwood CWSC
19	The City provides and maintains storm drain system.	City of Atherton
20	The City provides water service and maintains storm drain system.	City of Menlo Park
21	The City provides water, electricity, and cable service. It also maintains the storm drain and sewer systems.	City of Palo Alto
22	The City provides water service and maintains sewer and storm drains. Water mains crossing the ROW ~~at approximately 7 locations, including an 8-foot~~ include a 16-inch transmission main ~~at the Stevens Creek Freeway~~. Water mains are parallel to the ROW, ~~and~~ Central Expressway, and Evelyn Avenue. Sanitary sewers cross the ROW at approximately 13 locations. The sanitary sewers are parallel to the ROW, Central Expressway, and Evelyn Avenue ~~and Alma Street~~. Storm drains cross the ROW at approximately nine locations. The storm drains are parallel to the ROW~~, and~~ Central Expressway, and Evelyn Avenue.	City of Mountain View
23	The City provides water service.	City of Sunnyvale

ID	Utility Type and Locations	Owner
24	The City provides water and electric services and maintains sanitary sewer and storm drain systems. Water mains ranging from 8 to 24 inches in diameter cross the ROW at approximately 7 locations. A 27-inch main for recycled water crosses the ROW at 1 location. Overhead electrical wires cross the ROW at approximately seven locations. The wires have 12-kilovolt (kV) capacity. Sanitary sewers ranging from 8 to 27 inches in diameter cross the ROW at approximately 11 locations. Storm drains ranging from 12 to 60 inches in diameter cross the ROW at approximately eight locations. A 54-inch by 66-inch elliptical pipe is located approximately 600 feet east of Bower Avenue.	City of Santa Clara
25	The City provides water and cable service. San Jose Water Company and Great Oaks Water (privately owned) also provide water service. The City maintains sewers.	City of San Jose

Note: The CBOSS project is installing fiber optic in the Caltrain ROW and will be completed by 2015.

Source: Peninsula Corridor Joint Powers Board 2013.

Table 3.13-3. Utilities near Proposed Traction Power Facility Locations

No.	Proposed TPF	Size (feet)	City and Location	Utility Description
1	PS1	40 x 80	San Francisco, near Mariposa Street at Pennsylvania Avenue	12-foot reinforced concrete pipe storm drain, underground fiber-optic cables
2	PS2	40 x 80	San Francisco, near Blanken Avenue at Bayshore Boulevard	Underground fiber-optic cables
3	TPS1 Option 1	150 x 250	South San Francisco, north of Airport Boulevard	Adjacent to PG&E 115-kV substation, 115-kV transmission lines cross over are or in the vicinity of TPS1
4	TPS1 Option 2	150 x 250	South San Francisco, north of Airport Boulevard	25-kV transmission lines are in the vicinity of TPS1
5	TPS1 Option 3	150 x 250	South San Francisco, north of Airport Boulevard	115-kV transmission lines cross over are or in the vicinity of TPS1
6	TPS1 Option 4	150 x 250	South San Francisco, east of Dubuque Avenue	36-inch concrete pipe (service unknown)
~~6~~ 7	PS3 Option 1	40 x 80	Burlingame, between Summer and Lincoln. In ROW.	Underground fiber-optic cables
8	PS3 Option 2	40 x 80	Burlingame, south end of Star Way	Underground fiber-optic cables
~~7~~ 9	PS4 Option 1	40 x 80	San Mateo, north of the Hillsdale and El Camino Real intersection	Aerial fiber-optic cables
~~8~~ 10	PS4 Option 2	40 x 80	San Mateo, south corner of Hillsdale Station parking lot	Aerial fiber-optic cables, underground fiber-optic cables
11	PS4 Option 3	40 x 80	San Mateo, south of Hillsdale Boulevard	Aerial fiber-optic cables.
~~9~~ 12	SWS1 Option 1	60 x 150	Redwood City, between Buckingham and Nottingham	Underground fiber-optic cables
13	SWS1 Option 2	60 x 150	Redwood City, east of Woodside Road	Underground fiber-optic cables
~~10~~ 14	PS5 Option 1	40 x 80	Palo Alto, adjacent to Alma Street near Greenmeadow Way ~~Mountain View, near West Meadow Drive~~	Aerial fiber-optic cables, underground fiber-optic cables
15	PS5 Option 1B	40 x 80	Palo Alto, adjacent to Alma Street near Ferne Avenue	Aerial fiber-optic cables, underground fiber-optic cables

No.	Proposed TPF	Size (feet)	City and Location	Utility Description
~~11~~ 16	PS5 Option 2	40 x 80	Palo Alto, south of California Avenue Station	Aerial fiber-optic cables, underground fiber-optic cables, 12-5kV distribution power aerial, City storm water system
~~12~~ 17	PS6 Option 1	40 x 80	Sunnyvale, Murphy Avenue	Aerial fiber-optic cables, underground fiber-optic cables
~~13~~ 18	PS6 Option 2	40 x 80	Sunnyvale, north corner of Sunnyvale Station parking lot	Aerial fiber-optic cables, underground fiber-optic cables
~~14~~ 19	TPS2 Option 1	150 x 250	Santa Clara, north of Newhall Street in VTA/BART property	Adjacent to PG&E 115-kV substation, 115-kV transmission lines cross over or are in the vicinity, aerial fiber-optic cables
~~15~~ 20	TPS2 Option 2	150 x 250	Santa Clara, south of Stockton Avenue, east of Highway 880 in private property	115-kV transmission lines cross over are or in the vicinity, aerial fiber-optic cables
~~16~~ 21	TPS2 Option 3	150 x 250	San Jose, at Lenzen Avenue in JPB property	115-kV transmission lines cross over are or in the vicinity.
~~17~~ 22	PS7	40 X 80	San Jose, near Curtner Avenue in ROW	Underground fiber-optic cables
23	PS7, Variant A/B	40 X 80	San Jose, near West Alma Avenue in ROW	Underground fiber-optic cables

Source: Information compiled by JPB based on ~~35 percent~~ preliminary design and known utilities in Caltrain corridor.
PS = paralleling station
SWS = switching station
TPF = traction power facility
TPS = traction power substation

Each city and county department of public works jurisdiction through which Caltrain passes maintains a storm drain and sanitary sewer system. The systems vary by age, size, and type depending on the municipality. The City and County of San Francisco Department of Public Works maintains a combined storm drain and sewer system that consists of vitrified clay pipe (VCP); older iron/steel pipe (ISP); very old brick collector sewers; medium-sized reinforced concrete interceptor sewers, and large reinforced concrete consolidation sewers. Reinforced concrete pipe facilities generally used for storm drain and sewer systems also cross the project alignment at a number of locations.

Depending on the municipality, water service also varies within the Peninsula corridor. The San Francisco Public Utilities Commission (SFPUC) provides ~~water service~~ wholesale water supply to the City and County of San Francisco. The SFPUC also owns and operates the Regional Water System, which supplies water to the City and County of San Francisco, as well as many cities on the Peninsula. The Regional Water System draws approximately 85 percent of its water from the Upper Tuolumne River Watershed, collected in Hetch Hetchy Reservoir in Yosemite National Park, using an aqueduct system that delivers water by gravity to Bay Area reservoirs and customers. The remaining water supply is drawn from local surface waters in the Alameda and Peninsula watersheds (SFPUC 2011).

~~Its water source is from snow falling on more than 650 square miles of watershed land in Yosemite National Park and the Stanislaus National Forest. As the snow melts, it collects in the Hetch Hetchy storage reserves. From the storage reserves, water flows by gravity through 150 miles of pipeline and tunnels from the crest of the Sierras to the Crystal Springs Reservoir on the Peninsula.~~

Nearly all cities in San Mateo County provide water service to customers through their public works or utilities departments. Water service in South San Francisco, San Mateo, San Carlos, and unincorporated areas of Redwood City is provided by the privately owned CWSC. Water sources for cities in San Mateo County are from the SFPUC and local wells. A public works or utilities department also provides water service in most cities in Santa Clara County. A combination of public and private water service is provided in the cities of Sunnyvale and San Jose. In Sunnyvale, service is provided by the Public Works Department and by CWSC. The San Jose Municipal Water System and two privately owned companies (San Jose Water Company and Great Oaks Water) provide service to the City of San Jose. For cities in Santa Clara County, the water source can vary from well water, to the Los Gatos Creek watershed, Santa Clara Valley Water District, and SFPUC. Water pipelines range between 2 and 30 inches in diameter in most municipalities.

PG&E provides electricity and gas service to all but two cities within the project corridor. The cities of Palo Alto and Santa Clara provide electricity for their customers. Gas, however, is provided by PG&E. Overhead power and underground gas lines cross and run parallel and perpendicular to the Caltrain ROW. The City and County of San Francisco owns and operates the Hetch Hetchy water and power hydroelectric generating facilities that provide power to San Francisco via PG&E's electrical transmission and distribution system. Excluding Palo Alto and Santa Clara, power is sold to all Peninsula corridor cities by PG&E. Palo Alto gets its power from the Western Area Power Administration (WAPA). Santa Clara buys 40 percent of its power from WAPA and 20 percent from the market. The remaining 40 percent is provided by local power plants that are owned by the City. Electricity service is provided primarily from underground reinforced concrete vaults through a network of buried conduit and duct banks. Along the Peninsula corridor, PG&E maintains older, low-pressure cast iron natural gas lines (San Francisco), as well as new, high-pressure plastic lines.

Communication networks typically run underground fiber-optic cable parallel to the Peninsula corridor.

3.13.2 Impact Analysis

3.13.2.1 Methods for Analysis

A combination of geospatial analysis and internet research was used to determine public services and facilities within 0.25 mile of the Caltrain corridor from San Francisco to Caltrain's Tamien Station in San Jose. For utilities in the Caltrain ROW and near TPSs, information was obtained from Caltrain (Peninsula Corridor Joint Powers Board 2013). After determining the locations and character of public services, public facilities, and utilities in the project area, the analysis determined whether project construction or operation and maintenance would affect these services, facilities, and utilities.

The requirements of CPUC GO 26-D related to OCS clearances for freight rail operations are discussed separately in Section 3.14, *Transportation and Traffic*.

JPB would construct and operate the Proposed Project consistent with applicable CPUC general orders (including GOs 95, 118-A, 143-B, and 164-B) and with the new rule-making on 25 kVA systems used for high-speed rail (as and if applicable to the Caltrain system). JPB has consulted with CPUC periodically in development of the Proposed Project and would continue to consult to ensure compliance with applicable GO requirements. Consequently, the impact analysis below does not discuss the details of compliance with the specific requirements in the CPUC GOs, which would be part of final design coordination with the CPUC.

3.13.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines and professional judgment, the Proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below. The last two criteria regarding utilities are based on professional judgment and were added to ensure that all possible impacts to utilities are analyzed. The remaining criteria are from Appendix G of the State CEQA Guidelines.

Public Services

- Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or a need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services:[1]
  - Fire protection?
  - Police protection?
  - Schools?
  - Other public facilities?

[1] The CEQA guideline thresholds include parks in this criterion. However impacts on parks and recreation are addressed separately in Section 3.10, *Land Use and Recreation*.

Utilities

- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board (Regional Water Board).
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.
- Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.
- Have sufficient water supplies available to serve the project from existing entitlements and resources, or would new or expanded entitlements be needed.
- Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments.
- Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs.
- Comply with federal, state, and local statutes and regulations related to solid waste.
- Construction would result in a substantial disruption to utility service systems.
- Require or result in the construction of new utility facilities or expansion of existing utility facilities, the construction of which could cause significant environmental effects.

3.13.2.3 Impacts and Mitigation Measures

<u>Changes resulting from Project Variant 1 are described below each impact analysis, as necessary.</u>

Impact PSU-1	Substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or a need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services: fire protection, police protection, schools, or other public facilities
Level of Impact	Less than significant

This impact concerns the potential for the Proposed Project to result in the need for new public facilities, the construction of which might then have secondary physical impacts on the environment. This impact is analyzed in two different aspects: 1) whether Proposed Project's facilities would displace or physically affect public facilities, and 2) whether the Proposed Project would increase the demand for public services such that additional public facilities would be necessary.

Impacts related to emergency response are discussed separately in Section 3.8, *Hazards and Hazardous Materials*.

Construction

The Proposed Project would involve installation of OCS poles and associated wires. Most OCS poles would be placed within the Caltrain ROW, unless there are locations where there is insufficient right-of-way. Where OCS poles must be placed outside the Caltrain ROW, they would need to be placed only several feet beyond the existing Caltrain ROW. Review of aerial photographs of the areas where the OCS poles would be outside the Caltrain ROW did not identify the need for removal of structures; thus, displacement of existing public facilities is not expected.

In addition to the OCS poles and associated wiring, the Proposed Project would construct two TPSs (TPS1 and TPS2), one SWS (SWS1), and seven PSs (PS1 to PS7). All of these facilities would be within the Caltrain ROW with the exception of TPS1 (Options 1 through 3; Option 4 would be within the Caltrain ROW) and TPS2 (Options 1 and 2) (TPS2 Option 3 would be within the Caltrain ROW). The TPSs are proposed in commercial/industrial areas and their construction would not affect any public facilities, including schools, and police or fire services. Overbridge protection structures on 47 roadway bridges would also be enhanced or constructed but would not affect any of the public facilities noted in Table 3.13-1.

As discussed in Section 3.12, *Population and Housing*, construction would temporarily increase employment along the San Francisco Peninsula and workers are expected to be drawn from the greater San Francisco Bay Area and possibly beyond. Where workers already reside in the Bay Area, there would be no increase of population. Where drawn from beyond the San Francisco Bay Area, it is possibly there could be minor increases in local populations. However, new workers to the area are likely to be widely distributed across the Bay Area and, thus, not result in any substantial changes in local populations that might otherwise result in an increased demand for police, fire, school, or other facilities.

Because the Proposed Project would neither directly displace public facilities nor result in substantial changes in local population and demand for public services, construction of the Proposed Project would have less-than-significant impacts on public facilities.

Operations

Once constructed, operations of the OCS and TPFs would not affect adjacent or nearby existing public or community facilities.

As discussed in Section 3.10, *Land Use and Recreation*, the placement of some OCS poles outside the Caltrain ROW and land use restrictions due to electrical safety zone (ESZ) requirements would limit some uses of adjacent land. As discussed in Section 3.10, *Land Use and Recreation,* the placement of these facilities could constrain the ability in some areas to develop new structures or new vegetation to the property line. However, given the small amount of restricted area, this would be a less-than-significant land use impact. The vegetation clearance portion of the ESZ area may still be used for non-structural uses, such as walkways, landscaped park, and parking. Consequently, this is considered a less-than-significant impact on public facilities.

Contact between structures, vegetation or individuals and live wires of the OCS could cause a fire or accident. However, the Caltrain ROW would be maintained to ensure adequate structural and vegetation separation, as required by applicable CPUC requirements, in order to provide for fire safety for structures and people. TPFs could be subject to fire or other accidents that may require emergency response services. However, all facilities would be designed in compliance with existing building safety codes to provide for safe operation. As a result, project facilities are not expected to increase demand for fire and emergency services, which might otherwise result in a demand for additional fire or emergency facilities.

As discussed in Section 3.12, *Population and Housing*, the Proposed Project would serve only existing developed areas and is not expected to induce population growth. As a result, the Proposed Project is not expected to result in increased demand for police, fire, school, or other public facilities due to population growth.

Requirements and standard procedures for emergency response will be developed as part of the PCEP. Current Caltrain rules and regulations will be modified to include procedures like those contained in AMTRAK's AMT-2 Electrical Operating Instructions. This document will outline in detail how all abnormal situations are handled with the electrification system. Once these instructions and rules have been developed, training will be deployed to employees, first responders (e.g., Police, Fire, EMT etc.) adjacent transit agencies (i.e., BART, VTA, ACE, SamTrans, CCJPA, AMTRAK, UPRR) and other agencies as necessary and appropriate information disseminated to Caltrain riders and the public.

Significant impacts on public services and facilities would not result from operation of the Proposed Project.

Impact PSU-2	Exceed wastewater treatment requirements of the applicable Regional Water Board
Level of Impact	Significant
Mitigation Measure	HYD-1: Implement construction dewatering treatment, if necessary
Level of Impact after Mitigation	Less than significant

Construction

The project area lies within the jurisdiction of the San Francisco Bay Regional Water Quality Control Board. During construction, the Proposed Project would not generate substantial amounts of wastewater, except potentially during dewatering activities during sub-grade excavation for OCS pole installation and excavation for electrical ductbank installation or utility relocations. This impact is discussed under Impact HYD-1a in Section 3.9, *Hydrology and Water Quality*, and Mitigation Measure HYD-1 requires treatment to receiving water quality standards, including those of any receiving wastewater system.

Operations

As discussed under Impact HYD-1b in Section 3.9, *Hydrology and Water Quality*, the Proposed Project would result in minimal increases in impervious surfaces. Compliance with mandatory state and federal water quality regulations would minimize any potential increases in contaminated stormwater runoff such that potential runoff from new facilities would not have substantial effects on receiving wastewater treatment facilities.

The Proposed Project would also have a beneficial impact on water quality due to the reduction of diesel emissions and potential diesel fuel spills associated with diesel locomotives.

Thus, overall, the Proposed Project would have a less-than-significant impact on wastewater treatment requirements.

Impact PSU-3	Require or result in the construction of new water, wastewater, or stormwater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects
Level of Impact	No impact

The Proposed Project would result in a very minimal, if any, increase in water demand and wastewater production. There may be a small increase associated with the small increase in operations ~~(see Table 2-8~~) due to increased ridership (see Table 2-3) and associated water for hand-washing and toilet flushing. There may also be a small increase in water use associated with train washing due to the expansion of the train fleet. However, any increase would be negligible and likely indiscernible from existing water and wastewater needs for the existing facilities, and construction of new water and wastewater facilities would not be required. In addition, as noted under Impact PSU-2, due to the substantial reduction in diesel emissions, the loading of diesel particulates in downstream waters would be substantially reduced.

As discussed in Section 3.9 *Hydrology and Water Quality*, in compliance with state water quality regulations, runoff from TPFs would require treatment prior to discharge offsite. However, those stormwater treatment facilities would be located within the TPF footprints themselves and would not require additional stormwater treatment facilities offsite. Due to the location of the TPFs in highly urbanized and developed areas, the additional runoff is not considered substantial enough to change downstream drainage capacities and thus require additional offsite drainage facilities.

As discussed in Section 3.12, *Population and Housing*, the Proposed Project would serve only existing developed areas and is not expected to induce population growth. Therefore, the Proposed Project would not increase demand for new water, wastewater, or stormwater treatment facilities in other areas.

The Proposed Project would not require or result in the construction of new stormwater drainage facilities or expansion of existing facilities. Therefore, there would be no impact related to offsite drainage facilities.

Impact PSU-4	Have sufficient water supplies available to serve the project from existing entitlements and resources, or would new or expanded entitlements be needed
Level of Impact	Less than significant

Construction

As indicated under Impact AQ-3 in Section 3.2, *Air Quality*, project construction would require dust control measures, which would likely include water, to minimize fugitive dust associated with grading and vehicular travel on unpaved areas. However, because of limited ground-disturbing activities (construction of poles and wires mostly within Caltrain's ROW and the construction of TPFs) and the short-term nature of construction, the amount of water used would be negligible. Construction would otherwise not have large demands for water. Therefore, this impact would be less than significant.

Operation

The Proposed Project would not require new water supply entitlements and resources because it would not result in new potable water connections. As discussed in Section 3.12, *Population and*

Housing, the Proposed Project would serve only existing developed areas and is not expected to induce population growth and, thus, would not increase demand for new water supplies. As discussed for Impact PSU-3 above, any increase in water use at Caltrain facilities due to increased ridership would be negligible. Therefore, this impact would be less than significant.

Impact PSU-5	Result in a determination by the wastewater treatment provider that serves or may serve the Proposed Project that it has adequate capacity to serve the Proposed Project's projected demand in addition to the provider's existing commitments
Level of Impact	Less than significant

As discussed for Impact PSU-3 above, if any increase in wastewater production results from the Proposed Project, the increase would be negligible and likely would be indiscernible from existing Caltrain operations. Therefore, wastewater treatment needs for the Proposed Project would be adequately served by existing wastewater treatment providers. Therefore, this impact would be less than significant.

Impact PSU-6	Be served by a landfill with sufficient permitted capacity to accommodate the Proposed Project's solid waste disposal needs
Level of Impact	Less than significant

Construction

Proposed Project construction would not require demolition of any structures, which would result in large amounts of solid waste to be disposed of at local landfills. The only solid waste expected to result from project construction would be soil resulting from grading and excavation associated with construction of TPFs and OCS pole foundations as well as general packaging and other materials associated with construction materials and construction workers. Any uncontaminated soil that is not reused onsite would be recycled in accordance with the various state and local ordinances governing recycling. Contaminated soil would be disposed at facilities approved to receive such soil, as discussed in Section 3.8, *Hazards and Hazardous Materials*. Other construction waste is expected to minimal and readily handled by existing landfill facilities in the region, which have ample remaining capacity for such material in the aggregate through at least 2020. Therefore, construction impacts on landfills would be less than significant.

Operations

Normal EMU operations would not result in substantial new generation of solid waste above that associated with servicing of diesel locomotives today. Similarly, maintenance of the OCS and TPFs would not involve the generation of large amounts of solid waste. There would be a minor increase in solid waste production associated with the Proposed Project from increased ridership (e.g., disposable coffee cups, newspaper) but the volumes of waste would not be substantial relative to landfill capacity and would be waste that would be generated while using other modes of travel with or without the project. Therefore, Proposed Project operations would result in a less-than-significant impact on solid waste generation.

Impact PSU-7	Comply with federal, state, and local statutes and regulations related to solid waste
Level of Impact	Less than significant

Construction

Project construction would comply with all applicable regulatory requirements related to solid waste. As described for Impact HAZ-1 in Section 3.8, *Hazards and Hazardous Materials*, all hazardous materials handling during construction would be in accordance with applicable hazardous waste laws. Therefore, impacts related to solid waste generated by construction of the Proposed Project would be less than significant.

Operations

As discussed for Impact PSU-6, any increase in solid waste from proposed project operation would be negligible and would likely be indiscernible from existing Caltrain operations. Project operation would comply with all applicable regulatory requirements related to solid waste. In addition, refer to Impact HAZ-1 in Section 3.8, *Hazards and Hazardous Materials*, for information on hazardous materials handling during operation of the Proposed Project, as well as applicable hazardous waste laws and mandatory compliance with these laws. Impacts related to solid waste generated by operation of the Proposed Project would be less than significant.

Impact PSU-8	Construction activities would result in a substantial disruption to utility service systems
Level of Impact	Significant
Mitigation Measures	PSU-8a: Provide continuous coordination with all utility providers PSU-8b: Adjust OCS pole foundation locations PSU-8c: Schedule and notify users about potential service interruptions
Level of Impact after Mitigation	Less than significant

Known existing utilities within the Caltrain ROW and around TPFs are provided in Tables 3.13-2 and 3.13-3. Constructing OCS pole foundations, overhead facilities, TPSs, the switching station, and paralleling stations would have the potential to encroach upon existing overhead utilities and utilities that run underground longitudinally within or along the ROW. Under Project Variant 1, there would be less construction south of Tamien Station and less potential utility disruption than the Proposed Project. However, Mitigation Measures PSU-8a, PSU-8b, and PSU-8c would still apply and this impact's level of significance determination would not change.

The JPB would coordinate with all utility providers and local jurisdictions during the design phase of the Proposed Project to confirm the location of all subsurface and overhead utilities so that effective design treatments and construction procedures can be developed to avoid adverse impacts on existing utilities and prevent disruptions in service.

There is low to moderate potential for the Proposed Project facilities to affect underground utilities that cross the Caltrain ROW, and pole placement can generally be modified to avoid them. Underground utilities would be relocated if required to accommodate the installation of OCS and TPS equipment and facilities. Underground utilities and longitudinally running utilities would be avoided to the extent possible by design modifications.

Overhead utility conflicts would be avoided by raising the existing utility wires over OCS wires or relocating them under the tracks pursuant to federal, state and local code requirements. If relocation of overhead wires were required, a taller pole would be installed. Pursuant to CPUC GO 95 and other CPUC requirements, adequate separation and clearance would be provided between the new OCS facilities and other overhead electrical overhead transmission facilities where overhead utilities can be accommodated. Some overhead utility crossings will have to be relocated underground. If relocation underground is required, the overhead wires will be removed once the underground service is established.

In most cases, the JPB has reserved the right to have utilities relocated if they interfere or conflict with planned railroad facilities. In the event that a longitudinal or transverse utility line is in conflict with a proposed electrification facility, the utility owner would be requested to relocate it. If the responsibility for utility relocations lies with the JPB, then the utility relocation would be included as part of Proposed Project construction.

The JPB will give each utility owner advance warning of the Proposed Project to provide time to plan for relocation to minimize disruptions. No interference with existing utility service is anticipated during installation of connections to existing high-voltage power transmission facilities because the utility would put customer loads on alternate feeders during the connection activity.

The disruption of existing utilities would be a significant impact. Mitigation Measure PSU-8a would require that the JPB continuously coordinate with utility providers from preliminary engineering through final construction to ensure that potential conflicts are identified and disruption is minimized. As prescribed in Mitigation Measure PSU-8b, if unanticipated underground utilities are discovered, OCS pole foundations will be adjusted to avoid them. Additionally, Mitigation Measure PSU-8c would require that any short-term, limited service interruptions would be scheduled well in advance and appropriate notification provided to users. Implementation of these mitigation measures would reduce the impact to a less-than-significant level.

Mitigation Measure PSU-8a: Provide continuous coordination with all utility providers

The JPB will initiate coordination with all utility providers and local jurisdictions during engineering design and will continue coordination with these entities through final design and construction to ensure that all potential utility location conflicts are identified. To prevent damage to utility systems and minimize disruption or degradation of utility service to local customers, utilities will be avoided while constructing OCS pole foundations, TPFs, and overhead facilities where possible. Coordination efforts will focus on identifying potential conflicts, planning utility reroutes, and formulating and implementing strategies to address any problems that arise.

Mitigation Measure PSU-8b: Adjust OCS pole foundation locations

If underground utilities are discovered at proposed OCS pole foundation locations prior to construction, the JPB will assess the location of the underground utility and will adjust the location of the OCS pole foundations to avoid the utility wherever feasible. If the OCS pole foundation cannot be relocated to avoid the utility (which is unlikely), then the JPB will coordinate with the owner of the utility to identify feasible relocation options.

Mitigation Measure PSU-8c: Schedule and notify users about potential service interruptions

The JPB will coordinate with all utility providers to schedule any short-term, limited service interruptions at least 30 days in advance and will notify all appropriate users accordingly.

Impact PSU-9	Construction activities would result in the construction of new utility facilities or expansion of existing utility facilities, the construction of which could cause significant environmental effects
Level of Impact	Significant
Mitigation Measure	PSU-9: Require application of relevant construction mitigation measures to utility relocation and transmission line construction by others
Level of Impact after Mitigation	Less than significant

As described in Impact PSU-8, certain utilities crossing the ROW, at the locations of the two TPSs, along the ductbank connections from the TPSs to the Caltrain ROW, or along the route of electrical connections between the PG&E substations and the TPSs may need to be relocated. There would also be potential impacts due to the installation of transmission lines from PG&E to the TPSs. In addition, increased electrical demand of the Proposed Project could require PG&E to install additional facilities. These potential impacts are each discussed below.

Secondary Environmental Impacts of Utility Relocations

The OCS facility would be the lowest overhead line and other utility lines would have to be installed above the OCS facility with the appropriate clearances. For utility line relocations, construction would involve installation of taller poles within and potentially along the Caltrain ROW as necessary to achieve the appropriate height clearance. Construction impacts would be similar to the construction impacts described throughout this EIR for OCS installation and would include temporary air quality, noise, soil disturbance, and traffic effects but the effects would be limited to the area of the relocated utility itself. Mitigation is available to reduce construction period impacts to a less-than-significant level. Where the JPB is responsible for the utility relocation, relocation is considered part of the Proposed Project and all mitigation applicable to the Proposed Project would apply to JPB-initiated utility relocations. Utility owners will in most cases be the responsible party for completing the utility relocation. In those instances and pursuant to Mitigation Measure PSU-9, the JPB will require the same construction mitigation measures identified in this EIR for the OCS construction to be applied to utility relocation efforts by the utility owner within the Caltrain ROW or on Caltrain owned property. Outside the ROW the JPB would recommend the mitigation measures to the relevant city or county jurisdiction in their permitting for the relocation effort.

As described above under Impact PS-8, relocation of existing underground utilities is a low-order probability but may occur. For any underground utility relocations that may be necessary, the construction activity would involve excavation and removal of the existing underground facility and placement of the utility in an alternative alignment compatible with Proposed Project features. In addition, existing overhead utility lines that cannot be feasibly relocated above the OCS alignment would need to be relocated underground; electrical transmission or phone lines may be installed with either trenching or directional drilling. Temporary construction impacts would be associated with air quality, noise, soil disturbance, potential dewatering, and traffic and can also be addresses through the construction mitigation measures identified in this EIR and pursuant to Mitigation

Measure PSU-9, the JPB will require their application within the Caltrain ROW (and recommend them for use outside the ROW).

Operationally, relocated utilities would have little to no secondary impacts. Relocated overhead utilities might have a somewhat more observable character because they would be located at a higher elevation. However, given that these overhead utilities are already part of the existing visual character, they would not be expected to have a significant impact on local visual character or scenic views. Underground utilities would have no aesthetic impacts.

With Project Variant 1, there would be less need for utility relocation due to less OCS construction.

Secondary Environmental Impacts of Transmission Line Connections from PG&E

As described in Section 2.3.3, *Traction Power Substations, Switching Stations, and Paralleling Stations*, PG&E will be requested to provide power connections from its existing substations to the two proposed TPSs. All the potential TPS sites are located relatively close to their source PG&E substation, as discussed below.

- TPS1: The TPS1 Option 1 site is directly adjacent to the 115 kV PG&E East Grand substation in South San Francisco. The TPS1 Option 2 site is across the street and approximately 400 to 500 feet from the East Grand substation. The TPS1 Option 3 site is about 1,100 feet from the East Grand substation. TPS1 Option 4 is approximately 850 feet from the East Grand substation. Connection to the substation busbar is the preferred method of supply in comparison with a transmission line tap. In each case, connection to PG&E power could be via overhead line or underground ductbank.
- TPS2: The TPS2 Option 1 site is adjacent to a 115 kV PG&E Newhall Street substation in San Jose. The TPS2 Option 2 site is located approximately 400 feet from the Newhall Street substation across I-880. The TPS2 Option 3 site is approximately 1 mile from the Newhall Street substation. In each case, connection to PG&E power could be via overhead line or underground ductbank. In the case of TPS2 Option 2, it is probable that connection to the Newhall Street substation would be via a 115 kV ductbank under I-880.

These new transmission facilities would be installed in existing commercial and industrial areas or in or above existing roadways with the possible exception of the transmission line connection from PG&E to TPS2 Option 3. For TPS2, Option 3, the alignment of the connection to PG&E would be particularly lengthy and the routing is unknown at this time. It is likely that if a new overhead transmission line is needed, it would run along the Caltrain ROW or east of the ROW along adjacent streets in commercial and industrial areas. However, it is possible that it might be routed in or adjacent to residential areas east of the California ROW east of Chestnut Avenue. Overhead power lines are already located along most of the local streets where a new alignment might be routed, including along Chestnut Avenue.

Construction impacts for new overhead lines would be similar to the construction impacts described throughout this EIR for OCS installation and would include temporary air quality, noise, soil disturbance, and traffic effects, but the effects would be limited to the area of the overhead line itself. Temporary construction impacts for underground ductbank installation would be associated with air quality, noise, soil disturbance, potential dewatering, and traffic. In both cases, construction impacts can be addresses through the construction mitigation measures identified in this EIR, and, pursuant to Mitigation Measure PSU-9, the JPB will require their application for construction within the Caltrain ROW and recommend them for use by PG&E outside the ROW.

Operationally, new transmission lines from PG&E to the TPSs would have limited to no secondary impacts other than aesthetic impacts. Relocated overhead utilities might have a somewhat more observable character because they would be located at a higher elevation. However, given that these overhead utilities are already part of the existing visual character in the areas where they would be installed, they would not be expected to have a significant impact on local visual character or scenic views. Underground utilities would have no aesthetic impacts.

Project Variant 1 would not change the need for TPS connections to PG&E.

Secondary Environmental Impacts of Potential Electrical Transmission Facilities Due to Increased Electrical Demand

Under the Proposed Project, use of EMUs for approximately 75 percent of Caltrain's fleet for service between San Francisco and San Jose would increase electricity demand. As described in Section ~~2.4.5.3~~2.3.7.3, *Energy Consumption*, and Section 4.5, *Energy*, the Proposed Project would require approximately ~~83~~ 88 million kWh of electricity per year (in 2020) for train operation and idling. This represents an increase of ~~79~~ 84.6 million kWh of electrical demand over the existing system demand of ~~3.9~~ 4.2 million kWh (used for idling when diesel trains are plugged into station power). With fully electrified operations between San Francisco and San Jose service by 2040, the total electricity consumption would rise to 112 ~~105~~ million kWh.

To contextualize this demand, one can compare the Proposed Project's demand to the total electricity consumption with San Mateo and Santa Clara Counties in 2012 ~~2011~~ as shown in Table 3.13-4. These two counties were selected instead of San Francisco because the TPSs would be located in these two counties and would draw electricity from PG&E's transmission system in these two counties. As shown, the Proposed Project's electricity demand in 2020 would be less than 0.4% of the total electricity demand in both counties in 2012 ~~2011~~. With full electrification, the electricity demand in 2040 would be approximately 0.5% of the total electricity demand in the two counties in 2012 ~~2011~~.[2]

Project Variant 1 would not change the operational electricity demand because train operations would not change.

In 2008, Caltrain requested a study of the impact of Caltrain electrification on the PG&E power system to identify if new transmission or other facilities would be necessary due to the increase in electricity demand (LTK 2008). The results of the study showed that the PG&E transmission and generation system would support the traction electrification system loads under normal operating conditions and under various system contingencies, including transmission line, generator, and traction power system outages. No remedial measures to the PG&E system were proposed in the study.

[2] By way of comparison, the estimated annual electricity demand of the Facebook Menlo Park campus project would be 27 million kWh/year (City of Menlo Park 2011). The Apple Campus 2 project in Cupertino would have a projected electricity demand of 142 million kWh/year, but expects to supply the majority of this power from on-site photovoltaic and fuel cell systems with the remainder from off-site renewable energy direct access power (City of Cupertino 2013 ~~2012~~).

Table 3.13-4. Electricity Consumption by County, 2007–2011 (million kwh)

County	Sector	2012	2011	2010	2009	2008	2007
Santa Clara	Non-Residential	12,615	12,359	12,627	12,484	13,069	12,791
Santa Clara	Total	16,492	16,384	16,564	16,452	17,088	16,694
San Mateo	Non-Residential	2,935	2,919	3,131	3,354	3,474	3,282
San Mateo	Total	4,502	4,535	4,756	4,968	5,116	4,876
Both	Non-Residential	15,550	15,279	15,758	15,839	16,543	16,073
Both	Total	20,994	20,919	21,320	21,420	22,204	21,570

Source: California Energy Commission, 2013/2014. Energy Consumption Data Management System, http://ecdms.energy.ca.gov/elecbycounty.aspx

The study did identify the need for power factor correction capacitors to be incorporated in the new Caltrain TPSs as needed to handle the anticipated traction load growth. The TPSs are being designed to provide space for these facilities.

While the study was completed in late 2008, it is worth noting that, as shown in Table 3.13-4, electricity consumption from 2008 to 2011 (the latest year available from the California Energy Commission [CEC]) has slightly declined in both San Mateo and Santa Clara Counties. The general conditions of electricity demand in the project vicinity do not appear to have substantially changed.

At this time, there does not appear to be any need for additional PG&E transmission line facilities upstream of the PG&E substations that would connect to the TPSs. Consequently, other than the local connections from the PG&E substations to the TPSs, there would be no secondary environmental impact due to additional transmission line construction in the local area.

It should be noted that there are on-going meetings with the PG&E to continue coordinating on the Proposed Project. JPB will confirm its strategy for obtaining electricity from PG&E and submit a formal PG&E application to put the necessary electricity provider agreement in place. The application process will include reevaluation of the facility improvement assumptions.

The most recent CEC forecast of California energy demand was completed in 2012 and projected demand out to 2022 and estimated mid-range growth in demand from 2010 to 2020 of 1.3% per year (CEC 2012).

It is not possible to separate Caltrain's demand for electricity from other expected increases in demand created by population and economic growth in the Bay Area. As part of the process of developing detailed plans for the Proposed Project, the JPB would approach power suppliers much like any other major user to discuss power requirements. The suppliers would make proposals to the JPB for providing electricity; part of the analysis completed by these companies would be determining how and where the electricity would be produced and how it would be transported to Caltrain. Historically, California electricity supply has been able to keep up with demand. Given the Proposed Project's demand relative to overall electricity demands in the project area, the Proposed Project alone would not likely result in the need for additional power plants to be built.

However, as part of cumulative increases in electricity, the Proposed Project would contribute to the need for increased electricity generation in the future and transmission lines to connect new power plants to load centers. Should it be necessary to build new power plants or distribution facilities to meet this cumulative demand, these would be planned by the power production and distribution companies, not by JPB. Any environmental analysis of these new facilities would be completed by these companies because Caltrain would be only one of many customers for the new services and would only constitute a fraction of the overall electricity load served by providers. It would be speculative for Caltrain to analyze precisely where the cumulative impact would result in the construction of a new power plant and/or transmission lines and thus to analyze the secondary environmental impacts of that construction. Because such an analysis cannot be completed without speculation, no conclusion can be reached about the significance of the Proposed Project's contribution to potential cumulative secondary impacts of future power plant and transmission construction.

Mitigation Measure PSU-9: Require application of relevant construction mitigation measures to utility relocation and transmission line installation by others

The JPB will require that all relevant construction mitigation measures identified in this EIR be applied to utility relocation and transmission line efforts. Within the Caltrain ROW or Caltrain-owned property, the JPB can mandate the implementation of such measures. Outside the Caltrain ROW, the JPB will recommend their use by utility owners and/or inclusion in any encroachment permits required by local jurisdictions.

3.14 Transportation and Traffic

This section describes the transportation network and existing conditions in the project study area, provides a summary of applicable plans and regulations related to implementation and impact analysis of the Proposed Project, ~~as well as the~~ and discussed the potential transportation and traffic impacts of the Proposed Project. Transportation and traffic impacts associated with projected ridership, traffic, pedestrian and bike systems, safety hazards, emergency vehicle access, station parking and access are summarized herein, based on the transportation analysis report prepared for the Proposed Project by Fehr & Peers Transportation Consultants, which is Appendix D of the EIR. Impacts on freight were analyzed based on a characterization of existing conditions and future conditions with and without the Proposed Project.

Project Variant 1 would not change transportation impacts during operations because it would not change normal train service operations and thus it is not discussed below. During construction Project Variant 1 would have less OCS construction and less construction traffic overall. Construction of PS7 would occur near Alma Avenue in San Jose and thus construction traffic would shift from near Kurte Park to near Alma Avenue, but this would not substantially change construction traffic impacts (Mitigation Measure TRA-1a would still apply). Thus, Project Variant 1 would not change the impact analysis described below for the Proposed Project and is not discussed further in this section.

3.14.1 Existing Conditions

3.14.1.1 Regulatory Setting

The Proposed Project falls within the purview of several key state and regional long-range transportation plans, and local general plans. This section describes the regulatory framework of these plans, including the status of implementation. Some of the plans are still in progress and not yet fully adopted.

State and Regional Plans

California Transportation Plan 2025/2030

The *California Transportation Plan* (CTP) 2025 was adopted in 2006 and updated in 2007. The CTP, overseen by the California Department of Transportation (Caltrans), serves as a blueprint for California's transportation system defined by goals, policies, and strategies to meet the State's future mobility needs. The goals defined in the plan fall into three categories: social equity, prosperous economy, and quality environment. Each goal is tied to performance measures. In turn, members from regional and metropolitan planning agencies report to Caltrans these performance measures. The CTP 2030 Addendum updated the CTP 2025, to comply with the Safe, Accountable, Flexible, Efficient, Transportation Equity Act – A Legacy for Users (SAFETEA-LU). This federal law authorized transportation funding through 2009 and established new requirements for statewide and metropolitan transportation planning. Caltrans is presently working on an update of the CTP that would extend to 2040.

Plan Bay Area

Plan Bay Area is the San Francisco Bay Area's plan to meet the requirements of Senate Bill 375, which was signed into law in 2008. The law requires each of the state's metropolitan planning organizations (MPOs) to develop a Sustainable Communities Strategy (SCS) aimed at reducing greenhouse gas (GHG) emissions from passenger vehicles. *Plan Bay Area* is overseen by the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG). It serves as the region's SCS and the 2040 Regional Transportation Plan integrating transportation and land-use strategy to manage GHG emissions and plan for future population growth. In July 2013, *Plan Bay Area* was adopted by ABAG and the MTC. The Proposed Project and the San Francisco Downtown Extension (DTX) are two ~~is one~~ of the major projects included in *Plan Bay Area*.

California Public Utilities Commission General Orders

As described in Section 3.13, *Public Services and Utilities*, the California Public Utilities Commission (CPUC) has safety and security regulatory authority over all transit agencies in California. ~~The CPUC's Rail Transit Safety Section focuses on verification of the system safety and security plans of each rail transit agency to ensure these plans meet all state and federal rules and regulations.~~ According to the CPUC, an electrified Caltrain system falls under the rules and regulations governed by the Commission's Electric Safety and Reliability Branch (ESRB), Rail Operations and Safety Branch (ROSB) and Rail Crossings Engineering Section (RCES).

Rules established by the CPUC are called General Orders (GOs). The following GOs are related to rail transit safety and security (California Public Utilities Commission 2013).

- **GO 26-D:** Clearances on Railroads and Street Railroads as to Side and Overhead Structures, Parallel Tracks and Crossings. This order is relevant to providing physical clearances around railroad tracks and operations.
- **GO 72-B:** Construction and Maintenance. This order is relevant to providing standard types of pavement construction at railroad grade crossings.
- **GO 75-D:** Warning Device Requirements. This order is relevant to providing regulations governing standards for warning devices for at-grade highway-rail crossings.
- **GO 88-B:** Modification of Railroad Crossings. This order is relevant to providing rules for altering public highway-rail crossings.
- **GO 95:** Overhead Electric Line Construction. This order is relevant to providing electrical clearances around overhead lines. However, this order does not provide any specific guidance for 25 kVA systems proposed for use for the Proposed Project.
- **GO 118-A:** Construction, Reconstruction and Maintenance of Walkways, and Control of Vegetation adjacent to Railroad Tracks. This order is relevant to providing safe access and vegetation control.

The CPUC initiated new rule-making (13-03-009) in 2013 pursuant to Petition 12-10-011 concerning a new GO governing safety standards for the use of 25 kVA electrical lines to power high speed trains. The rules are intended to establish uniform safety requirements governing the design, construction, operation, and maintenance of 25 kVA overhead contact system (OCS), which is to be constructed for the operation of high-speed trains in California. CPUC meetings on this GO has resulted in discussions about the GO being specific to a fully grade-separated dedicated high-speed rail system. The draft GO addresses performance requirements, clearances and protection against electric shock, grounding and bonding, strength requirements, safe working practices, and reporting requirements. Because the OCS for the Proposed Project would be used in the future by both Caltrain and high-speed rail, some of the issues addressed in the draft GO may apply to the Proposed Project OCS. It also appears additional CPUC rule-making proceedings would be needed for the Proposed Project because it would not be a fully grade-separated ~~-~~dedicated ~~shared~~ system. As the draft GO proceeds through rule-making, JPB will coordinate with CPUC concerning the potential applicability of the GO to the Proposed Project and will consider ~~apply~~ any requirements in the adopted order (as well as additional requirements to be determined) during the final design of the Proposed Project.

Local Plans and Regulations

General Plans and Specific Plans

General plans and specific plans prepared by the local municipalities include specific goals, policies, and actions designed to maintain acceptable roadway traffic operations, reduce vehicle traffic, and maintain acceptable services for transit, pedestrian, and bicycle facilities within the jurisdiction of the municipalities. General plans and specific plans in the project area are discussed in Section 3.10, *Land Use and Recreation*, Appendix D, *Transportation Analysis*, and Appendix H, *Land Use Information*.

Station Area and Downtown Plans

A number of downtown and station area plans near Caltrain stations in the project area have been adopted or implemented in the past decade, or are currently in-progress. In general, these plans are overseen by municipalities along the Caltrain corridor. Appendix D details station area and downtown area plans completed since 2005 or currently in-progress. Some station area plans involve both public and private involvement or investment. In addition, some plans are part of the Grand Boulevard Initiative, a multi-jurisdictional, regional planning effort focused on the El Camino Real Corridor from San Francisco to San Jose (Grand Boulevard Initiative 2013). The Grand Boulevard initiative is currently in-progress.

Caltrain Plans and Policies

Caltrain has several plans relevant to this impact analysis which are described below

Caltrain Comprehensive Access Policy Program Statement

Caltrain adopted its *Comprehensive Access Program Policy Statement* in May 2010. The access guiding principles are as follows (Caltrain 2010):

- Increase access capacity to support ridership growth.
- Prioritize sustainable ("green") access.
- More effectively manage land and capital assets.
- Prioritize cost-effective access modes.
- Enhance customer satisfaction.
- Solidify partnerships to implement improvements.

Based on these guiding principles, the system-wide access mode of transportation priority is as follows: (1) Walk; (2) Transit; (3) Bike; and (4) Auto.

While the overall focus of capital investments at the system-wide level support walking, riding transit and bicycling, access mode prioritization at the station level will need to vary. Land uses and densities around the Caltrain stations vary from urban to suburban. Access strategies in an urban station area will differ from that of a suburban station area. Caltrain's access program prioritizes alternative modes of access at Transit Center stations (such as the San Francisco 4th and King Station), Intermodal Connectivity stations (such as the Millbrae Station), and Neighborhood Circulator stations (such as the Menlo Park Station) and auto access at auto-oriented stations (such as the Tamien Station). Transportation investments need to be tied to land use decisions to result in context-sensitive solutions and maximize return on investment.

The *Comprehensive Access Program Policy Statement* requires the development of an Access Strategic Plan and a Capital Improvement Plan as the next steps in developing a comprehensive access program. The following are example access strategies by mode. They are the types of capital investments that can be made throughout the Caltrain system to shift ~~our~~ the access mode of transportation away from auto to walk, transit and bike. These strategies are considered in the development of Caltrain's Access Strategic Plan and the Capital Investment Plan, the next key steps in developing the Comprehensive Access Program.

- All Modes: real-time information; signage/ wayfinding; lighting; security; universal design (Americans with Disabilities Act (ADA) requirements); pedestrian/bicycle crossing signal priority; demand-based pricing strategies; and inviting public spaces;
- Walk: transit-oriented development (TOD); direct circulation; platform circulation management; traffic controls; traffic calming; timed transfers; transit; enhanced service frequency and capacity; platform proximity; and bike routes/lanes/paths.
- Bike: on-board accommodations; bike parking and stations; E-lockers; and bike sharing
- Auto: reserved parking; shared parking; car sharing; dedicated drop-off spaces (kiss-n-ride, taxis, ADA); and parking fees/permits.

Caltrain Bicycle Access and Parking Plan

The *Caltrain Bicycle Access and Parking Plan* complements Caltrain's bikes on board program. The *Caltrain Bicycle Access and Parking Plan* (Caltrain 2008) proposes to increase the number of passengers who bicycle to Caltrain stations by making improvements to access bike parking throughout the system. The plan identifies specific improvements at the top 10 stations which account for 75 percent of the system's cyclist-passenger volumes: San Francisco, 22nd Street, Millbrae, Hillsdale, San Mateo, Redwood City, Palo Alto, Mountain View, Sunnyvale and San Jose Diridon. The plan also prescribes system-wide guidelines and best practices for improving bicycle facilities throughout the Caltrain system.

Caltrain's strategy is to provide a range of options to accommodate passengers' various needs for the bicycle portion of their Caltrain trip. Plan recommendations include:

- Cyclist-specific customer service and marketing.
- Cyclist focused safety and security improvements.
- Increasing overall bicycle parking supply.

- Providing a mix of bike parking for different user needs.
- Improving station access for passengers with bikes.
- Working with cities to improve station bike access.
- Studying innovative station-side concepts such as real-time bicycle capacity information, bike sharing, and subsidies for folding bikes.

The *Caltrain Bicycle Access and Parking Plan* contains Bicycle Parking and Access Guidelines to supplement existing Caltrain Design Criteria and Standards. Plan recommendations are implemented based on the timing of available funding.

3.14.1.2 Environmental Setting

This section presents an assessment of the existing conditions in the study area, and provides a basis for the assessment of future transportation conditions. All data and analysis presented is for the existing conditions in 2013, unless specified otherwise.

Study Area

Caltrain provides inter- and intra-county commuter rail service to the San Francisco Bay Area between San Francisco and Gilroy. The entire Caltrain corridor is divided into six fare zones. The 51-mile project corridor, bounded by the 4th and King Station in San Francisco and the Tamien Station in San Jose, has 24 weekday stations (27 total stations including Broadway in Burlingame, Atherton, and Stanford) across four fare zones (each zone is about 13 miles in length) along the Caltrain right-of-way (ROW). The Caltrain corridor continues south of the Proposed Project area to Gilroy, including two additional fare zones and five additional stations providing limited peak period, peak direction service. Table 3.14-1 displays Caltrain stations within the Proposed Project boundary and the jurisdictions in which these stations are located. Figure 3.14-1 displays the study area geographic boundaries, stations, and zone boundaries.

The study area for transportation and traffic analysis considers roadway, transit, bicycle, and pedestrian facilities that would be affected by Proposed Project operation. These facilities consist of Caltrain stations within the project boundary, regional transit systems that provide connecting service to Caltrain stations, freeways and arterial roads that runs parallel or perpendicular to the project corridor, and intersections and local roadways in the vicinity of Caltrain stations and at-grade crossings.

Existing Transit Conditions

This section summarizes the existing Caltrain transit system and other regional and local transit systems that connect to Caltrain stations.

Caltrain Service and Schedule

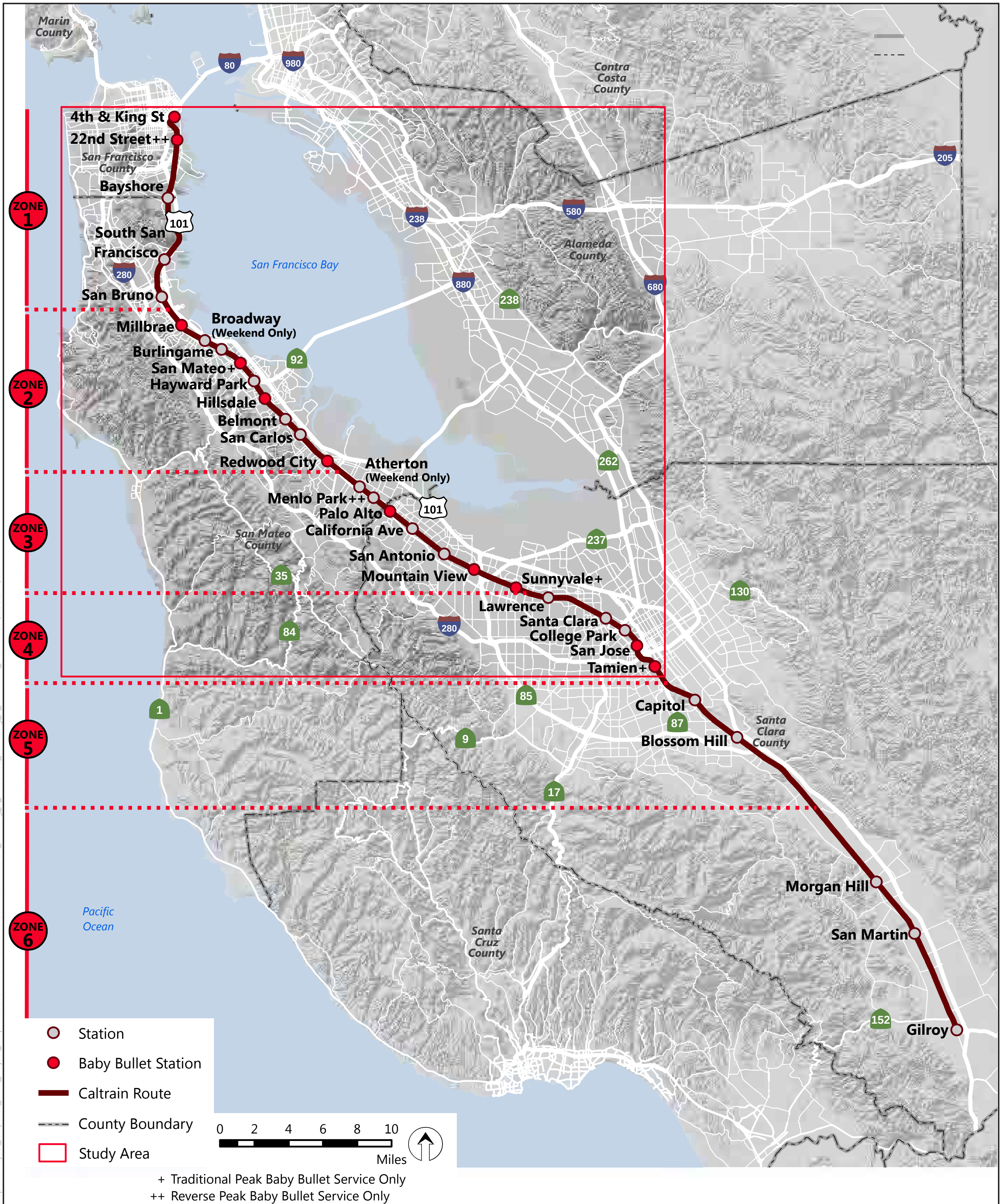
The JPB operates Caltrain 365 days a year with reduced schedules on major U.S. holidays. The current Caltrain operating schedule consists of 92 trains each weekday, 36 trains on Saturdays, and 32 trains on Sundays. On weekdays, three of these trains start in Gilroy during the morning commute period, and three terminate in Gilroy during the evening commute period. On Saturdays and Sundays, trains run between San Jose (Diridon) and San Francisco only.

Table 3.14-1. Caltrain Stations and Jurisdictions in Study Area

County	City	Caltrain Stations[a]
San Francisco	San Francisco	**4th and King** **22nd Street** ~~Bayshore~~
	Brisbane	Bayshore
San Mateo	South San Francisco	South San Francisco
	San Bruno	San Bruno
	Millbrae	**Millbrae**
	Burlingame	Broadway[b] Burlingame
	San Mateo	**San Mateo** Hayward Park **Hillsdale**
	Belmont	Belmont
	San Carlos	San Carlos
	Redwood City	**Redwood City**
	Atherton	Atherton[b]
	Menlo Park	**Menlo Park**[c]
Santa Clara	Palo Alto	**Palo Alto** Stanford[d] California Avenue
	Mountain View	San Antonio **Mountain View**
	Sunnyvale	**Sunnyvale** Lawrence
	Santa Clara	Santa Clara
	San Jose	College Park **San Jose Diridon** **Tamien**

Source: Appendix D, *Transportation Analysis*
[a] Stations with Baby Bullet service are displayed in **bold**.
[b] There is no current weekday service to Broadway or Atherton Stations at present, only weekend service. Weekday service would be restored to these stations with the Proposed Project.
[c] Baby Bullet service is provided in the ~~reverse~~ commute direction only.
[d] The Stanford Station is only used for special events, such as Stanford football games.

Weekday trains are a mix of Baby Bullets, Limited, and Local trains. Weekend service is a mix of weekend Baby Bullets and Local trains, with two Baby Bullet trains in each direction per day. Baby Bullet express service trains make the trip between San Francisco and San Jose in less than 1-hour. Table 3.14-2 shows the stations with Baby Bullet service in the study area. Local trains are operated at the shoulders of peak periods and serve to transition the service from peak to off-peak. Local trains stop at almost all stations between the San Jose Diridon Station and the San Francisco 4th and King Station, resulting in the longest travel times of all service types. Limited-stop trains operate as skip-stop for one-half of the route and as local trains for the other half, resulting in slightly faster travel times than Local trains.



Source: Fehr and Peers 2014.

Figure 3.14-1
Project Study Area
Peninsula Corridor Electrification Project

Scheduled headways[1] vary by time of day, station, and service type. During the AM and PM peak periods, all bullet stations are served by at least one Baby Bullet train per hour with headways ranging between 15 to 60 ~~30~~ minutes. The higher frequency bullet stations, including San Francisco 4th and King, Palo Alto, and San Jose Diridon, run at least two Baby Bullet trains per hour. Non-bullet stations operate Limited and Local trains at headways ranging from 30 minutes to 60 minutes during peak periods. During off-peak periods (early morning, midday, and after 7:00 p.m.), headways at all stations are generally about 60 minutes.

Caltrain Travel Time

Table 3.14-2 displays average travel times by service type and direction in the study area. Travel times for northbound and southbound directions are calculated between the Tamien or San Jose Diridon Station and the San Francisco 4th & King Station. Because Baby Bullet trains and Limited trains only stop at select stations, travel times on these trains are shorter than Local train travel times. Compared with Local trains, a passenger on a Baby Bullet can cut his/her travel time by about one-third.

Table 3.14-2. Average Caltrain Travel Time Between San Francisco and San Jose (2013)

	Average Travel Time in Minutes	
Service Type	Northbound	Southbound
Local	92	92
Limited	84	82
Baby Bullet	60	63
Source: Appendix D, *Transportation Analysis*		

When making travel choices, passengers often weigh factors such as the time- and cost-competitiveness of the modes available to them. Overall, Caltrain is faster than automobile for most southbound trips. For northbound trips, travel by automobile can be faster than Caltrain depending on specific origins and destinations. However, travel times may vary by origin-destination station pair and route. In addition, travel times by automobile are highly variable because of traffic conditions affected by weather, accidents and collisions, time of day, travel direction, and season.

Caltrain Ridership and Travel Patterns

Caltrain has experienced steady ridership growth since 2005. From 2012 to 2013, ridership increased by about 11 percent, which was in-step with job growth, as the region continued to recover from the great recession. In 2013, Caltrain carried approximately 47,000 passengers on a typical weekday. Table 3.14-3 displays the top ten stations with the highest number of average weekday ridership (AWR). The number of daily boardings at the San Francisco 4th and King Station is almost twice the number of daily boardings at the Palo Alto Station.

It should be noted that this EIR uses daily boardings as the measurement of ridership. A daily boarding is one individual using the train for a trip and is reported at the origin boarding station. A different convention for reporting station ridership is to use boardings and alightings (alightings are when one gets off the train at the end of the trip). Each trip includes one boarding (at the origin station) and one alighting (at the destination). The number of boardings plus alightings overall is

[1] The time between arrivals of trains moving in the same direction at a station.

double the number of boardings overall. Nominally, as most riders complete round trips on Caltrain, the amount of boardings and alightings at a station is double the amount of boardings.

Table 3.14-3. Top Ten Stations for Average Weekday Ridership (2013)

Station	Total Average Weekday Ridership
4th and King	10,786
Palo Alto	5,469
Mountain View	3,876
San Jose Diridon	3,489
Millbrae	3,255
Redwood City	2,619
Hillsdale	2,317
Sunnyvale	2,274
San Mateo	1,571
Menlo Park	1,526

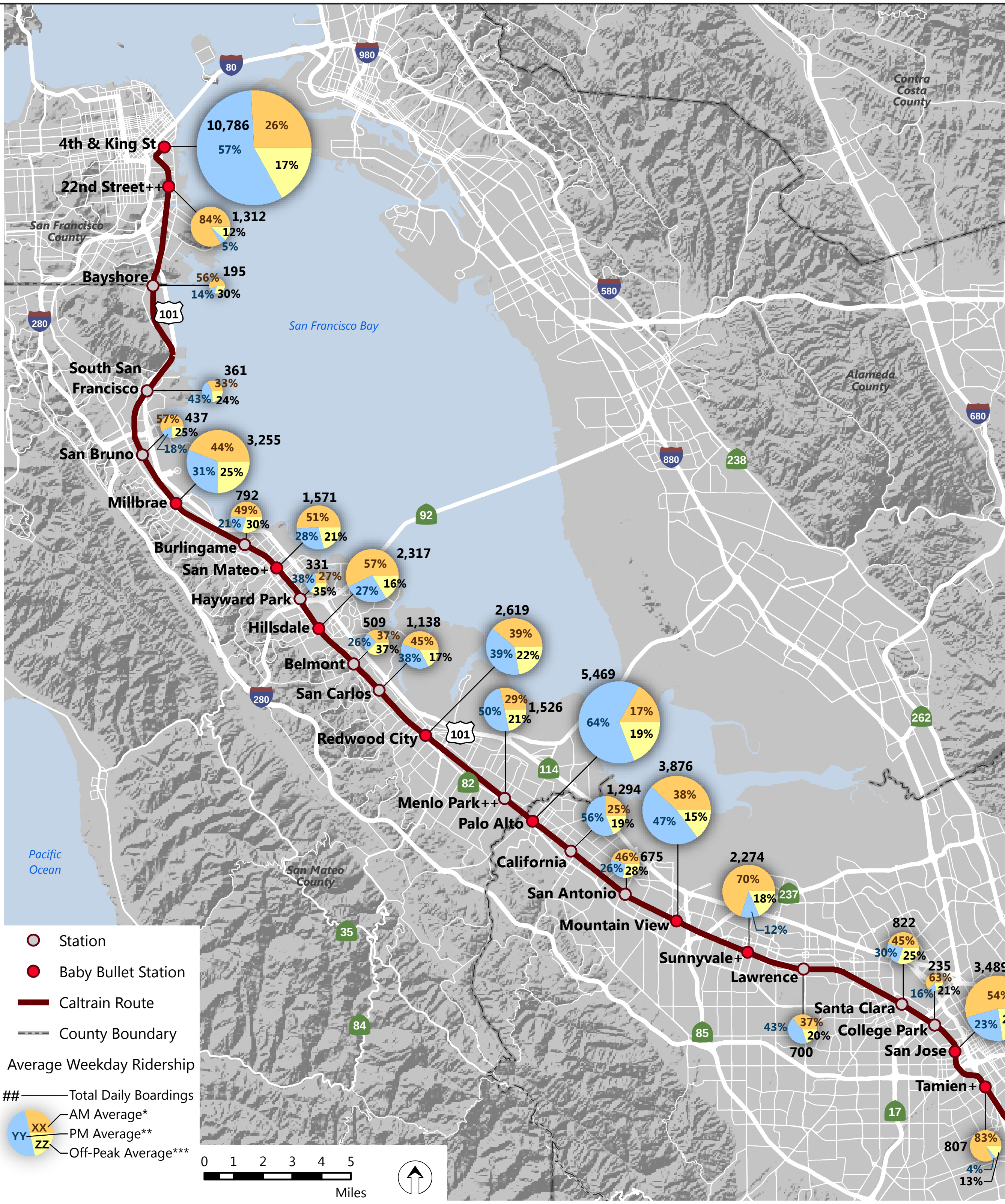
Sources: Caltrain 2013b; Appendix D, *Transportation Analysis*.

Weekday travel along the Caltrain corridor is characterized by interregional trips that primarily occur during the AM and PM peak periods. Weekday boardings between 6:30 and 10:30 a.m. constitute the AM peak period and PM trips between 4:00 and 8:00 p.m. constitute the PM peak period. The proportion of AM and PM passengers at each station varies. In the AM peak, the northbound ridership is larger than the southbound ridership. Off-peak midday ridership is more than twice as large as the off-peak evening ridership. However, neither off-peak ridership is close to the combined passenger volume traveling north and south in the study area during the AM and PM peak periods. Figure 3.14-2 displays the average weekday ridership by time of day by station.

The trip purpose of the majority of weekday Caltrain passengers is commuting, or travel for work, which is about 74 percent of the AWR, followed by the social/recreational trips (14 percent), school trips (8 percent), shopping/personal trips (3 percent), and airport trips (1 percent). The main trip purposes of Caltrain passengers are displayed in Figure 3.14-3.

Caltrain passengers use a range of modes to travel from their origin location to their origin station at the beginning of their trip. Morning and evening access modes vary depending on the activities and errands a passenger may engage in after alighting at a Caltrain station. In general, most trips in the morning are between a person's place of residence and work. In the evening, this pattern reverses, but a passenger may not travel directly home from a station. Instead, they may engage in "trip chaining" or a series of trips before reaching home, their final destination (McGuckin & Murakami 1999). This can also occur in the morning, especially if a person has younger children and must drop them off at school or daycare on the way to a Caltrain station. Trip chaining, in turn, can influence a passenger's travel mode choice.

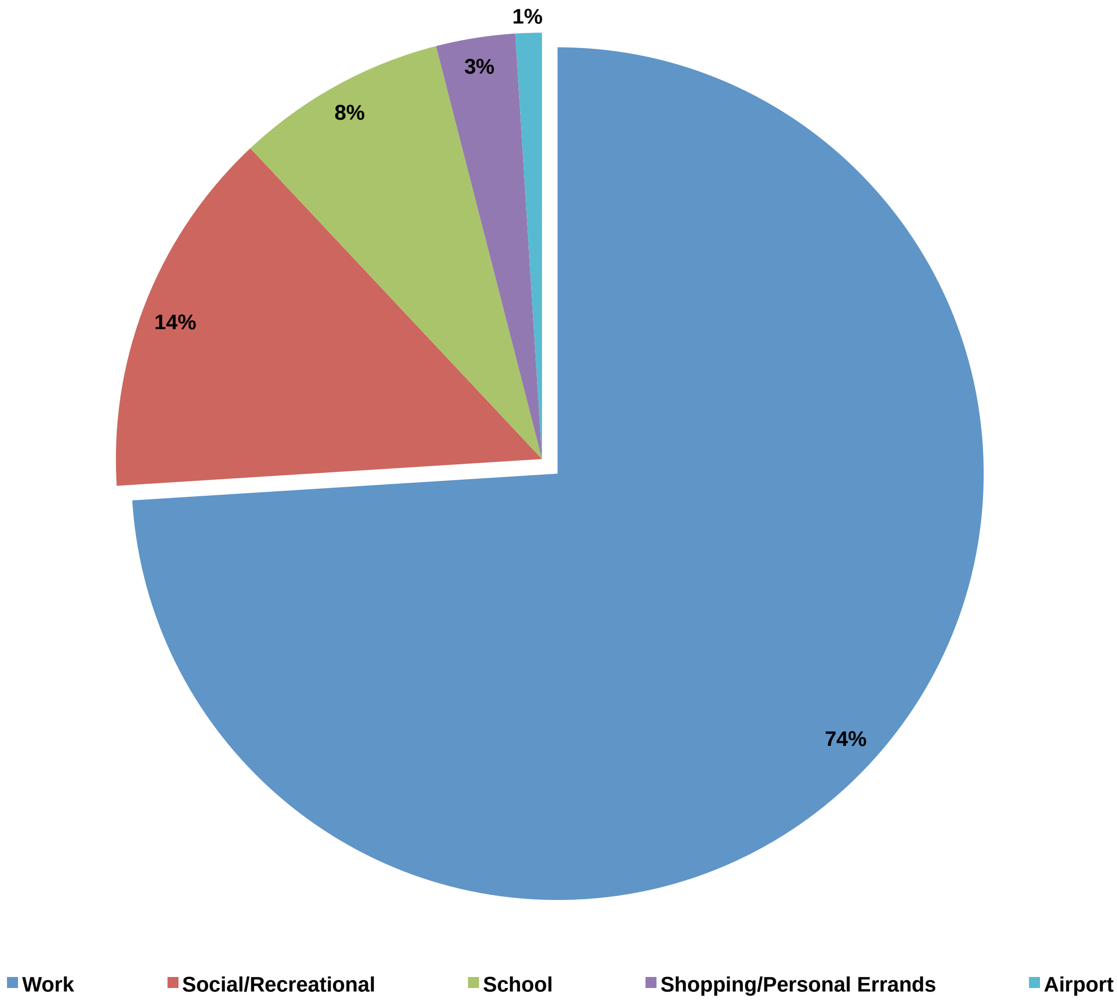
Travel mode share data was derived from the 2013 Caltrain Station Intercept Survey, conducted in June 2013 at 23 Caltrain stations during the weekday morning commute period (6:30 a.m. to 10:30 a.m.). Although the survey was conducted in the morning, the interviewers asked passengers questions about each passenger's return trip, which typically occurs during PM peak periods. Based on the survey at the Caltrain stations, the overall daily modes of access to Caltrain stations are estimated and shown in Figure 3.14-4.



+ Traditional Peak Baby Bullet Service Only
++ Reverse Peak Baby Bullet Service Only
* AM peak period boardings occur between 6:30 AM to 10:30 AM
** PM peak period boardings occur between 4:00 PM to 8:00 PM
*** Off-peak boardings occur between 5:00 AM to 6:29 AM, 10:30 AM to 3:59 PM, and 8:01 PM to 1:32 AM

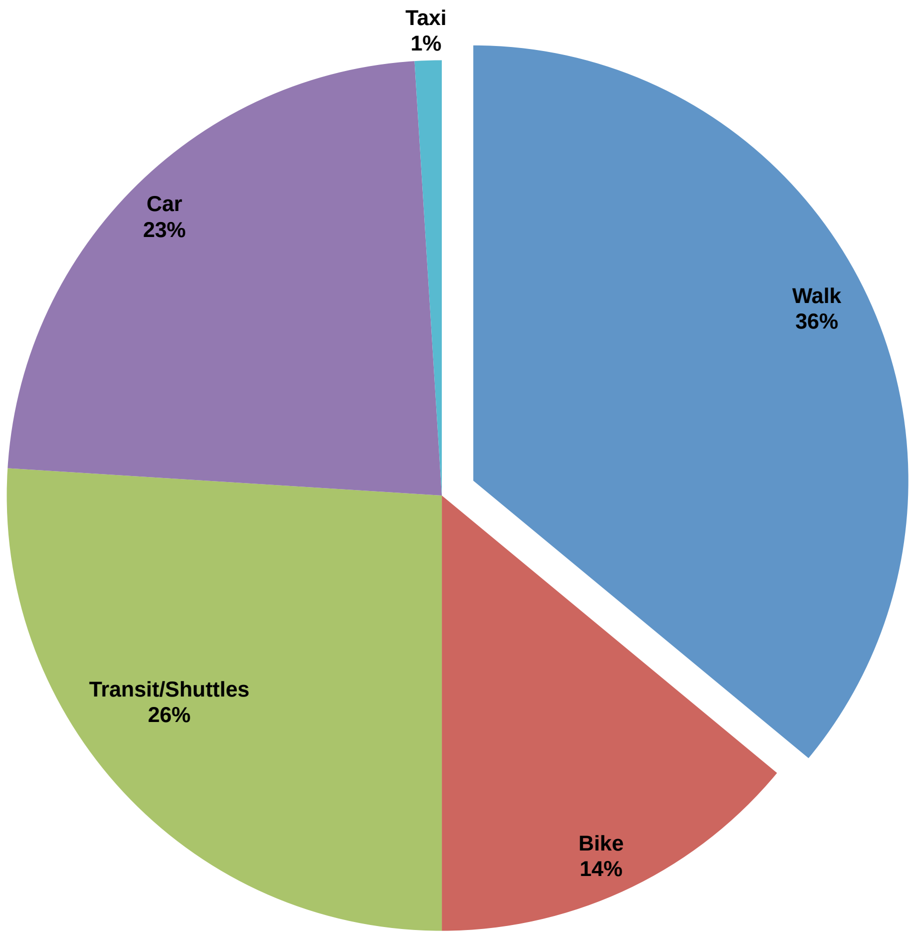
Source: Fehr and Peers 2014.

Figure 3.14-2
Average Weekday Ridership by Station (2013)
Peninsula Corridor Electrification Project



Source: Fehr & Peers 2014

Figure 3.14-3
Trip Purposes of Caltrain Passengers (2010)
Peninsula Corridor Electrification Project



Source: Fehr & Peers 2014

Figure 3.14-4
Daily Mode of Access to Caltrain Stations (2013)
Peninsula Corridor Electrification Project

The top daily access mode for Caltrain passengers traveling to stations is walking (36 percent). The high mode share for walking indicates that a high volume of passengers live or work within reasonable walking distance of their origin station. Travel by transit or public/private shuttle is the second most popular access mode (26 percent) followed by car (23 percent) and bicycle (14 percent). The car mode includes passengers who drove alone, passengers who were dropped off at the station or carpooled, and motorcycle and scooter riders. Of the 23 percent of passengers who accessed Caltrain by car, about 13 percent of passengers drove alone, 8 percent of passengers were dropped off, and 1 percent of passengers carpooled. The majority of Caltrain cyclists bring their bicycles on-board rather than parking their bicycle at their origin station. About 13 percent of passengers bring their bicycles on-board compared with only 1 percent who store their bicycles in lockers, racks, or shared bicycle storage at or near stations.

Figure 3.14-5 displays the modes of access for AM and PM peak passengers by stations. The top mode of access for Caltrain passengers traveling to stations in the AM peak period is driving alone (26 percent). In contrast, the top access mode for PM passengers is walking (48 percent). Walking is the second most popular mode for AM passengers. Driving is generally more popular in the morning, than the evening, with driving alone, kiss-and-ride, and carpooling. Kiss-and-ride is generally describes passengers who are dropped off at a station by car. Passengers who drove alone or carpooled, also referred to as park-and-ride, generally park their car at or near the station. Bicycle usage, both parked and on-board, is even for both time periods.

The travel mode of egress a passenger uses on the destination side of their trip can differ from the mode of access they used at the start of their trip. Mode of egress is the mode a passenger makes use of at their destination station to reach their final destination point, such as a place of work or a shopping center. On average, walking is the most common mode of egress across all stations. Overall, park-and-ride and kiss-and-ride are not as common as other modes of egress.

Regional Transit System

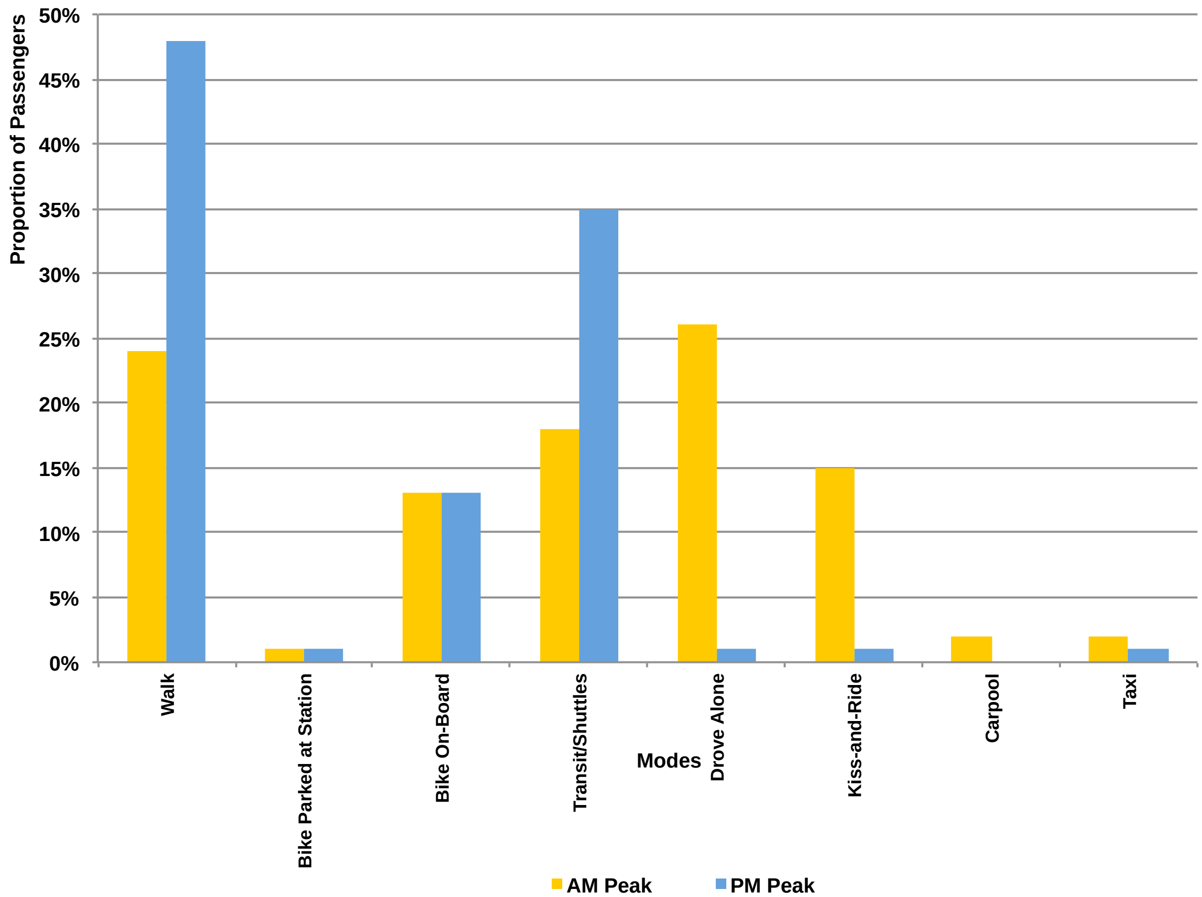
The greater San Francisco Bay Area is served by an extensive public transit network of rail, buses, and ferries. In general, Caltrain is well connected with the regional transit network, offering public transit connecting service to other service providers or public and private shuttles at all stations within the study area. Table 3.14-4 summarizes the service area of all transit systems that currently connect to a Caltrain station within the project area. Figures in Appendix D show all bus and rail systems connected to Caltrain in the project area.

Caltrain system is connected to the following bus transit systems:

- **San Mateo County Transit District (SamTrans)**: SamTrans operates 73 bus routes and paratransit service throughout San Mateo County and parts of San Francisco and Palo Alto. SamTrans buses, including the KX Express and Route ECR along El Camino Real between Palo Alto and Daly City connect to a number of Caltrain stations throughout the project area.
- **MUNI:** MUNI is operated by the San Francisco Municipal Transportation Agency (SFMTA), which oversees all light rail and bus service, bicycle and pedestrian program, taxis, parking, and traffic control operations in the City and County of San Francisco. The MUNI bus system consists of approximately 65 local and express routes. A number of MUNI Metro ~~light rail~~ and bus routes connects to the 4th and King, 22nd Street, and Bayshore Caltrain Stations.

1 **Table 3.14-4. Weekday Transit Connections by Stations (2013)**

Station	Station Address	Transit Connections (Provider, Route)
4th & King	700 4th Street, San Francisco, CA 94107	MUNI Bus: 10, 30, 45, 47, 80X, 81X, 83X, 91 owl, T owl, N owl MUNI Metro ~~Light Rail~~: N-Judah, T-Third Public Shuttles: Amtrak Shuttle
22nd Street	1149 22nd Street, San Francisco, CA 94107	MUNI Bus: 10, 22, 48 MUNI Metro ~~Light Rail~~: T-Third
Bayshore	400 Tunnel Avenue, ~~San Francisco~~ Brisbane, CA 94134	MUNI Bus: 8X, 8AX, 8BX, 9, 56 MUNI Metro ~~Light Rail~~: T-Third SamTrans: 292 Public Shuttles: Bayshore/Brisbane Senior shuttle, Bayshore/Brisbane Commuter Shuttle
South San Francisco	590 Dubuque Avenue, South San Francisco, CA 94080	SamTrans: All services are separated by bridges, etc. from Caltrain station Public Shuttles: Oyster Point, Utah-Grand
San Bruno	297 Huntington Avenue, San Bruno, CA 94066	SamTrans: not close and El Camino Real (where buses run) is 0.25 mile away Public Shuttles: Bayhill San Bruno Shuttle
Millbrae Transit Center	100 California Drive, Millbrae 94030	SamTrans: 397 BART: Richmond Line, Pittsburg/Bay Point (includes connection San Francisco International Airport) Public Shuttles: Broadway/Millbrae, Burlingame Bayside Area, North Burlingame, North Foster City, Sierra Point
Burlingame	290 California Drive, Burlingame, CA 94010	SamTrans: 46, 292 Public Shuttle: Burlingame Trolley
San Mateo	385 First Avenue, San Mateo, CA 94401	SamTrans: 250, 292, 295, 59
Hayward Park	401 Concar Drive, San Mateo, CA 94402	SamTrans: 53, 292, 397 (but not close to station) Public Shuttles: Norfolk
Hillsdale	3333 El Camino Real, San Mateo, CA 94403	SamTrans: ECR, KX, 57, 250, 251, 262, 292, 294, 295, 397, AC Transit: M Public Shuttles: Belmont–Hillsdale, Campus Drive, Lincoln Centre, Mariners Island/PCA, Oracle, Foster City Connections
Belmont	995 El Camino Real, Belmont, CA 94402	SamTrans: ECR, KX, 67, 260, 261, 262, 397, 398 Public Shuttles: Belmont–Hillsdale
San Carlos	599 El Camino Real, San Carlos, CA 94070	SamTrans: ECR, KX, FLXS, 260, 261, 295, 397, 398 Public Shuttles: Electronic Arts, Oracle, Redwood Shores (Bridge Park), Redwood Shores (Clipper)
Redwood City	1 James Avenue, Redwood City, CA 94063	SamTrans: ECR, KX, 270, 274, 275, 276, 278, 296, 297, 397, 398 Public Shuttles: Pacific Shores
Menlo Park	1120 Merrill Street, Menlo Park, CA 94025	SamTrans: ECR, 85, 286, 296 Public Shuttles: Marsh Road, Willow Road
Palo Alto	95 University Avenue, Palo Alto, CA 94301	SamTrans: ECR, 280, 281, 297, 397 VTA Bus: 22, 35, 522 AC Transit: U, Dumbarton Express Public Shuttles: Deer Creek, Stanford Marguerite, Crosstown/Embarcadero, East Palo Alto Community



Source: Fehr & Peers 2014

Figure 3.14-5
AM and PM Peak Mode of Access by Stations (2013)
Peninsula Corridor Electrification Project

Station	Station Address	Transit Connections (Provider, Route)
California Avenue	780 Stockton Avenue, San Jose, CA 95126	VTA Bus: 22, 89, 522 AC Transit: Dumbarton Express Public Shuttles: Deer Creek, Stanford Marguerite
San Antonio	190 Showers Drive, Mountain View, CA 94040	VTA Bus: 32, 34, 35, 40 Public Shuttles: Deer Creek, Stanford Marguerite
Mountain View	600 W. Evelyn Avenue, Mountain View, CA 94041	VTA Bus: 34, 35, 51, 52, 902 VTA Light Rail: Mountain View–Winchester Public Shuttles: Duane Avenue, Mary/Moffett, North Bayshore, Shoreline
Sunnyvale	121 W. Evelyn Avenue, Sunnyvale, CA 94086	VTA Bus: 32, 53, 54, 55, 304
Lawrence	137 San Zeno Way, Sunnyvale, CA 94086	Public Shuttles: Bowers–Walsh, Duane Avenue, Mission
Santa Clara	1001 Railroad Avenue, Santa Clara, CA 95050	VTA Bus: 10, Airport Flyer, 22, 32, 60, 81, 522 ACE
College Park	780 Stockton Avenue, San Jose, CA 95126	VTA Bus: 22, 61, 62, 522
San Jose Diridon	65 Cahill Street, San Jose, CA 95110	ACE Amtrak: Coast Starlight Capital Corridor VTA Bus: 22, 63, 64, 65, 68, 81, 180, 181, 522 VTA Light Rail: Mountain View–Winchester Santa Cruz METRO: Highway 17 Express MST: 55 Public Shuttles: DASH (Downtown Area Shuttle)
Tamien	1355 Lick Avenue, San Jose, CA 95110	VTA Bus: 25, 82 VTA Light Rail: Ohlone/Chynoweth–Almaden, Alum Rock–Santa Theresa

Source: Appendix D, *Transportation Analysis*

- **Santa Clara Valley Transportation Authority (VTA):** VTA provides light rail, bus, and paratransit service to the municipalities in Santa Clara County. In addition, VTA is the congestion management agency for Santa Clara County, responsible for countywide transportation planning and funding and for managing the county's congestion reduction and air quality improvement. A number of VTA bus routes, including express routes, connect to Caltrain stations within Santa Clara County.
- **Alameda-Contra Costa (AC) Transit:** AC Transit provides bus and paratransit services to 13 cities and adjacent unincorporated areas in Alameda and Contra Costa Counties. AC Transit operates 116 bus lines, including rapid services and transbay lines that traverse the San Francisco-Oakland Bay Bridge. AC Transit connects to Caltrain via the "M" bus line at the Hillsdale Station, the "U" line at the Palo Alto Station, and the Dumbarton Express at the Palo Alto and California Avenue Stations.
- **Santa Cruz Metropolitan Transit District (Santa Cruz METRO):** The Santa Cruz METRO operates about 30 bus routes year-round to Santa Cruz County. Caltrain passengers can travel to

Santa Cruz via the Highway 17 Express route from the San Jose Diridon Station. In addition to stopping in downtown Santa Cruz, the route also stops in Scotts Valley and Soquel.

- **Monterey-Salinas Transit (MST):** MST operates 59 bus routes in Monterey and southern Santa Cruz Counties. MST bus routes 55 and 79 connect to Caltrain at the San Jose Diridon Station.
- **Public and Private Shuttle Connections:** Shuttles connecting to Caltrain stations include transportation services that are publically or privately provided by transit agencies, community organizations, employers, and academic and cultural organizations. Most public shuttles operate fixed routes between Caltrain stations and employment sites. Private employer-provided regional shuttles provide direct service to employment sites from either residential neighborhood stops or from major transit hubs, including Caltrain stations. Currently, the Palo Alto Station experiences the highest frequency of public and private shuttles with about 75 shuttles each morning, followed by the Millbrae Station (51 shuttles), and the Mountain View Station (37 shuttles).

Caltrain is also connected to the following rail transit systems:

- **San Francisco Bay Area Rapid Transit (BART):** BART provides rail transit service to the cities in the northern portion of the San Francisco Peninsula, Oakland, Berkeley, Fremont, Walnut Creek, Dublin, Pleasanton, and other cities in the East Bay. Of the five BART lines, Caltrain connects directly to two at the Millbrae Station: the Richmond line and the Pittsburg/Bay Point line. The Pittsburg/Bay Point line includes a connection to San Francisco International Airport. BART passengers can also connect to the San Francisco 4th and King Station via MUNI Metro ~~light rail~~ and bus service.
- **MUNI Metro ~~Light Rail~~:** The MUNI Metro ~~light~~ rail system is a mixture of above- and below-ground service consisting of nine routes serving residential areas and the financial district in San Francisco. A number of MUNI Metro ~~light rail~~ and bus routes connects to the San Francisco 4th and King, 22nd Street, and Bayshore Stations.
- **Altamont Commuter Express (ACE) Commuter Rail:** ACE provides passenger rail service across the Altamont corridor, spanning San Jose to Stockton. ACE trains connect to Caltrain at the Santa Clara and San Jose Diridon Stations.
- **VTA Light Rail:** Of VTA's three light rail lines, two connect to Caltrain stations: The Mountain View–Winchester line at the Mountain View and San Jose Diridon Stations, and Ohlone/Chynoweth–Almaden line at the Tamien Station.
- **Amtrak:** In the San Francisco Bay Area, one Amtrak rail route (Coast Starlight) connects to Caltrain at the San Jose Diridon Station. The Coast Starlight connects the San Francisco Bay Area to Seattle and Los Angeles. In addition, Amtrak Thruway bus service at the San Francisco 4th and King Station connects Caltrain passengers to the closest Amtrak stations in Oakland and Emeryville.
- **Capital Corridor:** The Capital Corridor provides intercity passenger rail service to Sacramento, Oakland, and San Jose. Amtrak Thruway bus provides connections to nearby cities. Commuters traveling on Capitol Corridor trains from Sacramento and the East Bay can connect to Caltrain at the Santa Clara and San Jose Diridon Stations. The Capital Corridor is managed by the Capitol Corridor Joint Powers Authority (CCJPA), a partnership of six local transit agencies in the eight-county service area. BART provides daily management support to the CCJPA, and trains are operated by Amtrak.

Existing Traffic Conditions

Roadway System

The Caltrain corridor within the study area runs parallel to major north-south oriented freeways, Interstate (I)-280 and U.S. Highway 101 (US 101). East-west oriented freeways in the study area include I-380 and I-880. Figure 3.14-1 displays the major freeways within the study area. Table 3.14-5 lists major freeways and arterials in study area.

Table 3.14-5. Major Freeways, Expressways, and Arterial Streets in Study Area

County	Orientation	Name	Classification	Extent within Study Area
San Francisco	North-South	U.S. Highway 101	Freeway	San Francisco County to Santa Clara County
San Francisco	North-South	Interstate 280	Freeway	San Francisco County to Santa Clara County
San Francisco	East-West	Cesar Chavez Street	Arterial	San Francisco County
San Mateo	East-West	Interstate 380	Freeway	San Mateo County
San Mateo	North-South	State Route 82/El Camino Real	Arterial	San Mateo County to Santa Clara County
San Mateo	East-West	State Route 92	Freeway	San Mateo County
San Mateo	East-West	State Route 84	Arterial/Expressway	San Mateo County
Santa Clara	East-West	State Route 85	Freeway	Santa Clara County
Santa Clara	East-West	Lawrence Expressway	Arterial/Expressway	Santa Clara County
Santa Clara	North-South	State Route 87	Freeway	Santa Clara County
Santa Clara	Northeast-Southwest	Interstate 880	Freeway	Santa Clara County
Santa Clara	North-South	Alma/Central Expressway	Arterial/Expressway	Santa Clara County

Source: Appendix D, *Transportation Analysis*

I-280 begins in San Francisco and terminates in the south at the US 101 and I-680 interchange in north San Jose. Within the study area, US 101 connects to I-80 in San Francisco and continues south through Santa Clara County. I-380 runs east-west in north San Mateo County, connecting I-280 and US 101 and crossing perpendicular to the Caltrain ROW. In San Jose north of the US 101 and I-280 interchange, I-880 crosses perpendicular to the Caltrain ROW in a northeast to southwest orientation.

The Caltrain ROW runs parallel to or intersects with some major arterials in the study area. In San Francisco, Caltrain runs across east-west arterial Cesar Chavez Street above grade. The corridor runs parallel to State Route (SR) 82 (El Camino Real). El Camino Real is a major north-south oriented roadway that extends from San Mateo County south to Santa Clara County within the study area. In San Mateo County, SR 92 connects El Camino Real with US 101 and continues on to become the San Mateo Bridge, crossing the San Francisco Bay. Also in San Mateo County, Caltrain crosses SR 84 at Woodside Road in Redwood City. SR 84 eventually joins US 101 and continues east across the San Francisco Bay as the Dumbarton Bridge. In Santa Clara County, Caltrain travels parallel to Alma

Road/Central Expressway, which terminates at Mineta San Jose International Airport located west of Guadalupe Parkway.

Roadway System Performance

Congestion during the weekday morning and afternoon peak period is common on US 101 in both directions through San Francisco, San Mateo and Santa Clara Counties. During the morning peak period, southbound congestion on US 101 is common in San Francisco, from San Francisco International Airport to San Mateo, and in Palo Alto. Northbound US 101 during the morning peak period is regularly congested from San Jose to north of Mountain View in Santa Clara County, as well as near the San Francisco International Airport and in San Francisco. During the afternoon peak period, southbound US 101 has notable congestion from South San Francisco to Burlingame, San Carlos to Palo Alto, and Mountain View to San Jose. Northbound US 101 during the afternoon is mostly congested in Mountain View, San Carlos, and San Francisco.

I-280 also runs in a north-south orientation on the San Francisco Peninsula and is prone to backups during the peak period. During the morning peak period, southbound congestion is common from Daly City to San Bruno. Northbound morning congestion is common from San Jose to Cupertino and entering San Francisco. During the afternoon peak period, southbound congestion is common in southern San Francisco, Los Altos, and from Cupertino to San Jose. Northbound evening congestion typically occurs from Portola Valley to Woodside in San Mateo County.

At-Grade Crossings with Gates

Currently, there are 42 at-grade crossings of the Caltrain ROW within the study area. An at-grade crossing is an intersection of Caltrain tracks, roadways, walkways, or a combination of these at the same level. All other crossings in the study area are grade-separated, meaning that roadways, walkways, and railroads cross at different, non-conflicting elevations. Of the 42 at-grade crossings, ~~29~~ 31 at-grade crossing locations are adjacent to study intersections ~~have gates on all sides of the tracks that intersect with other travel modes.~~ Figure 3.14-6 displays all 42 at-grade crossings. The study evaluates the ~~29~~ 31 at-grade crossings with gates because Proposed Project operation could potentially affect the gate-down times at the crossing locations and thus the adjacent study intersections.

Gate-down time is a key measurement for both the performance of the existing and future Caltrain operations in this study. Gate-down time is a summation of multiple actions that occur in sequence in order to ensure all travel modes can cross safely at an at-grade crossing. These actions are listed and explained in chronological order below.

1. Gate flashers, located on gate arms to increase visibility, are triggered by a gate crossing event[2].
2. Gate arms descend, moving from vertical to horizontal position, indicating that all vehicular, bicycle, and pedestrian traffic must stop at the crossing to allow the train(s) to pass safely.
3. Train passes and fully clears the crossing.
4. Gate arms rise, moving from horizontal to vertical position.

[2] A gate-down event occurs when a train crosses or stops at a nearby upstream station. It can also occur when two trains pass simultaneously in opposite directions at a crossing.

Source: Fehr and Peers 2014.

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Figure 3.14-6
Study Intersections and At-Grade Crossings

After this sequence is complete, pedestrian, bicycle, and vehicular traffic can resume regular operations through the crossing. The gate-down times are key inputs into the intersection level of service analysis presented in the section below. The average gate-down times at the ~~29~~ 31 at-grade crossings in the study area were calculated empirically from gate-down event records collected in the field (2013). These records included the train number, timestamp of when the gate-down event sequence started, and a timestamp of when the gate-down event ended (when the gate arms were fully raised and the flashing red lights were off). Data on whether two trains occupied the crossing during the same gate down event (a "2-for-1" event), or if the gate-down sequence restarted was also used for this analysis. The gate-down time results are key inputs into the intersection level of service analysis presented in next section.

Intersection Levels of Service

To evaluate how the Proposed Project would affect corridor traffic patterns, a total of ~~82~~ 91 select intersections[3] in the study area were analyzed. These intersections were selected for evaluation using a tiered approach based on the criteria described below.

- Intersection Operations/Level of Service (LOS): Currently operating at LOS D, E, or F during peak hours.
- Transit-Oriented Development (TOD): Adjacent to station where significant TOD is planned.
- Gate-Down Time: Adjacent to at-grade crossing where the Proposed Project would result in substantial change in gate-down time.
- Intersection Geometry: Unusual geometry and/or signal operations.

Intersections in the study area that meet one or more of the criteria outlined above were selected for study using traffic operations modeling tools. As an additional step to provide additional discussion of potential traffic changes due to the Proposed Project, other intersections in the study area that do not meet the above criteria were reviewed qualitatively.

Intersection operation conditions described in the study are for the weekday AM peak hour typically between 7:00 a.m. and 9:00 a.m. and the weekday PM peak hour typically between 4:00 p.m. to 6:00 p.m. For more detailed information on the traffic model development and analysis process, including how the ~~82~~ 91 intersections were selected, see the transportation analysis report in Appendix D, *Transportation Analysis*. The ~~82~~ 91 intersections are shown on Figure 3.14-6 along with Caltrain stations and at-grade crossing locations.

The intersection analysis results include a descriptive term known as level of service (LOS). Level of service is a measure of traffic operating conditions, which varies from LOS A, which represents free flow conditions, with little or no delay, to LOS F, which represents congested conditions, with extremely long delays. Methods described in the Highway Capacity Manual (Transportation Research Board 2010) were used to calculate the levels of service for signalized and stop-controlled intersections. Levels of service for signalized intersections are determined by the average delay experienced by vehicles at the intersection. Table 3.14-6 summarizes the relationship between delay and levels of service for signalized intersections.

[3] The intersection of Broadway and US 101 Southbound Ramps (#84a) in Burlingame was added to the list of intersections as a result of the US 101/Broadway Interchange Reconstruction project; however, this intersection does not exist under Existing Conditions, bringing the total number of intersections modeled for future conditions to 91.

Table 3.14-6. Level of Service Designations for Signalized and Stop-Controlled Intersections

	Average Delay per Vehicle (seconds/vehicle)	
LOS Designation	Signalized Intersections	Stop-Controlled Intersections
A	≤ 10.0	≤ 10.0
B	10.1 to 20.0	10.1 to 15.0
C	20.1 to 35.0	15.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 80.0	35.1 to 50.0
F	> 80.0	> 50.0

Source: Appendix D, *Transportation Analysis*

For stop-controlled intersections, levels of service depend on the average delay experienced by vehicles on the stop-controlled approaches. Thus, for side-street stop-controlled intersections, levels of service are based on the average delay experienced by vehicles entering the intersection from the minor (stop-controlled) streets and vehicles making left-turns from the major street. For all-way stop-controlled intersections, levels of service are determined by the average delay for all movements through the intersection. The levels of service designations for stop-controlled intersections have different threshold values than those for signalized intersections, primarily because drivers expect different levels of performance from distinct types of transportation facilities. In general, stop-controlled intersections are expected to carry lower volumes of traffic than signalized intersections. Thus, for the same level of service, a lower level of delay is acceptable at stop-controlled intersections than at signalized intersections. Table 3.14-6 summarizes the relationship between delay and levels of service for stop-controlled intersections.

Table 3.14-7 identifies the geographic location of each study intersection and the associated AM and PM peak period levels of service at the study intersections. The study intersections include the at-grade crossing intersections with gates that are identified in the previous section. The traffic operation analysis at these at-grade crossing intersections take into account the vehicle delay during the gate-down events with the average gate-down times collected in the field (2013), as described in the previous section.

Table 3.14-7. Existing Intersection Delay and Levels of Service (2013)

Changes since the Draft EIR are shown in italics.

Int. ID	Intersection	Jurisdiction	Peak Hour [a]	Intersection Control	Delay [b]	LOS [c]
ZONE 1						
1	4th Street & King Street	SF	AM PM	Signal	56.6 84.5	E F
2	4th Street & Townsend Street	SF	AM PM	Signal	28.9 28.8	C C
3	Mission Bay Drive & 7th Street	SF	AM PM	Signal	8.3 12.7	A B
4	Mission Bay Drive & Berry Street	SF	AM PM	Signal	2.3 8.4	A A
5	7th Street & 16th Street	SF	AM PM	Signal	67.3 49.5	E D

Int. ID	Intersection	Jurisdiction	Peak Hour[a]	Intersection Control	Delay[b]	LOS[c]
6	16th Street & Owens Street	SF	AM PM	Signal	10.6 10.7	B B
7	22nd Street & Pennsylvania Street	SF	AM PM	All-way Stop	7.6 7.3	A A
8	22nd Street & Indiana Street	SF	AM PM	All-way Stop	5.3 5.4	A A
9	Tunnel Avenue & Blanken Avenue	SF	AM PM	All-way Stop	7.9 7.2	A A
10	Linden Avenue & Dollar Avenue	SSF	AM PM	Signal	15.1 48.9	B D
11	East Grand Avenue & Dubuque Way	SSF	AM PM	Signal	7.5 7.5	A A
12	S Linden Avenue & San Mateo Avenue	SSF	AM PM	Signal	6.7 7.4	A A
13	Scott Street & Herman Street	SB	AM PM	Side-Street Stop	9.8 14.0	A B
14	Scott Street & Montgomery Avenue	SB	AM PM	Side-Street Stop	4.8 5.7	A A
15	San Mateo Avenue & San Bruno Avenue	SB	AM PM	Signal	10.9 >120	B F
ZONE 2						
16	El Camino Real & Millbrae Avenue	MB	AM PM	Signal	43.4 42.7	D D
17	Millbrae Avenue & Rollins Road	MB	AM PM	Signal	33.0 38.8	C D
18	California Drive & Broadway	BG	AM PM	Signal	<u>*80.5*</u> <u>*58.7*</u>	<u>*F*</u> <u>*E*</u>
19	Carolan Avenue & Broadway	BG	AM PM	Signal	<u>*26.5*</u> <u>*39.2*</u>	<u>*C*</u> <u>*D*</u>
20	California Drive & Oak Grove Avenue	BG	AM PM	Signal	34.3 24.2	C C
21	Carolan Avenue & Oak Grove Avenue	BG	AM PM	Side-Street Stop	>120 92.1	F F
22	California Drive & North Lane	BG	AM PM	Side-Street Stop	<u>14.7</u> <u>11.4</u>	<u>B</u> <u>B</u>
23	Carolan Avenue & North Lane	BG	AM PM	Side-Street Stop	23.0 17.8	C C
24	Anita Road & Peninsula Avenue	BG	AM PM	Side-Street Stop	15.6 >120	C F
<u>*83*</u>	<u>*Broadway and Rollins Road*</u>	<u>*BG*</u>	<u>*AM*</u> <u>*PM*</u>	<u>*Signal*</u>	<u>*46.2*</u> <u>*95.6*</u>	<u>*D*</u> <u>*F*</u>
<u>*84*</u>	<u>*Rollins Road and Cadillac Way*</u>	<u>*BG*</u>	<u>*AM*</u> <u>*PM*</u>	<u>*Signal*</u>	<u>*89.1*</u> <u>*48.3*</u>	<u>*F*</u> <u>*D*</u>
<u>*85*</u>	<u>*Bayswater Avenue and California Drive*</u>	<u>*BG*</u>	<u>*AM*</u> <u>*PM*</u>	<u>*Signal*</u>	<u>*9.1*</u> <u>*8.7*</u>	<u>*A*</u> <u>*A*</u>
25	Woodside Way & Villa Terrace	SM	AM PM	Side-Street Stop	5.1 4.7	A A
26	North San Mateo Drive & Villa Terrace	SM	AM PM	Side-Street Stop	11.7 12.8	B B
27	Railroad Avenue & 1st Avenue	SM	AM PM	Side-Street Stop	10.4 19.0	B C

Int. ID	Intersection	Jurisdiction	Peak Hour[a]	Intersection Control	Delay[b]	LOS[c]
28	South B Street & 1st Avenue	SM	AM PM	Signal	22.6 30.5	C C
29	9th Avenue & S Railroad Avenue	SM	AM PM	Side-Street Stop	34.7 21.4	D C
30	South B Street & 9th Avenue	SM	AM PM	Signal	15.0 14.4	B B
31	Transit Center Way & 1st Avenue	SM	AM PM	Uncontrolle d	5.1 26.7	A D
32	Concar Drive & SR 92 Westbound Ramps	SM	AM PM	Signal	6.0 6.1	A A
33	S Delaware Street & E 25th Avenue	SM	AM PM	Signal	19.1 20.6	B C
34	E 25th Avenue & El Camino Real	SM	AM PM	Signal	32.0 80.6	C F
35	31st Avenue & El Camino Real	SM	AM PM	Signal	19.2 68.7	B E
36	E Hillsdale Boulevard & El Camino Real	SM	AM PM	Signal	43.7 67.1	D E
37	E Hillsdale Blvd. & Curtiss Street	SM	AM PM	Signal	12.0 14.7	B B
38	Peninsula Avenue & Arundel Road & Woodside Way	SM	AM PM	Side-Street Stop	14.3 >120	B F
39	El Camino Real & Ralston Avenue	BL	AM PM	Signal	>120 85.4	F F
40	El Camino Real & San Carlos Avenue	SC	AM PM	Signal	25.6 47.1	C D
41	Maple Street & Main Street	RC	AM PM	Side-Street Stop	*10.9* *14.3*	*B* *B*
42	Main Street & Beech Street	RC	AM PM	Side-Street Stop	5.2 8.6	A A
ZONE 3						
43	Main Street & Middlefield Road	RC	AM PM	Signal	*12.5* *20.1*	*B* *C*
44	Broadway Street & California Street	RC	AM PM	Signal	*60.0* >120	F F
45	El Camino Real & Whipple Avenue	RC	AM PM	Signal	74.7 48.3	E D
46	Arguello Street & Brewster Avenue	RC	AM PM	Signal	*14.7* *39.4*	*B* *D*
47	El Camino Real & Broadway Street	RC	AM PM	Signal	*27.5* *45.5*	*C* *D*
48	Arguello Street & Marshall Street	RC	AM PM	Signal	*15.1* *48.7*	*B* *D*
49	El Camino Real & James Avenue	RC	AM PM	Signal	*26.2* *33.7*	C C
50	El Camino Real & Fair Oaks Lane	AT	AM PM	Signal	33.6 27.6	C C
51	El Camino Real & Watkins Avenue	AT	AM PM	Side-street stop	34.5 48.1	D E
52	Fair Oaks Lane & Middlefield Road	AT	AM PM	Side-Street Stop	>120 41.3	F E

Int. ID	Intersection	Jurisdiction	Peak Hour [a]	Intersection Control	Delay [b]	LOS [c]
53	Watkins Avenue & Middlefield Road	AT	AM PM	Side-Street Stop	31.6 28.3	D D
54	Glenwood Avenue & Middlefield Road	AT	AM PM	Side-Street Stop	49.2 >120	E F
87	*Encinal Avenue and Middlefield Road*	*AT*	*AM* *PM*	*Signal*	*19.3* *12.7*	*B* *B*
86	*Encinal Avenue and El Camino Real*	*MP*	*AM* *PM*	*Signal*	*25.5* *30.9*	*C* *C*
55	El Camino Real & Glenwood Avenue	MP	AM PM	Signal	34.1 29.6	C C
56	El Camino Real & Oak Grove Avenue	MP	AM PM	Signal	17.9 30.9	B C
57	El Camino Real & Santa Cruz Avenue	MP	AM PM	Signal	9.1 12.5	A B
58	Merrill St & Santa Cruz Avenue	MP	AM PM	All-way Stop	7.3 8.9	A A
59	Ravenswood Avenue & Alma Street	MP	AM PM	Side-Street Stop	24.4 17.1	C C
60	El Camino Real & Ravenswood Avenue	MP	AM PM	Signal	39.3 119.0	D F
61	Ravenswood Avenue & Laurel Street	MP	AM PM	Signal	31.0 26.3	C C
88	*Laurel Street and Oak Grove Avenue*	*MP*	*AM* *PM*	*Signal*	*9.7* *8.6*	*A* *A*
89	*Laurel Street and Glenwood Avenue*	*MP*	*AM* *PM*	*All-way Stop*	*6.6* *5.9*	*A* *A*
90	*Laurel Street and Encinal Avenue*	*MP*	*AM* *PM*	*All-way Stop*	*5.7* *9.5*	*A* *A*
62	Alma Street & Palo Alto Avenue	PA	AM PM	Side-Street Stop	11.2 14.6	B B
63	Meadow Drive & Alma Street	PA	AM PM	Signal	72.6 62.0	E E
64	El Camino Real & Alma Street & Sand Hill Road	PA	AM PM	Signal	60.7 49.1	E D
65	High Street & University Avenue	PA	AM PM	Signal	12.6 14.1	B B
66	Alma Street & Churchill Avenue	PA	AM PM	Signal	66.0 64.0	E E
67	W Meadow Drive & Park Boulevard	PA	AM PM	Side-Street Stop	>120 29.3	F D
68	Alma Street & Charleston Road	PA	AM PM	Signal	63.5 *80.5*	E *F*
69	Showers Drive & Pacchetti Way	MV	AM PM	Signal	4.5 3.7	A A
70	Central Expressway & N Rengstorff Avenue	~~MV~~ *SCC*	AM PM	Signal	*75.5* *90.9*	*E* F
71	Central Expressway & Moffett Boulevard & Castro Street	~~MV~~ *SCC*	AM PM	Signal	*76.3* *66.5*	*E* *E*
72	W Evelyn Avenue & Hope Street	MV	AM PM	Signal	3.0 4.0	A A
73	Rengstorff Avenue & California Street	MV	AM PM	Signal	50.3 55.6	D E

Int. ID	Intersection	Jurisdiction	Peak Hour [a]	Intersection Control	Delay [b]	LOS [c]
74	Castro Street & Villa Street	MV	AM PM	Signal	11.8 21.2	B C
75	W Evelyn Avenue & S Mary Avenue	SV	AM PM	Signal	62.4 61.5	E E
76	W Evelyn Avenue & Frances Street	SV	AM PM	Signal	16.1 23.4	B C
ZONE 4						
77	Kifer Road & Lawrence Expressway	~~SCL~~ *SCC*	AM PM	Signal	96.6 >120	F F
78	Reed Avenue & Lawrence Expressway	~~SCL~~ *SCC*	AM PM	Signal	97.3 93.7	F F
79	El Camino Real & Railroad Avenue	SCL	AM PM	Signal	26.6 21.3	C C
80	W Santa Clara Street & Cahill Street	SJ	AM PM	Signal	10.4 12.7	B B
81	S Montgomery Street & W San Fernando Street	SJ	AM PM	Signal	7.9 9.6	A A
82	Lick Avenue & W Alma Avenue	SJ	AM PM	Signal	15.8 20.8	B C

Source: Appendix D, *Transportation Analysis*
Notes:
[a] AM = morning peak hour, PM = afternoon peak hour
[b] Delay measured in seconds.
[c] LOS designation pursuant to 2010 Highway Capacity Manual
Jurisdictions:

SF	San Francisco	SM	San Mateo	MV	Mountain View
SSF	South San Francisco	BL	Belmont	SV	Sunnyvale
SB	San Bruno	SC	San Carlos	SCL	Santa Clara
MB	Millbrae	RC	Redwood City	SCC	Santa Clara County
BG	Burlingame	AT	Atherton	SJ	San Jose
MP	Menlo Park	PA	Palo Alto		

Existing Bicycle and Pedestrian Conditions

Bikeway Facilities Connected to Caltrain Stations

In general, bicycle facilities within the study area are characterized by a network of mostly continuous routes within about 1 mile of stations. Bicycle facilities are classified based on the standard typology described below.

- Class I Bikeway (Bikeway Path): A completely separate ROW designated for the exclusive use of bicycles and pedestrians, with vehicle and pedestrian cross-flows minimized.
- Class II Bikeway (Bikeway Lane): A restricted ROW designated for the use of bicycles, with a striped lane on a street or highway. Bicycle lanes are generally 5 feet wide. Vehicle parking and vehicle and pedestrian cross-flows are permitted.
- Class III Bikeway (Bikeway Route): A ROW designated by signs or pavement markings for shared use with pedestrians or motor vehicles.

Most, but not all, Caltrain stations are connected to the surrounding roadway network via some type of bicycle facility. Existing bicycle facilities connected to Caltrain stations in the study area are shown in a figure in Appendix D. Major Class I bikeways in the study area include the Guadalupe River Trail, Bay Trail, Los Gatos Creek Trail, and the Coyote Creek Trail. The Guadalupe Trail, Los Gatos Creek Trail, and Coyote Creek Trail are located in Santa Clara County. The San Francisco Bay Trail runs through nine counties, including all three counties within the study area.

The density of bicycle facilities around stations varies. The average Caltrain station has about 13 miles of bicycle facilities within 1 mile. The Sunnyvale Station is surrounded by the most bike facility miles, with 24.3 miles within 1 mile of the station. The Mountain View Station is similar, with 24.1 miles of bike facilities within 1 mile of the station. Most bike facility miles near the Sunnyvale Station are Class III (15.8); around the Mountain View Station, Class II lanes are most common (16.7 miles). The San Carlos, South San Francisco, Palo Alto, and San Francisco 4th and King Stations are also near at least 17 miles of bikeway facility miles. Santa Clara, San Bruno, and College Park Stations are near fewer than 5 miles of bikeway facility miles. Overall, Class III bikeway routes are the most common type of bike facility near stations.

Bicycles Boardings and Parking at Caltrain Stations

Bicycles are allowed on Caltrain during all operating hours. Because bicycle boardings on Caltrain are on the rise, specific cars have been retrofitted to increase bicycle carrying capacity and store bicycles safely during travel.

Bike mode share of ridership has been increasing but the raw number of increased boardings is greater than the increase in the numbers of daily bike boarding. Average daily bike boardings increased by 16 percent from 2011 to 2012, outpacing the total ridership growth rate. From 2012 to 2013, bicycle boarding increased by another 16 percent, compared with a total ridership increase of 11 percent (Caltrain 2013b). Table 3.14-8 displays the top ten stations for bicycles brought on-board by passengers. The 4th and King Station in San Francisco is a major bike boarding station, with almost double the number of bikes that board at Palo Alto.

Table 3.14-8. Top Ten Stations for Bicycle Ridership (2013)

Station	Average Weekday Bicycle Ridership	Total Average Weekday Ridership	Proportion of Total Ridership at Station
San Francisco 4th and King	1,166	10,786	11%
Palo Alto	644	5,469	12%
Mountain View	464	3,876	12%
San Jose Diridon	305	3,489	9%
Redwood City	307	2,619	12%
Hillsdale	191	2,317	8%
Sunnyvale	215	2,274	9%
Menlo Park	169	1,526	11%
22nd Street	174	1,312	13%
California Avenue	199	1,294	15%

Source: Appendix D, *Transportation Analysis*

The boarding of passengers with bicycles is on a first-come, first-serve basis. If a bicycle car is full, the cyclist is asked to exit the train and wait for the next train, a situation commonly referred to as a "bicycle bump or denial." Bicycle denials can also be caused by additional circumstances, including swapped equipment and bicycle stacking that does not use the actual full capacity. In general, bicycle car capacity issues occur at the height of the morning and evening peak periods (SamTrans 2013).

In February 2013, Caltrain conducted annual ridership counts. This effort included a tally of passengers with bicycles who were denied boarding because of bicycle capacity limitations. Data were collected over the course of ~~1~~ one week and were not averaged. A total of 59 cyclists on seven trains were denied boarding. The majority of boarding denials occurred on southbound trains. In general, fewer than five bicycles are denied boarding at a time, but on occasion bike denials can affect a larger number of bicycles. Bicycle denials tend to occur at the Redwood City, Millbrae, and 22nd Street Stations but have been observed and reported throughout the system. The new passenger information system at the station (visual electronic message signs at the platforms) is able to broadcast and redirect bicyclists away from trains that are full to those that still have capacity.

Cyclists who ride Caltrain can either store their bicycles at Caltrain stations or bring their bicycles on board, both options which are limited by capacity. The majority of Caltrain cyclists bring their bikes on-board the train rather than parking their bike at a Caltrain station. As shown in Figure 3.14-4, of the 14 percent of Caltrain passengers who access stations via bicycle, about 13 percent of passengers bring their bicycles on-board, while about 1 percent of passengers park their bicycles at their origin station. In 2013, a total of 4,900 bicycles boarded daily.

At the Caltrain station, cyclists can store their bicycles on racks, lockers, or shared access bicycle parking facilities. Table 3.14-9 provides an inventory of dedicated bike parking capacity, by station. The only Caltrain station without dedicated bicycle parking is the College Park Station. The majority of bike parking facilities, including racks, lockers and shared facilities is owned and administered directly by Caltrain. At some stations, however, facilities may be owned and operated by a local jurisdiction or other transit property. Table 3.14-9 reflects all publicly available bike parking facilities regardless of administration or ownership.

Because trains have limited on-board space, Caltrain encourages customers to park their bikes at Caltrain stations or make use of the newly-implemented regional bike share pilot program, Bay Area Bicycle Share. The pilot program, led by the Bay Area Air Quality Management District (BAAQMD), was launched in August 2013 and is intended to provide easy access to a network of bicycles. The program proposes 700 bikes at 70 kiosk stations along the Peninsula corridor in San Francisco, Redwood City, Palo Alto, Mountain View, and San Jose. Members are able to check out a bike close to home or work and return it to any of the kiosk stations. The San Francisco 4th & King, Redwood City, Palo Alto, San Antonio, Mountain View, and San Jose Diridon Stations have a bicycle share kiosk at or within one 0.5 mile of the station.

Table 3.14-9. Bicycle Parking Capacity at Caltrain Stations (2013)

Station	Bicycle Rack Spaces	Bicycle Locker Spaces	Other Bicycle Amenities
4th and King	6	180	Attended bicycle parking facility Bay Area Bike Share kiosk
22nd Street	27	0	None
Bayshore	18	8	None
South San Francisco	18	20	None
San Bruno	8	16	None
Millbrae	24	28	None
Burlingame	13	18	None
San Mateo	11	12	None
Hayward Park	18	4	None
Hillsdale	18	12	None
Belmont	18	24	None
San Carlos	36	48	None
Redwood City	18	50	Bay Area Bike Share kiosk
Menlo Park	8	50	Shared access bicycle storage shed
Palo Alto	178	94	Shared access bicycle storage shed Electronic lockers Bay Area Bike Share kiosk
California Avenue	33	42	None
San Antonio	18	38	Bay Area Bike Share kiosk
Mountain View	23	116	Shared access bicycle storage shed Bay Area Bike Share kiosk
Sunnyvale	18	71	None
Lawrence	18	24	None
Santa Clara	18	54	Additional bicycle lockers across the street at VTA Transit Center (adjacent)
College Park	0	0	None
San Jose Diridon	16	48	Bay Area Bike Share kiosk
Tamien	18	18	None

Source: Appendix D, *Transportation Analysis*

Pedestrian Environment in Station Areas

The existing pedestrian infrastructure surrounding Caltrain stations in the study area provides a good level of accessibility, considering the varied mix of land uses around stations. Overall, walking to Caltrain stations is the most popular mode of access for passengers system-wide. As shown in Figure 3.14-4, about 36 percent of Caltrain passengers access Caltrain stations by walking.

Pedestrian Amenities

Although all stations offer mostly consistent pedestrian amenities on the platform, the quality of the pedestrian environment around the station area varies. Pedestrian environment on station platforms and within 0.25 mile of each station were evaluated based on field observations for the following components: wheelchair accessibility, direction of access to station, sidewalk completeness, presence of crosswalks, density of street tress, proximity to freeway, maximum posted speed limit on adjacent streets, and traffic calming measures on surrounding streets. Table 3.14-10 summarizes existing pedestrian environment and amenities within 0.25 mile of each station.

In addition the amenities listed in Table 3.14-10, most stations have audio public address systems to announce emergencies and train delays. Many stations also have electronic message boards to communicate with passengers. Some stations also include space for vendors who sell goods and services to passengers, including food and beverages.

Accessibility for Disabled Passengers

The majority of Caltrain stations are accessible to persons with disabilities, who can board either via a lift or accessible ramp. The following stations do not have wheelchair lifts: 22nd Street, South San Francisco, Broadway, Atherton, and College Park. All stations include a blue boarding assistance area for passengers with disabilities who need boarding assistance from the conductor. Every train has at least one wheelchair accessible car that can accommodate up to three wheelchairs or mobility devices (e.g., two-wheeled Segways). All wheelchair accessible cars are equipped with an accessible restroom.

Pedestrians and Public Crossings

A mix of grade-separated and at-grade crossings exist at Caltrain stations within the study area. For example, at San Jose Diridon and Palo Alto Stations, passengers can access the opposing directional platform via an underground pedestrian walkway. This type of grade-separated crossing does not require a passenger to cross over active railroad tracks. However, at some stations, such as Mountain View and Sunnyvale, at-grade crossings exist for passengers to cross tracks at the same level. These designated at-grade crossings are marked by a sign and/or a gate.

Because trains can operate at speeds up to 79 mph, pedestrians traversing at-grade crossings are advised to take great care by looking both ways and listening for oncoming trains. Caltrain distributes information to educate passengers on public crossing and platform safety on the Caltrain website, at Caltrain headquarters, in station areas, and on-board trains.

Existing Automobile Parking Conditions

This section summarizes existing parking capacity and occupancy at Caltrain parking lots located in station areas. In addition, on-street parking and parking lot capacities within the station areas are discussed. In general, Baby Bullet stations that have Caltrain parking lots tend to experience the highest parking occupancy rates. As shown in Figure 3.14-4, about 23 percent of passengers access Caltrain by car: about 13 percent drove alone, 8 percent were dropped off, and 1 percent carpooled. Passengers who drove alone or carpooled, also referred to as park-and-ride passengers, generally park their car at or near the station during the duration of their trip. Some passengers may leave a second vehicle at their destination station to have access to a private automobile to get to their ultimate destination. In total, about 14 percent of Caltrain passengers are park-and-ride customers.

The majority of Caltrain stations offer 24-hour parking. There are no Caltrain-operated parking lots at the 4th and King and 22nd Street Stations in San Francisco. Table 3.14-11 displays parking capacity and the average daily occupancy at each station in 2012.

Table 3.14-10. Existing Pedestrian Environment and Amenities in Station Areas

Station	Wheelchair Accessibility	Directions of Pedestrian Access[a]	Sidewalk Completeness	Presence of Crosswalks[b]	Density of Street Trees[c]	Near Freeway	Maximum Posted Speed Limit	Traffic Calming[d]
4th and King	Lifts on both platforms	4	75%	3	1	No	35 mph on King Street; 25 mph on other streets	No
22nd Street	No lift available	4	75%	2	2	Yes	25 mph on 22nd Street at Pennsylvania Street	No
Bayshore	Lifts on both platforms	3	25%	2	1	No	35 mph on Tunnel	No
South San Francisco	No lift available	2	75%	1	1	Yes	35 mph on East Grand Avenue	Yes
San Bruno	Lifts on both platforms	4	50%	1	1	No	30 mph on Huntington Avenue	Yes
Millbrae	Lifts and mini-high ramps on both platforms	4	75%	1	2	No	35 on El Camino Real	No
Burlingame	Lifts on both platforms	4	100%	2	2	No	25 mph on Howard Avenue	No
San Mateo	Lifts and mini-high ramps on both platforms	4	100%	3	2	No	25 mph on B Street	Yes
Hayward Park	Lifts on both platforms	4	50%	2	2	Yes	30 mph on Delaware Street	No
Hillsdale	Lifts and mini-high ramps on both platforms	3	75%	1	1	No	35 mph on Hillsdale Boulevard/El Camino	No
Belmont	Lifts on both platforms	4	75%	3	2	No	35 mph on El Camino	No
San Carlos	Lifts and mini-high ramps on both platforms	4	75%	1	2	No	35 mph on El Camino	Yes
Redwood City	Lifts and mini-high ramps on both platforms	4	100%	2	2	No	35 mph on El Camino	Yes
Menlo Park	Lifts and mini-high ramps on both platforms	4	100%	3	3	No	35 mph on El Camino	Yes
Palo Alto	Lifts and mini-high ramps on both platforms	4	75%	2	3	No	35 mph on El Camino	Yes

Station	Wheelchair Accessibility	Directions of Pedestrian Access[a]	Sidewalk Completeness	Presence of Crosswalks[b]	Density of Street Trees[c]	Near Freeway	Maximum Posted Speed Limit	Traffic Calming[d]
California Avenue	Lifts on both platforms	2	75%	2	2	No	35 mph on Alma Street	Yes
San Antonio	Lifts on both platforms	3	75%	3	2	No	45 mph Central Expressway	Yes
Mountain View	Lifts and mini-high ramps on both platforms	3	75%	3	2	No	45 mph on Central Expressway	Yes
Sunnyvale	Lifts and mini-high ramps on both platforms	4	75%	3	1	No	35 mph on Mathilda Avenue	No
Lawrence	Lifts on both platforms	2	50%	0	1	No	40 mph on Kifer Road	No
Santa Clara	Lifts and mini-high ramps on both platforms	3	75%	3	2	No	35 on El Camino Real	No
College Park	No lift available	2	75%	1	3	No	40 on Coleman Avenue	No
San Jose Diridon	Lifts and mini-high ramps on tracks 6–9	3	100%	3	1	No	35 mph on W Santa Clara Street	No
Tamien	Lifts on both platforms	2	75%	3	2	Yes	35 mph on W Alma Avenue	Yes

Source: Appendix D, *Transportation Analysis*

[a] Measurement of the number of directions a pedestrian can access the station, out of four possible directions. (Scale of 0 to 4)

[b] Measurement of marked crosswalks on streets adjacent to the station. (Scale of 0 to 3)

[c] Measurement of street tree density at station and on surrounding streets. Street trees can provide some shade from weather elements and enhance the urban design of station areas. (Scale of 0 to 3)

[d] Measurement indicating if traffic calming measures are in place on surrounding local or residential streets. Common traffic calming measures include curb extensions, pedestrian refuge islands, and speed bumps.

Table 3.14-11. Parking Capacity and Average Weekday Occupancy at Caltrain Station Lots (2012)

Station[a]	Caltrain Parking Lot Available (Yes / No)	Parking Capacity (Number of Parking Spots)	Average Daily Parking Occupancy
4th and King	No	--	--
22nd Street	No	--	--
Bayshore	Yes	38	13%
South San Francisco	Yes	74	51%
San Bruno	Yes	170	22%
Millbrae	Yes	490[b]	80%b
Burlingame	Yes	69	30%
San Mateo	Yes	42	20%
Hayward Park	Yes	210	3%
Hillsdale	Yes	513	86%
Belmont	Yes	375	20%
San Carlos	Yes	207	32%
Redwood City	Yes	553	46%
Menlo Park	Yes	155	33%
Palo Alto	Yes	350	87%
California Avenue	Yes	169	31%
San Antonio	Yes	193	33%
Mountain View	Yes	336	97%
Sunnyvale	Yes	391	100%
Lawrence	Yes	122	30%
Santa Clara	Yes	190	62%
College Park[c]	No	--	--
San Jose Diridon	Yes	576	99%
Tamien	Yes	245	98%

Source: Appendix D, *Transportation Analysis*

[a] Stations with Baby Bullet service are displayed in **bold**.

[b] There are 170 Caltrain parking spaces. There are approximately 2,980 spaces in shared parking with BART and the lot is 80% utilized, leaving approximately, 640 available spaces. This analysis assumes that 50% of those spaces (320 spaces) are available for Caltrain riders.

[c] There is no Caltrain lot at the College Park station. Parking is on the street. Given limited ridership and no plans to change service levels, parking demand was not evaluated at this location.

Several stations are close to or beyond full parking capacity. Average daily parking is slightly beyond capacity at Sunnyvale, with more than 100 percent of cars parked in the lot. Parking in excess of 100 percent possibly indicates vehicles parked illegally in the Caltrain lot in restricted areas. Parking at some Baby Bullet stations is very close to full capacity (90 percent or above) at Mountain View, San Jose Diridon, and Tamien Station. Millbrae, Hillsdale, and Palo Alto Station parking lots are all between 75 percent and 90 percent full. At stations with lower ridership, many lots are not full. At stations where parking is at, near, or beyond capacity, passengers who choose to drive tend to look for parking in non-Caltrain lots or on streets near the stations.

Existing Freight Rail Service

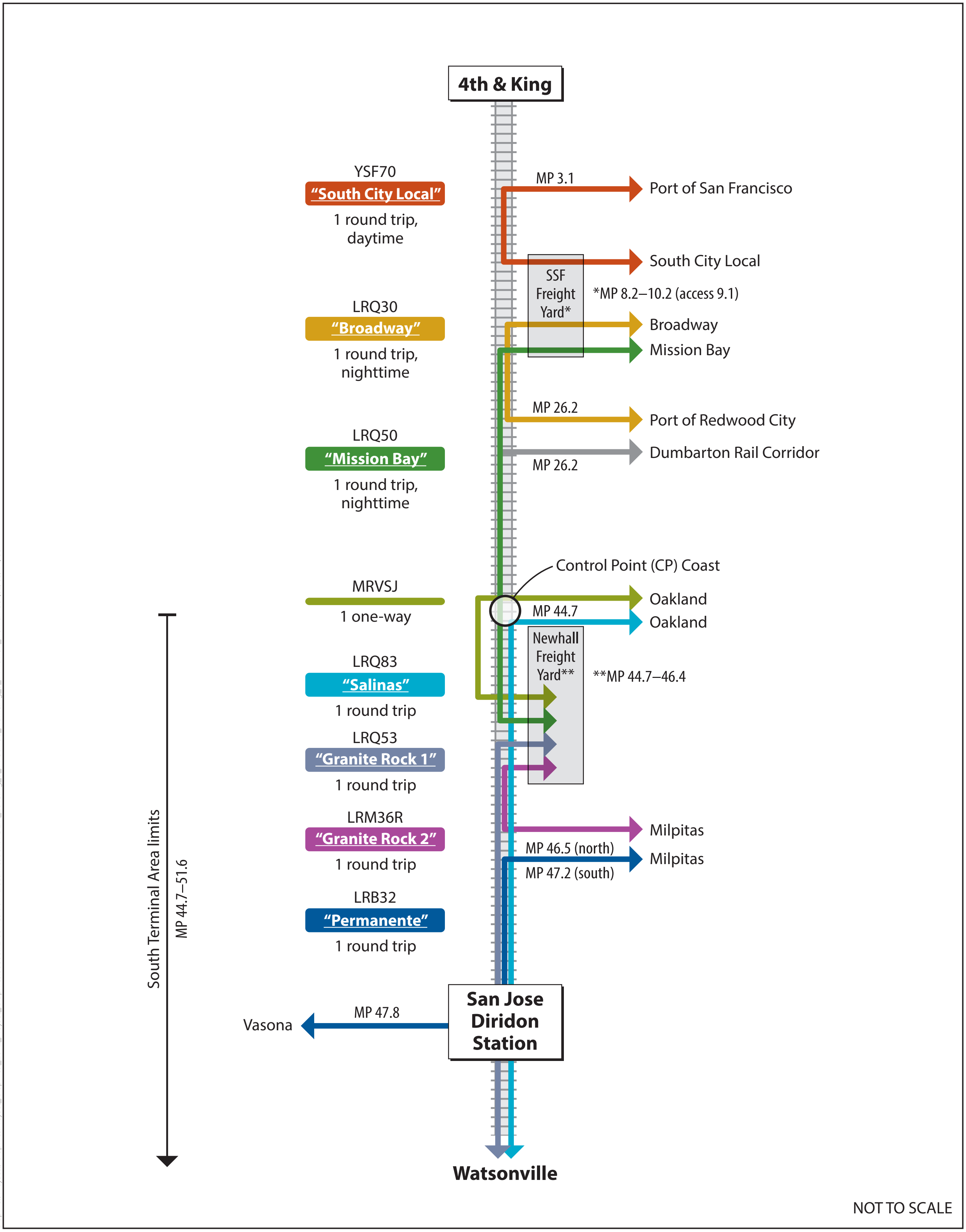
Freight service operates on the JPB-owned Caltrain corridor along with Caltrain passenger service and other tenant passenger service (ACE, Amtrak and Capitol Corridor). From San Francisco to Santa Clara, freight and passenger both use the same tracks, although there are areas where freight has exclusive spur tracks and sidings that lead to customer locations outside the Caltrain ROW. South of Santa Clara (south of Control Point [CP]) Coast at Milepost [MP] 44.7), freight has a dedicated freight track ("MT-1") owned by the Union Pacific Railroad (UPRR) to the southern end of the Caltrain corridor (at CP Lick at MP 52.0). All tracks in the Caltrain corridor are dispatched by Caltrain. South of MP 52.0, the ROW is owned by UPRR, which dispatches trains on its system, including Caltrain passenger trains. Because the Proposed Project is limited to the Caltrain corridor, Caltrain is the sole dispatcher within the project area.

Freight operates in the JPB-owned Caltrain corridor under a Trackage Rights Agreement (TRA) between UPRR and the JPB. This TRA provides that between midnight and 5 a.m., at least one main track will always be in service for freight. Between 10 a.m. and 3 p.m., the TRA requires the JPB to provide at least one 30-minute headway window in each direction. In practice today, freight commonly runs between 8 p.m. and 5 a.m., with occasional daytime service. Freight service hours are not limited by the TRA on the UP-owned MT-1 track between CP Coast and CP Lick (Santa Clara to south of Tamien Station).

Caltrain reviewed dispatch data for freight operations in the corridor in December 2012, which indicated that there is an average of seven round trips per day along the Caltrain corridor as follows and as shown in Figure 3.14-7.

- San Francisco to South San Francisco freight yard—one round trip daily during daytime ("South City" Local).
- South San Francisco freight yard to Redwood City—one round trip daily during nighttime ("Broadway").
- South San Francisco freight yard to San Jose (Newhall Yard)—one round trip daily during nighttime ("Mission Bay").
- South Terminal Area (South of CP Coast)—four round trips daily ("Salinas," "Granite Rock 1," "Granite Rock 2," and "Permanente") and one one-way daily ("MRVSJ").

Freight service does vary in response to freight customer needs and activity. For example, there was a notable decline in freight operations during the 2008–2009 recession and slow recovery afterwards, but freight service has been increasing in recent years with the economic recovery. In addition to the routine daily traffic noted above, freight operators also run periodic trains to serve non-routine episodic freight needs along the Caltrain corridor. The Peninsula Freight Rail User's Group (PFRUG) estimates that the number of rail cars between San Jose and San Francisco over the past decade has averaged about 60 to 80 cars per day in each direction (once loaded, once empty). This translates to 20,000–30,000 loaded rail cars carrying 2–3 million tons of cargo on the Peninsula each year, the equivalent of at least 100,000 truck trips annually. During peak years in the past decade, the numbers were substantially higher (PFRUG 2014).



Graphics/Projects/Graphics/Project_Graphics_2012_Project_Graphics:00606.12-001 Caltrain Electrification4-DEIR_2013:Fig_3_14-3thru6_Traffic:Fig_3_14-1thru7_Traffic.indd (02/03/14) SS

Figure 3.14-7
Existing Freight, October–December 2012
Peninsula Corridor Electrification Project

Due to a concern about potential height clearance requirements with the installation of the OCS, Caltrain also reviewed dispatch data for the past 8 years to identify the highest freight car (or "load") that had been authorized on the Caltrain corridor. Table 3.14-12 shows that data for the existing maximum freight heights that have operated in the corridor.

Table 3.14-12. Historic Freight Heights at Constrained Locations along the Caltrain ROW

Location	Historic Load (feet)
MP 1.29 Mariposa Street	15.92
MP 1.33 Tunnel 1	15.92
MP 1.72 22nd Street	15.92
MP 1.90 23rd Street	15.92
MP 1.93 Tunnel 2	15.92
MP 3.13 Oakdale Ave. OH	17.08
MP 3.19 Tunnel 3	17.08
MP 4.15 Paul Avenue	17.08
MP 4.27 Tunnel 4	17.08
MP 8.60 Oyster Point Parkway	18.92
MP 29.69 San Francisquito Bridge	18.92
MP 36.50 State Highway 85	18.92
MP 40.75 Lawrence Expressway	18.92
MP 46.15 Hedding Avenue	20.25
MP 47.89 San Carlos Avenue	20.25
MP 50.59 Curtner Avenue	20.25
MP 51.08 Private Overpass	20.25

Source: Caltrain dispatch data, 2006–2013

Trackage Rights Agreement between the JPB and Union Pacific

When the JPB acquired the Caltrain Corridor, the JPB and the predecessor to Union Pacific agreed to a Trackage Rights Agreement (TRA) which established the rights of each of the parties relative to the corridor. The TRA was negotiated between the JPB and Union Pacific's predecessor in interest, Southern Pacific Transportation Company, in 1991, with the understanding and expectation that passenger service would increase over time and could ultimately restrict freight operations. The TRA was filed with the Interstate Commerce Commission (predecessor of the Surface Transportation Board) as part of an approval process. Over time, passenger service has increased steadily due, in part, to significant public investment in the corridor. Since 1991, substantial capital investments in the corridor have been made by the JPB, including track improvements, station improvements, technology enhancements, and grade separations, all as required to support expansion of passenger service as contemplated by the TRA.

Several key requirements of the TRA are noted below:

- The JPB owns the right of way, known as the Peninsula Main Line and associated tracks between San Francisco and a point 2 miles south of Tamien Station, and controls the commuter passenger rail rights.
- The Union Pacific owns certain tracks along the corridor including the track referred to as "MT-1" from Santa Clara southward (also referred to as the "New Coast Main" and the "Santa Clara/Lick" line).
- The Union Pacific owns the freight rights and the intercity passenger rail rights.
- The TRA establishes required vertical clearance heights at specific constrained locations along the corridor.
- The TRA requires the JPB to allow for one daytime 30 minute freight window between 10 a.m. and 3 p.m. but the freight trains must operate at "Commuter Service Train Speeds" (which means up to 79 mph). The TRA also requires the JPB to provide for one track for exclusive freight use between midnight and 5 p.m.[4]
- Section 8.3(c) of the TRA recognizes that in the event that the JPB has a need to construct a transportation system that is a significant change in the method of delivery of commuter service that is incompatible with freight service, the JPB can file for permission from the Interstate Commerce Commission (now the Surface Transportation Board) to abandon freight service over the affected area and Union Pacific is not allowed to object or oppose such a filing.

3.14.2 Impact Analysis

3.14.2.1 Methods for Analysis

Construction impact analysis is based on evaluation of the Proposed Project's effects during construction on the existing transportation and traffic conditions described above.

The analysis year for the operational impact analysis is 2020. As described in Chapter 2, *Project Description*, the Proposed Project's construction and testing is expected to be complete in 2020 ~~2019~~. ~~Although electrified service is planned to start in 2019~~, and thus 2020 was chosen for the impact analysis ~~because it would represent a full year of project operation~~. In addition, 2020 is a year that lines up with well with other regional transportation analyses.

This section provides a comparison of with-project conditions in 2020 with the conditions with the No Project scenario as the operational baseline for the purposes of CEQA, because the Proposed Project can only have operational impacts once the new electrified service is actually operating. Although State CEQA Guidelines specify that the baseline should "normally" be the existing conditions extant at the time of preparation of the environmental document, the existing (2013) conditions are not the conditions that would be affected by operation of the Proposed Project. Thus, it would be fundamentally misleading to the public and decision-makers to measure the Proposed Project's impact by comparing 2020 with-project conditions with 2013 existing conditions. This section does disclose the existing conditions so that the reader may understand the changes that will

[4] It should be noted that freight operates at other times than discussed in the TRA, such as in the early evening. While the JPB permits such activity, the TRA does not require the JPB to provide for freight operations on the JPB-owned tracks except in relation to the single daytime window and midnight to 5 a.m.

occur relative to transportation and traffic both with and without the Proposed Project in 2020. All of the assumptions about 2020 conditions are documented in Appendix D, *Transportation Analysis*, and Appendix I, *Ridership Technical Memorandum*, and are based on regionally adopted assumptions about future land use growth and transportation network development.

An analysis was also conducted for conditions with and without the Proposed Project in 2040. The results of this analysis are presented in Section 4.1, *Cumulative Impacts*, because the 2040 conditions reflect an extensive amount of land use growth as well as projected transportation improvement completions over the next 26 years.

A more detailed description of the impact analysis for all subject areas other than freight service is provided in Appendix D, *Transportation Analysis*. A more detailed description of the system ridership modelling is provided in Appendix I.

Traffic and Roadway Systems

Analysis Scenarios

Proposed Project operation impacts on transportation and transit systems in the study area are evaluated for the following scenarios.

2020 No Project Scenario

This scenario reflects regional land use growth, population and employment growth, future transit connections, future transportation improvements, and Caltrain operations that are projected to occur in the study area by 2020 without the Proposed Project. These projected land use growth, transportation projects, and transit services are reflected in the travel demand forecasting model used to predict the future transit ridership and roadway traffic for the 2020 No Project condition.

Land Use Growth and Transportation System Changes

The VTA travel demand forecasting model was updated to reflect the 2013 conditions and adjusted and validated to reflect 2013 Caltrain system ridership (refers to VTA model thereafter). The model networks were also updated to reflect the current transit and highway networks. After the model was validated to the 2013 conditions, the projected land use growth and transit and transportation improvements by 2020 were input into the model and used to predict the future transit ridership and roadway traffic in 2020, which were then used to evaluate the Proposed Project's impacts on transit and transportation systems.

Land use projections contained in the ABAG SCS, prepared in September 2012, were used to develop the ridership and regional travel demand forecasts. Overall, the Caltrain service area is projected to experience significant growth in households, population, and jobs, with fairly balanced levels of growth spread out between the three counties in the study area.

Transportation and transit projects as defined in the *Plan Bay Area* regional transportation plan, adopted in mid-2013, were used to code in background improvements in the model networks. MTC provided the years of opening for the projects identified in *Plan Bay Area*. The background highway and transit projects that were planned to open by year 2020 are included in the 2020 model. The transportation projects include projects in the study area as well as key projects a regional traveler would consider transferring to in order to complete an inter-regional trip in the study area. For a list of projects reflected in the travel demand forecasting model, see the ridership technical memorandum in Appendix I.

Caltrain Operations

The 2020 No Project scenario is mostly identical to existing Caltrain operations in terms of schedule and frequency. The 2020 No Project scenario presumes continued diesel-hauled trains. No additional trains are assumed to be added by 2020. The two main changes from existing conditions are included as part of the 2020 No Project scenario.

- Relocation of San Bruno Station. As part of a grade-separation project currently under construction, the San Bruno Station will be moved from its current location at 297 Huntington Avenue to the corner of San Bruno and Huntington Avenue in 2014. The station relocation would not affect the schedule or frequency of trains at this station.
- Implementation of Caltrain Communications Based Overlay Signal System (CBOSS) Positive Train Control (PTC) advanced signal system. Currently being installed and scheduled to be operational by 2015, the CBOSS PTC system would increase safety both on the tracks and at at-grade crossings and improve reliability and operating performance of the current signal system. Travelers crossing the tracks via car, bike, or on foot would benefit from reduced gate-down times at select crossings and improved local traffic circulation. The CBOSS PTC system will be interoperable with all rail services operating on the same tracks, including freight (Caltrain 2013a).

2020 Project Scenario

This scenario reflects 2020 land use growth and transportation system changes combined with the Proposed Project.

Land Use Growth and Transportation System Changes

The projected land use growth and the proposed transit and transportation improvements used to develop the 2020 travel demand forecasting model for this scenario are the same as those used for the 2020 No Project condition.

Caltrain Operations

The 2020 Project scenario includes the following changes from existing conditions that would result in an increase in Caltrain capacity and operating performance.

- Conversion of Caltrain from diesel-hauled trains to electric multiple unit (EMU) trains for approximately 75 percent of the service[5] between the 4th and King Street Station in San Francisco and the Tamien Station in San Jose.
- Operation of up to six Caltrain trains per peak hour, per direction at operating speeds of up to 79 mph.
- Implementation of CBOSS PTC advanced signal system.

[5] As noted in Chapter 2, *Project Description*, the remaining 25 percent would be diesel-hauled.

EMU trains are more efficient than the current diesel-powered locomotives because they can accelerate and decelerate faster than diesel-hauled vehicles[6]. As a result, EMUs would provide faster and~~/or~~ more frequent service to more stations and, by extension, carry more passengers. The CBOSS PTC system, combined with the EMU fleet, would improve headways and operation flexibility by allowing trains to safely travel closer together along the ROW. This would translate to more frequent and dependable passenger service.

The 2020 Project scenario assumes an electrified rail corridor with the CBOSS PTC system. Combined, these two improvements would allow for substantial capacity and operating performance improvements for all service types (Baby Bullets, Limited, and Local trains). The number of daily weekday trains would increase from the current 92 to 114.

Table 3.14-13 summarizes the average weekday trains per day, by station, for the 2020 No Project and 2020 Project scenarios. Under the 2020 Project scenario, the total number of daily trains serving each station would increase across the study area, with the exception of College Park, which Caltrain would continue to serve with four trains daily. Two stations that do not have weekday service in existing conditions and in the 2020 No Project scenario would have weekday service in the 2020 Project condition: Broadway and Atherton. It should be noted that the proposed trains are based on a prospective 2020 schedule that was developed only for analytical purposes for this EIR. Although the schedule has yet been finalized, it is the best available data to be used for identifying the potential traffic operation impact of the Proposed Project. The actual schedule may vary, which could influence the number of station trains at some stations.

Caltrain Ridership, Mode of Access, and Mode of Egress Models

Ridership forecasting provides estimates of the total number of passengers that would ride Caltrain as a result of the Proposed Project. The forecasting also provides information on how access to individual stations along the Caltrain corridor would change in the future.

VTA develops and maintains a travel forecasting model for Santa Clara and San Mateo Counties, along with adjacent travel markets. The model estimates trips throughout the metropolitan area by various modes, including Caltrain and access-modes to Caltrain. The model is sensitive to multiple factors including population and employment densities, auto ownership rates, demographics (e.g., age, income level, household size), and transit network connections. Citywide growth within the VTA travel demand model generally matches ABAG growth forecasts as included in the Plan Bay Area. Ridership projections for transit systems that are assumed to connect to Caltrain in years 2020 are from the VTA model. However, because the model's scope is regional, it is not able to capture all of the details of extremely localized conditions at the station-level.

Caltrain has developed a calibration process that adjusts the VTA model outputs using factors found to be correlated to Caltrain station level ridership as well variables for which the model might be over- or undercompensating. For purposes of this study, calibration was performed for all stations providing service all day during weekdays within the study area.

[6] See Chapter 5 for comparison of performance of EMUs vs. non-electrification alternatives using newer Tier 4 diesel locomotives, diesel multiple units, and dual-mode multiple units .

Table 3.14-13. Average Weekday Daily Trains by Station with Prototypical Schedule

Station	Existing, 2020 No Project Scenario	2020 Project Scenario	Change with Project
4th and King	92	114	+22
22nd Street	58	90	+42
Bayshore	40	66	+26
South San Francisco	46	78	+32
San Bruno	56	66	+10
Millbrae	82	114	+32
Broadway	0	54	+54
Burlingame	58	66	+8
San Mateo	70	96	+26
Hayward Park	40	66	+26
Hillsdale	74	102	+28
Belmont	46	66	+20
San Carlos	64	78	+14
Redwood City	72	102	+30
Atherton	0	54	+54
Menlo Park	66	96	+30
Palo Alto	86	108	+22
California Avenue	52	66	+14
San Antonio	46	66	+20
Mountain View	80	108	+28
Sunnyvale	62	84	+22
Lawrence	56	66	+10
Santa Clara	58	66	+8
College Park	4	4	No change
San Jose Diridon	92	114	+22
Tamien	40	48	+8

Note: Based on prototypical schedule.
Source: Appendix D, *Transportation Analysis*

Fehr & Peers also developed the mode of access and mode of egress models to estimate access and egress mode shares to Caltrain stations. Using intercept passenger surveys conducted in 2013, the models estimate the actual proportions of riders accessing and egressing by auto (park-and-ride, kiss-and-ride), transit, walking, and bicycling.

Regional and City Vehicle Miles Traveled

A performance measure used to quantify the amount of vehicle travel is vehicle miles traveled (VMT). VMT measures the amount of miles vehicles travel along over roadway networks. VMT measurement has one primary limitation: it is not directly observed and, therefore, cannot be directly measured. It is calculated based on the number of vehicles multiplied by the distance traveled by each vehicle. The amount of VMT can be obtained through extensive surveys of residents, visitors, and employees, or by using a validated travel demand forecasting model that estimates vehicle demand. VMT estimates derived from the models are dependent on the level of detail in the network and other variables related to vehicle movement through the network. The traffic volume and distance traveled depends on land use types, density and intensity, and patterns as well as the supporting transportation system. The VTA model was used to provide the regional and city by city VMT estimates for analysis scenarios.

Intersection Levels of Service Analysis

Traffic operations at all ~~82~~ 91 select intersections in the study area were analyzed under the 2020 No Project scenario and the 2020 Project scenario. To obtain the level of service and the delay, the existing peak hour traffic microsimulation models (VISSIM and SimTraffic) were updated to reflect future peak hour operating conditions. This included updates to forecasted traffic volumes, signal timings, gate-down times, and frequencies of Caltrain at at-grade crossings.

Transit Systems

The potential impact of the Proposed Project on other transit systems was evaluated using the VTA model of system ridership with and without the Proposed Project using the same 2020 scenarios described above for traffic and roadway systems. The development and assumptions of the system ridership model are discussed in greater detail in Appendix I, *Ridership Technical Memorandum*.

Bicycle and Pedestrian Systems

The potential impact of the Proposed Project on bicycle and pedestrian systems was evaluated based on the profile and functionality of the existing systems and the physical changes that would occur under Proposed Project conditions.

Emergency Vehicle Access

The potential impact of the Proposed Project on emergency vehicle access was evaluated based on a comparison of the changes to roadway facilities and operations with and without the Proposed Project.

Caltrain Station Parking and Access

To forecast parking demand, first, forecasts for daily boardings per station per scenario were generated by the calibrated ridership model. The ratio of 2013 boardings occurring before noon to daily boardings was applied to the daily boardings forecasts to generate forecasts for boardings occurring before noon by station in future scenarios. To forecast the number of Caltrain riders arriving to the station and parking before noon by station and scenario, the park-and-ride access mode from the AM mode of access model was then applied to the forecasts of boardings occurring before noon. An average vehicle occupancy rate of 1.1 was applied to these values to forecast vehicle parking demand per station and scenario.

As confirmed by the intercept surveys, not all Caltrain park-and-rider passengers park in Caltrain lots; some park on-street or in non-Caltrain lots. For most stations, however, the majority of park-and-ride passengers parked in a Caltrain lot. Therefore, it was assumed that, generally, park-and-ride demand generated by the Proposed Project would be met a Caltrain lot if space was available.

However, for seven stations (Bayshore, San Bruno, Millbrae, Hayward Park, San Carlos, Menlo Park, and Lawrence) the intercept survey found that at least two-thirds of park-and-ride passengers parked on street or in non-Caltrain parking lots, even though the Caltrain lots had ample available parking. Therefore, for those seven stations, the proportion of park-and-ride passengers parking in a Caltrain lot was assumed to be the same as the proportion recorded from the intercept survey.

Impacts of the Proposed Project on station access were evaluated by identifying whether project operations would have any effect on routes of access to the Caltrain stations.

Freight Rail Service

The potential impact of the Proposed Project on freight service was evaluated based on consideration of the impacts of potential changes in freight service operational hours and overhead height clearances with the project area.

3.14.2.2 Thresholds of Significance

The State CEQA Guidelines Appendix G (14 CCR 15000 et seq.) identifies significance criteria that lead agencies may consider for determining whether a project could have significant impacts on existing transportation and circulation. Pursuant to the CEQA Guidelines Appendix G, a project impact would be considered significant if construction or operation of the Proposed Project would cause any of the following conditions.

- Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and nonmotorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.
- Conflict with an applicable Congestion Management Plan, including, but not limited to, LOS standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.
- Substantially increase hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
- Result in inadequate emergency access.
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or that otherwise decrease the performance or safety of such facilities.
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks.

The CEQA Guidelines are intended to provide general guidance for lead agencies evaluating impacts on the transportation system. The criteria for determining project impacts were identified by Caltrain based on consideration of the applicable policies, regulations, and guidelines defined by the Caltrain and local jurisdictions and by consideration of the CEQA Guidelines.

The significance criteria used in this EIR for the transportation and traffic impact analysis are as follows:

Overall Project

For the overall project, the Proposed Project's impact is considered significant if it results any of the following conditions.

- The Proposed Project would result in an increase in VMT per service population in the study area (e.g., San Francisco, San Mateo and Santa Clara Counties).
- The Proposed Project would interfere with, conflict with, or preclude other planned improvements such as transit projects, roadway extensions/expansions, and pedestrian or bicycle facility improvements.
- The Proposed Project would conflict or create inconsistencies with adopted regional transportation plans.
- The Proposed Project would result in unsafe access between Caltrain stations and adjacent streets.

The specific subject criteria by which to evaluate these broad general criteria are explained in the sections below.

Traffic and Roadway System

The Proposed Project would create a significant impact on the traffic and roadway system if any of the following criteria are met or exceeded:

- The project conflicts or creates inconsistencies with local traffic plans.
- The project substantially disrupts existing traffic operations, as defined below:

  For signalized intersections, the significance criteria are based on the typical average criteria for jurisdictions along the Caltrain corridor. Specifically, a significant project impact to a signalized intersection occurs if the project results in one of the following conditions:

  - The project causes an intersection to deteriorate from LOS D or better to LOS E or F, or
  - The project causes an intersection operating at LOS E or F under baseline (no project) conditions to increase in overall delay by 4 seconds or more.

  The above criteria apply to all signalized intersections except where a jurisdiction has adopted criteria permitting higher levels of congestion in certain areas or at certain intersections, in which case these criteria are used.

  For stop-controlled intersections, the significance criteria are defined to occur if the project results in both of the following conditions:

  - The project results in a change from LOS A–E to LOS F conditions for the worst case movement, and
  - The intersection satisfies one or more traffic signal warrants.
- The project creates a temporary but prolonged impact due to lane closures, need for temporary signals, emergency vehicle access, traffic hazards to bikes/pedestrians, damage to roadbed, or truck traffic on roadways not designated as truck routes.

Transit System

The project would create a significant impact related to transit service if any of the following criteria are met or exceeded:

- The project creates demand for public transit services above the capacity which is provided, or planned.
- The project disrupts existing transit services or facilities.
- The project interferes with planned transit services or facilities.
- The project conflicts or creates inconsistencies with adopted transit system plans, guidelines, policies, or standards.

The project substantially increase hazards for transit systems because of a design feature or otherwise substantially compromises the safety of transit facilities.

Pedestrian System

The project would create a significant impact related to the pedestrian system if any of the following criteria are met or exceeded:

- The project disrupts existing pedestrian facilities.
- The project interferes with planned pedestrian facilities.
- The project conflicts or creates inconsistencies with adopted pedestrian system plans, guidelines, policies, or standards.

Bicycle System

The project would create a significant impact related to facilities if any of the following criteria are met or exceeded:

- The project substantially disrupts existing bicycle facilities.
- The project substantially interferes with planned bicycle facilities.
- The project conflicts or creates substantial inconsistencies with adopted bicycle system plans.

Emergency Vehicles

The project would create a significant impact if the following criteria is met or exceeded:

- The project results in inadequate emergency vehicle circulation and/or access.

Station Vehicle Parking and Access

The project would create a significant impact if either of the following criteria is met or exceeded:

- The project does not meet Caltrain's *Comprehensive Access Program Policy Statement* or *Bicycle Access and Parking Plan.*
- The project would result in the construction of off-site parking facilities that would have secondary physical impacts on the environment.

Freight Rail Service

The project would create a significant impact if the following criteria is met or exceeded:

- The project results in a change in freight rail service such that resultant diversions to truck or other freight modes would result in significant secondary impacts related to air quality, noise, greenhouse gas emissions, or traffic operation (as defined by the other applicable significance criteria in this EIR).

3.14.2.3 Impacts and Mitigation Measures

None of the Project Variants described in Chapter 2, *Project Description*, would result in any changes to the impact analyses presented below.

Roadway Traffic Operations

Impact TRA-1a	Substantially disrupts existing or future traffic operations during construction
Level of Impact	Significant
Mitigation Measure	TRA-1a: Implement construction road Traffic Control Plan
Level of Impact after Mitigation	Less than significant

Construction activities for the Proposed Project would consist of the installation of OCS poles and wires, erection of overbridge protection barriers on roadway bridges that cross the Caltrain alignment, and the construction of traction power facilities (TPFs), specifically, traction power substations (TPSs), paralleling stations and the switching station. Most of the construction activities would be contained within specific work sites or within the Caltrain ROW. Although construction would temporarily increase trucks and employee vehicles on public roadways accessing the work sites, the impact from increase trips on roadway traffic operation would be minimal. However, the following construction activities could require temporary closures of travel lanes or road segments, which would reduce the vehicle capacity of the roadway segments, disrupt the traffic flow, and potentially increase vehicle delays on the roadway segments.

- Installation of OCS wires may require lane or road closures at at-grade crossing when the wires are installed across the roads.
- Installation of overbridge protection barriers may require one-lane closures on the side of the road the barriers are installed.
- Installation of the transmission line or underground conduit between the PG&E substations and the TPS and between the TPS and the Caltrain ROW or utility relocations may require lane or road closures when the work is conducted across public roadways.

Although the closures, where required, would be short-term, the construction impact on traffic operation is considered significant. Implementation of Mitigation Measure TRA-1a would reduce the temporary construction impact on roadway traffic to a less-than-significant level.

Mitigation Measure TRA-1a: Implement construction road Traffic Control Plan

The JPB would coordinate with the traffic departments of local jurisdictions and with all corridor emergency service providers to develop a Traffic Control Plan consistent with the Caltrans *Manual on Uniform Traffic Control Devices*[7] to mitigate construction impacts on transit service, roadway operations, emergency responses, pedestrian and bicycle facilities, and public safety. Measures that will be implemented throughout the course of project construction, will include, but not limited to, the following:

- Maintain acceptable response times and performance objectives for emergency response services.
- Limit number of simultaneous street closures and consequent detours of transit and vehicular traffic within each immediate vicinity, with closure time frame limited as much as feasible for each closure, unless alternative traffic routings are available.
- Implement traffic control measures to minimize traffic conflicts and delays to the traveling public for local roadways where lane closures and restricted travel speeds will be required for longer periods.
- Provide advance notice of all construction-related street closures, durations, and detours to local jurisdictions, emergency service providers, and motorists.
- Provide safety measures for vehicles, bicyclists and pedestrians to transit through construction zones safely.
- Limit sidewalk, bicycle, and pedestrian walkway closures to one location within each vicinity at a time, with a closure time frame limited as much as feasible for each closure unless alternative routings for pedestrian and bicycle transit are available.
- Provide designated areas for construction worker parking wherever feasible to minimize use of parking in residential or business areas.
- Coordinate any construction effects to parking at the San Jose Diridon Station and at other areas used for SAP Center Parking with the City of San Jose and SAP Center representatives to minimize disruption of event parking.
- If necessary. a Maintenance of Traffic Plan and/or a Traffic Management Plan would be established in accordance with Caltrans' *Manual on Uniform Traffic Control Devices.*

Impact TRA-1b	Conflicts or creates inconsistencies with regional traffic plans or substantially disrupts future regional traffic operations from Proposed Project operation
Level of Impact	Less than significant

Transportation is a major contributor to GHG emissions and a direct result of population and employment growth, which generates vehicle trips to move goods, provide public services, and connect people with work, school, shopping, and other activities. Growth in travel (especially vehicle travel) is due in large part to changes in urban development patterns (i.e., the built environment). VMT measures the amount of miles vehicles travel on roadway networks.

[7] "*California Manual on Uniform Traffic Control Devices.*" Caltrans. 2012. <http://www.dot.ca.gov/hq/traffops/engineering mutcd/index.htm>

Because the Proposed Project would shift travel demand from driving trips to transit trips and reduce the regional vehicle traffic and VMT on major highways and arterials in the study area, the Proposed Project would not substantially disrupt future regional traffic operations. In addition, many adopted regional transportation plans take into consideration the electrification of the Caltrain system when developing their respective plans. In the *Plan Bay Area,* MTC identifies the electrification of the Caltrain system as one of the major transit project expected for the future; therefore, the Proposed Project would not conflict or create inconsistencies with regional traffic plans.

Overall, as summarized in Table 3.14-14, regional VMT is expected to increase between 2013 and 2020. However, regional VMT in the peak and off-peak periods would be less under the 2020 Project scenario compared with the 2020 No Project scenario. Total daily VMT under the 2020 Project scenario is projected to decrease by approximately 235,000 miles compared with the 2020 No Project scenario

Table 3.14-14. Average Regional Daily Vehicle Miles Traveled

	Vehicle Miles Traveled		
Scenario	Peak Hours	Off-Peak Hours	Daily Total
Existing Condition	~~96,261,904~~ 96,260,000	~~82,400,965~~ 82,401,000	~~178,662,869~~ 178,660,000
2020 No Project	~~104,704,796~~ 104,705,000	~~90,671,307~~ 90,669,000	~~195,376,103~~ 195,375,000
2020 Project	~~104,517,191~~ 104,518,000	~~90,624,331~~ 90,625,000	~~195,141,522~~ 195,141,000

Source: Appendix D, *Transportation Analysis*.

While certain locations near the stations or on the Caltrain corridor may experience increases in traffic due to more automobiles driving to and from stations (see discussion below under Impact TRA-1c), numerous roadways along the Caltrain corridor would see reduced traffic volumes as a result of the Proposed Project. In particular, major arterials, such as El Camino Real, SR 84, SR 92, I-280, and US 101 and other roadways, would see reductions in overall vehicle traffic, as the Proposed Project would shift travel demand from driving trips to transit trips.

Table 3.14-15 displays daily VMT within each city for 2020 No Project and 2020 Project scenarios. City-level VMT is calculated by accounting for the total mileage of all vehicle trips within each city's boundaries, which known as the "boundary method" calculation.

Daily VMT in all cities along the corridor would decrease under the 2020 Project scenario compared with the 2020 No Project scenario. Total daily VMT under the 2020 Project scenario is projected to decrease by an average of ~~1.8~~ 0.9 percent in all cities along the corridor compared with the 2020 No Project scenario.

While certain locations on the Caltrain corridor may experience increases in traffic due to more automobiles driving to and from stations, the total effect is that total VMT in each city would decrease because of the Proposed Project.

Thus, the Proposed Project would have a beneficial impact on regional and city-level traffic overall by reducing vehicle miles traveled. Impact TRA-1c analyzes localized traffic impacts.

Table 3.14-15. Weekday Daily Regional Vehicle Miles Traveled within Each City, 2020 Scenario

	2020 No Project			2020 Project		
City	**Peak[a]**	**Off-Peak[b]**	**All**	**Peak[a]**	**Off-Peak[b]**	**All**
San Francisco	4,153,000	3,526,000	7,680,000	4,141,000	3,497,000	7,638,000
Brisbane	431,000	397,000	827,000	428,000	395,000	823,000
South San Francisco	700,000	574,000	1,275,000	695,000	506,000	1,200,000
San Bruno	499,000	363,000	862,000	496,000	360,000	856,000
Millbrae	210,000	164,000	374,000	209,000	136,000	344,000
Burlingame	480,000	427,000	906,000	476,000	422,000	898,000
San Mateo	1,260,000	1,114,000	2,374,000	1,252,000	1,101,000	2,354,000
Belmont	165,000	120,000	285,000	163,000	119,000	282,000
San Carlos	~~701,000~~ 317,000	263,000	~~963,000~~ 579,000	315,000	260,000	574,000
Redwood City	785,000	712,000	1,497,000	780,000	703,000	1,483,000
Atherton	65,000	38,000	104,000	65,000	38,000	103,000
Menlo Park	636,000	611,000	1,247,000	632,000	602,000	1,234,000
Palo Alto	800,000	664,000	1,464,000	795,000	657,000	1,451,000
Mountain View	1,006,000	872,000	1,878,000	1,002,000	865,000	1,867,000
Sunnyvale	1,379,000	1,099,000	2,478,000	1,372,000	1,077,000	2,449,000
Santa Clara	1,199,000	753,000	1,952,000	1,193,000	747,000	1,940,000
San Jose	9,722,000	7,750,000	17,473,000	9,705,000	7,673,000	17,378,000
TOTAL	**~~23,760,000~~ 23,807,000**	**~~19,050,000~~ 19,447,000**	**~~42,812,000~~ 43,255,000**	**~~23,291,000~~ 23,719,000**	**~~18,763,000~~ 19,158,000**	**~~42,051,000~~ 42,874,000**

Source: Appendix D, *Transportation Analysis*.
[a] Peak travel is defined as travel occurring from 5:00 a.m. to 9:00 a.m. and from 3:00 p.m. to 7:00 p.m.
[b] Off-peak travel is defined as travel occurring from 9:00 a.m. to 3:00 p.m. and from 7:00 p.m. to 5:00 a.m.

Impact TRA-1c	Conflicts or creates inconsistencies with local traffic plans or substantially disrupts future local traffic operations from Proposed Project operation in 2020
Level of Impact	Significant
Mitigation Measure	TRA-1c: Implement signal optimization and roadway geometry improvements at impacted intersections for the 2020 Project Condition
Level of Impact after Mitigation	Significant and unavoidable

Although the Proposed Project would reduce regional vehicle miles travelled, the Proposed Project would also affect local traffic operations along the Caltrain corridor in several ways. First, the number of trains would increase, increasing the number of gate down occurrences relative to the No Project scenario. Second, the increased train service and added train capacity would change traffic patterns resulting in potential increases in traffic near stations coupled with reduced traffic on parallel roads.

For the study at-grade crossing intersections overall, the average gate-down time per event is reduced at many crossings under the Project scenario compared with the No Project scenario in 2020. However, the increase in the number of trains is expected to result in an increase in the aggregate gate-down time over the peak hour at 14 locations compared with the No Project scenario in 2020 at grade crossings near study locations. Gate-down time during the peak hour would improve relative to the No Project scenario at seven locations. Gate-down time during the peak hour would be higher in one peak hour and lower in the other peak hour compared with the No Project scenario at 10 ~~eight~~ locations (for example at the Villa Terrace at-grade crossing in San Mateo, the Proposed Project would have less gate-down time in the AM peak hour, but more gate-down time in the PM peak hour compared with the No Project scenario).

The increase in number of gate-down events, along with increasing the number of corresponding signal preemption events, may degrade intersection operations even though the gate-down time per event is lower. The peak hour intersection results (level of service and average vehicle delay) for the 2020 No Project and 2020 Project scenarios are presented in Table 3.14-16.

Table 3.14-16. Intersection Delay and Levels of Service, 2020 No Project and 2020 Project Alternatives

(Intersections added after the Draft EIR are shown in italics to avoid confusion with prior formatting for showing significant impacts which uses underline).

Int. ID	Intersection	Jurisdiction	Peak Hour[a]	Intersection Control	2020 No Project Delay[b]	LOS[c]	2020 Project Delay[b]	LOS[c]	Change in Delay
ZONE 1									
1	4th Street & King Street	SF	AM PM	Signal	**>120** **>120**	**F** **F**	**>120** **≥120**	**F** **F**	0 **34.2**
2	4th Street & Townsend Street	SF	AM PM	Signal	**>120** **>120**	**F** **F**	**>120** **≥120**	**F** **F**	-31.6 **35.1**
3	Mission Bay Drive & 7th Street	SF	AM PM	Signal	10.1 13.4	B B	10.5 14.3	B B	0.4 0.9
4	Mission Bay Drive & Berry Street	SF	AM PM	Signal	1.9 6.9	A A	1.5 9.8	A A	-0.4 0.9
5	7th Street & 16th Street	SF	AM PM	Signal	**90.9** **67.7**	**F** **E**	**≥120** **64.5**	**F** **E**	**29.7** -3.2
6	16th Street & Owens Street	SF	AM PM	Signal	11.3 13.4	B B	11.6 13.7	B B	0.3 0.3
7	22nd Street & Pennsylvania Street	SF	AM PM	All-way Stop	9.2 7.3	A A	9.5 8.4	A A	0.3 1.1
8	22nd Street & Indiana Street	SF	AM PM	All-way Stop	6.1 5.4	A A	5.7 6.0	A A	-0.4 0.6
9	Tunnel Avenue & Blanken Avenue	SF	AM PM	All-way Stop	15.3 39.8	C E	23.1 37.8	C E	7.8 -2.0
10	Linden Avenue & Dollar Avenue	SSF	AM PM	Signal	15.9 40.9	B D	18.0 54.1	B D	2.1 13.2
11	East Grand Avenue & Dubuque Way	SSF	AM PM	Signal	8.9 10.9	A B	10.4 12.3	B B	1.5 1.4
12	S Linden Avenue & San Mateo Avenue	SSF	AM PM	Signal	8.0 8.6	A A	8.0 19.4	A B	0 10.8
13	Scott Street & Herman Street	SB	AM PM	Side-Street Stop	11.3 15.1	A C	9.6 14.6	A B	-1.7 -0.5
14	Scott Street & Montgomery Avenue	SB	AM PM	Side-Street Stop	5.9 6.2	A A	6.4 6.9	A A	0.5 0.7

Int. ID	Intersection	Jurisdiction	Peak Hour[a]	Intersection Control	2020 No Project Delay[b]	2020 No Project LOS[c]	2020 Project Delay[b]	2020 Project LOS[c]	Change in Delay
15	San Mateo Avenue & San Bruno Avenue	SB	AM PM	Signal	19.9 20.8	B C	21.5 19.1	C C	1.6 -1.7
ZONE 2									
16	El Camino Real & Millbrae Avenue	MB	AM PM	Signal	**75.7** **85.1**	**E** **F**	**105.4** **>120**	**F** **F**	**29.7** **53.4**
17	Millbrae Avenue & Rollins Road	MB	AM PM	Signal	38.0 **58.6**	D **E**	49.4 **88.2**	D **F**	11.4 **29.6**
18	California Drive & Broadway	BG	AM PM	Signal	***133.7*** ***157.2***	***F*** ***F***	***>120*** ***>120***	***F*** ***F***	*-0.7* ***6.8***
19	Carolan Avenue & Broadway	BG	AM PM	Signal	*46.3* *52.1*	*D* *D*	*26.0* *52.7*	*D* *D*	*-0.3* *0.6*
20	California Drive & Oak Grove Avenue	BG	AM PM	Signal	**91.3** 26.8	**F** C	53.2 29.9	D C	-38.1 3.1
21	Carolan Avenue & Oak Grove Avenue	BG	AM PM	Side-Street Stop	**>120** **>120**	**F** **F**	**≥120** **≥120**	**F** **F**	**≥60** **≥60**
22	California Drive & North Lane	BG	AM PM	Side-Street Stop	16.3 11.2	C B	15.5 12.9	C B	-0.8 1.7
23	Carolan Avenue & North Lane	BG	AM PM	Side-Street Stop	32.9 13.5	D B	38.5 15.4	E C	5.6 1.9
24	Anita Road & Peninsula Avenue	BG	AM PM	Side-Street Stop	17.2 **53.3**	C **F**	14.4 33.4	B D	-2.8 -19.9
83	*Broadway and Rollins Road*	*BG*	*AM* *PM*	*Signal*	*50.6* ***94.8***	*D* ***F***	*50.8* ***96.8***	*D* ***F***	*0.2* *2.0*
84	*Rollins Road and Cadillac Way*	*BG*	*AM* *PM*	*Signal*	*10.1* *5.7*	*B* *A*	*9.9* *5.9*	*A* *A*	*-0.2* *0.2*
84a	*Broadway and US 101 Southbound Ramps*	*BG*	*AM* *PM*	*Signal*	***59.1*** ***100.0***	***E*** ***F***	*49.0* ***85.4***	*D* ***F***	*-10.1* *-14.6*
85	*Bayswater Avenue and California Drive*	*BG*	*AM* *PM*	*Signal*	*11.0* *11.8*	*B* *B*	*11.1* *11.7*	*B* *B*	*0.1* *-0.1*
25	Woodside Way & Villa Terrace	SM	AM PM	Side-Street Stop	5.1 5.5	A A	5.2 5.3	A A	0.1 -0.2
26	North San Mateo Drive & Villa Terrace	SM	AM PM	Side-Street Stop	12.0 15.8	B C	11.6 16.0	B C	-0.4 0.2
27	Railroad Avenue & 1st Avenue	SM	AM PM	Side-Street Stop	12.6 17.8	B C	8.9 14.3	A B	-3.7 -3.5
28	South B Street & 1st Avenue	SM	AM PM	Signal	21.6 47.6	C D	16.3 50.8	B D	-5.3 3.2
29	9th Avenue & S Railroad Avenue	SM	AM PM	Side-Street Stop	41.8 41.8	E E	44.5 35.7	E E	2.7 -6.1
30	South B Street & 9th Avenue	SM	AM PM	Signal	15.3 21.8	C C	16.6 18.5	B B	1.3 -3.3
31	Transit Center Way & 1st Avenue	SM	AM PM	Uncontrolled	5.3 12.5	A B	4.2 11.4	A B	-1.1 -1.1
32	Concar Drive & SR 92 Westbound Ramps	SM	AM PM	Signal	7.0 9.2	A A	7.1 18.0	A B	0.1 8.8
33	S Delaware Street & E 25th Avenue	SM	AM PM	Signal	16.4 **69.5**	B **E**	15.5 43.2	B D	-0.9 -26.3
34	E 25th Avenue & El Camino Real	SM	AM PM	Signal	34.5 **90.6**	C **F**	30.9 **82.2**	C **F**	-3.6 -8.4
35	31st Avenue & El Camino Real	SM	AM PM	Signal	21.7 37.9	C D	21.2 44.2	C D	-0.5 6.3
36	E Hillsdale Boulevard & El Camino Real	SM	AM PM	Signal	**77.6** 49.9	**E** D	**86.6** 46.6	**F** D	**9.0** -3.3

Int. ID	Intersection	Jurisdiction	Peak Hour[a]	Intersection Control	2020 No Project Delay[b]	LOS[c]	2020 Project Delay[b]	LOS[c]	Change in Delay
37	E Hillsdale Blvd. & Curtiss Street	SM	AM PM	Signal	30.7 10.8	C B	38.1 10.2	D B	7.4 -0.6
38	Peninsula Avenue & Arundel Road & Woodside Way	SM	AM PM	Side-Street Stop	18.8 **54.5**	C **F**	16.8 31.2	C D	-2.0 -23.3
39	El Camino Real & Ralston Avenue	BL	AM PM	Signal	**>120** **>120**	**F** **F**	**>120** **>120**	**F** **F**	-8.3 1.6
40	El Camino Real & San Carlos Avenue	SC	AM PM	Signal	21.5 **67.9**	C **E**	21.9 42.3	C D	0.4 -25.6
41	Maple Street & Main Street[d]	RC	AM PM	Side-Street Stop	39.3 51.5	E F	35.4 31.7	E D	-3.9 -19.8
42	Main Street & Beech Street	RC	AM PM	Side-Street Stop	6.4 12.8	A B	7.9 42.4	A E	1.5 29.6
43	Main Street & Middlefield Road[d]	RC	AM PM	Signal	24.2 >120	C F	25.7 >120	C F	1.5 >60
44	Broadway Street & California Street[d]	RC	AM PM	Side-Street Stop	>120 >120	F F	>120 >120	F F	>-60 >-60
45	El Camino Real & Whipple Avenue	RC	AM PM	Signal	**59.0** 53.5	**E** D	48.7 45.2	D D	-10.3 -8.3
46	Arguello Street & Brewster Avenue[d]	RC	AM PM	Signal	36.9 >120	D F	46.6 115.3	D F	9.7 -49.0
47	El Camino Real & Broadway Street[d]	RC	AM PM	Signal	60.6 108.7	E F	58.9 114.1	E F	-1.7 5.4
48	Arguello Street & Marshall Street[d]	RC	AM PM	Signal	47.2 95.7	D F	34.4 82.7	C F	-12.8 -13.0
49	El Camino Real & James Avenue[d]	RC	AM PM	Signal	29.2 79.2	C E	28.8 91.1	C F	-0.4 11.9
ZONE 3									
50	El Camino Real & Fair Oaks Lane	AT	AM PM	Signal	37.1 30.2	D C	40.5 33.5	D C	3.4 3.3
<u>51</u>	El Camino Real & Watkins Avenue	AT	AM PM	Side-street stop	35.3 **>120**	E **F**	43.1 **<u>≥120</u>**	E **<u>F</u>**	7.8 **<u>≥60</u>**
52	Fair Oaks Lane & Middlefield Road	AT	AM PM	Side-Street Stop	**>120** **>120**	**F** **F**	**>120** **77.8**	**F** **F**	>-60 >-60
53	Watkins Avenue & Middlefield Road	AT	AM PM	Side-Street Stop	**52.5** **>120**	**F** **F**	**49.5** **91.5**	**F** **F**	-3.1 -30.3
<u>54</u>	Glenwood Avenue & Middlefield Road	AT	AM PM	Side-Street Stop	**70.9** **>120**	**F** **F**	**<u>≥120</u>** **<u>≥120</u>**	**<u>F</u>** **<u>F</u>**	**<u>50</u>** **<u>≥60</u>**
<u>*87*</u>	<u>*Encinal Avenue and Middlefield Road*</u>	<u>*AT*</u>	<u>*AM*</u> <u>*PM*</u>	<u>*Signal*</u>	<u>*21.0*</u> <u>*15.1*</u>	<u>*C*</u> <u>*B*</u>	<u>*22.7*</u> <u>*14.2*</u>	<u>*C*</u> <u>*B*</u>	<u>*1.7*</u> <u>*-0.9*</u>
<u>*86*</u>	<u>*Encinal Avenue and El Camino Real*</u>	<u>*MP*</u>	<u>*AM*</u> <u>*PM*</u>	<u>*Signal*</u>	<u>*15.0*</u> <u>***111.9***</u>	<u>*B*</u> <u>***F***</u>	<u>*16.6*</u> <u>***79.1***</u>	<u>*B*</u> <u>***E***</u>	<u>*1.6*</u> <u>*-32.8*</u>
<u>55</u>	El Camino Real & Glenwood Avenue	MP	AM PM	Signal	53.6 **72.1**	D **E**	**<u>94.6</u>** **<u>111.8</u>**	**<u>F</u>** **<u>F</u>**	**<u>41.0</u>** **<u>39.7</u>**
<u>56</u>	El Camino Real & Oak Grove Avenue	MP	AM PM	Signal	**56.3** 50.9	**E** D	**<u>66.6</u>** 40.1	**<u>E</u>** D	**<u>10.3</u>** -10.8
57	El Camino Real & Santa Cruz Avenue	MP	AM PM	Signal	30.5 27.9	C C	21.9 29.4	C C	-8.6 1.5
58	Merrill St & Santa Cruz Avenue	MP	AM PM	All-way Stop	12.9 **20.3**	B **C**	11.2 **>120**	B **F**	-1.7 **>60**
59	Ravenswood Avenue & Alma Street	MP	AM PM	Side-Street Stop	40.6 41.8	E E	29.8 27.1	D D	-10.8 -14.7

Int. ID	Intersection	Jurisdiction	Peak Hour[a]	Intersection Control	2020 No Project Delay[b]	LOS[c]	2020 Project Delay[b]	LOS[c]	Change in Delay
60	El Camino Real & Ravenswood Avenue	MP	AM PM	Signal	**73.6** **>120**	**E** **F**	**75.0** **>120**	**E** **F**	1.4 1.8
61	Ravenswood Avenue & Laurel Street	MP	AM PM	Signal	**73.4** **>120**	**E** **F**	37.0 50.1	D D	-36.4 >-60
88	*Laurel Street and Oak Grove Avenue*	*MP*	*AM* *PM*	*Signal*	*11.1* *10.7*	*B* *B*	*11.1* *13.0*	*B* *B*	*0.0* *2.3*
89	*Laurel Street and Glenwood Avenue*	*MP*	*AM* *PM*	*All-way Stop*	*6.9* *8.4*	*A* *A*	*6.9* *7.1*	*A* *A*	*0.0* *-1.3*
90	*Laurel Street and Encinal Avenue*	*MP*	*AM* *PM*	*All-way Stop*	*5.6* *6.6*	*A* *A*	*5.7* *6.3*	*A* *A*	*0.1* *-0.3*
62	Alma Street & Palo Alto Avenue	PA	AM PM	Side-Street Stop	8.4 12.4	A B	13.3 31.4	B D	4.9 19.0
63	Meadow Drive & Alma Street	PA	AM PM	Signal	**104.2** **>120**	**F** **F**	**110** **>120**	**F** **F**	**5.8** **29.1**
64	El Camino Real & Alma & Sand Hill Road	PA	AM PM	Signal	**58.5** 54.9	**E** D	**78.7** 53.5	**E** D	**20.2** -1.4
65	High Street & University Avenue	PA	AM PM	Signal	10.1 18.6	B B	12.8 18.4	B B	2.7 -0.2
66	Alma Street & Churchill Avenue	PA	AM PM	Signal	**83.9** **>120**	**F** **F**	**108.9** **>120**	**F** **F**	**25.0** **9.2**
67	W Meadow Drive & Park Boulevard	PA	AM PM	Side-Street Stop	**>120** **>120**	**F** **F**	**>120** **>120**	**F** **F**	>-60 >-60
68	Alma Street & Charleston Road	PA	AM PM	Signal	**>120** **>120**	**F** **F**	**>120** **>120**	**F** **F**	**28.4** **9.0**
69	Showers Drive & Pacchetti Way	MV	AM PM	Signal	4.4 5.0	A A	4.8 5.3	A A	0.4 0.3
70	Central Expressway & N Rengstorff Avenue	~~MV~~ SCC	AM PM	Signal	**>120** **>120**	**F** **F**	***>120*** **>120**	**F** **F**	***4.2*** ***46.6***
71	Central Expressway & Moffett Boulevard & Castro Street	~~MV~~ SCC	AM PM	Signal	**>120** **>120**	**F** **F**	**>120** **>120**	**F** **F**	*2.5* ***5.8***
72	W Evelyn Avenue & Hope Street	MV	AM PM	Signal	3.8 5.7	A A	3.8 5.8	A A	0 0.1
73	Rengstorff Avenue & California Street	MV	AM PM	Signal	29.5 **55.6**	C **E**	31.4 40.5	C D	1.9 -15.1
74	Castro Street & Villa Street	MV	AM PM	Signal	11.7 **65.5**	B **E**	14.7 **68.5**	B **E**	3.0 3.0
75	W Evelyn Avenue & S Mary Avenue	SV	AM PM	Signal	**68.7** **80.1**	**E** **F**	**56.7** **97.3**	**E** **F**	-12.0 **17.2**
76	W Evelyn Avenue & Frances Street	SV	AM PM	Signal	20 26.3	B C	31.9 36.6	C D	11.9 10.3
ZONE 4									
77	Kifer Road & Lawrence Expressway[e]	~~SCL~~ SCC	AM PM	Signal	111.4 >120	F F	114.6 >120	F F	3.2 2.9
78	Reed Avenue & Lawrence Expressway	~~SCL~~ SCC	AM PM	Signal	**107.3** **86.4**	**F** **F**	**107.4** **68.1**	**F** **F**	0.1 -18.3
79	El Camino Real & Railroad Avenue	SCL	AM PM	Signal	17.8 21.9	B C	20.1 22.1	C C	2.3 0.2
80	W Santa Clara Street & Cahill Street	SJ	AM PM	Signal	25.8 47.8	C D	23.0 **62.8**	C **E**	-2.8 **15.0**
81	S Montgomery Street & W San Fernando Street	SJ	AM PM	Signal	22.8 **64.3**	C **E**	29.0 **>120**	C **F**	6.2 **>60**

Int. ID	Intersection	Jurisdiction	Peak Hour[a]	Intersection Control	2020 No Project Delay[b]	2020 No Project LOS[c]	2020 Project Delay[b]	2020 Project LOS[c]	Change in Delay
82	Lick Avenue & W Alma Avenue	SJ	AM PM	Signal	23.2 30.3	C C	31.4 45.6	C D	8.2 15.3

Source: Appendix D, *Transportation Analysis*

Notes:

Jurisdictions:

SF	San Francisco	SM	San Mateo	MV	Mountain View
SSF	South San Francisco	BL	Belmont	SV	Sunnyvale
SB	San Bruno	SC	San Carlos	SCL	Santa Clara
MB	Millbrae	RC	Redwood City	SCC	Santa Clara County
BG	Burlingame	AT	Atherton	SJ	San Jose
MP	Menlo Park	PA	Palo Alto		

[a] AM = morning peak hour, PM = afternoon peak hour

[b] Delay measured in seconds

[c] LOS designation pursuant to 2010 Highway Capacity Manual

[d] Downtown Redwood City has no level of service standard for intersections in the *Downtown Precise Plan* area (Policy BE-29.4).

~~[e] City of Santa Clara level of service exemptions exist for new development, to facilitate alternate transportation in Station Focus Areas.~~

Bold font represents an LOS that is below the established threshold of significance as per the Significance Criteria

Bold Underline font represents locations and conditions where the Proposed Project would result in a significant impact relative to the No Project scenario.

Based on a prototypical schedule.

It should be noted that the analysis is based on a prospective 2020 schedule that was developed only for analytical purposes for this EIR. Although the schedule has yet been finalized, it is the best available data to be used for identifying the potential traffic operation impact of the Proposed Project. The actual schedule may vary, which could influence the schedule at some of the local stations, but would not be expected to substantially change the estimated vehicle delay at the study intersections.

The traffic operation analysis accounts for the changes in gate-down times at at-grade crossings and changes in local traffic patterns and traffic volumes near the stations. As shown in Table 3.14-16, a comparison of the intersection levels of service and delays under the 2020 No Project scenario with the 2020 Project scenario indicates that the Proposed Project would cause traffic delays for 21 study intersections to exceed the significance thresholds during the AM and/or PM peak hours. This is considered a significant impact.

Local roadway improvements, including signal optimization and roadway geometry improvements are proposed as part of Mitigation Measure TRA-1c to improve the operations and to reduce or eliminate the localized significant impact at the impacted intersections and at-grade crossings. Table 3.14-17 summarizes the intersection impacts and the associated mitigation measures proposed to reduce these identified impacts. Localized traffic impacts would be reduced to a less-than-significant level at ~~12~~ 14 of the significantly affected locations. The impact would remain significant and unavoidable at the other ~~9~~ 7 locations because either the proposed signal optimization and roadway geometry improvements would be insufficient to reduce the impact sufficiently or no feasible mitigation is available.

Table 3.14-17. Summary of Intersection Impacts and Mitigation Measures

Int. ID	City	Intersection	Impacted Peak Hour	Mitigation Strategies	Impact Significance after Mitigation
		Signalized Intersections			
1	San Francisco	4th Street and King Street	PM	Revise signal timing and phasing to better coordinate with 4th Street and Townsend Street	Less than significant
2	San Francisco	4th Street and Townsend Street	PM	Revise signal timing and phasing to better coordinate with 4th Street and King Street	Less than significant
5	San Francisco	7th Street and 16th Street	AM	Widen northbound approach to lengthen left turn pocket Remove parking lane to create a third lane for the eastbound approach Revise signal timing and phasing to better coordinate with 16th Street and Owens Street Pre-emption, pre-signals or queue cutters as necessary to manage queues relative to the rail crossing.	Less than significant
16	San Francisco	El Camino Real and Millbrae Avenue	AM and PM	Adjust signal timings to better serve traffic after project implementation	Less than significant
17	Millbrae	Millbrae Avenue and Rollins Road	PM	Adjust signal timings to better serve traffic after project implementation	Less than significant
18	Burlingame	California Drive and Broadway	~~AM and~~ PM	Adjust signal timings to better serve traffic after project implementation	Less than significant
36	San Mateo	E Hillsdale Boulevard and El Camino Real	AM	Adjust signal timings to better serve traffic after project implementation	Less than significant
55	Menlo Park	El Camino Real and Glenwood Avenue	AM and PM	Adjust signal timings to better serve traffic after project implementation	Less than significant ~~Significant and unavoidable[a]~~
56	Menlo Park	El Camino Real and Oak Grove Avenue	AM	Adjust signal timings to better serve traffic after project implementation	Less than significant ~~Significant and unavoidable[a]~~
63	Palo Alto	Meadow Drive and Alma Street	AM and PM	No feasible mitigations exist~~[b]~~[a]	Significant and unavoidable
64	Palo Alto	El Camino Real and Alma Street and Sand Hill Road	AM	Widen west leg of Sand Hill Road by adding one lane to allow southbound right turns on red Adjust signal timings to better serve traffic after project implementation Evaluate potential signal pre-emption with Caltrans and City of Palo Alto to manage traffic movements.	Less than significant
66	Palo Alto	Alma Street and Churchill Avenue	AM and PM	No feasible mitigations exist~~[b]~~[a]	Significant and unavoidable

Int. ID	City	Intersection	Impacted Peak Hour	Mitigation Strategies	Impact Significance after Mitigation
68	Palo Alto	Alma Street and Charleston Road	AM and PM	No feasible mitigations exist[~~b~~a]	Significant and unavoidable
70	Mt. View	Central Expressway and N Rengstorff Avenue	PM	No feasible mitigations exist[~~b~~a]	Significant and unavoidable
71	Mt. View	Central Expressway and Moffett Boulevard and Castro Street	AM and PM	No feasible mitigations exist[~~b~~a]	Significant and unavoidable
75	Sunnyvale	W Evelyn and S Mary Avenue	PM	No feasible mitigations exist[~~c~~b]	Significant and unavoidable
80	San Jose	W Santa Clara Street and Cahill Street	PM	Adjust signal timings to better serve traffic after project implementation	Less than significant
81	San Jose	South Montgomery Street and W San Fernando Street	PM	Adjust signal timings to better serve traffic after project implementation	Less than significant
		Stop-Controlled Intersections			
21	Burlingame	Carolan Avenue and Oak Grove Avenue	AM and PM	Signalize intersection	Significant and unavoidable[~~d~~c]
51	Atherton	El Camino Real and Watkins Avenue	AM and PM	Signalize intersection	Less than significant
54	Atherton	Glenwood Avenue and Middlefield Road	AM and PM	Signalize intersection	Less than significant

Source: Appendix D, *Transportation Analysis*

~~[a] Less-than-significant after mitigation but a secondary impact would be produced at Intersection #61 (Ravenswood Avenue and Laurel Street). After mitigation, the delay would increases by more than 4 seconds at Intersection #61.~~

[~~b~~a] Addition of through lanes along Central Expressway and Alma Street may reduce the impact at this location, but the addition of through lanes is subject to ROW constraints and is, therefore, infeasible.

[~~c~~b] Implementation of a grade-separated crossing may reduce the impact but is subject to fiscal constraints. Therefore, this mitigation is considered infeasible for purposes of this document.

[~~d~~c] Intersection impacts would be less than significant after mitigation, but a secondary impact would be produced at Intersection #20 (California Drive and Oak Grove Avenue) with the signalization of Carolan Avenue/Oak Grove Avenue. After mitigation, average vehicle delay would increase by more than 4 seconds at Intersection #20.

While grade separations are a technically feasible way to reduce traffic impacts at the at-grade locations, it is a highly expensive mitigation strategy. Caltrain has supported past and present grade-separation projects (such as the current San Bruno Grade Separation project) and will support future efforts at grade separation where acceptable to local communities and where local, state, and federal funding can be obtained to fund these improvements. However, using an average assumed cost of $50 million to $100 million per crossing (grade separations can cost much more sometimes), grade separating the at-grade crossings closest to the ~~nine~~ 7 significantly affected intersections (after mitigation in Mitigation TRA-1c) would cost $~~450~~ 350 million to $~~900~~ $700 million. The budget for the Proposed Project is $1.225 billion by comparison. Thus, Caltrain cannot commit to a comprehensive program of grade separations at this time to address all significantly affected intersections and this impact is considered significant and unavoidable.

Mitigation Measure TRA-1c: Implement signal optimization and roadway geometry improvements at impacted intersections for the 2020 Project Condition

Table 3.14-17 summarizes the intersection impacts and the associated mitigation measures proposed to minimize localized traffic impacts. Detailed description for improvements at each impacted intersections are included in the transportation analysis report in Appendix D, *Transportation Analysis*. Possible mitigation measures include signal optimization and roadway geometry improvements, as discussed below:

- Signal optimization: Signal timing optimization would be performed to reduce delay at signalized intersections. This can include optimizing the cycle time, splits, and phasing. In addition, for closely spaced intersections, optimizing the offset and better signal coordination will also reduce delay.
- Roadway geometry changes: Changing the roadway geometry could help reduce intersection delay. This would include changing the roadway width by widening the street or changing the existing geometry configuration through restriping. Intersection #64 (El Camino Real and Alma Street and Sand Hill Road) is an example of where roadway geometry could be altered as a mitigation measure to reduce intersection delay.
- A review of the significantly affected intersections identified one location (7th/16th Street in San Francisco) where, with the proposed mitigation, there is a possibility of queues backing up to the grade crossing. Thus, this measure also includes pre-emption, pre-signals or queue cutters at this location to prevent an increase in potential queue back to the grade crossing.
- JPB will coordinate with the CPUC during the final design phase of the project concerning adjustment of traffic signals and road geometry adjacent to at-grade crossings through the GO 88-B process.

JPB will coordinate with local jurisdictions during the design phase of roadway mitigation measures that affect roadways under local jurisdiction.

Transit Systems

Impact TRA-2a	Disrupts existing or planned transit services or facilities during construction
Level of Impact	Significant
Mitigation Measures	TRA-1a: Implement construction road Traffic Control Plan TRA-2a: Implement construction railway disruption control plan
Level of Impact after Mitigation	Less than significant

During the construction, installation of OCS poles and wires would require the use of on-track equipment in many locations. The majority of the work could be accomplished during the nighttime using single-track access; however, some portions of the work would require some multiple track shutdowns and could only be installed by using complete weekend outages, requiring suspension of passenger service, to increase working efficiency and reduce public safety risks. Although most of the on-track work would be conducted during nighttime hours with occasional service shutdowns occurring during weekends, the construction impact on Caltrain passengers (or ACE, Capitol Corridor, or Amtrak trains between Santa Clara and San Jose) that take trains at night or on the weekend is considered significant.

In addition, to accelerate construction completion, construction strategies to improve construction efficiency with minimizing construction impacts are included in the Proposed Project as shown in Chapter 2, *Project Description*, Table 2-5. The strategies that could potentially disrupt Caltrain service and affect Caltrain passengers and the connecting transit services include revising the Caltrain schedule, reducing the span of Caltrain service day, reducing the number of trains, shutting down service for specific weekends, and closing a station temporarily during construction. Although specific strategies have yet been determined, any of the strategies, if selected, would result in temporary significant impacts on Caltrain passengers and the connecting transit services.

Implementation of Mitigation Measure TRA-2a would reduce the temporary construction impact on rail passenger and freight service disruption to a less-than-significant level by minimizing the duration of potential disruption to service during construction.

Similar to Impact TRA-1a**,** construction impact on roadway transit services could be potentially significant when temporary lane or road closures are required on roadway segments, bridges, and at-grade crossings with transit services. Implementation of Mitigation Measure TRA-1a would reduce the temporary construction impact on roadway transit services to a less-than-significant level.

Mitigation Measure TRA-2a: Implement construction railway disruption control plan

The JPB will make efforts to contain disruption to Caltrain, tenant passenger, and freight services during construction. Measures that will be implemented throughout the course of project construction, will include, but <u>are</u> not limited to, the following:

- <u>The overall goal of this plan should be to minimize the overall duration of disruption of Caltrain, tenant passenger, and freight operations and maintain reasonable levels of service, while allowing for an expeditious completion of construction.</u>
- <u>Limit number of simultaneous track closures within each immediate vicinity, with closure time frame limited as much as feasible for each closure, unless bypass tracks are available.</u>

- Provide safety measures for rail services to transit through construction zones safely.
- Require contractors to coordinate with rail dispatch to minimize disruption of rail service in the corridor.
- Where feasible, limit closure of any tracks for construction activities to off-peak periods and weekends, when service is less frequent or late night, when no passenger service is scheduled.
- Where feasible, maintain acceptable service access for passenger and freight service.
- Where one open track cannot be maintained for passenger or freight use, limit multi-track closures to one location at a time, as much as feasible
- Where multi-track closures result in temporary elimination of transit rail service, work with local and regional transit providers to provide alternative transit service around the closure area including increased bus and shuttle service.
- Where multi-track closures result in temporary elimination of freight rail service, work with Union Pacific and freight users to schedule alternative freight service timing to minimize disruption to freight customers.
- Provide advance notice of all construction-related track closures to all affected parties. Provide advance notice to transit riders of any temporary disruption in transit service.
- Where temporary cessation of freight rail service is necessary due to multi-track closures and would result in substantial diversion to truck modes, Caltrain or its construction contractor shall coordinate with local jurisdictions and freight operations to determine preferred truck routes to minimize the effect on local traffic conditions.
- Construction in and adjacent to BART facilities will be coordinated in advance and during construction with BART including any necessary BART safety monitors. If construction would result in any potential service disruption, Caltrain or its construction contractor shall coordinate with BART to avoid the disruption and/or minimize the extent and duration of disruption and provide information to commuters on alternative transit options during the disruption.
- Caltrain and/or its construction contractor shall coordinate with Union Pacific in advance and during any potential disruption to freight operations and/or Union Pacific facilities. Union Pacific's emergency access will be maintained throughout construction.

Impact TRA-2b	Creates demand for public transit services above the capacity which is provided or planned; interferes with existing or planned transit services or facilities; or conflicts or creates inconsistencies with adopted transit system plans, guidelines, policies, or standards from Proposed Project operations
Level of Impact	Beneficial (Caltrain); Less than Significant (other transit services)

Proposed Project implementation would not conflict or create inconsistences with adopted transit plans, guidelines, policies or standards adopted by study area cities, counties, the MTC, or the State of California. Some of the adopted plans would extend through 2020 or expire after. On the city level, Caltrain is a beneficial component of currently approved and ongoing station area plans, downtown specific plans, and general plans. In some cases, a city's Caltrain station is the focal point of a plan or at least a major aspect of the circulation element within the city's general plan. On the regional level, Caltrain is consistent with *Plan Bay Area*. The Proposed Project is one of the major projects included in *Plan Bay Area*. *Plan Bay Area* serves as the region's SCS and the 2040 Regional Transportation Plan (preceded by *Transportation 2035 Plan for the San Francisco Bay Area*), integrating transportation and land-use strategy to manage greenhouse gas emissions and plan for future population growth. The transition from a diesel-hauled to electrified (EMU) fleet would contribute to regional greenhouse gas reduction goals. On the state-level, Caltrain is consistent with the State's blueprint for meeting future mobility needs. For example, the electrification of Caltrain would contribute to the quality environment goals, as EMUs are far more environmentally efficient than diesel-hauled locomotives. As a result, the impact of the Proposed Project relative to transit planning would be less than significant and beneficial.

Caltrain Transit Ridership and System Capacity

Table 3.14-18 displays ridership projections for the No Project and Project scenarios in 2020.

Table 3.14-18. Daily Ridership Forecasts by Station, San Francisco 4th and King to Tamien[a]

Station	Existing Conditions	2020 No Project	2020 Project
4th and King	10,790	13,000	14,340
22nd Street	1,310	1,950	2,310
Bayshore	200	440	730
South San Francisco	360	550	800
San Bruno	440	480	500
Millbrae	3,260	3,970	5,130
Broadway	0	0	390
Burlingame	790	890	760
San Mateo	1,570	1,740	1,910
Hayward Park	330	490	1,070
Hillsdale	2,320	2,740	3,370
Belmont	510	510	750
San Carlos	1,140	1,370	1,440
Redwood City	2,620	2,970	3,180
Atherton	0	0	280
Menlo Park	1,530	1,580	1,520
Palo Alto	5,470	6,380	7,910
California Avenue	1,290	1,410	1,380
San Antonio	680	750	840
Mountain View	3,876	4,580	5,920
Sunnyvale	2,270	2,720	3,280
Lawrence	700	920	1,160
Santa Clara	820	890	1,090
College Park[b]	--	--	--
San Jose Diridon	3,490	4,270	5,600
Tamien	810	1,220	2,100
Total	**46,560**	**55,830**	**67,730**

Source: Appendix D, *Transportation Analysis*.
<u>Daily Ridership is presented as passenger boardings, defined as the number of passengers who board a train at a given station.</u>
[a] Excludes boardings south of Tamien Station
[b] No service increases are proposed at the College Park Station and ridership at this station is very low at present (118 boardings/day). While College Park boardings are included in overall system ridership estimates, no analysis of localized traffic around this station was conducted given the low level of boardings and lack of proposed service increases.

Under the No Project scenario, corridor population and employment growth accompanied by changes to other transit connections and increases in highway congestion would contribute to the increase of Caltrain ridership, compared with the current condition. The change is not evenly distributed across all stations in the study area. With higher land use growth and transit connectivity, stations experiencing the greatest ridership increases, in percentage, would be 22nd Street, Bayshore, South San Francisco, San Bruno, and Hayward Park. These ridership gains are in line with the steady growth in Caltrain ridership since 2006. In percentage terms, San Francisco 4th and King would be one of the lowest growth stations, reflecting a redistribution of the trip origins and destinations to shorter intra-Peninsula travel in the future.

Proposed Project implementation would further increase the ridership because the Proposed Project would increase train frequencies and improve service levels as EMUs would be able to make more stops while maintaining travel times. The Proposed Project would raise 2020 ridership by 21 percent over the 2020 No Project condition. Stations with the greatest ridership increases in percentage between 2020 No Project and 2020 Project would be Bayshore, South San Francisco, Hayward Park and Tamien. Compared with 2020 No Project, small decreases in ridership are projected for Burlingame, Menlo Park, and California Avenue.

It should be noted that the specific station ridership forecasts are based on a prospective 2020 schedule that was developed only for analytical purposes for this EIR. The actual schedule may vary, which could influence some of the local station ridership, but would not be expected to substantially change the overall system ridership estimates. In advance of mixed service in 2020, Caltrain staff would analyze station-to-station ridership patterns and conduct public outreach to develop the actual customer timetable.

As a result, the impact would be less than significant and beneficial for the Caltrain system.

Ridership and Impact on Connecting Transit Systems

The ridership projections on the regional transit systems that connect to the Caltrain service assume that transit systems that currently connect to Caltrain, as described above, would remain in service in 2020. In addition, as described above, transit connections and extensions that were planned to open by years 2020 are also reflected in the projection. The planned transit projects are described in detail in Appendix D, *Transportation Analysis*, and Appendix I, *Ridership Technical Memorandum*. Ridership projections for connecting systems are derived from the VTA model. Ridership projections for the following systems are summarized in Table 3.14-19.

As shown in Table 3.14-9, the total number of system-wide boardings on Caltrain would be greater for the Project scenario than under the No Project scenario. The added Caltrain boardings associated with the Project scenario would result in a need for increased connecting transit services. Therefore, ridership on connecting systems would increase by 1.4 percent for the 2020 Project condition as compared with 2020 No Project condition.

Table 3.14-19. Ridership on Transit Systems Connecting to Caltrain

Connecting Transit System	Existing Conditions (observed)	2020 No Project	2020 Project	Change Project vs. No Project
BART	366,600	459,500	459,100	-0.1%
SamTrans Bus (Local and BRT)	39,800	73,400	75,800	3.3%
VTA Light Rail	34,600	70,600	70,700	0.1%
VTA Bus (Local and BRT)	103,100	165,600	167,100	0.9%
VTA BRT	-	42,500	42,500	0.0%
~~Muni~~ MUNI Metro	173,500	203,800	205,200	0.7%
~~Muni~~ MUNI Bus	531,700	592,600	595,500	0.5%
Shuttles (Public and Private)	NA	12,200	16,600	36.1%
Total	1,250,600	1,626,000	1,648,800	1.4%

Source: Appendix D, *Transportation Analysis*
BRT = bus rapid transit

As shown in Table 3.14-19, growth in the region by 2020 will increase demand for increased transit service. The Proposed Project is one of many projects in the planning phase to address that increased demand.

One concern is that the Proposed Project might result in induced ridership for other systems that would result in changes in physical conditions such as through the construction of additional transportation infrastructure to address the increased ridership. As shown in Table 3.14-19, compared with the 2020 No Project scenario, the Proposed Project is expected to slightly lower ridership on BART and slightly increase ridership on VTA and Samtrans. The largest induced ridership for public transit systems would be for SamTrans bus service (+ 3.3 percent). While the increased demand may increase the need for bus service and vehicles, given that Caltrain facilities already contain bus connections and the modest level of increase, the induced ridership is not expected to result in substantial new capital improvements for SamTrans beyond that which it would plan for without the Proposed Project. A similar conclusion applies for other public transit systems, all of which are estimated to have less than 1 percent increases due to induced ridership from the Proposed Project. Like Caltrain, other transit providers must plan for their future needs and construct the facilities to meet their system rider demands as feasible given funding availability.

The Proposed Project would also contribute substantially to increases in Caltrain and private shuttles. Although this increase by itself is not expected to require substantial new facilities, it would contribute to the need for bus shelters, stops, and maintenance facilities.

Because infrastructure improvements for transit services other than Caltrain and their funding are outside the responsibility of the JPB, the responsibility for managing the environmental effects of any additional transit facilities or service that might be necessary to meet future demands lies with each transit operator. For future improvements that may be necessary to accommodate increased Caltrain shuttle service due to increased ridership from the Proposed Project, such as shuttle bus stops, shelters, or other facilities, Caltrain will be required to complete the appropriate state (and federal if required) environmental review for such improvements and shall adopt feasible mitigation for any significant environmental impacts thus identified. For future improvements that may be necessary to accommodate increased other transit service due to increased ridership from the Proposed Project, the responsible transit operations will be required complete the appropriate state (and federal if required) environmental review for such improvements and shall adopt feasible mitigation for any significant environmental impacts thus identified.

At this time, it appears unlikely that the relatively modest increases in ridership for other transit services due to the Proposed Project would require the construction of additional transit infrastructure. Thus any secondary impacts due to construction of additional facilities would be less than significant and the Proposed Project's impact related to induced demand for additional transit infrastructure would be less than significant.

Potential Impacts on Other Transit Systems due Electromagnetic Interference

EMF/EMI impacts are discussed in Section 3.5, *Electromagnetic Fields and Electromagnetic Interference*.

Potential Conflicts between Proposed Project and Other Planned Transit Systems

Potential safety, operational, or construction conflicts between the other planned transit systems and the Proposed Project such as SFMTA's proposal to reroute the 22-Fillmore Electric Trolley Bus to 16th Street, the Downtown Extension, or the BART Silicon Valley Extension are addressed separately in Section 4.1, *Cumulative Impacts*.

Impact TRA-2c	Substantially increase hazards for transit system operations because of a design feature or otherwise substantially compromise the safety of transit facilities
Level of Impact	Less than significant

Under existing conditions, Caltrain operates a commuter railroad of 92 trains per day between San Jose and San Francisco at speeds up to 79 mph. Caltrain trains operate along the corridor in compliance with FRA requirements applicable to the different segments of the corridor in terms of speed and clearances required to safely operate the railroad. At-grade crossing warning devices are in place to provide advanced warning to motorists, pedestrians, and bicyclists of approaching trains and Caltrain trains use train horns per the FRA horn regulations to provide additional warning for safety purposes.

As described in Section 3.14.2.1, *Methods for Analysis*, Caltrain is presently enhancing the safety of the Caltrain corridor through the CBOSS PTC project, which will be completed by 2015. PTC helps to eliminate the potential for train-to-train collisions and over-speed rule violations (trains exceeding the civil speed limit). The train will be automatically stopped before collisions occur. It also provides additional safety for railroad workers on the tracks and requires interoperability between all rail services operating on the same tracks. This interoperability assures compliance among all vehicles using the same tracks with the PTC system. This is important for Caltrain as other operators on Caltrain tracks include intercity rail and freight. The Caltrain CBOSS PTC project also specifies additional capabilities to enable increased safety and operating performance for Caltrain and future high-speed rail service.

Additional benefits of the CBOSS PTC project include:

- Increased operating performance of the current signal system, enabling more frequent and more dependable passenger service to meet growing demand.
- Improved at-grade crossing warning functions.

- Integrated communication among all subsystems (such as the central control facility, train and wayside) for improved safety performance for highway vehicles and the riding public.
- Safe operations between Caltrain and other tenant railroads.

The CBOSS PTC project will improve safety along the corridor compared with existing conditions for both the 2020 No Project and 2020 Project scenarios.

The Proposed Project would increase daily service to 114 trains per day by 2020. These trains would operate at speeds up to 79 mph, the same top speed as at present. The proposed EMUs can accelerate and decelerate faster than diesel locomotives, which can help to improve safety because, in the event of an emergency, the EMUs would be able to stop in a shorter distance than diesel locomotives. Even though the number of trains would increase by approximately 20 percent, given the increased performance and control with the new EMUs and the safety benefit of CBOSS PTC, there should not be an increased risk of collision with vehicles, pedestrians, and bicycles compared with the existing conditions or compared with the 2020 No Project scenario.

As discussed in Section 3.8, *Hazards and Hazardous Materials*, the Proposed Project's new OCS would not pose an impediment to routine emergency equipment access for the Caltrain system or connecting transit systems like BART, SamTrans, MUNI ~~Muni~~, or VTA and the Proposed Project would not have a significant impact on emergency response or evacuation plans.

As discussed in Section 3.13, *Public Services and Utilities*, the OCS would be installed in compliance with industry safety standards and the future applicable CPUC General Order developed for 25 kVA systems concerning electrical safety operation. Vegetation and structural clearances would be maintained to provide for electrical safety.

As described in Chapter 2, *Project Description*, an electric safety zone (ESZ) will be established within 10 feet of the energized elements of the OCS. Vegetation would be removed within this zone and structures would not be allowed within 6 feet of the energized elements of the OCS. Creation of this zone will ensure that no trees or structures would interfere with the catenary system and will thus minimize potential fires or other consequences from downed wire events should they occur.

The system is designed to protect employees and the public from voltages caused by faults (i.e., energized wires coming into contact with earth/ground) and to remove power in the affected area. Under design conditions, it is estimated that clearing of the faulted area (e.g., the shutoff of power) should not exceed 10 cycles (0.167 seconds). In the unlikely probability the protection devices fail to detect abnormalities and energized wires come into contact with the earth, there would be arcing and the earth potential is raised and a potential for fire and other damage. This probability is very small and consistent with what one would expect from overhead electrical distribution lines already in service in the area.

The system would be resilient in facing rain or hail and will be designed withstand predicted winds in the area. Regarding lightning, lightening can cause a fault in the OCS or the TPFs similar to how it can affect power lines or power substations already along the system. As noted above, the system is designed to address potential faults and system protection devices exist to shut down the power in the event of those faults.

As discussed below, the Proposed Project would provide adequate vertical clearance for both existing passenger rail vehicles as well as freight vehicles to safely operate on the Caltrain corridor

~~as well as comply with any applicable FRA waiver requirements for temporal separation between EMUs and heavy freight trains to minimize the risk of freight-passenger collisions~~[8].

Thus, the Proposed Project would have a less-than-significant impact related to transit system hazards and safety.

Pedestrian Systems

Impact TRA-3a	Disrupts existing or planned pedestrian facilities during construction
Level of Impact	Significant
Mitigation Measure	TRA-1a: Implement construction Traffic Control Plan
Level of Impact after Mitigation	Less than significant

Construction impact on pedestrian facilities would be limited to locations where sidewalks or paths would require temporary closure to facilitate construction activities. This would occur related to closure of at-grade crossings when installing OCS infrastructure or when relocating utilities. The impact could be significant on pedestrian facilities, when temporary sidewalk or walking path closure is required. Implementation of Mitigation Measure TRA-1a would reduce the temporary construction impact to a less-than-significant level.

Impact TRA-3b	Disrupts existing pedestrian facilities, interferes with planned pedestrian facilities, or conflicts or creates inconsistencies with adopted pedestrian system plans, guidelines, policies, or standards from Proposed Project operations
Level of Impact	Significant
Mitigation Measure	TRA-3b: In cooperation with the City and County of San Francisco, implement surface pedestrian facility improvements to address the Proposed Project's additional pedestrian movements at and immediately adjacent to the San Francisco 4th and King Station
Level of Impact after Mitigation	Less than significant

Many cities are locating pedestrian facilities in locations near and complementary to Caltrain station areas. In some instances, pedestrian infrastructure enhancements are included in a city or county's bicycle or pedestrian plan, such as in the *City of South San Francisco Bicycle Master Plan* and the *San Mateo County Comprehensive Bicycle and Pedestrian Plan*. A full list and summaries of these pedestrian and bicycle plans for study area jurisdictions is in Appendix D, *Transportation Analysis*.

Increased ridership under Proposed Project conditions would subsequently cause increased pedestrian volumes at pedestrian facilities surrounding Caltrain stations. The existing pedestrian facilities were evaluated to determine if pedestrian facilities would be capable of accommodating increased pedestrian volumes. Results showed the existing facilities are capable of accommodating increased pedestrian volumes at all stations with the exception of the 4th and King Station in San Francisco.

[8] FRA initiated rule-making in 2013 regarding standards for alternative compliant vehicle. ~~It is possible that FRA may consider revisions to the current requirements for temporal separation which may allow for wider freight operational hours than specified in the FRA waiver~~. As discussed in Chapter 2, Caltrain now presumes that temporal separation will not be required for the Proposed Project and thus there would be no substantial change in operational freight windows with the project.

Existing pedestrian facilities, including sidewalks and crosswalks, surrounding the 4th and King Station currently experience high levels of pedestrian activity. This trend is projected to continue in future years.

As discussed in Appendix D, *Transportation Analysis*, boardings at the 4th and King Station would increase from 10,700 under existing conditions to 13,000 under 2020 No Project conditions or to 14,340 with the Proposed Project (an increase of 1,340 over 2020 No Project conditions). In 2040, without the Proposed Project (and the San Francisco Downtown Extension [DTX] and Transbay Transit Center [TTC]), daily boardings at the 4th and King Station would increase to 16,560. In 2040, with the Proposed Project (and DTX/TTC), boardings would increase to 15,230 (1,330 fewer boardings than under 2040 No Project conditions). There would be fewer boardings because customers would continue to the TTC located in downtown San Francisco instead of getting off at the 4th and King station. Thus, the Proposed Project would contribute to increased pedestrian activity from 2020 until DTX/TTC infrastructure is completed. Other transit improvements in proximity to the 4th and King stations, such as the Central Subway project, would also add pedestrians in this area.

Due to existing high levels of pedestrian activity and the anticipated increase in pedestrian activity under Proposed Project conditions as compared with No Project conditions, pedestrian facility capacity may be exceeded in 2020. Pedestrian facility flow and safety improvements will be implemented pursuant to Mitigation Measure TR-3b described below to allow the orderly movement of pedestrians, bicyclists, private vehicles, buses, and shuttles around the 4th and King Station. With this mitigation, the impact at the San Francisco 4th and King Station would be less than significant.

Mitigation Measure TRA-3b: In cooperation with the City and County of San Francisco, implement surface pedestrian facility improvements to address the Proposed Project's additional pedestrian movements at and immediately adjacent to the San Francisco 4th and King Station

The JPB, in cooperation with the City and County of San Francisco, will improve surface pedestrian facilities at the San Francisco 4th and King Station where needed to accommodate the Proposed Project's increase in pedestrian volumes. This mitigation applies to increased pedestrian traffic under Proposed Project conditions that would occur within the impact window beginning in 2020 and ending when DTX/TTC is fully operational.

Both the JPB and the City and County of San Francisco will implement a pedestrian access study to identify the surface improvements necessary to accommodate the Proposed Project's increased pedestrian demand during the impact window identified above. The JPB's responsibility will be to implement mutually agreed upon improvements necessary to accommodate pedestrian demand within the Caltrain station and JPB-owned right-of-way. The City and County of San Francisco will be responsible for implementing improvements on City streets and the public right-of-way surrounding the 4th and King Station. Because there are multiple contributors to pedestrians to the station, including Caltrain, <u>MUNI</u> ~~Muni~~ Metro J and T Lines, <u>MUNI</u> ~~Muni~~ bus lines, the future Central Subway, and other transit line and local land use development, cost shall be shared on a fair-share basis as determined mutually by the JPB and the City and County of San Francisco.

<u>The performance standard guiding specific measures selection is as follows:</u>

- Pedestrian delay and illegal crossing activity shall be equivalent to or better than No Project conditions, and peak hour pedestrian sidewalk densities on primary access routes to the Fourth and King Station shall be less than or equal to projected No Project densities.

The following surface improvements to pedestrian facilities will address increased pedestrian demand caused by the Proposed Project. These improvements will be studied in detail in the pedestrian access study.

- Widened curb waiting areas and added pedestrian bulbouts where high levels of demand cannot be accommodated by existing facilities.
- A pedestrian “scramble” at the intersection of 4th and Townsend Streets. A pedestrian scramble is an intersection that is striped and designed to allow pedestrians to cross diagonally in all directions during an all-way red signal at which all motor vehicles are stopped.
- Signalization improvements for both 4th and Townsend and 4th and King intersections. While a pedestrian scramble is not likely to be feasible at the intersection of 4th Street and King Street due intersection size, traffic volumes, and SMFTA at-grade transit operations, all-way pedestrian signals at existing crosswalks are potentially feasible.
- Widened crosswalks to increase pedestrian volumes and improve pedestrian sidewalk widths on the immediate approaches to the intersections of 4th and Townsend and 4th and King Streets, as appropriate and feasible.
- Pedestrian safety countermeasures, such as pedestrian barriers and improved signage, as necessary to address safety issues that are directly related to increased pedestrian volumes at station access points.

The improvements identified in the access study shall be completed in a manner that does not interfere with SMTA bus operations, SFMTA Metro or bicycle facilities in and around the station area.

The JPB will also coordinate with the CPUC during the final design phase of the Project concerning signal adjustments at 4th Street / King Street to ensure light rail vehicle operational safety through this intersection.

This measure does not include any above- or below-ground pedestrian facilities, because the Proposed Project’s impact can be address through feasible surface treatments described above.

Bicycle Facilities

Impact TRA-4a	Substantially disrupts existing bicycle facilities or interferes with planned bicycle facilities during construction
Level of Impact	Significant
Mitigation Measure	TRA-1a: Implement construction Traffic Control Plan
Level of Impact after Mitigation	Less than significant

Construction impact on bicycle facilities would be similar to the impact discussed in Impact TRA-3a. The impact would be significant on bicycle facilities when temporary shoulder or road closures are required on roadway segments, bridges, and at-grade crossings with bicycle lanes or high bicycle traffic. Implementation of Mitigation Measure TRA-1a would reduce the temporary construction impact to a less-than-significant level.

Impact TRA-4b	Substantially disrupts existing bicycle facilities or interferes with planned bicycle facilities; or conflicts or creates substantial inconsistencies with adopted bicycle system plans from Proposed Project operations
Level of Impact	Significant
Mitigation Measure	TRA-4b: Continue to improve bicycle facilities at Caltrain stations and partner with bike share programs where available following guidance in Caltrain's Bicycle Access and Parking Plan
Level of Impact after Mitigation	Less than significant

The Proposed Project may increase future demand for bicycle facilities however, most plans in the study area account for increased bicycle volumes through added bicycle infrastructure. The Proposed Project would not change the alignment and does not impede any existing or planned bicycle projects because the new improvements are limited to overhead infrastructure and the TPFs (which do not affect bicycle facilities).

Caltrain would continue accommodating bicycles on board EMUs. Any unmet on-board demand for bikes-on-board could be accommodated through the provision of increased bike parking at stations. This would allow passengers to safely and securely park their bikes before boarding the train. If a passenger is in need of a bike to egress from their destination station, they may also be able to use Bay Area Bike Share, travel by another mode, or to leave a bike securely parked at their destination station to facilitate their last-mile connection. Although long-range future plans for Bay Area Bike Share are not yet available, the program would be expanded to include 1,000 bikes and 100 stations in ~~2014~~ <u>the near future </u>(Cabanatuan 2013).

As explained above, Caltrain's *Bicycle Access and Parking Plan* includes a long-term plan of increasing bicycle parking supply for a variety of user needs, improving station access for bicyclists, working with cities to improve station bike access, and considering other station-side concepts.

Mitigation Measure TRA-4b would require Caltrain to continue implementation of its current planning improve bicycle facilities at Caltrain stations using the guidance provided in the *Bicycle Access and Parking Plan.* Over time Caltrain will use these guidelines to meet potential increased demand for such facilities. Thus, with mitigation, the Proposed Project would have a less-than-significant impact on bicycle facilities.

Mitigation Measure TRA-4b: Continue to improve bicycle facilities at Caltrain stations and partner with bike share programs where available, using the guidance in the Caltrain's Bicycle Access and Parking Plan

Caltrain will improve bicycle facilities at Caltrain stations where needed to accommodate increased demand over time for such facilities including bike parking and bike lockers necessary to safely and securely park bikes that are not taken on the train. Caltrain will work local and regional bike share programs to provide opportunities for Caltrain riders to utilize bike share facilities located at Caltrain stations (where feasible) or nearby (where not).

Emergency Vehicle Access

Impact TRA-5a	Results in inadequate emergency vehicle circulation and/or access during construction
Level of Impact	Significant
Mitigation Measure	TRA-1a: Implement construction Traffic Control Plan
Level of Impact after Mitigation	Less than significant

The Proposed Project could have a temporary impact on emergency vehicle access if an emergency occurs at the time when the Proposed Project construction requires temporary access or egress limitations. As described above, Mitigation Measure TRA-1a will require the preparation of a traffic control plan to help ensure continued emergency access to Caltrain ROW, at-grade crossings, and all nearby properties. Caltrain will coordinate with local public works department, local emergency providers, and Caltrans in the development of the traffic control plan to specifically address emergency response concerns. Thus, with mitigation, the Proposed Project's impact related to emergency response or evacuation would be less than significant.

Impact TRA-5b	Results in inadequate emergency vehicle circulation and/or access from Proposed Project operations
Level of Impact	Less than significant

The existing roadways surrounding Caltrain stations in the study area enable emergency vehicle response to all areas. Emergency vehicles often identify and use multiple routes dependent upon time of day and traffic conditions. Peak period traffic congestion generally does not result in delay for emergency vehicles, which have ROW and often utilize multi-lane major arterials for access. Emergency vehicles are permitted to use transit-only lanes or other vehicle-restricted lanes if necessary.

Emergency vehicles traveling on streets that cross the at-grade crossings would experience some additional delay at the intersections that would exceed the acceptable levels of service and that would have longer gate-down times with Proposed Project implementation. Unlike at intersections with traffic signals where emergency vehicles can pass through the intersection at reduced speeds even when receiving a red signal indication, emergency vehicles would not be able to cross through the at-grade crossings when the railroad gates are down. This may cause some minor delay to emergency vehicles, though delays would not substantially differ from typical congestion that already occurs around at-grade crossing locations and would only affect the small number of emergency vehicles that are actually traveling though study intersections.

Despite these localized traffic delay impacts, emergency vehicle response times are a function of travel along the entire path from their base to the incident location. The Proposed Project overall would substantially reduce overall vehicle miles travelled in the Peninsula corridor by approximately 235,000 miles/day in 2020 (compared with the No Project scenario) which would substantially improve congestion on a broad general basis. Most of the VMT reductions would be during peak hours, which is especially important in reducing congestion. The broad-based congestion improvement is expected to more than offset the localized effects at individual at-grade crossings and near Caltrain stations and result in a net improvement (compared with the No Project Scenario) in the emergency response times.

As a result, impacts related to emergency vehicle access and emergency response times would be considered less than significant.

Station Vehicle Parking and Access

Impact TRA-6a	Provide inadequate parking supply during construction
Level of Impact	Less than significant

Vehicle parking for construction vehicles, equipment, and workers is expected to be provided within Caltrain ROW and staging and access areas identified in Chapter 2, *Project Description*. Therefore, the parking supply on areas near the construction sites is not anticipated to be affected by the construction. The parking impact is considered less than significant.

Implementation of Mitigation Measure TRA-1a would further reduce the impact.

Impact TRA-6b	Does not meet Caltrain's *Comprehensive Access Program Policy Statement* or *Bicycle Access and Parking Plan* or would result in the construction of off-site parking facilities that would have secondary physical impacts on the environment from Proposed Project operations
Level of Impact before Mitigation	Less than significant

The Proposed Project would not interfere with the implementation and completion of the *Comprehensive Access Program Policy Statement* or the *Bicycle Access and Parking Plan*. The Proposed Project would increase both vehicular traffic around Caltrain stations but locations with high vehicle volumes are signalized and allow pedestrians to cross safely. No additional new at-grade crossings are planned with the Proposed Project and the implementation of CBOSS PTC further improves safety.

The remainder of this section concerns station parking facilities.

Parking is currently provided by Caltrain at most existing stations with the exception of the San Francisco 4th and King and the 22nd Street Stations. Most stations have supplemental parking options including on-street parking and non-Caltrain parking lots. System-wide, most Caltrain lots reach capacity prior to off-site lots and on-street spots; therefore, parking demand analysis for future scenarios take into account the capacity at Caltrain lots and the capacity from on-street parking and non-Caltrain lots within 0.25 miles of the Caltrain station.

Modeling of potential parking demand was completed for informational purposes based on behavioral forecasts (see Appendix D, *Transportation Analysis*). Actual parking demand will fluctuate based on day and month and based on people's changing mode of access to Caltrain. The parking supply and demand forecasted for 2020 is shown in Table 3.14-20.

The parking demand is forecasted to increase by 2020 at most stations regardless of the Proposed Project. This increase is due to increased ridership and changes in future modes of access. Although existing on street and non-Caltrain lot parking would accommodate some excess demand, there are still stations that exceed the supply of on-street parking, non-Caltrain and Caltrain lots. These stations include 4th and King, 22nd Street, South San Francisco, Hillsdale, Mountain View, Sunnyvale, and Tamien in the 2020 scenario. At most stations where impacts occur under Project scenarios they also occur in No Project scenarios, though to a lesser extent.

Table 3.14-20. Excess Weekday Parking Demand Beyond Capacity of Caltrain Lots and On-Street Parking

Station	2020 No Project	2020 Project
4th and King	35	124
22nd Street	0	18
Bayshore	0	0
South San Francisco	0	14
San Bruno	0	0
Millbrae	0[a]	0[a]
Broadway	No data	0
Burlingame	0	0
San Mateo	0	0
Hayward Park	0	0
Hillsdale	0	33[b]
Belmont	0	0
San Carlos	0	0
Redwood City	0	0
Atherton	-	0
Menlo Park	0	0
Palo Alto	0	0
California Avenue	0	0
San Antonio	0	0
Mountain View	0	136
Sunnyvale	189	447[c]
Lawrence	0	0
Santa Clara	0	0
San Jose Diridon	0	0
Tamien	0	455
Total Excess Demand	224	1,227

Source: Appendix D, *Transportation Analysis*
[a] Includes use of shared parking with BART.
[b] Includes potential loss of 10 spaces with PS4 Option 1.
[c] Includes potential loss of 10 spaces with PS6 Option 2.

Caltrain's 2010 *Comprehensive Access Program Policy Statement*, emphasizes station access by walking, transit, and bicycling over automobile access at most stations. The policy targets different access strategies at different stations based on the station characteristics and access opportunities. For example, the San Francisco 4th and King Station is a transit center where the access priority for autos is the lowest priority after transit, walking and bicycles. At intermodal connectivity and neighborhood circulator stations, auto access is not a priority. At auto-oriented stations, auto access is the primary priority access mode followed by biking.

Stations were categorized in consultation with Dr. Rick Wilson from Cal Poly-Pomona. The station categorization is not a formal part of the policy. Transit center stations include San Francisco 4th and King, Palo Alto, Mountain View, and San Jose Diridon. Intermodal connectivity stations include Redwood City, Millbrae, Hillsdale, Sunnyvale, San Mateo, and Menlo Park. Neighborhood circulator stations include San Carlos, California Avenue, Burlingame, San Antonio, San Bruno and Belmont. Although vehicle access is not a priority at these stations, vehicles are still a mode of access considered by Caltrain, but at a lower priority than other modes.

Since some of the parking deficits identified above are at stations where providing automobile access is not a priority, provision of substantial additional parking facilities at these stations would conflict with Caltrain's *Comprehensive Access Program Policy Statement*. Where parking deficits are at auto-oriented stations, provision of additional auto parking would be a priority, where feasible and where funding is available The *Comprehensive Access Program Policy Statement* is implemented by Caltrain in cooperation with local jurisdictions as part of Caltrain's long-term planning and capital improvement program; however access improvements are implemented on a funding available basis. Caltrain also works with local jurisdictions, other transit agencies, and local, state and federal funding partners to fund improvements to access to Caltrain stations via alternatives to automobiles including transit connections, bicycle and walking. Where future investments in these access modes are realized, they will help to reduce some of the excess parking demand. Caltrain is also working with many local jurisdictions concerning transit-oriented developments including exploring shared parking opportunities where appropriate. However, despite these efforts, given the funding limitations, priorities and long-term nature of Caltrain's implementation of its *Comprehensive Access Program Policy Statement*, it is likely that not all of the parking deficits will be addressed when the Proposed Project is in operation.

A parking deficit in and of itself, or the need to find a parking space off-site, while inconvenient is not inherently a significant physical impact on the environment. Some station users unaware of the parking deficits may circle[9] but experienced station users will modify their behavior to take into account the parking deficits and take alternative actions. Those actions may include arriving earlier, using other nearby stations with available parking[10], using the kiss and ride, using parking areas further from the station, or accessing the station via other modes such as transit, biking or walking.

At the extreme, lack of vehicle parking could result in some riders deciding to use an alternative transit system, carpool, or drive to their destination alone. This could result in lower Caltrain ridership than estimated in this EIR. As an unrealistic worst-case example, if the system deficit of approximately 1,000 spaces in excess of the Proposed Project were to mean 1,000 less Caltrain riders, then 2020 ridership would be lower by 2 percent than predicted overall for 2020. However, given that the Proposed Project would still result in substantial ridership increases (approximately 11,000 in 2020 compared with the No Project conditions) even in this worst-case situation, the environmental consequences would be less than significant because the Proposed Project's benefits to regional traffic, noise, air quality, and greenhouse gases would still be substantial (though slightly smaller). In this scenario, the localized traffic impacts around the stations with parking deficits would be slightly better than with full ridership.

The other potential impact of a parking deficit in and around Caltrain stations would be potential increased demand for additional off-site parking facilities, the construction of which might result in other secondary environmental impacts. However, as described above, Caltrain expects that the dominant response to parking deficits will be behavioral change on the part of the commuting public.

Thus, while the Proposed Project may result in a parking deficit at some stations, even with implementation of its access program, as described above this is not considered to result in a

[9] While circling vehicles may result in additional vehicle emissions, traffic and traffic noise, additional circling is not likely result in substantial additional criteria pollutant emissions, traffic, or noise around Caltrain stations above the thresholds used in this EIR.

[10] For example, users of the Hillsdale Station could utilize the nearby Hayward Park and Belmont Stations, which are forecasted to have a parking surplus in 2020.

significant environmental impact. Thus the Proposed Project would not result in a significant physical impact to the environment related to air quality, noise, traffic or greenhouse gas emissions or the secondary impacts of construction of parking facilities due to the potential parking deficits that may occur.

Freight Rail Service

Impact TRA-7a	Results in a change in freight rail service such that resultant diversions to truck or other freight modes would result in significant secondary impacts during construction
Level of Impact	Significant
Mitigation Measure	TRA-2a: Implement construction railway disruption control plan
Level of Impact after Mitigation	Less than significant

As described above under Impact TRA-2a, installation of OCS poles and wires would require the use of on-track equipment in many locations. Work could be accomplished during the nighttime using single-track access in many cases; however, some portions of the work would likely require some multiple track shutdowns at night which could result in temporary suspension of freight service in constrained areas.

Implementation of Mitigation Measure TRA-2a would reduce the temporary construction impact on freight service disruption to a less-than-significant level by minimizing the duration of potential disruption to service during construction.

Impact TRA-7b	Results in a change in freight rail service such that resultant diversions to truck or other freight modes would result in significant secondary impacts during operations
Level of Impact	Less than significant

The Proposed Project could affect existing freight service ~~in two ways: 1) through time constraints due to the requirements for temporal separation between proposed EMUs and freight trains in the FRA waiver; and 2)~~ through potential height restrictions due to OCS installation.

As discussed in Chapter 2, the Proposed Project presumes that temporal separation will not be required and thus substantial changes to freight operational windows will not be necessary. Thus, this analysis focused on potential constraints on freight heights.

Potential effects related to electromagnetic interference from the OCS to freight signaling equipment is discussed separately in Section 3.5.

Regarding the Trackage Rights Agreement (TRA) between the JPB and Union Pacific, resolution of potential TRA issues is a contractual matter between the parties and would not result in significant physical impacts to the environment and thus are not a concern under CEQA as explained further below:

- The TRA requires provision of one daytime 30-minute freight window between 10 a.m. and 3 p.m., provided the freight train operates at commuter passenger train speeds. The Proposed Project would not eliminate the ability to provide such a window.

- As established by the TRA, Union Pacific owns MT-1 south of Santa Clara. The Proposed Project will not electrify this portion of MT-1 and thus no conflict would occur.

- The Proposed Project is a commuter passenger rail project, not intercity rail, and the JPB owns the commuter passenger rail rights.
- The TRA requires provision of certain vertical clearances at constrained tunnels, bridges, and overpasses. As indicated in the analysis of this issue below, the project would not provide the TRA clearance heights at some locations with the OCS. As discussed below, the lack of TRA clearance heights is not expected to result in a significant physical impact on freight due to diversion of freight to other modes, as compared to existing conditions.
- The JPB anticipates engaging in good faith negotiations with Union Pacific regarding the vertical clearance issue. Because the TRA anticipates changing passenger service upgrades, JPB negotiations with Union Pacific will likely resolve the vertical clearance issue by amending the TRA. As a result, the EIR project description is adequate under CEQA as it describes a project that can be legally built, taking into account the TRA requirements and amendment provisions. Thus, it is not reasonably foreseeable that the Proposed Project will require additional construction in order to provide for TRA-mandated clearances. [11]

~~Cumulative Impacts on Freight Service due to Temporal Separation Requirements~~

~~Caltrain has been issued a waiver by FRA to allow the operation of the light-weight EMUs on the same system as heavy freight trains. However, the FRA waiver requires a temporal separation between the two different types of vehicles. It should be noted that the FRA is currently in a rule-making process for properties that want to operate "Alternative Compliant Vehicles" which is relevant to the EMUs in the Proposed Project. It is Caltrain's understanding that when the rulemaking is in place, the FRA waiver and the temporal separation requirement may no longer be necessary.~~

~~Given that the rulemaking is not yet in place, for the purpose of this EIR, temporal separation is assumed as described in the current FRA waiver. Based on the waiver, the Proposed Project would result in restriction of freight to midnight to 5 a.m. (compared with 8 p.m. to 5 a.m. at present) along the portion of the Caltrain corridor north of Santa Clara (north of CP Coast)[12].~~

~~At present, approximately three round-trip trains operate in this part of the Caltrain corridor. A smaller operational window is more likely to affect the longer freight moves. The South City Local already operates over a 2-night window due to equipment constraints and, thus, is not likely to be significantly affected by the constrained operational window. The more lengthy moves, particularly from South San Francisco to San Jose, would be more susceptible to time issues. If these longer freight round trips could not be completed in a single night using a single train consist, then trips may need to be staggered over several nights, as is done on the South City Local at present. Alternatively, additional trains operating in each direction (one-way transit per night) or lengthier trains could be employed in order to maintain the same level of service as a round-trip that could otherwise be completed in the same night.~~

[11] Failing agreement between Union Pacific and the JPB on the TRA issues, the JPB has the legal right to seek abandonment of freight rights under the TRA without Union Pacific objection or opposition. Caltrain is not proposing to seek abandonment at this time as it presumes that this issue can be negotiated in good faith between the parties to the TRA. As discussed in the analysis above, freight operations can continue and be compatible with the Proposed Project using the project-proposed vertical heights. As such, the EIR does not analyze potential abandonment of freight operations along the Caltrain Corridor.

[12] Freight service hours are not limited by the TRA on the UPRR-owned dedicated freight MT-1 track between CP Coast and CP Lick (Santa Clara to south of Tamien Station); operational hours would not be limited on this track.

~~While inconvenient and requiring change in freight operational practices north of Santa Clara, the compression of freight service hours to midnight to 5 a.m. would not be expected to result in a diversion of freight hauling from freight trains to trucks or other modes and, thus, would not result in any potential secondary impacts related to air quality, greenhouse gas emissions, noise, or traffic congestion.[13]~~

~~Section 4.1, *Cumulative Impacts*, discusses the potential impacts that may occur in the future with cumulative passenger and freight rail service relative to the restriction in operational windows.~~

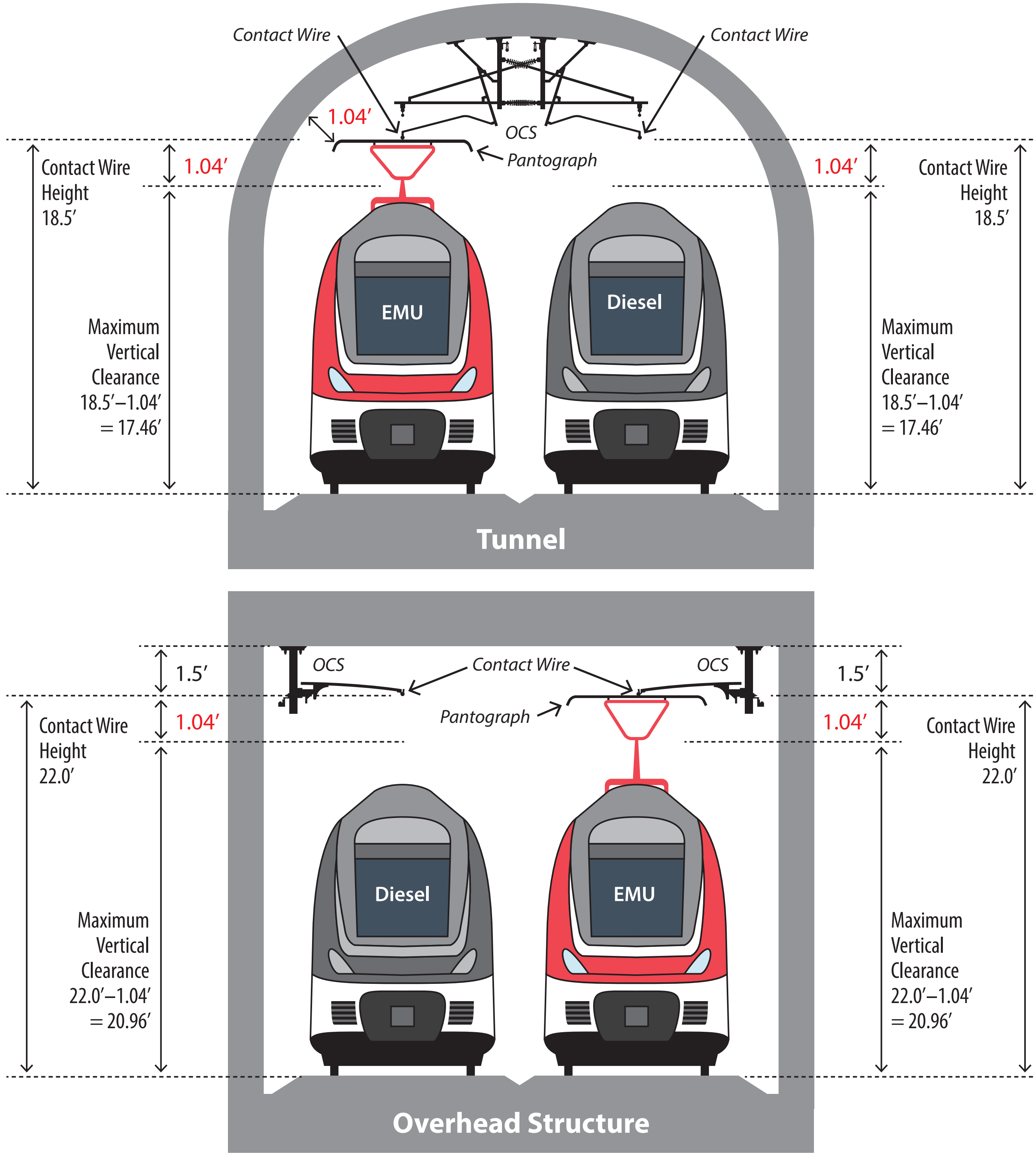
~~**Impacts on Freight Service due to Changes in Vertical Clearances**~~

Installation of the OCS would lower the existing vertical clearance at the San Francisco tunnels and at bridges and other crossings and structures over the Caltrain ROW. This could affect the ability of existing freight to continue operations if the vertical clearance is lowered below the highest height of current freight vehicles using the Caltrain ROW. Figure 3.14-8 illustrates clearances with OCS installation at a prototypical tunnel and overhead structure location. Table 3.14-21 shows the existing clearances and the future clearances with the project.

As discussed in Chapter 2, *Project Description*, the Proposed Project would include minor modifications at several of the San Francisco tunnels and at certain undercrossings to ensure that adequate vertical clearance is provided to accommodate existing Caltrain trains, the proposed EMUS, and the existing freight train heights. Consequently, existing freight vehicles that are currently used on the Caltrain corridor would not be restricted by lowered overhead clearances. Thus, no impact on existing freight service is expected due to the change in overhead clearances.

Section 4.1, *Cumulative Impacts*, discusses the potential impacts that may occur in the future if freight operators decide to use railcars that are higher than existing railcars now used on the corridor. This potential impact is disclosed as a potential cumulative impact because it does not involve the freight railcars that have been used in the last 8 years and, thus, would not be an ~~baseline~~ environmental impact as compared to the existing baseline.

[13] It should be noted that this is common practice on other light density freight lines shared with transit such as the RiverLine in New Jersey and some of the San Diego Trolley system.



Legend

1.04′ Minimum electrical clearance between top of train and contact wire and between the EMU pantograph and overhead or side structures.

Example Equipment Heights

Caltrain Existing Equipment . . Up to 15.92′
Freight .... 15.92′, 17.08′, 18.92′, 20.25′ (based on last 8 years use)
EMU .... 15.1′

NOT TO SCALE — PROTOTYPICAL LOCATION

Graphics ... 00606.12 (2-07-2014)

Figure 3.14-8
Vertical Clearances with OCS System in Potentially Constrained Areas

Table 3.14-21. Existing Effective Vertical Clearances and With the Proposed Project OCS

			Existing Effective[1]/ Historic Clearance[3,4]		Effective Vertical Clearance with OCS[2]		
Milepost	Bridge	TRA Clearance (CL)	Effective Clearance Over CL	Historic Freight Plate Height / Plate from past 8 years[3]	Effective Clearance Over CL	Allowable Plate Height / Plate[3]	Project Impact (Y/N)[5]
0.52	Signal Cantilever	N/A	22.48 (MT-1) 23.70 (MT-2)	15.50 / C	20.44 (MT-1) 21.66 (MT-2)	15.50 / C	N
0.70	Signal Cantilever	N/A	27.59 (MT-3) 28.07 (Lead Track)	15.50 / C	25.55 (MT-3) 26.03 (Lead Track)	15.50 / C	N
0.88	Signal Cantilever	N/A	25.45 (MT-1) 25.59 (MT-2)	15.50 / C	23.41 (MT-1) 23.55 (MT-2)	15.50 / C	N
1.10	Signal Bridge	N/A	25.45 (MT-1) 25.59 (MT-2)	15.50 / C	22.74 (MT-1) 22.64 (MT-2)	15.50 / C	N
1.20	Signal Bridge	N/A	23.12 (MT-1) 23.12 (MT-2)	15.50 / C	21.08 (MT-1) 21.08 (MT-2)	15.50 / C	N
1.29	Mariposa	21.25	20.51	15.50 / C	18.47	15.50 / C	N
1.33	Tunnel 1	21.92 (MT-1) 21.50 (MT-2)	20.80 (MT-1) 20.60 (MT-2)	15.50 / C	17.00 (MT-1) 17.00 (MT-2)	15.50 / C[6]	N
1.72	22nd St.	20.50	19.92	15.50 / C	16.84	15.50 / C	N
1.87	Signal Cantilever	N/A	24.81 (MT-1) 24.89 (MT-2)	15.50 / C	22.77 (MT-1) 22.85 (MT-2)	15.50 / C	N
1.90	23rd St.	21.00	20.25	15.50 / C	17.17	15.50 / C	N
1.93	Tunnel 2	21.74 (MT-1) 21.33 (MT-2)	20.70 (MT-1) 20.60 (MT-2)	15.50 / C	17.00 (MT-1) 17.00 (MT-2)	15.50 / C[6]	N
3.13	Oakdale	20.50	22.68	17.08 / F	20.64	17.08 / F	N
3.19	Tunnel 3	21.33 (MT-1) 21.17 (MT-2)	20.80 (MT-1) 20.80 (MT-2)	17.08 / F	18.00 (MT-1) 18.00 (MT-2)	17.08 / F[6]	N
4.15	Paul Ave	19.83	19.83	17.08 / F	17.79	17.08 / F	N
4.27	Tunnel 4	21.08 (MT-1) 21.08 (MT-2)	20.20 (MT-1) 20.10 (MT-2)	17.08 / F	18.00 (MT-1) 18.00 (MT-2)	17.08 / F[6]	N

			Existing Effective[1]/ Historic Clearance[3,4]		Effective Vertical Clearance with OCS[2]		
Milepost	Bridge	TRA Clearance (CL)	Effective Clearance Over CL	Historic Freight Plate Height / Plate from past 8 years[3]	Effective Clearance Over CL	Allowable Plate Height / Plate[3]	Project Impact (Y/N)[5]
5.10	Signal Bridge	N/A	23.17 (MT-1) 23.08 (MT-2) 23.33 (MT-3) 23.24 (MT-4) 23.60 (Lead Track)	18.92 / > F	21.13 (MT-1) 21.04 (MT-2) 21.29 (MT-3) 21.20 (MT-4) 21.56 (Lead Track)	18.92 / > F	N
5.48	Signal Bridge	N/A	28.18 (MT-1) 28.36 (MT-2) 28.20 (MT-3) 28.52 (MT-4)	18.92 / > F	26.14 (MT-1) 26.32 (MT-2) 26.16 (MT-3) 26.48 (MT-4)	18.92 / > F	N
5.83	Signal Bridge	N/A	27.36 (MT-1) 27.42 (MT-2) 27.55 (MT-3) 27.57 (MT-4) 27.57 (Lead track)	18.92 / > F	25.32 (MT-1) 25.38 (MT-2) 25.51 (MT-3) 25.53 (MT-4) 25.53 (Lead Track)	18.92 / > F	N
6.29	Signal Bridge	N/A	27.68 (MT-1) 27.61 (MT-2) 27.90 (MT-3) 27.87 (MT-4) 28.06 (Lead track)	18.92 / > F	25.64 (MT-1) 25.57 (MT-2) 25.86 (MT-3) 25.83 (MT-4) 26.02 (Lead Track)	18.92 / > F	N
6.95	Signal Bridge	N/A	28.10 (MT-1) 28.03 (MT-2) 27.91 (MT-3) 28.01 (MT-4)	18.92 / > F	26.06 (MT-1) 25.99 (MT-2) 25.87 (MT-3) 25.97 (MT-4)	18.92 / > F	N
8.24	Signal Cantilever	N/A	28.09 (MT-1) 27.94 (MT-2)	18.92 / > F	26.05 (MT-1) 25.90 (MT-2)	18.92 / > F	N
8.60	Oyster Point Parkway	N/A	22.19	18.92 / > F	20.15	18.92 / > F	N
9.10	Signal Bridge	N/A	21.59 (MT-1) 21.64 (MT-2)	18.92 / > F	19.55 (MT-1) 19.60 (MT-2)	18.92 / > F	N

			Existing Effective[1] / Historic Clearance[3,4]		Effective Vertical Clearance with OCS[2]		
Milepost	Bridge	TRA Clearance (CL)	Effective Clearance Over CL	Historic Freight Plate Height / Plate from past 8 years[3]	Effective Clearance Over CL	Allowable Plate Height / Plate[3]	Project Impact (Y/N)[5]
13.71	Signal Bridge	N/A	29.15 (MT-1) 29.10 (MT-2) 29.02 (MT-3)	18.92 / > F	27.11 (MT-1) 27.06 (MT-2) 26.98 (MT-3)	18.92 / > F	N
14.14	Signal Bridge	N/A	28.32 (MT-1) 28.40 (MT-2) 28.20 (MT-3)	18.92 / > F	26.28 (MT-1) 26.36 (MT-2) 26.16 (MT-3)	18.92 / > F	N
26.20	Signal Bridge	N/A	28.08 (MT-1) 28.06 (MT-2) 28.09 (MT-3)	18.92 / > F	26.04 (MT-1) 26.02 (MT-2) 26.05 (MT-3)	18.92 / > F	N
26.35	Signal Cantilever	N/A	27.74 (MT-2) 27.62 (MT-4)	18.92 / > F	25.70 (MT-2) 25.58 (MT-4)	18.92 / > F	N
27.12	Signal Bridge	N/A	27.60 (MT-1) 27.62 (MT-2) 27.58 (MT-3) 27.70 (MT-4)	18.92 / > F	25.56 (MT-1) 25.58 (MT-2) 25.54 (MT-3) 25.66 (MT-4)	18.92 / > F	N
29.69	San Francisquito	21.75	21.05	18.92 / > F	19.11	18.92 / > F	N
34.00	San Antonio Ave.	N/A	22.14	18.92 / > F	19.62	18.92 / > F	N
36.50	Hwy 85	N/A	22.14	18.92 / > F	20.10	18.92 / > F	N
36.88	Whisman Rd.	N/A	22.47	18.92 / > F	20.43	20.25 / H	N
38.60	Mathilda Ae.	N/A	22.37	18.92 / > F	20.33	20.25 / H	N
39.40	Pedestrian Overpass	N/A	21.85	18.92 / > F	19.81	18.92 / > F	N
39.46	Signal Bridge	N/A	27.86 (MT-1) 27.75 (MT-2) 27.93 (MT-3) 27.71 (MT-4)	18.92 / > F	25.82 (MT-1) 25.71 (MT-2) 25.89 (MT-3) 25.67 (MT-4)	20.25 / H	N

			Existing Effective[1]/ Historic Clearance[3,4]		Effective Vertical Clearance with OCS[2]		
Milepost	Bridge	TRA Clearance (CL)	Effective Clearance Over CL	Historic Freight Plate Height / Plate from past 8 years[3]	Effective Clearance Over CL	Allowable Plate Height / Plate[3]	Project Impact (Y/N)[5]
40.14	Signal Bridge	N/A	29.28 (MT-1) 29.22 (MT-2) 29.38 (MT-3) 29.44 (MT-4)	18.92 / > F	27.24 (MT-1) 27.18 (MT-2) 27.34 (MT-3) 27.40 (MT-4)	20.25 / H	N
40.75	Lawrence Expressway	N/A	22.13	18.92 / > F	20.09	18.92 / > F	N
40.90	Signal Bridge	N/A	27.17 (MT-1) 27.15 (MT-2) 27.29 (MT-3) 27.24 (MT-4)	18.92 / > F	25.13 (MT-1) 25.11 (MT-2) 25.25 (MT-3) 25.20 (MT-4)	20.25 / H	N
41.51	Signal Bridge	N/A	27.82 (MT-1) 27.80 (MT-2) 27.81 (MT-3) 27.91 (MT-4)	18.92 / > F	25.78 (MT-1) 25.76 (MT-2) 25.77 (MT-3) 25.87 (MT-4)	20.25 / H	N
42.50	San Tomas Expressway	N/A	22.37	18.92 / > F	21.33	20.25 / H	N
43.65	Lafayette Pedestrian Overpass	N/A	22.25	18.92 / > F	20.21	18.92 / > F	N
45.90	I-880	N/A	22.46	20.25 / H	20.42	20.25 / H	N
46.15	Hedding Ave.	N/A	22.07	20.25 / H	20.25	20.25 / H[7]	N
46.34	Signal Cantilever	N/A	24.06 (MT-2)	20.25 / H	22.02 (MT-2)	20.25 / H	N
46.50	Signal Cantilever	N/A	27.23 (MT-2) 27.50 (MT-3)	20.25 / H	25.19 (MT-2) 25.46 (MT-3)	20.25 / H	N
47.0	Cahill Station	15.67	Structure does not exist	20.25 / H	N/A	N/A	N
47.05	Signal Bridge	N/A	27.88 (MT-2) 28.05 (MT-3) 28.13 (Lead Track)	20.25 / H	25.84 (MT-2) 26.01 (MT-3) 26.09 (Lead Track)	20.25 / H	N

			Existing Effective[1]/ Historic Clearance[3,4]		Effective Vertical Clearance with OCS[2]		
Milepost	Bridge	TRA Clearance (CL)	Effective Clearance Over CL	Historic Freight Plate Height / Plate from past 8 years[3]	Effective Clearance Over CL	Allowable Plate Height / Plate[3]	Project Impact (Y/N)[5]
47.30	Signal Bridge	N/A	23.56 (MT-2) 23.44 (MT-3)	20.25 / H	21.52 (MT-2) 21.40 (MT-3)	20.25 / H	N
47.89	San Carlos Ave.	22.17	21.53	20.25 / H	20.25	20.25 / H[7]	N
49.13	Signal Cantilever	N/A	23.08 (MT-2)	20.25 / H	21.04 (MT-2)	20.25 / H	N
50.55	Signal Cantilever	N/A	27.76 (MT-2)	20.25 / H	25.72 (MT-2)	20.25 / H	N
50.59	Curtner Ave.	N/A	21.99	20.25 / H	20.25	20.25 / H[7]	N
50.65	Signal Cantilever	N/A	27.72 (MT-2)	20.25 / H	25.68 (MT-2)	20.25 / H	N
51.08	Private Overpass	N/A	21.96	20.25 / H	20.25	20.25 / H[7]	N
51.64	Signal Cantilever	N/A	25.24 (MT-2)	20.25 / H	23.20 (MT-2)	20.25 / H	N

General Notes:

1 Existing Effective Clearance is defined as the existing clearance measured over the centerline of the track minus 6” of dynamic envelope per Caltrain Standards.

2 Effective Vertical Clearance with OCS is defined as existing clearance measured over the centerline of the track minus 1.5’ of OCS structure depth and 1.04’ of electrical clearance envelope. Effective Vertical Clearance with OCS in the Tunnels includes design solution for notching / lowering that will enable the OCS to be installed to maintain clearance heights of 17’ in Tunnels 1 and 2 and 18’ in Tunnels 3 and 4.

3 Plate Heights are as defined by AAR: Plate C = 15.50’; Plate F = 17.08’; Plate H = 20.25’.

4 From Tunnel 2 going north, the tallest historic vehicle (last 8 years) is Caltrain’s Bombardier Vehicle at 15.92’. The tallest freight vehicle (last 8 years) is a Plate C at 15.50’. Between CP Tunnel (MP 5.10) and CP Coast (MP 43.4), the tallest historical freight load (last 8 years) is 18.92’, which is not directly correlated to an AAR Plate Size. Thus the designation for that height is “>F”. South of CP Coast, the tallest historical freight load (last 8 years) is 20.25’, which is AAR Plate “H”.

5 Analysis assumes that MT-1 South of CP Coast at MP 43.4 is not electrified and thus there’s no change to existing MT-1 clearance or impact to Freight traffic South of CP Coast.

6 Includes tunnel notching and track lowering as part of Proposed Project.

7 Includes track lowering as part of Proposed Project.