

Contents

	Page
List of Tables.....	v
List of Figures.....	xi
List of Acronyms and Abbreviations.....	xv
Chapter 1 Introduction	1-1
1.1 Overview	1-1
1.2 Project History	1-1
1.3 Need for Project.....	1-3
1.3.1 Current and Future Transportation Demand in the Caltrain Service Area	1-4
1.3.2 Current and Future Roadway Congestion in the Caltrain Corridor	1-7
1.3.3 Corridor Air Quality and Greenhouse Gas Emissions	1-8
1.3.4 Modernizing the Caltrain Service.....	1-9
1.3.5 Accommodating Future High-Speed Rail	1-9
1.4 Purpose of Project	1-10
1.5 Environmental Review Process.....	1-11
1.5.1 California Environmental Quality Act	1-11
1.5.2 Purpose of this EIR	1-15
1.5.3 Scope and Content of the EIR	1-15
1.6 EIR Organization.....	1-16
Chapter 2 Project Description	2-1
2.1 Location and Limits	2-1
2.2 Background	2-1
2.3 Project Description	2-4
2.3.1 Overhead Contact System	2-5
2.3.2 Auto-Transformer Power Feed Arrangement.....	2-8
2.3.3 Traction Power Substations, Switching Stations, and Paralleling Stations.....	2-8
2.3.4 Overbridge Protection Structures.....	2-9
2.3.5 At-Grade Crossing Warning Devices	2-11
2.3.6 Rolling Stock.....	2-12
2.3.7 Operations and Maintenance	2-12
2.3.8 Construction.....	2-15
2.3.9 Right-of-Way and Easement Needs.....	2-22
2.3.10 Relation to the High-Speed Rail Project	2-23
2.4 Costs and Funding.....	2-24

2.4.1	Capital Costs.....	2-24
2.4.2	Capital Funding Sources and Programming.....	2-24
2.4.3	Operating and Maintenance Costs and Revenues.....	2-25
2.5	Project Variants.....	2-25
2.6	Required Permits and Approvals.....	2-26
Chapter 3	Settings, Impacts, and Mitigation Measures.....	3-1
3.0	Approach to Impact Analysis	3-1
3.0.1	Topics Considered but Dismissed from Further Analysis	3-1
3.1	Aesthetics.....	3.1-1
3.1.1	Existing Conditions.....	3.1-1
3.1.2	Impact Analysis	3.1-20
3.2	Air Quality	3.2-1
3.2.1	Existing Conditions.....	3.2-1
3.2.2	Impact Analysis	3.2-9
3.3	Biological Resources	3.3-1
3.3.1	Existing Conditions.....	3.3-1
3.3.2	Impact Analysis	3.3-28
3.4	Cultural Resources	3.4-1
3.4.1	Existing Conditions.....	3.4-1
3.4.2	Impact Analysis	3.4-10
3.5	Electromagnetic Fields and Electromagnetic Interference.....	3.5-1
3.5.1	Existing Conditions.....	3.5-1
3.5.2	Impact Analysis	3.5-7
3.6	Geology, Soils, and Seismicity.....	3.6-1
3.6.1	Existing Conditions.....	3.6-1
3.6.2	Impact Analysis	3.6-7
3.7	Greenhouse Gas Emissions and Climate Change.....	3.7-1
3.7.1	Existing Conditions.....	3.7-1
3.7.2	Impact Analysis	3.7-7
3.8	Hazards and Hazardous Materials	3.8-1
3.8.1	Existing Conditions.....	3.8-1
3.8.2	Impact Analysis	3.8-23
3.9	Hydrology and Water Quality	3.9-1
3.9.1	Existing Conditions.....	3.9-1
3.9.2	Impact Analysis	3.9-19
3.10	Land Use and Recreation	3.10-1
3.10.1	Existing Conditions	3.10-2

3.10.2	Impact Analysis.....	3.10-11
3.11	Noise and Vibration	3.11-1
3.11.1	Existing Conditions	3.11-1
3.11.2	Impact Analysis.....	3.11-23
3.12	Population and Housing.....	3.12-1
3.12.1	Existing Conditions	3.12-1
3.12.2	Impact Analysis.....	3.12-3
3.13	Public Services and Utilities	3.13-1
3.13.1	Existing Conditions	3.13-1
3.13.2	Impact Analysis.....	3.13-17
3.14	Transportation and Traffic.....	3.14-1
3.14.1	Existing Conditions	3.14-1
3.14.2	Impact Analysis.....	3.14-30
Chapter 4	Other CEQA-Required Analysis	4-1
4.1	Cumulative Impacts	4-1
4.1.1	Approach and Methodology	4-1
4.1.2	Projections/Regional Growth Characteristics.....	4-2
4.1.3	Projects Considered	4-4
4.1.4	Cumulative Impact Analysis.....	4-42
4.2	Significant and Unavoidable Environmental Impacts.....	4-153
4.3	Significant and Irreversible Environmental Changes.....	4-154
4.4	Growth-Inducing Impacts	4-155
4.5	Energy	4-156
Chapter 5	Alternatives	5-1
5.1	Introduction	5-1
5.2	Alternatives Considered for Further Analysis.....	5-1
5.2.1	The No Project Alternative	5-4
5.2.2	Diesel Multiple Unit (DMU) Alternative.....	5-13
5.2.3	Dual-Mode Multiple Unit (Dual-Mode MU) Alternative.....	5-29
5.2.4	Tier 4 Diesel Locomotive Alternative (T4DL)	5-40
5.2.5	Electrification with OCS Installation by “Factory Train”	5-51
5.3	Environmentally Superior Alternative	5-57
5.4	Alternatives Screening Process.....	5-64
5.4.1	Alternatives Considered.....	5-64
5.4.2	Screening Process	5-67
5.4.3	Alternatives Screening Results and Conclusions	5-69

Chapter 6	Report Preparation	6-1
6.1	Lead Agency	6-1
6.1.1	Peninsula Corridor Joint Powers Board	6-1
6.2	List of Key EIR Preparers	6-1
6.2.1	ICF International	6-1
6.2.2	Circlepoint.....	6-2
6.2.3	Environmental Vision.....	6-2
6.2.4	Fehr & Peers.....	6-2
6.2.5	HortScience.....	6-2
6.2.6	Wilson, Ihrig & Associates, Inc.	6-3
Chapter 7	References.....	7-1

Appendices

Appendix A	NOP and Scoping Summary Report
Appendix B	Air Quality and Greenhouse Gas Analysis Technical Data
Appendix C	Noise and Vibration Technical Report
Appendix D	Transportation Analysis
Appendix E	Cultural Resources Programmatic Agreement
Appendix F	Tree Inventory and Canopy Assessment
Appendix G	Biological Resources Information
Appendix H	Land Use Information
Appendix I	Ridership Technical Memorandum
Appendix J	<u>Preliminary Overhead Contact System/Electrical Safety Zone/Tree Impact Maps</u>
Appendix K	<u>Key Assumptions for Alternative Analysis</u>

Tables

	Page
1-1	Anticipated Changes in San Francisco Employment 2010–2040..... 1-5
2-1	Fleet Requirements of the Electrification Program 2-5
2-2	Overhead Bridge Protection Barriers 2-10
2-3	Estimated Caltrain System Ridership with the Proposed Project..... 2-14
2-4	Potential Construction Strategies to Accelerate Project Completion 2-22
2-5	Funding Sources for Corridor Electrification Project 2-24
2-6	Permits, Funding, and Other Approvals Anticipated to be Required 2-26
3.1-1	Scenic Routes within 0.25 Mile of Project Features 3.1-10
3.2-1	National and State Ambient Air Quality Standards 3.2-2
3.2-2	Ambient Air Quality Monitoring Data for the Caltrain Corridor (2010–2012) 3.2-6
3.2-3	Federal and State Attainment Status of San Francisco, San Mateo, and Santa Clara Counties 3.2-8
3.2-4	Bay Area Air Quality Management District Project-Level Criteria Pollutant Emissions Thresholds..... 3.2-12
3.2-5	Maximum Unmitigated Construction Emissions 3.2-14
3.2-6	Maximum Mitigated Construction Emissions..... 3.2-15
3.2-7	Estimated Operational Emissions 3.2-18
3.2-8	Comparison of 2020 Daily PM10 Emissions using Conceptual Estimates for Other Particulate Sources 3.2-23
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) 3.2-24
3.2-10	Maximum Project-Level Health Risks during Construction 3.2-27
3.2-11	Modeled CO Concentrations at Affected Intersections 3.2-28
3.3-1	Summary of Jurisdictional Features in the Peninsula Corridor Electrification Project’s Vicinity 3.3-3
3.3-2	Special-Status Wildlife Species with Potential to Occur in the Project Corridor 3.3-7

3.3-3	Special-Status Plants Known to Occur or that May Occur in the Project Corridor	3.3-17
3.3-4	Estimated Tree Removal and Pruning Estimates by Jurisdiction.....	3.3-45
3.4-1	Prehistoric and Historic-Era Archaeological Sites In or Potentially In the Archaeological Study Area.....	3.4-14
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	3.4-15
3.5-1	Magnetic Field Strengths.....	3.5-3
3.5-2	DC Magnetic Field Data Summary	3.5-6
3.5-3	AC Magnetic Fields Measured along the Project Corridor	3.5-7
3.5-4	EMF Thresholds of Significance for Public and Occupational Exposure.....	3.5-9
3.5-5	Estimated EMF Field Strength for Caltrain Operations (frequency of 60 Hz).....	3.5-10
3.5-6	Measured Magnetic and Electric Field Values - Amtrak Northeast Corridor	3.5-11
3.6-1	Soil Classifications at Proposed Traction Power Facility Locations	3.6-5
3.7-1	Lifetimes and Global Warming Potentials of Several Greenhouse Gases	3.7-6
3.7-2	National, State, and Regional GHG Emissions Inventories.....	3.7-6
3.7-3	Construction GHG Emissions	3.7-11
3.7-4	Estimated Operational GHG Emissions.....	3.7-12
3.8-1	Known Hazardous Materials/Wastes Sites with Potential to Affect Proposed Traction Power Facility Sites.....	3.8-6
3.9-1	Hydrological Features in the Project Area from North to South	3.9-9
3.9-2	Beneficial Uses for Surface Waters within the Project Area	3.9-10
3.9-3	Water Quality Impairments within the Project Alignment	3.9-10
3.9-4	Designated Beneficial Uses for Groundwater in the Project Area	3.9-13
3.9-5	Current Portions of Caltrain ROW within FEMA-Designated 100-Year Floodplain	3.9-15
3.9-6	State and Local Sea Level Rise Projections for areas within the Project Vicinity	3.9-17
3.9-7	Potential Vulnerability to Coastal Flooding with Sea Level Rise along the Caltrain Alignment (2050/2100)	3.9-18
3.9-8	Potential Vulnerability for TPFs Subject to Mid-Century (2050) or End-of-Century (2100) Sea Level Rise Inundation.....	3.9-33
3.10-1	Predominant Land Uses within 0.25 Miles of the Caltrain Corridor.....	3.10-6

3.10-2	Publicly Owned Parks and Recreational Resources Directly Adjacent to the Caltrain Corridor.....	3.10-11
3.10-3	Traction Power Facility Compatibility with Existing Land Uses	3.10-15
3.11-1	Summary of Local Noise and Vibration Ordinances	3.11-2
3.11-2	Summary of 2013 Ambient Noise Measurement Locations and Noise Levels.....	3.11-11
3.11-3	Summary of 2009–2010 Ambient Noise Measurement Locations and Noise Levels.....	3.11-12
3.11-4	Summary of 2013 Vibration Measurement Locations and Ground-Borne Vibration Levels	3.11-17
3.11-5	Summary of 2009-2010 Vibration Measurement Locations and Ground-Borne Vibration Levels	3.11-20
3.11-6	Existing Caltrain/Freight/Non-Railroad Ambient Noise at Representative Sites	3.11-25
3.11-7	Typical Construction Equipment Noise Emission Levels	3.11-30
3.11-8	Vibration Source Levels for Construction Equipment	3.11-32
3.11-9	Land Use Categories and Metrics for Transit Noise Impact Criteria	3.11-34
3.11-10	FTA Construction Noise Assessments Criteria.....	3.11-35
3.11-11	Ground-Borne Vibration Impact Criteria for Human Annoyance.....	3.11-37
3.11-12	Ground-Borne Vibration Impact Criteria for Special Buildings.....	3.11-37
3.11-13	Construction Vibration Damage Criteria	3.11-38
3.11-14	Exposure to Construction Noise	3.11-39
3.11-15	Noise Levels and Impacts from Train Operation	3.11-44
3.11-16	Noise Levels and Impacts from Ancillary Facility Operation	3.11-46
3.11-17	Construction Equipment Vibration Impact Distances	3.11-51
3.12-1	2010–2040 Population, Housing and Employment Growth in the Counties of the Caltrain Corridor	3.12-2
3.13-1	Public Facilities within 0.25 Mile of the Caltrain Corridor.....	3.13-7
3.13-2	Summary of Existing Utilities within the Caltrain Corridor Right-of-Way	3.13-11
3.13-3	Utilities near Proposed Traction Power Facility Locations	3.13-14
3.13-4	Electricity Consumption by County, 2007–2011	3.13-28
3.14-1	Caltrain Stations and Jurisdictions in Study Area	3.14-6
3.14-2	Average Caltrain Travel Time Between San Francisco and San Jose (2013).....	3.14-7

3.14-3	Top Ten Stations for Average Weekday Ridership (2013).....	3.14-8
3.14-4	Weekday Transit Connections by Stations (2013).....	3.14-10
3.14-5	Major Freeways, Expressways, and Arterial Streets in Study Area	3.14-13
3.14-6	Level of Service Designations for Signalized and Stop-Controlled Intersections	3.14-16
3.14-7	Existing Intersection Delay and Levels of Service (2013)	3.14-16
3.14-8	Top Ten Stations for Bicycle Ridership (2013).....	3.14-21
3.14-9	Bicycle Parking Capacity at Caltrain Stations (2013)	3.14-23
3.14-10	Existing Pedestrian Environment and Amenities in Station Areas	3.14-25
3.14-11	Parking Capacity and Average Weekday Occupancy at Caltrain Station Lots (2012).....	3.14-27
3.14-12	Historic Freight Heights at Constrained Locations along the Caltrain ROW.....	3.14-29
3.14-13	Average Weekday Daily Trains by Station with Prototypical Schedule	3.14-34
3.14-14	Average Regional Daily Vehicle Miles Traveled.....	3.14-41
3.14-15	Weekday Daily Regional Vehicle Miles Traveled within Each City, 2020 Scenario	3.14-42
3.14-16	Intersection Delay and Levels of Service, 2020 No Project and 2020 Project Alternatives.....	3.14-43
3.14-17	Summary of Intersection Impacts and Mitigation Measures	3.14-48
3.14-18	Daily Ridership Forecasts by Station, San Francisco 4th and King to Tamien	3.14-53
3.14-19	Ridership on Transit Systems Connecting to Caltrain.....	3.14-55
3.14-20	Excess Weekday Parking Demand Beyond Capacity of Caltrain Lots and On-Street Parking	3.14-64
3.14-21	Existing Effective Vertical Clearances and With the Proposed Project OCS.....	3.14-69
4-1	Summary of Cumulative Impact Methodology	4-3
4-2	2010–2040 Population, Housing and Employment Growth in the Counties of the Caltrain Corridor	4-4
4-3	Projects Considered In the Cumulative Analysis	4-5
4-4	Key Assumptions in High-Speed Rail Blended Service Conceptual Description	4-19
4-5	Projected Blended Service High-Speed Rail 2029/2030 Weekday Daily Boardings at Peninsula Corridor Stations without Optional Redwood City HSR Station	4-21
4-6	Fleet Requirements of the Peninsula Corridor Electrification Project (2020–2019) and a Future Fully Electrified Service (San Jose – San Francisco).....	4-30

4-7	Projects Identified as Improvements to South Terminal Area	4-31
4-8	Cumulative Existing and Future (2040) Daily Train Service Along the Caltrain Corridor.....	4-38
4-9	Land Use Development Projects Adjacent to the Caltrain ROW	4-43
4-10	Summary of Cumulative Impacts Analysis.....	4-49
4-11	Cumulative Rail Noise Impacts, Overview	4-89
4-12	2020 Cumulative Rail Noise Levels, Change over Existing.....	4-90
4-13	2040 Cumulative Rail Noise Levels, Change over Existing.....	4-92
4-14	Potential Vibration Mitigation Procedures and Descriptions from the CHSRA Merced to Fresno EIS/EIR	4-106
4-15	Average Regional Daily Vehicle Miles of Traveled.....	4-113
4-16	Weekday Daily Regional Vehicle Miles Traveled Within Each City, 2040 Scenario.....	4-114
4-17	Intersection Delay and Levels of Service, 2040 Cumulative Conditions with and Without the Project Alternatives.....	4-115
4-18	Summary of 2040 Cumulative Intersection Impacts and Mitigation Measures.....	4-121
4-19	Daily Ridership Projections, 2040 No Project and Project Scenarios	4-127
4-20	Estimated Daily Ridership, Proposed Project and No Project Alternative	4-128
4-21	Comparison of Potential Caltrain Ridership to TTC with Varying Service Level Assumptions (Boardings and Alightings by Station)	4-128
4-22	Existing and Future 2040 Cumulative Parking Supply at Caltrain Stations.....	4-136
4-23	Changes in Effective Vertical Clearance with the Proposed Project OCS.....	4-142
4-24	Annual Direct Energy Consumption	4-156
5-1	Estimated Initial Acceleration Rates of Different Alternatives and the Proposed Project.....	5-2
5-2	Comparison of Ridership Estimates/Assumptions by Alternative.....	5-3
5-3	Comparison of Assumed Rolling Stock by Alternative.....	5-3
5-4	2020 Costs by Alternative.....	5-4
5-5	Estimated Daily Ridership, Proposed Project and No Project Alternative	5-5
5-6	Estimated Operational Emissions by Alternative	5-6

5-7a	Comparison of 2020 Daily PM10 Emissions using Conceptual Estimates for Other Particulate Sources	5-19
5-7b	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)	5-20
5-8	Estimated Operational GHG Emissions by Alternative	5-22
5-9	Noise Levels and Impacts from Train Operation, DMU Alternative (2020).....	5-25
5-10	Noise Levels and Impacts from Train Operations, Tier 4 Diesel Locomotive Alternative – Double-Head Scenario (2020).....	5-46
5-11	Comparison of Project Alternatives with the Proposed Project.....	5-59
5-12	Alternatives Screening, Tier 1 (Feasibility)	5-71
5-13	Alternatives Screening, Tier 2 (Environmental Impact).....	5-79
5-14	Alternatives Screening, Tier 3 (Purpose and Need).....	5-83
5-15	Alternatives Screening, Results	5-85

Figures

	Follows Page
2-1	Project Location 2-2
2-2	Project Vicinity 2-2
2-3	OCS Two Track Arrangement with Side Pole Construction 2-6
2-4	OCS Typical Portal Arrangement 2-6
2-5	OCS Two Track Arrangement with Center Pole Construction 2-6
2-6	OCS Multi-Track Arrangement with Headspan Construction..... 2-6
2-7	OCS Two Track Cantilever..... 2-6
2-8	Vegetation Clearance 2-8
2-9	Proposed Paralleling Station 1 (PS1), San Francisco..... 2-8
2-10	Proposed Paralleling Station 2 (PS2), San Francisco..... 2-8
2-11	Traction Power Substation 1 (TPS1), South San Francisco 2-8
2-12	Proposed Paralleling Station 3 (PS3), Options 1 and 2, Burlingame..... 2-8
2-13a	Proposed Paralleling Station 4, Option 1 (PS4, Option 1), San Mateo 2-8
2-13b	Proposed Paralleling Station 4, Options 2 and 3 (PS4, Options 2 and 3), San Mateo 2-8
2-14a	Proposed Switching Station 1, Option 1 (SWS1, Option 1), Redwood City 2-8
2-14b	Proposed Switching Station 1, Option 2 (SWS1, Option 2), Redwood City 2-8
2-15a	Proposed Paralleling Station 5, Options 1a and 1b (PS5, Options 1a and 1b), Palo Alto 2-8
2-15b	Proposed Paralleling Station 5, Option 2 (PS5, Option 2), Palo Alto 2-8
2-16	Proposed Paralleling Station 6, Options 1 & 2 (PS6, Options 1 & 2), Sunnyvale 2-8
2-17a	Traction Power Substation 2, Options 1 & 2 (TPS2, Options 1 & 2), San Jose 2-8
2-17b	Traction Power Substation 2, Option 3 (TPS2, Option 3), San Jose..... 2-8
2-18a	Proposed Paralleling Station 7 (PS7), San Jose 2-8
2-18b	Proposed Paralleling Station 7, Variants (PS7, Variants), San Jose 2-8
2-19	Typical Substation Compound 2-10
2-20	Typical 115–50 kV (2x25 kV) Primary Transformer (40 MVA) 2-10

2-21	Typical Autotransformer (10 MVA) at Paralleling or Switching Station	2-10
2-22	Typical Switching Station	2-10
2-23	Typical Overbridge Protection Barrier	2-12
2-24	Typical EMU Vehicles.....	2-12
2-25	Typical Pantograph	2-12
2-26	Estimated Construction Schedule.....	2-22
3.1-1	Representative Photo and Photo Simulation Locations	3.1-40
3.1-2	Representative Photos	3.1-40
3.1-3	Simulation 1: 4th and King Station, San Francisco	3.1-40
3.1-4	Simulation 2: PS2, San Francisco (near Bayshore).....	3.1-40
3.1-5	Simulation 3: Oak Grove Avenue, Burlingame	3.1-40
3.1-6	Simulation 4: San Carlos Caltrain Station, San Carlos.....	3.1-40
3.1-7	Simulation 5: Atherton Caltrain Station, Atherton	3.1-40
3.1-8	Simulation 6: Fair Oaks Grade Crossing, Atherton	3.1-40
3.1-9a	Simulation 7a: Churchill Avenue, Palo Alto	3.1-40
3.1-9b	Simulation 7b: Alma Street, Palo Alto	3.1-40
3.1-10	Simulation 8: Overbridge Protection Barrier near San Antonio Caltrain Station, Mountain View	3.1-40
3.1-11	Simulation 9: San Antonio Caltrain Station, Mountain View.....	3.1-40
3.1-12	Simulation 10: PS6, Option 1, Sunnyvale.....	3.1-40
3.1-13	Simulation 11: PS6, Option 2, Sunnyvale.....	3.1-40
3.1-14	Simulation 13: OCS System with Side Poles, San Jose.....	3.1-40
3.1-15	Simulation 14: PS7, San Jose	3.1-40
3.1-16	Simulation 15: PS3, Burlingame.....	3.1-40
3.1-17	Simulation 16: PS5, Option 1, Palo Alto.....	3.1-40
3.1-18	Simulation 17: Overbridge Protection Barrier, Mountain View	3.1-40
3.1-19a	Simulation 17a: Ravenswood Avenue, Menlo Park.....	3.1-40
3.1-19b	Simulation 17b: Glenwood Avenue, Menlo Park.....	3.1-40

3.3-1a-c	Special Status Wildlife Occurrences within 5 miles of Caltrain Peninsula Corridor Electrification Project Area	3.3-4
3.3-2a-c	Special Status Plant Occurrences within 5 miles of Caltrain Peninsula Corridor Electrification Project Area	3.3-6
3.4-1	Butterfly Passenger Shelters at Diridon Station	3.4-24
3.5-1	EMF Measurement Locations	3.5-4
3.9-1	Project Area Watersheds	3.9-8
3.9-2a-c	Hydrological Features within the Project Area	3.9-10
3.9-3	Groundwater Basins within the Project Area	3.9-12
3.9-4	Flood Hazard Areas within the Project Area	3.9-14
3.9-5	Vulnerability to Inundate from a 100-year Flood Event at Differing levels of Projected Future Sea Level Rise	3.9-18
3.11-1	Source-Path-Receiver Framework for Airborne Wayside Noise	3.11-8
3.11-2	Typical A-Weighted Sound Levels from Transit and Non-Transit Sources	3.11-8
3.11-3	Propagation of Ground-Borne Vibrations into Buildings	3.11-10
3.11-4	Typical Levels of Ground-Borne Vibration	3.11-10
3.11-5	Overview Map of All Fields Measurement Locations	3.11-10
3.11-6	Noise Impact Thresholds for FTA Category 1 and 2	3.11-34
3.11-7	Noise Impact Thresholds for FTA Category 3	3.11-34
3.11-8	Proposed Paralleling Station 5, Option 2 and Potential Mitigation Options 2b and 2c	3.11-50
3.14-1	Project Study Area	3.14-6
3.14-2	Average Weekday Ridership by Station (2013)	3.14-8
3.14-3	Trip Purposes of Caltrain Passengers (2010)	3.14-8
3.14-4	Daily Mode of Access to Caltrain Stations (2013)	3.14-8
3.14-5	AM and PM Peak Mode of Access by Stations (2013)	3.14-10
3.14-6	Study Intersections and At-Grade Crossings	3.14-14
3.14-7	Existing Freight, October–December 2012	3.14-28
3.14-8	Vertical Clearances with OCS System in Potentially Constrained Areas	3.14-68
4-1	Projects Considered in the Cumulative Analysis	4-4

4-2 Potential Passing Track Locations Studied to Date..... 4-24

4-3 Average Noise Levels along Caltrain Corridor by Cumulative Scenario 4-94

4-4 2040 Cumulative Noise Levels along Caltrain Corridor 4-94

4-5 2040 Cumulative Noise Levels along Caltrain Corridor 4-96

5-1 Simulated Acceleration Times to 79 mph by Alternative 5-2

Acronyms and Abbreviations

$\mu\text{g}/\text{m}^3$	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
$\text{C}_2\text{H}_3\text{Cl}$	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
<u>CalMod</u>	<u>Caltrain Modernization</u>
Caltrans	California Department of Transportation
CBOSS	Caltrain Communications Based Overlay Signal System
CCAA	California Clean Air Act
CCAs	Community Choice Aggregations
<u>CCSF</u>	<u>City and County of San Francisco</u>
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 ₂ e	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
<u>DCF</u>	<u>direct center feed</u>
<u>CWT</u>	<u>Constant Warning Time</u>
<u>DH</u>	<u>double-head</u>
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
<u>DTP</u>	<u>Denver Transit Partners</u>
<u>DTX</u>	<u>Downtown Extension</u>
DTSC	California Department of Toxic Substances Control
<u>Dual-Mode MU</u>	<u>Dual-Mode Multiple Unit</u>
<u>EC 4</u>	<u>Electrocode 4</u>
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
<u>EP3</u>	<u>Eagle P3 Commuter Rail Project</u>
ESA	Environmental Site Assessment
ESD	Emergency Services Department
ESP	energy service providers
<u>ESRB</u>	<u>Electric Safety and Reliability Branch</u>
ESZ	electrical safety zone
ETB	electric trolley bus
FC	Freeway Commercial
<u>ETF</u>	<u>Engineering Task Force</u>

<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 ₂ S	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-Defibrillators</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
<u>lbs</u>	<u>pounds</u>
L _{eq}	Equivalent Sound Level
LID	Low Impact Development
<u>LIRR</u>	<u>Long Island Railroad</u>
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	milligauss
mg/m ³	milligrams per cubic meter
MNRR	Metro-North Railroad
MOU	Memorandum of Understanding
MPE	Maximum Permissible Exposure
<u>MP</u>	<u>mile post</u>
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 ₂ O	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
<u>O&M</u>	<u>operation and maintenance</u>
OCS	overhead catenary system
OES	Office of Emergency Services
OSHA	Occupational Safety and Health Administration
<u>PARCS</u>	<u>Palo Alto Rail Corridor Study</u>
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
<u>PM</u>	<u>particulate matter</u>
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
<u>REL</u>	<u>reference exposure level</u>
Regional Water Board	Regional Water Quality Control Board
RF	Radio Frequency
RMS	root-mean-square
ROG	reactive organic gases
ROW	right of way
<u>ROSB</u>	<u>Rail Operations and Safety Branch</u>
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
<u>SH</u>	<u>single-head</u>
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SLR	sea level rise

<u>SJIA</u>	<u>San Jose International Airport</u>
<u>SJRRC</u>	<u>San Joaquin Regional Rail Commission</u>
SMART	Sonoma-Marín 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
<u>T4DL</u>	<u>Tier 4 Diesel Locomotive</u>
TCM	traffic control measure
TCP	Traffic Control Plan
TDS	total dissolved solids
TGV	Train A Grande Vitesse
<u>TIFIA</u>	<u>Transportation Infrastructure Finance and Innovation Act</u>
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
<u>UOM</u>	<u>Use, Operating and Maintenance Agreement</u>
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VCB	vacuum circuit breaker

VCP	vitriified clay pipe
VdB	velocity in decibels
VMT	vehicle miles of travel
VTA	Santa Clara Valley Transportation Authority
<u>VdB</u>	<u>Vibration Velocity Level</u>
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
<u>WIU</u>	<u>Wayside Interface Unit</u>
<u>YOE</u>	<u>year of expenditure</u>