2018 California State Rail Plan

Connecting California















This page intentionally left blank.

CALIFORNIA STATE TRANSPORTATION AGENCY

Edmund G. Brown Jr.
Governor

Brian C. Annis
Secretary

915 Capitol Mall, Suite 350B
Sacramento, CA 95814
916-323-5400
www.calsta.ca.gov

Dear Fellow Californians:

People have come from all over the world to live and work in California and to enjoy our natural and built environments, diverse population and economy, universities, and employment centers. Our transportation system connects these people, places, and goods. To effectively address a growing population and a growing economy, California needs a world-class multimodal transportation system, and a modern rail system is central to this.

A rail renaissance is already underway in California, with the state's three intercity rail services and five commuter rail services seeing significant new investment to make service faster, safer, more frequent, and more customer friendly. California's high-speed rail project is under construction and will fundamentally transform how people travel between our major regions while also providing convenient connections to our existing rail and transit systems. The California State Rail Plan (Rail Plan) will guide the State's priorities for future rail investments with its vision that California will have a premier, customer-focused, integrated rail system that successfully moves people and products while enhancing economic growth and quality of life.

I commend the California Department of Transportation (Caltrans) and its public and private sector partners for the work they have completed to develop a consensus rail vision to guide California. The California State Transportation Agency (CalSTA) has formally approved this Rail Plan.

This Rail Plan identifies ways to leverage investments to grow services in congested corridors, develop new regional rail services, provide customer-friendly connections, integrated ticketing and trip planning, reduce delays and travel times, and attract new riders. With this focus, the Rail Plan expects passenger rail trips to increase more than tenfold by 2040 to over 1.3 million rail trips each day. The Rail Plan also describes how California's rail system will improve its ability to move freight cleanly and efficiently by expanding freight rail capacity to handle a more than doubling of intermodal rail freight demand from ports.

Implementing the Rail Plan will take ongoing effort and coordinated planning between the State and our local agency partners. Ongoing partnerships will be instrumental to delivering the consensus vision of an integrated rail network to meet the State's policy goals of fostering livable communities, generating economic growth, and reducing harmful emissions.

Thank you to everyone who participated in the development of the 2018 California State Rail Plan.

Sincerely,

BRIAN C. ANNIS
Secretary

This page intentionally left blank.

2018 CALIFORNIA STATE RAIL PLAN

September 2018

Prepared for

California Department of
Transportation 1120 N Street

P.O. Box 942874

Sacramento, CA 95814

Prepared by

AECOM

300 Lakeside Drive
Oakland, CA 94612

with Cambridge Systematics, Inc.,
Center for Collaborative Policy,
Kimley-Horn Associates,
SMA Rail Consulting + IT,
Steer Davies Gleave,
T. Kear Transportation Planning
and Management

Statewide Rail Stakeholders

We would like to thank the following agencies and consultants:

California State Transportation Agency (CalSTA)

Brian Annis, *Secretary*
Christine Inouye, *Undersecretary*
Chad Edison, *Deputy Secretary for Transportation*
Ben De Alba, *Former Assistant Secretary for Rail and Ports*
Kate White, *Deputy Secretary for Environmental Policy and Housing Coordination*
Brian Kelly, *former Secretary and current CHSR CEO*

Prepared by

California State Department of Transportation (Caltrans)

Laurie Berman, *Caltrans Director*
Ryan Chamberlain, *Caltrans Chief Deputy Director*
Coco Briseno, *Caltrans Deputy Director Planning and Modal Programs*
Dara Wheeler, *DRMT Division Chief*
Kyle Gradinger, *Assistant Division Chief*
Andrew Cook, *Chief, Rail Planning Branch*
Emily Burstein, *Chief, Office of Rail Planning and Operations Support*
Shannon Simonds, *Associate Transportation Planner*
Shalini Chandra, *Transportation Engineer*
Denise Cross, *Associate Transportation Planner*
Clem Bomar, *Retired Annuitant*

With assistance from

AECOM
Cambridge Systematics
Arellano Associates
Center for Collaborative Policy
Kimley-Horn Associates
SMA Rail Consulting + IT
Steer Davies Gleave
T. Kear Transportation Planning and Management

State and Federal Agency Partners

CalSTA
California Air Resources Board
California Freight Advisory Committee
California High Speed Rail Authority
California Public Utilities Commission
California Transportation Commission
Federal Railroad Administration
Governor's Office of Business and Economic Development (GoBiz)
National Railroad Passenger Corporation/ Amtrak
State of Arizona Department of Transportation
State of Nevada Department of Transportation

Intercity Passenger Rail and Rail Transit

Bay Area Rapid Transit/BART
Capitol Corridor Joint Powers Authority/ Northern California Rail Partners
Los Angeles – San Diego – San Luis Obispo Rail Corridor Agency Joint Powers Authority
Los Angeles County Metropolitan Transportation Authority
North County Transit District
Peninsula Corridor Joint Powers Board/Caltrain
Sacramento Regional Transit/SacRT
San Diego Metropolitan Transit System
San Francisco Municipal Transportation Agency/ MUNI
San Joaquin Joint Powers Authority/ Altamont Corridor Express
Sonoma Marin Area Regional Transit
Southern California Regional Rail Authority/ Metrolink
Valley Transportation Authority
XpressWest

Regional Planning Agencies

California Association of Councils of Governments
Metropolitan Transportation Commission
Placer County Transportation Planning Agency
San Benito Council of Governments
San Bernardino Association of Governments
San Diego Association of Governments
San Francisco County Transportation Authority
San Joaquin Valley Regional Policy Council
San Luis Obispo Council of Governments
Santa Barbara County Association of Governments
Santa Cruz County Regional Transportation Commission
Sacramento Area Council of Governments
Southern California Association of Governments
Riverside County Transportation Commission
Transportation Agency for Monterey County

Freight Rail

California Shortline Railroad Association
California Association of Port Authorities/ California Airports Council
BNSF Railway
Genesee & Wyoming Inc.
Pacific Merchants Shipping Association
Union Pacific Railroad

Advocates

California Transit Association
California Farm Bureau Federation
Local Government Commission
The Nature Conservancy

Tribal Representation

Native American Advisory Committee
Northern California Chairman's Association
Central California Chairman's Association
Southern California Chairman's Association



This page intentionally left blank.

Table of Contents

1 Role of Rail in Statewide Transport 1

1.1 2018 California State Rail Plan Overview 2

1.2 State Rail Plan Purpose 3

1.3 State Multimodal Transportation 5
- 1.3.1 California's Rail System Summary 5
- 1.3.2 Trends and Opportunities 6

1.4 Role of Rail in the State Transportation System 15
- 1.4.1 Mobility 15
- 1.4.2 Economic Development and Demographic Changes 16
- 1.4.3 Passenger Rail Demand and Growth Trends 19
- 1.4.4 Freight Demand and Growth Trends 21
- 1.4.5 Land Use and Quality of Life 29
- 1.4.6 Environment 31
- 1.4.7 Safety 33
- 1.4.8 Tribal Context 35

1.5 Policies and Programs 36
- 1.5.1 Federal Policy Trends 36
- 1.5.2 State Policy Trends 37
- 1.5.3 Program Coordination 39
- 1.5.4 Regional Plans 42
- 1.5.5 Corridor-Level Plans 42
- 1.5.6 Private-Sector Railroad Services, Initiatives, and Plans 44

1.6 Governance and Funding 45
- 1.6.1 Federal Laws and Powers for Planning, Operating, and Funding Rail Services 45
- 1.6.2 State Laws and Powers for Planning, Operating, and Funding Rail Services 46
- 1.6.3 Local Authority for Funding Rail Improvements 49
- 1.6.4 Freight Rail Governance 49

1.7 Passenger Rail Service Delivery Agencies: Coordination and Background Information 52
- 1.7.1 Service Provider Engagement 52
- 1.7.2 Relevant Rail Initiatives and Plans 52
- 1.7.3 Passenger Service Providers 52
- 1.7.4 Freight Providers 54
- 1.7.5 Section 22102 Compliance Statement 55

1.8 Conclusion 56

2 Existing Rail System 57

2.1 Description and Inventory 60
2.1.1 Existing Passenger Rail Lines, Corridors, and Services 60
2.1.2 Existing State-Supported Intercity Rail Performance 82
2.1.3 California's Freight Railroad System 85
2.1.4 Rail Line Abandonments 92
2.1.5 Intermodal Facilities 93
2.1.6 Safety and Security 96
2.2 Infrastructure Constraints 97
2.2.1 Freight Rail Constraints 98
2.2.2 Other Constraints 98
2.3 Conclusion 99

3 California Rail Network Vision 101

3.1 California Transportation Plan 2040 Coordination 103
3.1.1 California State Rail Plan Vision Statement 105
3.1.2 GOAL 1: Improve Multimodal Mobility and Accessibility for all People 105
3.1.3 GOAL 2: Preserve the Multimodal Transportation System 113
3.1.4 GOAL 3: Support a Vibrant Economy 115
3.1.5 GOAL 4: Improve Public Safety and Security 119
3.1.6 GOAL 5: Foster Livable and Healthy Communities and Promote Social Equity 121
3.1.7 GOAL 6: Practice Environmental Stewardship 122
3.2 Program Effects 124
3.3 Conclusion 125

4 Proposed Passenger Improvements and Investments 127

4.1 Network Integration Strategic Service Planning 128
4.2 Pulse Scheduling....128
4.3 State Service and Connectivity Goals 129
4.3.1 Phasing....130
4.3.2 Interstate Rail Connections....130
4.3.3 Host Railroad Coordination....131
4.4 Service Areas and Organizational Framework 132
4.5 2022 Short-Term Plan – Statewide Goals 134
4.6 2022 Short-Term Plan – Regional Goals 135
4.6.1 Central Valley and Sierra Nevada....135
4.6.2 North San Francisco Bay Area and the North Coast 137
4.6.3 South San Francisco Bay Area....138
4.6.4 Central Coast 139
4.6.5 Las Vegas HSR 139
4.6.6 LOSSAN North 140
4.6.7 Los Angeles Urban Mobility Corridor....141
4.6.8 Inland Empire....142
4.6.9 LOSSAN South 143
4.7 2027 Mid-Term Plan – Statewide Goals....144
4.8 2027 Mid-Term Plan – Regional Goals 146
4.8.1 Central Valley and Sierra Nevada....146
4.8.2 North San Francisco Bay Area and the North Coast 147
4.8.3 South San Francisco Bay Area....148
4.8.4 Central Coast 149
4.8.5 Las Vegas HSR 150
4.8.6 North LOSSAN and Antelope Valley....150
4.8.7 Los Angeles Urban Mobility Corridor....152
4.8.8 Inland Empire....152
4.8.9 LOSSAN South 153
4.9 2040 Long-Term Vision – Statewide Goals 154
4.10 2040 Long-Term Vision – Regional Goals 156
4.10.1 Central Valley and Sierra Nevada....156
4.10.2 North San Francisco Bay Area....157
4.10.3 South San Francisco Bay Area....158
4.10.4 Central Coast 159
4.10.5 Las Vegas HSR 161
4.10.6 LOSSAN North and Antelope Valley....161
4.10.7 Los Angeles Urban Mobility Corridor....162
4.10.8 Inland Empire....163
4.10.9 LOSSAN South 165

5 Freight Rail Investment Strategy 167

5.1 Freight-Capacity Analysis....169

5.2 Corridor-Based Approach....171
5.1.1 Identifying Freight Corridors....173
5.1.2 Freight Rail Corridor Investment Strategy....173

5.2 Categories of Investment....175
5.2.1 Freight Rail Vision....175
5.2.2 Trade Corridor Improvements....177
5.2.3 Economic Development and Short Lines....178
5.2.4 Grade Crossing Improvement Needs throughout the State....179
5.2.5 Additional Terminal and Yard Capacity....180
5.2.6 Short-Haul Rail Improvements....181
5.2.7 Advancement of Zero- and Near-Zero-Emissions Technologies....181

5.3 Rail Projects with Freight Elements....182
5.3.1 Freight Rail Projects and the Freight Investment Strategy....182

6 The State's Rail Service and Investment Program 183

6.1 Passenger and Freight Rail Capital Program....184
6.1.1 Passenger and Freight Rail Integration....196

6.2 Funding for California Passenger and Freight Rail....197
6.2.1 Operating Costs and Funding....197
6.2.2 Funding Opportunities....198
6.2.3 Federal Rail Funding Fixing America's Surface Transportation Act....200
6.2.4 State Funding....203
6.2.5 Local Funding....208

6.3 Benefits of the State's 2040 Vision....209
6.3.1 Regional Balance and Distribution of Benefits....210
6.3.2 Passenger Rail Effects and Benefits....212
6.3.3 Freight Rail Effects and Benefits....216
6.3.4 Key Environmental Effects....223

6.4 Implementation....233
6.4.1 Coordinating Rail Policies and Plans....233
6.4.2 Environmental Policy....233
6.4.3 Land Use Coordination....235
6.4.4 Public-Private Partnerships....236
6.4.5 Positive Train Control....236

7 Public Outreach 237

7.1 Public and Agency Participation Approach 238
7.1.1 Public Involvement and Stakeholder Outreach Plan 238
7.1.2 Native American Tribal Consultation and Outreach Plan 239
7.1.3 Public Noticing and Commenting Process 240
7.1.4 California State Rail Plan Website 240
7.1.5 Rail Plan Factsheet 241
7.1.6 Early Engagement Survey 242
7.1.7 Interactive Map 242
7.1.8 Network Integration Strategic Service Planning Engagement 245
7.2 Stakeholder Involvement in State Rail Plan Preparation 246
7.2.1 Stakeholder Advisory Committee 246
7.2.2 Interstate Coordination 247
7.2.3 Rail Partners Working Group 248
7.2.4 Freight Railroad Coordination 249
7.2.5 Native American Stakeholder Involvement 249
7.2.6 Rail Plan Public Workshops 251

List of Tables

Table 1.1: California Transportation Facilities 5
Table 1.2: Enplanements for California's Top 11 State Airports 2011-2015 14
Table 1.3: Statewide Demographic Forecasts 16
Table 1.4: State-Supported Intercity Passenger Rail Agency Roles and Responsibilities 48
Table 2.1: Intercity Passenger Rail Historical Ridership 62
Table 2.2: Amtrak Thruway Bus Historical Ridership 66
Table 2.3: Historical Annual Ridership Information for California's Commuter Rail Operators 77
Table 2.4: Existing Urban Rail Systems in California 78
Table 2.5: Key Passenger Rail Intermodal Facilities 81
Table 2.6: State-Supported Routes – Ridership and Service Levels 83
Table 2.7: State-Supported Routes – Financial Operational Performance 84
Table 2.8: California's Freight Railroads 86
Table 2.9: Short Line Carload Service Traffic Originating (left) and Terminating (right) in California. 90
Table 2.10: Rail Line Abandonment Filings with FRA 92
Table 2.11: Intermodal Terminal Facility Characteristics 94
Table 2.12: Current versus Proposed Future Capacities 94
Table 5.1: Corridor Screening Framework for Freight Capacity Analysis 169
Table 5.2: Corridor Screening Framework for Freight Capacity Analysis 170
Table 5.3: Project Examples of Trade Corridor Improvements with Co-Benefits 177
Table 5.4: Project Examples of Economic Development and Short Lines with Co-Benefits 178
Table 5.5: Project Examples of Grade-Crossing Improvements with Co-Benefits. 179
Table 5.6: Examples of Adding Terminal and Yard Capacity and Co-Benefits. 180
Table 5.7: Project Examples of Short-Haul Rail Improvements 181
Table 6.1: 2022 Short-Term Project List (thousands $) 187
Table 6.2: 2027 Capital Costs. 190
Table 6.3: 2027 Mid-Term Project List (thousands $). 191
Table 6.4: 2040 Capital Projects Details 194
Table 6.5: 2040 Capital Costs. 195
Table 6.6: New 2016 Local Tax Measures. 208
Table 6.7: Value of Economic Benefits of Grade Separation in the SCAG Region 219
Table 6.8: Sea-Level Rise Estimates for San Francisco Bay. 224
Table 6.9: Grams CO_2 per Passenger Mile of Travel by Mode 230
Table 6.10: Annual Statewide Emission Reduction 231

List of Exhibits

Exhibit 1.1: Spatial Efficiency Across Modes 5
Exhibit 1.2: Emerging Mega-Regions in the U.S. and their Areas of Influence (2013) 6
Exhibit 1.3: Three Revolutions in Urban Transportation (ITDP, UC Davis) 8
Exhibit 1.4: Tract-to-Tract Commutes of 80 km/50 Miles or Less in California 13
Exhibit 1.5: California Passenger Rail Ridership for ACE, Caltrain, COASTER, Metrolink, Pacific Surfliner, San Joaquin, Capitol Corridor Lines by State Fiscal Year 17
Exhibit 1.6: Total Increase in California Rail Freight Tonnage Flows 2012-2015 (in million tons) 17
Exhibit 1.7: Growth in Intraregional Personal Travel, 2010 to 2040 20
Exhibit 1.8: Top 5 Rail Carload Commodities (millions of tons), 2013 and 2040 21
Exhibit 1.9: Top 5 Rail Intermodal Commodities (millions of tons), 2013 and 2040 21
Exhibit 1.10: Directional Distribution of California Rail Tonnage, 2013 and 2040 22
Exhibit 1.11: Intermodal Freight Flows 2013 and 2040, Tonnage and Direction 24
Exhibit 1.12: Carload Freight Flows 2013 and 2040, Tonnage and Direction 24
Exhibit 1.13: Volumes on Major Railroads, 2013 25
Exhibit 1.14: Expected Change in Volumes on Major Railroads, 2013-2040 26
Exhibit 1.15: National Fatalities by Transportation Mode 33
Exhibit 1.16: Current Long-Range Transportation Plans 40
Exhibit 2.1: California Intercity and Commuter Rail Network (Including Connecting Bus Service) . . 59
Exhibit 2.2: California Intercity Routes 60
Exhibit 2.3: Existing Services as Part of the 2022 Vision (Northern California) 74
Exhibit 2.4: Existing Services as Part of the 2022 Vision (Southern California) 75
Exhibit 2.5: Class I and Public Agency Owned Rail System 87
Exhibit 2.6: Short Line and Switching and Terminal Freight Railroads 88
Exhibit 2.7: Heavy Freight Traffic Corridor Bottlenecks 91
Exhibit 3.1: CTP 2040 Policy Framework 104
Exhibit 3.2: California Service (2040 Vision) 106

Exhibit 4.1: Sketch of "Pulsed" Services 128
Exhibit 4.2: Implementation Strategies Derivation Process 130
Exhibit 4.3: Caltrans Statewide 2040 Vision Rail Map 133
Exhibit 4.4: Northern California Service (2022 Vision) 136
Exhibit 4.5: Southern California Service (2022 Vision) 140
Exhibit 4.6: Northern California Service (2027 Vision) 145
Exhibit 4.7: Southern California Service (2027 Vision) 151
Exhibit 4.8: Northern California Service (2040 Vision) 155
Exhibit 4.9: Southern California Service (2040 Vision) 160
Exhibit 5.1: Transcontinental Freight Routes 172
Exhibit 6.1: Corridor Separation Evolution; Shared Track (80/110 mph), Shared Corridor (80/110 mph), Blended Passenger (80-125 mph) 196
Exhibit 6.2: Federal Government and State and Local Government Spending on Mass Transit and Rail across the U.S., 1956 to 2014 (billions of 2014 dollars) 199
Exhibit 6.3: Caltrans-Anticipated Annual Rail and Transit Investment Funding (Capital and Planning) 199
Exhibit 6.4: 2040 Vision Ridership Growth 213
Exhibit 6.5: County-to-County Ridership Demand "No Build" vs. 2040 Vision 214
Exhibit 6.6: Trends: California's Top Ten Trading Partners by Rail 218
Exhibit 6.7: Major Rail Line the Bay Area at Risk from Sea-Level Rise 225
Exhibit 6.8: Major Rail Lines in Central and Southern California at Risk from Sea-Level Rise 226
Exhibit 6.9: Inundation of the UPRR Martinez Subdivision at Hercules 227
Exhibit 6.10: Erosion of the Del Mar Bluffs in San Diego County 228
Exhibit 6.11: Rail Mode Share Shift in 2040 Vision 232
Exhibit 7.1: Factsheet 241
Exhibit 7.2: 2018 California Rail Plan Survey Summary Report 243
Exhibit 7.3: Online Interactive Map 244

Acronyms and Abbreviations

AADT	Annual Average Daily Traffic
AAR	Association of American Railroads
AB	Assembly Bill
ACE	Altamont Corridor Express
AC Transit	Alameda-Contra Costa Transit District
Amtrak	The National Rail Passenger Corporation
BART	San Francisco Bay Area Rapid Transit District
BCA	Benefit-Cost Analysis
BNSF	BNSF Railway
BUILD	Better Utilizing Investments to Leverage Development
CAGR	compound annual growth rate
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CBR	crude by rail
CCJPA	Capitol Corridor Joint Powers Authority
CEQA	California Environmental Quality Act
CFAC	California Freight Advisory Committee
CFMP	California Freight Mobility Plan
CFR	Code of Federal Regulations
CHSRA	California High-Speed Rail Authority
CO	carbon monoxide
CO_2	carbon dioxide
CPUC	California Public Utilities Commission
CSMP	Corridor System Management Plan
CTC	California Transportation Commission
CTP	California Transportation Plan
DMU	Diesel multiple unit
DRMT	Caltrans Division of Rail and Mass Transportation
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMFAC	CARB Emissions Factor model

EMU	electric multiple unit
°F	degrees Fahrenheit
FAF	Freight Analysis Framework
FAF3	Freight Analysis Framework version 3.5
FAST	Fixing America's Surface Transportation
FFY	federal fiscal year
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	fiscal year
GDP	Gross Domestic Product
GGRF	Greenhouse Gas Reduction Fund
GHG	greenhouse gas
g/PMT	grams per passenger mile traveled
HDC	High Desert Corridor
HSPTB	High-Speed Passenger Train Bond Program
HSR	High-Speed Rail
I	Interstate
ICTF	Intermodal Container Transfer Facility
INFRA	Infrastructure for Rebuilding America grant program
IRI Program	Intercity Rail Improvement Program
ITA	interagency transfer agreement
ITIP	Interregional Transportation Improvement Program
ITSP	Interregional Transportation Strategic Plan
JPA	Joint Powers Authority
LA Metro	Los Angeles County Metropolitan Transportation Authority
LAUS	Los Angeles Union Station
LAX	Los Angeles International Airport
LCTOP	Low Carbon Transit Operations Program
LOS	Level of Service
LOSSAN	Los Angeles–San Diego–San Luis Obispo Rail Corridor Agency
MAP 21	Moving Ahead for Progress in the 21st Century Act
mph	Mile(s) per hour
MPO	Metropolitan Planning Organization

MTC	Metropolitan Transportation Commission
Muni	San Francisco Municipal Railway
NAAC	Native American Advisory Committee
NATCOP	Native American Tribal Coordination and Outreach Plan
NCTD	North County Transit District
NISSP	Network Integration Strategic Service Planning
NOx	nitrogen oxide
O&M	Operation and Maintenance
OCTA	Orange County Transportation Authority
OTP	on-time performance
OTS	Office of Traffic Safety
P3	public-private partnership
PCJPB	Peninsula Corridor Joint Powers Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
PISOP	Public Involvement and Stakeholder Outreach Plan
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
POLA	Port of Los Angeles
POLB	Port of Long Beach
PPP	Public-Private Partnerships
PRCIP	Passenger Rail Corridor Investment Plan
PRIIA	Passenger Rail Investment and Improvement Act of 2008
PTA	Public Transportation Account
PTC	Positive Train Control
Rail Plan	2018 California State Rail Plan
RCTC	Riverside County Transportation Commission
ROG	reactive organic gases
ROSB	Railroad Operations and Safety Branch
RRIF	Railroad Infrastructure Financing and Improvement Act
RSIA	Federal Rail Safety Improvement Act of 2008
RT	Sacramento Regional Transit
RTP	Regional Transportation Plan
RTPA	Regional Transportation Planning Agency

SAC	Stakeholder Advisory Committee
SANDAG	San Diego Association of Governments
SANDAG Tribal Working Group	San Diego Association of Governments, Interagency Technical Working Group on Tribal Transportation Issues
SB	Senate Bill
SCAG	Southern California Association of Governments
SCCRTC	Santa Cruz County Regional Transportation Commission
SCRRA	Southern California Regional Rail Authority
SCS	Sustainable Communities Strategies
SCVTA	Santa Clara Valley Transportation Authority
SDMTS	San Diego Metropolitan Transit System
SFAP	Sustainable Freight Action Plan
SFMTA	San Francisco Municipal Transportation Agency
SHA	State Highway Account
SJJPA	San Joaquin Joint Powers Authority
SJRRC	San Joaquin Regional Rail Commission
SLOCOG	San Luis Obispo Council of Governments
SMART	Sonoma-Marin Area Regional Transit District
SRPAA	State Rail Plan Approval Authority
SRTA	State Rail Transportation Authority
STA	State Transit Assistance
STB	Surface Transportation Board
STIP	State Transportation Improvement Program
TAMC	Transportation Agency for Monterey County
TCAG	Tulare County Association of Governments
TCEA	Trade Corridor Enhancement Account
TCEP	Trade Corridor Enhancement Program
TCRF	Traffic Congestion Relief Fund
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIGER	Transportation Investment Generating Economic Recovery
TIRCP	Transit and Intercity Rail Capital Program
TOD	Transit-Oriented Development
UPRR	Union Pacific Railroad
USC	United States Code

U.S. DOT	United States Department of Transportation
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
2040 Vision	2040 Passenger Rail Vision
VMT	Vehicle miles traveled

This page intentionally left blank.

Executive Summary



WHAT IS THE 2018 CALIFORNIA STATE RAIL PLAN?

The Rail Plan establishes a long-term vision for **prioritizing state investment** in an **efficient, effective passenger and freight rail system**, which supports the goals and policies of the California Transportation Plan 2040. The Rail Plan identifies **service goals, capital costs, and a phased strategy** for achieving the Vision. This ambitious plan identifies a coordinated, statewide passenger rail network that will get Californians where they want to go, when they want to go, and enhance the movement of goods by rail to support California's industries and the economy.

PASSENGER RAIL: Rail Plan investments will open the door for travelers to **glide past traffic** on reliable trains and buses in dedicated lanes; **transfer quickly and easily** with timed transfers; and to plan an entire, door-to-door trip, even on different trains, using a **single ticket.**

FREIGHT RAIL: The Rail Plan establishes state priorities for freight: improving **trade corridors, yards and terminals**, and **access** for businesses; and enhancing the competitiveness of California's ports and intermodal transfer facilities.

IMPLEMENTATION HIGHLIGHTS

The Short-Term Plan (2022)

- » Caltrain electrification
- » Committed rail improvements/extensions
- » More bus connections to fill gaps
- » Elimination of existing rail freight bottlenecks
- » Statewide service planning – connect train routes

The Ten Year Plan (2027)

- » High Speed Rail – Central Valley and Silicon Valley segments
- » More frequencies using available capacity
- » Timed connections between services
- » Fully operational integrated ticketing
- » Rail freight – shared passenger lines, trade corridors

The Vision (2040)

- » High Speed Rail – Anaheim to San Francisco by 2033
- » High Speed Rail connections – Sacramento, Inland Empire, San Diego
- » New regional rail system connections
- » Regular frequencies & fast services
- » Dedicated rail freight capacity







Statewide Map

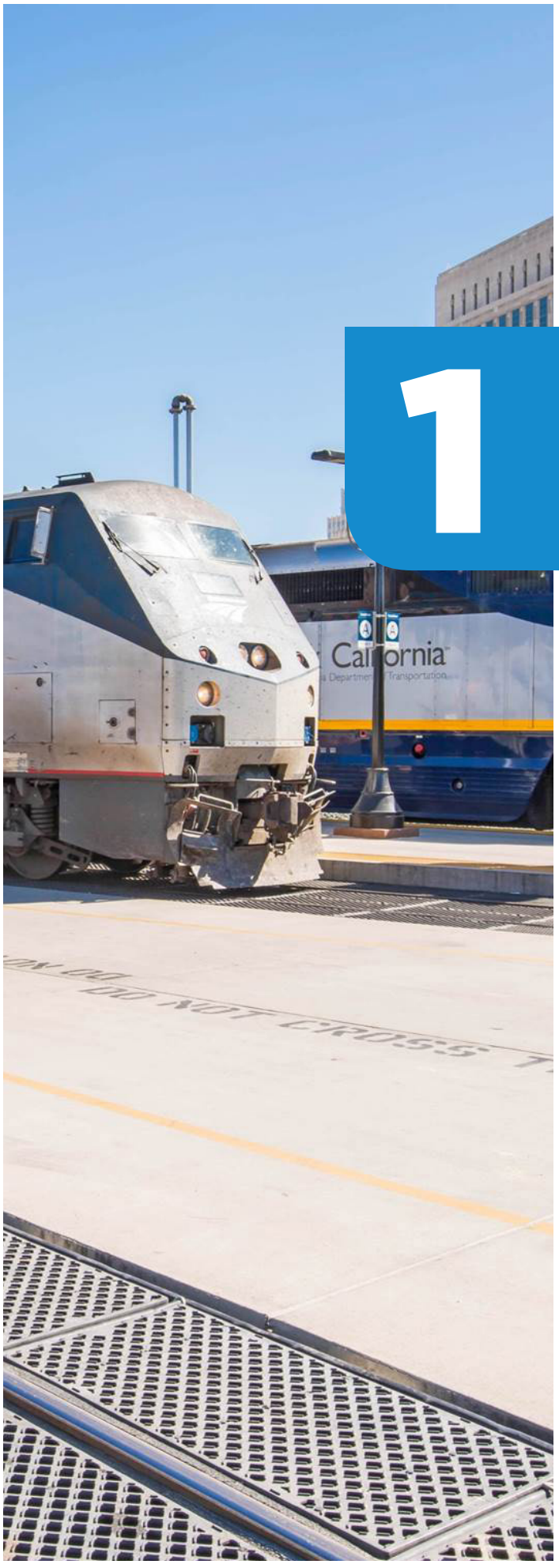


Rail Plan Vision

California has a premier, customer-focused, integrated rail system that successfully moves people and products while enhancing economic growth and quality of life.

Service Categories

- Rail Service - Operating Speed Over 125 Miles Per Hour
- Rail Service - Operating Speed Up To 125 Miles Per Hour
- Express Bus /Urban Rail Transit Network
- Amtrak Long Distance Trains
- Ferry Boat



1 Role of Rail in Statewide Transport

Caltrans' mission in developing the California State Rail Plan is to provide a framework for a safe, sustainable, integrated, and efficient California rail network that successfully moves people and goods while enhancing the State's economy and livability.

1.1 2018 California State Rail Plan Overview

California is building the future every day. California is the world's fifth-largest economy; is home to nearly 40 million people; and supports world-class cities, universities, and research centers, and the world's most valuable, innovative, and technologically advanced companies. The State's agricultural industry feeds the nation. Ports through which goods and products flow to and through the rest of the nation are a center of international trade. California's iconic parks and landscapes draw visitors from all over the world.

California can experience even greater success by efficiently connecting and updating the transportation system built on rail networks and highways from the 19th and 20th centuries. The status quo is not enough to support this growing economy and meet its robust economic and environmental future needs. Residents and workers in California's growing mega-regions face mounting vehicle congestion and crippling commute times due to pressures on the housing market and the aging transportation infrastructure. This creates bottlenecks in the movement of goods, and in access to popular destinations and across California's borders. Quality of life is further impacted by transportation-related air pollution. The state's farms and forests are threatened by erratic patterns of drought and downpour, and by extreme weather generated by greenhouse gas (GHG) emissions and a changing climate.

California is uniquely poised to meet these challenges. The State is a national leader in developing a passenger and freight rail network connecting its growing regions. Modern rail is the most cost- and energy-efficient transportation technology to quickly, safely, and affordably connect people to their destinations, and goods to their markets. Californians must continue to invest in and build an advanced, integrated statewide rail system befitting both their needs and their ambitions to continue to compete and thrive on the cutting edge of global technology; to lead in efforts to curb climate change; and to grow sustainably and resiliently in a fast-changing world.



1.2 State Rail Plan Purpose

The 2018 California State Rail Plan (Rail Plan) establishes a statewide vision of an integrated rail system that provides comprehensive and coordinated service to passengers through more frequent service, and convenient transfers between rail services and transit. This integrated system uses the existing rail system more efficiently; expands the coverage and mix of rail services in several key corridors; scales proposed services to meet anticipated market demand; and facilitates network-wide coordination through scheduled, or "pulsed," transfers. For passengers, this integrated system means a faster, more convenient and reliable door-to-door travel experience. For freight movements, this integrated system means better system reliability and a clear pathway to growing capacity, which leads to economic benefits that reverberate locally, regionally, and nationally.

The California transportation network today:

- Total highway / roadway centerline miles: 175,818
- More than 13,133 State-owned bridges
- Twelve California seaports, including the nation's largest port complex
- More than 300 airports (Commercial and General Aviation)
- One of the nation's most extensive passenger and freight rail systems with more than 10,000 passenger and freight route miles

The Rail Plan anticipates exciting new developments in California's rail system, and presents a future vision for statewide rail travel that builds on the State's existing conventional rail, along with opportunities provided by high-speed rail (HSR) and transit; leverages emerging technologies such as electrification and advanced train control systems that help make rail travel more efficient, faster, safer, and more reliable; makes the existing system more cost-effective to operate; and channels savings to new capital projects and system enhancements. The Rail Plan assesses a changing funding landscape, including the influence of newly funded Senate Bill (SB) 1 transportation package and California's Cap-and-Trade Program for reducing GHG emissions. The planned rail system envisioned in the Rail Plan will improve Californians' quality of life by mitigating roadway congestion; reducing vehicle emissions; supporting compact land use; and offering convenient, reliable, and automobile-competitive alternative travel and goods movement. The Rail Plan also addresses issues of access (defined as the availability of opportunities within a certain distance), as well as mobility (the ability to move between activity sites).[1] A statewide rail system offers a viable alternative to driving for both local and long-distance trips for all populations, including those who lack access to or cannot afford automobiles, and for people who choose not to drive.

1 Hanson, Susan, The Geography of Urban Transportation, 2004, accessed 2016.

The Rail Plan vision includes a 2040 time horizon that is not financially constrained. The vision provides a technical framework for realizing the full potential of our existing rail network, and using available capacity on freight-heavy routes in a fully integrated statewide passenger service that draws on detailed input and guidance from key stakeholder initiatives and leadership. In partnership with those same stakeholders, this vision can be achieved in phases, with different levels of integration activated as improvements are delivered over time.

Phasing implementation prioritizes more intensive utilization of the existing infrastructure while minimizing duplicate or stranded investments. A mid-term 10-year capital program is derived from the 2040 Passenger Rail Vision (2040 Vision). This program builds on the already programmed short-term capital projects, and represents what the State reasonably expects can be funded by 2027.

However, these phases are meant to establish the thresholds that guide strategic planning and do not preclude projects in one time frame from funding in a nearer term time frame. The Rail Plan provides for incremental service planning and capital investment decision-making with an ultimate network vision in mind: it offers leadership toward a more integrated, convenient, and efficient statewide rail system.

Chapter 1 provides the statewide context of California's multimodal transportation system, outlining the key trends and opportunities guiding transportation planning; characterizing rail's role in the State transportation system; and highlighting key multimodal policies, programs, and plans on which statewide planning for the rail network is based. This chapter also reviews the rail governance structure and identifies funding opportunities from Federal, State, local, and other sources.



1.3 State Multimodal Transportation

California's multimodal transportation system, consisting of highway, rail, transit, seaport, and airport systems, provides the foundation from which the State economy can flourish. It provides residents with access to jobs, and businesses with access to markets. New trends and opportunities are emerging in all modes and scales of transportation planning, and were considered and incorporated in developing the Rail Plan.

1.3.1 California's Rail System Summary

In California, freight rail services are provided by two Class I railroads, or large railroads; and 27 Class III railroads, or small railroads. The National Rail Passenger Corporation (Amtrak) operates four long-distance services. The State of California sponsors three corridor services. There are five commuter railroads in the State of California, of which the newest commenced operations in 2017. Most of these passenger services operate over trackage owned by the Class I railroads.

Table 1.1: California Transportation Facilities[2]

Freight Rail Route Mileage	
Freight: Class I Railroads	5,418
Freight: Class III Railroads	1,317
Freight: Switching Terminals	275
Passenger Rail Route Mileage	
Long-Distance	887
Intercity Passenger Rail	1,663
Commuter and Regional Rail	830
Urban Mass Transit Rail	382
Highway/Roadway	
Highway/Roadway Mileage	175,818
Airports	
Commercial Service Airports	28
General Aviation Airports	215
Special Use Airports	68
Ports	
Seaports (Inland and Coastal)	12
International Ports of Entry	6

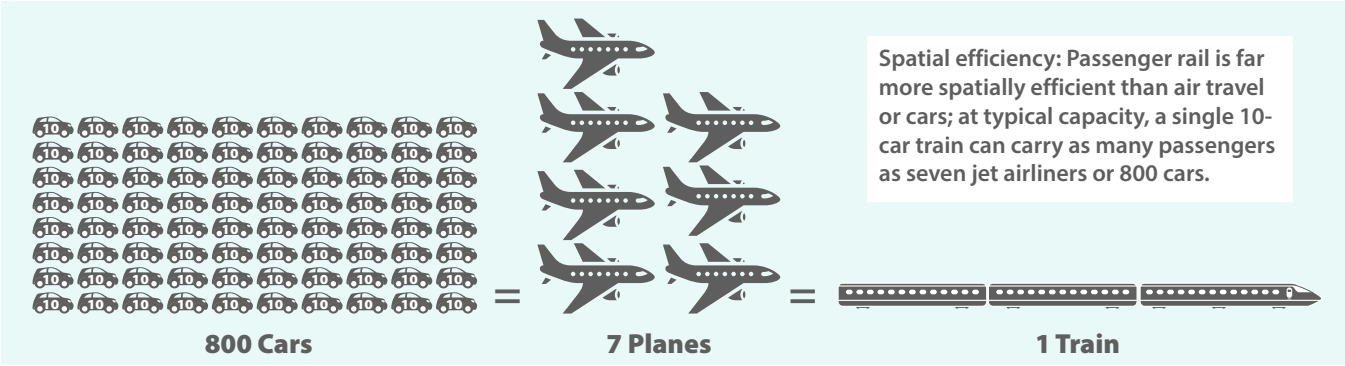


Exhibit 1.1: Spatial Efficiency Across Modes

2 Route miles are estimated by adding each agency or railroad company's operating route miles.

1.3.2 Trends and Opportunities

The Rail Plan addresses the following key trends and opportunities for the California transportation system:

Population growth. The State population is now 39 million; this is almost four times its 1950 population of 10 million, when the core of California's highway (interstate) transportation system was built. This quadrupling of the population results in severe congestion on roads, rail, airports, and bridges. By 2040, the State's population is projected to grow from 39 million[3] to 50 million.[4] Accommodating population growth, while transporting people and goods, will pressure the already-strained capacity of the State's transportation system. The integrated rail system envisioned for 2040 in the Rail Plan will provide significant new, reliable capacity to the existing transportation system, moderating the pressure of population growth.

Mega-Regional Planning. Mega-regions are extended geographical areas around a metropolitan center that connect regions through transportation and communication networks. They often have interlocking economies, shared natural resources and open space, and overlapping transportation networks.[5] Comprehensive evidence shows that mega-regions are emerging as an efficient scale for planning and managing transportation, labor, housing, land use, and economic systems. California is home to both a northern and southern mega-region (see Exhibit 1.2);[6] increasingly, the regional planning organizations in these areas are not in a position to optimize services without considering the cross-border and cross-regional impacts.[7]

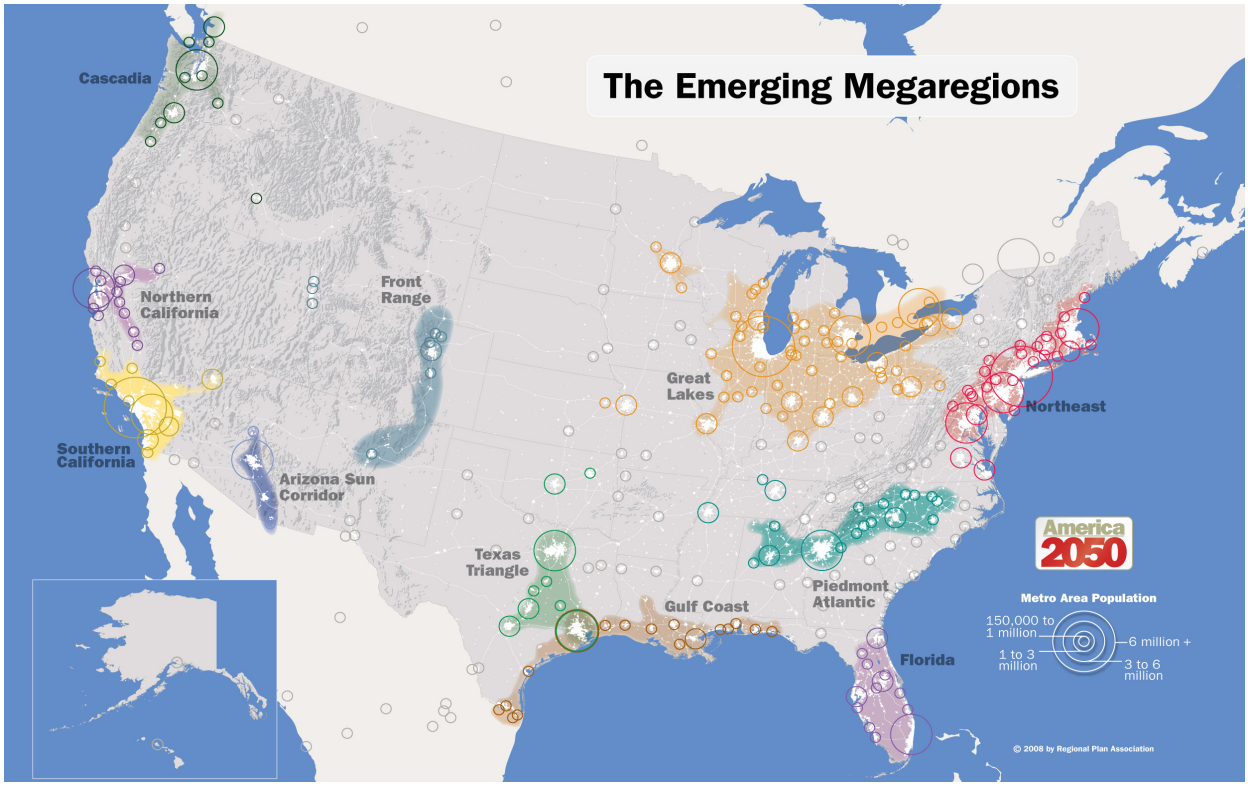


Exhibit 1.2: Emerging Mega-Regions in the U.S. and their Areas of Influence (2013) [8]

3 California Department of Finance, *Population Estimates for California* (2015).

4 California Department of Finance, *"New Population Projections: California to Surpass 50 Million in 2049"* (2013).

5 Regional Plan Association, "Emerging Mega-Regions in the U.S. and Their Areas of Influence," accessed 2017.

6 The research names 10 or 11 nationwide mega-regions; two are in California. The California mega-regions account for nearly 95 percent of the State's population.

7 Bay Area Council: Economic Institute, The Northern California Megaregion: Innovative, Connected, Growing" (2016).

8 Regional Plan Association, *"Emerging Mega-Regions in the U.S. and their Areas of Influence,"* accessed 2017.

System preservation. Much of California's multimodal transportation system was built in the mid-20th century, and is approaching the end of (or exceeding) its useful life. Simply maintaining the existing transportation system generates significant internal and external costs. Internal costs include sustaining quality operations and performing frequent maintenance and upkeep to ensure that the existing capacity can accommodate demand, and that public health and safety are preserved. External costs include harmful pollutants emitted by motor vehicles, airports, railroads, and seaports. These pollutants adversely affect public health and contribute to global climate change, which jeopardizes the State's ecological and economic future. A stronger freight and passenger rail system, along with the anticipated mode shift, will help alleviate the demands on existing highway infrastructure and with anticipated mode shift to reduce the rate of degradation of the existing transportation system.

California Air Quality and Climate Change Mandates. The passage of Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, was landmark legislation requiring California to reduce GHG emissions to 1990 levels by 2020. SB 32 (Statutes of 2016) requires GHG levels to be 40 percent below 1990 levels by 2030. Governor's Executive Order B-30-15 further requires GHG levels to be 80 percent below 1990 levels by 2050. The transportation sector must play a large role in these reductions, which are the most aggressive in the country. Climate change is already affecting California, with extreme heat, more frequent and intense wildfires, poor air quality, drought, and related public health concerns—as well as sea-level rise and flooding—which threaten transportation infrastructure and economic vitality. These impacts escalate maintenance and preservation costs, and may seriously affect transportation infrastructure, causing economic disruptions, safety issues, and reduced quality of life. A more extensive and efficient rail system can reduce the transportation sector's substantial GHG emissions; add resiliency to the transportation system; mitigate climate change's adverse impacts; and contribute to California's ambitious GHG reduction requirements.

As elaborated in the air quality study presented in Chapter 6 of this Rail Plan, with the implementation of the Rail Plan 2040 Vision, the anticipated mode shift from highways to rail will reduce carbon dioxide emissions per passenger mile of travel by nearly 20 times.

First- and Last-Mile Connections.

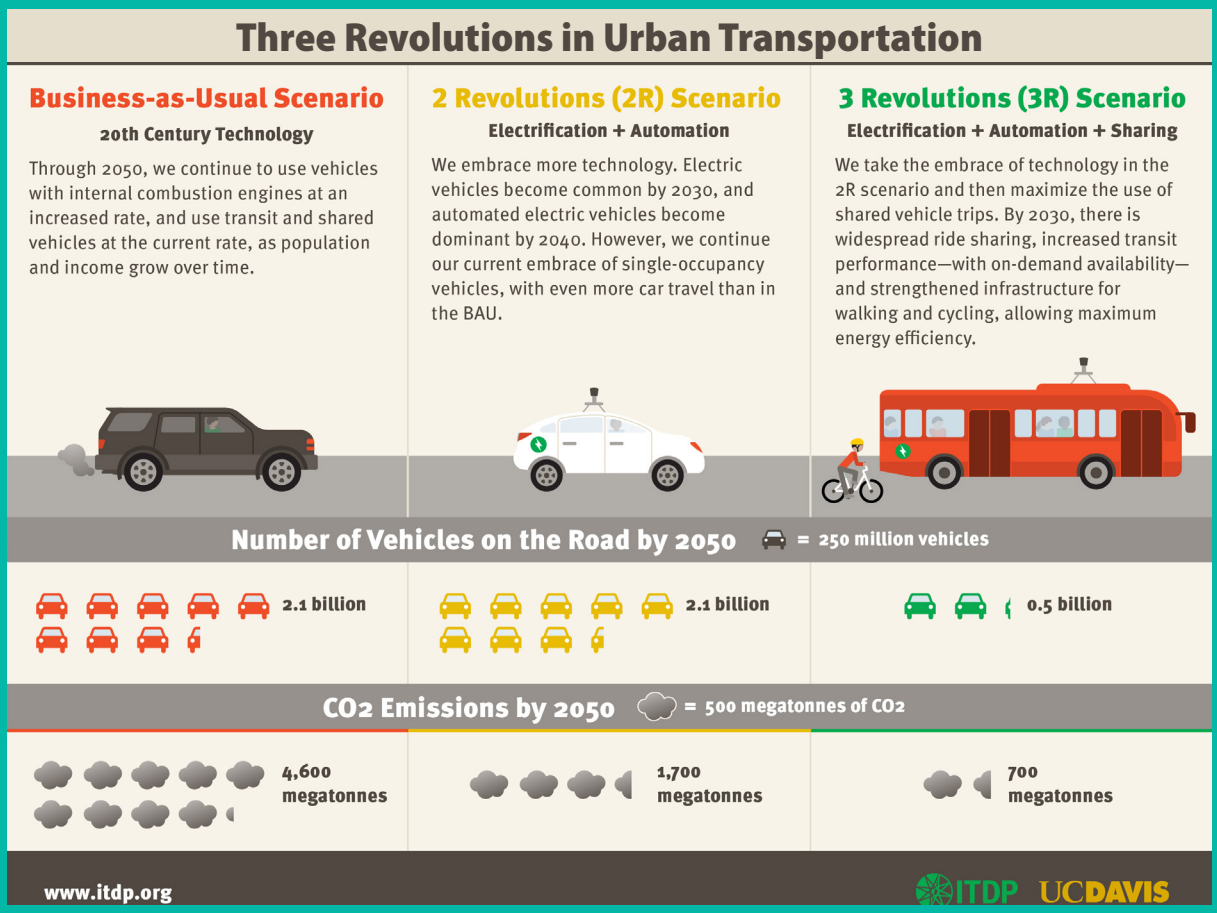
A rail journey does not begin when a passenger boards a train, but when the passenger leaves their home or place of work on the way to the rail station. Similarly, the journey does not end when the train pulls into the arriving station, but when the passenger arrives at their final destination. Covering this gap between the rail stations and the origin and destination is known as the "first/last mile connection." Solutions to this challenge (discussed in Chapter 3) include, among other things, emerging technologies that enhance bike-share, car-share, and transit park-and-ride schemes.



Emerging Technologies

Transportation will continue to encounter fundamental innovations and changes. Research out of the UC Davis Institute of Transportation Studies defines the most significant changes as the three revolutions – electrification, automation, and shared mobility. Hyperloop, among other theoretical future technologies, could present additional opportunities for rail and transit. These technologies are largely untested at scale. Strong, coordinated policies can guide implementation to help achieve GHG emissions targets, livability, and mobility goals.

These technologies can be positive, but their implementation is the key. Electrification can improve air quality, but will only reduce GHG emissions if power is generated by renewable energy. Automation may improve efficiency and reduce labor costs; however, it may incentivize traffic congestion and sprawl. Shared-mobility can reduce vehicle miles traveled (VMT) and GHG, reduce car ownership, and promote biking and walking, but policies and leadership are required to ensure a sustainable system. The key is efficient, equitable use of limited space. Leading research indicates that the associated benefits of automation and electrification may be lost, or even that sprawl may be encouraged and congestion and GHG emissions may be increased, if these technologies are not linked to increased shared mobility and active transportation. The State is neutral on specific technologies and supports studying opportunities for partnership with companies exploring these technologies, but better use and expansion of rail and transit capacity in California will yield the greatest, most far-reaching benefits.



Note: Numbers in the exhibit represent global figures, but the principles are consistent in a California context.

Exhibit 1.3: Three Revolutions in Urban Transportation (ITDP, UC Davis)

A changing rail funding landscape. California recently passed SB 1, authorizing an estimated $52 billion in tax revenue over the next decade to help cover the State's transportation needs. A substantial portion will be dedicated to rail and transit needs. SB 1 adds a ½ percent diesel sales tax specifically in support of intercity and commuter rail operational and capital needs. It also adds significant new revenue to public transit, which includes commuter rail and other high-capacity transit corridors that are essential to the integrated rail network. This is funded by a new 3.5 percent diesel sales tax and $350 million per year from new vehicle license fees that support both transit and intercity rail capital needs. Combining this funding with existing funding for rail and transit, such as the Transit and Intercity Rail Capital Program (TIRCP) and subsequent modification SB 9, the State has committed to fund transformative capital improvements that focus on connectivity between systems. California is dedicated to modernizing the entire transit system, and many significant investments can be made to improve the rail network within this expanded budget authority.



Rail Investment Funding Sources:

- Local Transportation Fund
- Local Sales Tax
- State Transit Assistance
- Intercity Rail Program Funding
- State Transportation Improvement Program
- California GHG Reduction Fund
- Transit and Intercity Rail Capital Program
- HSR Funding
  - Proposition 1A bonds
- Additional funding and program enhancements guided by SB 1
  - State Transit Assistance
  - State Rail Assistance
  - Transit and Intercity Rail Capital Program
  - Congested Corridor Program
  - Trade Corridor Enhancement Account
- Federal Discretionary Programs
  - TIGER/BUILD
  - FASTLANE/INFRA
  - FTA Capital Investment Grants
  - FRA FAST Act Grants
- Federal Formula Programs
- Public Private Partnerships

Advances in Rolling Stock

As technology advances, so do the options for delivering a low- and zero-emission rail network. California is recommending the electrification of many parts of the rail network. Although the air-quality benefits of electrification have been demonstrated, there are other tangible benefits that accrue from electrification. Electric trains can accelerate and decelerate faster and stay at top speed for longer periods of time, allowing trains to make more trips and provide faster travel times for passengers. More frequent service reduces reliance on schedules and increases the number of available seats. In addition to lowering GHG emissions, electric trains are quieter and can offer lower operating and maintenance (O&M) costs. Passengers and surrounding residents will no longer be exposed to exhaust generated by diesel locomotives. Benefits to fuel economy also include higher energy efficiency due to regenerative braking capabilities, and less power lost when the train is idling. However, electrification is not the only path to improved operations, lower costs, and reducing or eliminating emissions.

In addition to fully electrified electric multiple unit (EMU) systems, diesel multiple units (DMUs), battery-hybrid multiple units, renewable diesel, and other alternative fuels offer service improvements and cost savings. Modern DMUs began appearing in the United States in the last 15 years. Since then, DMUs have entered service in the San Francisco Bay Area (Sonoma-Marin Area Rail Transit District [SMART]) and San Diego (Sprinter). Within the next year, DMUs will be operating between Pittsburg and Antioch (eBART). DMUs' appeal today is partly because they have lower cost profiles in comparison to locomotive-hauled trains, but also because they are smaller, quieter, and less invasive to the communities they serve than the traditional locomotive-hauled equipment. In terms of the total O&M costs per train mile, multiple unit regional rail services can operate at $20 to $60 per train mile. Traditional commuter railroads tend to range between $50 and $200. Multiple unit services achieve train operating costs below nearly all traditional locomotive rail services. Capital costs for rolling stock can also be much lower, because separate locomotives and passenger cars are not needed.

DMUs and emerging battery hybrid systems in particular offer an opportunity to capture the improved cost and operational benefits of EMUs with increased flexibility in shared corridors; options for overcoming physical or capital cost challenges to catenary or third rail operations; and rolling stock flexibility between electrified and nonelectrified portions of the network. Battery hybrid and DMU systems are an important tool in phased implementation and market development. As battery technology improves and hybrid systems are increasingly deployed around the world, there will be improved opportunities to study, develop, and implement such technology in California.



High-Speed Rail. The deployment of HSR in California will revolutionize the efficient movement of large volumes of people at fast speeds over long distances, and will do so at an anticipated lower operations cost than other rail and transit services in the state. Additionally, HSR is perfectly suited to accommodate mega-regional travel, and to address planning challenges that may arise from the scale, pace, and form of urbanization.[9] For the first time in California, there will be a significant alternative to automobile travel for medium-distance travel, and an air-competitive option in many markets.

Integrated passenger rail service. The HSR System will revolutionize intercity travel in California; coupled with existing rail, it will provide an extensive and practical rail system. The Rail Plan's integrated service concept lays the foundation for a coordinated rail network. By integrating HSR, intercity rail and bus, and regional rail and local transit, this 2040 Vision benefits residents in rural, suburban, and urban areas across the state. Implementation of the integrated service concept will reduce transfer times, increase service frequencies, integrate ticketing, and help local services coordinate with each other; changes that are expected to dramatically boost ridership and lead to operating efficiencies. In addition, connections to neighboring states and Mexico will be streamlined as California's rail system grows and matures.

Freight Benefits. As described in detail in Chapters 5 and 6, planned investments in freight rail would generate a range of benefits. They increase the efficiency of the freight system, reducing travel times, costs, and emissions of existing trips. Efficiency and capacity improvements attract trips away from other modes (primarily trucks), potentially saving costs, emissions, and time—as well as improving the safety of those trips. Diverting trips to other modes can also lower congestion, positively impacting emissions and safety on the roadway networks generally. The investments can make a region more economically competitive, attracting development from other regions. These benefit transfers from one geographic area to another are not always counted as net benefits, and benefit tabulation varies by methodology.

Rail Congestion Trends. A central concern for California's rail system is to ensure that there is sufficient capacity to handle current and anticipated rail traffic in a timely and efficient manner. Insufficient capacity leads to poor service performance, reducing the competitiveness of rail service with other modes, and increases costs for service providers. Such "bottlenecks" were analyzed for the Rail Plan, and capacity needs for current and projected passenger and freight traffic were identified. Bottlenecks are defined as locations where a rail line's practical capacity is less than what is required for projected traffic volumes. Practical capacity is driven by infrastructure configuration (number of tracks, signal system type, etc.) and the number and mix of train types (passenger, HSR, manifest, intermodal, etc.) using the segment. For a given physical configuration, capacity is highest when all of the trains have the same dynamic performance in terms of operating speeds, acceleration, and deceleration. Conversely, large variations in the dynamic performance of various trains operating over a route will adversely affect capacity.

9 Catherine Ross, Policy & Practice: Transport and megaregions: high-speed rail in the United States (2011).

Highway Trends. A review of 5 years of mainline Annual Average Daily Traffic (AADT) volumes (2011 through 2015) obtained from the California Department of Transportation (Caltrans) Freeway Performance Measurement System database for specific locations along Interstate (I)-5, I-10, and I-80 showed increasing traffic volumes. These freeways parallel north-south and east-west existing Class I rail lines. The increases are not limited to metropolitan areas like Los Angeles and Alameda Counties. Increasing traffic volumes are also seen in inland counties like Merced and Stanislaus (along I-5), and Solano and Placer (along I-80). For example, east-west interstate AADT in Los Angeles County increased 4.9 percent over the period. Likewise, north-south interstate AADT in Stanislaus County increased 16.2 percent over the same 5 years.

This trend of increasing traffic volume is also seen in the increasing amount of time that segments of these freeways experience Level of Service (LOS) D (LOS D signifies that traffic conditions are approaching unstable flow) or worse during peak commute periods. AADT and LOS figures for metropolitan and inland counties over the 5 years are seen in Appendix A. The major implication here is that, absent major investments all along these major interstate freeways to increase speeds and fluidity, shippers may look increasingly to rail transportation as an alternative for north-south and east-west long-distance movements, presenting a unique opportunity for rail to play a larger role in major corridor movements, and not just remain a last alternative.



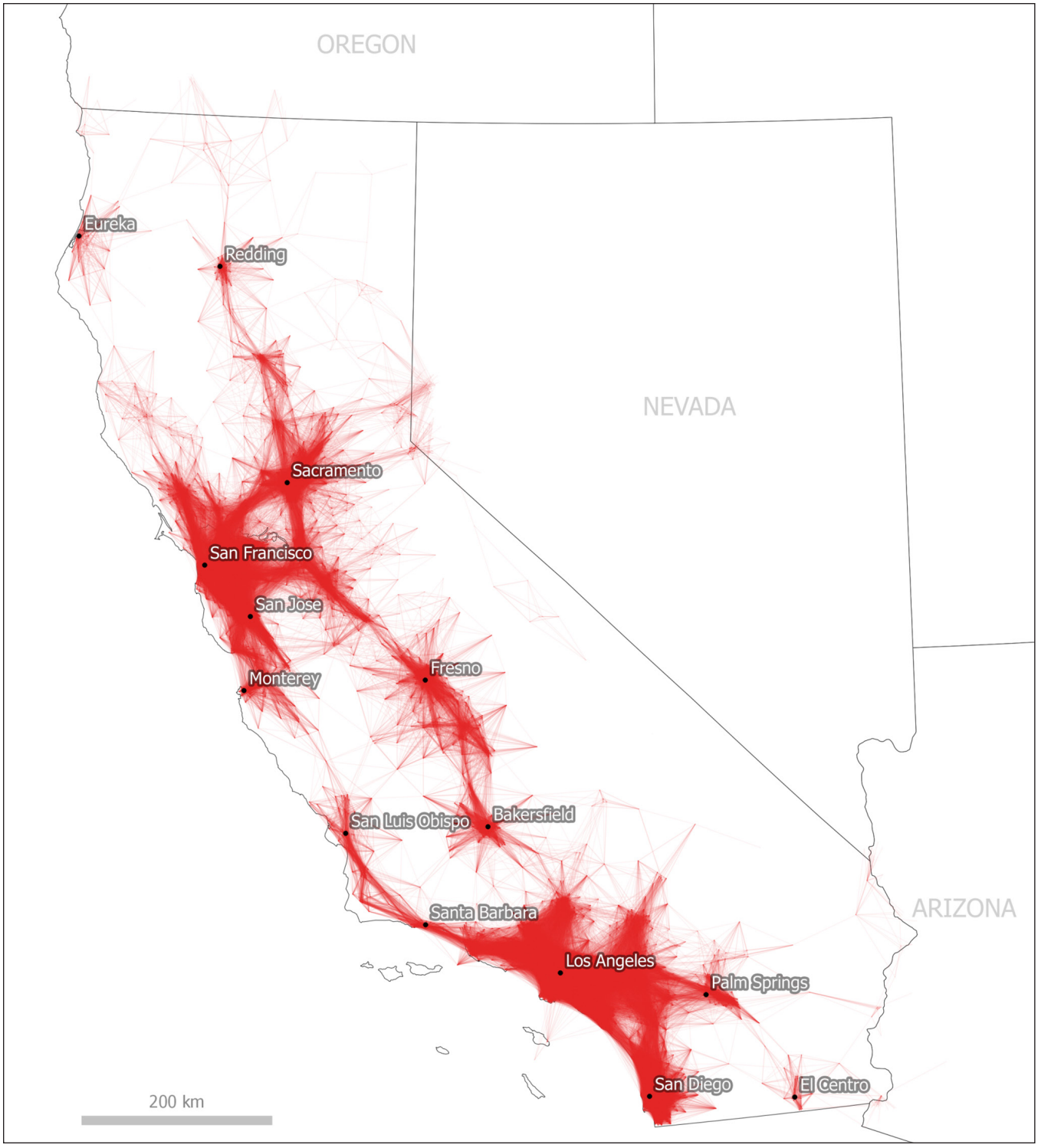


Exhibit 1.4: Tract-to-Tract Commutes of 80 km/50 Miles or Less in California [10]

Exhibit 1.4 shows the density of daily commuter travel activity within 50 miles of the large-scale mega-regions.

10 Garrett Dash Nelson, Alasdair Rae, *An Economic Geography of the United States From Commutes to Megaregions*, "Tract-to-Tract Commutes of 80 km/50 miles or less in California", 2017.

Airport Trends. There are 26 commercial airports in California. Of these, 11 accounted for more than 98 percent of total passenger enplanements in 2015. As seen in Table 1.2, the two airports with the highest volume of enplanements are Los Angeles and San Francisco. Over the last 5 years, these two airports experienced increases in enplanements of 19.1 percent and 20.6 percent, respectively. Rapid growth has been seen at six other airports: San Diego, Oakland, Santa Ana, Sacramento, San Jose, and Palm Springs. Enplanements dropped over this period at Ontario, Burbank, and Long Beach airports. The total growth in enplanements was 16.5 percent.



Table 1.2: Enplanements for California's Top 11 State Airports 2011-2015

Airport	Code	2011	2012	2013	2014	2015	Change Over Period
Los Angeles	LAX	30,528,737	31,326,268	32,425,892	34,314,197	36,351,272	19.1%
San Francisco	SFO	20,056,568	21,284,236	21,704,626	22,770,783	24,190,560	20.6%
San Diego	SAN	8,465,683	8,686,621	8,878,772	9,333,152	9,985,763	18.0%
Oakland	OAK	4,550,526	4,926,683	4,770,716	5,069,257	5,506,687	21.0%
Santa Ana	SNA	4,247,802	4,381,172	4,540,628	4,584,147	4,945,209	16.4%
San Jose	SJC	4,108,006	4,077,654	4,315,839	4,621,003	4,822,480	17.4%
Sacramento	SMF	4,370,895	4,357,899	4,255,145	4,384,616	4,714,729	7.9%
Ontario	ONT	2,271,458	2,142,393	1,970,538	2,037,346	2,089,801	-8.0%
Burbank	BUR	2,144,915	2,027,203	1,918,011	1,928,491	1,973,897	-8.0%
Long Beach	LGB	1,512,212	1,554,846	1,438,756	1,368,923	1,220,937	-19.3%
Palm Springs	PSP	759,510	867,720	875,699	953,607	947,728	24.8%
Total		**83,016,312**	**85,632,695**	**87,094,622**	**91,365,522**	**96,749,063**	**16.5%**

Source: https://www.faa.gov/data_research/aviation/

The Federal Aviation Administration forecasts growth of around 2 percent per year at the State's three largest airports. Such a rate could push Year 2040 enplanements at Los Angeles to 56.3 million, at San Francisco to 38.7 million, and at San Diego to 16 million.[11] Rail, therefore, plays a very important role as airport capacity throughout the state reaches its maximum. Efficient rail services among mega-regions provide excellent alternatives that bring passengers right to the city centers rather than the airports, which are usually located away from the city centers. Along with rail and transit, linkages to the airports from the city centers will become ever more important over the next two decades for moving people efficiently to and from airports. As expanding airport capacity becomes more challenging (i.e., the cost of land in urban areas, and the environmental impacts of building on green fields or potential relocation expenses[12]), HSR offers viable alternatives to alleviate capacity constraints on short interstate air trips.

11 Federal Aviation Administration, *Terminal Area Forecast Summary*, Fiscal Years 2015-2040.

12 International Transport Forum, *Expanding Airport Capacity Under Constraints in Large Urban Areas* (2013).

1.4 Role of Rail in the State Transportation System

Supporting a changing population, an expanding economy, and an intersecting social, political, and physical environment will require new and strategic transportation planning. Coordination between different modes of transportation and land use planning must drive priorities to ensure that no one system bears an undue burden to provide access and mobility to all of California's communities.

California's multimodal transportation system, consisting of highway, rail, transit, seaport, and airport systems, provides the foundation from which the State's economy can flourish. It provides residents with access to jobs and services, and businesses with access to markets.

Rail is an essential element of California's multimodal transportation network. Of all transportation technologies or modes, rail is best able to move people and goods quickly and safely, for less money, and with far fewer environmental impacts. This section aims to address the key ways in which rail supports and enhances California's multimodal transportation system. The importance of rail to the state cannot be underestimated. California must meet the challenges of accommodating a growing and changing population, expanding the economy, reducing GHG emissions, and protecting the environment, while increasing the livability and quality of life for all Californians, especially the most disadvantaged.



The rail system has the potential existing latent capacity to provide additional service, with more efficient performance. With longer trains, more frequent services, better connectivity, and greater ease of access, the number of riders will grow, reducing average costs per passenger. More trains, running more often and with faster travel times, will also be automobile- and air-competitive. This will not only motivate travelers to use rail and transit for more daily trips, but will complement needed capacity on roads and at airports—expansions that will require significant investment.

The State rail system provides essential mobility for both residents and goods. The Rail Plan provides the framework for helping the State rail system meet these goals. Specifically, the integrated passenger rail service concept in the Rail Plan will facilitate a coordinated rail system, increasing its utility for existing rail users; incentivizing more rail travel; and further leveraging rail's economic, environmental, safety, and quality-of-life benefits. Along with investing in passenger rail, existing rail corridors will become more fluid and reliable, allowing domestic and international goods movement by rail to grow as a share of total goods movement.

1.4.1 Mobility

The State's rail system provides both residents and industries with a competitive travel alternative to highway and air travel, lowering household and business transportation costs, and mitigating the roadway congestion caused by continued growth. California must improve and increase the efficiency of all modes and intermodal connections to address its transportation challenges; it needs competitive options to spur progress toward scalable solutions, both in and across regions.

1.4.2 Economic Development and Demographic Changes

Since the Great Recession (December 2007 through June 2009), unemployment and housing foreclosure rates have decreased nationwide, and State and municipal credit ratings have steadily improved, contributing to a positive economic outlook for the State.[13]

A robust passenger rail system supports the economy by providing Californians with access to jobs, education, health care, goods and services, and social and recreational activities. The freight rail system is an important vehicle through which California goods and services reach international, national, and local markets, thereby sustaining California jobs.

Over the coming decades, the State's population is projected to grow 25 percent, while the number of households is expected to grow similarly. The projected population increase would bring the State total to 47 million residents. Los Angeles, Riverside, San Bernardino, and San Diego Counties are expected to add the most people by 2040. Employment is projected to increase by a similar annual rate during this period; the expected 2040 employment is approximately 20 million workers. Los Angeles, Riverside, San Bernardino, and San Diego Counties are also expected to add the most jobs by 2040. Table 1.3 displays these population, household, and employment data.

Table 1.3: Statewide Demographic Forecasts[14]

	2010	2020	2029	2040
Population	37,335,085	40,639,392	43,624,393	46,804,202
Households	12,583,816	13,910,434	15,088,299	16,465,705
Employment[a]	16,204,377	18,488,891	19,548,788	21,295,761

[a] Total nonfarm employment.



13 U.S. Bureau of Economic Analysis, *Regional Economic Accounts*, Q2, 2015.

14 Analysis for the Rail Plan was based on the data available in 2017, which was estimated at 48 million. This change in forecast does not make any material impact in the recommendations of the plan.

This anticipated population growth will increase demand for consumer products and associated goods movement, warehousing, distribution centers, and intermodal facilities. Additional freight growth will be driven by national and international consumer demand. Much of this freight is generated by the busiest port complex in the nation: the Port of Los Angeles (POLA) and the Port of Long Beach (POLB). Freight rail offers the most efficient way to transport certain types of goods across the state and the nation. A sustainable, reliable, and cost-effective freight rail system helps California ports and businesses compete with those in neighboring states, Mexico and Canada, fostering industrial growth and economic opportunity for Californians.

Demands for passenger and freight rail have increased over the past several years (see Exhibits 1.5 and 1.6). As of 2018, California is the fifth largest economy in the world, with a gross domestic product surpassing $2.7 trillion.[15] California businesses export roughly $162 billion worth of goods to more than 225 foreign countries annually.[16]

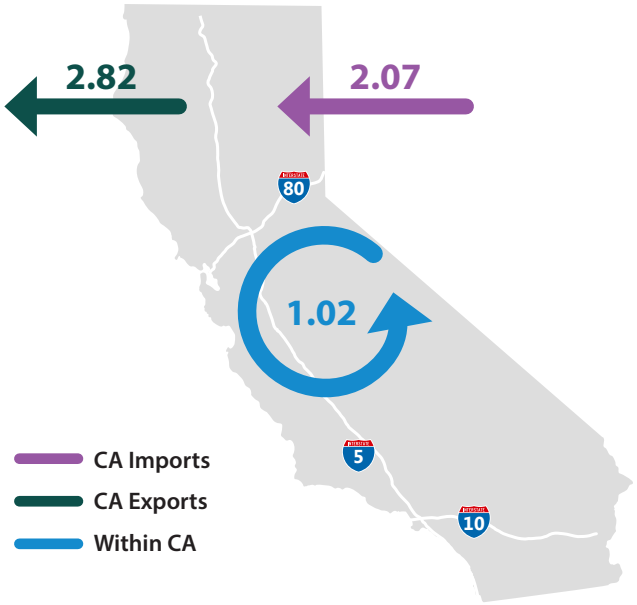


Exhibit 1.6:
Total Increase in California Rail Freight Tonnage Flows 2012-2015 (in million tons) [18]

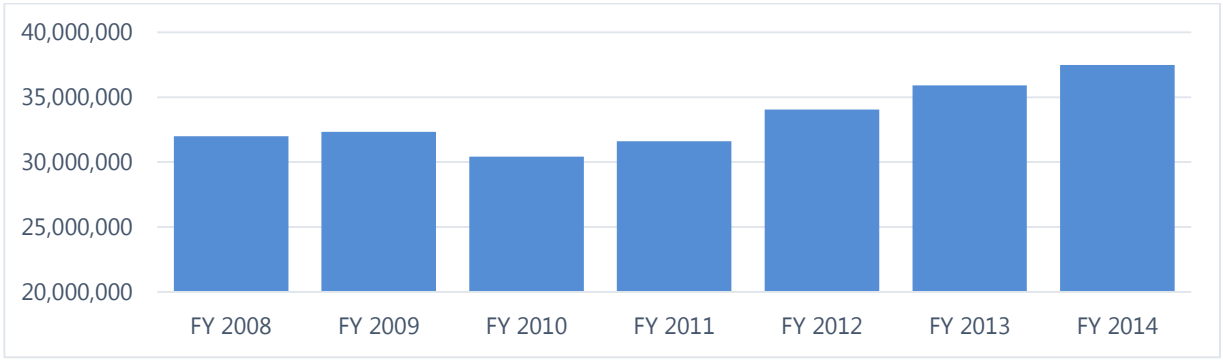


Exhibit 1.5: California Passenger Rail Ridership for ACE, Caltrain, COASTER, Metrolink, Pacific Surfliner, San Joaquin, Capitol Corridor Lines by State Fiscal Year [17]

15 Bureau of Economic Analysis, US Department of Commerce. (https://www.bea.gov/regional/bearfacts/pdf.cfm?fips=06000&areatype=STATE&geotype=3)

16 International Trade Administration, "Trade Stats Express. U.S. Dept. of Commerce" (2012).

17 Amtrak (2016).

18 Note: Total flows selected for rail domestic mode. Figures calculated using three extractions: California origin to combined national total destination (CA Exports); combined national total origin to California destination (CA Imports); and California origin to California destination (Within CA). Within CA totals were subtracted from CA Exports and CA Imports to avoid double counting. Source: Oak Ridge.

Rail forms an increasingly integral part of California's transportation system, and will play a key role in accommodating the growth of this system. Amtrak operates more than 70 intercity trains per day in California; attracting 5.6 million boardings annually, up from 3.6 million a decade earlier.[19] California commuter rail ridership grew to nearly 33 million trips in fiscal year (FY) 2016, from 21.6 million trips a decade earlier.[20] These commuter rail services connect to California's urban transit systems, which served 1.5 billion trips in 2014.[21]

Changes in the age distribution of the growing population could also increase dependency on the passenger rail system; the State's population aged 60 and older is projected to increase from more than 6 million in 2010 to more than 12 million in 2040.[22] As the population ages, people increasingly need mobility assistance; providing access to quality rail and transit helps people with mobility needs or those who can no longer drive to maintain their independence. Also, younger generations may increasingly choose rail transport. For example, Millennials,[23] those who were born around 1980 and reached adulthood around 2000, have shown a preference to reside in urban centers with good public transportation systems; this allows them to save money by avoiding automobile ownership.

The State rail system also plays a central role in the movement of goods, both in California and nationally. Today, the State generates approximately 51 million tons of freight, receives 94 million tons from out of state, and generates 27 percent of the nation's intermodal volume in terms of units (more than 30 million tons of cargo annually).[24] Much of this freight is generated by the busiest port complex in the nation, the POLA and POLB.

Lastly, the railroad industry is a significant employer in the State. Amtrak and the freight railroads combined have 11,500 California employees, earning $1 billion in wages and benefits.[25]



19 Amtrak, Amtrak Fact Sheet, *Fiscal Year 2015 State of California*, 2016.

20 American Public Transit Association, *Public Transportation Ridership Report: Fourth Quarter 2015*.

21 Federal Transit Administration, National Transit Database 2014, Table 19: Transit Operating Statistics: Service Supplied and Consumed, Accessed 2016.

22 California Department of Aging, *California State Plan on Aging*, 2013–2017.

23 APTA, *Millennials & Mobility: Understanding the Millennial Mindset*, October 2013.

24 STB, Waybill Sample (2013).

25 Association of American Railroads, *Railroads and States, California*, accessed 2017.

1.4.3 Passenger Rail Demand and Growth Trends

According to an analysis comparing patterns and projections between 2010 and 2040, in year 2010, Californians took an estimated 361 million annual interregional trips on all modes of travel. California's busiest interregional travel market exists between the Los Angeles Basin[26] and San Diego County (98.2 million annual person trips),[27] followed by Sacramento[28] to/from the San Francisco Bay Area[29] (42.3 million); the Bay Area to/from the northern San Joaquin Valley[30] (31.2 million); the Los Angeles Basin to the southern San Joaquin Valley[31] (25.1 million); and the Los Angeles Basin to the Central Coast[32] (22.1 million).

By 2040, interregional travel is forecast to increase by 50.9 percent to 544.7 million (Exhibit 1.7) trips annually, out of which about 70 percent of the increased demand can be addressed through an efficient rail network, mainly in the mid- to long-distance range. The mode shift model[33] shows that almost 90 percent of the long-distance travel (200- to 350-mile range) may be partially or entirely on a HSR segment that is well connected to the statewide network. The California High-Speed Rail Authority (CHSRA) Ridership Gaussian Process Regression Model estimates approximately 14 million annual long-distance HSR riders in 2029 and 41.3 million annual long-distance HSR riders in 2040.[34]

The regional economic concentration will be reflected in California's five busiest interregional travel corridors by 2040, which are projected to account for over 60 percent of the total 544.7 million interregional person trips by year 2040:

- Los Angeles Basin to/from San Diego (139.1 million)
- Sacramento to/from San Francisco Bay Area (73.5 million)
- San Francisco Bay Area to/from the northern San Joaquin Valley (48.9 million)
- Los Angeles Basin to the southern San Joaquin Valley (38.9 million)
- San Francisco Bay Area to/from Central Coast (29.7 million)

The rail system will be an important element for meeting this growing interregional travel demand, and a better integrated rail/transit system with high-speed service can serve a higher proportion of this demand. As portrayed in Exhibit 1.7, the growth in interregional passenger travel and 2040 annual two-way person trip figures shows that several regional pairs are expected to experience over 70 percent increases in interregional travel (see reddish-brown arrows). These include the San Francisco Bay Area-Sacramento, San Francisco Bay Area-San Joaquin Valley South, Sacramento-San Diego, Sacramento-Northern California, Sacramento-San Joaquin North, and Sacramento-San Joaquin Valley-South pairs. The interregional market growth are shown as percentages in boxed numbers which will likely continue to involve travel between the State's major metropolitan areas and adjacent regions, such as the Los Angeles Basin-San Diego and San Francisco Bay Area-Sacramento pairs.

26 Includes Ventura, Los Angeles, San Bernardino, Orange, Riverside, and Imperial Counties.

27 California Statewide Travel Demand Model, 2016.

28 Includes Placer, El Dorado, Yuba, Sutter, Sacramento, and Yolo Counties.

29 Includes Sonoma, Napa, Solano, Marin, Contra Costa, San Francisco, Alameda, San Mateo, and Santa Clara Counties.

30 Includes San Joaquin, Amador, Calaveras, Stanislaus, Tuolumne, Merced, Mariposa, and Madera Counties.

31 Includes Fresno, Kern, Kings, and Tulare Counties.

32 Includes Monterey, San Benito, San Luis Obispo, Santa Barbara, and Santa Cruz Counties.

33 California High Speed Rail Authority, California High-Speed Rail Ridership and Revenue Model, 2016.

34 Long-Distance Trips = Trips > 50 miles. Source: California High Speed Rail Authority, California High-Speed Rail Draft 2018 Business Plan – Ridership and Revenue Risk Analysis, 2018.

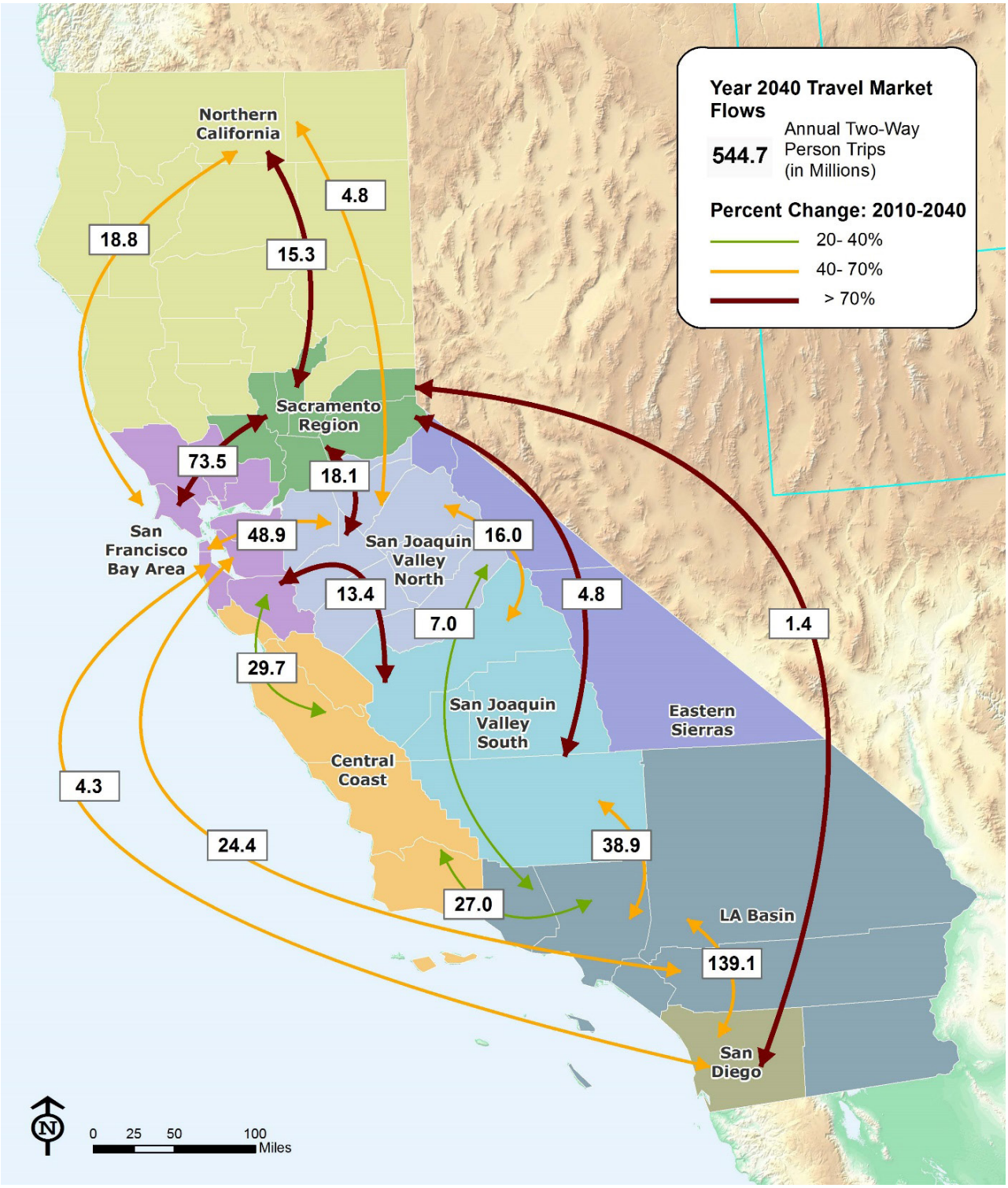


Exhibit 1.7: Growth in Intraregional Personal Travel, 2010 to 2040 [35]

Note: This exhibit shows data for the largest and/or highest-growth interregional travel markets. To retain legibility, some travel markets are not shown on the map.

35 California High Speed Rail Authority, *California High-Speed Rail Ridership and Revenue Model,* 2016.

1.4.4 Freight Demand and Growth Trends

As of 2018, California is the fifth largest economy in the world, with a gross domestic product surpassing $2.7 trillion.[36] California businesses export roughly $162 billion worth of goods to more than 225 foreign countries annually,[37] and all of this has implications for freight rail in the state.

To understand how traffic trends may impact California's rail system, traffic was projected for the year 2040 and compared with a base year of 2013.[38] Overall base year and 2040 tonnages for the top carload commodities are shown in Exhibits 1.8 and 1.9.

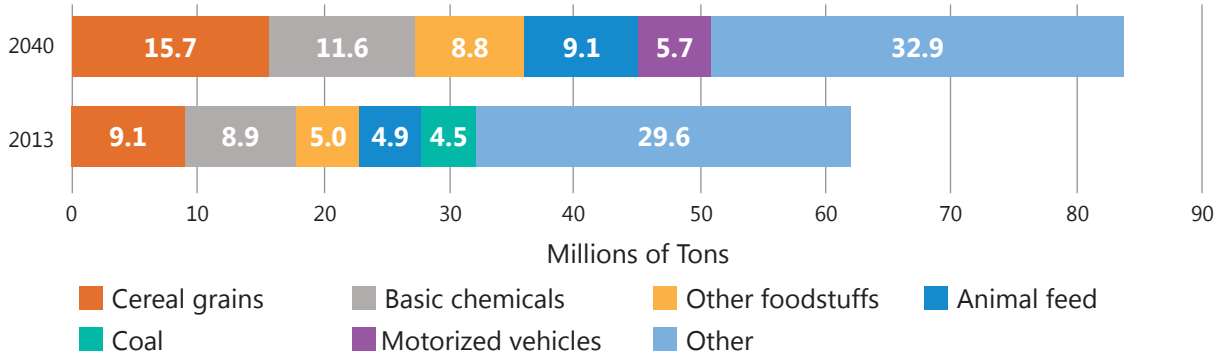
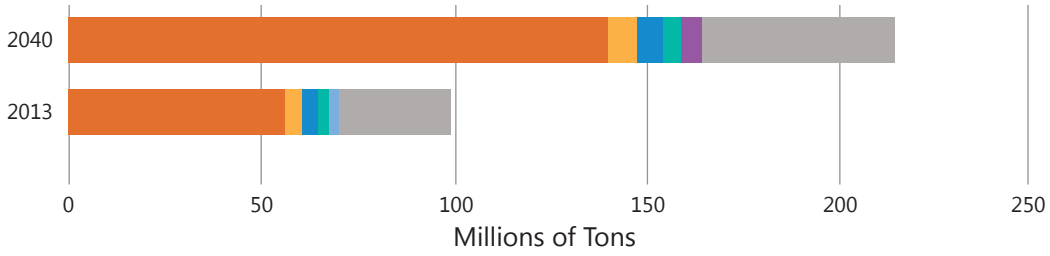


Exhibit 1.8: Top 5 Rail Carload Commodities (millions of tons), 2013 and 2040 [39]



Commodity	2013	2040
Mixed freight	56.2	139
Cereal grains	4.7	8
Basic chemicals	3.5	7.2
Gravel	3.1	4.6
Textiles/leather		4.6
Other foodstuffs	2.6	
Other	28.4	49.9

Exhibit 1.9: Top 5 Rail Intermodal Commodities (millions of tons), 2013 and 2040 [40]

36 Bureau of Economic Analysis, US Department of Commerce. (https://www.bea.gov/regional/bearfacts/pdf.cfm?fips=06000&areatype=STATE&geotype=3)

37 International Trade Administration, *"Trade Stats Express. U.S. Dept. of Commerce"* (2012).

38 The process was used to develop the rail traffic forecast, as described in Appendix A,

39 Source: STB Confidential Carload Waybill Sample and forecast from FHWA Freight Analysis Framework 3.5.

40 Source: STB Confidential Carload Waybill Sample and forecast from FHWA Freight Analysis Framework 3.5.

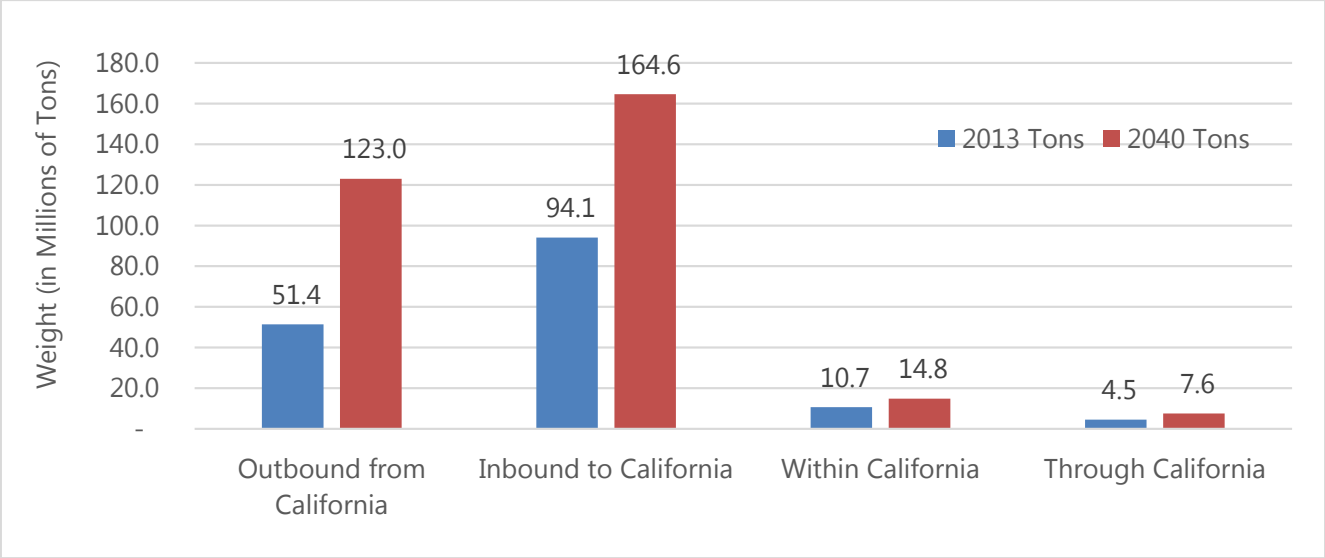


Exhibit 1.10: Directional Distribution of California Rail Tonnage, 2013 and 2040 [41]

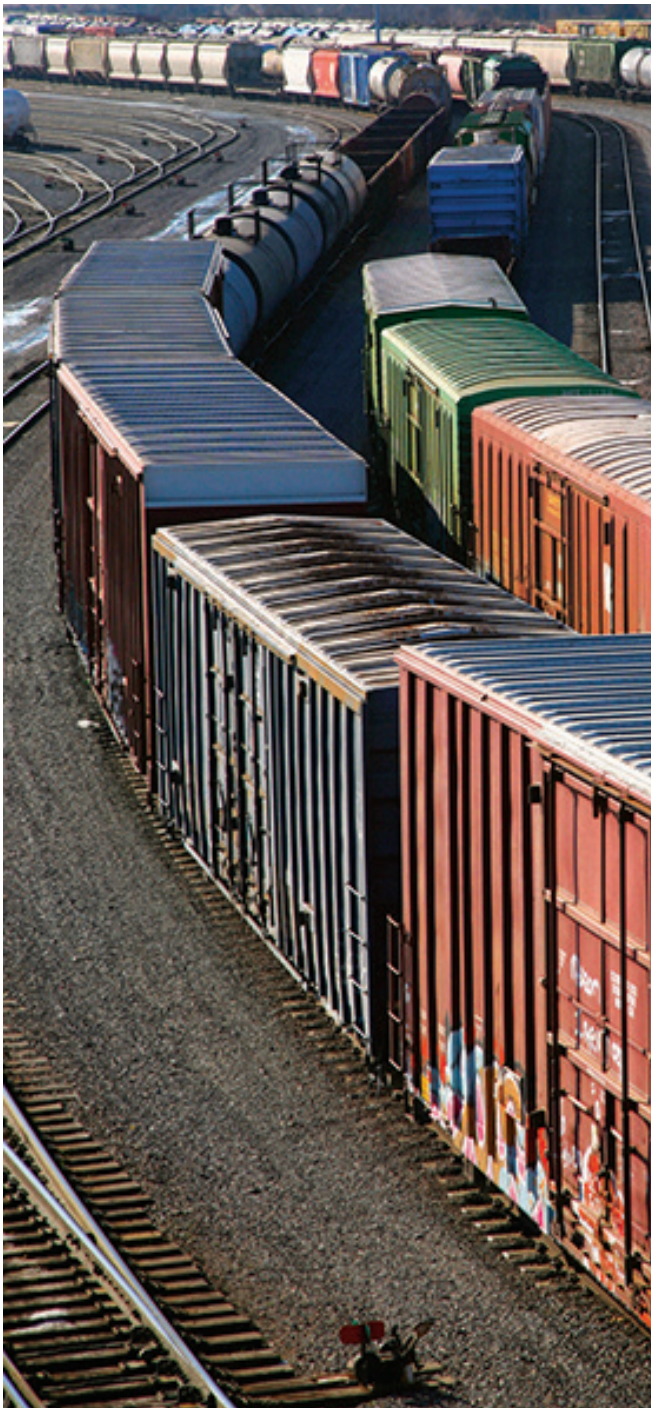
Exhibit 1.10 shows the general inbound, outbound, intrastate, and through flow of tonnage in California. The majority of the traffic is either inbound or outbound. Intrastate traffic is negligible, a reflection of California's economic geography and the superior competitiveness of rail for long-haul moves. Similarly, California's location and the topography of its rail network result in very modest volumes of through-traffic.

Both inbound and outbound traffic are expected to increase by roughly the same amount: approximately 70 million tons. Because the outbound tonnage is almost half the amount of the inbound tonnage in 2013, the increase in outbound tonnage seen in 2040 is more substantial than that of inbound traffic.

41 STB, 2013 STB Confidential Carload Waybill Sample, Freight Analysis Framework (FAF) 3, Ports of Long Beach and Los Angeles, 2013.

Exhibits 1.11 and 1.12 show the general direction of movement of tonnage by region for intermodal and carload traffic.[42] Notably, in 2013, 63 percent of all traffic (intermodal and carload tons) originated and terminated in the Midwest/Northeast (including Canada) and Pacific Northwest (North). At the same time, 31 percent of all traffic originated and terminated in the Southeast (southern states and Mexico). Intermodal traffic is a mostly east-west flow, while the westbound flow from the Midwest/Northeast dominates carload movements. This total traffic will double by 2040; the directional flows remaining largely the same: 63 percent to/from the Midwest/Northeast and Pacific Northwest, and 32 percent to/from the Southeast. Rail traffic in California (the circular flows) will grow by 38 percent from 2013 to 2040.

Current and projected 2040 freight train volume trends along California's major railroad network are shown in Exhibits 1.13 and 1.14, which show that freight growth along the transcontinental route is increasing at a much faster pace than the population growth in California, demonstrating the role that California plays in the movement of goods and the overall economy of the nation. These figures reflect volumes on major railroads only, and do not include locals, short hauls, and other movements such as light engines, equipment transfers, and maintenance of way. The strongest growth in freight traffic is expected along the Union Pacific Railroad's (UPRR's) Sunset Route east of Los Angeles, the BNSF Railway's (BNSF's) Central Valley Route south from Sacramento to Barstow, and east of Los Angeles on BNSF and UPRR routes. The highest growth in intermodal rail traffic is expected east of Sacramento on the UPRR Overland Route, south of Sacramento through the Central Valley toward Barstow, and between Los Angeles and points east. Consistent with recent trends, intermodal train volumes are expected to grow faster than carload volumes.



42 For the definitions of the regions found in these exhibits, please refer to Chapter 4.

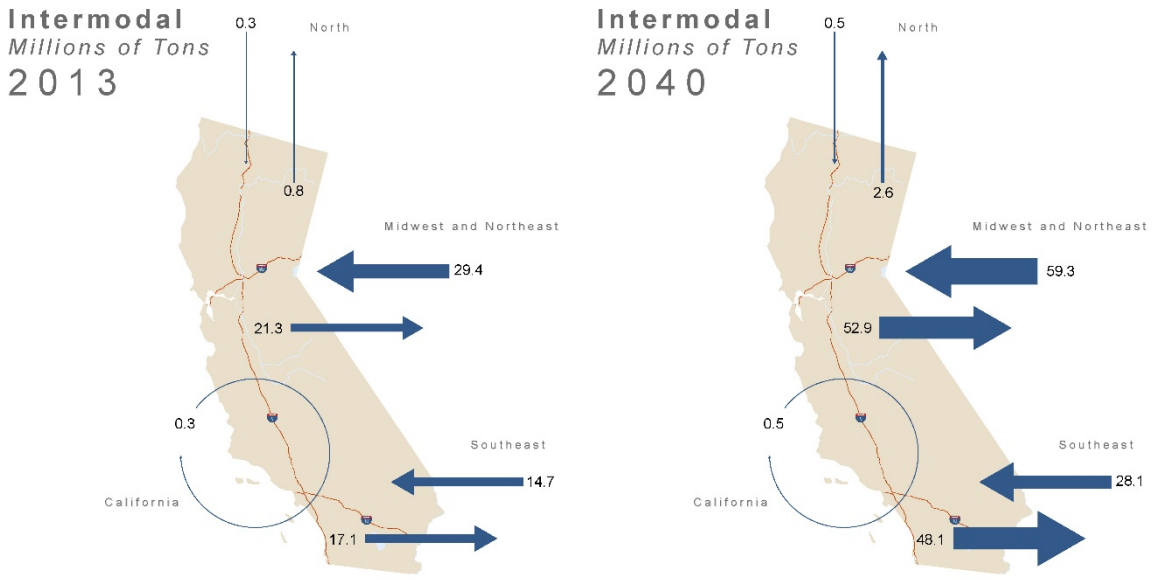


Exhibit 1.11: Intermodal Freight Flows 2013 and 2040, Tonnage and Direction [43]

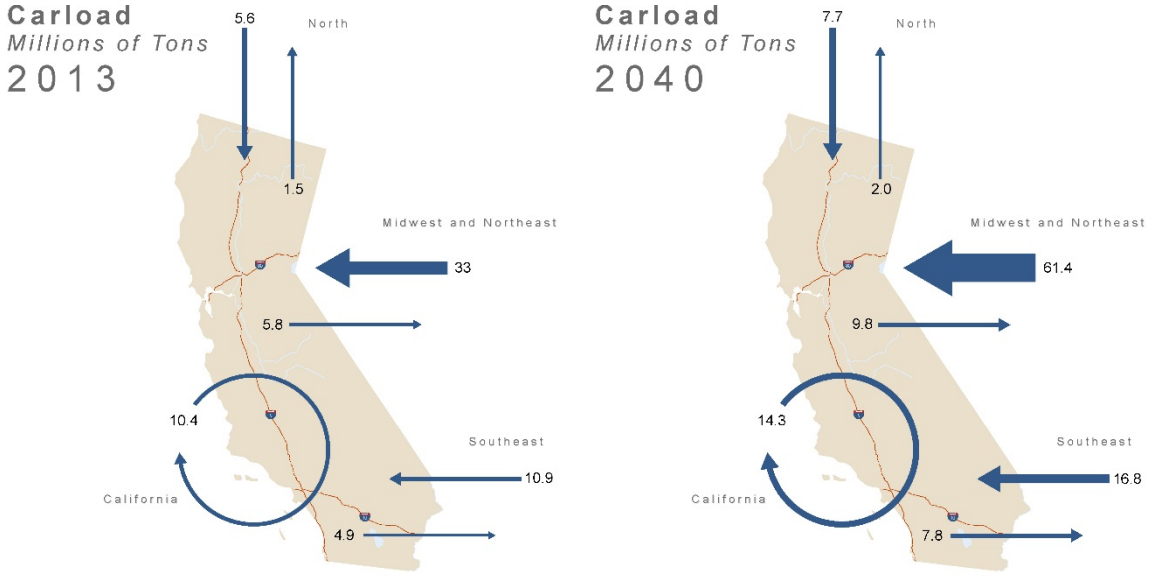


Exhibit 1.12: Carload Freight Flows 2013 and 2040, Tonnage and Direction [44]

43 STB, *2013 STB Confidential Carload Waybill Sample, Freight Analysis Framework (FAF) 3, Ports of Long Beach and Los Angeles.*

44 STB, *2013 STB Confidential Carload Waybill Sample, Freight Analysis Framework (FAF) 3, Ports of Long Beach and Los Angeles.*

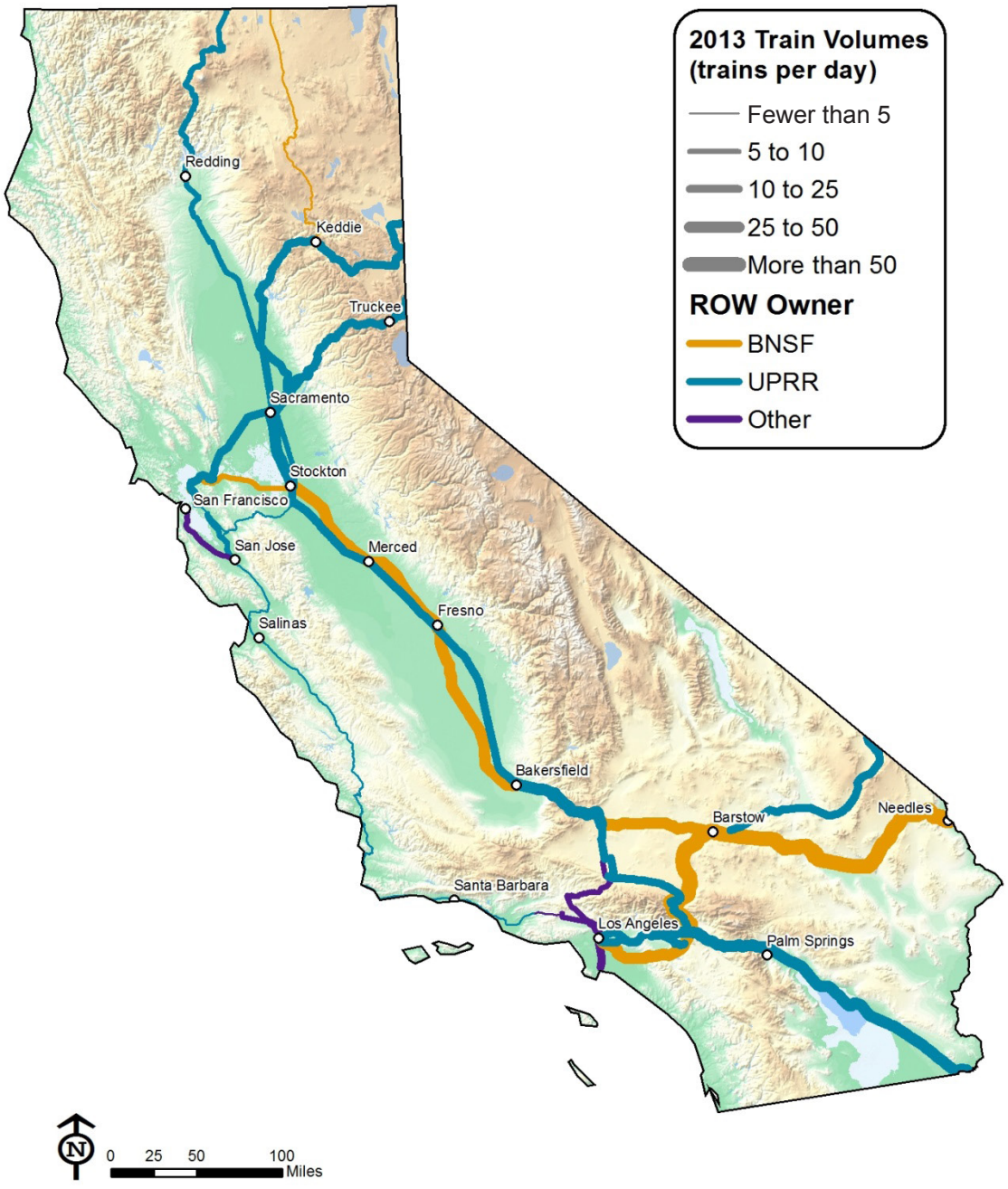


Exhibit 1.13: Volumes on Major Railroads, 2013

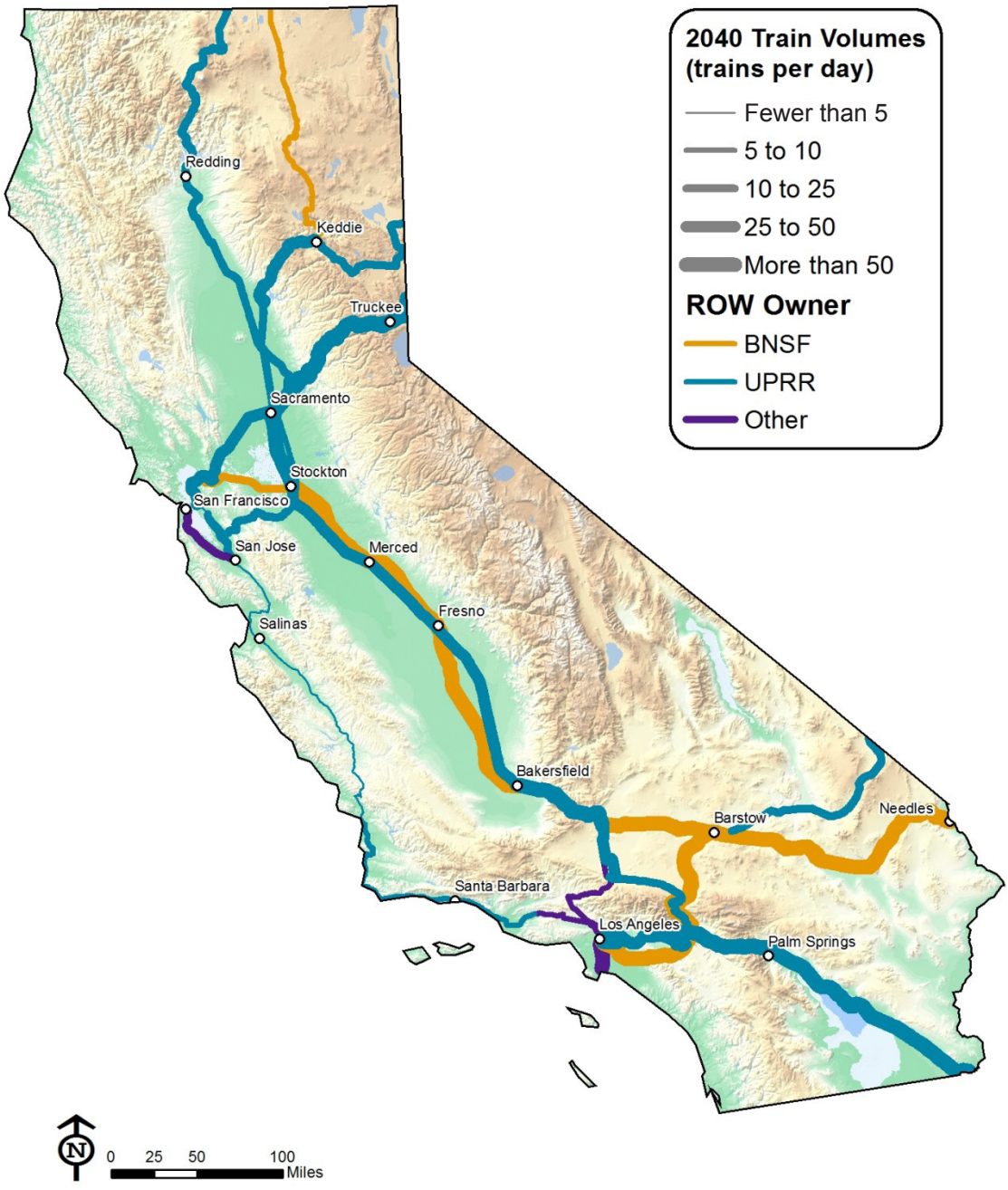


Exhibit 1.14: Expected Change in Volumes on Major Railroads, 2013-2040

As shown in Exhibits 1.13 and 1.14, the greatest growth is seen in the BNSF's Needles Subdivision between Barstow and Needles, and in the UPRR's Yuma Subdivision around Palm Springs, which increase by 60 and almost 50 trains per day, respectively. The UPRR Fresno, the BNSF Stockton, and the BNSF Bakersfield Subdivisions through Central Valley each will have a modest increase of around 20 freight trains per day. Combined across corridors, freight movement between Stockton and Sacramento will have an increase of more than 60 freight trains per day. The UPRR Roseville Subdivision from Sacramento to Reno (east of Truckee) will have increase of almost 50 freight trains per day. A significant mode shift[45] from highways to rail is assumed by rail forecasts along these long-distance freight corridors, implying the capacity improvements that will be needed along major trade corridors. It is pertinent that the State's policy supports the infrastructure to accommodate the projected growth, and maintain California's competitive edge in the global market and throughout the nation.

Declining Coal Demand

The production of coal has dropped by about 46 percent since a 2008 peak. Although there are some uneven geographic impacts, and the near term-expectations for coal production and consumption are modestly positive, the long-term projection for coal is for continued and steep declines. Coal represents the single highest-volume commodity shipped by rail. U.S. production has been in decline since 2008. The near-term outlook is modestly positive due to the weakening dollar and regulatory changes. The long-term outlook will experience continued substantial declines.



45 California High Speed Rail Authority, California High-Speed Rail Ridership and Revenue Model, 2016.

Energy Sector Demand

The crude oil market is sensitive to global prices, which plummeted in the fourth quarter of 2014 before steadying. The net result has been that development of new oil production in the United States cratered, and crude by rail (CBR) volumes have decreased by 80 percent from the peak.[46] Inbound supplies (frac sand, drill pipe, and chemicals) began to recover in 2016. Some opportunities for CBR remain, particularly between North Dakota and the West Coast, and the Canadian tar sands and refiners in the United States. The resulting increase in rail capacity has driven down rates for other commodities . The per-bushel cost to carry spring wheat from North Dakota to the West Coast has dropped by a third over the past 2 years, according to United States Department of Agriculture.

Challenges to California Competitiveness

Potential challenges to freight movement from Asian manufacturing influence the State's partnerships to support ports and capture related economic benefits. Though California remains the most direct route to Asia, the Panama Canal expansion makes East Coast Ports stronger competitors for some markets. Rail traffic originating at the California ports could likewise shift. In 2002, Southern California ports handled 39 percent of container imports in the United States; by 2013, it had decreased to 32 percent. There have also been some shifts in Asian manufacturing, driven by higher wage rates in China that have begun to trigger a shift in manufacturing activity to Near East Asian countries such as India, which is equidistant to the East and West coasts of the United States. There are also strong reshoring and near-shoring trends to the United States and Mexico, which both result in freight rail potentially being shifted away from California rail lines.

Intermodal and International Growth

Additionally, California intermodal traffic is expected to continue to grow. The large population centers make California's ports attractive for international traffic, thus ensuring the continued viability of inland movement by rail. The Rail Plan anticipates that intermodal rail traffic will double by 2040, driven largely by the doubling of international cargo growth pressure along principal trade corridors, especially those with high volumes of intercity passenger service. This will require more efficient use, as well as expansion, of existing capacity in shared corridors. Trade corridor improvements must be coordinated with intercity passenger network development, which may include separated freight tracks in congested locations.

In 2013, 62.1 million and 98.6 million tons of goods were moved in carload and intermodal services, respectively. The large share of intermodal traffic reflects the substantial container volumes associated with the San Pedro Bay and Oakland Ports. By 2040, these totals are expected to grow to 96.8 million tons of carload and 213.3 million tons of intermodal, respectively; with compound annual growth rates of approximately 1.7 and 2.9 percent for carload and intermodal service, respectively. The top five carload commodities are anticipated to grow at similar rates, with cereal grains showing the strongest growth. For intermodal traffic, mixed freight shows the greatest increase, with its share of the market increasing from 57 percent in 2013 to 65 percent in 2040.

46 Wall Street Journal. http://www.wsj.com/articles/freight-rail-traffic-tumbles-on-falling-coal-oil-demand-1438982945.

Implications for California

These and other recent trends—including declining coal demand and shifting logistics and manufacturing landscapes—have implications for California,

First, pressure on capacity will be reduced in the near term, because of declines in coal/energy use and reduced growth projections for carload traffic. There is a long-term need to provide the capacity to realize opportunities to explore new markets and new revenue sources for rail. These markets must be consistent with the State's long-term interest to utilize existing rail rights of way to provide for future transportation options—which could otherwise result in additional lanes of freeway in congested urban corridors. Public rail investments can be used to spur economic development and take advantage of rail energy and environmental efficiencies where it is cost-effective.

Second, the level of intermodal growth projected in this Rail Plan will prioritize state investments in dedicated rail freight improvements on ports and national trade corridor routes to provide sufficient capacity for intermodal rail freight movements.

Finally, partnerships between the State, regions, ports, and railroads are important to preserve market share for California ports, and this is reflected in the priorities for freight identified in the Rail Plan.

1.4.5 Land Use and Quality of Life

For decades, California has both benefited from and been challenged by high rates of growth and urbanization. Often, this growth has taken the form of low-density suburban sprawl, placing burdens on the transportation network and the environment as California's infrastructure expansion struggled to meet demands to move people and goods over greater distances. However, recent policies and trends suggest that perhaps that pattern may be slowing down, which could shorten trips and therefore help alleviate congestion and reduce emissions.

Land use and transportation policy are connected and co-dependent. The ultimate goal of both is to sustainably manage growth while continuing to facilitate economic development and improved quality of life. State policy actions, specifically the passage of SB 375 (2008),[47] reflect the State's recognition of the importance of coordination as a way to create healthy communities. Many local jurisdictions have begun implementing land use policies targeted toward transit-oriented development (TOD),[48] infill development,[49] and other strategies likely to increase passenger rail demand.

Rail has a unique effect among transport modes, in that its structure of networked nodes (organized around rail stations and connection points) and its spatial efficiency (moving more people and goods using less physical space) result in efficient land use. A connected network, "specifically, the synergy between a modern, statewide rail network, with HSR as its backbone, will catalyze more compact land use patterns, the combined effect of which will be even greater reductions in GHG emissions."[50] This effect has key benefits, both for the transportation system and the environment, because concentrated development around stations spares rural land and open space from the pressures of urban development. Less energy and travel time are needed to transport people and goods. With

47 SB 375 is the Sustainable Communities and Climate Protection Act of 2008—explained in Section 1.5.2.

48 Transit-oriented development: moderate to higher-density development in easy walking distance of a major transit stop.

49 New development and redevelopment projects on vacant or underused land in existing developed areas.

50 California High Speed Rail Authority, California High-Speed Rail Sustainability Report, December 2016.

efficient use of rail, positive environmental and social benefits are created for communities, while further enhancing economic strength and resilient transport networks.

Some regional planning organizations, like the Metropolitan Transportation Commission (MTC), have developed their Sustainable Communities Strategies (SCSs) to require that all new development happen in the existing urban footprint.[51] These types of strategic and coordinated land use and transportation planning processes are also supported by State environmental goals,[52] as described by the Air Resources Board and the Strategic Growth Council.

Integrating rail systems with multimodal transportation and land use planning that minimizes sprawl offers residents, workers, and tourists more travel choices and better access to jobs, retail, entertainment, recreational facilities, and open spaces. A connected statewide network will improve the quality of life for all, and help mitigate concerns regarding access, particularly for those people living in transit-dependent households, which are often vulnerable communities. By working to connect passenger and commuter rail systems with complementary transit, bicycle, and pedestrian infrastructure, greater access and mobility will be realized. These improvements support livable communities for all, improved public health, and reductions in VMT and automobile dependency.

Station Area Planning

Robust station area planning is an important land use and development trend that can help solve the first mile/last mile challenge, maximize ridership, integrate statewide services, and optimize returns on public investment. Dense, walkable development near rail stations not only provides seamless connections between rail services and origins and final destinations—thereby decreasing overall travel times—but also leverages public investment in the rail network through sustainable development and value capture. Focusing urban development at or near rail stations is important in preventing sprawl, maintaining neighborhood affordability and equity, sustainably growing California's cities and communities, and maximizing the environmental benefits of integrated statewide rail transportation.

Rail stations are complex places that must balance the competing needs of physical rail infrastructure, often multiple rail service providers or public agencies, and the local community and local governments. Because of the value created through effective rail transportation, the land on, above (air rights), or walkable to rail stations is typically quite valuable relative to the station's location and how well it is served. Planning is needed to effectively understand the trade-offs involved in prioritizing dense, walkable development, transit access, and/or parking availability. Strategic implementation of those plans is needed for effective development around stations, and to capture the value created by the station. For these reasons, effective, long-range planning and governing structures are crucial to both optimizing the station operations and leveraging the value created in the community.

Health and Equity

The role of public transit in public health is increasingly recognized by health advocates and transportation providers alike. Transportation is not an end in itself, but a means of providing access to important destinations, including jobs, education, healthy foods, recreation, worship, community activities, and healthcare. This is especially critical for disadvantaged and underserved communities where public transit may be the only mode of transportation. Adequate, affordable public transit that reduces travel times will ensure the healthy well-being of the community.

The Rail Plan supports policies that promote health and equity, including extended bus service to rural areas; expanded bicycle, walking, and transit trips to provide first-and-last-mile transit connections; and safe nonautomobile modes for shorter trips. These kinds of transportation-related policies and programs foster more accessible, livable, and healthier communities. Through collaboration between rail and health providers, improving transportation and health can be achieved in a manner that will benefit entire communities.

51 Plan Bay Area (MTC's SCS) identifies Priority Development Areas and Priority Conservation Areas, and calls for all new development to happen in the current urban footprint. Other MPOs prioritize urban infill development.

52 California Air Resources Board, Vibrant Communities and Landscapes A Vision for California in 2050. (2016).

1.4.6 Environment

The California Air Resources Board's 2014 update to its Climate Change Scoping Plan emphasized increased certainty in humans' role in climate change and accelerating the impacts of climate change, which is already affecting California through its contributions to extreme heat, more frequent and intense wildfires, low air quality, and increased sea-level rise. An increase in the global average temperature of 3.6 degrees Fahrenheit (°F) above pre-industrial levels (2.0°F above present levels) "poses severe risks to natural systems and human health and well-being."[53]

Rail investments contribute to reduced impacts on the environment by offering shippers and travelers a cleaner alternative to motor vehicle and air travel. In the Bay Area, the Caltrain corridor alone is responsible for saving more than 200 metric tons of GHG emissions per day. Over the course of the year, that equates to 50,000 metric tons of carbon dioxide saved, and more than 1 million dollars on the cap-and-trade market, just from mode shift.[54] Electrification of the Caltrain line will lead to further net air quality benefits in the form of reduced on-board emissions from the switch away from diesel trains.



53 California Air Resources Board, *First Update to the Climate Change Scoping Plan* (2014).

54 UC Berkeley, UC Connect Study, *Rail and the California Economy* (2017).

Passenger rail services often provide cost- and time-competitive alternatives to automobile travel, particularly when accompanied by increased development density, mixed land uses, connected transit services, and safe bicycle and pedestrian ingress and egress to stations. The freight rail system reduces environmental impacts further by removing heavy truck traffic from roadways. The Ventura County Port's reinvestment in their short line railroad (Ventura County Railroad) has taken the equivalent of 5,000 trucks off the road each year at a reduced emissions profile.[55] Reduced motor vehicle use eases roadway congestion and improves air quality by lowering on-road emissions. Investments in grade separations and crossings also reduce surface vehicle traffic delays and associated emissions per mile. Additional emissions reductions result from requirements for diesel locomotives, State and regional investment in cleaner locomotives, and other operational improvements, such as electric wayside power at layover facilities and stations.

California's set of vehicle, fuel, and land use policies is projected to decrease passenger transportation emissions by 50 percent over the next 2 decades.[56] Because rail travel generates significantly lower GHG emissions per passenger mile and freight ton-mile than automobiles and trucks, investment in rail facilities promotes progress toward meeting State GHG emissions reduction goals.

In 2015, Amtrak riders in California generated approximately 835 million passenger miles.[57] Four of California's commuter railroads—Caltrain and Altamont Corridor Express (ACE) in the Bay Area, Metrolink in the Los Angeles area, and COASTER in San Diego County—carried 107,000 riders on average per weekday in 2015, generating a savings in VMT of 3.2 million.[58]



55 UC Berkeley, UC Connect Study, *Rail and the California Economy* (2017).

56 California Air Resources Board First Update to the Climate Change Scoping Plan (2014).

57 Amtrak, *Amtrak Fact Sheet, Fiscal Year 2015 State of California,* 2016.

58 Assuming an average trip length of about 30 miles, according to the Public Transportation Fact Book, American Public Transportation Association (2011).

1.4.7 Safety

The Federal Railroad Administration (FRA) tracks "all accidents and incidents resulting in injury or death to an individual or damage to equipment or a roadbed arising from the carrier's operations during the month."[59] Exhibit 1.15 summarizes California and national passenger rail–related accidents and incidents from 2006 to 2015. Overall accidents/nonfatal incidents in California accounted for 8 percent, and mirrored the national average.

Despite these trends, the FRA reports that fatalities per mile are 17 times more likely in an automobile than in an intercity passenger train.[60] Moving freight by rail reduces the number of trucks on roads—reducing congestion and the potential for truck-related accidents. This supports the State's goal of 'Toward Zero Deaths' to be achieved in coordination with local Vision Zero programs to move toward zero fatalities or serious injuries on highways and arterial roads.[61]

Investments in new technologies, such as Positive Train Control (PTC), can further contribute to improved rail system safety. At-grade crossing improvements, such as crossing gates, warning systems, physical barriers, and grade separations, help reduce potential conflicts between rail vehicles, motor vehicles, bicyclists, and pedestrians.

Investment in HSR further improves the safety of the rail system. Mode shift leads to reductions in VMT, which lead to lower incidences of traffic accidents; and an integrated, statewide rail network provides a competitive alternative to driving.

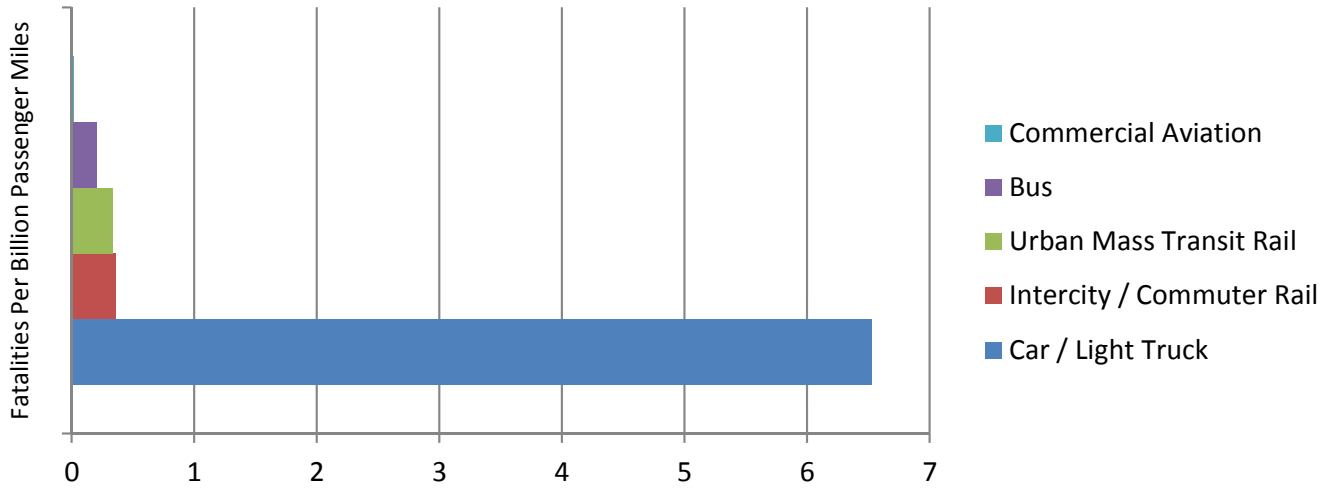


Exhibit 1.15: National Fatalities by Transportation Mode [62]

59 FRA, *FRA Guide for Preparing Accident/Incident Reports* (2011).

60 FRA, Office of Safety Analysis, accessed 2016, The rate for intercity passenger rail = 0.43 per billion; for car passengers/drivers = 7.3 per billion.

61 Caltrans, California Transportation Plan 2040 (2016).

62 FRA, Office of Safety Analysis Website, accessed 2016.

The California Highway Patrol Office of Traffic Safety (OTS) reports annual fatality and injury statistics. Using 2010 as the base year,[63] OTS reported 2,739 persons killed, or $25.3 billion dollars in damages—just associated with loss of life. In 2010, there were nearly 200,000 additional injury collisions, and more than 250,000 property-damage only collisions,[64] resulting in billions more in damages. The HSR analysis also assumes that accident rates stay constant over time; therefore, the only possibility for a reduction in incidences of accidents comes from mode shift. Further safety improvements and economic benefits will result from the integration of the entire network, as outlined in the Rail Plan.



63 2010 numbers were used for consistency with the HSR benefit-cost analysis data years, but it is worth noting that fatal accidents have increased every year since, and accidents per VMT have also increased.

64 California Highway Patrol, *2010 Annual Report of Fatal and Injury Motor Vehicle Traffic Collisions* (2010).

1.4.8 Tribal Context

Both passenger and freight rail systems, if properly maintained, serve as engines of economic growth, contribute to State environmental goals, improve safety, and enhance Californians' quality of life. The Rail Plan provides the framework for helping the State rail system meet these goals. Specifically, the integrated service concept in the Rail Plan will facilitate a coordinated rail system, increasing the system's utility for existing rail users; incentivizing more rail travel; and further leveraging rail's economic, environmental, safety, and quality-of-life benefits.

This Rail Plan seeks to ensure that Native American communities share in the benefits of a modernized, fully integrated rail system. In addition to fostering mobility, economic, and environmental benefits, the Rail Plan aims to promote the early inclusion of tribal governments during the planning and development of future rail projects, both to ensure the protection of California's diverse tribal cultural heritage and resources and to ensure that tribal concerns regarding mobility, accessibility, and connectivity are accounted for during the transportation planning efforts.

As part of the State Rail Plan development process, statewide outreach to Native American tribal government partners and stakeholders was conducted by Caltrans' Division of Rail and Mass Transportation (DRMT). Through a variety of outreach methods, the planning team sought to provide multiple opportunities for tribes to participate and provide input throughout the development of the Rail Plan, to help identify any concerns the tribes may have regarding the build-out of the 2040 Vision. The tribal outreach effort included selecting tribal representatives for the project's advisory committee; sending informational letters to tribal government leaders statewide at key milestones of the Rail Plan's development; attending and presenting information at the Caltrans Native American Advisory Committee meetings, and seeking the Committee's input; and holding statewide Tribal Listening Sessions to provide information, solicit input from the tribal participants, and again invite formal consultation with Caltrans regarding the development of the Rail Plan. In addition, multiple follow-up letters and emails were exchanged with tribes to address questions and concerns. By working closely with Tribal representatives, the planning team was able to provide geographic- and context-specific information for Tribes that requested such information, and to respond to concerns.

1.5 Policies and Programs

The Federal and California State governments have developed a series of policies and planning documents to guide the transportation system toward a more efficient use of public dollars by investing in the entire intermodal network—including highway, rail, and transit—and also addressing other trends in sustainability[65] and smart growth.[66] This section discusses the trends and implications for planning; Chapter 6 will elaborate on the funding sources and their potential uses.

1.5.1 Federal Policy Trends

Recent Federal transportation policies have shifted toward the application of performance-based planning principles, which rely on data and analytics to support policy decisions that help achieve desired outcomes. The Moving Ahead for Progress in the 21st Century Act of 2012 mandated a renewed emphasis on performance management in Federal-aid programs, and called for integrating performance-based approaches in statewide and regional transportation planning practices.

The most recent Federal surface transportation reauthorization legislation, the Fixing America's Surface Transportation Act of 2015 (FAST Act), allocates funding to states for highway, transit, and railway programs over a 5-year period. The FAST Act continues and reinforces the goals set forth in the Moving Ahead for Progress in the 21st Century Act of 2012, calling for performance-based benefit-cost analyses (BCAs)s to support prioritization and funding of State plans and programs. Other Federal programs offer additional funding through competitive, performance-based grant programs. This shift toward performance-based planning has in turn forced State and regional planning and funding systems to require clear performance standards, measurable metrics, and achievable benchmarks.

The Better Utilizing Investments to Leverage Development (BUILD)(formerly Transportation Investment Generating Economic Recovery (TIGER)) grant program supports multi-modal and multi-jurisdictional projects, which are difficult to fund through traditional Federal programs. Awards focus on capital projects that generate economic development and improve access to reliable, safe, and affordable transportation for both urban and rural communities.[67]

The FAST Act established a new National Highway Freight Program, with dedicated funding. Although the program is focused on highways, up to 10 percent is set aside for rail, ports, and intermodal projects. The program includes funds apportioned to states on a formula basis, and FASTLANE competitive grants. This new Federal program provides new opportunities for the State's freight rail program.

Eligible projects for Infrastructure for Rebuilding America (INFRA)/FASTLANE grants include railway-highway grade crossing or grade separation projects, or freight projects that are 1) an intermodal or rail project; or 2) within the boundaries of a public or private freight rail, water (including ports), or intermodal facility. For a freight project within the boundaries of a freight rail, water (including ports), or intermodal facility, these funds can only support project elements that provide public benefits.[68]

65 In ecology, sustainability is the capacity to endure; it is how biological systems remain diverse and productive indefinitely. However, in more general terms, sustainability is the endurance of systems and processes.

66 Smart growth is an urban planning and transportation concept that concentrates growth in compact, walkable urban centers to avoid sprawl.

67 USDOT, *TIGER Discretionary Grants,* 2016.

68 USDOT, FASTLANE Notice of Funding Opportunity, 2016.

1.5.2 State Policy Trends

California has been at the forefront in proactively identifying and addressing critical trends that impact the condition and performance of a statewide transportation system, including:

Climate change. Since 2002, State legal and administrative directives have set policies aimed at reducing GHG emissions to limit the harmful effects of climate change. Investment in efficient freight and passenger rail systems constitute key steps toward meeting the targets of the following policies:

- California's landmark "Global Warming Solutions Act of 2006," AB 32, created the Cap-and-Trade program, and requires that California's GHG emissions be reduced to 1990 levels by the year 2020. Executive Order B-30-15 (2015) establishes a California GHG reduction target of 40 percent below 1990 levels by 2030, and reaffirms the long-term target of reducing GHGs to 80 percent below 1990 levels by 2050 (Executive Order S-3-05).
- SB 375, the "Sustainable Communities and Climate Protection Act of 2008," promotes integrated transportation and land use planning at the regional level to reduce GHG emissions from passenger vehicle travel, and helps California meet AB 32 goals. SB 375 requires the California Air Resources Board to develop regional GHG emissions reduction targets for passenger vehicle travel, setting benchmarks in 2020 and 2035 for each of the State's 18 Metropolitan Planning Organizations[69] (MPOs).[70]
- AB 1482 (2015) directs ongoing updates to the State's climate adaptation strategy, Safeguarding California (beginning in 2017), and requires future updates (every 3 years) to describe the vulnerabilities from climate change in a minimum of nine specific sectors, including transportation. It also identifies the priority actions needed to reduce climate risks in each of the sectors.[71] Investment in efficient freight and passenger rail systems constitutes a key step toward meeting these targets.

Dedicated State support for passenger rail systems. Governor Brown signed into law SB 1, the road repair and accountability act of 2017—the first legislation in more than 20 years to significantly increase state transportation funding.[72] In addition to dedicated funding programs for rail, SB 1 authorized the Solutions for Congested Corridors Program, which will provide $2.5 billion over 10 years for multimodal investments to improve the State's most congested travel corridors. Corridor-based planning to be undertaken by Caltrans will place increased emphasis on rail and transit as a competitive solution for relieving congestion on state highways, and on reducing GHG emissions.

Complete streets. AB 1358 (2008) requires cities and counties to include complete streets policies in their general plans. These policies aim to ensure that roadways safely accommodate bicyclists, pedestrians, transit riders, children, the elderly, the disabled, and motorists. Complete streets policies can help improve Californians' first-mile and last-mile connections to the state passenger rail system via urban transit, commuter rail, and intercity rail hubs.



69 An MPO is a Federally mandated and Federally funded transportation policy-making organization in the United States that is made up of representatives from local government and governmental transportation authorities.

70 Caltrans, 2013 *California State Rail Plan* (2013).

71 Ibid.

72 CTC, *General Overview: SB 1.*

Sustainable goods movement. In 2015, Governor Brown issued Executive Order B-32-15, which directs State agencies to improve freight efficiency, transition to zero-emission technologies, and identify State policies, programs, and investments to achieve these goals while increasing the competitiveness of California's freight system. Ensuring efficient access to markets through the freight rail system is a central component of this strategy.

Mitigating transportation impacts. SB 743 (2013) created a process to change the way transportation impacts are analyzed and mitigated to focus on reducing VMT instead of automobile LOS. This approach will promote projects and plans that reduce GHG emissions, emphasize infill development (use of existing undeveloped land), enhance multimodal transportation options, and encourage a diversity of land uses. SB 743 provides exemptions to the California Environmental Quality Act requirements to help streamline the environmental review process for certain transit and rail accessibility projects that do not add motor vehicle capacity.

Environmental Justice. SB 535, signed into law in September 2012, established environmental justice goals and requirements for the Cap-and-Trade program. The law addresses concerns that actions taken to achieve the goals laid out by AB 32 must not disproportionately affect low-income and disadvantaged communities. It states that 25 percent of the cap-and-trade funds are required to be used for projects that will benefit disadvantaged areas, and that at least 10 percent must be allocated to projects actually located in disadvantaged communities. This legislation is part of increasing emphasis at the State level to link environmental justice, public health, and social and racial equity issues with other State goals, including GHG reductions and transportation goals.

Cap-and-Trade. AB 32 created the Cap-and-Trade Program, which requires California to reduce its GHG emissions to 1990 levels by 2020—a reduction of approximately 15 percent below emissions expected under a "business as usual" scenario. In addition, SB 862 established a long-term funding plan for portions of Cap-and-Trade Program money, including a continuous appropriation of 25 percent of the funds to HSR and 10 percent to the Transit and Intercity Capital Program. The Transit and Intercity Capital Program was created to provide grants from the Greenhouse Gas Reduction Fund to fund capital improvements that will modernize California's intercity, commuter, and urban rail systems—and bus and ferry transit systems—to reduce emissions of GHGs by reducing congestion and VMT throughout California. With the passage of SB 1, an additional $3 billion will be added to the TIRCP over the next 10 years. All of these mechanisms represent a significant and ongoing funding stream for the rail system. In 2017, AB 398 extended the Cap and Trade Program through 2030.



At-Grade crossing in San Mateo, California. Caltrans will continue to address public safety and environmental impacts of the rail system by supporting grade separation projects and modernizing the rail fleet.

1.5.3 Program Coordination

The Rail Plan is one of six periodically updated long-range modal plans that apply the vision, goals, and policies of the California Transportation Plan (CTP) to specific modes of travel. The Rail Plan clarifies rail's role in the multimodal transportation system.

California Transportation Plan 2040

California's long-range transportation plan, the CTP, is required, under SB 391 (2009), to identify "the statewide integrated multimodal transportation system" needed to reduce GHG emissions to 1990 levels by 2020, and 80 percent below the 1990 levels by 2050. SB 391 added this new requirement under AB 32 to help meet California's climate change goals by requiring the CTP to be updated every 5 years.

The CTP 2040 (2016) is an umbrella plan that integrates Caltrans' modal plans into a statewide multimodal transportation vision. CTP 2040 offers a detailed overview of the existing transportation network, and assesses future transportation trends and challenges. It offers strategies that improve mobility and accessibility across all modes, contribute to system preservation, support a vibrant economy, improve public safety and security, promote livable communities and social equity, and support environmental stewardship.

The CTP 2040 includes the State's transportation policies and performance objectives. It describes broad systemic umbrella concepts and strategies synthesized from Regional Transportation Plans (RTPs) and SCSs, and presents recommendations for transportation system planning. The CTP 2040 identifies a series of broad policies that aim to address recent trends and challenges, meet Federal and State regulatory obligations, and move toward a more efficient, competitive, multimodal transportation system (see Exhibit 1.16).

CTP 2040 Statewide Transportation Vision

California's transportation system is safe, sustainable, universally accessible, and globally competitive. It provides reliable and efficient mobility for people, goods, and services, while meeting the State's GHG emission reduction goals and preserving the unique character of California's communities.



INTERREGIONAL TRANSPORTATION STRATEGIC PLAN
Next Update: 2020

The Interregional Transportation Strategic Plan (ITSP) is California's long-range planning document for the interregional transportation system. It reflects input from the public, regional RTPs, and statewide modal planning. The ITSP prioritizes interregional state highway projects and summarizes information about other interregional transportation modes, including freight and passenger rail, to improve movement of people and freight safely and sustainably. The ITSP identifies 11 Strategic Interregional Corridors that are typically characterized by high volumes of freight movement and significant recreational tourism; they constitute the most significant interregional travel corridors in California.

CALIFORNIA AVIATION SYSTEM PLAN
Next Update: 2020

This plan includes updated programs and directives to better support aviation sustainability. It also provides guidance for Caltrans district planners and local planners for coordination with surface transportation systems, including rail and public transit systems.

CALIFORNIA FREIGHT MOBILITY PLAN
Next Update: 2019

The California Freight Mobility Plan (CFMP) is a statewide, long-range plan for California's freight transportation system. It was developed by CalSTA and Caltrans in consultation with the California Freight Advisory Committee (CFAC). The plan includes designation of priority freight corridors and identification of improvement projects supporting interregional goods movement. It serves as a foundation for ongoing work to achieve a sustainable freight transport system.

STATEWIDE TRANSIT STRATEGIC PLAN
Next Update: 2018

The Statewide Transit Strategic Plan helps the State and partners gain a better understanding of present and future roles and responsibilities to support public transportation. The plan provides a framework for a cost-effective transit system to improve mobility, meet associated GHG emissions targets, provide improved access to jobs, and make environmental improvements.

TOWARD AN ACTIVE CALIFORNIA STATE BICYCLE AND PEDESTRIAN PLAN
Updated 2017

Toward an Active California is a strategic policy plan that will guide the planning and development of active transportation facilities, and maximize future investments statewide. The plan calls for safe, convenient, and comfortable access to walking and bicycling for people of all ages, abilities, and incomes by 2040. This includes multimodal access to better integrate bicycle and pedestrian needs for enhanced connectivity with all modes, including planned high-speed, intercity, and commuter rail.

SUSTAINABLE FREIGHT ACTION PLAN
Updated 2016

Executive Order B-32-15 directed CalSTA and the California Environmental Protection Agency to develop a Sustainable Freight Action Plan (SFAP) in coordination with the California Air Resources Board (CARB), Caltrans, the California Energy Commission, and the Governor's Office of Business and Economic Development. The SFAP is intended to promote the state's environmental, public health, and safety goals in the freight sector. This plan establishes targets to improve multimodal goods movement efficiency, a transition to zero-emission technologies, and the increased competitiveness of California's economy.

Exhibit 1.16: Current Long-Range Transportation Plans

In response to State legislation and executive orders, CTP 2040 includes an innovative approach to address climate change and GHG emissions. Three scenarios were evaluated to illustrate the potential effectiveness of State policies, programs, and major investments on reaching GHG emissions goals. In addition to GHG reductions, each scenario was evaluated based on multimodal system performance and economic impacts.

Scenario analyses informed policy recommendations, which were refined through extensive outreach and coordination with stakeholders to reflect the full breadth of California's geographic and cultural diversity. The aim of CTP 2040 is to ensure that transportation and land use policy decisions and investments made at all levels of government, and in the private sector, will complement one another to enhance California's economy, improve social equity, support local communities, protect the environment, and achieve GHG reduction goals.



1.5.4 Regional Plans

A seamless interregional travel experience requires coordinated transportation planning and interagency cooperation with neighboring states, and at the State and regional levels. The FRA requires coordinated passenger rail planning under its new state rail planning guidelines. The FRA has indicated that the coordinated system-level and project-level planning presented in state rail plans and service development plans will be linked to future Federal funding for HSR or conventional intercity passenger rail projects.

Regional Transportation Plans and Sustainable Communities Strategies

RTPs are the long-term blueprints of regions' transportation systems. MPOs and regional transportation planning agencies (RTPAs) develop the RTPs as guided by Federal and State statutes. RTPs are the basis for statewide transportation plans, including the Rail Plan and CTP 2040, and all regional transportation investments, including regional and local rail.

SB 375 not only updated AB 32 to strengthen the GHG reduction targets for the State, but also required each MPO to prepare an SCS as a key component of its RTP. SCSs tie transportation investments to sustainable growth patterns as a strategy for reducing GHG emissions. All SCSs must contain transportation, land use, and housing strategies as a means to develop plans at a regional scale to reduce emissions and promote long-term sustainable development patterns and investments.[73]

Each region's most recent RTPS/SCSs are incorporated into the State Rail Plan as underlying assumptions for service goals; and are likewise expected to use the State Rail Plan guidance to align their regional goals and priorities with statewide benefits and connectivity. Both the RTPs/SCSs and the Rail Plan align with the goals and policies of the CTP and inform funding and project delivery. However, the Rail Plan is mode-specific and therefore provides more detailed rail objectives. It also seeks to coordinate with future regional planning to better connect services between regions and across the state to increase ridership and improve mobility.

Additionally, the statewide travel demand modeling assumes that regions will plan for growth in priority development areas as outlined in SB 375, and therefore accounts for concentrated housing and jobs growth in certain parts of a region to facilitate coordinated land uses around transit-rich corridors.

1.5.5 Corridor-Level Plans

In addition to the Federal, State, and regional planning activities, all initiatives, plans, and studies developed directly by service providers and stakeholder agencies themselves at a corridor level were reviewed to inform the development of this Rail Plan, and to ensure that it aligns with local planning activities.

California High-Speed Rail Business Plan

CHSRA is responsible for planning, designing, building, and operating the planned HSR corridor connecting Northern and Southern California via the Central Valley. Pursuant to AB 528, the High-Speed Rail Business Plan summarizes the most recent HSR System plans, services, ridership forecasts, and financial scenarios. Updated every 2 years, this document forms a key input into planning and modeling efforts for the Rail Plan. CHSRA published its new 2018 Business Plan in June 2018.



73 Air Resources Board, *Sustainable Communities* (2016).

Southwest Multi-State Rail Planning Study

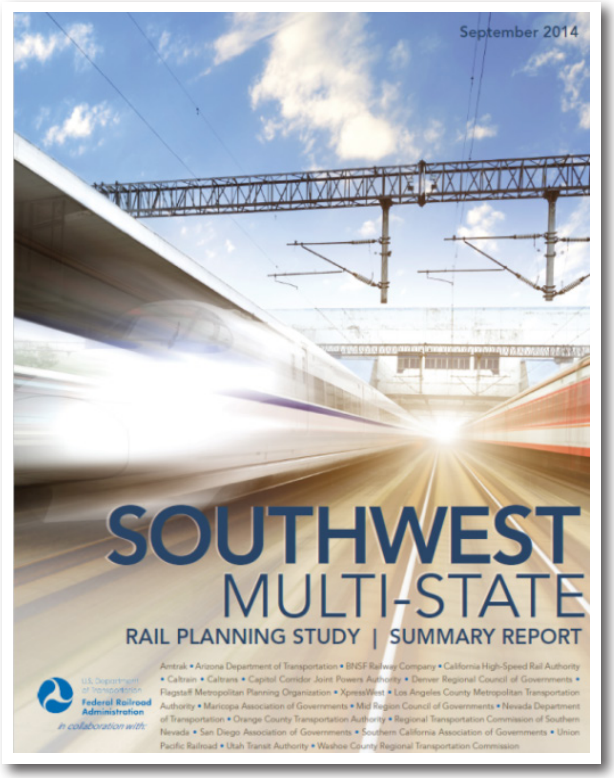
The Southwest Multi-State Rail Planning Study was a 2014 rail planning effort led by FRA. The study is part of a national effort to develop high-performance interstate passenger rail networks through a common preliminary technical vision and strategic planning at the multi-state and mega-regional level.

The study focused on Arizona, California, and Nevada, and parts of Utah, Colorado, and New Mexico, and identified key corridors for future planning. Those recommendations are carried in the Rail Plan, with phased implementation steps the State of California can take to invest in those services, as well as future planning needs to continue to coordinate with stakeholders outside of California.

The Rail Plan shares guiding principles from the FRA study in its efforts to:

- **Support** development of safe, reliable, efficient, and interconnected multimodal travel options.
- **Balance** providing a premier transportation system with the duty to be a responsible steward of public dollars.
- **Consider** factors such as return on investment, cost-effectiveness, and modal alternatives when developing the network.
- **Envision** a preliminary multi-state rail network that supports environmental, social, and economic sustainability.
- **Encourage** cross-state coordination to achieve the most optimal outcomes in network planning.

Specifically, the Rail Plan's 2040 Vision builds on the study's vision for major corridors in California, and interstate connections between Sacramento and Reno and Los Angeles, Las Vegas, and Phoenix. The 2040 Vision also leverages lessons learned from the study; specifically, incorporating a multimodal perspective and recognizing the importance of Federal involvement in multi-state planning. Therefore, the Rail Plan seeks to integrate the Southwest Multi-State Rail Planning Study into existing and ongoing transportation planning efforts. The Rail Plan also includes specific funding and policy support for a Blue Ribbon Panel to organize relevant stakeholders and advance service planning.



Passenger Rail Corridor Investment Plans

A Passenger Rail Corridor Investment Plan (PRCIP), as defined by the FRA, consists of two primary elements: a Service Development Plan, which is focused on passenger rail service planning and alternatives analysis; and a programmatic, corridor-level environmental analysis of rail services being proposed. The PRCIP includes an alternatives analysis, and presents the preferred alternative that best addresses the underlying transportation issues. Completing a PRCIP is a precondition of high-speed and intercity passenger rail Federal investment.

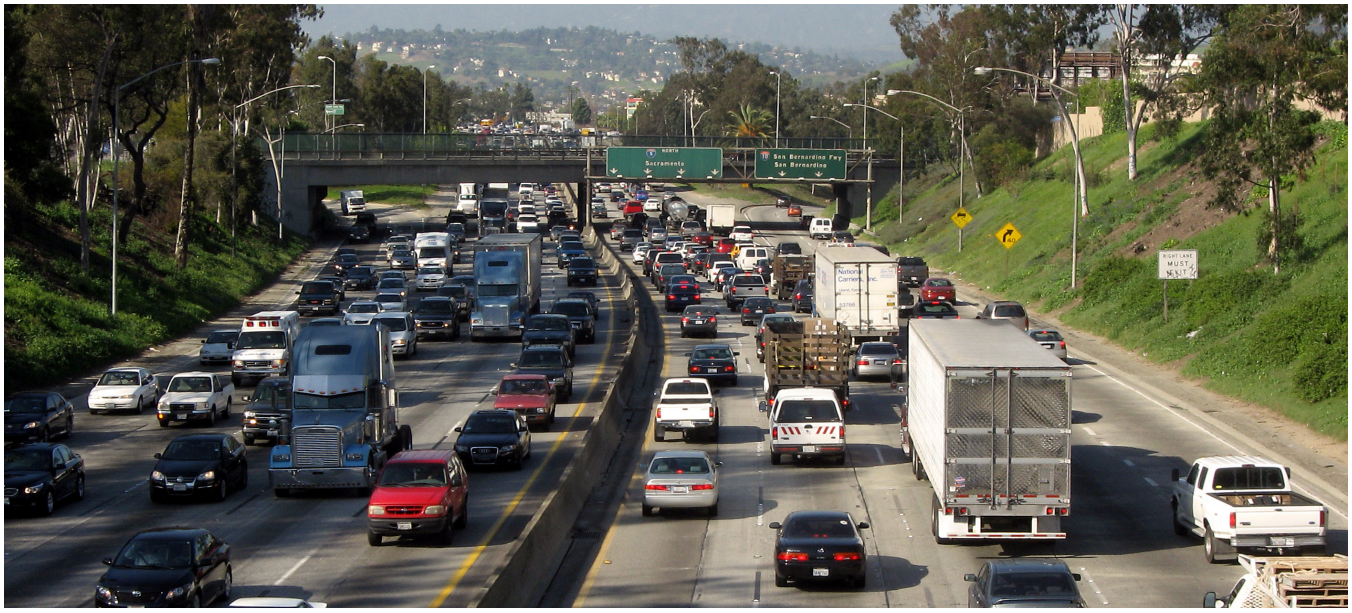
Corridor System Management Plans

Caltrans also provides for the development of Corridor System Management Plans (CSMPs). CSMPs are developed to facilitate the efficient and effective movement of people and goods along California's most congested transportation corridors. CSMPs help Caltrans and its regional planning partners prioritize, implement, and manage multimodal investments. CSMPs are developed by Caltrans in consultation with local stakeholders, and they provide critical insights into rail capacity and intermodal accessibility issues and solutions at key chokepoints throughout California.

Each CSMP presents an analysis of existing and future travel conditions, and proposes traffic management strategies and transportation improvements to maintain and enhance mobility. Analyses encompass state highways, local roadways, transit, and other transportation modes. CSMPs result in a phasing plan of recommended operational improvements, intelligent transportation system strategies, and capacity expansion projects to maintain or improve corridor performance. CSMPs are required for all projects receiving funding from the Corridor Mobility Improvement Account under Proposition 1B[74] (2006).

1.5.6 Private-Sector Railroad Services, Initiatives, and Plans

Coordination with private-sector railroads was conducted to identify any plans and initiatives relevant to the State rail network. The two Class I (the largest class) railroads operating in California publicly announce their near-term investment plans annually. Most recently, BNSF's 2016 capital plan called for $4.3 billion in improvements system-wide, of which $180 million would be allocated to California.[75] Similarly, UPRR's projected capital plan of $3.75 billion system-wide included $121.6 million of track improvements, signal system enhancements, and bridge infrastructure in California.[76]



74 Proposition 1B, the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006, "authorized the issuance of $19.93 billion in State general obligation bonds for specific transportation programs intended to relieve congestion, facilitate goods movement, improve air quality, and enhance the safety of the State's transportation system." (CTC, Proposition 1B (2016), accessed 2016.

75 BNSF Railway, BNSF plans $180 million capital program in California for 2016 (2016), accessed 2016.

76 Union Pacific Railroad, Union Pacific Plans to Invest $121.6 Million in its California Rail Infrastructure (2016).

1.6 Governance and Funding

This section provides a high-level summary of the governance and funding of the California State rail system, including powers and regulations related to the rail system and rail revenue sources at the Federal, State, and local levels. The latter portions of this section provide an overview of freight rail governance. Chapter 6 lists the funding sources for rail improvements in more detail.

1.6.1 Federal Laws and Powers for Planning, Operating, and Funding Rail Services

The FRA, the Federal Transit Administration (FTA), and the Surface Transportation Board (STB) each play a role in passenger rail governance.

Federal Railroad Administration

From its beginnings in 1966, the FRA has held the primary Federal responsibility for enforcing the safe operation of the national rail network. In subsequent years, the agency's portfolio was expanded to encompass other functions, including overseeing a rail research program and administering Federal grants to Amtrak. More fundamental changes to the FRA's responsibilities came on approval of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA). Historically, the FRA's role was focused primarily on safety; under PRIIA, the agency was entrusted with active management of rail policy development and investment, more akin to FTA's role with public transit. Central to this change has been PRIIA's requirement that FRA oversee comprehensive state rail plans, regional passenger rail planning projects (such as Northeast Corridor Futures), and administration of Federal grant and loan programs for intercity passenger rail with the states, Amtrak, and other rail operators. The recent FAST Act continues and expands on these FRA responsibilities through various funding and policy provisions.

Federal law (49 United States Code [USC] § 22702) and the minimum requirements established by the FRA under that code section govern state rail plans, which are required to be updated every 4 years. This Rail Plan is compliant with Title 49 USC Section 22102, which pertains to a state's eligibility to receive Federal financial assistance. Compliance requires, among other things, an adequate plan for rail transportation in the state, and a suitable process for updating, revising, and modifying that plan. The Rail Plan and periodic updates fulfill this requirement.

Federal Transit Administration

The FTA provides financial and technical assistance to state and local public transit service providers, including commuter railroads. The FTA oversees capital and operating grants to the transit providers, and ensures that grant recipients are managing their programs in accordance with Federal, statutory, and administrative requirements. Under traditional grant agreements, carried forward in the FAST Act as part of the New Starts, Core Capacity, and other similar programs, local stakeholders are typically required to provide a 50 percent local match to receive Federal funds. In this way, the FTA and local project sponsors play a joint role in project development and investment.

Surface Transportation Board

The STB is the Federal economic regulatory body for the railroad industry, and the successor to the Interstate Commerce Commission. The STB settles railroad rate and service disputes, and reviews proposed railroad mergers, acquisitions, abandonments, and new line construction. More recently, it has been assigned responsibility for mediating conflicts between passenger operators (including Amtrak and other intercity and commuter rail operators) and track-host freight railroads. This responsibility includes investigating causes of poor on-time performance (OTP), or other intercity passenger rail service quality deficiencies caused by the operator, the track-host railroad, or the managing entity.

1.6.2 State Laws and Powers for Planning, Operating, and Funding Rail Services

Many California agencies are involved in overseeing rail planning, operating, and funding. Chief among these is the California State Transportation Agency (CalSTA), which was formed in 2013 to bring together the State's multiple transportation-related departments under one agency. CalSTA oversees Caltrans, the California Transportation Commission (CTC), CHSRA, and other departments related to transportation. Under CalSTA, the focus of rail's role in transportation has increased substantially, with HSR and Caltrans now being under one state agency. CalSTA has been designated the State Rail Plan Approval Authority, and Caltrans is responsible for rail planning in the State, including development of the Rail Plan.

The CTC is composed of 11 members appointed by the governor and the California State Legislature.[77] The CTC is responsible for programing and allocating funds, and advises the Secretary of Transportation and the California State Legislature on issues related to transportation planning and funding.

As the State Department of Transportation, Caltrans is charged with planning and maintaining the State's transportation system. The Caltrans DRMT is responsible for developing the Rail Plan; administering Federal and State capital grant programs, primarily for intercity rail projects; providing oversight and support to State-supported intercity rail services; and managing and procuring State-owned intercity rail equipment and related facilities.

CHSRA is a unique State entity, responsible for planning and implementing the State's long-term HSR vision. CHSRA also is under the jurisdiction of CalSTA, and is separate from Caltrans and the CTC.

Although the State retains many rail funding and planning responsibilities, the passage of SB 45 in 1998 allowed for regional agencies to play a more active role in passenger rail planning and delivery. Today, State-supported intercity rail services are administered by Joint Powers Authorities (JPAs), and statewide rail planning has evolved toward greater collaboration between State and local agencies.

In 2017, California made a bold commitment to investing in the State's transportation network by passing SB 1. The legislation invests $5.4 billion a year over the next decade to maintain and improve transportation infrastructure across California. Key among these investments are an estimated $750 million in new funding for transit agencies as part of the overall funding package to support the State's rail network. SB 1 is an example of the partnership between the legislature, Caltrans, and other stakeholders to deliver the transportation system California depends on.

Laws and Powers for Rail Planning

In accordance with PRIIA,[78] the State of California must develop a state rail plan to be eligible to receive Federal funding for rail projects. California Government Code Section 14036 requires Caltrans to prepare a California State Rail Plan that generally aligns federal and state requirements. A State Rail Plan was developed in 2013, with this Rail Plan presenting an integrated statewide vision for HSR, intercity rail, and State requirements for the Rail Plan, with some State-specific additions.

Caltrans is designated as the State rail transportation authority to prepare, maintain, coordinate, and administer the Rail Plan. CalSTA is designated to approve the plan, compliant with U.S. Code Title 49 Section 22705.

Today, all State-supported intercity rail routes are managed and administered by regional JPAs consisting of membership from stakeholder jurisdictions and agencies. Intercity Rail Agreements AB 1779 and SB 1225 (2012) authorized Caltrans to enter into interagency transfer agreements (ITAs) for additional intercity rail corridors with respect to the Los Angeles-San Diego-San Luis Obispo Rail Corridor Agency (LOSSAN) and San Joaquin corridors. Among other powers, each JPA is authorized to:

- Make and enter into contracts;
- Own and lease property;
- Manage and build facilities; and
- Incur debts.

77 Of the 11 members, nine are appointed by the governor, one is appointed by the Senate Rules Committee, and one is appointed by the Speaker of the Assembly. There also are two ex officio nonvoting members appointed by the State Senate and State Assembly. These ex officio members are often the chairs of the transportation policy committee in each house.

78 PRIIA, Section 303 (2008).

JPAs are also responsible for fiscal planning through the annual business plans they submit to the State.

The Secretary of Transportation retains the responsibility for overall planning, coordination, and budgeting of the intercity rail services, for the development of a statewide passenger rail network that meets statewide and regional goals and objectives, and for preparing the Interregional Transportation Improvement Program of projects for intercity passenger rail services and statewide transit systems.

On the local level, MPOs and RTPAs must develop RTPs,[79] which are guiding documents for regional transportation investments, including regional rail investments. The RTPs serve as key inputs to the statewide transportation plans, contributing to both the Rail Plan and the CTP. Emerging corridor agency planning is being conducted by RTPAs in the Coachella Valley and in the Central Valley, and along the Central Coast Corridor. Future RTPs will evolve to incorporate statewide, interregional, mega-regional, and emerging corridor agency plans as well.

Laws and Powers for Rail Funding under PRIIA

States are responsible for sharing the costs of all Amtrak routes of less than 750 miles. The law requires states and Amtrak "to jointly develop a cost-sharing methodology to equitably charge states for state-supported intercity passenger rail service."[80] In California, Caltrans now funds all operating expenses for these state-supported routes. Capital expenses are funded by a combination of Federal, State, regional, and private funds. Table 1.4 summarizes California's State-supported routes – *Pacific Surfliner*, *San Joaquin,* and *Capitol Corridor*. Regional agencies must also meet the performance standards outlined in PRIIA Section 209. Regional commuter trains receive funding from both the Federal and State governments, in addition to local jurisdictions.



79 State legislation, Government Code Section 65080 et seq., of Chapter 2.5 and Federal legislation, USC, Title 23, Sections 134 and 135 et seq.

80 Amtrak, *Amtrak National Facts,* accessed 2016.

Table 1.4: State-Supported Intercity Passenger Rail Agency Roles and Responsibilities[81]

	Pacific Surfliner	San Joaquin	Capitol Corridor
Governance			
Management	Los Angeles–San Diego–San Luis Obispo Rail Corridor Agency (LOSSAN) JPA	San Joaquin Joint Powers Authority (SJJPA)	Capitol Corridor Joint Powers Authority (CCJPA)
Operations	Amtrak	Amtrak	Amtrak
Oversight	Caltrans	Caltrans	Caltrans
Funding			
Operating funding	Caltrans	Caltrans	Caltrans
Capital funding	Caltrans and local agencies	Caltrans and local agencies	Caltrans and local agencies
Equipment			
Equipment Ownership	Amtrak and Caltrans	Primarily Caltrans	Primarily Caltrans
Maintenance	Amtrak	Amtrak with oversight from CCJPA and SJJPA	Amtrak with oversight from CCJPA
Track Ownership	UPRR, Ventura County Transportation Commission, Los Angeles County Metropolitan Transportation Authority (LA Metro), BNSF, Orange County Transportation Authority (OCTCA), North County Transit District (NCTD), San Diego Metropolitan Transit System (SDMTS)	UPRR, BNSF	UPRR, Peninsula Corridor Joint Powers Board (PCJPB)

81 Sources:
Amtrak, *About Amtrak California*, accessed 2016;
Caltrans, 2013 California State Rail Plan (2013);
LOSSAN Rail Corridor Agency, Business Plan FY 2016-17 – FY 2017-18, 2016. Accessed 2016.

1.6.3 Local Authority for Funding Rail Improvements

Article XIIIB of the State Constitution allows local agencies to enact sales tax measures, subject to voter approval. More than 22 counties have passed local "self-help" tax measures dedicated to transportation funding, including rail enhancements. Local sales taxes typically support local projects, have sunset dates, and are under local control.[82] Regional rail projects have been included in the expenditure plans. Several regional agencies have successfully passed and/or are considering future ballot measures. In the Bay Area, for example, voters approved a $3.5 billion bond measure, Measure RR, to upgrade the 44-year-old Bay Area Rapid Transit (BART) system. BART has connections to the Capitol Corridor trains at its Richmond and Oakland Coliseum stations, and to the Caltrain commuter service at its Millbrae station.

During the 2016 elections, a number of local and regional entities took up ballot measures for self-funding transportation improvements, investments in passenger rail and transit expansion, and investments in state of good repair for existing infrastructure assets. For greater detail on 2016 local and regional tax measures, please refer to Chapter 2.

1.6.4 Freight Rail Governance

California's freight railroads are owned and/or operated by private companies, ranging in size from North America's two largest Class I railroads, BNSF and UPRR, to short-line railroads such as the Fillmore & Western, Pacific Harbor Line, San Diego & Imperial Valley Railroad, and Yreka Western Railroad, which are often owned by a parent company such as Genesee & Wyoming. Unlike other freight carriers, such as trucking companies and air delivery services that rely on public infrastructure to conduct their operations, most North American railroads operate as integrated systems; they have full responsibility for building and maintaining their infrastructure, in addition to transporting goods.

Federal regulations exempt freight rail operators from many kinds of state and local regulations that might affect other businesses.[83] For example, states and local governments can set speed limits for trucks on public roads, but cannot set limits on railroad operating speeds. Likewise, only the STB has jurisdiction over the economic regulation of railroads. The Federal government also enforces regulations pertaining to rail employee labor and retirement practices.



82 Martin Wachs, *Devolution as Revolution*, ACCESS, No. 22, spring 2003.

83 Initially established by the Interstate Commerce Act of 1887.

Although freight railroads are largely interstate and regulated by the Federal government, State and local governments have tools at their disposal to influence rail carrier operations, including:

- **Taxation.** States set property and income tax rates for operations that occur in their jurisdictions, which Federal law requires to be done in a nondiscriminatory manner. Rail-owned property that serves a transportation purpose, such as tracks, typically is taxed at a single statewide rate, with proceeds channeled to the communities in which the activity occurs. Active rail-owned property that does not serve a transportation purpose, such as buildings and open space, is subject to local tax levy.
- **Safety programs.** Railroad safety regulation is reserved for the Federal government through the FRA. However, states can opt-in to a program in which inspectors are trained and certified by the FRA to assist in special enforcement activities and other rail safety work. In California, the California Public Utilities Commission (CPUC) employs federally certified inspectors to ensure that railroads comply with both federal and state railroad-safety regulations. The CPUC also issues an annual Railroad Safety Report to the State Legislature. Some states, like California, generate funds to offset the costs of these safety activities through a rail-related fee. In addition, states can impose regulations that supplement those specified by the FRA. However, carriers often view these state-level regulations as a burden, given their need to operate consistently across state boundaries.

  In California, regulation of freight rail safety operations is administered by the CPUC Office of Rail Safety, Railroad Operations and Safety Branch (ROSB). The FRA certifies CPUC staff as inspectors with various disciplines. ROSB is responsible for ensuring that California communities and railroad employees are protected from unsafe practices on freight and passenger railroads. ROSB does this by enforcing state and federal rail safety rules, regulations, and inspection efforts; and by carrying out proactive assessments of potential risks before they create dangerous conditions. ROSB rail safety inspectors investigate rail accidents and safety-related complaints. ROSB inspectors recommend safety improvements to the CPUC, railroads, and the federal government as appropriate.
- **Freight rail assistance and related economic development initiatives.** States offer a variety of incentives to support railroad line preservation, capacity expansion, and economic development. Incentives include loan guarantees, tax credits, direct investments, and matching grants to leverage private investments by railroads and shippers. Recent financing innovations have included leveraging private funds with public funds, which can reduce the costs assumed by a railroad or other entity, thereby increasing a project's financial rate of return. California's Carl Moyer Memorial Air Quality Standards Attainment Program, which provides for cleaner-than-required engines and equipment, has helped finance purchases of low-emission locomotives at many freight railroads.



- **Highway-rail at-grade crossings.** Caltrans and the CPUC administer the Section 130 Grade Crossing Hazard Elimination Program (Section 130 Program), which provides federal funds to local agencies (cities and counties) and railroads to eliminate hazards at existing at-grade public highway-rail crossings. The purpose of the Section 130 Program is to reduce the number, severity, and potential of hazards to motorists, bicyclists, and pedestrians at crossings. The Section 130 Program is a cooperative effort between the Federal Highway Administration (FHWA), Caltrans, railroad companies, local agencies, and the CPUC. The CPUC selects crossings based on their hazard potential. For each crossing, a diagnostic field meeting considers improvements with all interested parties and discusses accident history, vehicle and train volumes, pedestrian needs, geometry, and roadway/rail operations. The CPUC then ranks the crossing improvement projects based on six factors including potential reduction in accidents, pedestrian, bus and hazardous material vehicle usage, and an accident prediction formula. The CPUC then creates the final priority list annually and provides the list of projects to Caltrans. Caltrans secures funding, administers the funding, and issues contracts to railroads and local agencies to proceed with the improvements. The costs associated with the installation, upgrade, or replacement of an active warning device are usually the responsibility of public agencies and the railroad. The local roadway agencies are responsible for warning devices on the approach to each crossing, interconnections with railroad equipment, and traffic signs and markings. The railroad assumes responsibility for the O&M of the active warning devices at the crossing.

Beyond these specific areas, state regulations that apply to all businesses may also apply to railroads on issues not specifically under Federal jurisdiction. As a result, freight railroads are subject to a range of state-level environmental, safety, engineering standards, and land use regulations.



1.7 Passenger Rail Service Delivery Agencies: Coordination and Background Information

This section describes the agencies that deliver rail services in California. It also describes the coordination process followed in developing the Rail Plan, and summarizes other rail initiatives and plans that are relevant to the Rail Plan.

1.7.1 Service Provider Engagement

Coordination with stakeholder entities is a critical component of the Rail Plan. To ensure that service provider information is accurately reported in this document, JPAs and other service operators throughout the State were engaged to obtain operating and financial data; information on upcoming projects, plans, and service changes; and information on any recent or planned changes to route administration and service delivery.

Caltrans convened a Stakeholder Advisory Committee (SAC) to provide input to the development of the Rail Plan. The SAC "includes representatives from diverse groups of passenger rail operators, planning agencies, freight rail interests, Tribal Nations, private railroads, ports, transit operators, and neighboring states." Several advocacy groups were also invited to participate on the SAC.[84]

1.7.2 Relevant Rail Initiatives and Plans

In addition to the Federal, State, and regional planning activities, various initiatives, plans, and studies developed directly by the service providers and stakeholder agencies themselves were reviewed to inform the development of this Rail Plan, and ensure that it aligns with local planning activities. These specific plans are detailed in Chapter 4.

1.7.3 Passenger Service Providers

This section summarizes institutional and strategic arrangements available to increase coordination between rail services in the implementation of the 2040 Vision. Examples of arrangements between separate rail agencies, between rail agencies and other bodies of government, and between rail agencies and the private sector in place or available to provide service to passengers are discussed.

High-Speed Rail: California High-Speed Rail Authority

CHSRA was formed in 1996[85] to initiate HSR planning and implementation in the State. CHSRA maintains its own board,[86] and must submit a business plan to the California State Legislature every 2 years.[87] The 2018 Business Plan calls for initial segments between San Francisco and Gilroy via San Jose (Silicon Valley) and between Madera and Bakersfield (Central Valley), with service opening by 2027. The larger Phase 1 of the HSR corridor is planned to run from San Francisco to the Los Angeles basin in less than 3 hours, with top speeds exceeding 200 miles per hour (mph). Phase 2 would then extend the system to Sacramento, the Inland Empire, and San Diego.[88]

Intercity Rail: Long-Distance Routes

Amtrak operates four long-distance routes serving portions of California:

- The *Coast Starlight*, from Los Angeles to Seattle
- The *California Zephyr*, from Emeryville to Chicago
- The *Southwest Chief,* from Los Angeles to Chicago
- The *Sunset Limited*, from Los Angeles to New Orleans

These routes are funded through Amtrak's Federal appropriations.

84 Caltrans, 2018 *California State Rail Plan: Stakeholder Advisory Committee,* accessed 2016.

85 Pursuant to SB 1420 (1996).

86 The CHSRA Board of Directors consists of nine members; of these, five are appointed by the governor, two are appointed by the Senate Committee on rules, and two are appointed by the Speaker of the Assembly.

87 As outlined in AB 528 (Chapter 237, Statutes of 2013) and SB 1029 (Budget Act of 2012-2013).

88 CHSRA, *Business Plan* (2016).

Intercity Rail: State-Supported Intercity Passenger Rail Routes

The State is responsible for funding the three in-State Amtrak-operated rail services. These "State-supported" routes and their major stations are:

- The *Pacific Surfliner*, serving Sacramento, San Luis Obispo, Santa Barbara, Los Angeles, Anaheim, Santa Ana, Oceanside, and San Diego
- The *San Joaquin*, serving Oakland, Richmond, Martinez, Stockton, Modesto, Madera, Fresno, and Bakersfield
- The *Capitol Corridor*, serving San Jose, Oakland, Richmond, Martinez, Davis, Sacramento, and Auburn

These intercity routes are distinct from local commuter rail services in that they serve longer-distance travelers in addition to daily commuters.

Since 2015, all three lines are managed by regional JPAs, which have responsibility for planning and administration. Table 1.4 lists the roles and responsibilities of State-supported intercity passenger rail agencies.

Commuter Rail Service Providers

In addition to the Amtrak-operated, JPA-administered, and State-supported routes, several regional commuter systems serve the metropolitan areas of the San Francisco Bay Area, Los Angeles, and San Diego. These commuter rail services are often overseen by their own JPAs, composed of representatives from their rail service area. Commuter rail services support multimodal transportation options, and their connections to longer-distance rail facilitate travel to statewide destinations. Chapter 2 summarizes California's commuter rail services, routes, and administrators.

Intergovernmental Coordination between Service Providers

County transportation agencies, regional commissions, JPAs, regional passenger rail agencies, and privately owned freight railroads play important roles in the delivery of passenger and freight rail services in California. Together, these agencies support statewide planning goals through planning, funding, and provision of rail services. The Rail Plan's integrated passenger rail service will improve the integration through coordinated transfers and better collaboration between service delivery agencies.

This section highlights the agencies primarily responsible for service delivery by route distance. Chapter 2.1 discusses the services in greater detail.

A JPA is a special entity, consisting of two or more government agencies that jointly exercise power over a shared service across relevant regions. JPAs have been established throughout California to organize and manage passenger rail service across jurisdictional and geographic boundaries. JPAs have proven to be useful in scaling the provision of rail service across governmental geographies, while maintaining the benefits of local knowledge of the markets being served. As the State moves forward to integrate more service across more regions, such organizations will become even more important.

Intercity and commuter rail services are currently provided by the following eight JPAs, described in detail in Chapter 2:

- Capitol Corridor Joint Powers Authority (CCJPA)
- Los Angeles-San Diego-San Luis Obispo Rail Corridor Agency (LOSSAN)
- San Joaquin Joint Powers Authority (SJJPA)
- Peninsula Corridor Joint Powers Board (PCJPB)
- Southern California Regional Rail Authority (SCRRA)
- San Joaquin Regional Rail Commission (SJRRC)
- North County Transit District (NCTD) (COASTER)
- Sonoma-Marin Area Rail Transit (SMART) District

Intergovernmental Coordination between Service Providers and Local Government

As relates to station area planning, successful intergovernmental partnerships are crucial to effective TOD. Urban design, consistent zoning, and local service integration are all generally outside the purview of rail service providers, but are still important to the overall success of the integrated network. Partnerships between service providers and local governments, especially in regard to land use and station development, will be mutually beneficial in terms of maximizing the value of the rail service, the value of local real estate, and return on investment of local dollars.

The Salesforce Transit Center (also known as the Transbay Transit Center) project provides an example of such a partnership. The Transbay JPA was created to plan and construct the multimodal HSR terminal in downtown San Francisco. The mega-project is an ongoing collaboration between CHSRA, PCJPB, the City of San Francisco, San Francisco Municipal Transportation Agency (SFMTA), BART, and multiple public bus services. When complete, integrated services and timed connections will be available for rail services traveling throughout the State.



1.7.4 Freight Providers

Freight Rail Services and Intermodal Connections

California's freight railroad system supports industries and consumers, and links the State with other geographic markets. Freight railroads are classified by size. BNSF and UPRR are the only Class I railroads in the State, and handle a majority of the State's tonnage. California has no Class II (i.e., regional) railroads, and has 27 active Class III (i.e., short-line) railroads. Chapter 2 discusses the freight rail system and ports in greater detail.

Intermodal rail terminals—locations where containers and bulk cargo are transferred from rail to truck or rail to ship, and vice versa—help link the freight rail network with the State's overall multimodal system. Most international cargo is handled at intermodal terminals at California's three container ports (referred to as on-dock intermodal terminals) or at locations within a few miles of the ports (referred to as near-dock terminals). Domestic cargo and some international cargo are handled at off-dock intermodal terminals. California is home to three major container ports: POLA and POLB, collectively known as the San Pedro Bay Ports, and the Port of Oakland.

As the intermodal market has grown for both international and domestic cargo, both Class I railroads and the ports have identified the need for new or expanded terminals near the San Pedro Bay ports and the Port of Oakland. However, the recent slowdown in rail traffic and difficulties in obtaining the necessary approvals have greatly slowed the progress of these initiatives. Nevertheless, the projected long-term growth in traffic through these ports will require increased capacity in rail intermodal terminals in the future.

Private-Sector Involvement

Currently, intercity services in California are provided by agreements with Class I freight railroad operators (i.e., BNSF and UPRR). These agreements may be orchestrated through Amtrak, which has a nationwide access agreement, or by public railroad operators (e.g., ACE contracts directly with UPRR). Private contract service providers also operate trains through agreement with various operators throughout the state. Most of these arrangements essentially involve provision of a specified service for a fee.

In addition to coordination among government entities, innovative partnerships will be needed to integrate rail services with private entities. Such partnerships would include both private operations of public rail services, and coordination with private-sector providers of nonrail connecting services, such as airlines, rideshare operators, and private bus operators.

Although such models are common in Europe and Asia, private rail operators are less familiar in the United States. These agreements can take the form of private-sector firms competing to operate government-owned services; or private concessions and public infrastructure for set periods of time and agreed costs. When managed properly, they can be successful tools for managing long-term costs and risk, while ensuring responsive service to passengers.



Several public rail operators, such as ACE, Caltrain, and COASTER, are operated by a private entity that provides on-board conductor and engineer staff, dispatch, and maintenance. Although the infrastructure and rolling stock are publicly owned, their stewardship is managed privately for a set contract period. At the end of the period, these functions can either revert to the public entity, or be put back on the marketplace in whole or in part in a new contract offering, at the public entity's discretion. Such an arrangement provides flexible opportunities to provide the best service to customers at the lowest cost, while minimizing risk.

Beyond the provision of rail services, private-sector partnerships can also work to integrate wider sectors of the transportation industry to extend the reach of rail service to more customers. This can take a variety of forms, many of which are already in place, and are described in detail in Chapter 3. Caltrans defines a public-private partnership (P3) as "a comprehensive development lease agreement formed between public and private sector partners that allows for more private sector participation than is seen in the conventional or traditional project delivery method, like design bid build, that is typically used by the Department to deliver a project. [89]" It is anticipated that use of P3s and agreements will increase as California implements its network integration.

1.7.5 Section 22102 Compliance Statement

Compliance requires, among other things, an adequate plan for rail transportation in the state, and a suitable process for updating, revising, and modifying that plan. The Rail Plan and periodic updates fulfill this requirement.

89 Caltrans Public-Private Partnership Program Guide, January 2013. http://www.dot.ca.gov/p3/documents//p3_guide.pdf

1.8 Conclusion

To adequately support its projected population growth, economic goals, and climate change responsibilities, California must develop its railroads, highways, ports, airports, local assets, and land use practices to find ever-greater efficiency in investment, economic output, energy use, and user capacity. This development will require a redirection of legacy planning and investment solutions; and new ways of strategizing investments, and adapting and leveraging the latest technological solutions.

Modern, integrated rail service must play an increasingly prominent role in the statewide multimodal transportation system, and the Rail Plan provides a framework for fulfilling this challenge. The advent of new technologies, implementation of HSR and advanced train control systems, groundbreaking policies for reining in GHG emissions, continued population and economic growth, and other factors will influence and drive development of the rail network in California over the next several decades. The Rail Plan seeks to integrate and optimize the State rail network as a core component of the multimodal transportation system.

Chapter 2 examines the existing rail infrastructure and funding landscape in greater detail, projecting future trends and changes, and identifying needs and opportunities.





2 Existing Rail System

California's rail system is and will continue to be critically important to a statewide, multimodal transportation system that is efficient, flexible, and sustainable for all persons and markets. The existing rail system moves people and goods throughout the state through a range of infrastructure and services. Planning for rail is often more complicated than planning for roads or highways because the State, in large part, does not own the infrastructure. However, understanding the delicate dynamics of rail operations, service providers, funding mechanisms, and future trends and challenges is imperative for assessing the future possibilities of rail in California.

For example, county transportation agencies, regional commissions, JPAs, regional passenger rail agencies, and privately owned freight railroads play important roles in the delivery of passenger and freight rail services in California. Together, these agencies support statewide planning goals through planning, funding, and provision of rail services. The Rail Plan's integrated passenger rail service will foster better collaboration between service delivery agencies.

Chapter 2 inventories the statewide rail system, including the existing passenger rail system, which is composed of Amtrak long-distance and State-supported intercity passenger trains and locally supported commuter and urban rail services, with connections to other modes of transportation. The proposed passenger rail system includes HSR and many other improvements to better connect the rail system and create a seamless, door-to-door travel experience for passengers. Additionally, freight railroads and facilities are vital to California's goods movement, and must substantially grow in their carrying capacity to meet broader economic and societal trends and challenges.

The Rail Plan builds on the existing statewide rail system, connected by HSR, to extend the impact of the rail system in achieving integrated service offerings between diverse markets. The coordination among various existing rail and transit service providers is critical to implementing a fully integrated system. The Rail Plan also protects and enhances the freight-carrying capacity of the State's existing freight rail providers, often recommending investments that reduce conflicts between freight and passenger trains. This chapter details how strategic investment and planning decisions help the State to maintain the existing rail capacity, and build on past efforts to move California's rail system forward.

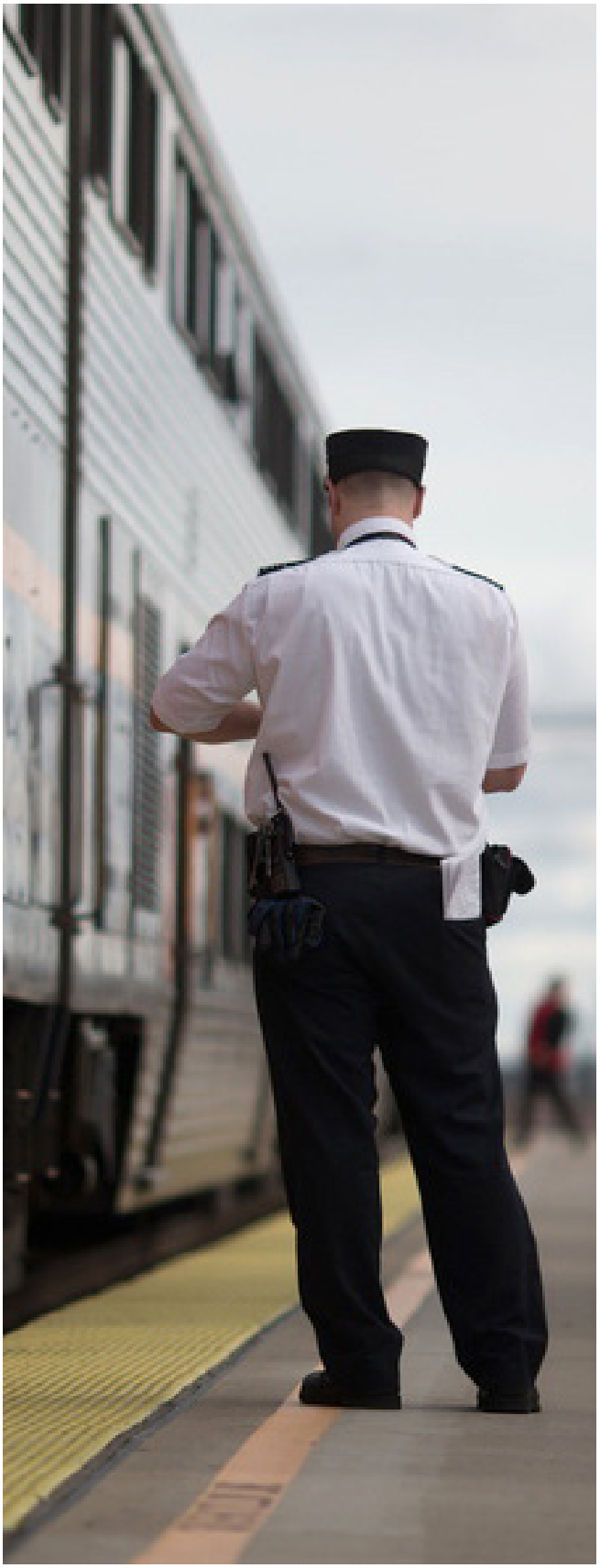




Exhibit 2.1: California Intercity and Commuter Rail Network (Including Connecting Bus Service)

2.1 Description and Inventory

2.1.1 Existing Passenger Rail Lines, Corridors, and Services

Expanding and improving an integrated statewide rail system requires coordination between service providers, as well as between service providers and local governments. This section summarizes existing passenger rail service providers in California, with a detailed explanation of the three categories of passenger rail services operating in California today:

1. Intercity passenger rail services;
2. Commuter rail services in metropolitan regions or between adjacent regions; and
3. Urban passenger rail transit systems serving metropolitan areas.

Intercity Passenger Rail Services

Intercity passenger rail provides transportation between metropolitan areas, to rural areas, and to points beyond California's borders. Amtrak operates all intercity rail services in the state. California's intercity rail services can be divided into two groups: Amtrak long-distance routes, which are funded by Amtrak and serve both California and interstate markets; and State-supported routes that serve California travel markets. Exhibit 2.1 maps California's State-supported and long-distance intercity rail routes.



Exhibit 2.2: California Intercity Routes

Amtrak Long-Distance Routes[90]

These are the multi-state Amtrak long-distance passenger routes serving California.

- ***California Zephyr*** **(Emeryville – Sacramento – Reno – Denver – Chicago).** The *California Zephyr* provides daily round-trip regional service in the Emeryville-Sacramento-Reno corridor. Extra coaches are often operated on this portion of the route to handle heavy loads to and from Reno. Connecting buses link Emeryville with San Francisco. A stop in Truckee serves Lake Tahoe and nearby Sierra Nevada ski areas. En route to Chicago, the *California Zephyr* also serves Salt Lake City, Denver, and Omaha. The route served 417,322 passengers in federal fiscal year (FFY) 2016 across its entire interstate route.
- ***Coast Starlight*** **(Los Angeles – Oakland – Sacramento – Portland – Seattle).** The *Coast Starlight*'s daily round trip is the second-most popular long-distance train in the Amtrak system. A substantial portion of the route's ridership is generated by intrastate California travel. The route provides the only rail service north from Sacramento to Redding and the Pacific Northwest, and the only one-seat rail service from the Bay Area to Los Angeles. Connections with the *Pacific Surfliner* at Los Angeles provide access to San Diego, and connections with the *San Joaquins* at Sacramento and Martinez provide access to the Central Valley. Portland and Seattle are major stops to the north. The route served 453,131 passengers in FFY 2016.
- ***Sunset Limited*** **(Los Angeles – San Antonio – New Orleans).** The *Sunset Limited*, originating and terminating in Los Angeles, operates 3 days per week in each direction and is the only rail service serving Palm Springs. It continues east, connecting California to Tucson, El Paso, San Antonio, Houston, and New Orleans. The *Texas Eagle*, which links Chicago with San Antonio, carries through-cars to and from the *Sunset Limited*. The route served 98,079 passengers in FFY 2016; in addition, a portion of the 306,321 passengers in FFY 2016 on the *Texas Eagle* had an endpoint of their journey in California.
- ***Southwest Chief*** **(Los Angeles – Albuquerque – Kansas City – Chicago).** The daily round-trip *Southwest Chief* provides the only rail service in California between Los Angeles and Victorville, Barstow, and Needles to the east. Beyond California, major stops include Flagstaff (Grand Canyon), Albuquerque, Kansas City, and Chicago. The route served 364,748 passengers in FFY 2016.



90 Ridership information from: Amtrak, Amtrak FY15 Ridership and Revenue, 2015, accessed 2016.

State-Supported Services

State-supported routes are services funded by the State, administered by JPAs, and operated by Amtrak under contract with each JPA. Amtrak also provides maintenance on the equipment, some of which is owned by the State and some by Amtrak. The State funds the services and provides oversight, including overall planning, coordinating, and budgeting. This ensures that the State-supported system, including the Thruway bus network, is integrated internally with the rest of the commuter and planned HSR Systems, as well as the transit system in California, with the goal of an integrated and seamless system.

In FY 2017, the three State-supported corridor services were ranked second, third, and sixth in ridership across all Amtrak routes nationally, behind only the Northeast Corridor (NEC: Boston to Washington D.C.). California State-supported ridership accounted for more than 38 percent of total national State-supported ridership,[91] and three of the top ten busiest Amtrak stations were in California (Los Angeles, Sacramento, and San Diego[92]).

Section 2.1.2 provides data on State-supported intercity rail performance from FFY 2008-2015.

Appendix A includes information on State-supported route ownership and track characteristics, the Amtrak Thruway bus system, historical State-supported route performance, and connecting rail services; and includes maps of the State-supported intercity rail routes, along with their supporting Amtrak Thruway bus routes. Table 2.1 shows Intercity Passenger Rail Historical Ridership.

Table 2.1: Intercity Passenger Rail Historical Ridership

Fiscal Year	Surfliner	San Joaquin	Capitol Corridor	Total Intercity Rail Ridership	Thruway Bus Ridership
2005	2,454,396	743,245	1,260,249	4,457,890	879,418
2006	2,655,490	801,242	1,273,088	4,729,820	956,661
2007	2,685,194	789,641	1,450,069	4,924,904	880,678
2008	2,835,132	894,346	1,693,580	5,423,058	1,068,190
2009	2,696,951	958,946	1,599,625	5,255,522	950,911
2010	2,614,777	967,437	1,580,619	5,162,833	991,548
2011	2,746,320	1,032,579	1,708,618	5,487,517	1,121,210
2012	2,664,935	1,133,654	1,746,397	5,544,986	1,189,359
2013	2,689,465	1,195,898	1,701,185	5,586,548	1,184,752
2014	2,673,170	1,202,624	1,419,084	5,294,878	1,126,985
2015	2,827,134	1,181,639	1,474,873	5,483,646	1,135,535
2016	2,924,117	1,135,424	1,560,814	5,620,355	1,118,625

91 Amtrak, FY '17 Ridership Revenue Fact Sheet

92 CATC, 2016 Annual Report Final, 2016.

Pacific Surfliner (San Luis Obispo – Los Angeles – San Diego)

The *Pacific Surfliner* operates along the Southern California coast; it is the second-busiest Amtrak route in the nation, serving 2,924,117 passengers in FFY 2016.

Route Description. The *Pacific Surfliner* extends 351 route-miles, serving 29 stations between San Luis Obispo and San Diego, including Los Angeles. There are 17 stations between San Luis Obispo and Los Angeles, and 12 south of Los Angeles. UPRR owns 175 miles of line between San Luis Obispo and Moorpark. Most of the route from Moorpark to San Diego is publicly owned by regional and local agencies, except the 22-mile segment between Redondo Junction in Los Angeles and Fullerton, which is owned by BNSF.

Effective November 6, 2016, the *Pacific Surfliner* route features 12 daily round trips between San Diego and Los Angeles. Five trips extend north to Santa Barbara and Goleta, with two of these trips extending further north to San Luis Obispo. Dedicated Amtrak Thruway bus connections provide service to and from San Luis Obispo for rail passengers making connections in Santa Barbara on trains that terminate in Goleta. Bus routes connect with many of the *Pacific Surfliner* stops, providing service to a large network of destinations, including Bakersfield, San Jose, and other Bay Area stops; various communities on the Central Coast; Indio; San Pedro; Hemet; Las Vegas; and many points between.

Travel Times. Current San Diego to Los Angeles travel times average 2 hours and 51 minutes. Los Angeles to Santa Barbara travel times average 2 hours and 37 minutes in the northbound direction, and 2 hours and 53 minutes in the southbound direction. Los Angeles to San Luis Obispo travel times average 5 hours and 28 minutes in both directions. Between Los Angeles and San Diego, only portions of the 70-mile plus segment between Santa Ana and Sorrento Valley have a maximum authorized speed of 90 mph.

Proposed Improvement Strategies. A major improvement strategy in the LOSSAN Corridor is to address capacity needs, including future studies, as well as grant funding for the lease of rolling stock equipment. Additionally, grade-separation efforts, such as Rosecrans-Marquardt, will contribute to increased train frequencies. Frequency expansion, including peak-hour services between Los Angeles and Santa Barbara, will help improve corridor performance and provide travel-time savings. Beyond capacity improvements, further business class enhancements will provide improved travel opportunities for riders.



San Joaquins (Bay Area/Sacramento – Stockton – Bakersfield)

The *San Joaquins* provides service from the San Francisco Bay Area and Sacramento through the San Joaquin Valley to Bakersfield. It is the sixth-busiest Amtrak route in the nation in FFY 2017, with 1,122,301 passengers.[93]

Route Description. The *San Joaquins* route extends 316 route-miles between Oakland and Bakersfield, with 13 intermediate stops. In addition, the Stockton-Sacramento segment of the route extends 49 miles, with one intermediate stop. BNSF primarily owns the right-of-way (Port Chicago-Bakersfield); however, UPRR owns 39 miles between Oakland and Port Chicago and 49 miles between Stockton and Sacramento.

Seven daily round-trip trains currently serve the *San Joaquins* route, of which five run between Oakland and Bakersfield and two run between Sacramento and Bakersfield. All trains between Stockton and Bakersfield operate on the same tracks. Connecting Thruway buses run between Stockton and Sacramento for trains serving Oakland. For trains serving Sacramento, connecting buses operate between Stockton, Oakland, and San Francisco. All trains connect to a bus from Bakersfield to Los Angeles. In addition, there is an extensive network of connecting buses north to Redding and McKinleyville; west to San Jose and to the Central Coast; and east to many points, including Las Vegas, Coachella Valley, Reno, and Yosemite. Altogether, 55 percent of riders use one or more buses for a portion of their trip.

Travel Times. The average travel time in the northbound direction between Bakersfield and Oakland is 6 hours and 12 minutes, and 5 hours and 18 minutes between Bakersfield and Sacramento. The average southbound travel time is 6 hours and 10 minutes between Oakland and Bakersfield, and 5 hours and 20 minutes between Sacramento and Bakersfield.

Proposed Improvement Strategies. The delivery of new locomotives to the corridor will provide major environmental improvements to many areas particularly challenged by air quality. As an example of the progress already being made, on May 7, 2018, the new "Morning Express" began providing early morning service from Fresno to Sacramento to serve the business commute market in the Central Valley. Additionally, certain stations along this corridor have disjointed land uses that create access constraints. Rail access issues are often overlooked, but are crucial to system connectivity and seamlessness of the travel experience for the rider, resulting in higher ridership. Continued study and infrastructure investment are necessary to improve some access issues, particularly to link intercity rail services to regional rail and transit.



93 SJJPA 2017 Business Plan.

Capitol Corridor (Roseville/Auburn – Sacramento – Oakland – San Jose)

The *Capitol Corridor* provides service between San Jose, the East Bay, and the Sacramento region. It is the third-busiest Amtrak route in the nation. More than 1.5 million passengers traveled on this route in FFY 2016.

Route Description. The *Capitol Corridor* extends 169 route-miles and has seven daily round trips between Oakland and San Jose, 15 weekday round trips between Sacramento and Oakland (11 on weekends), and one daily round trip extending from Sacramento to Auburn. UPRR owns most of the right-of way (166 miles), and PCJPB owns 3 miles between Santa Clara and San Jose. The route has a number of Thruway bus connections. Trains at Emeryville have a bus connection to and from San Francisco. Bus routes connect the *Capitol Corridor* to a large network of destinations, including north to Redding and McKinleyville; south to Stockton, Santa Cruz and the Central Coast; and east to Stateline and Reno.

Travel Times. Current Sacramento-Oakland travel times average 2 hours and 1 minute in the eastbound direction, and 1 hour and 54 minutes in the westbound direction. Oakland-San Jose travel times average 1 hour and 4 minutes in the eastbound direction, and 1 hour and 18 minutes in the westbound direction. The Auburn-Sacramento trip averages 1 hour and 3 minutes in both directions.

Proposed Improvement Strategies. The *Capitol Corridor* was awarded $4.62 million for its Travel Time Reduction project to improve track and signal systems to increase safety and speeds along the corridor. Further improvements include service to additional markets and bicycle access and storage.



Amtrak California Thruway Bus Network

An extensive network of dedicated *Amtrak Thruway* buses supports intercity passenger rail by providing dedicated connecting service with guaranteed seating to markets without direct passenger rail service. To ride the bus, a passenger must purchase an integrated train and bus ticket. Caltrans is conducting a "California Intercity Bus Study" and will recommend strategies and improvements to further integrate the statewide rail and transit network. Appendix A describes the bus network in greater detail.

Table 2.2: Amtrak Thruway Bus Historical Ridership[94]

Fiscal Year	Thruway Bus Ridership
2005	879,418
2006	956,661
2007	880,678
2008	1,068,190
2009	950,911
2010	991,548
2011	1,121,210
2012	1,189,359
2013	1,184,752
2014	1,126,985
2015	1,135,535
2016	1,118,625



94 Source: Amtrak Performance Reports, based on FFY.

Intercity Rail: Service Providers and Roles and Responsibilities

A JPA is a special entity consisting of two or more government agencies jointly exercising power over a shared service. JPAs have proven useful in scaling the provision of rail service across governmental geographies, while maintaining the benefits of local knowledge of the market being served. Three JPAs have been established in California to organize and manage intercity passenger rail service across jurisdictional and geographic boundaries; they are described in the sections below.

The State funds the services and provides oversight, including overall planning, coordinating, and budgeting, to ensure that the State-supported rail and Thruway bus system are integrated internally and with the rest of the commuter and planned HSR Systems, as well as the transit systems—with the goal of a statewide integrated and seamless system.

Appendix A describes State-supported intercity passenger rail agency roles and responsibilities.

Capitol Corridor Joint Powers Authority

The CCJPA was the first agency that took over administration of intercity operations from Caltrans under the provisions of SB 457. The CCJPA board consists of two representatives from each of the eight counties along the 150-plus-mile route between Auburn and San Jose (Placer, Sacramento, Yolo, Solano, Contra Costa, San Francisco, Alameda, and Santa Clara Counties), which are represented by Placer County Transportation Planning Agency, Sacramento Regional Transit District (RT), San Francisco BART District, Santa Clara Valley Transportation Authority (SCVTA), Solano Transportation Authority, and Yolo County Transportation District. BART provides day-to-day management support to the CCJPA, under contract. The CCJPA is also supported by the MTC and the Sacramento Area Council of Governments. The majority of the equipment on the route is owned by the State. Amtrak maintains the equipment, with oversight by the CCJPA.

Los Angeles–San Diego–San Luis Obispo Rail Corridor Agency

Effective July 1, 2015, administrative and oversight responsibility passed from Caltrans to the LOSSAN JPA under the provisions of an ITA between the State and LOSSAN that was completed pursuant to the provisions of SB 1225 (2012). The LOSSAN Board of Directors is composed of current and former elected officials representing rail owners, operators, and planning agencies along Amtrak's *Pacific Surfliner* corridor between San Diego, Los Angeles, and San Luis Obispo. OCTA serves as the managing agency on behalf of the LOSSAN JPA. The *Pacific Surfliner* uses a combination of State- and Amtrak-owned equipment on the route. Amtrak owns the locomotives and 40 bi-level cars, as well as additional equipment leased from Amtrak; and the State owns 10 cars. Amtrak maintains the equipment.

San Joaquin Joint Powers Authority



The SJJPA took over management and administration of the *San Joaquins* service from the State on July 1, 2015, under the provisions of an ITA between the State and the SJJPA, pursuant to AB 1779 (2012). The ten Member Agencies that make up the SJJPA are Alameda County, Contra Costa Transportation Authority, Fresno Council of Governments, Kings County Association of Governments, Madera County Transportation Commission, Merced County Association of Governments, RT, SJRRC, Stanislaus Council of Governments, and Tulare County Association of Governments (TCAG). The SJRRC is the Managing Agency for the SJJPA. The majority of the equipment on the route is owned by the State. Amtrak maintains the equipment, with oversight of equipment maintenance by the SJJPA and the CCJPA, working in partnership with Caltrans.

Intercity Rail: Emerging Corridors

Regional agencies and jurisdictions across California are currently engaged in coordinated planning with the State and rail operators to develop new passenger rail corridors and services, which provide opportunities to develop intercity and regional rail connections to a statewide passenger system.

Coachella Valley – San Gorgonio Pass Rail Corridor

The Riverside County Transportation Commission (RCTC) has been studying passenger service in a 141-mile rail corridor between Los Angeles Union Station (LAUS) and Indio, California, since 1991. Passenger service in this corridor is being proposed to provide a safe, reliable, and convenient intercity passenger rail travel option to address mobility challenges that are likely to expand as growth increases in population, employment, and tourism.

RCTC, in coordination with the FRA, completed an Alternatives Analysis in 2016 that evaluated several alternatives for new intercity passenger rail service between Los Angeles and Indio. RCTC is preparing a Passenger Rail Corridor Investment Plan, including a Program Environmental Impact Statement (EIS)/ Program Environmental Impact Report (EIR) for a twice-daily round-trip service. This EIS/EIR will evaluate and conceptualize the way service will operate in the corridor, and will determine what infrastructure improvements would be needed to accommodate the new service.



Central Coast Rail

The Coast Route between Los Angeles, Santa Barbara, San Luis Obispo, Salinas, and San Jose is defined as a state intercity passenger rail corridor in California Government Code. Regional agencies and jurisdictions along this route have been coordinating with Caltrans and rail operators, both independently and through a Coast Rail Coordinating Council, to develop proposals for expanding passenger rail service in the Central Coast counties.

Rail Extension to Salinas

The Transportation Agency for Monterey County (TAMC) is planning an extension of passenger rail service to Salinas, which has been conceived as either an extension of Caltrain commuter rail service or Capitol Corridor intercity service, including two daily round trips that would begin with stops in San Jose, Gilroy, Pajaro/Watsonville, Castroville, and Salinas. TAMC is proceeding with a reduced "Kick Start" project, using available state funds that would accommodate an initial service with station and track improvements at Gilroy and Salinas. TAMC is in the process of undertaking National Environmental Policy Act (NEPA) environmental review of the San Jose to Salinas segment, undertaking design work for capital improvements, purchasing right-of-way, and coordinating with the State and rail operators on a strategy for implementing service.



Monterey Branch Line.

TAMC purchased the Monterey Branch Line between Castroville and Monterey from UPRR in 2003 with the intention of reestablishing intercity passenger rail service between the San Francisco Bay Area and the Monterey Peninsula. TAMC subsequently adopted a preferred alternative for FTA Small Starts funding, identifying a light-rail commuter service on a segment between Marina and Monterey with a future connection to intercity passenger rail service at Castroville. Due to a lack of funding, though, this project has not progressed beyond the environmental stage. The Branch Line is currently being planned to include a commuter transit service guideway, and remains an opportunity for providing a future passenger rail service connection for popular tourist destinations on the Monterey Peninsula.

Santa Cruz Branch Line.

The Santa Cruz County Regional Transportation Commission (SCCRTC) purchased the Santa Cruz Branch Line between Watsonville and Davenport, which is currently an active freight short line serving local industries. SCCRTC completed a feasibility study of passenger service alternatives in 2015, including various options for providing commuter service between Santa Cruz and Watsonville, and connections to intercity passenger service at Pajaro/Watsonville, providing a reliable travel option in the congested Highway 1 corridor.



Coast Route Service North of San Luis Obispo.

The San Luis Obispo Council of Governments (SLOCOG), in coordination with its Central Coast Coordinating Council Partner agencies, has planned a once-daily intercity passenger rail service, referred to as the *Coast Daylight*. This service has been conceived as an extension of *Pacific Surfliner* service north of San Luis Obispo to San Jose or San Francisco, providing an additional passenger rail frequency on the Coast Route, with proposed stops in Paso Robles, King City, Soledad, Salinas, Castroville, Pajaro/Watsonville, and San Jose. Additional service in the Coast Route will provide passenger rail access to the State-supported rail network, including access to the Fort Hunter Liggett military installation outside of King City.

SLOCOG completed an EIS/EIR for the Coast Route in San Luis Obispo and Monterey Counties in 2015. This document encompassed a broad range of improvements identified in the Coast Corridor Service Development Plan completed by Caltrans in 2013, and in previous plans and studies.

Central Valley: Tulare Cross Valley Corridor

TCAG is preparing a Cross Valley Corridor Plan to improve transportation system connections and mobility by developing a short-line rail corridor between Huron and Porterville, a corridor that includes the proposed Kings/Tulare HSR Station and planned connections to the California HSR system. This corridor is planned to utilize existing rail right-of-way to provide passenger rail access to population centers in Kings-Tulare Counties, including the Lemoore Naval Air Station facility.

CROSS VALLEY
CORRIDOR PLAN

Xpress West and High Desert Corridor

This region encompasses the privately developed HSR route for service to Las Vegas, connecting to Victorville, and eventually to Palmdale. The developer of the Victorville to Palmdale segment (known as the High Desert Corridor [HDC]) has not been finalized and could be either public or private sector.

HSR to Arizona

The State envisions that a HSR line will eventually run between Phoenix and Los Angeles, serving the Coachella Valley. Caltrans has engaged with the Arizona Department of Transportation and the FRA to study and plan for service in this corridor. One result of the Southwest Multi-State Rail Planning Study was a recommendation for a Blue Ribbon Commission to guide the Los Angeles to Phoenix HSR planning. The Commission would engage a technical committee that will include planning and analysis from MPOs and the State to ensure network integration. The 2018 Rail Plan supports HSR to Arizona service with two actions: identifying the clear importance of service to Coachella Valley, and supporting the Blue Ribbon Commission and the opportunity for both states to invest in the corridor.

Commuter Rail

Commuter rail systems typically provide passenger service within a single region, and occasionally between regions. Service is more frequent during peak commuting periods. These commuter rail services are essential to supporting and connecting regional economies.

Commuter rail capital funding comes from federal, state, and local sources, while operating funding is the responsibility of local and regional entities. Exhibit 2.2 and Exhibit 2.3 map these commuter rail services. Appendix A discusses other transit services that connect to the commuter rail lines.

Commuter rail in California currently operates in five markets, as discussed in the following sections.

Caltrain

Caltrain offers service from San Francisco through the San Francisco Peninsula to San Jose and Gilroy. Ridership for FY 2016 was 19,233,427.[95]

Route Description. Caltrain operates 7 days a week on 77 miles of track owned by the PCJPB—from San Francisco to Tamien in San Jose—and by the UPRR from Tamien to Gilroy. Caltrain serves 32 stations in 19 cities between the cities of San Francisco, San Jose, and Gilroy in the counties of San Francisco, San Mateo, and Santa Clara. The system has a mixture of local, limited, and express trains. It serves work centers in San Francisco, the Peninsula, and Silicon Valley, including developing residential areas in southern Santa Clara County. Caltrain operates 92 weekday trains between San Francisco and San Jose. Of the 92 trains, 22 are express Baby Bullet (limited-stop express) trains that have only four to six stops between San Francisco and San Jose.[96] Weekdays, there is service at least every hour from 4 a.m. until midnight, with significantly higher frequencies during peak commute periods.

The system provides extensive weekend service, including 36 Saturday trains and 32 Sunday trains. The weekend service consists primarily of local trains operating between San Francisco and San Jose Diridon stations on 1-hour headways from 7 a.m. until 11 p.m. on Saturdays, and 8 a.m. to 10 p.m. on Sundays,[97] supplemented by four Baby Bullet trains. On weekends, buses provide a connection between San Jose Diridon and Tamien stations between approximately 7:30 a.m. and 10:30 p.m.



95 Caltrain, Ridership, 2016, accessed 2016.
96 Caltrain, Weekend Timetable, 2016, accessed 2016.
97 Caltrain, Weekend Timetable, April 2016, accessed 2016.

The ridership increased by 9 percent between FY 2014 and FY 2015, and 3.7 percent between FY 2015 and FY 2016, with a total of 19.2 million total passengers for FY 2016. The frequency is dependent on time of day and location of stations, with the peak hours and busiest stations receiving the most frequent service. Caltrain owns and operates 118 passenger cars and 29 locomotives.[98]

Travel Times. The current San Francisco to San Jose local trip time is 1 hour and 30 minutes. Caltrain also offers two express trains at various times during the daily schedule. The Limited Stop train has a travel time of approximately 1 hour and 15 minutes to 1 hour and 30 minutes from San Francisco to San Jose. The Baby Bullet train has a San Francisco to San Jose trip time of approximately 1 hour and 5 minutes.[99]

Proposed Improvement Strategies. Focused improvements in the Caltrain corridor include the electrification program and installation of the PTC system. These improvements increase corridor frequency, efficiency, and safety.

Altamont Corridor Express

ACE offers service from Stockton to San Jose via Livermore and Fremont. ACE ridership was approximately 1.3 million in FY 2015-2016.[100]

Route Description. ACE operates on weekdays on more than 85 miles of track owned by UPRR and PCJPB. ACE has just over 5,000 daily riders[101] and serves a total of 10 stations (Stockton, Lathrop/ Manteca, Tracy, Vasco Road, Livermore, Pleasanton, Fremont, Great America, Santa Clara, and San Jose). Free parking is available at all stations, except at the Santa Clara and San Jose stations, where there are daily fees of $4 and $3, respectively.

Travel Times. All westbound trips occur in the morning, with four total westbound trips departing Stockton between 4:20 a.m. and 7:05 a.m. All four eastbound trips occur in the evening, departing San Jose between 3:35 p.m. and 6:38 p.m. This schedule serves commuters working in San Jose, but also those commuting from the Central Valley to the Tri-Valley, and to BART for other Bay Area destinations. The running time between Stockton and San Jose is approximately 2 hours and 12 minutes.[102]

Proposed Improvement Strategies. ACE received TIRCP funding for platform lengthening, and has begun to expand capacity and access. This includes new locomotives capable of handling longer trains on the same schedule. Additionally, ACE was awarded $400 million from SB 1 for additional ACE*forward* improvements.



Metrolink

Metrolink offers a large network of commuter rail services between Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura Counties. Metrolink served approximately 10.9 million passengers in FY 2015-2016.[103]

Route Description. Metrolink currently operates 171 daily trains on weekdays, serving 60 stations on seven lines with more than 43,000 daily weekday passengers.[104] The seven lines and their approximate running times are shown in **Table A.5** in Appendix A.

Most weekday trains operate during peak commuting hours before 8:30 a.m. and after 3:30 p.m. Metrolink also provides Saturday and Sunday service on the Antelope Valley, San Bernardino, Orange County, Inland Empire-Orange County, and 91/Perris Valley lines.

98 Caltrain, Commute Fleet, April 2016, accessed 2016.

99 Caltrain, Weekday Timetable, April 2016, accessed 2017.

100 American Public Transportation Association, *Transit Ridership Report: Fourth Quarter* 2016, March 2017, accessed 2016.

101 American Public Transportation Association, *Transit Ridership Report: Fourth Quarter 2016*, March 2017, accessed 2016.

102 ACE Rail Schedule, October 2016, accessed 2016.

103 American Public Transportation Association, Transit Ridership Report: Fourth Quarter 2016, March 2017, accessed 2016

104 *ibid*

Metrolink has a total of 534 route-miles in the regional system; of those, 146 are shared route miles, where Metrolink trains share the track with freight and other passenger trains.[105] All Metrolink stations have ticket-vending machines. Stations on the Metrolink routes are owned by the cities or regional transportation agencies. More than 30,000 parking spaces are provided, the majority of which are free.

Travel Times. Current travel time from Los Angeles to San Bernardino is 1 hour and 43 minutes; from Los Angeles to Riverside is 1 hour and 28 minutes; and from Los Angeles to Perris is 2 hours and 13 minutes. All lines and their approximate running times are shown in **Table A.5** in Appendix A.

Proposed Improvement Strategies. Significant improvements are being realized through a majority replacement of the locomotive fleet with new Electro-Motive Diesel F-125 locomotives. Metrolink is also at the forefront of PTC completion, which will increase safety.



105 *ibid*

COASTER

COASTER commuter trains offer service along the San Diego County coastline, from Oceanside to San Diego, via Carlsbad, Encinitas, and Solana Beach. COASTER served 1,556,056 passengers in FY 2015-2016.[106]

Route Description. The COASTER serves an average of 5,700 weekday passengers at eight stations between San Diego and Oceanside on 41 route-miles. It runs 126 trains per week, primarily concentrated during peak periods.[107] Four round trips are operated on Saturdays, Sundays, and holidays. Additional service is provided in the spring and summer, and for special events such as home games at Petco Park for the San Diego Padres Major League Baseball franchise. All stations have free parking available, except downtown San Diego's Santa Fe Depot, where metered parking is available. Trains run between Oceanside and San Diego Santa Fe Depot from approximately 5:00 a.m. to 8:30 p.m.

Travel Times. Current travel time from Oceanside to San Diego is approximately 1 hour.

Proposed Improvement Strategies. Partner agencies are investing in corridor projects to expand single-track sections to double-track to improve service via increased frequency, speed, and reliability.



106 NCTD, Personal Communications, May 2017.
107 COASTER, *Fact Sheet,* 2016, accessed 2016.

Sonoma-Marin Area Rail Transit

SMART is a voter-approved commuter rail service that runs (in an initial segment) from Santa Rosa to San Rafael. Rail service on the initial segment commenced in August 2017.

Route Description. SMART's initial segment runs 43 miles from Sonoma County Airport in Santa Rosa, south to San Rafael Transit Center, with eight intermediate stops. Trains began commercial operations on August 25, 2017. The service will eventually serve 14 stations along 70 miles of rail, from Cloverdale to Larkspur Landing, where it will connect with commuter Golden Gate ferries to/from San Francisco; although the first phase in operation is from Santa Rosa Airport to San Rafael, a 43-mile section. The project aims to bring the publicly owned Northwestern Pacific Railroad alignment into passenger use to encourage modal shift and relieve traffic on Highway 101. Passenger service beyond the initial operating will be extended as funding becomes available.[108]

Seven self-propelled DMU trainsets, each with two cars, operate along the initial segment. Trains run every 30 minutes in both directions during peak weekday hours, with one mid-day trip scheduled. SMART provides weekend service.

Travel Times. SMART launched passenger service in August 2017. The travel time from the northernmost station, Sonoma County Airport, to the southernmost station, San Rafael, is 1 hour and 7 minutes.

Proposed Improvement Strategies. The key improvements to this corridor include extensions to Cloverdale and Larkspur, adding service for additional markets and connections to the Bay Area.



108 Sonoma-Marin Area Rail Transit, Website, 2016, accessed 2016

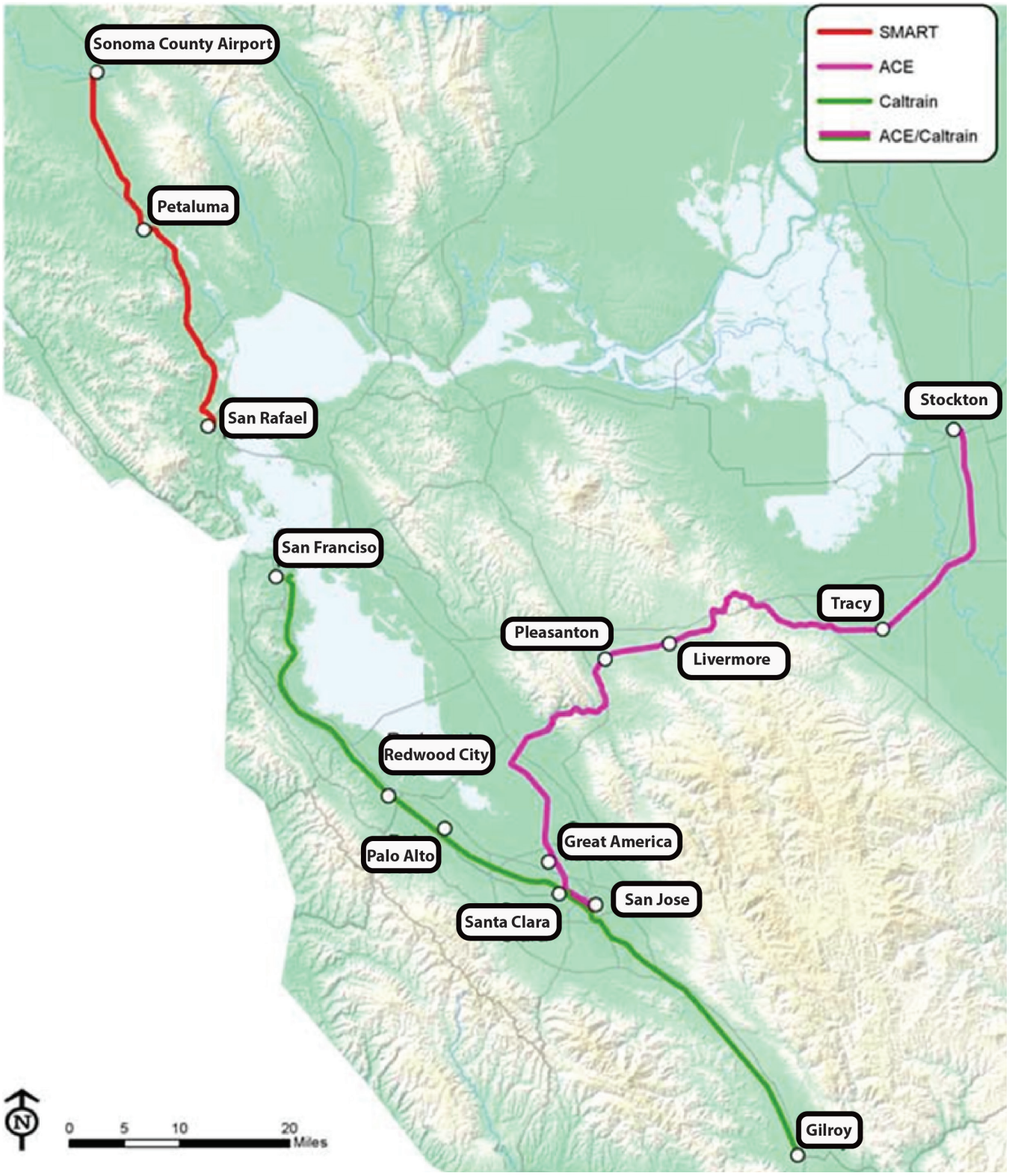


Exhibit 2.3: Existing Services as Part of the 2022 Vision (Northern California)

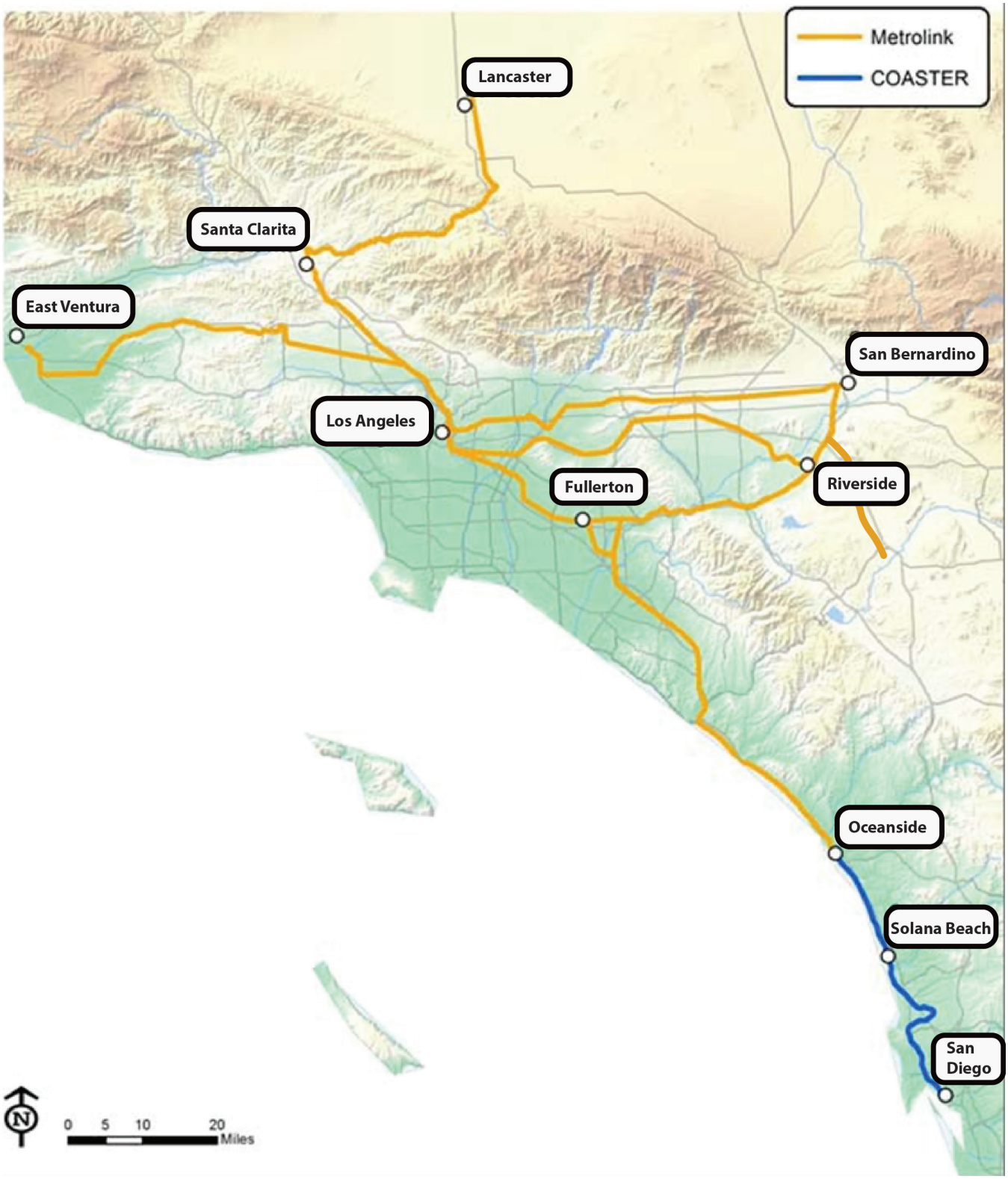


Exhibit 2.4: Existing Services as Part of the 2022 Vision (Southern California)

Commuter Rail: Service Providers

The five regional commuter systems serve the metropolitan areas of the San Francisco Bay Area, Los Angeles, and San Diego. Exhibits 2.2 and 2.3 provide maps of these services. These commuter rail services are overseen by various administrative structures, including JPAs and districts, composed of representatives from their rail service area. Appendix A, **Table A.6,** summarizes California's commuter rail services, routes, and administrators; and Table 2.3 provides ridership history for the services. Commuter rail services support multimodal transportation options, and their connections to longer-distance rail facilitate travel to statewide destinations.

All of the commuter rail operators contract with a private entity or entities, or Amtrak, to provide operations and equipment maintenance. Such an arrangement provides flexible opportunities to provide the best service to customers at the lowest cost, while minimizing risk.

Commuter rail services are currently provided by a variety of management structures, including JPAs and transit districts.

Peninsula Corridor Joint Powers Board (Caltrain)

The PCJPB owns and operates the Caltrain commuter rail service between San Francisco and Gilroy, which serves San Francisco, San Mateo, and Santa Clara Counties. Passenger rail has been continuously operating for more than 150 years. PCJPB's Board of Directors includes nine members who represent San Francisco County (and City), San Mateo County, and Santa Clara County.[109] Public involvement with the service began in 1980, when Caltrans contracted with the Southern Pacific Railroad to fund operations. In 1987, the PCJPB was formed to manage the line. The PCJPB bought the railroad right-of-way in 1991, and subsequently extended service to Gilroy. Service is provided by a private operator under contract to the PCJPB.

Southern California Regional Rail Authority (Metrolink)

SCRRA operates and governs Metrolink. SCRRA's eleven-member Board of Directors represents five county agencies (LA Metro, OCTA, RCTC, San Bernardino County Transportation Authority, and Ventura County Transportation Commission).[110] Metrolink serves six counties, and currently operates a network of more than 500 route-miles. A substantial portion of the service is operated on publicly owned lines, but services are also provided on lines owned and operated by BNSF and UPRR.

San Joaquin Regional Rail Commission

SJRRC owns, operates, and makes policy for ACE. The San Joaquin Council of Governments appoints the Board of Directors, which governs SJRRC. Board selections are made based on nominations by local governments.[111] UPRR is the primary track owner, and PCJPB owns the track between Santa Clara and San Jose.

North County Transit District (COASTER)

NCTD operates the COASTER along with the BREEZE bus service and SPRINTER light-rail service. The NCTD Board of Directors includes members from incorporated cities in its jurisdiction, along with the Fifth District County Supervisor, who represents unincorporated areas of the jurisdictions and the cities of Carlsbad, Oceanside, Vista, and San Marcos.[112] NCTD is the primary track owner, and the SDMTS is a track owner in San Diego.

109 Caltrain, Board of Directors, 2017, accessed 2017.

110 Metrolink, About Metrolink, 2017, accessed 2017.

111 ACE, Board of Directors, 2017, accessed 2017.

112 NCTD, Board of Directors, 2017, accessed 2017.

Sonoma-Marin Area Rail Transit District

The SMART District currently oversees the development, planning, and operation of the SMART rail service. SMART's twelve-member Board is composed of two county supervisors from both Marin County and Sonoma County, three City Council members from each county, and two Golden Gate Bridge District members.[113]

Overall, commuter rail ridership has continued to grow over the past decade. Table 2.3 shows that annual ridership for the state's four commuter rail operators increased by more than 11 million trips since 2005. FY 2015 ridership was 33.3 million across the four lines. Caltrain ridership grew the fastest. With an express service (i.e., the Baby Bullet) and a resurgent job market, it nearly doubled ridership from 2005 to 2015.

Table 2.3: Historical Annual Ridership Information for California's Commuter Rail Operators

State Fiscal Year	ACE [a]	Caltrain [b]	COASTER [c]	Metrolink [d]	Total Commuter Rail Ridership
2005	941,693	9,454,467	1,432,468	9,946,566	21,775,194
2006	708,274	10,148,616	1,554,450	10,584,078	22,995,418
2007	805,257	10,980,802	1,560,729	11,026,264	24,373,052
2008	797,253	11,961,717	1,686,015	12,013,206	26,458,191
2009	683,190	12,691,717	1,501,619	12,332,037	27,208,563
2010	676,958	11,967,716	1,271,620	11,325,800	25,242,094
2011	838,750	12,673,420	1,390,142	11,142,645	26,044,957
2012	786,947	14,134,117	1,624,211	11,977,540	28,522,815
2013	940,774	15,595,559	1,629,196	12,112,826	30,278,355
2014	1,713,664	17,029,447	1,673,816	11,769,645	32,186,572
2015	1,244,309	18,567,173	1,641,525	11,826,382	33,279,389
2016	1,295,500	19,233,427	1,556,056	10,903,000	32,987,983

Note: Map excludes SMART, whose revenue operations will begin in 2017.

[a] Ridership data for 2004 to 2008: California State Controller's Office, Transit Operators and Non-Transit Claimants Annual Report. Other years: State Controller's Office, Open Data website, 2016. Accessed 2016.

[b] Caltrain, Personal Communications (2016).

[c] NCTD, Personal Communications (2016).

[d] Metrolink, Monthly Line Ridership Reports. Accessed 2016.

113 SMART, Who We Are, 2017, accessed 2017.

Urban Rail Systems

Urban rail systems provide passenger service within a metropolitan area. Urban rail service exists in a number of different forms for varying purposes, and includes high-capacity, high-speed heavy-rail transit service (i.e., subways and elevated trains); lower-speed, lower-capacity streetcars and cable cars offering localized service (and often sharing roadways with motor vehicles); and light-rail systems, which offer capacities and speeds between those of heavy rail and streetcar systems. There are seven different agencies:

- Bay Area Rapid Transit (BART),
- Los Angeles County Metropolitan Transportation Authority (Metro)
- Sacramento Regional Transit (RT)
- San Francisco Municipal Transportation Agency (SFMTA)
- Santa Clara Valley Transportation Authority (SCVTA)
- North County Transit District (NCTD)
- San Diego Metropolitan Transit System (SDMTS)

These agencies offer nine urban rail transit systems, including two heavy-rail transit systems, five light-rail transit systems, and one cable car system. Table 2.4 details urban rail services by operator. Connections to commuter and intercity rail systems provide convenient access for passengers traveling long distances with rail.



Table 2.4: Existing Urban Rail Systems in California[114]

Type	Operator	Service Name	Service Area
Heavy-Rail Transit	**BART**	*BART* Green Line	Warm Springs/South Fremont (Berryessa)[a] – Oakland – San Francisco – Daly City
		Orange Line	Richmond – Oakland – Warm Springs/South Fremont (Berryessa)
		Red Line	Richmond – San Francisco – Daly City – Millbrae
		Blue Line	Dublin/Pleasanton – Oakland – San Francisco – Daly City
		Yellow Line	Pittsburg/Bay Point – San Francisco – San Francisco Airport – Millbrae
	LA Metro	*Metro Rail:* Red Line	Los Angeles – Hollywood – North Hollywood
		Purple Line	Los Angeles – Westlake – Wilshire/Western

[a] Berryessa BART will be operational in 2018.

114 Sources: BART, LA Metro, RT, SFMTA, SCVTA, and SDMTS, 2016.

Table 2.4: Existing Urban Rail Systems in California (continued)

Type	Operator	Service Name	Service Area
Light-Rail Transit	**RT**	RT Light Rail: Gold Line	Downtown – Sunrise – Folsom
		Blue Line	Watt/I-80 – Downtown – Consumnes River College
		Green Line	Downtown Sacramento – Richards Boulevard.
	SFMTA	*San Francisco Municipal Railway (Muni):* F – Market-Wharves (Streetcar Line)	Fisherman's Wharf – Castro
		J – Church	Ferry Building – Noe Valley – Balboa Park
		K – Ingleside	Ferry Building – Ingleside District – Balboa Park
		L – Taraval	Ferry Building – San Francisco Zoo
		M – Oceanview	Ferry Building – Oceanview District – Balboa Park
		N – Judah	Caltrain Station – Ocean Beach
		T – Third Street	Castro Station – Bayshore
	SCVTA	*SCVTA Light Rail:* 900: Almaden to Ohlone/ Chynoweth	Almaden – Ohlone/Chynoweth
		901: Santa Teresa to Alum Rock	Santa Teresa – Ohlone/Chynoweth – San Jose – Tasman – Alum Rock
		902: Mountain View to Winchester	Mountain View – Tasman – San Jose – Winchester
	LA Metro	*Metro Rail:* Blue Line	Los Angeles – Compton – Long Beach
		Gold Line	East Los Angeles – LAUS – Pasadena – Azusa
		Green Line	Redondo Beach – Aviation/Los Angeles International Airport (LAX) – Lynwood-Norwalk
		Expo Line	Los Angeles – Crenshaw – Culver City – Santa Monica
	NCTD	SPRINTER	Oceanside – Vista – San Marcos – Escondido
	SDMTS	*San Diego Trolley:* Blue Line	San Diego – San Ysidro
		Orange Line	San Diego – El Cajon
		Green Line	San Diego – Qualcomm – San Diego State University – Santee
Cable Car	**SFMTA**	*Muni Cable Car:* California Street	Embarcadero Station – California Street – Van Ness
		Powell-Mason/Hyde	Powell Street – Mason Street – Taylor/Bay Street, Powell Street – Hyde Street – Victorian Park



Excursion Passenger Rail Services

Excursion railroads typically serve recreational trips and provide an alternative to automobile travel for tourists visiting scenic destinations throughout the state. They also provide an educational function, helping visitors understand what rail travel was like in previous generations. Often, visitors ride in historic railroad passenger cars pulled by diesel locomotives—and in some cases, by steam locomotives. Many excursion railroads operate in California, including the Sierra Railroad; the Fillmore and Western Railway; the Santa Cruz & Monterey Bay Railway; the Santa Cruz, Big Trees, & Pacific Railway; the Sacramento Southern Railroad; and the Napa Valley Wine Train. These railroads are sometimes referred to as heritage railroads. In addition, regular seasonal charter trains operate to serve markets such as the Reno and Lake Tahoe area, often using a combination of Amtrak and private rail equipment.

Passenger Intermodal Facilities

Many passenger intermodal facilities throughout California facilitate transfers between intercity rail, commuter rail, and bus/rail transit. Most Amtrak stations in California offer transit connections, while several key intermodal hubs offer transfers to other travel modes. Table 2.5 details key passenger intermodal facilities and their location, and available connections to Amtrak other travel modes.

California's rail system also facilitates connections to state airports. Appendix A, **Table A.6**, indicates rail corridors serving California's major commercial airports.



The Napa Valley Wine Train serves recreational trips in the Napa Valley wine country
Source: https://commons.wikimedia.org/

Table 2.5: Key Passenger Rail Intermodal Facilities[115]

Facility Name	Location	Connecting Amtrak Services	Connecting Commuter Rail/Transit Services	Other Connections
Anaheim – Anaheim Regional Transportation Intermodal Center Station	Anaheim	*Pacific Surfliner*	Metrolink, OCTA buses	Anaheim Resort Transit to Disneyland
Bob Hope Airport Regional Intermodal Transportation Center	Burbank	*Pacific Surfliner*, Amtrak Thruway bus	Metrolink, LA Metro buses, Burbank Bus shuttle connection to LA Metro Red/ Orange Line	Bob Hope Airport
Emeryville Amtrak	Emeryville	*Capitol Corridor, Coast Starlight, San Joaquins, California Zephyr,* Amtrak Thruway bus	Alameda-Contra Costa Transit District (AC Transit) buses, Emery-Go-Round	San Francisco
LAUS	Los Angeles	*Pacific Surfliner, Southwest Chief, Sunset Limited,* Amtrak Thruway bus	Los Angeles Department of Transportation (LADOT) Downtown Area Short Hop (DASH); LA Metro buses and Gold, Red, and Purple Line rail; Metrolink; municipal buses	LAX (via FlyAway shuttle)
Millbrae Intermodal Terminal	Millbrae	N/A	BART, Burlingame Trolley, Caltrain, San Mateo County District (SamTrans) buses	San Francisco International Airport (via BART)
Oakland Coliseum	Oakland	*Capitol Corridor*	BART, AC Transit buses	Oakland Airport shuttle
Oceanside Transportation Center	Oceanside	*Pacific Surfliner, Coast Starlight,* Amtrak Thruway bus	COASTER, Metrolink, NCTD buses, Riverside Transit, SPRINTER	BREEZE Buses
Old Town San Diego	San Diego	*Pacific Surfliner*	COASTER, SDMTS Trolley and buses	
Richmond Amtrak/BART Station	Richmond	*Capitol Corridor, San Joaquins*	BART, AC Transit buses	N/A
Sacramento Valley Station	Sacramento	*Capitol Corridor, Coast Starlight, San Joaquins, California Zephyr,* Amtrak Thruway bus	RT light rail and buses, Roseville Transit Kings' game day service	N/A
Santa Clara Station	Santa Clara	*Capitol Corridor,* Amtrak Thruway bus	ACE, Caltrain, SCVTA light rail and buses	SJC Airport (via SCVTA)
Santa Fe Depot	San Diego	*Pacific Surfliner,* Amtrak Thruway bus	SDMTS trolley/light rail and buses	San Diego Airport (via SDMTS)
San Jose Diridon Station	San Jose	*Capitol Corridor, Coast Starlight,* Amtrak Thruway bus	ACE, Caltrain, Santa Cruz METRO and Monterey-Salinas Transit buses, SCVTA light rail and buses	N/A
Stockton ACE	Stockton	*San Joaquins,* Amtrak Thruway Bus	ACE, San Joaquin Regional Transit District buses	N/A
San Ysidro	San Diego	N/A	SDMTS trolley/light rail and buses	Tijuana Airport, United States-Mexico border connection

115 Source: Cambridge Systematics, Inc., 2016.

2.1.2 Existing State-Supported Intercity Rail Performance

This section presents performance information for the three State-supported intercity passenger rail routes. Appendix A provides more detailed passenger rail system performance data.

Service Performance of State-Supported Routes

Table 2.6 presents historic intercity passenger rail ridership and service levels on State-supported routes. *Pacific Surfliner* ridership increased by 10 percent from FFY 2006-2016, to more than 2.9 million. *San Joaquins* ridership increased 40 percent over the same period, with a ridership of 1.1 million in FFY 2016. Capitol Corridor ridership increased 23 percent, with a ridership of more than 1.5 million in FFY 2016.[116] During the recession, ridership for the commuter-heavy *Pacific Surfliner* and *Capitol Corridor* dipped more than ridership for the *San Joaquins*.

Ridership across the three routes increased 19 percent between FFY 2006 and FFY 2016, and was more than 5.5 million in FFY 2016. The largest single-year ridership decrease occurred in FFY 2009 (8 percent), and the largest single-year increase occurred in FFY 2008 (12 percent).

Table 2.6 also presents passenger mile and OTP. A passenger mile is equivalent to 1 mile traveled by one passenger. OTP is the percentage of instances in which a train arrives on time at a station, where on time is defined as a deviation from schedule of 15 minutes or less. "Frequency" refers to the number of round trips per day.

Table 2.7 displays the financial and operational performance of the State-supported routes. Both revenues and expenses grew substantially over the period from FFY 2006 to FFY 2016. However, expenses grew at a slower rate, resulting in an increasing farebox ratio (the total fare revenue divided by total operating expenses, a metric that shows the fraction of operating expenses that are met by passenger fares). Across the three lines, revenues increased by 100 percent over the period, to approximately $150.3 million in FFY 2016; and expenses increased by 50 percent, to approximately $236 million. In FFY 2014, under the requirements of Section 209 of PRIIA, the State assumed responsibility for 100 percent of the operating costs on the *Pacific Surfliner*; therefore, both revenues and expenses increased significantly, beginning in that year. Farebox ratios during the last 10 years grew from 56.4 percent to 78.8 percent for *Pacific Surfliner*, 46 percent to 49.6 percent for *San Joaquin*, and 38.6 percent to 56.3 percent for *Capitol Corridor*.



116 Amtrak began adjusting Capitol Corridor ridership numbers in FY 2014 onwards to account for actual ticket scans. Previous estimations made usage assumptions about multi-ride tickets, and these estimates were inflated. The current method results in reported ridership being 15 to 20 percent lower than prior years. CCJPA, Capitol Corridor Intercity Passenger Rail Service Business Plan Update FY 2016-17 – FY 2017-2018 Final Draft, February 2016, accessed 2017.

Table 2.6: State-Supported Routes – Ridership and Service Levels[117]

	Actual											
	FFY 05	FFY 06	FFY 07	FFY 08	FFY 09	FFY 10	FFY 11	FFY 12	FFY 13	FFY 14	FFY15	FFY 16
***Pacific Surfliner* Route**												
Annual Ridership (thousands)[a]	2,520	2,658	2,707	2,899	2,593	2,614	2,787	2,640	2,706	2,681	2,827	2,924
Annual Passenger Miles (thousands)	201,915	218,372	222,446	240,761	213,656	215,640	230,759	223,501	232,276	205,497	241,451	251,650
OTP	72.90%	76.10%	74.80%	76.1%	83.1%	76.3%	77.5%	75.5%	84.8%	77.0%	77.9%	78.1%
***Frequency (Round Trips)*[b]**												
San Diego – Los Angeles[c]	11	11	11	11	11	11	11	11	11	11	11	11
Los Angeles – Goleta	5	5	5	5	5	5	5	5	5	5	5	5
Goleta – San Luis Obispo	2	2	2	2	2	2	2	2	2	2	2	2
***San Joaquins* Route**												
Annual Ridership (thousands)	756	800	805	950	929	978	1,067	1,145	1,220	1,188	1,177	1,122
Annual Passenger Miles (thousands)	115,621	120,615	120,914	139,005	133,712	139,405	156,428	166,337	170,076	165,538	164,250	155,936
OTP	63.50%	62.60%	67.90%	82.6%	89.6%	90.7%	89.5%	88.1%	77.7%	75.4%	73.4%	83.2%
Frequency (Round Trips)												
Oakland – Bakersfield[f]	4	4	4	4	4	4	4	4	4	4	4	5
Sacramento – Bakersfield	2	2	2	2	2	2	2	2	2	2	2	2
***Capitol Corridor* Route**												
Annual Ridership (thousands)[d]	1,260	1,274	1,450	1,694	1,600	1,581	1,709	1,746	1,701	1,419	1,475	1,561
Annual Passenger Miles (thousands)	85,906	86,519	96,343	109,882	102,283	101,251	109,074	111,191	112,158	96,161	98,943	104,135
OTP	84.70%	72.70%	74.60%	86.0%	92.3%	93.1%	94.9%	93.9%	95.0%	95.3%	93.0%	94.1%
Frequency (Round Trips)												
San Jose – Oakland	4	7	7	7	7	7	7	7	7	7	7	7
Oakland – Sacramento[d]	12	16	16	16	16	16	16	15	15	15	15	15
Sacramento – Auburn	1	1	1	1	1	1	1	1	1	1	1	1
State-Supported Route Summary												
Annual Ridership (thousands)	4,537	4,731	4,962	5,542	5,122	5,172	5,563	5,531	5,627	5,288	5,479	5,607
Annual Passenger Miles (thousands)	403,442	425,506	439,704	489,648	449,651	456,296	496,260	501,029	514,510	467,196	504,644	511,721

a Total ridership, including State and Amtrak shares.
b Service frequencies shown are for weekday service.
c One additional weekend round trip. Approximately 12 weekend round trips.
d See earlier footnote about Capitol Corridor ridership reporting methodology changing in FY 2014 to reflect actual ticket scans. Change resulted in 15-20% lower reported ridership.
e End point OTP.
f Starting in June 2016, the *San Joaquins* began offering 5 Oakland-Bakersfield round trips per day.

117 Sources: Caltrans rail operational database.

Table 2.7: State-Supported Routes – Financial Operational Performance [118]

	Actual											
	FFY 05	**FFY 06**	**FFY 07**	**FFY 08**	**FFY 09**	**FFY 10**	**FFY 11**	**FFY 12**	**FFY 13**	**FFY 14**	**FFY15**	**FFY 16**
Revenue (Million Dollars)												
Pacific Surfliner (State Portion)	$28.10	$32.60	$35.50	$38.30	$34.90	$35.80	$40.30	$43.09	$46.38	$70.40	$75.80	$79.47
San Joaquins	$23.30	$26.50	$26.40	$31.30	$29.60	$33.20	$37.80	$41.09	$41.83	$41.22	$40.46	$38.67
Capitol Corridor	$15.20	$16.00	$19.30	$23.80	$23.50	$24.20	$27.10	$29.49	$29.19	$29.23	$30.09	$32.19
Total Revenue	**$66.60**	**$75.10**	**$81.20**	**$93.3**	**$88.00**	**$93.20**	**$105.30**	**$113.67**	**$117.40**	**$140.85**	**$146.35**	**$150.33**
Expenses (Million Dollars)												
Pacific Surfliner (State Portion)	$49.20	$57.80	$56.90	$63.00	$61.60	$67.00	$69.80	$72.88	$73.76	$102.73	$110.00	$100.90
San Joaquins	$50.80	$58.20	$60.60	$68.30	$65.10	$67.80	$69.80	$73.09	$73.26	$81.86	$80.02	$78.04
Capitol Corridor	$39.30	$41.50	$46.00	$53.30	$51.00	$53.90	$57.90	$59.41	$58.64	$57.71	$58.06	$57.14
Total Expenses	**$139.30**	**$157.50**	**$163.50**	**$184.7**	**$177.7**	**$188.7**	**$197.5**	**$205.38**	**$205.66**	**$242.30**	**$248.08**	**$236.08**
Farebox Ratio												
Pacific Surfliner	57.10%	56.40%	62.40%	60.8%	56.6%	53.5%	57.7%	59.1%	62.9%	68.5%	68.9%	78.8%
San Joaquins	44.50%	46.00%	45.50%	45.8%	45.5%	48.9%	54.2%	56.2%	57.1%	50.4%	50.6%	49.6%
Capitol Corridor	36.60%	38.60%	41.90%	44.6%	46.1%	44.9%	46.9%	49.6%	49.8%	50.6%	51.8%	56.3%
State Costs (Million Dollars)												
Existing Routes												
Pacific Surfliner	$21.20	$25.20	$21.40	$24.7	$26.8	$31.2	$29.6	$29.7	$27.4	$32.3	$34.2	$32.55
San Joaquins	$27.40	$31.70	$34.20	$37.1	$35.5	$33.6	$32.0	$32	$31.4	$40.6	$40.1	$43.44
Capitol Corridor	$24.10	$25.50	$26.70	$29.6	$27.5	$29.7	$30.2	$29.9	$29.5	$28.5	$27.96	$33.01
Subtotal	**$72.70**	**$82.40**	**$82.30**	**$91.3**	**$89.7**	**$94.5**	**$91.7**	**$91.6**	**$88.3**	**$101.4**	**$102.26**	**$109.00**
Equipment Heavy Overhaul	$13.50	$13.80	$14.00	$13.8	$13.2	$12.7	$16.1	$2.6	$4.2	$1.6	$1.7	$0
Total	**$86.20**	**$96.20**	**$96.30**	**$105.1**	**$102.9**	**$107.2**	**$107.8**	**$94.2**	**$92.5**	**$103**	**$103.96**	**$109.00**

118 Source: Caltrans rail operational database.

2.1.3 California's Freight Railroad System

California's freight railroad system links industries and consumers throughout the state with North American and overseas markets. The 5,295-mile freight rail system is central to the handling of the state's international trade, and plays a central role in maintaining the competitiveness of some of its principal freight-oriented industries. In 2013, the base year for the Rail Plan, California's rail network handled 159.6 million tons of commodities, of which 60.9 million tons originated, and 103.7 million tons terminated, in California.[119] According to the Association of American Railroads (AAR), California ranked eighth among states in terms of rail tons originated in 2012.[120]

Railroads are commonly characterized in the context of revenues, with Class I being the largest, and Class III being the smallest. BNSF and UPRR, two Class I railroads, each with annual revenues of more than $475 million (2013), provide service throughout the state. Class II carriers have revenues between $38.05 million and $475.75 million (2013); there are no Class II railroads in California. Finally, with revenues of less than $38.05 million (2013), Class III carriers, commonly referred to as "short lines," provide service to various communities across the state. In 2016, a total of 27 short lines, including seven terminal and switching railroads, operated in the state. All freight railroads serving the state, along with their parent company (if they have one) and route mileage operated (miles owned plus trackage rights), are listed in Table 2.8.

California's Class I and publicly owned rail network is displayed in Exhibit 2.4, and short lines operating in the state are shown in Exhibit 2.5. The vast majority of the route-miles in this network (3,871 miles) is owned by the two Class I railroads, BNSF and UPRR, followed by short lines (1,296 route-miles). Public ownership accounts for almost 700 miles, most of which are concentrated around the state's major metropolitan areas in Southern California and the Bay Area. Because the publicly owned lines are Class I spin-offs of the former Atchison Topeka and Santa Fe Railway and the former Southern Pacific Railroad, successors BNSF and UPRR continue to hold trackage rights over most of the existing mileage. In some instances, these rights have been ceded or transferred to short-line operators.

Union Pacific Railroad

UPRR operates 32,000 route-miles of track across 23 states, and is California's largest railroad in terms of volume, employees, and mileage. In 2015, with a workforce of about 5,000 employees, UPRR's California operations handled more than 3 million carloads on a network of almost 3,300 miles.[121]



119 AAR, AAR Fact Sheet, California (2013).

120 AAR, AAR State Rankings 2012.

121 UPRR, California Fact Sheets, 2015; 10-K Filings (2011).

Table 2.8: California's Freight Railroads[122]

Name	Standard Carrier Alpha Code	Parent Company	Total Miles Operated[b]
BNSF Railway	BNSF	Berkshire Hathaway	2,114
UPRR	UPRR	Independent	3,292
Class III Railroads (Short Lines)			
– Local Railroads			
Arizona & California Railroad Company	ARZC	Genesee & Wyoming Inc.	190 (84 in CA)
California Northern Railroad	CFNR	Genesee & Wyoming Inc.	210
Central Oregon & Pacific Railroad	CORP	Genesee & Wyoming Inc.	305 (56 in CA)
Fillmore and Western[a]	FWRY	Independent	28
Lake County Railway	LCR/LCY	Frontier Rail	54
Napa Valley Wine Train[a]	NVRR	Independent	18
Northwestern Pacific Co.	NWP	Independent	63
Pacific Sun Railroad, LLC	PSRR	Watco	62
Sacramento Southern Railroad	SSR	State of California	3
Sacramento Valley Railroad	SAV	Patriot Rail	7
San Diego & Imperial Valley Railroad	SDIY	Genesee & Wyoming Inc.	1
San Joaquin Valley Railroad Company	SJVR	Genesee & Wyoming Inc.	297
San Francisco Bay Railroad	SFBR	Independent	7
Santa Cruz, Big Trees & Pacific Railway	SCBG	Roaring Camp, Inc.	9
Santa Cruz and Monterey Bay Railway Company	SCMB	Iowa Pacific Holdings	31
Santa Maria Valley Railroad	SMVRR	Independent	14
Sierra Northern Railway	SERA	Independent	68
Stockton Terminal and Eastern Railroad	STE	OmniTrax	25
Trona Railway Company	TRC	Searles Valley Minerals/Nirma	31
Ventura County Railroad Company	VCRR	Genesee & Wyoming Inc.	9
West Isle Line, Inc.	WFS	Western Farm Service	5
– Switching and Terminal Railroads			
Central California Traction	CCT	BNSF/UPRR	96
Los Angeles Junction Railway Company	LAJ	BNSF	64
Modesto & Empire Traction Company	MET	Independent	49
Oakland Terminal Railway	OTR	BNSF/UPRR	10
Pacific Harbor Line, Inc.	PHL	Anacostia & Pacific	59
Quincy Railroad	QRR	Independent	3
Richmond Pacific Railroad Corporation	RPRC	Independent	6

[a] Primarily passenger operator, but does handle some freight.
[b] Includes trackage rights.
Note: The table does not include freight railroads that operate solely for the purpose of its owner. These include CEMEX's South Western Portland Cement Railroad, U.S. Gypsum's operation near Plaster City, and several railroads operating on military facilities.

122 Sources: American Short Line and Regional Railroad Association, AAR, carrier Interviews 2016.



Exhibit 2.5: Class I and Public Agency Owned Rail System



Exhibit 2.6: Short Line and Switching and Terminal Freight Railroads [123]

Note: Exhibit shows short lines mentioned in Table 2.8.

123 Rail lines with less than 10 miles of track are not shown on the map.

Today, UPRR operates an expansive rail line network that serves California's diverse regions, including the agriculturally rich San Joaquin Valley, the Port of Oakland, the San Francisco Bay Area, and the Los Angeles metropolitan area. For its carload services, UPRR operates two system classification yards at West Colton in southern California and Roseville in northern California; and three regional yards in Lathrop (San Joaquin County), Commerce (Los Angeles County), and Yermo (San Bernardino County). Intermodal services are available at six dedicated terminals, in Oakland, Stockton, and the Los Angeles and Long Beach region. UPRR also has shared use of the on-dock rail terminals at POLA and POLB, which are discussed in more detail in Section 2.1.5. In California, UPRR holds trackage rights over BNSF in various locations, most notably between San Bernardino and Yermo over Cajon Pass.

BNSF Railway Company

BNSF is North America's largest intermodal carrier, handling more than 4.9 million trailers and containers in 2015 in the United States, compared to UPRR's 3.9 million.[124][125] BNSF operates more than 32,000 route-miles of track throughout the United States across 28 states. In addition to its own routes, BNSF holds trackage rights over the UPRR between Salt Lake City and the San Francisco Bay Area, Tehachapi Pass between Bakersfield and Mojave, and in the Central Valley.

BNSF operates more than 2,114 route-miles in California, with a workforce of almost 3,500 employees. These operations occur on 1,149 miles owned by BNSF and 965 miles of line on which BNSF holds trackage rights. BNSF moves about 3.9 million carloads per year in California.[126] Major BNSF freight hubs include the major system yard at Barstow, five dedicated intermodal terminals, and shared on-dock rail facilities at POLA and POLB. There are a total of 11 carload yards located in the cities of Bakersfield, Barstow, Commerce, Needles, Riverbank, San Bernardino, San Diego, Stockton, and Wilmington. The five intermodal facilities are in Fresno, Richmond, San Bernardino, Stockton, and Los Angeles.[127]

California serves as the western anchor of BNSF's Transcontinental Corridor route, which links Southern and Northern California with Chicago. On this corridor, consumer products—including everything from food and automobile products to agricultural and industrial products—represent the majority of BNSF's transported commodities.[128]

Class III Short Lines (Local, Terminal, and Switching Railroads)

California's 20 local railroads and seven switching and terminal railroads are a diverse group, varying widely in terms of mileage, ownership, traffic volumes, and markets served. Although some, such as the Santa Maria Valley Railroad, the Trona Railway, and the Modesto & Empire Traction Company, have been longstanding fixtures in California's rail map, many more came into existence during the industry restructuring of the 1980s and 1990s, when the Class I railroads streamlined their networks by selling off or abandoning light-density lines. Since then, the short-line sector has consolidated, with the majority of carriers coming under the control of a handful of holding companies. In California, as in the rest of the United States, the largest short-line operator is Genesee & Wyoming, operating six of the 20 short lines; and 657 miles, or 51 percent of the total short-line mileage. Other holding companies, such as Watco, Omnitrax, and Patriot Rail, are also present in California, with each operating only one railroad. Also, BNSF and UPRR continue to own three switching railroads (two of them jointly).

With the exception of Pacific Harbor Line, which handles container traffic at the San Pedro Bay ports, the State's short lines focus on carload traffic. By providing "last mile" service to many smaller shippers in the state's rural communities, they ensure continued access to rail service and facilitate economic development. Tourist passenger service is also part of the business mix for several short lines; for a few, such as the Napa Valley Railroad and the Fillmore and Western, it is their primary business.

124 UPRR, Union Pacific Railroad: Weekly Carloads and Intermodal Traffic Report, Week 52 (Week of December 27, 2015 through January 2, 2016; Week of December 28, 2014 through January 3, 2015).

125 BNSF Railway, BNSF Railway: Weekly Intermodal and Carload Units Report Week 52 (Week ending January 2, 2016; Week ending January 3, 2015).

126 BNSF, California 2015 Fact Sheet (2015).

127 *ibid*

128 BNSF, State Fact Sheet for the State of California (2010).

Short Line Trends

The vast majority (89 percent) of rail traffic tonnage in California is handled entirely by the Class I railroads. In part, the high volume of intermodal freight drives the high Class I share, traffic that short lines commonly do not handle. The situation is different for carload traffic, where almost one in five (19 percent) originated carloads begin their trip on a short line. Eight percent of carloads end their trip on a California short line. For the more rural regions of the state, short lines take on even greater importance as a means to accessing rail service. As shown in Table 2.9, upwards of 41 percent of all carload traffic originating in the Central Valley is on short lines. In Northern California, more than one out of four carloads begin or end their trip on a short line.

Short lines are responsible for transporting most of the alcoholic beverages (93 percent) and fuel oils (78 percent) originating in California. They are also responsible for transporting more than half of the transportation equipment (52 percent), and almost a third of fertilizers (28 percent) terminating in California.

Because carload traffic is projected to increase by more than 50 percent between 2013 and 2040, (Table 2.9) short lines will need to grow to handle the increasing carload traffic.

Short Line Performance

It is apparent that some short lines operating in California are not meeting critical volume thresholds, and services and investment in track and equipment are declining. Concurrently, short line railroads are facing pressure for investment to remain competitive with the Class I railroads, as well as other modes of freight transportation. Remaining competitive includes short lines being able to accommodate heavier-weight railcars (i.e., loaded car weights of 286,000 pounds, or "286K"), and providing competitive pricing and service offerings in conjunction with their Class I connections. Although the Class I rail network is generally in excellent physical condition, short lines tend to have less well-maintained track and other infrastructure elements. Although most of California's short lines can handle 286K railcars, light track and outdated bridges on a number of routes greatly impede efficiency and produce risks.

Many of the short lines contacted during the development of the Rail Plan expressed concerns regarding new environmental, safety, and insurance-related regulations (including the recently imposed hazmat fees, and two-person crew requirements) that they are required to follow. Although the desired intent behind these requirements is positive, many of the short lines are cash-strapped and find the additional costs imposed by these regulations difficult to bear.

Table 2.9: Short Line Carload Service Traffic Originating (left) and Terminating (right) in California[129]

	Originating		Terminating	
California Regions	**Short Line Traffic % (units)**	**Short Line Traffic % (tons)**	**Short Line Traffic % (units)**	**Short Line Traffic % (tons)**
Northern California	28%	23%	33%	23%
Southern California	6%	8%	2%	3%
Bay Area and Central Coast	9%	9%	2%	3%
Central Valley	41%	39%	16%	15%
California Statewide	18%	19%	7%	8%

129 Surface Transportation Board, 2013 STB Confidential Carload Waybill Sample, FAF 3, Ports of Long Beach and Los Angeles. STB 2015 Waybill Sample became available after Rail Plan analysis was complete.

Positive Train Control

The Class I railroads are implementing PTC largely at their own expense, and installation is well underway in California and elsewhere. However, PTC poses costly challenges to some short lines that are handling hazardous materials, or more commonly must operate over PTC-equipped Class I main lines. The $100,000-plus cost of retrofitting older locomotives that are typical of short line fleets is beyond the financial ability of many carriers.

Freight Corridor Bottlenecks

In Northern California, substantial growth is expected along three primary trade corridors: Bay Area to Central Valley, Central Valley, and Central Valley to Reno. Primary trade corridors are also major intercity passenger rail corridors, and accommodating future train volumes will require additional capacity.

The lack of a connection between the UPRR Oakland and Niles subdivisions at the Niles Junction currently precludes use of Niles Canyon for expanded freight service. This area is an immediate priority that supports the Alameda County and MTC efforts to improve goods movement in the Bay Area through dedicated rail freight improvements south of Oakland.

Significant intermodal- and international-related growth is expected along key trade corridors throughout Southern California. If projected train volumes materialize, accommodating passenger and freight rail will require additional capacity and separate freight and passenger track. Immediate priorities being pursued by the state that are in line with the Rail Plan include BNSF San Bernardino Improvements to unlock capacity made possible with completion of a Rosecrans Marquardt grade separation; and significant additional track capacity supporting significantly increased passenger service in the urban corridor between Los Angeles and Fullerton, and for freight movement out of Southern California.

Exhibit 2.6 below maps eight of the bottlenecks with the highest estimated daily freight train flows (listed as the last eight in **Table A.21** in Appendix A).

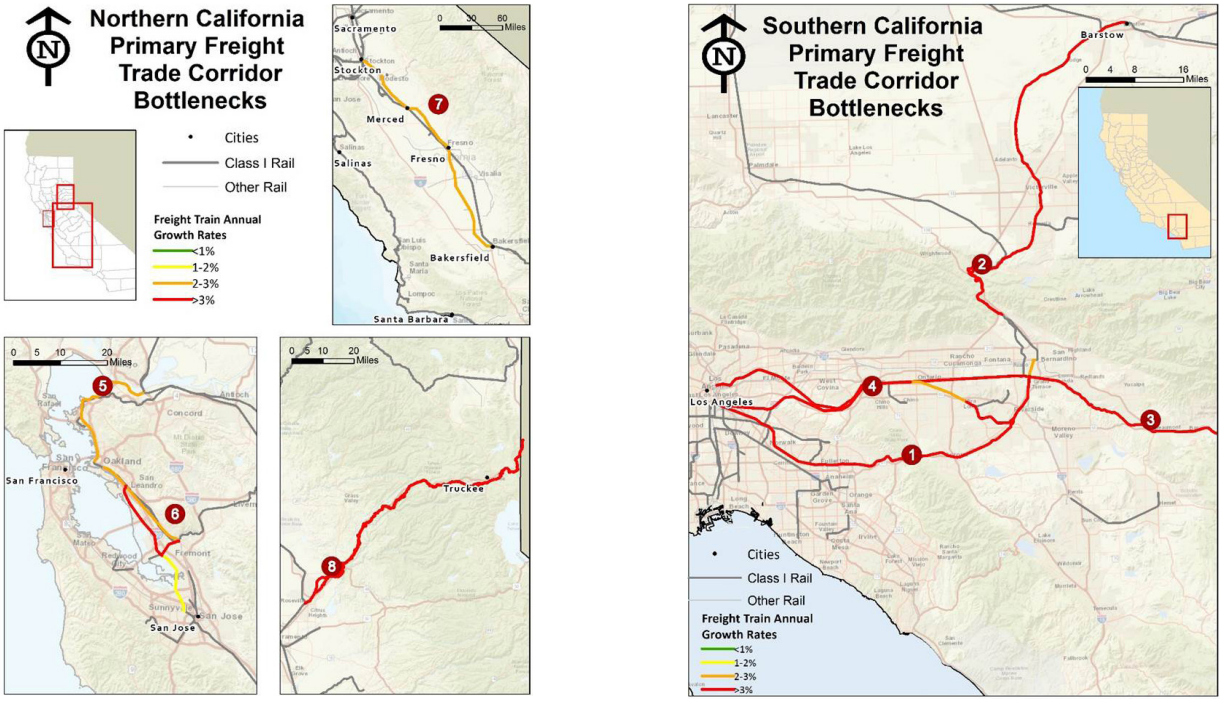


Exhibit 2.7: Heavy Freight Traffic Corridor Bottlenecks

1. BNSF San Bernardino (Los Angeles-San Bernardino via Fullerton and Riverside), 2. BNSF Cajon (Barstow to Keenbrook), 3. UPRR Sunset Route (Yuma Subdivision), 4. UPRR Alhambra and Los Angeles, 5. UPRR Martinez (Oakland to Martinez), 6.Southern Oakland Route (Oakland to Niles Junction), 7.BNSF Mainline Stockton to Bakersfield (San Joaquin Corridor), 8. UPRR Roseville to Reno over Donner Pass

2.1.4 Rail Line Abandonments

Rail lines are classified as abandoned when the STB has granted permission to remove a line from service, with no potential for operation in the foreseeable future. Subsequently, track materials are scrapped and the right-of-way is sold off, reverted to abutters, or "rail banked" for use as a transportation corridor in the future. Table 2.10 lists all of the STB abandonment filings in California since the 2013 Rail Plan was developed.[130]

Miles of route proposed for abandonment changed sporadically from year to year, and short lines consistently submitted more abandonment requests than Class I railroads. Between 2005 and 2015, short-line railroad abandonment requests affected almost 201 miles, compared to only 105 miles attributed to Class I railroads. Among the abandonments commenced by Class I railroads, many were for industrial leads or other connectors to specific facilities and industries.

Table 2.10: Rail Line Abandonment Filings with FRA[131]

Name	Year	Counties	Length
UPRR; SCVTA	2013	Alameda	1.97
UPRR	2013	Riverside; San Bernardino	1.27
Alameda Belt Line Railroad	2012	Alameda	2.61
UPRR; SCVTA	2012	Plumas; Lassen	8.95
BNSF	2012	Los Angeles	5.3
UPRR	2011	Riverside; San Bernardino	3.73
BNSF Railway	2011	Los Angeles	4.85



130 A complete listing of abandonment filings in California since 2005 can be found in Appendix ___(?).

131 A complete listing of abandonment filings in California since 2005 can be found in Appendix ___(?).

2.1.5 Intermodal Facilities

Trains carrying containers and trailers represent one link in the multimodal supply chain that connects shippers with receivers; other links include container ships and trucks. Intermodal rail terminals are established to facilitate transfer of containers and trailers between modes (ship to rail, truck to rail, and vice versa). In California, the majority of intermodal traffic is associated with the Port of Oakland, POLA, and POLB; a sizable but smaller volume is related to traffic associated with the rest of the United States, Canada, and Mexico.

California's intermodal terminals are concentrated in the state's two largest metropolitan regions, which also host the state's largest port areas: the San Pedro Bay Ports in Southern California, and the Port of Oakland in the San Francisco Bay Area. Two intermodal facilities are in the Central Valley; these primarily serve the Central Coast and Central Valley regions, and are focused on domestic rail traffic, although they also handle international traffic transloaded into domestic equipment. Key characteristics of California's rail intermodal terminals are shown in Table 2.11. These facilities are defined as inland, on-dock, off-dock, or near-dock terminals. Containers can be loaded directly onto railcars from a ship at on-dock facilities. At off-dock and near-dock facilities, containers are first transported from the port terminals to the facilities. Off-dock facilities are more than 5 miles from the marine terminals, and near-dock are within 5 miles of the marine terminal. Rail intermodal service at the inland terminals consists of domestic trailers, domestic containers, and international containers moving between rail intermodal facilities on specialized rail cars.[132]

Intermodal Terminal Needs

Growth in both domestic and international intermodal demand is expected to exceed available capacity at some locations, such as the San Pedro Bay Ports. Solutions will require reconfiguration of existing intermodal facilities; and potentially, construction of new ones. Recent experience has shown that such projects can be controversial—as was the case with BNSF's proposed Southern California Intermodal Gateway near the San Pedro Bay Ports—and therefore difficult to execute. In addition to addressing capacity constraints at existing locations, there is the opportunity to develop new intermodal services, including short-haul shuttles that transport international traffic from port areas to inland freight hubs. The State has an interest in these projects because of their relationship to the economic growth opportunities associated with intermodal rail, and because they contribute to increased use of rail in a manner that benefits the state's economy and environment through improved competitiveness, employment opportunities, and lower collateral impacts than would result from use of trucks.

Because of the environmental impact intermodal freight activity has on surrounding communities, technological development of cleaner rail equipment will be a key consideration in proposals to expand such activity. The State will look to incorporate clean technological practices in future project proposals.

Projections for continued growth in intermodal traffic indicate the need for substantial additional terminal capacity. Table 2.12 lists the proposed expansions by region that will result in a doubling of the current lift capacities of California's intermodal facilities. These include pending expansion plans for Lathrop, the Long Beach Intermodal Container Transfer Facility (ICTF), and POLA/POLB on-dock intermodal facilities. Two new facilities are also being considered: the Oakland Outer Harbor Rail Intermodal Yard and the Southern California International Gateway at POLA.

132 Caltrans, 2013 California State Rail Plan (2013).

Table 2.11: Intermodal Terminal Facility Characteristics [133][134]

Location/Name	Serving Carrier(s)	Facility Type	Current Cap.(Lifts)
Central Valley			
Lathrop	UPRR	Inland	270,000
Stockton/Mariposa	BNSF	Inland	300,000
Bay Area			
Oakland International Gateway (OIG)	BNSF	Near-dock	300,000
Railport-Oakland	UPRR	Near-dock	450,000
Southern California			
East Los Angeles	UPRR	Inland	650,000
San Bernardino	BNSF	Inland	660,000
ICTF, Long Beach	UPRR	Near-dock	760,000
City of Industry	UPRR	Off-dock	232,000
Hobart	BNSF	Off-dock	1,700,000
Los Angeles Transportation Center	UPRR	Off-dock	340,000
POLA/POLB On-Dock Intermodal Facilities	UPRR, BNSF	On-dock	2,257,775
TOTAL			**7,919,775**

Table 2.12: Current versus Proposed Future Capacities[135]

	Yard Capacity (Lifts)	Future (Lifts)	Increase (Lifts)
Central Valley	570,000	1,030,000	460,000
Bay Area	750,000	1,150,000	400,000
Southern California	6,600,000	12,260,000	5,660,000
TOTAL	**7,200,000**	**14,440,000**	**6,520,000**

133 Does not include intermodal facilities that are captive to a single shipper.

134 Sources: California State Rail Plan (2013); Oakland Army Base Rail Master Plan Report (2012); Manteca Bulletin: UPRR expansion may take up to 40 years (2015); Journal of Commerce: Railroads Expand ICTF Capacity; Southern California International Gateway Recirculated Draft EIR (2012).

135 Sources: California State Rail Plan (2013); Oakland Army Base Rail Master Plan Report, 2012: UPRR expansion may take up to 40 years; Manteca Bulletin (2015); Journal of Commerce: Railroads expand ICTF Capacity; Southern California International Gateway Recirculated Draft EIR (2012).

Carload Yards

For carload service, carriers operate a variety of yards to collect, distribute, and sort traffic, similar to the way a hub and spoke system works for large airlines. Most common are industry yards, which handle incoming and outgoing traffic from nearby rail customers. These yards are located throughout the state, on Class I railroads, as well as some of the short lines. Regional yards process traffic associated with larger geographic areas, consolidating and dispatching traffic to and from industry yards, as well as local industries. Largest in terms of size and volume are system yards, which sort or "classify" traffic by a carrier's major traffic lanes. In California, there are three system yards. UPRR operates two—one in Roseville and the other in West Colton—which process carload traffic for the northern and southern parts of the state, respectively. BNSF's Barstow Yard processes most of BNSF's manifest traffic for the entire state.[136]



Intermodal freight being loaded at POLB

136 Caltrans, 2013 California State Rail Plan (2013).

2.1.6 Safety and Security

Like all transportation systems, freight and passenger rail operations face safety and security challenges.

Rail-related safety incidents range from minor injuries to fatalities, which can occur due to at-grade crossing conflicts, trespassing on railroad property, pedestrian conditions, human error, and other deficiencies. Where deficiencies exist, safety risks can be mitigated through a combination of programs, such as public education campaigns. The California Operation Lifesaver Incorporated program, for example, administers an outreach program to share a rail safety message with the public, K-8 students, emergency responders, and professional drivers. Sometimes safety risks can be improved through track and signal upgrades, gate and warning system activation, and grade separations when practicable.

The safety and security of railroads is regulated by federal and state law, and enforced by a variety of federal and state agencies. Funding of critical safety improvements is administered through a variety of federal and state programs.

Regulatory Agencies

Federal rail safety regulators include:

- **The FRA Office of Railroad Safety,** which conducts safety inspections, collects and analyzes accident data, and enforces existing safety laws and regulations. A Passenger Rail Division in the Office of Safety develops passenger-rail–specific safety programs and initiatives, and enforces safety policies, regulations, and guidance for commuter, intercity, and HSR.
- **Transportation Security Administration,** which oversees Amtrak and commuter rail system security by monitoring stations and infrastructure, and identifying and mitigating potential security risks to both passengers and cargo.
- **National Transportation Safety Board,** which investigates and reports on all passenger railroad fatalities or property damage.

State rail safety regulators include:

- **CPUC,** which helps enforce federal safety and security regulations; conducts design safety reviews of crossing projects; investigates railroad accidents; regulates safety and security at transit crossings and stations; and responds to safety-related public and agency inquiries. The CPUC also hires railroad safety inspectors to supplement FRA's regional inspectors. In addition to safety regulation, the CPUC has authority over the construction and/or modification of existing crossings and grade separations.
- **Caltrans DRMT,** which inspects state-owned rail equipment and facilities; funds safety improvements; and is a partner in safety education and awareness programs.
- **Pipeline and Hazardous Materials Safety Administration (PHMSA),** which regulates the rail transportation of materials that are poisonous by inhalation and carried in tank cars.
- **California Office of Emergency Services (Cal OES),** which coordinates preparedness for and response to natural and manmade disasters; and administers transit security grants to intercity passenger rail and commuter rail systems.

Safety Regulations

Regulations aimed at improving rail system safety include the following:

Highway Rail-Grade Crossing Safety Action Plans

The Rail Safety Improvement Act (RSIA) of 2008 requires 10 states, including California, to prepare and submit plans to prioritize specific highway rail grade crossing improvements so that resources will be invested where the greatest improvements in safety are anticipated. California has a plan filed with FHWA, as required by RSIA California's action plan, that identifies specific solutions for improving safety at railroad and rail transit crossings in California. It includes development of a comprehensive rail-crossing inventory database, and implementing data-driven, risk-based project selection methodologies for Section 130 and other grade-crossing safety funding programs. The State will continue to work closely with its federal and local agency partners to implement the identified strategies, and will continue on an ongoing basis to review and update the plan as strategies evolve. The CPUC is in the process of revising the plan by June 2019.

Crude Oil Safety

Much of the concern regarding increased shipments of crude oil by rail is focused on safety and environmental impacts. Incidents involving oil by rail in California increased from three in 2011 to 25 in 2013.[137] Railroad safety regulation is primarily a federal responsibility, and the United States Department of Transportation (U.S. DOT) has moved to adopt new safety and operational practices. Notably, this includes a new specification for a safer tank car (U.S. DOT 117), hazmat reporting requirements, and more stringent regulations on certain operating practices. In California, the State has responded with some new requirements and regulations, including the CPUC's Crude Oil Reconnaissance Team, whose duty is to monitor, assess, and solve any risks involved in future crude oil projects.

SB 730 – Two-Person Train Crew Requirements

SB 730 was signed into law in early September of 2015. The bill requires that at least two persons operate all freight trains and light-engine movements. The safety impacts from differing crew sizes are a matter of considerable debate. At this time, most freight operations are conducted with two-person crews, but Amtrak and other passenger operators, as well as some short lines, frequently have only one operator in the cab.

137 FRA, CA Crude Oil by Rail Shipments and Railway Accidents, 2015. Accessed 2015.

2.2 Infrastructure Constraints

Section 2.1 (and the corresponding sections of Appendix A) inventoried existing passenger and freight rail services, identified rail capacity issues, and outlined infrastructure needs. Some of the state's immediate deficiencies include:

- At-grade crossings,[138] track curves,[139] surrounding land uses,[140] or speed limits that require trains to travel at slower speeds;[141]
- Facilities and existing rail-related infrastructure, such as stations that are too small[142] or require reversing maneuvers,[143] or bridges that are at capacity;[144]
- Insufficient numbers and insufficient capacities of rail cars;[145] and,
- Insufficient numbers of tracks or passing sidings.

In addition, existing peak-period congestion issues affect several components of the rail system. Caltrain, in particular, already operates at or near capacity during peak period.[146] The Peninsula Corridor in the Bay Area will continue to experience high rail demand as job growth concentrates in San Francisco and Silicon Valley. These near-term needs will necessitate new infrastructure investments.

In addition to short-term challenges to addressing existing deficiencies, increased future demand will further stress the overburdened system. The Statewide Rail Market Analysis Tool provides

138 In Stockton, an at-grade crossing between two major freight routes poses a challenge to *San Joaquin* operations (I 20).

139 Sharp curves at Rose Canyon limit the *Pacific Surfliner* to 65 mph (I 51).

140 *Capitol Corridor* must operate at slower speeds north of the Berkeley/Oakland station due to the proximity of the freeway. There also is limited capacity for trains terminating in Berkeley/Oakland (I 32).

141 There is a speed limit of 50 mph for *Capitol Corridor* trains between Auburn and Sacramento (I 32).

142 Van Nuys is an example of a station where the *Pacific Surfliner* has only one platform, but expansion is difficult due to ownership rights (I 48).

143 The East Ventura station requires a reversing maneuver to access the platform (I 48).

144 The lifting bridge over Suisun Bay in Martinez is not large enough, and requires the *Capitol Corridor* to reduce speeds (I 32).

145 Capacity on the *Pacific Surfliner* is constrained during holidays and other peak-service periods (I 83).

146 Some of these capacity issues may be addressed in the Caltrain Modernization Program.

estimates of 2040 travel demand by rail corridor, with some corridors expecting an increase in person trips by more than 30 percent. The Rail Plan's capacity analysis examined each segment under projected conditions in 2040. The analysis made assumptions about future operating characteristics, and identified the necessary infrastructure improvements to address the projected capacity needs. The combination of projected freight and passenger traffic growth in the primary corridors of California's rail network will result in bottlenecks that will impede the efficient flow of traffic. The potential improvements range from simple, minor infrastructure upgrades to more complex and costly investments, including but not limited to:

- Improved signaling and turnout switch controls;
- Improved/new sidings;
- Electrification;
- Double-tracking, triple-tracking, and overtake sections;
- Grade separations; and
- Line speed improvements.

2.2.1 Freight Rail Constraints

Most critical to maintaining the viability of California's freight rail system is ensuring that there is adequate capacity on the core network to maintain or improve rail's competitiveness with trucks. As noted previously, insufficient capacity that leads to congestion and higher costs will impact the railroad's ability to compete, and may shift traffic away from rail. Most of the potential congestion impacts are on joint passenger and freight facilities, with the attendant potential conflicts from the varying demands of passenger and freight services. As passenger rail service is expanded, adequate capacity must be provided for current and future freight rail needs. These needs may include not only through services, but also industrial access and the attendant local switching.

Hazardous Material Transport

For many years, the railroad and chemical industries and U.S. DOT have been actively engaged in improving the safe transport of hazardous materials by rail. Substantial progress was made in the design of and materials used in tank cars, reporting, custody, education, communications, and safe handling. In May 2015, the FRA and the PHMSA issued updated safety regulations related to transporting flammable liquids by rail. These regulations include a tank car standard, U.S. DOT 117, that incorporates enhanced tank head and shell puncture-resistance systems, and enhanced top fittings protection. California is actively pursuing preventative and emergency response measures to improve the safety of crude oil and hazardous materials shipments, especially in track and hazardous materials inspection and grade-crossing improvements.

Grade Crossings

The federal Section 130 program has been an ongoing source for investments in grade-crossing improvements underway or pending on the state's primary network. Caltrans and CPUC have a partnership with railroad companies and local road agencies. CPUC engineers assigned to various counties review the crossings in their respective territories and nominate crossings for the Section 130 program. There is a need to strengthen partnership between state and railroad operators, particularly among short lines that must bear a portion of the cost of maintaining crossing warning devices. Additional funds from federal and state sources could help address some of these concerns.

The CPUC and Caltrans also administer the Railroad Crossing Automatic Warning Device Maintenance Fund, which provides funds to railroads for the local government's share of the costs of maintaining automatic warning devices at highway-rail crossings. This program helps with a portion of the cost of maintaining crossing warning devices.

2.2.2 Other Constraints

Even with a clearly defined and well-supported rail vision, there are constraints to service implementation. Existing infrastructure and land uses—such as rail operating in dense urban places, along sensitive environmental areas, or in similarly challenging locations—sometimes can only be resolved by major and expensive overhauls. Corridors that are jointly used by multiple public and private owners or jurisdictions also may pose a coordination challenge to future projects and

integration efforts. A plurality of demands for the rail system is a challenge; even the most well-integrated state rail system will be unable to serve all locations or with the same service levels. Instead, greater integration is meant to maximize rail service and benefits. Funding is another important constraint to future system preservation and enhancement.

Furthermore, even when technically feasible and well funded, efforts to improve passenger service rail may be hindered without appropriate policies, contracts, and coordination efforts. This Rail Plan, which brought together service providers throughout the state, outlines policy goals to meet the Plan's vision for the more integrated system. It also follows the policies and recommendations established by the CTP 2040 for rail's role in the broader multimodal system.

2.3 Conclusion

California's existing rail system is extensive and complicated and boasts some of the most popular and well-traveled rail lines in the United States. Rail offers an alternative to driving for residents, employees, visitors, and businesses alike. The coordination between intercity rail, commuter rail, urban rail, and other connecting services such as Amtrak Thruway buses, provide access to a statewide network. This existing system is critical to the success of future rail travel and rail planning in California. Chapter 3 details the Rail Plan vision for an integrated passenger and freight rail network, including opportunities to improve the multimodal transportation system by creating a viable, efficient, sustainable, and enjoyable alternative to automobile travel.



This page intentionally left blank.



3 California Rail Network Vision

California's climate, natural and built environments, diverse population and economy, universities, and employment centers attract people from all over the world. Connecting these people, places, and goods in a cost-effective and efficient manner requires a sustainable, multimodal transportation system. A sustainable system must be accessible to all, provide for travel options to increasingly congested roads and highways, support development of vibrant and healthy communities, enhance the environment by reducing emissions and pollution, and support the state's economy by ensuring the fluid movement of goods and services to and from international, national, regional, and local markets.

An advantage of private automobile travel is the convenience of traveling from origin to destination in one vehicle without being reminded of the high cost of driving, other than the occasional visit to the gas pump. Rail transportation, however, can offer many advantages over the private car, including a lower cost per mile to operate; the ability to bypass congestion; potentially shorter end-to-end travel times between many origins and destinations; the



ability to be productive while moving (reading, working, or resting); and extraordinary safety benefits.[147] Public transit trips are also associated with increased physical activity, and further bicycle and pedestrian improvements at rail stations make that correlation stronger. Active travel helps to reduce chronic disease and is significantly beneficial for health and health-care costs, when coupled with safety improvements and VMT substitution.[148]

However, connecting between different rail systems is often a much more challenging experience. Schedules may result in substantial transfer delays, physical connections may be poor, and multiple payments may be needed. These and other issues (including limited frequencies of service and travel times) negatively affect the ability of the rail mode to compete with other modes. The Rail Plan presents a path toward eliminating as many of these barriers as possible, so that transferring across modes or across systems will feel to the rail passenger as simple as merging off of one road and onto another.

The Rail Plan defines a system that will help to fundamentally shift the way passengers view their travel choices. Imagine if you could reliably board a train at least every 30 minutes at a station in denser urban regions, or at least every 60 minutes at any station in the rest of the state, and travel seamlessly to any city in California? That is the vision for passenger rail in California.

The remainder of this chapter defines the 2040 Vision for passenger and freight rail, and how the 2040 Vision directly supports the State policy goals established in the CTP 2040. This chapter also describes the planning principles and policies underlying the 2040 Vision.

147 According to 2015 data from the U.S. DOT Bureau of Transportation Statistics, nearly 95 percent of national transportation fatalities occur on highways (35,092 versus 13 fatalities on trains).

148 Maizlish, Neil, Ph.D., MPH, California Department of Public Health Office of Health Equity. Increasing Walking, Cycling, and Transit: Improving Californians' Health, Saving Costs, and Reducing Greenhouse Gases (2016), accessed 2017.

3.1 California Transportation Plan 2040 Coordination



The Rail Plan is one of seven mode-specific plans that support the vision, goals, and policies of the CTP 2040. The CTP 2040 uses a "whole system" planning approach to evaluate the impact of plans system-wide—across modes and regions—on transportation and land use scenarios and policies.[149] Because the Rail Plan is mode-specific, it supports the CTP 2040 goals, but plans beyond the scope and provides many more rail details. The CTP 2040 acts as an umbrella plan and sets a policy framework to organize and guide the development of each subsequent modal plan. Each plan, in turn, provides service, delivery, and connectivity goals to identify how the State will invest in each specific mode to support statewide mobility goals.

The vision for CTP 2040 is to achieve a fully integrated, multimodal, and sustainable transportation system that supports the environment, the economy, and social equity. CTP 2040 offers a detailed overview of the existing transportation network, and assesses future transportation trends and challenges. It offers strategies to improve mobility and accessibility across all modes, contribute to system preservation, support a vibrant economy, improve public safety and security, promote livable communities and social equity, and support environmental stewardship.

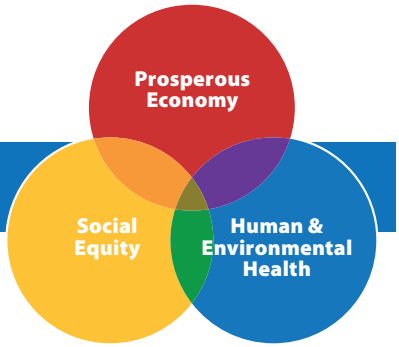
CTP 2040 identifies six broad goals, each with a series of policies and implementation recommendations (Exhibit 3.1). The policies aim to address recent transportation trends and challenges; meet federal and state regulatory obligations; and move toward a more efficient, competitive, multimodal transportation system.

CTP 2040 Vision: Sustainability

California's transportation system is safe, sustainable, universally accessible, and globally competitive. It provides reliable and efficient mobility for people, goods, and services, while meeting the state's GHG emission reduction goals and preserving the unique character of California's communities

149 CTP 2040 Fact Sheet (2016), accessed 2016.

CTP2040 Policy Framework



THE VISION
SUSTAINABILITY

California's transportation system is safe, sustainable, universally accessible, and globally competitive. It provides reliable and efficient mobility for people, goods, and services, while meeting the State's greenhouse gas emission reduction goals and preserving the unique character of California's communities.

THE GOALS

1	2	3	4	5	6
Improve Multimodal Mobility and Accessibility for All People	Preserve the Multimodal Transportation System	Support a Vibrant Economy	Improve Public Safety and Security	Foster Livable and Healthy Communities and Promote Social Equity	Practice Environmental Stewardship

THE POLICIES

1	2	3	4	5	6
POLICY 1 Manage and Operate an Efficient Integrated System	POLICY 1 Apply Sustainable Preventative Maintenance and Rehabilitation Strategies	POLICY 1 Support Transportation Choices to Enhance Economic Activity	POLICY 1 Reduce Fatalities, Serious Injuries, and Collisions	POLICY 1 Expand Engagement in Multimodal Transportation Planning and Decision Making	POLICY 1 Integrate Environmental Considerations in All Stages of Planning and Implementation
POLICY 2 Invest Strategically to Optimize System Performance	POLICY 2 Evaluate Multimodal Life Cycle Costs in Project Decision Making	POLICY 2 Enhance Freight Mobility, Reliability, and Global Competitiveness	POLICY 2 Provide for System Security, Emergency Preparedness, Response, and Recovery	POLICY 2 Integrate Multimodal Transportation and Land Use Development	POLICY 2 Conserve and Enhance Natural, Agricultural, and Cultural Resources
POLICY 3 Provide Viable and Equitable Multimodal Choices Including Active Transportation	POLICY 3 Adapt the Transportation System to Reduce Impacts from Climate Change	POLICY 3 Seek Sustainable and Flexible Funding to Maintain and Improve the System		POLICY 3 Integrate Health and Social Equity in Transportation Planning and Decision Making	POLICY 3 Reduce Greenhouse Gas Emissions and Other Air Pollutants
					POLICY 4 Transform to a Clean and Energy Efficient Transportation System

Exhibit 3.1: CTP 2040 Policy Framework

The CTP 2040 Policy Framework sets out specific goals and supporting policies to guide strategic planning across all modes of transportation in California.

3.1.1 California State Rail Plan Vision Statement

The Vision Statement identifies rail's strategic role in advancing California's needs, using the transportation capacity that our rail corridors can provide through more intensive use, and largely within existing rail rights-of-way, to handle the equivalent volume of many additional lanes of freeway for cars and trucks. The 2040 Vision anticipates booming ridership on a truly integrated, statewide system that is a natural result of interconnecting so many more markets, and allowing the network to provide value not just for getting to work, but to travel for many purposes on clean, comfortable trains. The 2040 Vision also anticipates shared benefits and freight-specific investments that will allow significantly more freight capacity in the most important freight traffic corridors.

The 2040 Vision defines the State's interest in planning for the rail network, and policies for investing in passenger and freight rail to achieve the 2040 Vision. The Vision Statement describes how the State desires the rail system to function in 2040 (the horizon year for the Rail Plan), and how it will support the goals and policies of the CTP 2040.

California State Rail Plan Vision Statement

California will have a premier, customer-focused, integrated rail system that successfully moves people and products while enhancing economic growth and quality of life.

3.1.2 GOAL 1: Improve Multimodal Mobility and Accessibility for all People

Policy 1: Manage and Operate an Efficient Integrated System

The 2040 Vision foresees an efficient network of rail services that provide a statewide mobility solution, benefiting both regional and interregional travel needs. The vision will also build on and fully realize the benefits of California's investment in the HSR System by integrating intercity and local rail services with the HSR spine to expand the reach of the combined rail network to more Californians.

The 2040 Vision includes the following attributes:

Connectivity to Top Population and Employment Centers: The 2040 Vision establishes a State interest in connecting the most populous California cities and the communities between to the passenger rail network, to provide transportation options for the entire state, using existing or planned rail rights-of-way and corridors.

Competitive Travel Times and Service Frequencies: Existing intercity and regional rail service would be expanded in phases over time to provide more frequencies that both complement the HSR System, and significantly improve public transport for both long-distance and regional trips. The passenger rail network will be developed to provide travel times that are competitive with air travel times in the longest-distance trips between major urban areas, and automobile-competitive in regional markets. The 2040 Vision establishes service frequency goals for individual corridors on the state network that are tailored to market demand.

Rail Service Integration: The 2040 Vision foresees a statewide passenger rail network that physically integrates services at hub stations, allowing for seamless transfers between services, and convenient trips by rail across the state. These hubs provide connection points to local and regional transit systems, providing fast, frequent access to regional destinations and expanding the coverage of the state rail network. In addition to service goals, the Vision establishes state connectivity goals and key transfer hubs that tie corridors together.



Exhibit 3.2: California Service (2040 Vision)

Pulsed Schedules: A key component of the Vision is a pulsed system, a transportation network with trains[150] operating on coordinated schedules that repeat regularly—every hour or half hour, for example. The immediate advantage that a pulsed system affords the end user is that its repetitive pattern is intuitive and user-friendly, because services are usually offered at the same time every hour (or even half-hour) throughout the day. More importantly, the cyclical nature enables connecting services at hubs to be linked together easily and efficiently; connections between services can be designed to allow optimal onward travel consistently throughout the day, with minimal transfer times.

Efficient Infrastructure Design and Use: Another benefit of a repeating schedule is that it allows for optimal design of infrastructure requirements. Knowing the schedule and where trains meet allows engineers to design routes featuring more targeted and often less expensive infrastructure solutions. Additionally, track segments can be designed to meet pre-determined travel times. For example, if the pulsed schedule only requires trains to travel a segment in 60 minutes, expensive projects that would reduce that travel time but would create significant community impacts can be revisited; a wider range of solutions may be available to planners, that would be more acceptable to communities and the environment.

Multiple Service Types

Each mode and service in the transportation network, from streetcars to HSR, represents a tool designed for a certain kind of trip. When integrated effectively, these tools will form a seamless network that is both robust and flexible enough to meet diverse passenger transportation needs. For example, HSR trains can cover long distances, and passengers can transfer quickly to regional trains or local transit buses to get to their final destination in the most efficient manner.

The 2040 Vision identifies service types for different corridors based on travel time requirements for providing automobile- and air-competitive trips, as well as the State's interest in providing access to the rail network.

- **High-Speed Rail** provides air-competitive travel times between major urban centers of the state (when used for long-distance travel); and high capacity for longer distance regional and interregional trips between hubs (often used to link passengers to other services at one or both ends). HSR has numerous nonstop or limited-stop services tied to meeting long-distance market demand, but also offers trains that stop at all stations on a regular basis (every 30 or 60 minutes, based on market demand), allowing connectivity throughout the statewide rail network. Unlike the other categories, most sections of infrastructure used by HSR are designed for speeds over 125 mph (with long sections allowing speeds up to 220 mph).
- **Intercity** passenger rail services provide fast service between regions, with stops at major cities or at connectivity hubs in corridors that do not require HSR-level travel times to meet market demand.
- **Regional** services provide both express and local trips within a region, enabling access to the state rail network, with connections to intercity and high-speed services at hubs for longer-distance trips. Regional services operate with automobile-competitive travel times, which may be faster than automobile travel in rush-hour periods, but generally operate at slower speeds than intercity service.

150 Although trains account for the majority of this pulsed system, Integrated Express Buses are included in the coordination and pulsed schedule planning.

- **Amtrak Long-Distance Trains** provide connectivity to cross-border markets in Oregon, Nevada, and Arizona, in addition to providing service to rural communities. These trains service fewer stations and with lower frequencies, but increase network-wide connectivity and flexibility.
- **Integrated Express Bus** service is an important part of the statewide transportation system. Bus services can be used to extend the reach of the statewide passenger rail network, providing connections to parts of the state where rail services cannot be extended, including rural markets that are too small or remote to support rail service, where rail rights-of-way do not exist, or where it may be too expensive to upgrade track to meet state service and connectivity goals. Bus services can also fill low-ridership time slots in a regular rail schedule, where bus service is more time-competitive with automobile trips than rail, or where state and regional investments in managed or high-occupancy vehicle lanes in urban areas can be leveraged for express bus operations to bypass congestion.

The 2040 Vision identifies corridors that could support more than one type of service, where there may be a market for providing local service in addition to express service, thereby providing access to the state network for local communities. Other, primarily rural corridors can include one type of service that serves all stops.

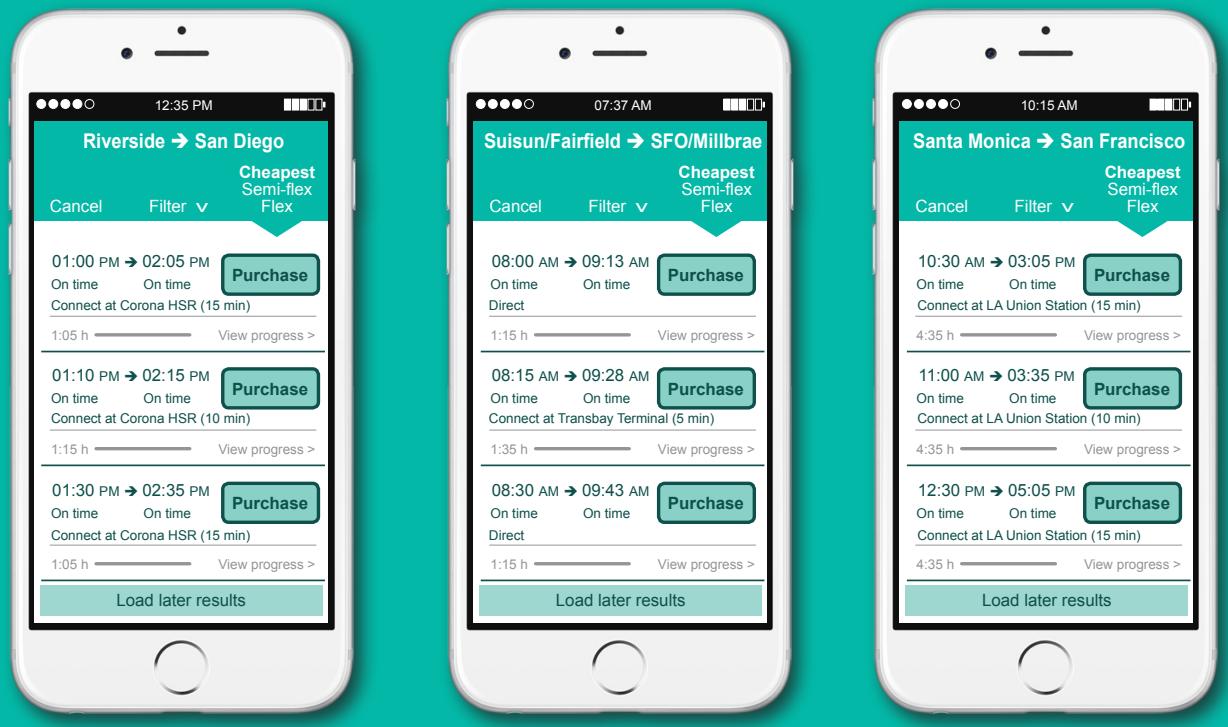
Integrated Ticketing and Fare Coordination: Successful implementation of the 2040 Vision requires coordinated fares and integrated ticketing options across service providers.

Coordinated fare collection streamlines the methods of payment across different services over the course of a journey. Some agencies already work together to provide free transfers between services, like the Los Angeles County Rail 2 Rail program that allows Metrolink monthly pass holders on the Orange and Ventura County corridors to travel on *Pacific Surfliner* trains. Metrolink also provides a free fare program, EZ Transit Pass, whereby a valid Metrolink ticket will grant you free transit on 15 different transit services, including Metro Rail, with the initiation of mobile ticket scanners at fare gates. Statewide integrated ticketing will go even further, allowing a passenger to use one ticket that works across all modes, rather than having multiple cards, mobile apps, and tickets. Additional features of an integrated fare collection system could include passes that work with combined ticket types, benefits to frequent travelers, and specialized fare packages for events and tourist attractions.



Integrated Passenger Service

The Rail Plan envisions integrated, door-to-door rail service. Rather than piecing together itineraries across different services and service providers, users will be able to plan a trip and buy a ticket for the entire integrated network in a seamless fashion. The graphic below represents both the possibility of schedule integration on different technological platforms and possible outcomes for rail travel in California with an integrated system.



One challenge going forward will be to scale these efforts to include more systems, and to achieve inter-operability of fare media across regions and the entire state, rather than just within metropolitan regions. Another challenge will be to leverage smartphone technology to streamline the purchase and use of integrated fare media. Amtrak and various commuter rail and transit operators in California currently support a smartphone application that can sell and save e-tickets to the phone, which can be scanned by train conductors. This app also provides on-time status and alerts. It will also be important to provide safety nets, like maintaining a cash payment or cash card option, for populations that may not have access to a bank account or smartphone.

Policy 2: Invest Strategically to Optimize System Performance

The CTP 2040 recommends investing to ensure that the transportation system is truly multimodal and integrated to serve all of the state's population and businesses, as well as to seek a broad suite of strategies to manage congestion in the state's most congested corridors. Investments in an integrated rail system strengthens one mode in the state's multimodal transportation system, while benefiting the entire system by providing viable alternatives to traveling on congested road and highway corridors.

The 2040 Vision incorporates a strategic framework to guide state and regional service planning and capital investment to support development of the ultimate 2040 Rail Plan Vision in phases over time. The integrated, scheduled network in the 2040 Vision is designed to optimize performance of the rail network to maximize use of existing infrastructure in shared passenger and freight corridors. This would be a first priority, with targeted investments made where necessary to connect the state network, and provide the capacity needed to grow freight and passenger services toward the 2040 network goals of the Rail Plan.

Electrification and Zero Emission Technology (ZET)

The 2040 Vision recognizes opportunities to electrify or deploy other zero-emission vehicle technologies on as much of the intercity passenger rail network as possible, which allows the system to be operated in a more efficient, cost-effective, and cleaner manner than is possible with existing diesel-powered locomotive technology.

Electrification for some parts of the statewide rail network will mean traditional catenary-based systems. For other services, this will mean other zero or near-zero emissions technologies.

This definition of electrification provides considerable opportunities to increase system efficiencies and performance, and improve air quality. This means that longer trains can be deployed and accelerated faster, and that the rail network supports the State's efforts to reach its GHG emissions

The State's investment strategy will include service development plans that identify individual elements (e.g., rail line and station infrastructure, vehicles, and other needs such as communications and systems) based on anticipated funding to develop the network. Key provisions of the investment strategy include:

- **Services scaled to market demand:** Integrated services will be scaled to market demand to maintain a reasonable balance between O&M costs in relation to fare revenues.
- **Providing for rail freight capacity:** Where passenger services are operating in corridors where track is shared with freight, sufficient capacity and other infrastructure will be provided to accommodate both freight and passenger traffic needs. The scheduling of trains will consider maintenance windows, as required. Taking freight owner/operator needs into account, slotted timetable planning methods will be used to identify specific capacity improvement projects that enhance timetable reliability and reduce overall infrastructure spending needs, creating a better operating environment for freight trains. Finally, the State's investment strategy recognizes the value to goods movement and the potential impact on the need for highway investments of supporting trade corridor investments that deliver benefits for freight rail.



Hybrid power systems allow trains to run alternately on overhead electrical and battery power.
(Source: https://www.flickr.com/photos/camperdown/6308355515)

- **Avoiding duplicate investments:** The integrated network will not include duplicate or overlapping investments. Where multiple services operate in the same corridor, the mix of services (such as high-speed, express, and local) should address regional and statewide needs, and serve all markets, often using the same corridor.
- **Avoiding stranded investments:** To the greatest extent possible, interim investments will be incorporated into the long-range plan.
- **Phased delivery of integrated services:** As market conditions and ridership indicate, services can be integrated and expanded in phases over time. The 2040 Vision is divided into three time phases, representing building-blocks for achieving the Vision: . Specific dates are used for the building blocks, but some projects may get completed well in advance of these dates, and others may take a few years longer. The years for each phase have been chosen as markers that meet statutory planning requirements. They are as follows:
    - **Short-Term (by 2022):** The short-term capital plan in the 2040 Vision represents improvements already being planned, for which funding for construction and implementation is largely committed. These improvements serve as the near-term foundation for integrating the rail network. The short-term plan identifies the region-specific service planning studies required to implement the mid-term and long-term Vision. The short-term investment program is also intended to address the significant existing rail freight bottlenecks on trade corridors.
    - **Mid-Term (by 2027):** The mid-term capital plan is intended to represent a realistic phasing of the 2040 Vision, where the State coordinates with rail partners to grow passenger services to a level that maximizes use of the capacity available on existing rail infrastructure, with targeted infrastructure investments that tie services together and provide new access to different regions, including regions that now have only limited rail access. The mid-term capital plan begins growing rail freight capacity in significant rail freight corridors. This mid-term phase includes projects that the State expects will have a reasonable funding commitment, employing a range of funding strategies. Finally, during this phase, many of the detailed planning studies necessary to prioritize and advance long term improvements will be funded and completed.
    - **Long-Term (by 2040):** The long-term capital plan includes the infrastructure elements required to support the service and connectivity goals of the 2040 Vision, and to maximize the performance and market-capture potential of passenger rail within the 2040 time horizon of the plan. The plan provides for additional rail freight capacity as investments to expand the passenger rail system are made. The long-term plan represents the integration of services that is possible.

The 2040 Vision represents a strategy for meeting the state's transportation needs that takes advantage of rail's ability to develop in existing rights-of-way to add capacity. The first priority of the 2040 Vision is to make existing lines more efficient, making better uses of existing frequencies to improve productivity of passenger services. The State intends to achieve the Vision through service planning, in partnership with local communities.

Policy 3: Provide Viable and Equitable Multimodal Choices, Including Active Transportation

The 2040 Vision establishes the State's interest in developing a statewide passenger rail network that is time- and cost-competitive with other modes. Passenger rail and intercity bus services will be physically integrated with each other and with transit operations at mobility hubs, providing communities with statewide, door-to-door access via a seamless passenger rail network. The 2040 Vision allows for additional passenger rail frequencies to be physically connected, serving specific regional or corridor-level travel markets that are not necessary for statewide connectivity.

However, when poorly integrated, the first-mile/last-mile portions of a trip can present an insurmountable hurdle to rail passengers, because they cannot access stations or their destinations from a rail station. The expanded passenger rail access and connectivity that are part of the Vision provide opportunities to expand the use of bicycling, walking, and transit trips to provide first- and last-mile connections to a system that can be used for regional commute and interregional travel. When well integrated across agencies, urban mass transit and local land use policies can provide nearly seamless connections to rail stations in ways that reduce trip time, reduce trip cost, and ultimately reduce barriers to ridership. Some opportunities for reducing the first-mile/last-mile challenge include:

- State support for network and station planning will ensure that stations are pedestrian- and bicycle-friendly and accessible to public transit systems, providing connections to major centers of population and employment. This includes making transfers between rail and bus, transit, and active transportation as efficient and intuitive as possible. Reducing the time and difficulty of transfers is crucial to stimulating additional ridership, as is dramatically reducing the risk of delay due to missed connections.
- Bicycle- and car-sharing systems can be expanded, and stations can be designed for simple pick-up and drop-off.
- Secure and convenient bicycle parking can be provided at stations.
- Safe and complete pedestrian and bicycle networks can bring passengers as close to the platform as possible, with minimal interaction with road networks.
- Where transit connections are made that are less frequent (primarily those services that operate less frequently than every 15 minutes), the State has an interest in coordinating with local and regional transit partners to coordinate the schedules of bus trips that expand coverage.

Rail rights-of-way also present opportunities to develop walking and bicycling networks, connecting communities at the regional level. The 2040 Vision supports preserving rail corridor rights-of-way and assets for multimodal uses wherever feasible. Implementation will result from site-specific planning with every entity that owns infrastructure or operates on the right-of-way, with an emphasis on safety. Multi-use corridors support state and local mobility goals, and can safely enhance access for all modes coexisting in a corridor.[151]



SMART Rail corridor, pre-project build out, with future rail right-of-way and bicycle corridor

151 Rails-to-Trails Conservancy, *America's Rails with Trails* (2013), accessed 2016.

3.1.3 GOAL 2: Preserve the Multimodal Transportation System

Policy 1: Apply Sustainable Preventive Maintenance and Rehabilitation Strategies

By 2040, California's rail system will be a premier, national leader in its functionality, innovation, and effectiveness. The State will regularly benchmark the passenger and freight rail services in California against those of other states and international leaders as it supports development of the rail network to deliver a best-in-class system. To be premier, the system needs to be in a good state of repair, with investments made over time to maintain the system. The Rail Plan Vision supports state investment in capitalized maintenance costs to preserve the performance of the passenger and freight rail network.

Investment in an expanded and more efficient passenger and freight rail network in California is intended to enhance the state's ability to maintain and rehabilitate the entire transportation system by shifting car and truck trips, particularly long-distance interregional trips, from the state highway system to rail. This shift is expected to reduce vehicular wear and tear on the state's interregional roadways, and the substantial costs associated with bringing roadway infrastructure into a state of good repair. In addition, by improving the economics of the rail system, additional resources will become available in support of capitalized maintenance to ensure that railroads remain in a state of good repair throughout their life cycle, and that services achieve a high degree of reliability.

Policy 2: Evaluate Multimodal Life-Cycle Costs in Project Decision Making

The 2040 Vision is intended to provide a significant option for statewide travel and goods movement in interregional travel corridors. It can help evaluate ways to improve mobility on a corridor through various combinations of improvements to rail and transit, along with highway improvements. Life-cycle costs analysis could lead to efficient road use, parking, and fuel pricing; and to efficient road space allocation, leading to an overall reduction in the growth of VMT.

The network efficiencies and performance improvements associated with the 2040 Vision are expected to result in significant infrastructure savings that can be factored into corridor-level investment decisions, based on transportation demand management programs. This multimodal consideration of long-term corridor needs can maximize the effectiveness of asset management, and promote efficient use of limited resources for highway and bridge maintenance programs.

Investment decisions in the rail mode will focus on optimizing decisions across the life cycle, especially in the area of rolling stock replacement and maintenance. By considering the total cost of rolling stock across its life-cycle costs, new approaches will be considered to allow the fleet to be refreshed and replaced more regularly, based on commercial decisions and total expenditure across both capital and operating resources.



San Jose transit mall (Source: wikimedia commons, https://commons.wikimedia.org/wiki/File:VTA_Light_Rail_Santa_Clara_Street_Station.jpg)

Policy 3: Adapt the Multimodal Transportation System to Reduce Impacts from Climate Change

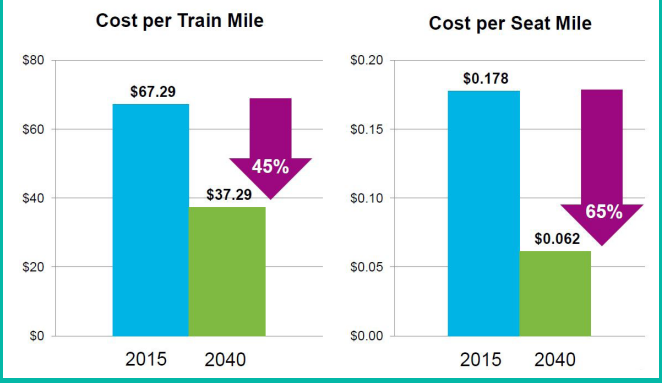
Infrastructure planning and investment in the state must facilitate meeting the state's climate goals, and must prioritize actions that both build climate preparedness and reduce GHG emissions. The Rail Plan is an important component of the State's strategy for reducing GHG emissions, and is one of many plans that leverage State support to reduce fuel dependency and serve disadvantaged communities in a changing climate.

The State will pursue and support technology and fuel-based solutions to reduce fuel consumption; and will work to increase the number of seats filled on each train operated (often referred to as the load factor), to reduce GHG emissions per passenger mile. In addition, because the Rail Plan includes significant core infrastructure, especially high-speed infrastructure, that is electrified, additional opportunities to expand electrification on adjoining corridors and on services that share HSR blended infrastructure will be pursued to operate a cleaner rail system. By 2040, Caltrans expects a majority of passenger miles on the rail system to be provided by electric trains.

Caltrans and CHSRA will take climate change into account in all planning and investment decisions that support implementation of the Rail Plan. Wherever possible, the Rail Plan supports flexible and adaptive approaches to prepare for uncertain climate impacts. The State supports and will use information from vulnerability assessments and other data to inform long-term life-cycle analysis in project selection, including anticipated climate impacts.[152]

Furthermore, current and future planning and requirements should reflect climate change adaptation in a more coordinated manner.[153] The 2040 Vision provides a common framework for coordinated planning between the State, rail operators, and stakeholder agencies to develop network infrastructure that takes known and projected climate change impacts into account.

The State expects that increased passenger rail revenues generated from increased use of the system will, in the ultimate 2040 Vision, allow the state network services to operate without a subsidy, and generate profits in some corridors that can be reinvested in maintaining and improving the system. Even for projects that will require large capital investments for infrastructure, the resulting service and connectivity enhancements cause an increase in ridership and overall efficiency that is sufficient to make the benefit-cost analysis positive. Because that is extrapolated out to the entire transportation system, the needed investments outlined in the Rail Plan are reasonable, considering the total future growth captured on the rail system. Efficient operations attract future private dollars in associated economic development and drive down the operating subsidies. These operating savings can be immediately returned to the system in the form of capital investments to continue implementation of the long-term vision and to increase efficiency. It becomes a self-fulfilling prophecy of sustainable funding that reinforces the need for detailed, collaborative service implementation planning to guide project prioritization as a way to organize projects that can help deliver network-wide efficiencies.



152 Natural Resources Agency, *Safeguarding California: Implementation Action Plans* (2016), accessed 2016.

153 Ibid

3.1.4 GOAL 3: Support a Vibrant Economy

Policy 1: Support Transportation Choices that Enhance Economic Activity

California's rail system will successfully move people and products by balancing the needs of freight rail and passenger rail customers. On the one hand, the freight rail system provides California's businesses, producers, and manufacturers with cost-effective transportation connections to national and international markets, making the state an effective place to conduct business. On the other hand, the passenger rail system provides access to essential and nonessential trips alike. Passenger rail also provides major safety and productivity benefits, further enhancing California's economy. Safety benefits translate into significant hospital and health care savings.[154]

Currently, many passenger rail operations share tracks owned by UPRR and BNSF. The infrastructure requirements for additional passenger rail service will be negotiated between public rail operators and private railroad companies. Requirements and negotiated terms for further shared use of freight railroad track may include major investments to enhance the capacity of these lines. These improvements and investments help to decrease bottlenecks and improve freight mobility and reliability, and support the shift of freight from trucks to rail where it is economically feasible to do so.

The passenger and freight rail systems support growth of California's existing businesses and communities, and the development of new businesses in the state. An integrated and coordinated passenger rail system connects workers to their jobs and travelers to recreation, and fosters sustainable development around rail stations. The rail system of the future will also be significantly less expensive on a unit basis than today's rail services, lowering the overall household and business expenditures on transportation, and further enhancing California's economy.[155] A robust passenger rail system is necessary to support the continued development and competitiveness of California's economy.



Port of Long Beach (Source: https://commons.wikimedia.org/wiki/File:Intermodal_ship-to-rail_transfer.JPG)

154 According to the Center for Disease Control's "State-Based Motor Vehicle Data & Information," in 2013, California lost $4.48 billion in medical expenses and work-loss due to collision fatalities. Short- and long-term hospital follow-up visits related to crash-related injuries translate into additional health care costs than can be mitigated or eliminated through safety improvements and decreased VMTs.

155 Fang, Kevin, and Jamey Volker, The National Center for Sustainable Transportation. Cutting Greenhouse Gas Emissions Is Only the Beginning: *A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled* (2017), accessed 2017.

Policy 2: Enhance Freight Mobility, Reliability, and Global Competitiveness

California is committed to developing a world-class, sustainable freight rail system, and the Rail Plan addresses state policies and practices to enhance freight rail services. Those companies, subject to certain federal and state laws and regulations, are responsible for daily operational decisions and capital investments on the freight rail network. There is a need to strengthen partnerships that better align with the policies and action of the state and private freight rail companies. The 2040 Vision establishes a framework for partnerships between the freight railroads and the State—a framework that supports rail freight investment that is consistent with the State's sustainable freight goals.

The Rail Plan process identified five major areas of need and opportunity of statewide importance for freight rail services:

- **Trade corridor improvements:** California has several critical multimodal freight corridors that support both domestic and international trade. Given the importance of these corridors to the regional, state, and national economies, the Rail Plan has a significant interest in transforming these corridors into primary, high-capacity freight routes, shifting a share of freight loads from trucks to freight rail.
- **Economic development and short lines:** Traditional and emerging industries in the state can take advantage of freight rail services. The Rail Plan has an opportunity to support programs that provide grants and loans to short lines, to improve and upgrade their track to current standards; or to shippers, to provide or improve rail network access.
- **Statewide grade crossing improvements:** Grade-crossing projects, including grade separations, are extremely expensive, and federal and state program funds are limited. The Rail Plan will endeavor to expand funding for grade-crossing improvements, and continue advocacy for an expansion of the federal Section 130 program and the state Section 190 Grade Separation Program.
- **Terminal and yard capacity:** There is a need to expand intermodal terminal capacity in California. Many of these projects are in urban centers with access challenges on congested roadways. Roadway access improvements and congestion alleviation are critical in achieving the concepts of the California State Rail Plan Vision Statement.
- **Short-haul trains:** Short-haul trains can serve as efficient transportation between ports and distribution centers.

Freight railroads are understandably concerned about the preservation of their existing operating flexibility and their future capacity to accommodate growing freight train traffic. Therefore, they are interested in minimizing impacts on existing and future freight rail operations. Caltrans will consider the potential impacts of the planned passenger rail service improvements on railroad capacity and access to industry spurs and yards. The infrastructure investments necessary for increased passenger train volumes will be planned so as to add capacity and flexibility to freight operations. The 2040 Vision enables market-responsive growth in goods movement by freight rail, while also providing for increased passenger capacity.



Richmond Pacific Railroad locomotive at work in Richmond, California
(Source: wikimedia commons, https://commons.wikimedia.org/wiki/File:Richmond_Pacific_Railroad_RPRC_Switcher_1268.JPG)

Policy 3: Seek Sustainable and Flexible Funding to Maintain and Improve the System

The integrated statewide mobility solution represented by the 2040 Vision encompasses a range of services that will require strategic investment and active partnerships to realize. The Vision therefore provides an operator-neutral framework for partnerships between the State, other public agencies, and private industry that can be used to leverage different sources of funding and different types of operating models to deliver cost-effective infrastructure and service improvements that implement the Rail Plan.

The intent of the 2040 Vision is to improve the efficiency and effectiveness of the intercity passenger rail network, to drive down costs and increase ridership and revenue. The integrated statewide network will realize infrastructure savings through more intensive use of existing infrastructure; scheduled operations will allow infrastructure capacity to be targeted where needed to grow the passenger and freight network over time. The 2040 Vision establishes a State interest in providing for higher frequencies on the integrated network to improve the convenience of passenger rail travel, which will dramatically increase ridership on the state's rail services. The State expects that increased passenger rail revenues generated from increased use of the system will, in the ultimate 2040 Vision, allow the state network services to operate without a subsidy, and generate profits in some corridors that can be reinvested in maintaining and improving the system.

The State supports public-public partnerships as well as public-private partnerships to deliver a variety of project types. Partnerships between service providers and local governments, especially in regard to land use and station development, will be mutually beneficial in terms of maximizing the value of the rail service, maximizing the value of local real estate, and maximizing return on investment of local dollars.

In addition to coordination among government entities, innovative partnerships will be needed to integrate rail services with private entities. Such partnerships would include both private operations of public rail services and coordination with private-sector providers of nonrail connecting services, such as airlines, rideshare operators, and private bus operators.

Beyond the provision of rail services, private-sector partnerships can also work to integrate wider sectors of the transportation industry to extend the reach of rail service to more customers. This can take a variety of forms, and many are already in place, including:

- **Intercity Bus:** Currently, Amtrak uses connecting bus services to extend and bridge rail services in the state. Beyond Amtrak, other long-distance and connecting bus services operate in California, and could be coordinated in a future integrated network to provide integrated fares and coordinated schedules to increase utility to customers.
- **Ride-Share and Ride-Hailing Apps:**[156] Ride-share service providers, especially ride-hailing apps, are already playing an increasing role in solving first-mile/last-mile challenges. By extending the local reach of urban transit networks and rail stations, on-demand ride hailing and ride sharing can provide key connections to origins and final destinations for passengers. Establishing partnerships between rail providers and these companies can elevate those services and provide better value for passengers. Some agencies are already pursuing these options, like OCTA's micro-transit pilot program, OCFlex, which seeks to solve first-mile/last mile challenges and increase ridership with on-demand ride hailing options.[157]



Metro bike share in Los Angeles
(Source: https://commons.wikimedia.org/wiki/File:Metro_Bike_Share_7th_and_Bixel_Los_Angeles.jpg)

156 Ride-sharing and ride-hailing apps are also referred to as Transportation Network Companies.

157 Orange County on the Move, On-Demand Shared Ride Service Coming to Orange County, 11 -1-2017.

- **Bicycle Share Providers** are playing an increasing role in improving first-mile/last-mile challenges. City-managed bicycle share (like The Metro Bike Share program), public-private bicycle share partnerships (like Capital Bikeshares in Washington, DC), dockless bicycle share systems (like Spin), and electric-assist bicycle share programs (like JUMP) are just some of the new and expanding bicycle share delivery options that have emerged in the past 4 years. Many of these bicycle share programs use regional fare cards (like Clipper Card) for payment; others use an app platform that is not geographically specific (like Social Bicycles) for bicycle reservations. Ease of access and ticketing and reservation integration allow bicycle share to provide another mobility option that can increase access and reduce first-mile/last mile and first-hour/last-hour restrictions.
- **Air-Rail Alliance Code-Sharing:** Common in Europe and occasionally in the northeastern United States, an air-rail alliance takes the concept of code-sharing between partnered airlines and extends it to the rail network. By allowing airlines to sell airline and rail services on a single ticket, the rail network can be used to extend the reach of airports, and better connect communities without an international or even regional airport.
- **Rail-Air Substitution:** Population growth is predicted to strain the multimodal transportation system, including airports. Coordination between rail and air can expand an airport's catchment zone (especially when connected with intercity or HSR services) and attract new markets. A rail system that is connected to both a local or regional market, as well as a statewide market, can help divert some of the airport demand and reduce capacity burdens. Although the result can be a reduction, or complete elimination, of inefficient air services, it actually benefits both air and rail partners. It does this by freeing capacity for more profitable and long-haul air travel, while increasing rail ridership, thereby providing customers flexibility on the same routes.[158][159]

It is anticipated that use of public-private partnerships and agreements will increase as California implements its network integration.

In the northeastern United States, United Airlines and Amtrak have an alliance connecting services to and from Newark Liberty International Airport and several regional cities served by Amtrak. Airline customers can buy a single ticket that includes their rail connection to and from the airport.



Similar arrangements are quite common in Europe, even involving American carriers. American Airlines has an air-rail alliance with Deutsche Bahn (the German national railroad) to provide rail connections at Frankfurt Airport. Germany has perhaps the most robust examples of connecting rail and air services, which occur in approximately 16 cities and involve dozens of domestic and international airlines. Through such agreements, rail services are integrated into the entire global transportation network, providing great value for passengers and rail service providers across the rail service spectrum.

158 Resource Systems Group, Inc., Airport Cooperative Research Program; Transportation Research Board; National Academies of Sciences, Engineering, and Medicine. *Integrating Aviation and Passenger Rail Planning* (2015).

159 Although there is a market (travel distances between 200 and 500 miles) for HSR or other intercity rail services to replace air travel (beyond the aforementioned inefficient routes), the research shows that this is unlikely to occur, especially in the context of the United States.

3.1.5 GOAL 4: Improve Public Safety and Security

Policy 1: Reduce Fatalities, Serious Injuries, and Collisions

The state rail system will offer high performance to customers, consistent with the emphasis on performance management metrics in the 2016 FAST Act Federal surface transportation legislation. Another measure of success for the state rail system will be the movement of people and products safely and without incident. The Rail Plan supports significant passenger and rail freight investments, including grade-crossing improvement projects to eliminate at-grade conflicts; and supports full implementation of PTC to reduce fatalities, serious injuries, and collisions on the rail system.

Even without these necessary safety improvements to the system, the FRA reports that fatalities per mile are 17 times more likely in an automobile than in an intercity passenger train.[160]

Between 2000 and 2009, California had 7.28 fatalities per billion miles traveled in a car, versus 0.43 fatality per billion miles traveled on Amtrak, commuter and urban rail systems, buses, and commercial aviation. This supports the need to reduce VMTs, because VMTs are strongly correlated with fatalities per capita.[161] Safety improvements to the rail network will only continue to reduce injury and death on the transportation system.

Policy 2: Provide for System Security, Emergency Preparedness, Response, and Recovery

Inherent in a multimodal transportation system are network redundancies that can offer system security and emergency preparedness. An integrated, statewide rail network is crucial to the state's emergency preparedness, because it provides a viable evacuation option, particularly for the 10 million Californians who do not drive. Developing the rail network to be reliable, safe, and efficient for daily uses will ensure that the system can respond and recover during an emergency.



160 FRA, Office of Safety Analysis, accessed 2016, The rate for intercity passenger rail = 0.43 per billion; for car passengers/drivers = 7.3 per billion.

161 Fang, Kevin, and Jamey Volker, The National Center for Sustainable Transportation. *Cutting Greenhouse Gas Emissions Is Only the Beginning: A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled* (2017), accessed 2017.

Extreme Weather Events and Transportation Resiliency

In 1994, 10 seconds of shaking during the Northridge Earthquake created havoc in Los Angeles County. Many commuters lost access to freeways—especially from Santa Clarita to either Los Angeles or the San Fernando Valley. Nine days after the earthquake, Metrolink reached 22,000 daily boardings along the Santa Clarita line at a time when normal ridership was 1,000 daily riders. The catastrophe of the 1994 earthquake illustrates the importance of a resilient, multimodal system and how rail can offer evacuation and alternative travel options if roads and highways are compromised.





Metrolink riders using commuter rail in Santa Clarita, after the Northridge Earthquake[162]

In late 2017 and early 2018 alone, California experienced extreme weather incidents across the state. In October 2017, a series of more than 200 wildfires in Northern California ravaged entire communities, especially in the Sonoma and Santa Rosa areas. More than 40 people lost their lives in the fires; 8,400 buildings were destroyed, with some estimating that property damage could reach $65 billion[1]. SMART rail services commenced operations in August 2017 and quickly sprang into action, providing free evacuation transportation for Sonoma and Marin county fire victims. They were able to transport emergency personnel where needed, as well as victims fleeing to safer areas. They ran free services for 2 weeks and, as a way to help start the rebuilding process, offered free services to anyone with a receipt from a local business for some time after that. SMART accredits some of their success in responding to the fires and maintaining flexibility to assist in evacuations to their newness. Because they had just opened, all employees were up to date with emergency preparedness training and knew exactly the steps needed to prepare the trains for their own evacuation.

In January 2018, mudslides in Santa Barbara and Ventura counties took the lives of 19 people and closed Highway 101 for over a week. During the closure, the *Pacific Surfliner* increased services to provide additional round-trip service to Santa Barbara, and borrowed an additional 15 railcars from northern California to accommodate the increased demand. During the Highway 101 closure, the *Pacific Surfliner* was the only north-south transportation route for anyone needing to travel or evacuate along the coast. Their ability to react quickly, increase service, and coordinate with partners to acquire more capacity allowed a continued throughput of people while workers expedited Highway 101 clearances.

162 Photo Credit: Dana Peters (http://trn.trains.com/bonus/TL1990#twelve)

3.1.6 GOAL 5: Foster Livable and Healthy Communities and Promote Social Equity

Policy 1: Expand Collaboration and Community Engagement in Multimodal Transportation Planning and Decision-Making

The Rail Plan has implemented many of the recommendations for this policy, including early collaboration with stakeholders and partner agencies to implement transparent decision-making for all investment options, as well to include economic, health, equity, and sustainability considerations in the planning process. The long-range planning process undertaken by the State as part of the Rail Plan includes local, regional, and tribal outreach to improve collaboration and engagement. The 2040 Vision also provides a framework for ongoing collaboration and engagement with partners and stakeholders, tied to implementation actions that support development of the Vision, including specific planning studies needed to facilitate conversations with communities regarding the ways the rail network can be improved to meet local needs. The State will develop the Vision through this engagement process.



Transbay Joint Powers Authority (TJPA), 2017.

The Salesforce Transit Center in San Francisco, now under construction, will serve as a key hub station for California High Speed Rail connections to other local and intercity rail and bus services.

Policy 2: Integrate Multimodal Transportation and Land Use Development

Passenger rail is a safe, clean, and efficient mode of transportation, with stations that support efficient and transit-oriented land use development. RTPs now include SCSs, which link land use planning and transportation investments to meet regional targets for GHG emissions reductions. The 2040 Vision of an integrated state network tying the state's population centers together will enhance regional SCSs and will provide for expanded access to a statewide network that supports sustainable, efficient land use development. This 2040 Vision for passenger rail is an important state tool for working with regional agencies and stakeholders to address the mega-regional nature of transportation needs in California. California's two mega-regions account for nearly 95 percent of the population, and therefore must be taken into consideration when planning transportation[163] —especially transportation well-suited for inter- and intra-regional passenger travel and goods movement, like rail. In the Northern California mega-region, for example, building a second Transbay tube to accommodate conventional rail will expand the mega-regional travel options, while further decreasing congestion on parallel corridors.

The 2040 Vision provides for attractive opportunities in more communities for station area planning that supports walkable, TOD near-station sites with access to a statewide rail network—a network providing for local, regional, interregional, and out-of-state travel. The 2040 Vision is focused on providing transportation improvements using existing rights-of-way that generally serve existing city centers, or that provide for future growth around sites that can be designed around rail, transit, and active transportation. The 2040 Vision supports California's Vibrant Communities and Landscapes component of the State's climate strategy.[164]

163 Bay Area Council: Economic Institute, *The Northern California Megaregion: Innovative, Connected, Growing* (2016).

164 CARB, *Vibrant Communities and Landscapes: A Vision for California in 2050* (2016).

Policy 3: Integrate Health and Social Equity in Transportation Planning and Decision-Making

This policy recognizes the need for a comprehensive multimodal system that increases access to education, employment opportunities, amenities, and health care; and preserves California's competitive edge as a highly desirable place to live and work. The Rail Plan will build on this vision of quality of life for all Californians, especially by providing viable access to destinations across the state without a car. Rail network investments and station stops can be well integrated with local transit, bicycle, and pedestrian improvements to provide for a healthy transportation system with a statewide reach.

The State supports integrating social equity in the rail planning process. The 2040 Vision plans for many more access points to a transportation network than exist today, or that were envisioned previously, providing economic benefits and opportunities to disadvantaged communities in the state. Implementation actions and investment supported by the 2040 Vision are also associated with discussion and evaluation of improvements to possible community impacts of rail service, including establishment of quiet zones and implementation of grade-crossing improvements to make rail corridors good neighbors.



3.1.7 GOAL 6: Practice Environmental Stewardship

Policy 1: Integrate Environmental Considerations in All Stages of Planning and Implementation

The 2040 Vision represents a significant state strategy for meeting California's future mobility needs and environmental goals by developing and investing-in a clean, efficient state rail network for the movement of people and goods. The Rail Plan provides a program-level platform from which more detailed service and environmental analysis must be conducted by the State and rail operators as the 2040 Vision is implemented.



Policy 2: Conserve and Enhance Natural, Agricultural, and Cultural Resources

The 2040 Vision supports development of existing rail corridors and rights-of-way as a priority for adding transportation capacity that serves the needs of future population growth and avoids sprawl-inducing impacts of new roadway construction or expansion of state highways. The 2040 Vision outlines a state strategy for planning and investment in transportation infrastructure that supports local and regional planning and efficient growth around rail stations, thereby reducing development pressures on natural and agricultural resources. Planning for services that are part of the 2040 Vision will be sensitive to the preservation of natural resources, and mitigation strategies will be deployed at the landscape level, with superior ecological outcomes wherever possible. The state rail planning process includes early outreach and consultation with Native American tribes to identify and disclose concerns about cultural resource disturbance, which will be addressed throughout the planning and project-development process.

Policy 3: Reduce GHG Emissions and Other Air Pollutants

As the state's passenger rail system grows, the resulting reduction in VMTs and reduced rate of highway expansion will result in air quality benefits. As described in Chapter 2, emissions from transportation account for 38 percent of California's total GHG emissions, the vast majority of which come from on-road sources. Limiting the growth of VMTs through mode-shift will reduce on-road sources of pollution. Rail is also a relatively energy-efficient way to move freight. According to federal statistics, an average freight rail car moves 10.6 miles per gallon of fuel consumed, while an average combination truck moves 5.9 miles per gallon.[165] A 2009 FRA study reported that a double-stack container-trailer-freight rail car moves freight three to five times more fuel-efficiently than a truck.[166] Each freight train carries much more total weight than a single combination truck, so each train movement reduces truck traffic on highways and reduces GHG emissions.

Policy 4: Transform to a Clean and Energy Efficient Transportation System

An accessible, connected, integrated, state-of-the-art passenger rail system offers travelers a wealth of mobility choices, reducing reliance on the automobile. Reducing the number of automobile trips will reduce pressure on—and improve the performance of—the state's highway network, while decreasing VMTs and GHG emissions.

Rail's ability to transport more people with fewer emissions supports a clean and energy-efficient transportation system. The intent of the 2040 Vision is to accommodate additional demand for trips, and grow the rail network in a manner that incorporates substantial electrification of the state network, with improvements possible on additional corridors where there is support to do so. The statewide HSR network included in the 2040 Vision will be powered entirely from renewable energy sources, providing a growing market for clean energy providers.

To support transformation of the technology used in the rail system, CARB has petitioned the United States Environmental Protection Agency (U.S. EPA) to adopt more stringent national locomotive emissions standards. These include more stringent standards for remanufactured locomotives; and a Tier 5 standard for new locomotives that would require capability for zero-emission operation in designated areas, such as disadvantaged and high-traffic regions, to better protect the health of those residents. Under the proposed standard, with capability for zero-emission operation, newly manufactured locomotives could achieve 99 percent control of oxides of nitrogen (NO_x) and diesel particulate matter; 98 percent control of hydrocarbons, and 10 to 25 percent control of GHGs.

165 Bureau of Transportation Statistics, *National Transportation Statistics* (2011), Tables 4 14 (2012) and 4 17.

166 FRA, *Comparative Evaluation of Rail and Truck Fuel Efficiency on Competitive Corridors* (2009), page 5.

3.2 Program Effects

The state's passenger and freight rail vision and investment program has been carefully developed to provide benefits to California residents and businesses, while minimizing adverse impacts. To evaluate the performance of the vision and investment program toward meeting the stated goals and objectives, Chapter 6 considers program effects across many measures, including the following:

- **Access and mobility:** Effects are measured through forecast changes in travel times; passenger rail ridership and revenue; number of travelers using air versus passenger rail and automobiles; roadway travel by trucks and automobiles; and elimination of rail congestion locations and choke points. As passenger rail service frequencies are increased, the system can carry more passengers to more destinations in less time. This is achieved through reduced wait times at destinations and transfer points, improved connections, and expanded travel time flexibility—all providing travelers with more seamless mobility.
- **Environmental stewardship:** Effects are measured through projected changes in GHG and criteria and toxic air pollutant emissions; consideration of actions taken to address rail-related noise; the extent to which projects and programs can support the State's climate change policies; and the extent to which sea-level rise and extreme weather may affect rail corridors and investment needs.
- **Livable and healthy communities:** Effects are considered by evaluating impacts on grade crossings, quiet zones, and other neighborhoods near rail lines, yards, and passenger stations; the extent to which projects and programs support local land use visions in RTPs and sustainable communities strategies; and the extent to which expanded passenger rail service integrates with local transportation options.
- **Safety and security:** Effects are considered by summarizing research results regarding the demonstrated safety benefits of passenger and freight rail travel versus highway travel; and by including and prioritizing programs that directly fund rail safety improvements.
- **Economic benefits:** The potential job creation and economic growth effects are addressed quantitatively through synthesis of recently completed economic and benefit-cost analyses, which are used to characterize enhanced real estate values near passenger rail stations. This plan also considers potential highway and bridge maintenance cost reductions from reduced truck and automobile travel. It decreases direct and indirect health care costs for the State and individuals as a result of improved safety associated with reduced VMTs (from mode shift). Additionally, households spend nearly 20 percent of their income on transportation, largely from the associated costs of car ownership.[167] Increasing access to alternatives, as is the goal of the 2040 Vision, will help to lower VMTs, thereby reducing total household transportation costs and increasing disposable income.

167 Fang, Kevin, and Jamey Volker, The National Center for Sustainable Transportation. *Cutting Greenhouse Gas Emissions Is Only the Beginning: A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled* (2017), accessed 2017.

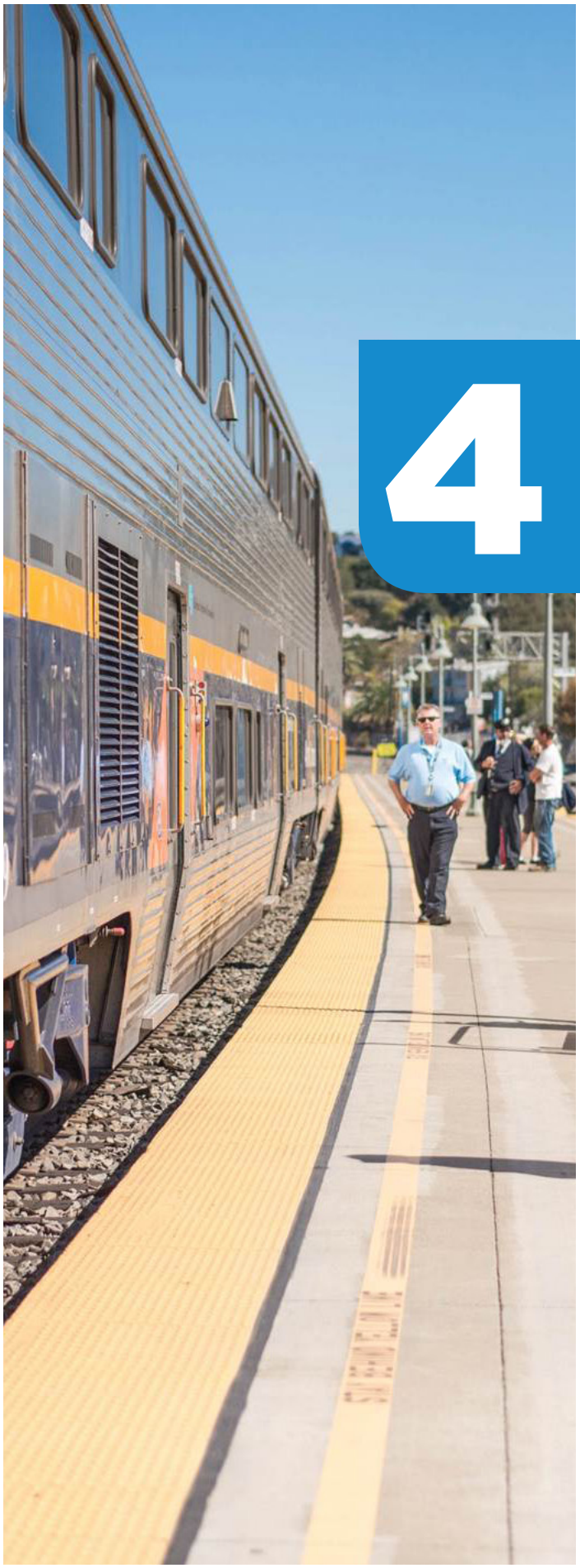
3.3 Conclusion

California's diversity is one of the state's strongest assets; however, the diversity of people and places poses great challenges to safeguarding against climate impacts and preparing for future vulnerabilities. To sustainably and equitably prepare for the future and expand mobility choices for California's residents, visitors, and businesses, the state needs a robust, multimodal transportation system—and an integrated passenger and freight rail network. An integrated rail system that is developed in coordination with land use planning strengthens the benefits of both by increasing access, and dispersing mobility and equity benefits. Furthermore, almost every city or region in the state is vulnerable to at least one effect of climate change, and planning and being equipped to handle all of them is a daunting task. The Rail Plan can help by guiding rail planning and corresponding investments to incorporate State policies that aim to reduce GHG emissions, reflect climate change adaptation strategies, and provide a seamless travel experience for all populations.

The 2040 Vision and planning framework details how a pulsed system incorporates integrated and complementary services, and can be sustainably executed through a phased investment strategy. Chapter 4 will elaborate on these planning principles, and explain geographically specific connectivity and service delivery goals and options.



This page intentionally left blank.



4 Proposed Passenger Improvements and Investments

Chapter 4 presents the service improvements and investments needed to achieve the Rail Plan Vision. The Rail Plan supports near-term plans and proposals being developed in individual corridors and regions, with a targeted completion date of 2022; but presents a flexible, corridor-level framework for developing the passenger rail system over the plan's long-term, 2040 time horizon. This framework is intended to serve as the basis for State-led service implementation planning, to be undertaken in coordination with regional agencies, rail operators, and stakeholders to achieve the 2040 Vision. The Rail Plan does not seek to prescribe specific projects or solutions and their associated costs, but rather to provide a path for implementation and a common understanding of how the state's rail network should develop to meet the State's goals.

4.1 Network Integration Strategic Service Planning

The 2018 State Rail Plan Vision was developed as part of the State's Network Integration Strategic Service Planning (NISSP) process. The overarching goal of the NISSP is to plan for a statewide passenger rail system that maximizes the performance potential of intercity passenger rail as a time- and cost-competitive travel option for meeting the state's transportation needs and goals. The network planning process undertaken as part of the Rail Plan included an assessment of statewide travel demand, existing rail service and infrastructure, service types responding to market demand in different regions or corridors, and infrastructure elements required to support service levels and address infrastructure constraints. The draft network vision was developed through an iterative process of network planning, ridership and revenue modeling, capital improvement analysis, and operations and revenue analysis.

In addition to the demand and infrastructure analysis from the NISSP, the most recent planning or programming documents in each service area were reviewed to identify projects related to passenger rail. Documents reviewed include RTPs, corridor strategic plans, corridor business plans, and programming documents such as the State Transportation Improvement Program (STIP) and the Safe, Reliable, High-Speed Passenger Train Bond Act for the 21st Century (Proposition 1A).

4.2 Pulse Scheduling

State network planning in the Rail Plan is based on *pulse scheduling*, which represents uniform train service patterns that repeat throughout the day on regular, recurring time intervals. This timetable-based planning approach allows for timed transfers between services at hub stations where a transfer is required to complete a trip across the state, or to a location served by local transit. The benefit to users of pulse scheduling is that a repeating timetable allows for easy trip planning and seamless travel by ensuring that connections between trains can be made throughout the day, with minimal transfer times. By not requiring a train for every travel market, pulse scheduling allows fewer trains to serve more destinations through connections, similar to the way airlines use hubs to allow smaller communities more frequent access to more destinations than would otherwise be possible, and at a lower cost. Pulse schedule planning allows cost savings to be realized by reducing the set of infrastructure improvements needed to operate services to only those that are necessary to reliably operate the timetable (e.g., the capacity of a single-track railroad can be maximized to operate services before additional track infrastructure is needed to accommodate a greater service frequency).

The Rail Plan has preliminarily identified a 30-minute or 60-minute service frequency (or headway) across most portions of the state by 2040. Because the HSR system will serve as the major artery for the long-distance travel option of the statewide system, the service plans from the *2016 CHSRA Business Plan* were used to determine primary time point hubs for the integrated, statewide network.

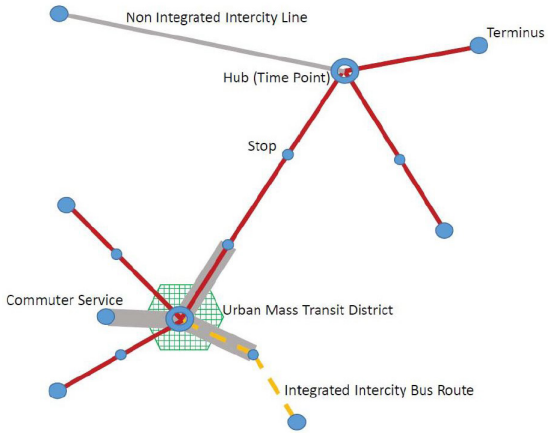


Exhibit 4.1: Sketch of "Pulsed" Services

4.3 State Service and Connectivity Goals

The Rail Plan presents the State's goals for providing and connecting services in different regions. Service goals describe the service-desired train frequencies on the state passenger rail network; reflect the travel times needed to provide services that are competitive with automobile and air travel; and provide for timed connections at mobility hubs. These hubs will have co-located rail, transit, bicycle, and pedestrian facilities to connect people to the rail network through coordinated schedules and infrastructure. In some cases, hubs will require infrastructure investments to improve connectivity. However, many of the statewide hubs already exist and only need operational and minor capital improvements to achieve the statewide rail connectivity and service goals.

Service goals balance travel times with the need to schedule connections between services where transfers are needed for travel between different travel markets. Service goals identify where peak (including seasonal) and off-peak services differ in travel times and frequencies, but where there will still be some exceptions to identified frequencies, based on capacity improvements and market demand. Service goals are also operator-neutral and strategic, rather than prescriptive—the Rail Plan does not determine specific operating and institutional responsibilities, which must be negotiated over time to deliver improvements with the 2040 Vision in mind.

In some cases, service goals are associated with delivery options, where the State's goal can be met with different types or services and capital investments to address funding needs or specific geographical and operational constraints.

Service delivery options represent the physical improvements and capital investments necessary to achieve the service goals; and ultimately, the 2040 Vision.

In other cases, service goals assume that local transit systems will continue operating services at current levels and proceed with planned improvements to provide necessary local and regional connectivity. Where connectivity hubs have been identified on the network, the State will work with regional partners to co-locate all service types at the hubs to enhance mobility and ease of transfer between modes of transit. For the many other transit services not identified on the statewide network, connectivity to the rail network will be important for local and regional mobility; but those decisions will be made by local transit agencies and local decision-makers with the connectivity opportunities that are provided by stops on an expanded statewide network. The State supports needed local connectivity, but based on market analysis, not all local services can connect as part of the pulsed statewide rail network.

4.3.1 Phasing

The service goals and service delivery options identified in the Rail Plan provide a strategic framework for service implementation planning, coordination between the State and rail partners, and prioritization of capital improvements in phases tied to the short-term (2022), mid-term (2027), and long-term (2040) Vision in the Rail Plan. The goals of the phased implementation strategy in the Rail Plan are to follow through on the committed, funded service improvements planned across the state (mostly expected to be complete by 2022), which leverages existing assets and prioritizes maximizing use of existing infrastructure. The long-term 2040 Vision defers significant infrastructure investments that are necessary to integrate passenger rail services, and fully realize the possible service and connectivity goals in the 2040 Vision, if funding and regional support are available to deliver those infrastructure elements. The time phases described in the Rail Plan also identify the specific service planning and analysis that are needed to develop and integrate the rail network over time in a manner that is responsive to the needs of local and regional stakeholders. Critically, the time horizons used in the Rail Plan do not tie to the specific completion year of the recommended projects. Some projects may be completed ahead of the specified year; others may be near completed by the Rail Plan date. The project years and corresponding plans serve as important planning markers and meet statutory planning requirements.

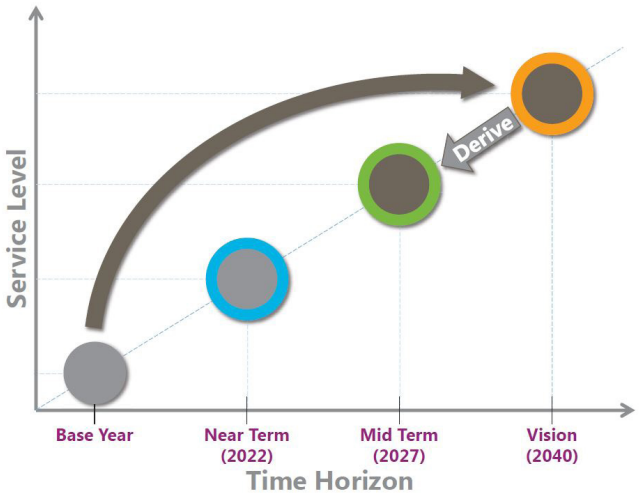


Exhibit 4.2: Implementation Strategies Derivation Process

4.3.2 Interstate Rail Connections

Beyond California's statewide goals, the State has an interest in maintaining long-distance national Amtrak service, with interstate connections to Oregon, Nevada, and Arizona; such connections provide service and access to communities that are not on the high-frequency State passenger rail network. The State also has an interest in developing specific passenger rail corridors in coordination with Nevada and Arizona, to provide for future interstate HSR service to Las Vegas, Nevada; and Phoenix, Arizona. These future HSR connections represent significant opportunities for accommodating interstate travel to these important destinations via passenger rail, which will address congestion on interstate highways and at California's airports.

The Rail Plan also seeks to address cross-border congestion between California and Mexico through passenger rail connections at the border, providing service that is integrated with the state network.

4.3.3 Host Railroad Coordination

Freight railroad owners desire to improve existing operating efficiency and preserve future capacity to accommodate growing freight rail traffic. Therefore, they are interested in minimizing or improving passenger rail impacts on existing and future freight rail operations. Caltrans will consider the potential impacts of the planned passenger rail service improvements on railroad capacity, and access to yards and customers. Infrastructure investments necessary for increased passenger train volumes will also add capacity and flexibility to freight operations. The goal will be to enable continued, market-responsive growth in goods movement by freight rail, while also providing for increased passenger capacity. This goal will be achieved through early and continuous dialogue with the freight railroad partners, and progressive identification of shared opportunities.

In some cases, ensuring capacity for passenger and freight rail operations will be realized through development of a shared track infrastructure used by both freight and passenger trains. In other cases, ensuring capacity for freight will involve the development of largely dedicated track for passenger and freight trains in a shared right-of-way, while retaining the ability to share track under certain conditions; or the development of completely separate freight and passenger infrastructure.

The nature of corridor development may change over time as more passenger service is phased in. Limits on passenger train growth in a corridor during early phases of network development will place a premium on using available passenger train slots for the highest-ridership services (often running with more cars on each train than today), while supplementing the service with integrated express bus service during off-peak or lower-demand times of day. Additional growth would be achieved through significant investments in physical infrastructure, in partnership with the freight railroads. In return for granting more passenger trains access to freight railroads' lines, many funding options will be considered, including various combinations of upfront capital project investments and infrastructure access fees, as well as agreements on future capital investments tied to ensuring reliable service for both freight and passenger services. The partners may conclude that future growth needs will require investing in dedicated passenger rail infrastructure for all or a portion of a corridor.

Additionally, where freight and passenger services share a corridor, opportunities may exist to expand or reorganize tenancy agreements with host railroads for passenger services to gain additional capacity on the freight rail network. Passenger service providers must have the ability to purchase additional slots for more passenger service; in this way, services can be scaled to meet market demand over time, while minimizing large capital outlays for new infrastructure and limiting redundant infrastructure as the network evolves toward the 2040 Vision.

Although the Rail Plan reflects a general understanding of the type of investments appropriate to each corridor, specific decisions will be made through detailed implementation planning and host railroad negotiations. A detailed description of the proposed freight rail improvements and investments is included in Chapter 5.

4.4 Service Areas and Organizational Framework

In addition to organizing proposed passenger improvements, the three time horizons in the Rail Plan mark important milestones in building toward the 2040 Vision. The geographic service regions described in this chapter were refined from service regions developed in the network planning effort as a framework for understanding, discussing, and organizing future services. Those service areas were developed to facilitate planning and analysis for services that could be grouped into logical statewide rail travel sheds, justified by early market and ridership analysis. HSR and intercity services, as well as several regional services, are likely to operate across more than one service area, and may be described in both where it is necessary to do so.

The Rail Plan defines nine geographic service areas. These service areas were developed to guide planning, based on market analysis, ridership forecasts, and corridor-based planning principles. Exhibit 4.3 visually represents the geographies and the service goals defined in the 2040 Vision. These areas are:

- **Central Valley and Sierra Nevada:** This region includes the state rail network in the San Joaquin and Sacramento Valleys, including service and improvements between Palmdale and Bakersfield in the south, and Sacramento and Redding in the north; as well as connections to Reno, Carson City, the Sierra Nevada, and counties north of Sacramento.
- **North San Francisco Bay Area and the North Coast:** This region includes the state rail network between Sacramento and Oakland/San Francisco, as well as the north San Francisco Bay Area rail network in Marin, Sonoma, Napa, and Solano Counties. The rail network connecting the Stockton area to the San Francisco Bay Area at Martinez is included in this geographic region.
- **South San Francisco Bay Area:** This region includes the state rail network providing services to and from the south San Francisco Bay Area, including the San Francisco-San Jose Peninsula Corridor, the rail network between Oakland and San Jose, and the network carrying services between the Stockton Area and San Jose over the Altamont Pass.
- **Central Coast:** This region encompasses the Central Coast rail network between San Jose in the north and Santa Barbara/Goleta in the south, including the UPRR Coast Route and Monterey and Santa Cruz Branch Lines.
- **Las Vegas to HSR:** This region encompasses the HSR route being privately developed for service between Las Vegas and Victorville or Palmdale. The developer of the Victorville to Palmdale segment (known as the HDC) has not been finalized and could be either public or private sector.
- **LOSSAN North and Antelope Valley:** This region includes the state rail network included in the existing LOSSAN North corridor between San Luis Obispo, Santa Barbara, and Los Angeles. The regional rail corridor between Santa Clarita and Los Angeles is included in this region.
- **Los Angeles Urban Mobility Corridor:** This region includes the high-capacity rail network being developed for different services between Burbank and Anaheim through the Los Angeles Area and LAUS. Services providing connectivity to the state network in the Los Angeles area are included in this region.
- **Inland Empire:** The Inland Empire region includes the rail network connecting San Bernardino and Riverside Counties to Los Angeles, Orange County, and San Diego.
- **LOSSAN South:** The LOSSAN South region includes the existing LOSSAN South Corridor between Los Angeles/Anaheim and San Diego.

State service goals and improvements, organized by timeframe and geographic region, are described in the sections that follow. Exhibit 4.3 shows the entire statewide build-out of the 2040 Vision. The hubs identified on the map represent connectivity points rather than specific station locations, which will be decided through detailed implementation studies with local inputs.

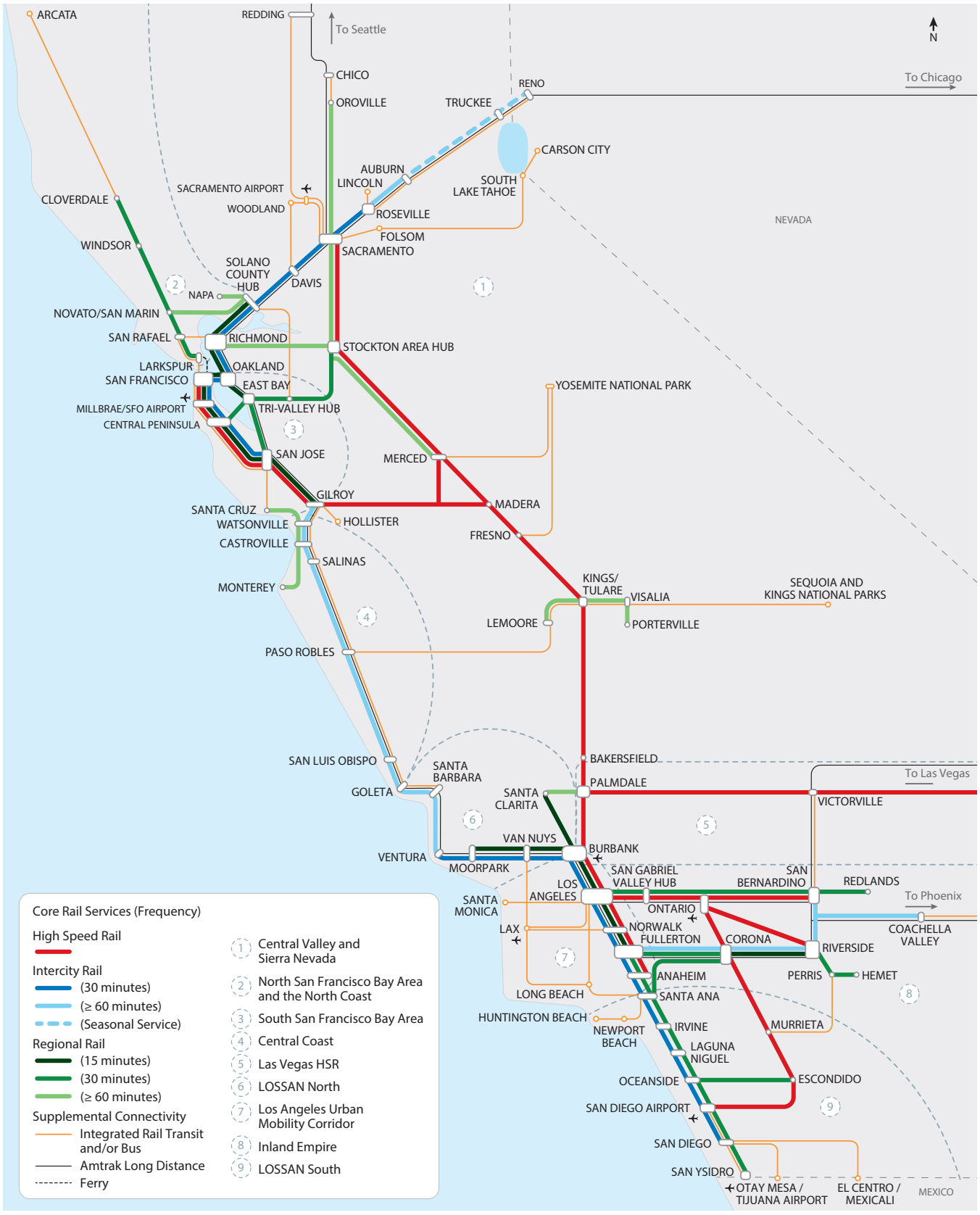


Exhibit 4.3: Caltrans Statewide 2040 Vision Rail Map

4.5 2022 Short-Term Plan – Statewide Goals

The 2022 statewide goals identify service improvements that will lay the foundation for integrating the passenger rail network. These improvements have already been or are being planned; and are funded, or likely to be funded, for construction and implementation, and will be underway or completed by 2022.

Additionally, specific planning, environmental, and engineering studies needed to implement service goals in the long-term vision are described here. Because these are preliminary descriptions of studies, and details will not be available until each study begins, scope and definitions are intentionally broad. Service goals related to frequency presented here largely represent peak hour, with possible exceptions to midday or weekend frequency as markets are developed and investments come on line.

Statewide focus areas for the 2022 horizon include:

- Planned and committed projects, including service extensions to Larkspur, Redlands, and Salinas; electrification of the Caltrain service between Gilroy and San Francisco via San Jose; and increased frequencies throughout the state.
- Environmental clearance and preliminary construction for HSR Silicon Valley to Central Valley service and for the ACE extension to Modesto and Ceres.
- Assisting communities statewide in better connecting transit systems to rail, and enhancing station area functions.
- Working with available or identified capacity from existing host railroad agreements; or from opportunities with clear paths for negotiation.
- Strategic planning for fleet management, replacement, and expansion, as well as the expansion or construction of new maintenance facilities.
- Conducting research and development and targeted investments in integrated ticketing and travel planning.
- Identifying opportunities to begin developing integrated schedules and repeated patterns, especially in areas of shared regional and intercity operations.
- Making significant progress in implementing alternative fuels or zero-emission technology on both rail and integrated express bus services.
- Continuation of California advocacy for continuation of the federally funded Amtrak long-distance trains: the *Coast Starlight* (Seattle-Los Angeles), the *California Zephyr* (Emeryville-Chicago), the *Southwest Chief* (Los Angeles-Chicago), and the *Sunset Limited* (Los Angeles-New Orleans). These trains provide the only rail service to a number of California communities throughout the state, and connect the state to the national rail network.
- Service implementation planning for the 2027 and 2040 time horizons.



4.6 2022 Short-Term Plan – Regional Goals

4.6.1 Central Valley and Sierra Nevada

The 2022 regional goals include building out planned investments in the regional intercity rail network, and integration with full HSR Phase I.

Service Goals and Improvements:

- Introduce early-morning service into Sacramento and the Bay Area from the San Joaquin Valley, using mid-corridor starts from Fresno and Stockton.
- Increase peak-period service between Roseville and Sacramento (at least three trains per day in each direction).
- Implement integrated express bus service from Sacramento to Redding via the Sacramento International Airport.
- Implement bi-hourly service between Bakersfield and Stockton.
- Expand service between Stockton and Sacramento, with a target of at least four trains per day in each direction; with potential new stations in Elk Grove, Sacramento, and North Natomas/Sacramento Airport, and integrated express bus continuing to Chico, via Marysville. Related projects include the Stockton Wye and ACE Maintenance Facility Lead Track.
- Increase seasonal integrated express bus service to from Sacramento to Reno and South Lake Tahoe.
- Invest in Bakersfield to Sacramento and Martinez corridor improvements, focused on increasing ridership through faster, integrated train schedules; improved reliability; and better transit connectivity.

Planning, Analysis, and Project Development:

- Study expansion of Sacramento-Roseville service to hourly and half-hourly, based on market and network development.
- Plan for additional, post-2025 regional service frequency to Merced via Modesto and Ceres.
- Plan for phased growth in east-west service across the Altamont Pass to hourly off-peak and half-hourly peak service, enabling connectivity to regional transit and statewide rail networks, including connectivity in the Tri-Valley.
- Complete the HSR Connected Corridor Study, planning for phased improvements to northern San Joaquin Valley services, and a clear investment plan that provides enhanced regional and intercity rail services prior to future HSR service.
- Study potential regional rail and integrated express bus needs to communities between Fresno and Bakersfield, and develop recommendations that consider capacity currently used for San Joaquin service, along with regional rail opportunities and the need to feed HSR stations at Fresno, Kings-Tulare, and Bakersfield.
- Develop recommendations for 2027 that primarily leverage existing investments; and for 2040 that consider additional investment opportunities.
- Study expansion of integrated rail service north from Sacramento to Marysville, including potential stations in northern Sacramento, to serve residents and provide connections to Sacramento International Airport.
- Study the potential for seasonal rail service to the Lake Tahoe region during congested travel periods, such as peak-travel weekends, with potential termini in Truckee, California, or Sparks, Nevada, through a bi-state planning effort.
- Study rail options to connect the Sacramento International Airport to the state network.
- Study the potential for regular, daytime passenger rail to Redding.

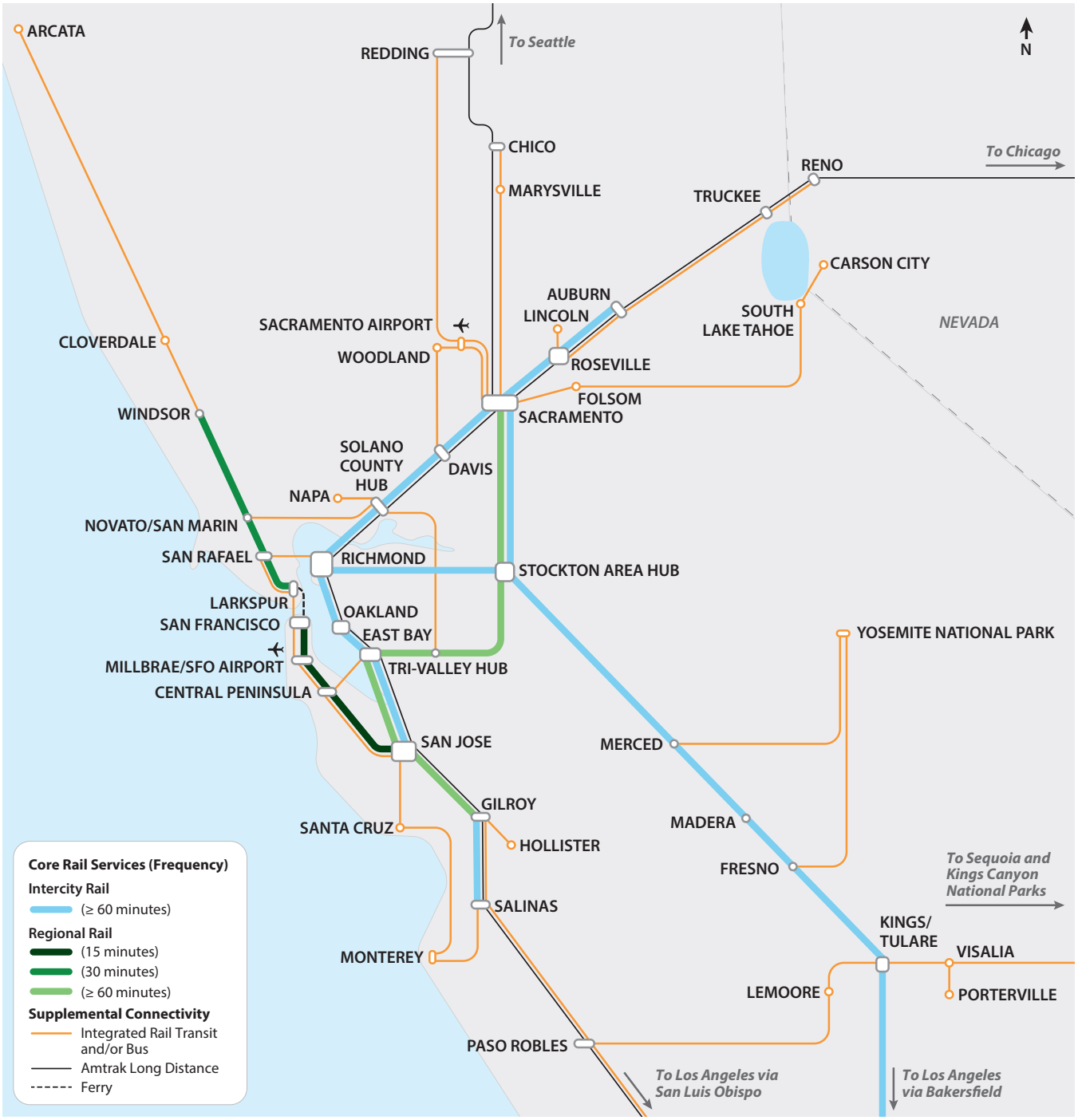


Exhibit 4.4: Northern California Service (2022 Vision)

4.6.2 North San Francisco Bay Area and the North Coast

The 2022 regional goals focus on optimizing existing rail services and building on the recently established SMART service from San Rafael to Sonoma County Airport, with half-hourly peak-period service. Primary goals include improving intercity rail service between Oakland and Roseville, and enhancing connectivity between the North Bay Area and North Coast with the rest of the statewide network.

Service Goals and Improvements:

- Improve service speeds and frequencies between Roseville and Oakland with track and right-of-way improvements, and by introducing an optimized rail schedule that better uses capacity available under existing and enhanced railroad agreements across all intercity rail service providers.
- Improve ridership and revenue on intercity and regional rail via improved integrated express bus service and improved connectivity to high-frequency urban transit between Roseville and Oakland.
- Connect SMART at the San Rafael Transit Center to Richmond with integrated express bus service.
- Extend SMART rail service to Larkspur to an integrated ferry connection to San Francisco.
- Establish integrated express bus services to connect to communities north of Windsor (on the North Coast) with SMART, and to connect the Napa Valley with intercity services in Solano County and Martinez.

Planning, Analysis, and Project Development:

- Evaluate options for higher-capacity hourly off-peak and half-hourly peak intercity rail service between Sacramento and Oakland on the existing alignment (with the potential for some trips being served by integrated express bus in low-congestion periods).
- Evaluate options for improved connections at Martinez for trains between Stockton and Martinez with those traveling between Sacramento and Oakland.
- Evaluate intercity and regional rail options for the Sacramento to Oakland corridor, allowing both local and express services over all or part of the route. Include an assessment of service needs with and without a new Transbay crossing to San Francisco and the Peninsula, as well as the business-case and phasing recommendations for adding service beyond what is possible on the existing alignment.
- Evaluate options for expanding integrated express bus services connecting northern California communities with SMART and the state's intercity rail corridors.
- Plan for completion of SMART to Cloverdale by 2027.
- Evaluate expansion of rail service from San Rafael, Sonoma, and Napa Counties to Solano County, considering rail service primarily on existing rail alignments, with potential connections to the statewide network at Fairfield-Suisun or near Vallejo.

4.6.3 South San Francisco Bay Area

The 2022 regional goals focus on optimizing regional service timetables, building out planned expansion, and electrification investments in the regional transit and commuter rail networks. The Rail Plan supports electrification of the Peninsula Corridor as a high priority. It is the artery through which long-distance services from the Central Valley and Southern California will serve the Bay Area. Caltrain electrification is critical to mitigating congestion on the Highway 101 corridor, and to supporting a key state and national engine for economic growth.

Service Goals and Improvements:

- Run six trains per hour in each direction in peak periods, providing express and local service, between San Francisco and San Jose, supported by the Caltrain Modernization Program and Peninsula Corridor Electrification Project.
- Make improvements to the 25th Avenue grade separation and South San Francisco station.
- Improve service speeds and frequencies between San Jose and Oakland with track and right of-way improvements, and by introducing an optimized rail schedule that better uses capacity available under existing and enhanced railroad agreements across all intercity and regional rail service providers.
- Improve ridership and revenue on intercity and regional rail services by enhancing integrated express bus services and by improving connectivity to high-frequency urban transit networks at rail stations between San Jose and Oakland.
- Provide initial integrated express bus services connecting the Peninsula and East Bay across the Dumbarton Bridge, via regional and intercity rail stations, allowing connectivity to the statewide rail network.
- Provide initial integrated express bus services in the I-680 corridor, using freeway managed lanes to better connect the San Ramon Valley to Sacramento and the Bay Area.
- Enhance integrated express bus services in the Highway 101 corridor using managed lane improvements in San Mateo County between Santa Clara and San Francisco. Provide additional integrated express bus service on the Highway 101 Corridor between San Francisco and San Jose, possibly in separate lanes.

Planning, Analysis, and Project Development:

- Plan for integrated all-day, express, and local service between San Francisco and San Jose, allowing all stations to be served at least half-hourly, and to connect with the statewide rail network in San Jose.
- Plan for capacity investments in the San Jose to San Francisco corridor that address 2027 and 2040 growth.
- Evaluate intercity and regional rail options for the San Jose to Oakland corridor, allowing both local and express services over all or part of the route. Include an assessment of service needs with and without a new Transbay crossing to San Francisco and the Peninsula, as well as the business-case and phasing recommendations for adding service beyond what is possible with existing capacity.
- Study the final alignment of the Downtown Extension to Salesforce Transit Center, allowing future high-speed and regional services to serve the Salesforce Transit Center.
- Conduct a long-term Northern California mega-regional demand analysis to refine specific needs and opportunities for an integrated rail and bus network.
- Complete operational analyses of the Salesforce Transit Center with the goal of optimizing capacity to accommodate high-speed, intercity, and regional rail service types and potential through-train service opportunities.
- Continue work with Alameda County to study freight and passenger rail investments in the East Bay and to determine investments by alignment, and select a preferred alignment for Oakland to San Jose passenger rail services.

- Analyze opportunities to provide necessary rail capacity between Oakland and San Jose, considering existing and planned BART and UPRR investments.
- Complete a study of the Dumbarton alignment to connect the Peninsula and East Bay within a regional network, including alternatives for both integrated express bus and rail service.
- Provide half-hourly integrated express bus service in the I-680 corridor, providing connections at the Solano County hub, Martinez, the Tri-Valley hub, and the Pleasanton ACE station.

4.6.4 Central Coast

The 2022 regional goals provide for additional service frequencies connecting the Central Coast and San Francisco Bay Area, and for early planning for the Santa Cruz – Monterey County regional network.

Service Goals and Improvements:

- Run two intercity trains per day, connecting the San Francisco Bay Area to Salinas via San Jose, including new stations in Pajaro/ Watsonville and Castroville.
- Make early investment in additional local stops on the Coast Route in Soledad and King City, for immediate use by the long-distance *Coast Starlight* and longer-term use by intercity trains between Goleta and Gilroy.
- Provide bi-hourly integrated express bus service connecting communities between San Jose, Salinas, San Luis Obispo, and Santa Barbara, including directly serving significant population centers not on the existing rail line, and providing important connections between trains that terminate in Goleta or San Luis Obispo in the south and San Jose or Salinas in the north.
- Provide enhanced integrated express bus service, connecting the Central Valley at Paso Robles.
- Provide enhanced and initial integrated express bus service, connecting Hollister, Monterey, and Santa Cruz to the statewide rail network.

Planning, Analysis, and Project Development

- Analyze opportunities for an enhanced rail network to improve connections between the Monterey Peninsula, Santa Cruz, Salinas, and Hollister to HSR at Gilroy.
- Plan for improvements to the Coast and Santa Barbara Subdivisions to increase frequencies between San Jose and Goleta by 2027 and 2040.

4.6.5 Las Vegas HSR

The State intends to support improvements providing connections to Las Vegas services and will coordinate with the private project sponsor and local planning authorities to develop detailed operations plans. The State will ensure integration and inter-operability between California HSR and Las Vegas services.

Planning, Analysis, and Project Development:

- Ensure HDC environmental clearance and right-of-way acquisition between Victorville and Palmdale.
- Complete HDC service integration study.

4.6.6 LOSSAN North

The 2022 regional goals support service improvements between Los Angeles, Ventura, and Santa Barbara Counties, and connections to regional destinations and the statewide network. Investments by 2022 will improve schedule reliability throughout the corridor.

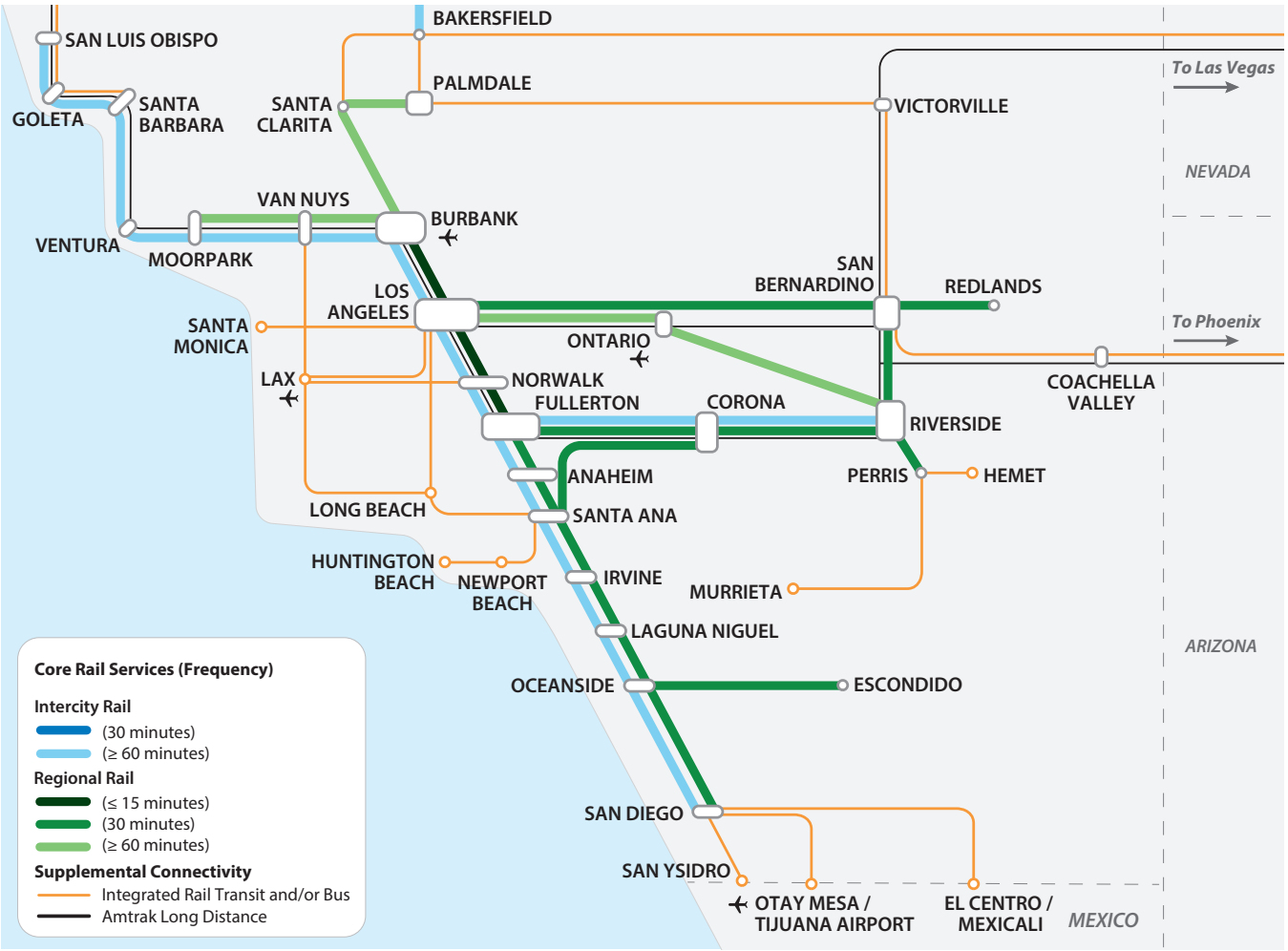


Exhibit 4.5: Southern California Service (2022 Vision)

Service Goals and Improvements:

- Invest in LOSSAN North corridor improvements that focus on increasing ridership on existing frequencies through faster, integrated train schedules; improved reliability; and better transit connectivity, which includes investment in layover facilities.
- Increase frequency between Santa Barbara and Los Angeles by at least one train per day in each direction, achieving largely bi-hourly service in the corridor, with some gaps filled by integrated express bus.
- Integrate intercity and regional rail services to provide improved rail service, with at least hourly service at most stations, and at least half-hourly service during the peak.

Planning, Analysis, and Project Development:

- Begin detailed planning and implementation studies for improvements in LOSSAN North should as early as possible, addressing:
  - Corridor requirements for achieving 2027 and 2040 phased expansion of service, including goals of hourly intercity service to Goleta, half- hourly regional service to Ventura County, and integrated express and local service on at least half-hourly headways between Chatsworth and Los Angeles.
  - The North LOSSAN Corridor interface with the HSR System at Burbank/Bob Hope Airport.
  - Ongoing planning to address regional rail service needs between Ventura and Santa Barbara Counties during peak periods, building on peak-period service planned for implementation in 2018.

4.6.7 Los Angeles Urban Mobility Corridor

The 2022 Short-Term Plan regional goals support the significant regional commitment to rail capacity and service improvements in the Los Angeles area. The Rail Plan seeks to harmonize statewide goals with those investments by integrating service in the Los Angeles Area with the statewide network. The Los Angeles Urban Mobility Corridor, extending from Burbank to Anaheim, is a critical piece of the statewide network that will provide needed freight and passenger capacity in this significantly congested transportation corridor. During this period, construction of run-through tracks at LAUS will advance, but not be complete.

The Rosecrans-Marquardt grade separation will be completed during this time, allowing increases in service from San Diego, Riverside, and Orange Counties.

Service Goals and Improvements:

- Develop well-integrated rail service provided by both intercity and regional rail operators, including:
  - hourly express and half-hourly peak (hourly off-peak) local service between Anaheim and LAUS, using capacity benefits of the Rosecrans-Marquardt grade separation;
  - additional local service between Fullerton and Los Angeles as a result of increased service from Perris Valley and Riverside, using capacity benefits of the Rosecrans-Marquardt grade separation; and
  - at least half-hourly peak and hourly off-peak service from Burbank to LAUS.
- Ensure Crenshaw corridor and Regional Connector completion, allowing improved access to statewide rail network.
- Provide initial integrated express bus service between:
  - LAX and Van Nuys;
  - LAX and LAUS, Long Beach, and Los Angeles; and
  - Long Beach and Santa Ana.

Planning, Analysis, and Project Development:

- Determine final design for run-through tracks at LAUS, accommodating HSR, intercity rail, regional rail, and local transit operators; and begin construction.
- Plan for integration of LA Metro projects with the statewide rail network at key connection points such as Van Nuys, Chatsworth, Burbank, Glendale, LAUS, and Norwalk/Santa Fe Springs.
- Plan to incorporate integrated express bus services as part of the Los Angeles Urban Mobility Corridor regional network.
- Perform implementation planning study for HSR Phase 2 service east of LAUS.

4.6.8 Inland Empire

The 2022 regional goals support service and frequency improvements to connect the Inland Empire to Southern California regional networks and future HSR and interstate service expansions. Advance planning is critical for development of future electrified regional services and phased implementation HSR services in the Inland Empire.

Service Goals and Improvements:

- Provide half-hourly peak and hourly off-peak regional service between Los Angeles and San Bernardino, and Los Angeles and Riverside/ Perris Valley, with integrated express bus to fill any gaps in the schedule caused by insufficient available railroad capacity.
- Provide half-hourly integrated regional service between San Bernardino and Redlands, with train connections to the statewide network.

Planning, Analysis, and Project Development:

- Plan for achieving 2027 and 2040 phased expansion of service, inclusive of Phase 2 HSR, intercity rail, and regional rail investments connecting Los Angeles and the Inland Empire, service to the Coachella Valley, and service from the Inland Empire to San Diego.
- Form an Interstate Blue Ribbon Commission in cooperation with Arizona to coordinate future service expansion to Arizona via the Inland Empire.



4.6.9 LOSSAN South

The 2022 regional goals support analysis of operating complementary services and stopping patterns in a shared corridor along the South LOSSAN and Orange County corridors between Los Angeles and San Diego. Analysis of timetable and regional scheduling will lead to reliability and service speed improvements.

Service Goals and Improvements:

- Introduce initial integrated service, featuring hourly express and half-hourly local service between Los Angeles and San Diego (with exceptions to half-hourly local headways based on availability of slots between Los Angeles and Fullerton), taking advantage of the expanded capacity afforded by the completion of the Rosecrans-Marquardt grade separation, the completion of multiple double-track projects in the San Diego region, and other infrastructure improvements.

Planning, Analysis, and Project Development:

- Plan for achieving 2027 and 2040 phased expansion of service, inclusive of Phase 2 HSR, intercity rail, and regional rail investments connecting Los Angeles and San Diego; improved connectivity to Mexico border crossings; and enhanced local transit connections at key stations along the corridor.
- Identify maintenance facility requirements for integrated services in LOSSAN South corridor.
- Complete a feasibility study addressing maintenance needs in the LOSSAN South rail corridor. Include a review and analysis of existing and planned train service levels and schedules to facilitate a more synchronized operating pattern in the corridor, one that will no longer require trains to layover at the Santa Fe Depot in Downtown San Diego. The facility itself is at capacity, and residential growth in the area has constrained the ability to expand at the current location. Advance coordinated, multi-agency efforts to implement this study and construct a layover and maintenance facility as soon as possible.



4.7 2027 Mid-Term Plan – Statewide Goals

The 2027 service goals focus on targeted improvements for initiating HSR service, and maximizing service in existing rail corridors. Service goals related to frequency presented here largely represent peak hours, with possible exceptions for midday or weekend frequency as markets are developed and investments come on line.

By 2027, there will be a minimum service of every 2 hours on the core system, including integrated express bus services to places like Redding and Reno. The 2027 plan is based on funding levels reasonably expected from sources currently available at the federal, state, and local levels. Some services may be improved well in advance of 2027, while others may be near completion but not yet complete.

Key Components of the 2027 Plan Include:

- Provide HSR revenue service-ready corridors in the Central Valley (Madera to Bakersfield) and Silicon Valley (San Francisco to Gilroy).
- Initiate statewide pulse-hub operations on at least a bi-hourly basis, with hourly service on certain high-demand corridors.
- Make full use of programmed corridor capacity—e.g., places where agencies intend to have a completed core capacity transit, HSR, or intercity rail project, including:
  - Proposed capacity expansion of the San Bernardino Line;
  - Service expansion and restructuring made possible by the LAUS run-through tracks;
  - Early investment in blended-service corridors (Gilroy-San Francisco and Burbank-Anaheim);
  - Growth of service to Modesto, Ceres, and Merced;
  - Planned capacity in the corridor between Sacramento and Roseville;
  - Targeted expansion of service from Oakland and the Central Valley to San Jose; and
  - Extension of SMART corridor north of Windsor.
- Make full use of negotiated slots on existing capacity.
- Target connectivity investments at hubs to connect to HSR.
- Provide fully developed and operational integrated ticketing.
- Assist communities statewide in better connecting transit systems to rail and enhancing station area functions.
- Implement a new fleet and maintenance facility strategy.
- Perform service implementation planning for the 2040 time horizon.



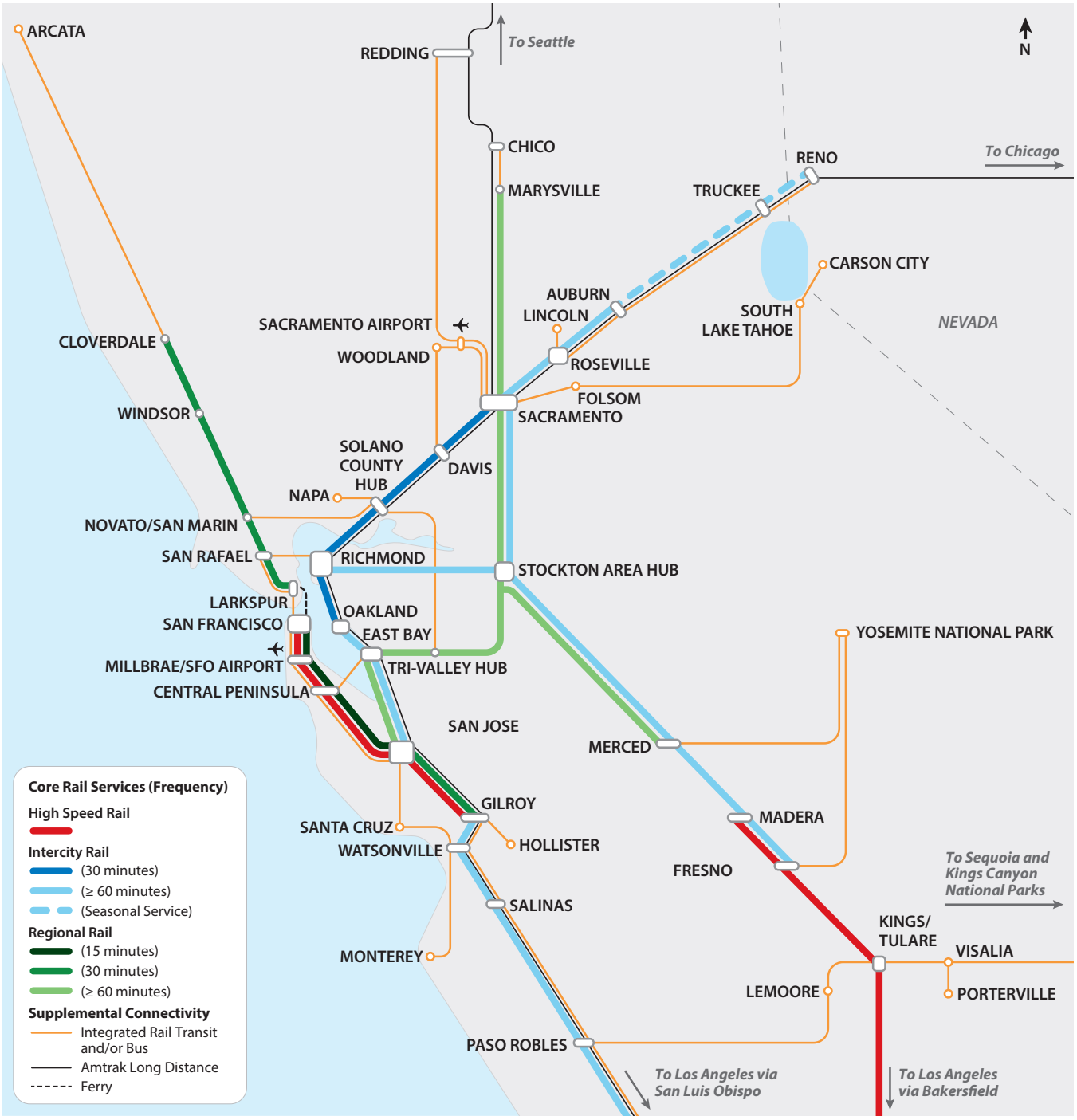


Exhibit 4.6: Northern California Service (2027 Vision)

4.8 2027 Mid-Term Plan – Regional Goals

4.8.1 Central Valley and Sierra Nevada

The 2027 Mid-Term Plan regional goals focus on targeted investments to increase service to Sacramento, connecting to the HSR network in Merced, and providing for connections to Southern California.

Service Goals and Improvements

- Provide weekday peak-period regional service from Ceres and Madera to the Bay Area, and Merced to the Bay Area; with additional operating frequencies, based on market demand and available railroad capacity. Integrated express bus connections at Merced to regional rail stations during time slots not served by rail on at least a bi-hourly basis, 7 days per week.
- Provide Central Valley HSR services, including hourly service from Madera to Bakersfield, with integrated connections to statewide services, including:
  - demand-based service with the most frequent service during peak travel periods; and
  - demand-based connectivity (at least bi-hourly) to statewide rail and integrated express bus services at HSR.
- Kings-Tulare, Merced, Madera, and Bakersfield stations:
  - continue construction of the remainder of the Phase 1 HSR System.
- Provide half-hourly peak and bi-hourly off-peak service from Roseville to Sacramento, integrated at Roseville with bi-hourly integrated express bus services from Reno and North Lake Tahoe, as well as with local transit services.
- Provide hourly seasonal and bi-hourly off-seasonal service from Roseville to Reno.
- Provide hourly service from Fresno, Madera, and Merced to Sacramento, with connections to and from HSR at the HSR Madera transfer station, including:
  - HSR connection to regional rail corridor stations north of Merced at the Merced HSR station (meeting regional trains extended to Merced);
  - HSR connection to stations north of Merced on the express rail corridor to Stockton and Sacramento at the Madera HSR transfer station; and
  - integrated express bus service to fill any gaps in the schedule caused by railroad capacity limitations.
- Implement 2027 recommendations with a study that addresses rail and integrated express bus service in communities between Fresno and Bakersfield.
- Provide enhanced integrated express bus connections at Sacramento to Carson City and South Lake Tahoe (on a demand-based frequency).
- Provide integrated express bus connections to Yosemite National Park at Merced and Fresno.
- Provide integrated express bus connections at Kings- Tulare to Visalia, Porterville, Lemoore, and the Central Coast, with at least a bi-hourly frequency. Initial integrated express us service to Sequoia and Kings Canyon National Parks on a demand-based frequency.

Planning, Analysis, and Project Development:

- Complete HSR planning efforts to identify the service needs between Madera, Merced, and the rest of the northern San Joaquin Valley and Sacramento, including identification of an alignment and infrastructure that meets express and local station stop needs, and consideration of electrification of the corridor. Begin acquisition of right-of-way.
- Assist communities throughout the Central Valley and the Sierras in better connecting transit systems to rail, and enhancing station area functions, as well as in identifying any additional integrated express bus corridors.
- Determine future regional rail requirements in the southern Central Valley (Lemoore to Visalia/ Porterville, plus additional region-identified opportunities).

4.8.2 North San Francisco Bay Area and the North Coast

The Rail Plan supports investments that leverage full use of existing regional corridor capacity between Sacramento and Oakland; expansion of planned rail service in Marin and Sonoma Counties; and implementation of integrated express bus service to the statewide network in Solano County.

Service Goals and Improvements

- Provide Integrated regional service from Larkspur to Cloverdale as part of SMART Phase 2, increasing the utility of the service, and providing a rail link between northern Sonoma County and North Coast communities, with ferry connections to San Francisco, including:
  - integrated express bus services connecting SMART services to North Coast communities, to Richmond, to regional and HSR services in San Francisco, and to the statewide rail network at Suisun-Fairfield; and
  - integrated express bus services connecting Napa County and Suisun-Fairfield.
- Provide half-hourly peak and hourly off-peak intercity service from Oakland to Sacramento (with the potential for some trips to be served by integrated express bus in low-congestion periods, should sufficient railroad capacity not be available).
- Stockton-Richmond/Martinez bi-hourly regional service for connections to the statewide rail network.
- Richmond/Martinez station connectivity investment to turn Stockton-Richmond/ Martinez trains.
- Implement improvements to the integrated express bus network recommended by the 2022 study.

Planning, Analysis, and Project Development:

- Perform implementation planning for a connection from Marin and Napa Counties to the state network at a Solano County hub, based on the results of the 2022 evaluation.
- Plan for a new electrified alignment between Richmond and the Solano County hub, including selection of an alignment and determination of service needs for express and local service on the corridor.
- Begin implementation of the results of the study on intercity and regional rail options for the Sacramento to Oakland corridor, including detailed planning based on the Transbay tunnel decision.
- Assist communities throughout the North Bay and North State area in better connecting transit systems to rail, and enhancing station area functions.



4.8.3 South San Francisco Bay Area

The Rail Plan supports investments to leverage HSR connections from San Jose to regional rail and bus services. Future rail service improvements assume BART urban rail expansion to downtown San Jose via Milpitas, and in the Tri-Valley area.

Service Goals and Improvements:

- Implement integrated, all-day express and local service between San Francisco and San Jose, with all stations connected at least hourly to the statewide rail network in San Jose.
- Improve San Francisco to San Jose corridor capacity through the first phase of investments in grade separations, grade-crossing improvements, and level boarding at priority locations.
- Provide Silicon Valley HSR half-hourly services from San Francisco to Gilroy with integrated bus connections at Gilroy to points south on the Central Coast. Provide demand-based service, with the most frequent service during peak travel periods.
- Continue construction of the remainder of the Phase 1 HSR System improvements between Gilroy and San Francisco, and the Downtown Extension to the Salesforce Transit Center, allowing as many as four HSR trains per hour to San Francisco.
- Provide half-hourly peak and at least bi-hourly off- peak services between Oakland and San Jose, leveraging initial implementation of Alameda County East Bay rail planning recommendations reached prior to 2022.
- Provide up to half-hourly peak service in the Altamont corridor connecting San Jose and the Stockton Area, with timed connections in the Tri-Valley and East Bay to integrated transit and express bus services.
- Provide hourly integrated express bus services between the East Bay and the Central Valley, filling gaps not served by rail, making connections to other rail and high-frequency transit corridors.
- Provide half-hourly peak and hourly off-peak bus or rail service in the Dumbarton Corridor (based on the results of the 2022 study), with connections in the East Bay to Altamont Corridor, Oakland to San Jose rail, and BART services.
- Open an East Bay hub station near Newark, Hayward, or Fremont to allow connections to north-south service between Oakland and San Jose; and east-west services between the Stockton area and San Jose, and a regional Dumbarton Bay Crossing. The location will be chosen consistent with results of the 2022 study.

Planning, Analysis, and Project Development:

- Perform implementation planning for an Oakland hub and East Bay rail network that could connect future service between Sacramento and the East Bay to San Francisco, based on the decisions reached in the mega-regional and Transbay tube studies completed by 2022. The importance and function of the Oakland hub will depend on the design of the services between Sacramento and the Bay Area, and regional planning for a new Transbay tube.
- In all cases, it is very desirable to provide convenient connections between the passenger rail services and the BART network.
- Plan for full grade separation and level boarding on corridor between San Francisco and San Jose, to improve corridor capacity and safety by 2040.
- Assist communities throughout the East Bay, South Bay, Peninsula, and Tri-Valley in better connecting transit systems to rail, and enhancing station area functions.

4.8.4 Central Coast

The Rail Plan supports investments that expand passenger rail access to the Central Coast, connecting services to Phase 1 HSR in the North, and service to the south on the LOSSAN North Corridor between San Luis Obispo and Los Angeles.

Service Goals and Improvements:

- Provide at least hourly peak-period regional rail service between Gilroy and San Jose, integrated with the statewide rail system at both Gilroy and San Jose.
- Provide bi-hourly rail service, connecting Salinas to the statewide rail network at Gilroy.
- Provide at least bi-hourly integrated express bus service, connecting Hollister to the statewide rail network at Gilroy.
- Provide bi-hourly integrated intercity rail and integrated express bus service from Salinas to San Luis Obispo, including at least one intercity rail service in addition to the long-distance *Coast Starlight*.
- Provide bi-hourly integrated intercity rail and integrated express bus service from San Luis Obispo to Santa Barbara, including at least three intercity rail frequencies in addition to the long-distance *Coast Starlight*.
- Provide bi-hourly integrated express bus service from Paso Robles to the Central Valley.

Planning, Analysis, and Project Development:

- Perform implementation planning for development of an integrated Central Coast intercity rail, regional rail, and express bus network, providing coastal mobility and key connections to the statewide network, including equipment procurement requirements that address the unique operating and market characteristics of coastal service. This includes:
  - implementation planning for connecting Monterey and Santa Cruz to the statewide rail network with regional rail services, if recommended by the 2022 study;
  - determination of an appropriate mix of rail and bus services, based on infrastructure capabilities, market study, and the business case for investments; with an initial goal of planning for rail service every 4 hours between San Luis Obispo and Salinas, and bi-hourly rail service between Salinas and Gilroy; and
  - implementation planning for rail services, including determination of maintenance facility and equipment needs, and opportunities for through-running trains north of Gilroy and south of Goleta.
- Assist communities throughout the Central Coast in better connecting transit systems to rail and enhancing station area functions.



4.8.5 Las Vegas HSR

The Rail Plan supports investments connecting privately operated HSR service to Las Vegas with the state passenger rail network, to expand the reach and performance of this service.

Service Goals and Improvements:

- Provide integrated express bus services connecting to the statewide rail system in Bakersfield, Palmdale, San Bernardino, and Riverside.
- Include Las Vegas HSR service in the statewide integrated ticketing system.
- Enhance integrated express bus service, in partnership with a private project sponsor, to connect Las Vegas HSR service between Victorville and Las Vegas with the statewide rail network, based on frequency improvements to the corridors serving Bakersfield, Palmdale, San Bernardino, and Riverside.
- Begin construction of the HDC connection, based on the results of HDC environmental clearance, subject to available financing, between Victorville and Palmdale, to connect with Phase 1 HSR service. If HSR service between Las Vegas and Victorville can be advanced and initiated before 2027, the timing for constructing the HDC should be coordinated to extend this service to Palmdale in this timeframe.

Planning, Analysis, and Project Development:

- Conduct a long-term, 2040-focused service integration study, addressing Las Vegas HSR and HDC in the context of the statewide network, including the potential for through-train operations.

4.8.6 North LOSSAN and Antelope Valley

The 2018 State Rail Plan supports investments by 2027, providing expanded services on the North LOSSAN corridor between San Luis Obispo and Los Angeles, providing access to the Central Coast. This includes services providing access for commute trips in the San Fernando Valley that address significant highway congestion between Ventura, Santa Clarita, and Los Angeles, and services continuing along the Coast Route to popular Central Coast destinations north of San Luis Obispo. Regional services north of Los Angeles to the Antelope Valley will continue and may change after HSR service begins, based on market demand. The State supports a partnership to provide service south of Santa Clarita.

Service Goals and Improvements:

- Make service improvements between Los Angeles and San Luis Obispo that support the following frequencies:
  - at least hourly rail service between Los Angeles and Chatsworth;
  - every-2 hour rail service between Chatsworth and Goleta; and
  - every–4 hour rail service between Goleta and San Luis Obispo.
- Provide half-hourly service to ensure connectivity between the Santa Clarita and San Fernando Valley communities and Los Angeles, and the statewide network, including HSR services.

Planning, Analysis, and Project Development:

- Study electrification of corridor segments north of Burbank on the SCRRA Valley Subdivision and west of Burbank on the LOSSAN North Corridor, to leverage the benefits of HSR electrification. Determine appropriate investments both in conjunction with HSR Phase 1 service in the region, and for the 2040 time horizon.
- Determine the appropriate mix of regional bus and rail services between Santa Clarita and the Antelope Valley for the time when HSR services will be integrated into the regional rail system.
- Study to determine the long-term mix of express and local services that can be supported in the corridor, including the extent of electrification that is possible, and the end point for half-hourly services (i.e., Chatsworth, Moorpark, or Ventura). Decisions about electrifying the corridor will influence service patterns and which corridor sections may need peak-only additional service.
- In the event that capacity cannot be upgraded to allow blended service operations at half-hourly intervals, integrated express bus services could supplement rail services to fill service gaps.

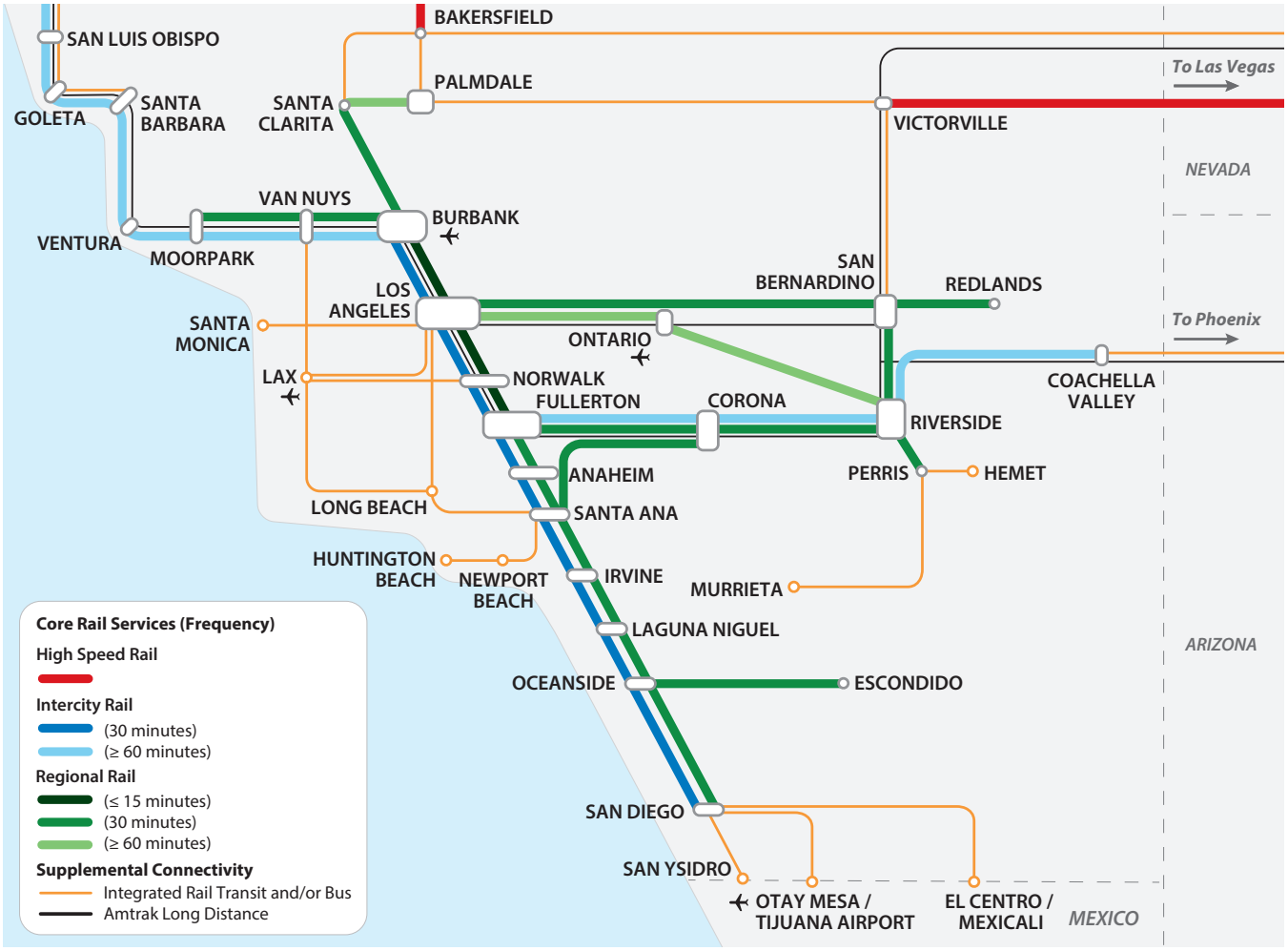


Exhibit 4.7: Southern California Service (2027 Vision)

4.8.7 Los Angeles Urban Mobility Corridor

By 2027, the Los Angeles Urban Mobility Corridor will provide significant capacity and trip-time reductions across the Los Angeles area, and improve the entire rail travel experience from Ventura County to San Diego. With Los Angeles set to host its third Olympic Games in 2028, initial improvements to increase capacity and to permit run-through Metrolink and LOSSAN services at LAUS will provide the ability to move enormous volumes of travelers to Olympic venues spread throughout the region. Investments in these run-through intercity, regional and Olympic services at LAUS will unlock end-to-end travel markets that have been stymied by stub-end operations.

Service Goals and Improvements:

- Provide run-through service at LAUS as part of the Link Union Station program, allowing for the restructuring of intercity and regional services passing through LAUS, covering local and express stations throughout the region on at least a half-hourly basis (local stops) and hourly basis (express stops).
- Provide half-hourly integrated express bus services connecting Santa Monica, LAX, and Long Beach to LAUS.
- Continue construction of HSR-supporting infrastructure between Burbank and Anaheim.
- Implement recommendations from 2022 studies related to integrated express bus network and integration of LA Metro high-capacity transit projects into the statewide network.

4.8.8 Inland Empire

The 2018 State Rail Plan supports development of regional rail corridors, providing for statewide connectivity and access between Los Angeles and the Inland Empire. This phased strategy for developing future HSR service between Los Angeles and San Diego makes full use of available capacity, and supports implementation of regional plans for expanding service between Los Angeles, San Bernardino, and Riverside.

Service Goals and Improvements:

- Provide half-hourly all-day service on the San Bernardino subdivision between Los Angeles and San Bernardino, with core capacity improvements.
- Provide half-hourly peak-rail service on the 91/Perris Valley Line, with all-day rail and integrated express bus services leveraging remaining available rail slots on the Riverside and 91/Perris Valley Line corridors to connect to the statewide rail network serving Orange County, San Diego, and Los Angeles on a half-hourly basis.
- Make early rail investments with stakeholder engagement and coordination to deliver connecting services between LAUS and Indio in the Coachella Valley.
- Provide half-hourly regional rail service between Perris Valley and Riverside, with extension of rail and/or integrated express bus service to Hemet and Murrieta, based on regional development timelines.

Planning, Analysis, and Project Development:

- Determine the extent of 2040 electrification on LAUS to Inland Empire lines; plan for implementation on at least corridors served by express rail service, and potentially also on corridors served by local rail services.
- Plan for half-hourly all-day local service between Los Angeles and Riverside via Fullerton, and between Riverside and Laguna Niguel, by 2040.
- Plan for half-hourly express rail services (to be implemented by 2040) connecting Riverside, San Bernardino, and Ontario with Los Angeles and the rest of the statewide rail system.
- Plan for integrated half-hourly rail service to Hemet by 2040.
- Plan for HSR services connecting Los Angeles, Ontario, Riverside, and San Bernardino to each other and to San Diego, using electrified east-west express rail corridors. Include identification of opportunities to further upgrade corridor speeds through phased investment when Coachella Valley and Arizona rail service plans reach their recommendations.
- Select a corridor for 2040 Coachella Valley regular-interval service.

4.8.9 LOSSAN South

The Rail Plan supports improvements by 2027, providing for a regular, frequent service on the LOSSAN South Corridor between Los Angeles and San Diego, supported by Urban Mobility Corridor investments between Los Angeles and Orange Counties. The Rail Plan anticipates that service levels will be fully implemented by 2027 in this corridor, and that future long -distance travel between San Diego and the rest of the state will be served by the State's significant investment in HSR service through the Inland Empire.

Service Goals and Improvements:

- Complete maintenance and layover facility investments for integrated services.
- Continue service improvements to solidify half-hourly service to all local stations, with increased reach of half-hourly network due to capacity improvements between Fullerton and Los Angeles, as well as between Fullerton and Riverside.

Planning, Analysis, and Project Development:

- Plan for 2040 LOSSAN South network, including increase in express train service to half-hourly, and integration of 2029 HSR services to Anaheim.

4.9 2040 Long-Term Vision – Statewide Goals

The 2040 Vision represents the full build-out of the long-term planning goals for the integrated, statewide rail network. The 2040 Vision supports an energy-efficient rail network, which will be realized either through traditional catenary-based systems or other zero or near-zero emission technologies[168]. Service goals related to frequency presented here largely represent peak hours, with possible exceptions for midday or weekend frequencies as markets are developed and investments come on line.

The highlights of the 2040 Vision include:

- HSR expansion and integration beyond the initial operational segments;
- expansion of network capacity in full realization of the integrated service goals;
- establishment of regional rail networks, providing integration with the statewide network and expanded regional access; and
- intensification of services implemented during the short- and mid-term horizon years.



168 As defined in Health and Safety Code Section 44258, "zero-emission vehicle" means a vehicle that produces no emissions of criteria pollutants, toxic air contaminants, and GHGs when stationary or operating, as determined by CARB. "Near-zero-emission vehicle" means a vehicle that uses zero-emission technologies, enables technologies that provide a pathway to zero-emissions operations, or incorporates other technologies that significantly reduce criteria pollutants, toxic air contaminants, and GHG emissions, as defined by CARB in consultation with the California Energy Commission, consistent with meeting the State's mid- and long-term air-quality standards and climate goals.



Exhibit 4.8: Northern California Service (2040 Vision)

4.10 2040 Long-Term Vision – Regional Goals

4.10.1 Central Valley and Sierra Nevada

The 2040 Vision expands the reach of the HSR System to the Northern Central Valley, providing for regular, frequent connections to HSR trains from Sacramento to the San Joaquin Valley and Southern California, while also providing service to communities between Merced and Sacramento, and access to the state passenger rail network.

Service Goals and Improvements:

- Provide Phase 1 HSR service, with initial hourly service to local stations, and half-hourly service to local stations by 2040.
- Provide electrified HSR run-through service from the Central Valley to Sacramento, including new infrastructure to speed trip times.
- Provide off-peak local service, which is expected to rely on transfers between Bay Area and Sacramento HSR trains at Merced and/or Madera transfer stations to achieve full connectivity.
- Ensure that HSR express stopping patterns and service operate at market-drive levels.
- Provide hourly service between Richmond/ Martinez and Stockton, based on transfer locations recommended in the Northern Bay Area study.
- Provide half-hourly rail service from Roseville to Sacramento.
- Extend hourly rail service north from Sacramento to Oroville.
- Provide hourly, timed and integrated express bus service from Oroville to Chico.
- Provide hourly integrated express bus service north from Sacramento to Woodland and communities between.
- Provide every-2-hour integrated express bus service north from Sacramento, via Sacramento International Airport, to Redding and communities between.
- Provide every–2-hour integrated express bus service east from Sacramento to Carson City.
- Provide every-2-hour integrated express bus service east from Roseville to Reno.
- Enhance integrated express bus service to national parks from Kings-Tulare, Fresno, and Merced.
- Provide hourly regional rail service connecting Lemoore, Hanford, King-Tulare HSR station, Visalia, and Porterville, based on the 2027 study.
- Implement 2040 recommendations of the 2022 study on rail and integrated express bus services between Fresno and Bakersfield.



4.10.2 North San Francisco Bay Area

The 2040 Vision in the North San Francisco Bay Area will provide for fast, frequent service connecting the Sacramento region and outer Solano and Contra Costa County suburbs to Oakland and San Francisco, with connections to Napa, Marin, and Sonoma Counties, and to the North Coast. Development of the 2040 Vision in the North San Francisco Bay Area is dependent on decisions to pursue construction of a second Transbay tube between the San Francisco Salesforce Transit Center and Oakland. This possible long-term improvement provides an opportunity to extend conventional electrified rail services, including HSR from Southern California and regional electric service between San Jose and San Francisco, across the Bay to Oakland; and to connect electrified passenger rail service from Sacramento directly to San Francisco and San Jose along the Peninsula Corridor. An electrified conventional rail tube also offers the opportunity for additional regional electric service for regional trips between Solano County and the East Bay to San Francisco and San Jose as an option for relieving severe congestion in the I-80 and I-880 highway corridors, especially during peak commute periods. The cost of a new Transbay tube could be justified by the access to additional travel markets made possible by this improvement, which would support ridership on the intercity passenger rail network and help reduce congestion.

Service Goals and Improvements:

- Provide half-hourly electrified intercity service between Sacramento and San Francisco through an Oakland hub (and continuing to San Jose).
- Provide half-hourly electrified regional service between a Solano County hub and San Francisco via a Richmond and Oakland hub.
- Provide half-hourly electrified local service between a Solano County hub and an East Bay hub through Richmond and Oakland on a dedicated electrified passenger line south of Oakland.
- Provide hourly service connecting the Stockton Area hub and Martinez/Richmond.
- Provide half-hourly peak and hourly off-peak service between Cloverdale and Larkspur corridor, with integrated express bus connections from San Rafael to San Francisco and Richmond, and ferry connections from Larkspur to San Francisco.
- Provide hourly service between a Solano County hub and Novato, providing timed connections to service between Cloverdale and Larkspur, or through service to Marin or Sonoma Counties.
- Provide hourly service between Napa and the Solano County hub, providing connection between Napa County and the state rail network.

Second Oakland-San Francisco Transbay Crossing

In 2017, San Francisco and San Jose ranked second and fifth, respectively, for worst cities for vehicular congestion in the country – both with 2 to 3 percent more congestion than 2016. Simultaneously, BART trains are running at capacity and at crush-capacity during peak commute hours, and Caltrain reaches bi-directional maximum capacity during the peak. As the regional population grows, continued strain is put on the transportation system; and as the median income and housing prices grow exponentially in the Bay Area core, lower income workers are forced to move farther away from their jobs, increasing their dependency on a congested transportation system. Although these intertwined problems contribute to the State's support of a second Transbay crossing, there are additional megaregional and statewide implications of not building a second crossing. The Rail Plan supports many Bay Area improvements, but without a conventional rail crossing to better connect to the Central Valley and Sacramento regions, the Bay Area will receive much less interregional investment. Without the crossing, the region lacks access to additional markets and to additional railroads, thus decreasing the statewide economic and mobility opportunities associated with Bay Area investments. There are many decisions still to be made regarding the location, type, timeline, funding, and equity concerns of constructing a second Transbay crossing, and the State supports short-term action to study the alternatives; but implementing the Rail Plan vision and pursuing partnerships to generate associated economic growth depend on a second Transbay crossing.

4.10.3 South San Francisco Bay Area

The 2040 Vision in the South San Francisco Bay Area supports continued operation of HSR service between San Francisco and Los Angeles in the Peninsula Corridor, with development of regional electric services connecting the East Bay to San Francisco and San Jose—and possible extension of intercity services from Sacramento to San Jose via the electrified Peninsula Corridor, if a second Transbay tube were constructed that carries conventional electric trains. The 2040 Vision assumes that a dedicated passenger line south of Oakland could be electrified at least as far south as an East Bay hub. Services between that hub and San Jose are focused on providing for east-west connectivity to the Tri-Valley and Stockton Area, given the establishment of fast, frequent BART service in the East Bay to San Jose serving regional trips. Development of the South San Francisco Bay Area network in the 2040 Vision provides significant regional and intercity passenger rail options that complement planned urban rail and transit expansion, addressing highway congestion in the San Francisco Bay Area, and providing for connections to the rest of the state.



Service Goals and Improvements:

- Provide full HSR Phase I service, with direct trains between San Francisco and Los Angeles/Anaheim, serving HSR local stations half-hourly by 2040.
- Implement integrated all-day express and local services between San Francisco and San Jose, with all stations connected at least half-hourly to the statewide rail network at San Jose.
- Complete San Francisco to San Jose corridor capacity improvements, including grade separations, level boarding, and platform lengthening.
- Implement the recommended Transbay tube alternative, including at least half-hourly electric regional rail, making all local stops between the Salesforce Transit Center and the Richmond and Solano County hubs, as well as the East Bay hub south of Oakland. This also includes intercity trains providing half-hourly service to Sacramento as extensions of half-hourly express service from San Jose to the Salesforce Transit Center.
- Provide half-hourly regional electric services between a Solano County hub and an East Bay hub through Oakland, with half-hourly connectivity or through service to San Jose.
- Provide half-hourly peak and hourly off-peak service, 7 days per week, between the Stockton Area and San Jose through a Tri-Valley hub and an East Bay hub.
- Provide half-hourly bus or rail service in the Dumbarton corridor (based on the results of the 2022 study), integrated with East Bay, BART, and Altamont services.

4.10.4 Central Coast

The 2040 Vision in the Central Coast region supports expansion of services along the Coast Route, providing access to and from Northern and Southern California; and providing for additional through frequencies on a limited but regular schedule, supplemented by integrated express bus connections. The 2040 Vision supports establishment of a regional rail network on the Central Coast, providing connections from Santa Cruz, Monterey, and Salinas to the state network at Gilroy; with the possibility of different train routings to allow Santa Cruz to Monterey service, providing for transportation capacity in the constrained coastal Highway 1 corridor.

Service Goals and Improvements:

- As envisioned by the Rail Plan, form a regional rail network, connecting Central Coast communities to each other, feeding into HSR at Gilroy.
- Provide hourly service connecting Gilroy and Salinas, with establishment of a hub station at Pajaro/Watsonville that provides hourly connections to Santa Cruz; and a hub station at Castroville that provides hourly connections to Monterey.
- Provide hourly integrated express bus connection between Gilroy and Hollister.
- Provide hourly integrated intercity rail and express bus service from Salinas to San Luis Obispo, including intercity rail services at least every 4 hours.
- Provide hourly integrated intercity rail and express bus service from San Luis Obispo to Goleta/Santa Barbara, including at least bi-hourly intercity rail services.
- Provide hourly integrated express bus service from Paso Robles to the Central Valley.



San Luis Obispo Station (Source: wikimedia commons, https://upload.wikimedia.org/wikipedia/commons/6/6a/San_Luis_Obispo_Amtrak_Station_Ca._-_panoramio.jpg)

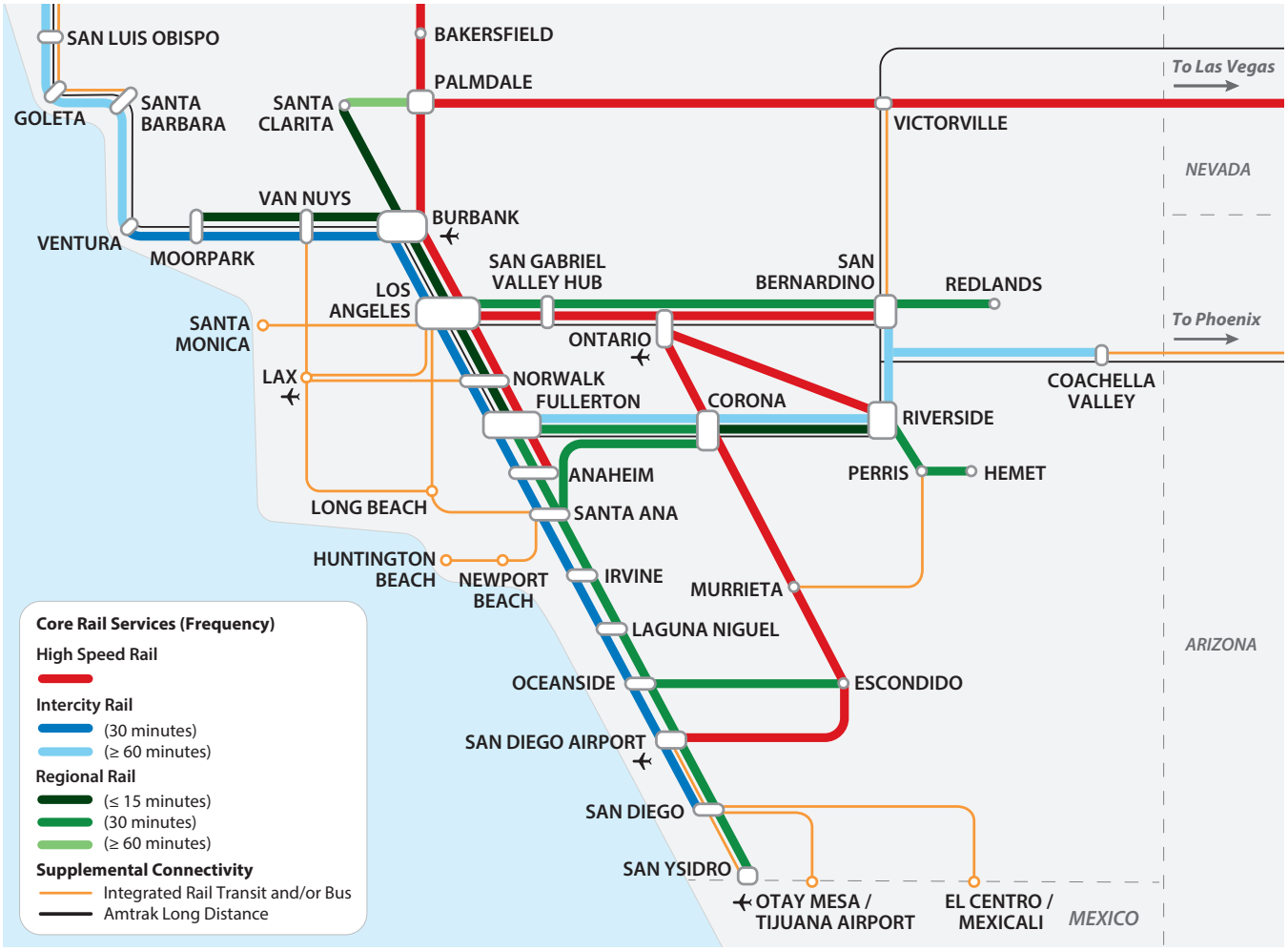


Exhibit 4.9: Southern California Service (2040 Vision)

4.10.5 Las Vegas HSR

The State supports the implementation of HSR service between Las Vegas and Los Angeles via an expanded HSR network beyond Victorville and Las Vegas, to the California Statewide rail network.

Service Goals and Improvements:

- Full build-out of HSR Phase I and subsequent expansion and integration will provide regular high-speed connections and through-run connections to Las Vegas via Palmdale to Victorville.

4.10.6 LOSSAN North and Antelope Valley

The Rail Plan identifies integrated rail services that connect communities in the North LOSSAN region to the rest of Southern California, the Central Valley, and southern Nevada via HSR in Burbank and LAUS. Expanded coastal services integrated with regional and intercity services in the Los Angeles area, and HSR connections in Burbank and LAUS provide the LOSSAN North area with fast and frequent access to destinations across Southern California.

Service Goals and Improvements:

- Provide service between Goleta and LAUS with the following service characteristics:
  - half-hourly local service between Chatsworth and LAUS;
  - half-hourly express service between Oxnard and LAUS, with timed connections at all hubs (Chatsworth, Van Nuys, and Burbank); and
  - hourly intercity service connecting LAUS and Goleta.
- Develop the Burbank/Bob Hope Airport as a major hub, connecting services extending west to Santa Barbara/Goleta, as well as north to Palmdale.



4.10.7 Los Angeles Urban Mobility Corridor

The Los Angeles Urban Mobility Corridor between Burbank and Anaheim will be an electrified railroad, providing enormous benefits to regional and statewide travel. With electrification and run-through operations at LAUS, the Los Angeles Urban Mobility Corridor will provide valuable traffic relief on Highway 101, I-5, and other regional roadways. The Urban Mobility Corridor will expand commuter options beyond the suburb-to-downtown-Los Angeles market by providing fast, frequent, and reliable services from Ventura County to San Diego, and from to Riverside and San Bernardino.

Statewide connections from the Greater Los Angeles Area to the rest of the state will be achieved by running a half-hourly integrated service that connects Greater Los Angeles with San Diego, the Central Valley, and Northern California.

The Rail Plan supports locally directed transit expansion projects, funded partly by local ballot measures, to continue to build out the passenger rail network in the Los Angeles area and extend the reach of integrated rail and transit services.

Frequent integrated express bus connections will connect communities throughout the Greater Los Angeles Area to the statewide rail system at major hubs, such as LAUS, Burbank, and Santa Ana.

Service Goals and Improvements:

- Provide very frequent service between LAUS and Burbank.
  - Provide frequent HSR services to northern California.
  - Provide frequent HSR services to Las Vegas.
  - Provide half-hourly express rail service, continuing on to Oxnard.
  - Provide half-hourly local service, continuing on to Santa Clarita.
  - Provide half-hourly local service, continuing on to Chatsworth.
- Provide very frequent service between LAUS and Fullerton via the Norwalk/Santa Fe Springs hub, with connections between services and connections to urban transit.
  - Provide frequent HSR service.
  - Provide hourly express service to the Inland Empire.
  - Provide half-hourly express service to San Diego.
  - Provide half-hourly service, continuing on to the Inland Empire and making local stops.
  - Provide half-hourly service, continuing on to San Diego and making local stops.
- Provide very frequent service between Fullerton and Anaheim.
  - Provide frequent HSR service, terminating at the Anaheim hub.
  - Provide half-hourly express rail service.
  - Provide half-hourly local rail service.
- Provide half-hourly integrated express bus services, connecting all hubs (Santa Monica, Van Nuys, LAX, Long Beach, and LAUS) to the statewide rail network.
- Form an urban rail network and high-capacity bus rapid transit connections between Los Angeles area hubs, and extend the statewide rail network throughout the Los Angeles region, including:
  - LAUS;
  - Pasadena;
  - Burbank;
  - South El Monte/Whittier;
  - Santa Monica;
  - LAX, Torrance;
  - San Pedro;
  - Long Beach; and
  - Santa Ana.

4.10.8 Inland Empire

The design decisions for the HSR System expansion will have major impacts on the way passenger service is delivered to Inland Empire communities; the planning for HSR is a priority for the State. A routing via Ontario Airport could be combined with one or more spurs that would provide direct, one-seat ride access to Riverside and San Bernardino with high-speed trainsets. This option has the most potential for blended service investments that would increase capacity for trains operating at varying speeds and stopping patterns between Los Angeles and the Inland Empire, and lower the overall capital cost.

Statewide connections from the Inland Empire to the rest of the state are achieved by running a half-hourly integrated service that connects Los Angeles to San Diego via Ontario Airport, and a half-hourly integrated service that connects the Inland Empire with Orange County. Furthermore, a half-hourly integrated express bus service between Victorville and San Bernardino connects the Inland Empire with Las Vegas from San Bernardino and Riverside. An hourly service connects San Bernardino and Riverside to the Coachella Valley, the city of Indio, and onward to Arizona (including Phoenix). Finally, a half-hourly direct service connects to the Inland Empire from San Diego via Corona, and/or Ontario to Riverside and to San Bernardino.

Further planning efforts for the HSR System expansion can assist in determining the ability to pursue phased implementation that may initially invest in improvements (such as those featured in the routing via Ontario Airport), while creating a pathway to future additional investments in significant dedicated HSR infrastructure all the way to San Bernardino and/or Riverside, perhaps as part of a system connecting to Phoenix.



Service Goals and Improvements:

- Provide HSR service between LAUS and San Diego via the Inland Empire, with the following characteristics:
  - HSR trains running from Los Angeles, Riverside, and San Bernardino via Ontario Airport, with trains providing service at local stops at least half-hourly to maximize statewide connectivity;
  - express intercity and HSR trains, providing at least half-hourly all-day service between Los Angeles and San Bernardino via Ontario Airport;
  - express intercity and HSR trains, providing at least half-hourly all-day service between Los Angeles and Riverside via Ontario Airport;
  - HSR trains on express service schedules, driven by market demand between Riverside and San Diego, as well as San Bernardino and San Diego;
  - HSR between Ontario Airport and San Diego via Corona; and
  - the potential to upgrade east-west express rail corridors beyond 2040 to accommodate HSR extension to Coachella Valley and Arizona.
- Provide at least half-hourly local service between LAUS and San Bernardino via Fullerton, Corona, and Riverside.
- Provide half-hourly local service, connecting Laguna Niguel to Riverside via Corona.
- Provide half-hourly local service between Riverside and Hemet via Perris. Trains could continue on to Orange County (Laguna Niguel).
- Provide half-hourly service between LAUS and San Bernardino, making local stops via a San Gabriel Valley hub that provides connectivity to other rail services and urban mass transit.
- Provide hourly service to the Coachella Valley from San Bernardino and Riverside. The State foresees the provision of this service as an opportunity to provide the groundwork for anticipated HSR service to Arizona. The State also envisions that a high-speed line will eventually run between Phoenix and Los Angeles, serving the Coachella Valley.
- Provide half-hourly integrated express bus service from San Bernardino between the Inland Empire and HSR service at Victorville (with service to Las Vegas).

Planning, Analysis, and Project Development:

- Complete HSR planning for post-2040 investments, including additional upgrades to east-west infrastructure, planning for HSR to the Coachella Valley and Arizona, and potential connectivity via San Bernardino to Victorville and Las Vegas.



Solana Beach Station (Source: wikimedia commons, Brian Zimmerman, https://commons.wikimedia.org/wiki/File:Coaster_F40PHM-2C_2104_at_Solana_Beach,_CA.JPG)

4.10.9 LOSSAN South

The Rail Plan calls for multiple connections from Imperial County and the Mexico border area to the statewide network at San Diego, using a combination of potential rail services to San Ysidro, and integrated express bus service from Imperial County/Mexicali and Otay Mesa/Tijuana Airport, allowing cross-border connections. Regular half-hourly regional services between Los Angeles and San Diego will use both local and express service patterns to fully integrate local stations in Orange and San Diego Counties into the statewide network.

The design of this corridor will have major operational impacts on the rest of the state's rail network. This corridor, together with the Peninsula blended-service corridor in the Bay Area, is the most critical corridor to design early and strategically.

Service Goals and Improvements:

- Provide at least half-hourly HSR service to stations between San Diego Airport and the Inland Empire and LAUS, with one-seat rides or connections to destinations throughout the state.
- Provide half-hourly express service between Los Angeles and San Diego, with timed connections at hubs in Santa Ana, Laguna Niguel, Oceanside, and the San Diego Airport.
- Provide half-hourly service, making all local stops between LAUS and Laguna Niguel. Laguna Niguel could serve as the southern terminus of electrified local services connecting to the Los Angeles Urban Mobility Corridor.
- Provide half-hourly service between Oceanside and Escondido, with connections to HSR services.
- Provide San Diego integrated transit connections to services to San Ysidro, and integrated express bus connections to Otay Mesa and the Tijuana Airport.
- Create a San Diego hub for HSR, intercity rail, regional rail, and high-capacity transit at the San Diego HSR station.
- Provide half-hourly service from the Mexico border, possibly from Tijuana—with customs and border pre-clearance—to San Diego, if the service can be delivered with a significant improvement in travel time over the existing local transit service.
- Provide integrated express bus service from the San Diego hub to El Centro/Calexico via El Cajon.



This page intentionally left blank.



5 Freight Rail Investment Strategy

Since its initial development in the 19th century, California's rail network has evolved in response to the changing needs of what is now the United States' largest state economy. The freight rail network, responsible for the movement of goods that generate that economic competitiveness, operates on privately owned infrastructure that has integrated freight and passenger service on the same tracks. To date, private capital has been the principal source of funding for upkeep and improvement of the freight network.

By improving rail infrastructure to attract additional long-distance freight movement (otherwise concentrated on highways), extra capacity is created on highways for passengers and short-distance freight travel. Improvements to the rail network allow for the shift of goods movement from automobile and air to rail, thereby creating capacity on those existing infrastructures by reducing demand. Rail, therefore, is an effective mechanism for congestion relief on highways, and for the movement of people and goods, while simultaneously improving and complementing parallel trade corridors.

Because freight rail is owned and operated by private industry and is therefore market-driven, patterns of goods movement are determined by the reliability and availability of the transportation network. It is imperative that California's infrastructure—especially the long-distance, transcontinental routes—remain robust and competitive as a means for further generating economic activity at ports throughout the state and throughout the country. There are still areas where public and private interests intersect; in such situations, public participation is beneficial, or even necessary, to support and enhance the entire statewide, multimodal transportation system.

This chapter presents freight capacity analysis, corridor-based planning, and investment strategies that address the needs of California's freight rail system and help ensure its long-term utility and viability. Rather than identifying a comprehensive list of projects, the chapter describes categories of investments that will advance the State's vision for a rail network; describes how they can impact California's economy, environment, and communities; and identifies opportunities where investments will be mutually beneficial for both passenger travel and goods movement. This chapter also articulates the State's strategy for improving the rail network through the context of transportation objectives defined in the CTP 2040 and the Governor's Sustainable Freight Action Plan, while laying the foundation for the next update of the California Freight Mobility Plan.



5.1 Freight-Capacity Analysis

Freight-capacity analysis takes into account the freight and passenger vision for 2040 and the current freight train volumes, where 30 to 50 daily trains per track represents the range between moderate and dense freight volumes. Denser freight volumes require increased signaling, sidings, grade crossings, and track capacity to safely accommodate higher numbers of trains. The LOS of the rail corridors, as defined by the association of American railroad, is calculated by dividing the expected train volume by the available capacity.

The 2013 freight volumes and commodity information was based on 2013 STB Confidential Carload Waybill Samples . The forecast analysis used the FAF version 3.5 (FAF3) database with 2007 as a base year, and used a combination of actual data and modeled behavior. The FAF forecast was adjusted based on Moody's Economic data of industry sector output for third quarter in 2015. The process involved linking FAF3- derived commodity flow growth rates to 2013 Carload Waybill samples of rail traffic volumes.

Table 5.1: Corridor Screening Framework for Freight Capacity Analysis

		Passenger Train Traffic		
		No Traffic	**Moderate Traffic > 10 daily trains per direction**	**Dense Traffic > 10 daily trains per direction**
Freight Train Traffic	**No traffic**	No analysis	No analysis	No analysis
	Moderate traffic > 30 daily trains per track	No analysis	No analysis	High-level analysis, potentially detailed
	Dense traffic > 30 daily trains per track	High-level analysis	High-level analysis, potentially detailed	Detailed analysis



The forecasts for California rail activity suggests substantial growth, from 161 million tons in 2013 to 319 million tons in 2040, with rail carrying 15.2 million units. In 2013, 58 percent of tonnage originated in United States, and exported tonnage and imported tonnage each accounted for 21 percent. By 2040, exported tonnage is expected to decline slightly, to 20 percent from 21 percent, but despite the shift in commodity origin, the directional distribution is not expected to change. The commodities shipped by rail in California are projected to achieve a compound annual growth rate (CAGR) of 2.6 percent between 2013 and 2040. Outbound goods are projected to have the highest CAGR, 3.3 percent; inbound goods are projected to have a CAGR of 2.3 percent. The projected growth in train volumes will affect the performance of the system, its capital needs, and potential shifts in mode share between rail and other competing modes. It is important to take into account the overall LOS of the train network as the corridors are being developed for passenger, shared, or freight-only routes.



Table 5.2: Corridor Screening Framework for Freight Capacity Analysis

LOS	Description of Operating Characteristics	Volume-to-Capacity Ratio
A	Free-flow conditions with unimpeded fluidity.	0% to 60.0%
B	Reasonably unimpeded operations and fluidity, with slight restrictions at pinch points.	60.1% to 70.0%
C	Stable operations and fluidity, with some on-time performance issues.	70.1 %to 80.0%
D	Approaching unstable operations with moderate fluidity. Added trains will increase delays and decrease on-time performance.	80.1% to 90.0%
E	Unstable operations, low average speeds, impeded fluidity, and poor on-time performance.	90.1% to 99.0%
F	Adverse signal progression, causing high delay, very low average speeds, extremely poor on-time performance, and no fluidity across line.	100%

5.2 Corridor-Based Approach

Freight growth along the transcontinental corridors is projected to double in the next 20 years, representing a more significant increase than population growth (and its corresponding demands of the transportation network). Accordingly, the State's interest in freight rail planning concerns not just accommodating passenger rail on existing rail infrastructure, but also ensuring efficient management of the entire rail network, to promote goods movement and maintain and expand the economic gains that California has achieved in the past few decades. Future growth projections show that rail in California has the potential to continue to serve as a national hub and distribution center for economic activity in the United States, if the infrastructure can keep up with the growth demands.

One key to efficiently managing the transportation system is corridor planning. As has been explained throughout this Rail Plan, long-term planning for freight improvements can be difficult because the State does not own the infrastructure, and the freight rail industry is sensitive to releasing information on their long-term projects, for profit and proprietary reasons. However, there are opportunities to work with the freight railroads, and there are opportunities to maximize State money by investing in projects that benefit an entire corridor rather than individual projects. A corridor-based approached to freight rail planning helps to identify the best projects that will intensify the use of existing infrastructure, and invest in projects that can improve parallel and complementary routes or projects in a corridor. As elaborated in Exhibit 5.1, there are multiple transcontinental freight routes and many sea ports along the east coast, west coast, and the Gulf of Mexico that are constantly competing for business. If one region fails to meet the growing demand of the market, another might step up to fill the gap, shifting business away from the region. It is paramount for California to invest in its transportation network to maintain its economic edge.

The Rail Plan's freight strategy draws from a number of existing plans and policies that attempt to identify and define corridors and subsequent investment priorities. In the 2013 Rail Plan, funding priorities were guided by the amount of gross tonnage carried on the existing freight rail system. The priorities based on that metric were defined in Caltrans' 2014 Freight Mobility Plan, in consultation with the CFAC.

The development of criteria for defining, selecting, and prioritizing corridors is an integral part of corridor-based planning. Volumes of tonnage, as identified in previous freight and state rail plans, can serve as one of the selection criteria. Other selection categories might include:

- critical connections to transcontinental routes;
- railroad classification;
- location, with respect to land and sea ports; and
- available alternatives for port traffic.

Defining corridors allows better collaboration among transportation agencies at the local, regional, and state levels as they identify multimodal approaches to solving problems and prioritizing funding. It can make it easier to examine trade-offs, trade corridor impacts, and joint passenger and freight rail effects. Often, the state, regional, and local agencies have similar overarching objectives, but different plans for reaching them; and corridor-based planning allows for a more open and cross-jurisdictional process that weighs corridor-wide, and therefore network-wide impacts. This can include transportation decisions and nontransportation decisions—such as land use planning, zoning, and environmental regulations—to help decision makers invest more strategically for the greatest benefit and efficiency.

For example, a proposed grade separation on a lightly used line that is projected to serve an intermodal terminal may not be justifiable, absent construction of the terminal. In that case, corridor-level planning allows a broader look at the overall gains for the entire corridor, and bundles the projects together, from the standpoint of funding, sequencing of construction, and impact. This type of corridor-level project delivery will result in more timely overarching and coordinated improvements for the specific corridor, which will improve system-wide mobility and efficiency.



Legend

US Ports

Rail Freight Volume in Kilotons	Truck Freight Volume in Kilotons
0 - 50	0 - 500
51 - 100	501 - 1,000
101 - 500	1,001 - 5,000
501 - 1,000	5,001 - 10,000
1,001 - 5,000	10,001 - 25,000

Exhibit 5.1: Transcontinental Freight Routes [169]

169 Kim, Jaehoon. International Journal of Traffic and Transportation Engineering. Multimodal Freight Distribution and Economic Development due to International Capacity Expansion, (2015).

5.1.1 Identifying Freight Corridors

Planning for freight rail and goods movement through the corridor-based approach is important for maximizing investments, but it is key to first understand the options for securing capacity and identifying corridors. Ensuring the appropriate capacity for passenger and freight rail operations can happen in a few different ways. First, there can be shared track infrastructure used by both freight and passenger trains. Second, there can be largely dedicated track for passenger and freight in a shared right-of-way that retains the ability to share track under certain conditions. Finally, capacity can be ensured by the development of completely separate freight and passenger infrastructure. Rail freight corridors are characterized as follows:

- **Primary Trade Corridors**, requiring investment in dedicated freight capacity;
- **Shared Corridors**, where state investment in expanding the passenger rail network will provide capacity benefits for freight rail; and
- **Interregional Investment Corridors**,[170] defined in the ITSP as corridors where the State has an interest in investing in rail as a strategy to ensure capacity for goods movement, and to address projected trucking volumes on parallel interregional highway segments.

The nature of corridor development may change over time, as more passenger service is phased in. Limits on passenger train growth in a corridor during the early phases of network development will place a premium on using available passenger train slots for the highest-ridership services, and lengthening train consists where necessary, while supplementing the service with integrated express bus during off-peak or lower-demand times of day. Additional growth would be achieved through significant investments in physical infrastructure, in partnership with the freight railroads. For more passenger trains to gain access to freight railroads' lines, the freight railroads may require up-front capital project investments and ongoing access fee agreements, enabling capital investments to be made by the railroad corridor owner over time. The partners may conclude that future growth needs may require investing in dedicated or mostly dedicated passenger rail infrastructure for all or a portion of the corridor.

Although the Rail Plan reflects a general understanding of the type of investment appropriate to each corridor, specific decisions will be made through detailed implementation planning and negotiations with host railroads. The established goals and objectives of the freight rail planning process that should guide future implementation planning and negotiations are:

- improving trade corridors;
- developing economic opportunities;
- improving the safety and efficiency of the rail network;
- advancing climate and environmental goals;
- eliminating adverse impacts from rail (i.e., noise, congestion, and safety) on communities; and
- improving the overall quality of life.

The most effective projects and efficient investments will be those that satisfy one or more of the overall goals and objectives, and address national trade route demands, while serving economic needs at the local and regional levels. These corridor-level planning and investment decisions play a major role in shaping the economy and trade growth along every corridor within regions and across the entire state. A corridor-based approach for planning has system-wide effects—each investment decision aimed at improving a portion of the network has cascading impacts on the performance and reliability of rail and goods movement statewide, thereby impacting the future growth and overall demand for rail services.

5.1.2 Freight Rail Corridor Investment Strategy

Freight rail plays an integral mobility role in trade corridors, and with innovative techniques, alternatives analysis, corridor evaluation, and cost-benefit analyses, the available funding can be targeted to identify investment programs and system-management strategies.

Establishing a network of identified corridors, and conducting targeted studies to identify the needs of the entire system, can help clarify which projects

170 Caltrans. *ITSP,* (2015).

support corridor-wide improvements. In this way, system-wide efficiencies can be increased, creating a multi-tiered strategy for prioritizing funding. Corridor plans can provide an effective link between statewide modal plans and local and regional needs that can simultaneously enhance statewide and urban mobility and statewide and transcontinental goods movement. The identification of the needs, priorities, and funding availability help identify the investment level required to achieve the performance expectations from the network.

For example, California's Trade Corridor Investment Fund, which was specifically established to ensure the continued competitiveness of California's trade-related infrastructure, can fund freight rail projects that benefit the economy of the state, and create capacity on freeways. The newly established Trade Corridor Enhancement Program (TCEP) indicates that investments in goods movement are a state priority, and can provide additional opportunities to address strategic investments in highway and rail trade corridors. Funds designated for grade crossing improvements can be invested efficiently to minimize interaction of rail and roadways. Additionally, many passenger rail improvements benefit freight, and the co-investment in these corridors result in co-benefits to freight rail. The improvements are often inextricably tied, and state investments intend to maximize the co-benefits to passenger and freight rail where possible.

Freight rail can also benefit from freight-specific federal and state funding. For example, the FAST Act of 2015 contains freight-related provisions that offer the prospect of modest funding for freight rail. Other funding sources include local ballot initiatives, some of which direct money to freight rail or goods movement more broadly. Flexibility in the use of public funds (federal, state, and local) can provide the means to accelerate some of the freight railroads' investments, either for the direct benefit of goods movement, or for shared benefits achieved while addressing passenger rail needs.

Phased Investment Strategy

Similar to the passenger rail investment strategy, phasing freight rail investments allows for the most efficient use of money to intensify uses, and avoids duplicated or stranded investments while building toward the long-term goals.

The Rail Plan freight investment strategy envisions an evolving partnership between the State and freight railroads to:

- eliminate bottlenecks and use existing corridors more intensively, enhancing the capabilities of both freight and passenger trains in the short term;
- use significant new federal and state funding programs, such as FASTLANE and TCEA, to implement corridor investment programs for freight improvements;
- make shared investments that improve the performance and utility of freight and passenger operations through strategic identification of infrastructure projects that provide benefits to all operators; and
- implement quiet zones and grade separations, and foster the use of cleaner and quieter locomotives that will make railroads better neighbors.

In the short-term (2022) horizon, addressing existing trade corridor bottlenecks is the top priority. These improvements will greatly increase the reliability and efficiency of the entire statewide rail network, and can be implemented in this time frame. Building on the short-term improvements, the mid-term (2027) horizon year prioritizes investing in shared corridors and dedicated trade corridor capacity. Again, these investments will need to be identified through strategic implementation planning with freight and passenger rail providers, but improving shared corridors will improve the functionality of the entire system for passenger mobility and economic growth. Finally, the long-term vision (2040) will expand on all the short- and mid term improvements, and will represent the integration of all services possible.

Recognizing the potential impact of proposed improvements is important in prioritizing the needs of the system. Through this process, the most important issues can be identified and addressed first through appropriate policy and funding strategies.

5.2 Categories of Investment

Chapter 3 of the Rail Plan presents a vision for the state's rail system, and sets forth the context for rail-related investments by developing a premier, customer-focused, integrated system that successfully moves people and products, while enhancing economic growth and quality of life for all Californians. As described in the previous section, with a corridor-based planning approach, the investments can be more effective, and create system-wide improvements. In this context, six major areas of need and opportunity (also referred to as categories of investment) were identified for freight rail in California:

- trade corridor improvements;
- economic development and short lines;
- grade-crossing improvement needs throughout the state ;
- additional terminal and yard capacity;
- short-haul rail improvements; and
- advancement of zero- and near-zero-emissions technologies.

These categories of improvement are expected to improve the freight rail system in accordance with the State's vision for freight rail. Through the framework of these investment categories, the remainder of this chapter defines and articulates the freight rail investment strategy with example projects, and identifies their potential impacts. The project examples will also identify where freight improvements will have passenger rail co-benefits.

5.2.1 Freight Rail Vision

A premier system requires improved trade corridors, yards, and terminals; clean, advanced technology equipment; upgraded track conditions for short lines; and innovative service concepts that have efficiency and safety benefits for all users. A customer-focused system will lead to improved access to the rail network (Class I and Short Lines), with competitive cost and service (improved speeds and service options), enhancing options for the state's shippers. An integrated system requires improved intermodal terminal and transload connections to smooth transfers between modes. The Rail Plan is focused on supporting development of a rail network that moves both people and products; it will address strategies and improvements for coordinating passenger and freight service, and preserving freight capacity as passenger services grow. Economic growth will be achieved through trade corridor improvements and the availability of competitive modal options for California's industries. Finally, the freight component of the state rail vision will support improvements in California's quality of life through modal energy/emissions benefits associated with the adoption of zero- and low-emissions technologies, and the movement of freight by rail and mode-shift to rail where feasible. The Rail Plan will also address grade-crossing impacts.



Zero-Emission Technologies

Electrification eliminates mobile sources of GHGs and other pollutants. However, GHGs at the source of electrical generation can still pose a threat to air quality, human health, and climate. Approximately 57 percent of California's electricity is still produced by burning natural gas or other fossil fuels such as oil, bio-mass, or coal. The remaining balance (43 percent) of electricity produced in California is from a combination of sources including nuclear, hydro, solar, geothermal, and wind. Providing zero-emission GHG trains is a laudable goal.

Germany recently acquired 14 passenger trainsets for regional services in Saxony, based on a DMU design using hydrogen fuel-cell technologies for propulsion power. The trains commenced service between Buxtehude–Bremervörde–Bremerhaven–Cuxhaven in December 2017. The route, branded as Coradia iLint, is the first train to be produced in large quantities, travel long distances (375 to 500 miles on a tankful of hydrogen), and be powered by a hydrogen fuel-cell. In addition to being a zero-emission train, the propulsion system is almost noise-free, according to news reports from Germany.

The hydrogen fuel cell produces the electric energy needed to power the train. The by-product of the chemical process converting hydrogen into electrical energy is water vapor. Flexible energy storage is provided by lithium-ion batteries that accumulate the energy and supply it when needed, with the help of an intelligent energy management system. Alstom, the supplier of the trainsets, promises to provide the necessary hydrogen supply infrastructure on the route. The hydrogen is acquired from chemical plants where hydrogen is produced as a waste product.

China is currently operating a fuel-cell tram (streetcar) in Tangshan city. Service commenced in October 2017. The fuel-cell powered tram was developed by Tangshan Railway Vehicle Co. Ltd., under the guidance of Chinese rail manufacturer China Railway Rolling Stock Corporation. Railroads in the United States are developing fuel-cell locomotives for yard switching duties. India is developing hybrid-hydrogen electric locomotive for mainline use. Toronto Metrolinx has begun a study of hydrogen fuel-cell locomotives and trainsets for its regional rail network.



Ultra-low emissions switching locomotive (Source: flickr, Roy Luck, https://commons.wikimedia.org/wiki/File:Union_Pacific_Genset_switcher,_Eureka_Yard.jpg)

California will continue to evaluate hydrogen fuel-cell technologies for propulsion power for freight railyard switchers and light-density passenger rail lines now using DMU.

5.2.2 Trade Corridor Improvements

Trade corridor improvements focus on core system capacity, efficiency, reliability, and economic development. System capacity improvements (e.g., adding additional track or sidings) can help address current and future bottlenecks, allowing for additional traffic, decreased travel times, and improved reliability. Improved reliability and faster travel times impact the entire network, just as slowdowns at bottlenecks have a cascading effect on the rest of the system. A reduction in bottlenecks will make the system more efficient and reliable, fostering economic development and competitiveness. Current and future bottlenecks can also be tackled through various operational strategies, such as directional running or segregating by train type where parallel lines are available. This type of network rationalization could reduce conflicts between freight and passenger service, while also increasing overall capacity.

If bottlenecks are reduced, thereby decreasing travel times, overall emissions could also be reduced through more efficient rail operations. Additionally, the potential diversion of freight from highways will create more capacity on the roadways, further reducing emissions. Signalization improvements offer increased capacity and speeds, greater reliability, and safety benefits. Improvements to bridges and tunnels are primarily associated with keeping the structures in a state of good repair, and with ensuring that these structures can handle modern freight equipment.

Examples of trade corridor improvements and how they would contribute to California's overall rail vision, including potential co-benefits for both freight and passenger rail, are summarized in Table 5.3.

Table 5.3: Project Examples of Trade Corridor Improvements with Co-Benefits

Investment	Freight	Passenger
Trade Corridor		
Capacity improvements – UPRR Martinez Subdivision	✓	✓
Siding and access improvements – Benicia	✓	
Track additions – Bakersfield to Mojave	✓	
Capacity improvements – southern route to/from Oakland – UPRR Niles, Coast, Oakland Subs	✓	✓
New connections to facilitate Northern California route alternatives – Stockton Wye	✓	✓
Merced to Stockton improvements – BNSF Stockton Sub	✓	✓
Joint-use facilities on the Altamont Pass rail corridor and an intermodal rail shuttle between Port of Oakland and the northern part of the Central Valley	✓	✓
Double-tracking and signal improvements in San Diego County	✓	✓
Complete UPRR Alhambra Subdivision double track	✓	
BNSF – Los Angeles to Barstow Corridor	✓	✓

5.2.3 Economic Development and Short Lines



California's short lines handle approximately one-tenth of the state's carload freight tonnage, and are a critical link between many of the state's freight-intensive industries, ports, and principal trade corridors. Therefore, it is important to maintain a modern and efficient short-line rail system in California that operates seamlessly with its Class I connections.

The principal challenge that must be addressed is that some of the state's short-line trackage cannot handle freight cars weighing 286,000 pounds, a standard that the Class I railroads adopted in 1994. Where a line is not 286K-capable, the common practice is to either load a railcar to less than its maximum capacity, or to transfer the load to trucks for transport to a location where the railroad can handle the heavier load. Both practices unnecessarily increase costs through the inefficient use of assets, the additional steps required, and the increased travel time.

Addressing the 286K issue on a line typically requires undertaking one or more improvements, including replacing rail, ensuring that there are an adequate number of performing ties, and strengthening or replacing bridges. Concurrently, except for short lengths of line, it is greatly beneficial to bring track conditions up to FRA Track Class II, which allows speeds of up to 25 mph for freight trains. Higher speeds greatly improve the operational efficiency of railroads, reduce their costs, and have the potential to improve the marketability of rail service, particularly for potential new rail shippers. Industrial spurs provide direct access to the rail network and reduce truck movement, and often are a necessity for some industries that wish to use rail.

Some examples of short-line-focused improvements and how they would contribute to California's overall rail vision, including potential co-benefits for both freight and passenger rail, are summarized in Table 5.4.

Table 5.4: Project Examples of Economic Development and Short Lines with Co-Benefits

Investment	Freight	Passenger
Economic Development and Short Lines		
Freight spurs/sidings SMART/Northwestern Pacific Railroad – increase rail opportunities for North Bay shippers	✓	✓
Evaluate rail-served industrial development infrastructure for Northern Contra Costa Waterfront	✓	
Track and yard expansion	✓	
Reload yard and multiple rail upgrades for CTC	✓	
Sidings, track upgrades, industrial spurs, and loaders for rail-served customers	✓	
State of good repair and infrastructure upgrades to maintain and expand service	✓	✓
Track and yard expansion (Santa Maria Valley Railroad)	✓	✓
Grade separation at SCRRA tracks on San Canyon Road	✓	

5.2.4 Grade Crossing Improvement Needs throughout the State

The most common freight-related projects at the regional level have been rail grade-crossing improvements; primarily, grade separation projects. Grade separations are expensive, but there are other cost-efficient ways of making a grade-crossing safe using funding allocations from federal and state programs for other types of crossing improvements. Although the comparative safety risks and delays at rural crossings are much lower than in the state's high-volume corridors, particularly in urban areas, the equipment at many rural crossings does not meet current standards for safety and operational efficiency, and is expensive to maintain. By conglomerating upgrade projects and prioritizing them based on corridor-level planning, the reliability and safety improvements become more enhanced throughout the region.

By incorporating current best practices, technology, and equipment, improving these crossings enhances safety, and reduces vehicular and pedestrian delays. Ongoing maintenance costs are also reduced, creating savings that accrue to the railroads and the state and local agencies—which together share the financial burden.

Some examples of grade-crossing improvements and how they would contribute to California's overall rail vision, including potential co-benefits for both freight and passenger rail, are summarized in Table 5.5.

Table 5.5: Project Examples of Grade-Crossing Improvements with Co-Benefits

Investment	Freight	Passenger
Grade Crossings Improvements		
Address community impacts through corridor-based improvement plan as rail traffic grows/shifts	✓	✓
Bridge and crossing improvements	✓	✓
Address rural grade crossing needs, including along short lines	✓	
Develop corridor improvement program along major highways	✓	✓
City of Colfax grade separation	✓	
Improvements along BNSF and UPRR main lines in Fresno	✓	
Develop corridor improvement program along major highways	✓	✓

5.2.5 Additional Terminal and Yard Capacity

Terminals and yards are instrumental in the handling of goods at the beginning of their trip by rail, at the end of their trip by rail, or at intermediate locations along the way. These facilities help maintain the efficient flow of intermodal and carload traffic across the network. Intermodal rail terminals are established to facilitate transfer of containers and trailers between modes (ship to rail, truck to rail, and vice-versa).[171] Future growth studies show that the demand at the ports and at terminals will increase at a much faster pace than the population growth of California—indicating that freight and goods movement for the economy of the state and rest of the country will rely on the transcontinental routes originating in California. Improvements to terminals help ensure that capacity is sufficient to meet demand for goods movement, and help maintain—and perhaps improve—rail's competitive position.

Additional terminal capacity might also improve travel times and reliability, and potentially serve markets that are currently not being served due to capacity constraints. The State also has an interest in supporting regional economic development and investment in ports—proposals for economic development in the North Coast region and improvements to the Port of Humboldt Bay being two examples. The Rail Plan Vision for freight supports the expansion of new freight rail facilities at ports if the benefits and feasibility of those projects can be documented to justify State investment, which can leverage regional funding support and private investment to deliver improvements.

Some examples of terminal and yard capacity improvements and how they would contribute to California's overall rail vision are summarized in Table 5.6.

Table 5.6: Examples of Adding Terminal and Yard Capacity and Co-Benefits

Investment	Freight	Passenger
Terminal and Yards		
Ensure capacity and connectivity at Port of Oakland – 7th Street Grade Separation	✓	
Potential battery assist switcher demonstrations	✓	
Planned intermodal expansions	✓	
Improvements and expansion of rail facilities at ports	✓	
Intermodal terminal expansion to address growth – terminal access improvements for on-dock rail	✓	
Reduce yard and terminal emissions through implementation of zero-emissions technologies – cargo handling and switching	✓	
Realize truck/rail emission tradeoffs – on-dock and near-dock terminals	✓	
Port of San Diego yard capacity improvements	✓	

171 The majority of intermodal traffic in California is associated with the Port of Oakland, POLA, and POLB; a sizeable but smaller volume is related to traffic associated with the United States, Canada, and Mexico. For a more detailed description and list of intermodal facilities in California, please refer to Chapter 2.

5.2.6 Short-Haul Rail Improvements

Short-haul rail shuttles connecting ports with inland regions that host substantial international trade-related distribution activity offer the opportunity to improve the velocity of the flow of goods into and out of the densely populated regions of Southern California and San Francisco Bay Area. With sufficiently high volumes, short-haul rail shuttles transfer the volume of freight truck traffic away from the already congested highways, particularly in and around the major ports. The capital investment in short-haul rail shuttle improvement can be made using funds from the Traffic Congestion Relief Program, given a clear analysis of how the rail shuttle can help relieve congestion on roadways. The feasibility of short-haul rail shuttles is highly sensitive to the differential in costs between rail and highway transportation, and efficient operation would be required to maximize their viability and capture a better rate of return on the investment of public funds.

The ways that short-haul rail improvements would contribute to California's overall rail vision are summarized in Table 5.7.

Table 5.7: Project Examples of Short-Haul Rail Improvements

Investment	Freight	Passenger
Short Haul		
Reassess short-haul link between Oakland and Central Valley	✓	
Connectivity to Bay Area ports	✓	
Connectivity to Southern California ports	✓	
Potential Shafter terminal expansion	✓	
Reexamine inland port concepts	✓	

5.2.7 Advancement of Zero- and Near-Zero-Emissions Technologies

Priority should be given to rail projects that support the deployment of technologies that produce zero or near-zero air emissions, as defined in Health and Safety Code Section 44258. An element of the California Sustainable Freight Action Plan is that zero-emissions equipment should be deployed, where feasible, to reliably and efficiently transport freight; near-zero-emission equipment powered by clean, low-carbon renewable fuels should be used everywhere else.[172] The use of less polluting equipment reduces GHGs and other toxic emissions, and ultimately improves air quality. CARB's petition to the U.S. EPA, which requests adoption of more stringent national locomotive emissions standards, would support the move toward a cleaner freight rail transport system and protect the health and environment near freight facilities. The freight railroads are private companies that operate in national and transcontinental markets, and therefore may be more reluctant to invest in zero- and near-zero-emissions technologies to meet California-specific standards. However, the State's role in advancing the adoption of this technology is central, from both a regulatory and financial perspective, because it can help advance development of the prerequisite technology; and by providing financial incentives, support its commercialization.

172 CARB's November 2016 Technology Assessment: Freight Locomotives (Assessment) considers potential advanced locomotive technologies that could operate on the existing freight rail network with emissions well below the current national Tier 4 emission levels. In particular, the Assessment states that the most technologically feasible and cost-effective advanced technology for near-term deployment is the installation of a compact after-treatment system onto new and remanufactured diesel-electric freight interstate line haul locomotives. As a further step, after-treatment-equipped freight locomotives could be augmented with on-board batteries to provide an additional 10 to 25 percent reduction in diesel fuel consumption and GHG emissions.

5.3 Rail Projects with Freight Elements

Paralleling the proposed passenger rail improvements presented in Chapter 4, a set of projects that contain a freight rail element can be found in Appendix A. These projects present the existing need on the freight rail network. Consideration of these projects also helps identify potential gaps where specific initiatives may be needed to advance the State's vision and goals for freight rail.

The projects on the current list, extracted from the 2014 CFMP, subsequent RTPs, and stakeholder input, represent the potential costs of freight improvements by 2040. Based on projects from these existing lists, the total improvements will cost between $20 and $40 billion. Only projects that include a freight rail element are included; nevertheless, in some regions, most or all projects address joint-use passenger and freight facility needs, along with grade separations and other crossing improvements. Grade separations benefit freight reliability and speed, as well as highway users and abutters and the overall safety of the transportation system.

5.3.1 Freight Rail Projects and the Freight Investment Strategy

The freight investment strategy identifies projects under each of the investment categories guiding the freight rail strategy. Unlike passenger-rail projects, specific regional service goals and investments tied to specific horizon years cannot be identified, due to the differing nature of the private-public relationships required for delivery.

As previously discussed, for the most part, private freight railroad investment plans are not included. Therefore, unlike passenger rail projects, the freight rail strategy does not identify specific service goals tied to time horizons. Rather, the freight investment strategy helps prioritize projects in the short term as a means to intensify services and reduce redundancies in the long term, with the understanding that private freight companies respond to market demands, and change plans accordingly. Most investments are associated with maintaining the infrastructure in a state of good repair, and therefore are usually exempt from any kind of reporting requirement. However, information about projects that require extended planning cycles and environmental review—such as those involving new or reconfigured terminals and major civil engineering efforts—may be publicly available. Appendix A includes a list of funded projects identified in the CFMP 2014.

The appendices provide prospective lists of current and planned investments drawn from the CFMP, RTPs, and stakeholder feedback, and are neither exhaustive, nor meant to necessarily reflect the State's priorities for funding freight rail. They do not recommend specific projects for adoption in the Rail Plan; rather, they highlight improvements that various stakeholders have identified as important. Freight projects will be proposed based on the investment strategy listed in this chapter.

The freight rail needs, as identified throughout this chapter, suggest that trade corridor improvements and at-grade crossings are the two biggest categories of need as we prepare to invest in a more reliable rail network. Congestion relief, efficient transportation, better air quality, and safety are all goals that are met by investing in these projects. Yard capacity improvements are location-based, and despite the fact that they impact the whole network, come as a secondary priority for the investment of public funds. Because the railroad industry is predominantly privately owned and operates nationwide, the short-line industry needs more organization to enter into better public-private partnerships for maintenance and providing connectivity to the larger network. Together, these identified improvements, based on strategic and phased investment from public and private coordination, will increase the efficiency, reliability, and safety of goods movement in California and the United States.



6 The State's Rail Service and Investment Program

California's multimodal transportation network is a complex system that moves people, goods, and services, furthering the state's robust economy. As California moves forward to implement sustainable practices and build climate resiliency and adaptability while maintaining a technological and economic edge, effective solutions must be found to maintain efficiency in strategic interregional transportation corridors.

Chapter 6 presents the proposed capital plan; federal, state, and local funding sources; program effects; and current and future rail studies and reports necessary for the implementation of the 2040 Vision. Details of the passenger rail Capital Program include implementation goals for the short-term (2022), mid-term (2027) and long-term (2040 Vision) time horizons, with appropriate funding sources; as well as the freight rail funding strategy, along with relevant shared-use corridor and safety programs. This chapter also explains the 2040 Vision program effects and benefits to both the passenger and freight networks, economic benefits, shared environmental impacts and benefits, and the regional balance in the distribution of benefits. Finally, ongoing coordination between existing rail plans is important for future implementation planning, and this chapter identifies those as well as other identified future planning needs and proposed studies.

6.1 Passenger and Freight Rail Capital Program

California needs to decide how best to invest public dollars strategically to maximize benefits without compromising LOS, while building and phasing investments in a manner that does not duplicate efforts over time.

As identified in the ITSP and further expanded on in the Rail Plan, a modernized and integrated statewide rail network is an investment that allows the State to strengthen regional transportation corridors and provide viable alternatives to the movement of goods, people, and services.

The Rail Plan offers an investment strategy that allows the State to focus on corridor-level rail investments to achieve service goals that will help in closing capacity gaps, improving corridor safety, and increasing frequency and reliability of intercity passenger rail.

Metropolitan Los Angeles and San Francisco both rank in the top five for most congested urban areas in the world.[173] Los Angeles was ranked as having the worst automobile congestion in the world, with drivers spending an average of 104 hours stuck in congestion in 2016, costing the city an estimated $9.7 billion—or $2,408 per driver. Meanwhile, the San Francisco Bay Area has the most congested arterial and city streets in the United States during commute hours.

Automobile congestion, coupled with the economic losses attached to congestion, along with aggressive air quality and GHG emissions targets, make the case for shifting travel mode shares away from driving.

Passenger Rail Program

Passenger rail services across California, where strategic and timely investments have been made, are serving record numbers of passengers and achieving record growth rates. Where passenger service is provided and well-planned to meet customer needs, it is successful—and often overwhelmed by passenger demand. The passenger rail program presented in the 2040 Vision represents a series of strategic investments to continue maximizing the return from existing and ongoing investments, and then connect them with fully integrated regional and statewide service networks.

As detailed in Chapter 4, the 2040 Vision sets forth specific service goals to deliver a fully integrated statewide network of passenger rail services. The following sections describe the capital costs associated with the service delivery goals presented in Chapter 4 necessary for achieving full connectivity in the 2040 Vision. The 2040 Vision assumes that the completed California HSR will serve as the backbone of a statewide system of interconnected regional networks.

Capital Planning

This section details the methodology used to identify capital improvements, compile cost estimates, and phased improvements over short-term (2022), mid-term (2027), and long-term (2040 Vision) time horizons, ensuring that infrastructure scales to meet market needs and is not redundant or stranded by future investments. Based on the service goals established for the 2040 Vision, the planned and required capital investments are defined to detail the needed infrastructure improvements and understand their related costs.

173 INRIX, *Los Angeles Tops INRIX Global Congestion Ranking, Global Traffic Scorecard,* 2017.

Methodology

Assembling the Capital Program for the Rail Plan followed two tracks: citing costs for established projects; and estimating costs for additional projects. The majority of the Capital Program in the 2040 Vision represents previously identified projects that improve the safety and capacity of existing infrastructure and realize its potential; and aligns investments for improved accessibility, reliability, safety, and sustainability of the multimodal connectivity of the state. It leverages existing assets and connects and evolves regional rail and local transit networks.

First, established costs for existing and defined projects were identified and citied from publicly available documents. Where relevant, these costs were escalated to 2018 dollars for consistency. Such cited costs make up the bulk of projects listed in the 2022 time horizon, when projects included in the capital plan are further along in the development process.

Second, additional capital costs in the Rail Plan include planning-level estimates that consider complexity, environment, geographic location (urban, suburban, and rural), proximity to active tracks, and other factors that may influence costs. Planning-level estimates of capital cost are within a rough order of magnitude—intended to inform investment decisions, and not be interpreted as engineering-level estimates.

The cost catalog developed for this process follows FRA's Standardized Cost Categories, with unit costs for typical elements identified based on an average project cost. For high-cost improvements, such as intermodal hubs, a lump-sum cost is assumed, based on comparable costs from recent projects of similar scope.

The 2040 Vision provides the service type, frequency (system pulse), required average service speed, departure and arrival times, and route nodes used to develop corridor-specific improvements and build related capital cost estimates. These service plans were used to identify capacity requirements at the corridor level throughout the state, which are the primary basis for all project descriptions and assumptions in this estimate. The corridors were investigated through a survey of the existing infrastructure and conditions. The capacity and capabilities of that infrastructure was compared with future capacity requirements.

State Capital Investments

The service and connectivity goals, along with corridor-level improvements required to achieve the 2040 Vision, are described in a phased plan with capital projects identified for the next 4 years (2022); mid-range needs identified for the next decade (2027); and long-range improvements and investments for long-range (2040) planning toward the envisioned future.

- **2022** catalogs the Capital Plan of ongoing and committed projects as part of an enhanced existing conditions assessment of present and near-term rail services across the state.
- **2027** captures new and established projects and planning studies intended to maximize capacity and utility of the existing passenger rail network, and to begin using HSR while connecting it to the statewide integrated network.
- **2040** identifies additional corridor-level investments and service goals needed to fully realize the 2040 Vision, connecting regional networks into a statewide, integrated system.

To achieve the 2040 Vision Network described in Chapter 4, the Rail Plan identifies a robust, strategic capital investment program that catalogs near-term projects, maximizes returns from existing investments, and builds out and connects regional networks into an integrated statewide system. The full spectrum of passenger rail modes is included in the capital investment program, from Urban Rail projects to potential future HSR extensions.

2022 (Near-Term) Infrastructure Investment

The 2022 services goals and Capital Program are focused on identifying the planned, committed, or otherwise under-construction projects that will ultimately serve the network identified in the 2040 Vision. Goals for the 2022 Capital Programs and projects list, which will potentially be achieved earlier than 2022, include relevant state-level projects that are already scoped, scheduled, and budgeted; and establish existing conditions for future capital cost analysis. Although capital projects identified for 2022 have specific operators and modes associated with the service, the subsequent time horizons are intended to be mode- and operator–neutral, and assign costs to service types rather than any specific entity or jurisdiction.

Intercity Rail improvements for 2022 include capacity expansion and speed improvements to existing intercity rail services; grade separations and other safety improvements; and shared freight corridor improvements, like new sidings and double-tracking sections. In addition, a number of planning studies have been identified and included in the Capital Program to explore project implementation for future service goals. These projects positively impact the statewide network, improving interregional corridors and overall connectivity goals, inciting State interest in project sponsorship and funding.

There are a number of commuter rail improvements identified in the 2022 Capital Program, including the SMART extension and Caltrain's Peninsula Corridor Electrification Project.



Table 6.1 catalogs capital costs for projects supporting the integrated statewide network in 2022. Costs attributed to locally led, privately sponsored, or CHSRA-programmed projects are included in the overall 2040 Vision.

Table 6.1: 2022 Short-Term Project List (thousands $)[174]

Planning Area	Corridor	2022 Capital Projects	2022 Capital Cost (thousands $)	2022 Pricing Source
South Bay Area	San Francisco-San Jose	Peninsula Corridor Electrification Program	$1,980,000	Caltrain
		Completion of Full Electrified Service + Targeted Corridor Infrastructure Improvements/Grade Separation Planning	$280,000	Caltrain + Regional Programming
		Caltrain CBOSS PTC	$248,000	Caltrain
		25th Avenue Grade Separation	$165,000	Caltrain
		South San Francisco Station Improvements	$61,000	Caltrain
	San Jose-Gilroy	PTC Expansion + Added Frequency	$47,000	FRA Award + Regional Programming
	San Jose-Stockton	ACEforward Capacity Expansion	$26,000	TIRCP/ Air Quality Management District Award
	Oakland-San Jose	Coast Subdivision Rail Corridor Improvements	$20,000	Caltrans 2018 Interregional Transportation Improvement Program (ITIP)
	Multiple	Regional Network and Service Integration Project Development (Peninsula, Dumbarton, East Bay, Altamont)	$6,000	CSRP Pricing Catalog
North Bay Area	San Francisco-Oakland	New Transbay Crossing Planning	$10,000	BART
	Multiple	North Bay to Sacramento Network and Service Integration Project Development (Marin, Sonoma, Napa, Solano, Yolo, Sacramento, Contra Costa, Alameda)	$3,000	CSRP Pricing Catalog
	Larkspur-Cloverdale	SMART Windsor - Larkspur Connection Ferry Connection to San Francisco	$139,000	SMART
		Two New Trainsets for Expanded Capacity	$11,000	TIRCP Award
		San Rafael Transit Center	$45,000	SMART

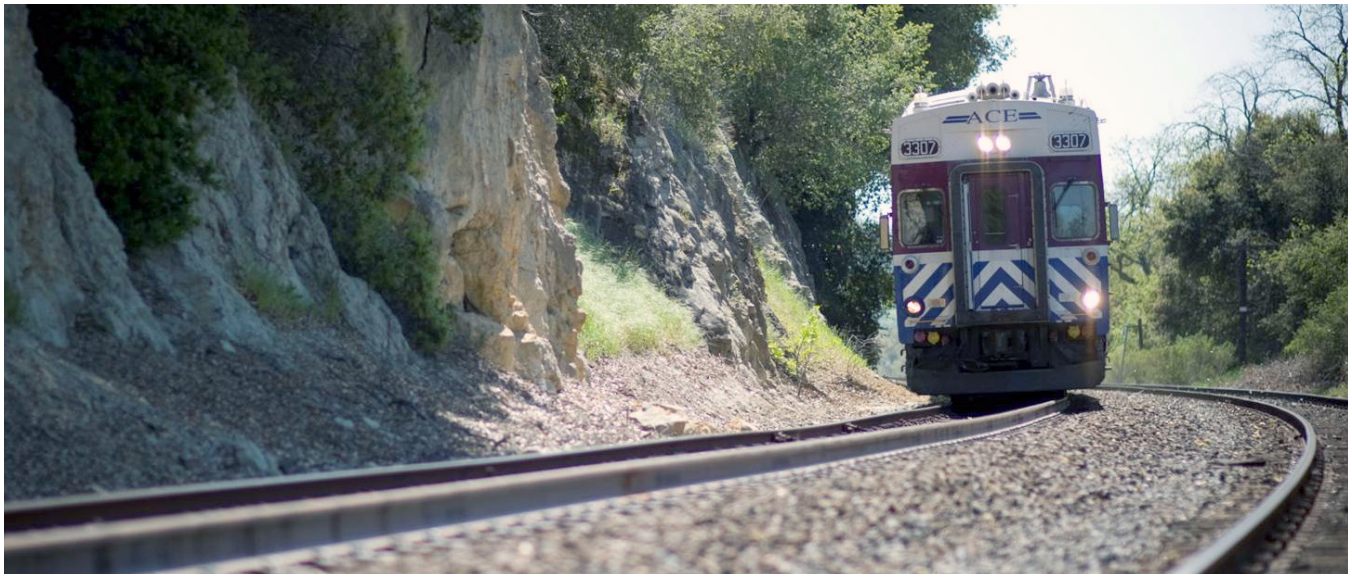
174 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

Table 6.1: 2022 Short-Term Project List (thousands $)(continued)

Planning Area	Corridor	2022 Capital Projects	2022 Capital Cost (thousands $)	2022 Pricing Source
Central Valley/ Sierra Nevada	Sacramento-Roseville	Placer County Service Expansion (Increased Capitol Corridor Service)	$79,000	TIRCP Award
	Fresno-Stockton	Merced Station Double-Tracking	$10,000	CTC Allocation
		Stockton to Escalon Double-Tracking	$23,000	CTC Allocation
		Stockton Maintenance Facility Lead Track and Stockton Wye	$32,000	Caltrans
		Bi-Hourly + Morning Express Service Expansion	$186,000	Caltrans
Central Valley/ Sierra Nevada	Multiple	HSR-Connected Corridors Network and Service Integration Project Development	$4,000	CSRP Pricing Catalog
		Regional Network and Service Integration Project Development (Kern, Kings, Tulare, Fresno, Madera,Shasta,Yuba, Butte, Tehana, Shasta)	$2,000	CSRP Pricing Catalog
Central Coast	San Jose-Goleta	Central Coast Network and Service Integration Project Development	$2,000	CSRP Pricing Catalog
	San Jose-Goleta	Central Coast Layover Facility and Station Expansion	$12,500	Caltrans
	Salinas-San Jose	Kick-Start Service	$81,000	TAMC + CSRP Pricing Catalog
LOSSAN North	San Luis Obispo-Los Angeles	LOSSAN North Frequency Expansion Corridor Performance and Travel Time Improvement, Including Van Nuys Station Double-Tracking	$236,000	Caltrans
	Goleta to Chatsworth	Seacliff Siding and Extension	$23,000	Caltrans
Vegas to Palmdale	Victorville to Las Vegas	Nevada-HDC Network and Service Integration Project Development	$1,000	CSRP Pricing Catalog
	Palmdale to Victorville			
Los Angeles Urban Mobility Corridor	Multiple	LA Metro Statewide Network Service Integration Project Development	$2,000	CSRP Pricing Catalog
	Los Angeles-Fullerton	Rosecrans/Marquandt Avenue Grade Separation	$155,000	Project Funding Plan
	LAUS	Metro Frequency Improvement at LAUS	$162,000	TIRCP Award
Inland Empire	San Bernardino-Redlands	Redlands Passenger Rail Project	$265,000	San Bernardino County Transportation Authority
	Multiple	HSR-Connected Corridors Network and Service Integration Project Development; Blue Ribbon Commission for CA-AZ Rail Service	$4,000	CSRP Pricing Catalog

Table 6.1: 2022 Short-Term Project List (thousands $)(continued)

Planning Area	Corridor	2022 Capital Projects	2022 Capital Cost (thousands $)	2022 Pricing Source
LOSSAN South	Irvine-Oceanside	Laguna Niguel to San Juan Capistrano Passing Siding	$25,000	TIRCP Award
		San Onofre-Pulgas Phase 2	$29,000	NCTD
	Oceanside-Sorrento Valley	San Elijo Lagoon Double-Tracking	$76,000	San Diego Association of Governments (SANDAG)
		Batiquitos Lagoon Double-Tracking	$69,000	SANDAG
		Poinsettia Station Improvements	$29,000	SANDAG
	Sorrento Valley-Santa Fe Depot	San Diego River Bridge, Elvira-Morena Double-Tracking	$286,000	TIRCP Award
		Maintenance and layover facility project study	$250	CSRP Pricing Catalog
	San Diego-Mexican Border	United States-Mexico Network and Service Integration Project Development	$1,000	CSRP Pricing Catalog
Statewide	Multiple	Amtrak Equipment Replacement, Fleet Capacity Expansion and Maintenance Facility Planning, Americans with Disabilities Act Access Improvements	$300,000	Caltrans
		Mobility Hub Project Development	$5,000	CSRP Pricing Catalog
		Fare Integration and Demonstration	$27,500	Caltrans
		Statewide maintenance facility study	$500	CSRP Pricing Catalog
Total				**$5,168,750**



2027 (Mid-Term) Infrastructure Investment

The 2027 Capital Program and service goals are focused on maximizing the potential of existing infrastructure, making full use of available passenger rail capacity, and making key investments in regional networks to prepare for integration with HSR. In identifying service goals for 2027, every rail network in the state was carefully examined to identify latent capacity for additional service, while assessing it against the ridership potential of the corridor. Goals for the 2027 Capital Program include identifying achievable mid-term improvements that affordably increase opportunities for additional long-distance passenger rail trips per day, while strengthening an integrated rail network that leverages HSR investments and enables rapid statewide travel by rail, creating more options for automobile-dependent communities.

Key projects in the 2027 Capital Program include preparing regional networks to connect to and leverage HSR service. Additional service frequencies and improved speeds connecting greater Los Angeles, Orange County, and the Inland Empire to HSR hubs at Burbank, LAUS, and Anaheim are key investments in this time period. Similarly, investments include improving blended-speed regional service expansions in the Central Valley, for interim connections from HSR in Merced to Stockton and Sacramento.

HSR capital costs include projects necessary to complete Silicon Valley to Central Valley service delivery.

Intercity rail improvements include further capacity improvements, service expansions, and infrastructure around the state. The 2027 Capital Program includes supporting extended service in Sonoma County to Cloverdale; enhanced capacity between San Jose and Sacramento, with improved travel times, frequency, and other right-of-way improvements building toward electrification of the corridor; and increasing service frequencies north of Sacramento to Placer County.

The plan supports increased service on the coastal corridors, using strategic track investments, sidings, layover facilities, and other capacity and speed improvements to bring service to the coast throughout the day. Additional service on the Central Coast, providing connections north to the San Francisco Bay Area, and connections south to the Los Angeles area, will provide residents and businesses with frequent, fast, and reliable connections within the Central Coast, and beyond to high-speed hubs in Gilroy and Burbank.

Urban Rail investments include expansions of Los Angeles, San Diego, Sacramento, and San Francisco Bay Area rail transit networks, largely funded through local ballot initiatives. These projects are extensions and connections in the existing transit networks, identified and led by relevant local stakeholders. Major investments include the completion of BART service to San Jose, numerous expansions of the LA Metro system, and the extension of rail service to the Sacramento International Airport.

The Las Vegas HSR project is included in the 2027 capital project time horizon.

Table 6.2 catalogs capital costs for projects supporting the integrated statewide network in 2027. Costs attributed to locally led, privately sponsored, or CHSRA-programmed projects are included in the overall 2040 Vision.

Table 6.2: 2027 Capital Costs[175]

Planning Area	Capital Cost [thousands $]
South Bay Area	$3,570,000
North Bay Area	$225,000
Central Valley/Sierra Nevada	$1,150,000
Central Coast	$262,000
LOSSAN North	$550,000
Vegas to Palmdale	$8,395,000
Los Angeles Urban Mobility Corridor	$2,500,000
Inland Empire	$950,000
LOSSAN South	$950,000
Statewide	$1,210,000
Total	**$19,762,000**

175 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

Table 6.3 contains high-level capital cost estimates for projects supporting the integrated statewide network in 2027. Costs attributed to locally led, privately sponsored, or CHSRA-programmed projects are included in the overall 2040 Vision.

Table 6.3: 2027 Mid-Term Project List (thousands $)[176]

Planning Area	Corridor	2027 Capital Projects	2027 Capital Cost (thousands $)
South Bay Area	San Francisco-San Jose	San Francisco-San Jose Grade Separations, Level Boarding, Longer Trains, and Performance Improvement (Phase 1)	$1,250,000
		San Jose-Gilroy Service Increase	
		Diridon Station Mobility Hub Phase 1	
		Corridor Capacity and Safety Improvement Project Development	
	Altamont, East Bay (south of Oakland) and Dumbarton	Oakland-San Jose Capacity Increase for Passenger and Goods Movement	$2,300,000
		Tri-Valley Connectivity Between BART and the Statewide Rail Network	
		Dumbarton Rail Crossing Integration with Statewide Rail Network (Phase 1)	
		Altamont Corridor Capacity Increase for Passenger and Goods Movement	
		I-680 Integrated Express Bus	
	Multiple	Regional Network and Service Integration Project Development (Peninsula, Dumbarton, East Bay, Altamont)	$20,000
North Bay Area	San Francisco-Oakland	New Transbay Crossing Project Development	$60,000
	Oakland-Sacramento	Martinez Station Capacity Improvement for Corridor Connectivity	$100,000
		Stockton-Martinez Capacity Upgrades for Bi-Hourly Service	
		Corridor-Wide Station Capacity and Safety Improvements	
	Multiple	North Bay to Sacramento Network and Service Integration Project Development (Marin, Sonoma, Napa, Solano, Yolo, Sacramento, Contra Costa, Alameda)	$10,000
	Larkspur-Cloverdale	SMART Windsor to Cloverdale Extension, Including Fleet	$55,000
Central Valley/Sierra Nevada	Sacramento-Roseville	Placer County Service Expansion (Phase 2)	$200,000
	Fresno/Merced-Stockton-Sacramento	Regional Rail Expansion to Merced and Sacramento	$950,000
		Hourly Service from Fresno to Sacramento	
		Madera Mobility Hub	
		Sierra Nevada Integrated Express Bus	
		North State Integrated Express Bus Expansion	

176 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

Table 6.3: 2027 Mid-Term Project List (thousands $)(continued)

Planning Area	Corridor	2027 Capital Projects	2027 Capital Cost (thousands $)
Central Coast	Gilroy-Goleta	Bi-Hourly Integrated Service from Salinas and Hollister to Gilroy	$262,000
		San Luis Obispo-Salinas Intercity Rail Increase and Bi-Hourly Integrated Service	
		Central Coast Layover Facility and Station Expansion	
		Bi-Hourly Integrated Service from Paso Robles to the Central Valley	
		Goleta-San Luis Obispo Intercity Rail Increase and Bi-Hourly Integrated Service	
LOSSAN North	Goleta/ Santa Clarita-Burbank-Los Angeles	Bi-Hourly Express Service Goleta-Los Angeles	$550,000
		Hourly Local Service Chatsworth-Los Angeles	
		Hourly Local Service Santa Clarita-Los Angeles	
Vegas to Palmdale	Victorville to Las Vegas	HSR Palmdale-Las Vegas	$8,395,000
Los Angeles Urban Mobility Corridor	LAUS	LAUS Passenger Capacity Expansion and Run-Through Tracks	$2,500,000
	Burbank-Los Angeles-Anaheim	Corridor Capacity and Grade Separation Projects for First Phase of Integrated Local and Express Service	
Inland Empire	Multiple	First Phase Integrated Local and Express Service Los Angeles-San Bernardino	$950,000
		First Phase Integrated Local Service Los Angeles-Riverside-Perris Valley	
		First Phase Integrated Local Service Riverside-Orange County	
		Initial Service to Coachella Valley	
LOSSAN South	Anaheim-San Diego	First Phase Integrated Local and Express Service Los Angeles-Anaheim-San Diego	$950,000
Statewide	Multiple	Amtrak/State Equipment Replacement, Fleet Capacity Expansion and Maintenance Facility Investment	$900,000
		Corridor Service Improvement - Capitalized Maintenance	$20,000
		Integrated Express Bus in Partnership with Regional Service	$150,000
		Project Development for Statewide Network Investments	$100,000
		Fare Integration - Phase 2	$40,000
Total			**$19,762,000**

2040 (Long-Term) Infrastructure Investment

The 2040 Capital Program is focused on completion of the full build-out of regional networks to integrate the statewide system and HSR with unified service throughout the state. The program represents the long-term investments needed to achieve the passenger rail service goals described in the 2040 Vision (see Chapter 4). These include incremental projects built to expand and connect previously described services in the 2022 and 2027 programs; wider-scale investments to modernize services through electrification and connectivity improvements at station hubs; and large infrastructure projects like HSR expansion, intermodal hubs, new Transbay tube, and urban rail transit investments.

HSR expansion is of key importance to the 2040 Capital Program, and includes electrified blended service from Sacramento to Merced and through the Inland Empire, as well as HSR service to San Diego.

Intercity rail improvements for 2040 include electrification of express services in both Northern and Southern California, complementing HSR in network hubs with pulsed service schedules to achieve the 2040 Vision.

This includes wide-scale electrification of intercity services in the San Jose-Oakland-Sacramento corridor; Central Valley from Merced to Sacramento; and Inland Empire, from Los Angeles separately to San Bernardino and Riverside, and on to the Coachella Valley. Large investments are identified for a shared second Transbay tube (hosting regional and intercity rail) to improve San Francisco-to-Oakland capacity, and improve overall Northern California network functionality. Complementary services to the HSR expansion are included in both the Sacramento-to-Merced corridor, east-west in the Central Valley, and throughout the Inland Empire. These projects require numerous grade separations and track improvements to support service speeds and safety in identified corridors.

The end result is a modern, energy-efficient, and fully integrated statewide network, providing the frequent, fast, and pulse-scheduled services described in the 2040 Vision. This network will provide seamless service to passengers, and serve as the high-level State investment needed for California to be increasingly economically competitive while true to its environmental and equity goals, improving quality of life across the state.

Table 6.4 catalogs capital costs for projects supporting the integrated statewide network in 2040.

Table 6.4: 2040 Capital Projects Details

Planning Area	Corridor	2040 Capital Projects	2040 Capital Cost (thousands $) [176]
South Bay Area	San Francisco-San Jose	San Francisco-San Jose Grade Separations, Level Boarding, Longer Trains and Performance Improvement (Phase 2)	$6,000,000
		Implement Regional Rail Utilizing New Transbay Crossing	
		Downtown Extension from 4th and King	
		HSR Corridor Investment for Phase 1 Service	
	Altamont, East Bay (south of Oakland) and Dumbarton	Implement Regional Rail Utilizing New Transbay Crossing, including East Bay services in Alameda County	$1,700,000
		Implement Integrated Regional Rail Service Utilizing Altamont and Dumbarton Rail Corridors	
North Bay Area	Multiple	New Transbay Crossing	$18,400,000
		BART-Conventional Rail Mobility Hub Investments	
		Implement Express & Regional Rail Utilizing New Transbay Crossing, including new alignment with high-level crossing to Solano County and significantly faster travel times between Sacramento and the Bay Area	
		Stockton-Richmond Capacity Upgrades for Hourly Service	
		Regional Rail Expansion from Marin and Napa Counties to Solano County	
Central Valley/Sierra Nevada	Multiple	Implement Full Integrated Rail Service to Placer County	$4,900,000
		Implement Blended Rail Service from Merced to Sacramento with Express and Local Service	
		Implement Regional Rail Connecting Lemore, Hanford, Porterville and Visalia with the Statewide Rail Network	
Central Coast	Gilroy-Goleta	Hourly Integrated Rail Service from Salinas to Gilroy	$1,500,000
		Implement Regional Rail Connecting Monterey and Santa Cruz to the Statewide Rail Network	
		Implement Central Coast Rail & Express Bus Service from Salinas to Goleta	
LOSSAN North	Goleta/ Santa Clarita-Burbank-Los Angeles	Hourly Express Service Goleta-LA	$700,000
		Implement Half-Hourly Express & Local Rail Service Chatsworth-LA	
		Implement Half-Hourly Local Rail Service Santa Clarita-LA	

177 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

Table 6.4: 2040 Capital Projects Details (continued)

Planning Area	Corridor	2040 Capital Projects	2040 Capital Cost (thousands $) [176]
Inland Empire	Multiple	Integrated Local and Express Service Los Angeles-San Bernardino	$17,300,000
		Integrated Local and Express Service Los Angeles-Riverside	
		Integrated Local Service Riverside-Orange County	
		Blended Rail Services from Los Angeles, Riverside, and San Bernardino to Ontario Airport	
		High Speed Rail Services from San Diego to Ontario Airport, continuing to Inland Empire and Los Angeles on Blended Service corridors	
		Integrated Local Service Extension to Hemet	
		Integrated Express Rail Service on New Alignment to Coachella Valley	
LOSSAN South	Anaheim-San Diego	Implement Half-Hourly Local and Express Services LA-Anaheim-San Diego	$1,200,000
	San Diego-Mexican Border	Implement Enhaced Rail Service to Mexican Border	
Statewide	Multiple	Statewide Fleet and Maintenance Facility Investments	$550,000
		Corridor Service Improvement - Capitalized Maintenance	$50,000
		HSR Phase 1 Service (including completion of LA Urban Mobility Corridor Investments, excluding capital investment included in other projects)	$67,490,000
Total			**$119,790,000**

Table 6.5: 2040 Capital Costs[178]

Planning Area	Capital Cost [thousands $]
South Bay Area	$7,700,000
North Bay Area	$18,400,000
Central Valley/Sierra Nevada	$4,900,000
Central Coast	$1,500,000
LOSSAN North	$700,000
Inland Empire	$17,300,000
LOSSAN South	$1,200,000
Statewide	$68,090,000
Total	**$119,790,000**

178 Estimated costs in 2018 dollars. These costs are planning-level estimates and require further study in implementation.

6.1.1 Passenger and Freight Rail Integration

Intercity and commuter railroad operations in shared-use corridors are quite common across the country.

A shared-use corridor generally involves passenger and freight operations using the same track plant.

Most of California's intercity and commuter-rail operations occur on shared track, with the exception of the SCRRA line segment between Palmdale and Lancaster. This situation is expected to change with HSR implementation. Some HSR sections will be classified as shared right-of-way or shared corridors.

As defined by the FRA, shared-use corridors can take on three different forms:

Shared tracks. In this form, the trains of two or more service providers operate over the same tracks. The most common arrangement is that of a freight carrier and an intercity or regional passenger service provider, all sharing the same track, with dispatching performed by the track owner.[179]

Shared Right-of-Way. In this form, two rail services are operated independently on separate parallel tracks having a track centerline separation of less than 30 feet[180]. Separation of 30 feet or less triggers the application of certain FRA safety regulations.

Shared corridors. In this form, two rail services are operated independently on separate parallel tracks having a track centerline separation between 30 and 200 feet. Two hundred feet is considered the outer limit of separation, where an accident on one line could interfere with operations on the other. Shared right-of-way operations exist on a broad scale in several metropolitan regions where FRA-compliant railroads share right-of-way with rapid transit systems (e.g., Washington, D.C., New Jersey, and Chicago). Most of California's intercity and commuter rail operations occur on shared track (as discussed above), with the exception of the SCRRA line segment between Palmdale and Lancaster, where SCRRA's line is operated separately from the parallel UPRR freight line. This situation is expected to change with HSR implementation. Some HSR sections will be classified as shared right-of-way or shared corridors.

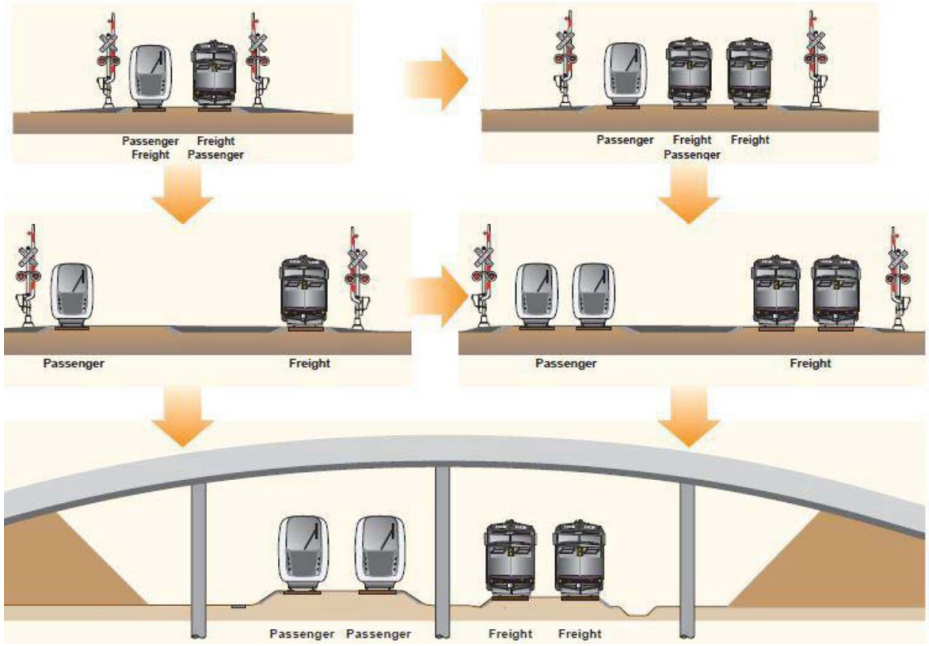


Exhibit 6.1: Corridor Separation Evolution; Shared Track (80/110 mph), Shared Corridor (80/110 mph), Blended Passenger (80-125 mph)

179 Time of day separation" is a distinct category of shared tracks that is not covered in this overall definition. Such an arrangement is required when the passenger rail vehicles are not compliant with FRA standards. California hosts two such operations: the San Diego Trolley on two branches, and the SPRINTER between Oceanside and Escondido

180 49 Code of Federal Regulations (CFR) Appendix A to Part 211, Statement of Agency Policy Concerning Waivers Related to Shared Use of Trackage or Rights-of-Way by Light Rail and Conventional Operations.

6.2 Funding for California Passenger and Freight Rail

California's rail system is funded by a number of sources and programs, including state fuel taxes and fees, federal fuel taxes, federal grant programs, state bonds, the cap-and-trade program, and local sales tax measures. Currently, the largest sources of funding include the state's Public Transportation Account (PTA) (funded by the diesel fuel tax and other state accounts), the Greenhouse Gas Reduction Fund (GGRF) from the Cap-and-Trade program, and federal fixed guideway capital investment grants. Detailed descriptions of these funding sources are provided later in the chapter.

Passenger rail capital projects draw funding from a number of sources at the federal, state, and local levels. Funding sources are more likely to have committed to near-term projects than to long-term projects, which are more open-ended. Due to the private-sector nature of freight rail, less detail is known regarding freight capital spending. However, public funding sources for shared corridor improvements are identified in the next section, and delineated in the 2022 projects list. This section describes the full breadth of funding options available at the federal, state, and local levels.

6.2.1 Operating Costs and Funding

Capital costs are only half the equation to establishing a financially sustainable passenger rail service. The other half consists of O&M costs for providing the service. Although operating passenger rail service is costly, there are massive efficiencies and economies of scale to be captured through well-planned, fast, and frequent service. In this way, the more frequently and faster the trains run, the more people ride, and the more cost-effective it is to provide the service per passenger mile traveled.

Key factors to lowering costs include:

- more efficient train rolling stock, largely through electrification and modern DMU trains that are cleaner and lighter than traditional diesel locomotive-hauled trains;
- faster train speeds, allowing for shorter trips and more hours of revenue service, with more efficient train crew service;
- faster turn-arounds, reducing the amount of time trains are idling at station or in rail yards; and
- changes in travel distances, largely through integrating regional and statewide services to ensure market sensitivity in route and service planning.



Several studies have shown that DMU trains are a practical alternative to diesel locomotive-hauled trains when train lengths are less than about four to five passenger cars. DMUs similar to the new trains operating in Marin County are not likely to replace current locomotive-hauled service on existing commuter rail lines directly, but could be used to extend or feed current routes, provide off-peak service, or replace locomotives in a high-service-frequency operating scenario where shorter, more frequent DMUs replace longer, less frequent locomotive-hauled trains. In addition to significant operating efficiencies gained by operating DMU on light-density routes, DMU are quieter and less polluting.

Taken together, these changes reduce unit costs for train operations, crews, and other overhead, resulting in more service available for far lower unit prices.

Although the O&M costs for the 2040 integrated network seem higher than the O&M costs for existing (i.e., today's) rail services, increased train speeds and frequencies, newer equipment, longer consists (i.e., higher capacity), longer travel distances, and increased operating efficiencies all contribute to driving down the average cost per train mile and cost per seat mile. The 2040 integrated network has a 45 percent lower cost per train mile, and a 65 percent lower cost per seat mile over today's service.

Fares

Higher ridership and lower cost of providing service ultimately means that the "fare box recovery ratio," or the portion of the cost of providing a ride that is paid for by rider fares, improves to the point that certain operations and services can be self-funding. Although it may not be the goal for public passenger rail service or transit to be profitable, local, express, and HSR services all benefit from the financial sustainability of self-funding their operations through low costs and high ridership.

6.2.2 Funding Opportunities

California's transportation system is at a precipice for making pivotal decisions and setting course for the mobility of the state and the rest of the country for several years to come. State and local spending has outpaced federal spending over the past few decades. Exhibit 6.2 shows the amount of spending by year on mass transit and rail by federal, state, and local sources across the United States. In 2014, state and local governments accounted for 77 percent of the nation's mass transit and rail spending. Combined nationwide spending was an estimated $68.4 billion.

With the passage of SB 1, the Road Repair and Accountability Act of 2017, California has increased its transportation investment to rebuild by fixing neighborhood streets, freeways, and bridges in communities across California, and by targeting funds toward transit and congested trade and commute corridor improvements. SB 1 invests an average of $5.2 billion annually over the next decade to fix California's transportation system—and invests at an even higher level beyond the first decade. It will address a backlog of repairs and upgrades, while ensuring a cleaner and more sustainable travel network for the future.

California's state-maintained transportation infrastructure will receive $26 billion, roughly half of SB 1 revenue. The other half will go to local roads, transit agencies, and an expansion of the state's growing network of pedestrian and cycle routes. Each year, this new funding will be used to tackle deferred maintenance needs both on the state highway system and the local road system.

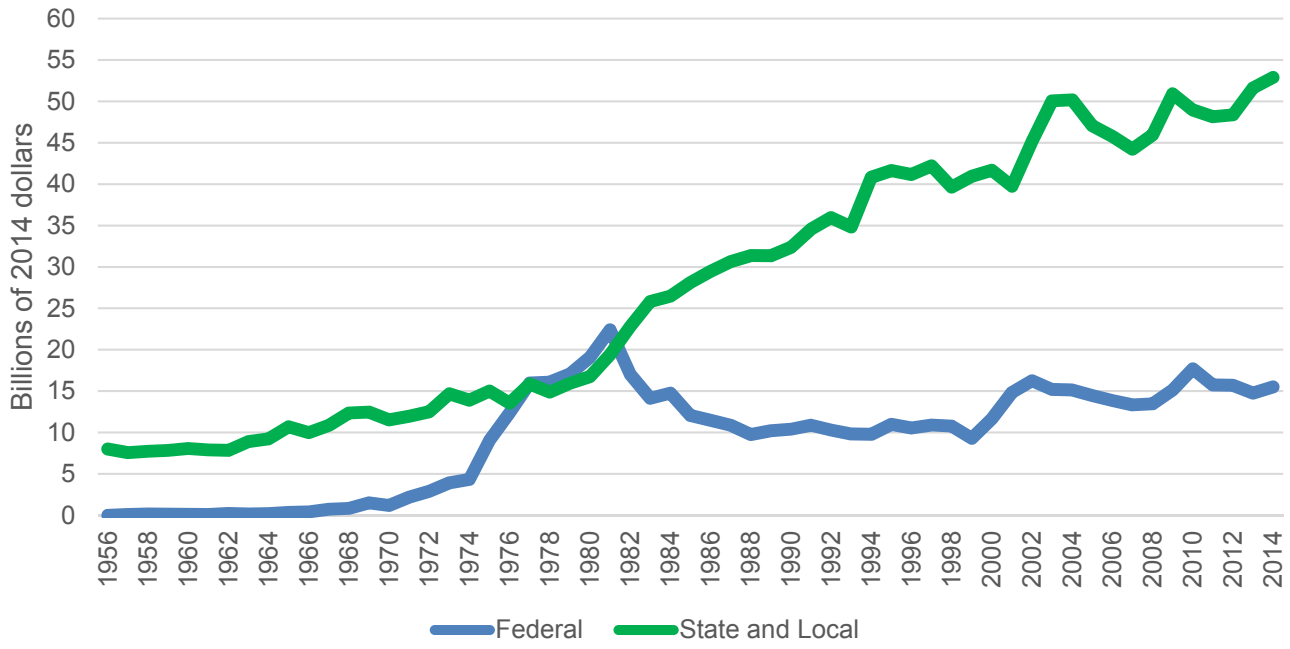
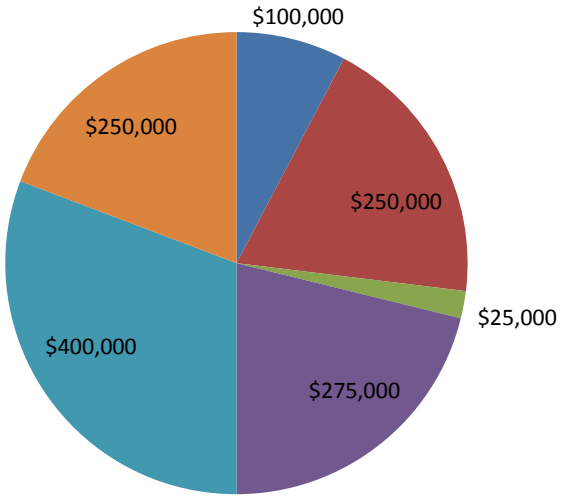


Exhibit 6.2: Federal Government and State and Local Government Spending on Mass Transit and Rail across the U.S., 1956 to 2014 (billions of 2014 dollars) [181]



- Active Transportation
- Local Partnership Grants
- Local Planning
- Corridor Mobility
- Transit Capital
- Trade Corridors

The State of California and Caltrans have made a commitment to funding improvements in the rail, transit, and local transportation systems necessary to work toward achieving the 2040 Vision. The 2017-2018 Budget proposed more than a billion dollars annually in funding for transit, congested and trade corridors, and active transportation.

Source: Governor's Budget Overview 2017-2018 (http://www.lao.ca.gov/Publications/Report/3694/10)

Exhibit 6.3: Caltrans-Anticipated Annual Rail and Transit Investment Funding (Capital and Planning)

181 Congressional Budget Office, *Public Spending on Transportation and Water Infrastructure, 1956 to 2014 (Data Underlying Figures)* (2015), accessed 2016.

6.2.3 Federal Rail Funding Fixing America's Surface Transportation Act[182]

The FAST Act of 2015 authorized $10.4 billion nationally for passenger rail (equivalent to about $2.1 billion annually over 5 years). Of this overall amount, the FAST Act authorizes $2.2 billion over 5 years for three new competitive rail development grant programs that build off of an earlier $10 billion investment through the High-Speed Intercity Passenger Rail Program:[183]

Consolidated Rail Infrastructure and Safety Improvements (Sec. 11301). The purpose of this grant program is to improve the safety, efficiency, and reliability of passenger and freight rail systems. Eligible activities include a wide range of capital, regional, and corridor planning; environmental analyses; research; workforce development; and training projects.

Federal-State Partnership for State of Good Repair (Sec. 11302). The purpose of this grant program is to reduce the state of good repair backlog on publicly owned or Amtrak-owned infrastructure, equipment, and facilities. Eligible activities include capital projects to (1) replace existing assets in-kind or with assets that increase capacity or service levels; (2) ensure that service can be maintained while existing assets are brought into a state of good repair; and (3) bring existing assets into a state of good repair.

Restoration and Enhancement Grants (Sec. 11303). The purpose of this grant program is to provide operating assistance to initiate, restore, or enhance intercity passenger rail transportation. Grants are limited to 3 years of operating assistance per route and may not be renewed.

The FAST Act investments are expected to increase spending by $1.7 billion over 5 years, controlling for inflation. [184]

Federal Transit Administration Formula Grants

The FAST Act reauthorized funding of FTA formula grants through 2020, providing more stability and predictability in funding for transit agencies. There are also competitive grant programs, but the FTA formula funds that support Rail Plan service and delivery goals are:

Rural Areas – 5311
Tribal Transit Formula Grants – 5311(c)(2)(B)
Urbanized Area Formula Grants – 5307
State of Good Repair – 5337
Rural Transportation Assistance Program – 5311(b)(3)

National Highway Freight Program

Section 1116 of the FAST Act created the formula-funded National Highway Freight Program, which funds projects that support the movement of goods on the National Highway Freight Network, including rail crossings, with $1.2 billion annually in funding. California is expected to receive $600 million over the next 5 years, or an average of $117 million per year, from the National Highway Freight Program. As much as 10 percent of these funds may be put toward improvements to freight rail or ports.

182 FRA, *FAST ACT Overview*, 2017.
183 FRA, *FAST ACT Overview*, 2017.
184 America Road and Transportation Builders, 2015 *"Fixing America's Surface Transportation Act" – A Comprehensive Analysis* (2015), accessed 2016.

National Surface Transportation and Innovative Finance Bureau

The FAST Act reorganized federal loan and discretionary programs under the new Surface Transportation and Innovative Finance Bureau.[185] The Bureau houses the following programs:

Transportation Infrastructure Finance and Innovation Act (1998) (TIFIA). The act provides federal credit and financing assistance with flexible repayment terms to projects of national and regional significance, including rail transit programs. To date, California has received roughly $2.8 billion in TIFIA assistance, $1.7 billion of which has gone to rail transit programs, primarily intercity rail in Los Angeles. The FAST Act reauthorized TIFIA, but with funding levels significantly lower than Moving Ahead for Progress in the 21st Century Act (MAP-21). [186]

Railroad Infrastructure Financing and Improvement Act (RRIF) (2015). The FAST Act expanded eligible projects for railroad rehabilitation and improvement financing to include transit-oriented and station development. The FAST Act also shortens review time and allows joint public-private ventures to encourage more applications to apply. As of May 31, 2015, the program has executed 35 loans for approximately $2.7 billion nationally. Some California projects have received loans through RRIF.[187]

Nationally Significant Freight and Highway Program (2015). Section 1105 of the FAST Act created the Nationally Significant Freight and Highway Program, a competitive grant program. The program is planning to allocate $4.5 billion in grants in fiscal years 2016 through 2021. The minimum grant awarded is $25 million.

FASTLANE/INFRA Grants Program



The FAST Act established the FASTLANE/INFRA grant program, which provides competitive grants to nationally and regionally significant freight and highway projects that demonstrate cost-effectiveness and the ability to generate national or regional economic, mobility, or safety benefits. Eligible projects include freight rail and freight intermodal facility improvements and improvements within the border of freight rail and intermodal facilities.[188] The FFY 2016 FASTLANE/INFRA grants awarded $759 million to 18 projects nationally.[189] California received one of the grants, although it was for a highway rather than rail project. FASTLANE/INFRA grants were authorized $4.5 billion from FFY 2016 to FFY 2020.[190]

Fixed Guideway Capital Investment Grants (Section 3005) The Fixed Guideway Capital Investment Grants Program is a discretionary program that provides funding for new or expanded commuter rail, ferry, or bus rapid transit projects. It includes four categories: New Starts, Small Starts, Core Capacity, and Programs of Interrelated Projects. It is programmed to fund $2.3 billion of projects nationally each year from FFY 2016 through FFY 2020.[191] The FFY 2017 funding recommendations for the program included nine California projects across the four categories. These California projects were allocated over $2.3 billion in federal funding through FFY 2016, and had $4.4 billion in remaining federal funding needs after FFY 2016. The FFY 2017 budget recommendations cover more than $1.1 billion of these remaining needs in that year.[192]

185 FRA, *FAST ACT Overview*, 2017.

186 Squire Patton Boggs, FAST Act: Opportunities for Private Sector Investment and P3s (2015), accessed 2016. TIFIA funding will be $275 million in FFY 2016 and 2017, $285 million in 2018, and $300 million in 2019 and 2020.

187 FRA, *RRIF Program Fact Sheet* (2015), accessed 2016.

188 FRA, *FAST ACT Overview*, 2017.

189 U.S. DOT, *Fiscal Year 2016 FASTLANE Awards Annual Report* (2016), accessed 2016.

190 U.S. DOT, *FASTLANE Grants FAQs* (2016), accessed 2016.

191 FTA, *Fixed Guideway Capital Investment Grants,* accessed 2016.

192 FTA, *Annual Report on Funding Recommendations, Fiscal Year 2017, Capital Investment Grant Program,* (2016), accessed 2016.

BUILD - Better Utilizing Investments to Leverage Development



The U.S. DOT awards competitive federal Better Utilizing Investments to Leverage Development (BUILD; formerly TIGER) discretionary grants to fund capital investments in surface transportation infrastructure. BUILD grants focus on capital projects that generate economic development and improve access to reliable, safe, and affordable transportation. Both rail and port projects are eligible. In FFY 2017, the ninth round of former TIGER grants awarded nearly $500 million in transportation improvement projects, including rail. A California project received $9 million from this round.[185] TIGER had previously funded $5.5 billion of grants nationally from 2009 to 2017.[193]

Railroad Safety Risk Reduction Program (Section 130)

Section 130 of the RSIA of 2008 established the Railroad Safety Risk Reduction program. This program has been continued under the FAST Act as a set-aside from the Highway Safety and Improvement Program, and is apportioned to eligible states by formula. About 50 percent of the state's allocation must go to installing protective devices at at-grade crossings. Under the FAST Act, California is expected to receive $82 million via this program for crossing safety enhancement projects between the years 2016 and 2020.[194]

U.S. Department of Transportation
Federal Railroad Administration



Workers supporting high speed rail construction in Fresno

193 U.S. DOT, *Tiger Discretionary Grants*, 2016, accessed 2017.
194 Caltrans, *FAST Act Memorandum* (2015), accessed 2017.

6.2.4 State Funding

The California State Legislature passed SB 1 and the Road Repair and Accountability Act of 2017 to reform the transportation program and increase transportation revenue. In the 2016-2017 budget documentation, the Governor presented a transportation funding and reform package that included a new road improvement charge; stabilization of the gasoline excise tax to 18 cents, with an adjustment annually of the broader gasoline tax to inflation; an increase in the diesel excise tax; additional money provided by the cap-and-trade program; and costs savings from increasing Caltrans' efficiency.[195] This funding package will generate $5.4 billion annually, and establishes new funding sources like a new annual vehicle fee, amongst other things. The Transportation Improvement Fee and Road Improvement Fee generate $16.35 billion and $191 million, respectively, over the next 10 years. This section describes all the opportunities to pursue state funding.

WHERE DOES THE MONEY GO?

California's State-maintained transportation infrastructure will receive roughly half of SB 1 revenue: $26 billion. The other half will go to local roads, transit agencies, and an expansion of the state's growing network of pedestrian and cycle routes. Each year, this new funding will be used to tackle deferred maintenance needs, both on the state highway system and the local road system, including:

- Maintenance and Rehabilitation of the State Highway System: **$1.5 billion**
- Maintaining and Repairing the State's Bridges and Culverts: **$400 million**
- Repairs to Local Streets and Roads: **$1.5 billion**
- Matching Funds for Local Agencies: **$200 million**
  Will go to local entities that are already making their own extra investment in transportation. These matching funds will support the efforts of cities and counties with voter-approved transportation tax measures.
- Bicycle and Pedestrian Projects: **$100 million**
  Will go to cities, counties, and regional transportation agencies to build or convert more bicycle paths, crosswalks, and sidewalks. It is a significant increase in funding for these projects through the Active Transportation Program.
- Freeway Service Patrol: **$25 million**
  Assists stranded motorists on the most congested freeways to keep drivers moving during peak hours.
- New Funding to Transit Agencies to help them increase access and service and build capital projects: **more than $750 million**
- TCEP: **$300 million**
  Will fund freight projects along important trade corridor routes.
- Solutions for Congested Corridors Program: **$250 million**
  Will go to projects from regional agencies and the state that will improve traffic flow and mobility along the state's most congested routes, while also seeking to improve air quality and health.
- Local Planning Grants: **$25 million**
  Addresses community needs by providing support for planning that may have previously lacked funding; good planning will increase the value of transportation investments.
- Transportation-Related Research at state universities: **$7 million**
  Will help identify cost-effective materials and methods to improve the benefits of transportation investments.
- Workforce Training Programs: **$5 million**
  Every $1 billion spent on infrastructure projects creates more than 13,000 jobs, according to federal government estimates. California needs to ensure there is a ready workforce to carry out these transportation projects.

Source: http://www.rebuildingca.ca.gov/overview.html

195 Legislative Analyst's Office, Governor's Budget Summary 2016-17 – Transportation Summary (2016), accessed 2016.

State Transportation Accounts

State Highway Account

The bulk of State Highway Account (SHA) funding goes to the State highway system. The SHA receives its funds from state gasoline fuel taxes, state vehicle weight fees, and reimbursements from the Federal Trust Fund for Federal Aid projects and other smaller sources of funds.

The SHA had an estimated $11.4 billion available for distribution in FY 2016-2017.[196] The SHA is funded 60 percent from state sources and 40 percent from federal sources. It does not fund passenger rail directly, but rather flows into the PTA and STIP.

Public Transportation Account

The PTA is a trust fund to be used "only for transportation planning and mass transportation purposes." The PTA is now almost exclusively funded through the sales tax on diesel fuel, and there is a transfer of $25 million from the SHA. The 2016-2017 State Budget includes $1.24 billion in PTA resources.

PTA funds are apportioned between state and local programs in accordance with Proposition 22, passed by the voters in 2010.[197] Approximately 60 percent of the funds go to the local State Transit Assistance (STA) program, through which funds are apportioned on a formula basis to local transit agencies. The state portion goes to intercity rail operations ($130.8 million in the 2016-2017 state budget), state-owned equipment rehabilitation, staff support to Caltrans and other state agencies that support mass transportation, and rail projects in the STIP. The PTA is the only state funding source for state-supported intercity rail service operations.

SB 1 significantly increased the amount of funding in the PTA, but low fuel prices, along with greater fuel-efficient vehicles may erode the future revenue in this account.

State Transportation Improvement Program

The STIP is a program and not a funding source; it is funded through the SHA, the Federal Trust Fund, and a small amount from the PTA. The STIP devotes 25 percent of its expenditures to the Caltrans ITIP, which includes intercity rail improvements; and 75 percent of its expenditures to the Regional Agencies' Regional Transportation Improvement Program, which funds local projects, including regional rail transit.[198]

The amended 2016 STIP Capacity for 2015-2016 through 2020-2021 is $1.95 billion, with $250 million for transit (including passenger rail) from the PTA,[199] and the remaining amount from the SHA. Available funding for the 2016 STIP was not sufficient to fund existing programed projects from the 2014 STIP; therefore, the 2016 STIP was reduced by $167 million for PTA projects, and by a similar percentage for road projects. This caused the CTC to rescind funding for previously committed STIP projects.

SB 1 stabilized and increased funding in the STIP program, which will be reflected in forthcoming years.

State Transit Assistance Program

The STA funds day-to-day transit operations and capital infrastructure. The revenue for the STA comes from diesel fuel sales taxes and distributes funds to MPOs/RTPAs based on population, or to transit agencies based on revenue. SB 1 provides $250 million annual to the STA. SB 1 also creates an STA Capital Program of $105 million annually to fund transit, with a specific focus on state of good repair.

196 CalSTA, *2016-17 California State Transportation Financing Package* (2016). Accessed 2016.

197 Per Proposition 22, passed by voters in 2010.

198 California Streets and Highways Code Section 164.

199 CTC, *Adoption of 2016 State Transportation Improvement Program (STIP) Resolution G-16-19* (2016), accessed 2016.

The Section 190 Grade Separation Program

This is a State-funded safety program that supports projects that replace and upgrade existing at-grade railroad crossings, primarily with grade separations. The CPUC establishes a project list, and the Caltrans DRMT administers the program.

Section 190 of the California Streets and Highways Code requires the State's annual budget to include $15 million for funding these projects.[200] The maximum funding per project is $5 million annually.

Trade Corridors Improvement Fund

The Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 (Proposition 1B) created the Trade Corridors Improvement Fund; and provided for allocation by the CTC of $2 billion in bond funds for infrastructure improvements on highway and rail corridors that have a high volume of freight movement, and for specified categories of projects eligible to receive these funds.

Automatic Grade-Crossing Warning Device Maintenance Fund

Caltrans sets aside a minimum allocation of $1 million per year for this fund, which is administered by CPUC. As indicated in Table A.28 in Appendix A, claims have continued to exceed fund allocations in recent years. In response, the CTC has approved allocations of $2 million per year. In the FY 2015-2016 State Budget, funding was increased to $3.8 million to help close this funding gap.[201]



200 Caltrans DRMT, *Grade Separation Program Section 190 Guidelines* (2016), accessed 2016.

201 CPUC, Rail Crossing Engineering Section, "Grade Crossing Maintenance Fund Program," February 2016.

State Bonds

State bonds used to fund California's rail system include the following.

Proposition 108 – Passenger Rail and Clean Air Bond Act (1990)

Officially known as the Passenger Rail and Clean Air Bond Act of 1990, Proposition 108 provided a bond issue of $1 billion exclusively for intercity rail ($225 million), commuter rail, and rail transit. The bond provided funds for purchase of right-of-way and rolling stock and other capital investments. The bond's funding capacity is almost entirely exhausted.

Proposition 116 – Clean Air and Transportation Improvement Bond (1990)

The Clean Air and Transportation Improvement Bond of 1990 authorized a bond of $1.99 billion to fund passenger rail and transit projects, including approximately $382 million for intercity rail projects, $1.37 billion for urban and commuter rail projects, and $235 million for other transit and transit-related projects. The bond's funding capacity is virtually exhausted.

Proposition 1A – High-Speed Passenger Train Bond Program (2008)

Known as the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century of 2008, Proposition 1A authorized a total of $9.95 billion in bond funding for rail investments, including $9 billion for HSR directly; the remaining $950 million was dedicated to intercity and commuter rail that provides connectivity to the HSR system under the High-Speed Passenger Train Bond Program (HSPTB).

The HSPTB program funds, allocated by the CTC, funds both the $190-million Intercity Rail Program and the $760-million Urban and Commuter Rail formula-funded program. As of the third quarter of FY 2015-2016, $124 million of the Intercity Rail Program funding had been allocated ($68 million to the competitive portion of the program, and $56 million to the formula-based portion of the program); and $687 million of the Urban and Commuter Rail Program had been allocated.[202]

Proposition 1B – Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act (2006)

Proposition 1B authorizes $19.9 billion in general obligation bonds for a wide variety of programs. The CTC was authorized to manage $12 billion[203] of this money, including the following programs that impact rail funding:

Public Transportation Modernization, Improvement, and Service Enhancement Account

Proposition 1B authorized the Public Transportation Modernization, Improvement, and Service Enhancement Account with $3.6 billion, $3.49 billion of which has been committed.[204] The account had an estimated $87 million available for distribution in FY 2016-2017.[205]

Intercity Rail Improvement Program

Proposition 1B authorized the Intercity Rail Improvement Program (IRI Program) with $400 million, of which $125 million were reserved for intercity passenger rail equipment. The IRI Program consists of seventeen projects: two projects that remain unallocated, two projects that are partially allocated, five projects are fully allocated, and eight projects that are completed. The total programmed amount is $392 million.

Highway Railroad Crossing Safety Account (Freight)

Proposition 1B authorized the Highway Railroad Crossing Safety Account with $250 million for high-priority grade separation and railroad crossing safety improvements. The Highway Railroad Crossing Safety Account program has a total of 37 projects programmed; $242,354,000 has been allocated to these projects, and $19 million has been expended. Twenty-two of the 37 projects have completed construction. The amount of unprogrammed available funds is $0.6 million[206] as of March 2016, all of which has been committed.[207] The account had an estimated $9.4 million budgeted for distribution in FY 2016-2017.[208]

202 Caltrans, *Fiscal Year 2015-16 3rd Quarter Report High-Speed Passenger Train Bond Program* (2016), accessed 2016.

203 CTC, *Proposition 1B: Promises Made, Promises Kept* (2015), accessed 2016.

204 State of California, *Strategic Growth Plan Bond Accountability – Proposition 1B* (2016), accessed 2016.

205 CalSTA, 2016-17 *California State Transportation Financing Package* (2016), accessed 2016.

206 CATC, *Quarterly Reports '15-'16* (2016).

207 State of California, *Strategic Growth Plan Bond Accountability – Proposition 1B* (2016), accessed 2016.

208 CalSTA, 2016-17 *California State Transportation Financing Package* (2016), accessed 2016.

Cap-and-Trade Program California Greenhouse Gas Reduction Fund

In 2006, the California State Legislature passed AB 32, with the ambitious goal of reducing GHG in the state. AB 32 created the Cap-and-Trade Program, and authorized CARB to establish a carbon permit auction. A series of subsequent bills allocated the revenue from the Cap-and-Trade Program to the newly created California GGRF, which is also known as the California Climate Investments Program.[209]

Transit and Intercity Rail Capital Program

One program under GGRF allocates 25 percent of revenues to HSR, and 10 percent to the TIRCP. The TIRCP is a competitive grant program that receives annual appropriations equivalent to 10 percent of the State's Cap-and-Trade auction revenues. This program is dedicated to transformative transit and rail projects that will have a significant impact on increasing ridership and reducing GHGs. TIRCP will receive an average of $300 million annually from SB 1; a minimum of 25 percent of that will fund projects that benefit disadvantaged communities. This program has also received funds from sources other than Cap-and-Trade auction revenues, including early debt repayment appropriated to the TIRCP.

Low Carbon Transit Operations Program

Another transportation program now available through the GGRF includes the Low Carbon Transit Operations Program (LCTOP), under which funds are allocated to local agencies to support new or enhanced bus and rail services and intermodal transit facilities, and to prioritize projects that support disadvantaged communities. The LCTOP receives a continuous allocation of 5 percent of the Cap-and-Trade revenues via GGRF.

Revenue from the Cap-and-Trade Program is allocated to GGRF. To date (FY 2013-2014 through FY 2015-2016), GGRF funding has included $707 million to the HSR program, $224 million to the TIRCP, and $116 million to the LCTOP, in addition to other non transit programs. For FY 2016-2017, GGRF allocated 25 percent of funds to the HSR program, $135 million plus 10 percent of funds to the TIRCP, and 5 percent of funds to the LCTOP.

Road Repair and Accountability Act (SB 1)

In addition to enhancing and stabilizing existing funding sources such as the TIRCP, the STA, and the STIP, SB 1 created new funding programs that will help fund rail and transit projects and deliver the Rail Plan.

State Rail Assistance Program

The State Rail Assistance Program is specifically designed as a revenue source for intercity and commuter rail. The revenue comes from 0.5 percent of a new diesel sales tax revenue, as defined in SB 1. Half of the revenue will be evenly distributed between the five commuter rail operators, and half is allocated to intercity rail corridors. CalSTA announced the first round of awards, totaling $51.9 million, in January 2018. It is estimated that the annual revenue for this program will be $44 million.

Solutions for Congested Corridors Program

The Solutions for Congested Corridors Program aims to reduce congestion and support multimodal, accessible, and equitable transportation projects. The program prioritizes comprehensive corridor plans that reflect coordinated planning. This competitive program makes an average of $250 million available annually.

Trade Corridor Enhancement Program

The TCEP is funded through SB 1, with revenues of approximately $300 million annually. This program establishes the Trade Corridor Enhancement Account to provide stable funding for freight that prioritizes corridor-based freight projects nominated by local agencies and the State. As of July 2017, with the passage of SB 103, the TCEP was combined with the National Highway Freight Program.

209 CARB, *California Climate Investments from the Greenhouse Gas Reduction Fund* (2016), accessed 2016.

6.2.5 Local Funding

As noted Chapter 1, Article XIIIB of the State Constitution allows for local sales tax measures subject to voter approval. The majority of county sales tax measures are used to fund urban transit, but also support commuter rail services and intercity rail stations.

There are already many local sales tax measures throughout the state. In November 2016, voters approved many new local sales tax measures, including Los Angeles Measure M, LA Metro's transportation ballot measure. This measure includes funding to expand the rail and rapid transit system, to accelerate rail construction and build new rail lines, to enhance local regional and express bus service, and to improve system connectivity. Measure M included $1.9 billion for regional rail improvements (i.e., for the Metrolink commuter rail system) over the next 40 years. Table 6.6 outlines other local tax measures that were approved on the November ballot and that support the statewide rail network and connectivity goals.

Table 6.6: New 2016 Local Tax Measures

Location	Explanation of Funding Source	Amount	Description of Proposed Improvements
BART Region (San Francisco, Contra Costa, and Alameda Counties) (Measure RR)	Property tax, for 40 years	$3.5 billion	Repairs and maintenance on BART transit: electrical systems, rail replacement, fixing leaking tunnels, and upgrading central computer control system.
Alameda and Contra Costa Counties (Measure C1)	20-year parcel tax extension	$30 million/ year	AC Transit bus O&M.
Santa Clara County (Measure B)	0.5% sales tax for 30 years	$6.5 billion	$1.5 billion for BART Phase II; $250 million for bicycle/pedestrian projects; $2.85 billion for highways; $1.2 billion for local streets; $500 million for transit operations.
Santa Cruz County (Measure D)	0.5% sales tax for 30 years	$500 million	Portion of the money for analysis of rail as a transit option.
Merced County (Measure V)	0.5% sales tax for 30 years	$450 million	Half of the funding to local jurisdictions (nondiscretionary); of the remaining half, 20 percent on bicycle/pedestrian and 5 percent on transit.
Stanislaus County (Measure L)	0.5% sales tax for 25 years	$975 million	Local street and road improvements, traffic management, bicycle/pedestrian improvements and transit connection improvements.
Los Angeles County (Measure M)	0.5% sales tax increase, plus continue the existing (Measure R) 0.5% sales tax, set to expire in 2039, in perpetuity	$860 million/ year, estimated $100 billion over 40 years	Big expansion of rail, bus transit, bicycle/ pedestrian projects, and 10 highway projects. 17 percent of funds would go to cities for local streets projects.

6.3 Benefits of the State's 2040 Vision

The service and connectivity goals analyzed for plan assumptions outlined in this section were developed for planning purposes to enable ridership and revenue forecasting. Service planning continues in many corridors, and specific operating plans and timetables have not been finalized at this time. Service plan implementation will require funding and agreements that are yet to be established. Therefore, the service plan assumptions described below are illustrative and do not reflect a commitment to provide the indicated services.

The illustrative service plan assumptions reflect phased implementation of the California HSR System and blended operations with intercity rail routes to deliver integrated statewide passenger rail service. The assumptions are consistent with the California HSR 2018 Business Plan (2018 Business Plan), and planned near-term expansion of the California intercity and regional rail network. Finally, the assumptions include increased passenger service on those corridors shared with freight traffic that freight rail operators have agreed to evaluate, or are currently evaluating.

The expenditures will result in nearly 463,000 full-time jobs, and labor income surpassing $28 billion across industries.[210] By 2040, state and local tax revenues anticipated from the expenditures will be close to $2 billion, and federal tax revenues will be $5.4 billion. New federal and state trade corridor funding will accelerate many of these investments, bringing the economic benefits sooner.

The Rail Plan identifies $40.8 billion of direct expenditures planned by private railroads and regional agencies, resulting in a total economic output of nearly $77.5 billion by 2040—a payout of nearly two dollars for every dollar invested.



210 Steere Davies Gleave, 2018 State Rail Plan Analysis, Appendix A.6.

6.3.1 Regional Balance and Distribution of Benefits

The equitable distribution of public investments and their returns is a key metric to successful economic development and good stewardship of the state's fiscal resources. When properly planned, integrated rail networks are effective tools for connecting people to jobs, and goods to markets. By focusing investment on connecting and expanding existing regional networks into a statewide system, benefits are distributed in a balanced way throughout the state.

Distribution of Passenger Rail Benefits

By increasing service frequencies, expanding coverage areas, and improving speeds, direct and indirect benefits will accrue throughout the state. In an integrated statewide system, a grade separation in San Bernardino can improve service connections from Sacramento or Oakland. An electrification project in Sacramento can improve service speeds in San Jose when that investment is part of a coordinated program to improve an entire corridor and build an integrated system. Double-tracking in Los Angeles can improve service frequency in Fresno. Furthermore, by connecting and coordinating these services, regional hubs can be established throughout the state in places like Suisun-Fairfield, Burbank, Ontario, Stockton, Palmdale, or Escondido.

Taken together, the 2040 Vision has the potential to change the shape of the State of California. Bakersfield will be an hour and a half from Los Angeles; Fresno would no longer be a 3.5-hour drive from San Francisco, but rather a 2-hour train ride; Sacramento and Los Angeles would go from a nearly 7-hour drive to a 3-hour train ride. Time savings will be realized even within regional networks; San Bernardino will be 45 minutes closer to Los Angeles, cutting half the time required when driving. The power of the integrated statewide network is to move markets closer to one another, and expand economic opportunity for all.

Even places without direct passenger rail service will experience benefits ranging from improved connections to vastly improved services. Integrated bus service from Redding, Calexico, Arcata, or Yosemite National Park can offer timed and direct passenger services to the rail network, connecting these communities to the rest of the state by passenger rail.

The 2040 Vision is strategic in its approach to scaling phased, market-oriented investments toward an integrated statewide network. Through specific investments that support the vision, the benefits of an integrated network will be distributed to system users and their communities throughout the state.

Mode Shift and Safety Benefits

Mode shifts from driving to rail will benefit California in many ways, resulting in travel time and connectivity benefits across the state, safety improvements, and congestion mitigation. Based on the 2040 Vision and the associated system enhancements, intercity and regional rail ridership will increase to more than 1.3 million riders per day. For all travel on all modes, rail passenger miles will account for 30 percent of the total growth in trips, resulting in 7 percent of the total statewide mode share.

Of the expected total growth on the transportation system, mode shift to rail will draw 74 million of the daily VMTs from roads. This will significantly mitigate congestion on roads and aid in achieving statewide GHG emissions reductions targets. Because rail is many times safer than driving, the mode shift of 74 million VMTs away from highways can potentially reduce more than 250 fatalities per year and 19,000 transportation-related injuries in California by 2040. At a value of a statistical life of $9.6 million, this represents a net gain of $2.4 billion to the economy of California per year.

Ridership and Revenue Analysis

The rail vision is being implemented through a strategic approach using conceptual planning techniques. It begins with an estimation of the available infrastructure required to meet the service and connectivity goals, as described in Chapter 4. A dynamic simulation is then used to validate the assumptions and analyze multiple alternatives that generated a statewide netgraph model, with precise running times between hub stations and overlapping frequencies of multiple trains, to achieve pulse schedules and set daily running patterns.

Once a feasible alternative was arrived at using the statewide netgraph model and the capacity analysis, a ridership analysis was performed to determine the volume of passengers that can be accommodated by these corridors. The ridership numbers were developed to match the conceptual planning for the 2040 Vision, and the results show a large increase in ridership demand across the entire network resulting from network integration. The county-to-county travel results (Exhibit 6.2) indicated that a significant portion of the transit market can be captured with improved rail and public transit connections. The analysis used the State "Rail Market Analysis Tool" and an assignment model; and the demand was estimated based on rail and transit service impedances and the assignment model to allocate demand to the tested network. The data represent only trips that use a rail service on one leg of a trip, so the visual representation provides an overview of the strength demand for connections between different counties.

The statewide ridership model produces high-level results for the corridors. Subsequent analysis with a more detailed model would be required to better understand the demand at hubs and regional connectivity for prioritizing service improvements and investments in a corridor.

Distribution of Freight Rail Benefits

The success of freight rail networks depends on how well they connect freight generators to markets. Freight network constituents include the main-line and short-line railroads, ports, and shippers. The Rail Plan identifies a host of improvements and programs, from grade separation on main-line freight railroads to assistance for short-haul and short-line services to increase capacity and access throughout the freight network. In this way, a safety or capacity investment to a main line in one part of the state and a short-line investment to another all build toward a more robust transportation network that spurs economic development throughout the entire state.



6.3.2 Passenger Rail Effects and Benefits

The passenger rail improvements detailed in Chapter 4 represent significant investments in passenger services and capital projects. Beyond better connectivity and an improved statewide transportation network, these investments will have benefits to several important areas, including but not limited to significant returns to local, regional, and statewide economies; increased ridership; reduced per-capita operating costs; and, of course, the benefits of the newer technology and efficiencies in transportation on the environment.

Economic Benefits

Benefits include employment (measured as person-years of full-time employment), income (wages and salaries) associated with this employment, and firm output (essentially the same as expenditures).

Improvements in California's rail system are investments that will pay off in terms of greater economic activity: new construction, more jobs, and growing tax revenues.

- The $40.8 billion of direct expenditures identified in the Rail Plan will result in a total output for the economy of nearly $77.5 billion by 2040—a payout of nearly 2 dollars for every dollar invested.
- The expenditures will result in a total employment impact across affected industries of nearly 463,000 full time jobs, and labor income of more than $28 billion.
- By 2040, state and local tax revenues anticipated from the expenditures will be close to $2 billion, and federal tax revenues will be $5.4 billion.

The tax impacts pertain to taxes for which revenues can be directly inferred from economic expenditures, such as sales or income taxes.

Direct Economic Benefits

463,000 full-time jobs
$28 billion in labor income

$77.5 billion in new state
economic output by 2040



Increased Ridership

The 2040 Vision anticipates an increase in intercity passenger rail ridership, including HSR, to approximately 1.3 million riders per day. Current daily state intercity passenger rail ridership is approximately 115,000 trips per day. This is nearly a twelvefold increase in ridership from current levels, as shown in Exhibit 6.4. This increase assumes faster rail service and smooth transfers at hubs; better accessibility and timed connections to transit and rail services at stations; and integrated ticketing throughout the transportation network.

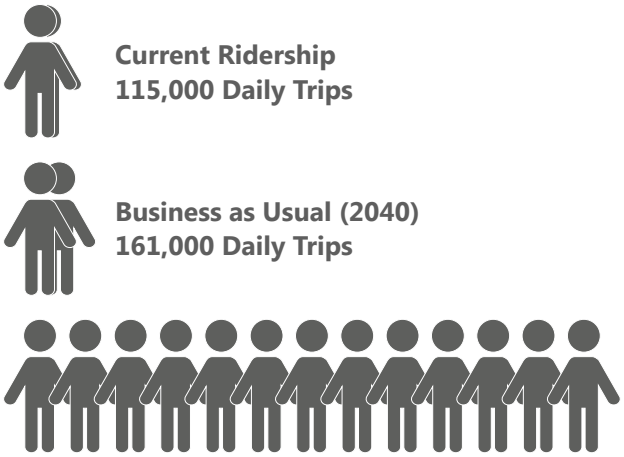


Exhibit 6.4: 2040 Vision Ridership Growth

Rail Capacity and Congestion

The 2040 Vision projects a volume of passengers be carried throughout the state on the intercity and local rail system that will result in large numbers of passenger miles being served by the rail system instead of the highway system. The 2040 Vision projects an additional 90 million passenger miles per day on the rail system, exclusive of urban transit. This is equivalent to the rail network accommodating 1.5 times the current daily traffic volumes of the entirety of I-5, from the Oregon state line to the border with Mexico. Likewise, it would accommodate the equivalent of 1.8 times the current daily traffic volume on Highway 101 from the Oregon state line to Los Angeles.

In addition to increased rail ridership, improved systemwide connectivity will expand the efficiency and reach of the rail and transit networks, as well as the entire transportation system. Currently, California accommodates 3.9 million daily transit boardings. Rail has more capacity on existing rights-of-way than any other transport mode; therefore, coupled with better connectivity, rail presents an opportunity to capture more riders, complementing and relieving some of the growing transportation pressures on the highway system. Rail also provides connections to the vast transit network that is expected to accommodate 9 million daily riders by 2040, further expanding the impact the rail network and increased rail ridership has on statewide mobility.

As shown in Exhibit 6.4, translating the ridership growth numbers in Exhibit 6.2, the number of passengers using rail instead of highways in key corridors could increase dramatically. The rail travel patterns between counties seen after the implementation of the 2040 Vision plan is much denser and more diverse. Reduced travel times and better network connectivity can provide more options for travelers. It is anticipated that of total transportation trips made on all modes, 30 percent of the growth will be made by rail instead of by automobile. Of the expected growth by 2040, 74 million fewer daily VMTs will occur on and need to be managed on highways, due to mode shift from roads to rail. This has the additional benefit of removing travelers from highways, thereby eliminating some of the anticipated congestion and improving the level and quality of service on the transportation network as a whole. Under the "No Build Scenario," whereby the status quo is maintained, only a modest increase would occur in intercounty travel on rail, and possibly all the additional growth that could have been accommodated by rail would end up on highways.

Exhibit 6.5 shows intercounty travel for current conditions, "No Build" scenario, and 2040 Vision.

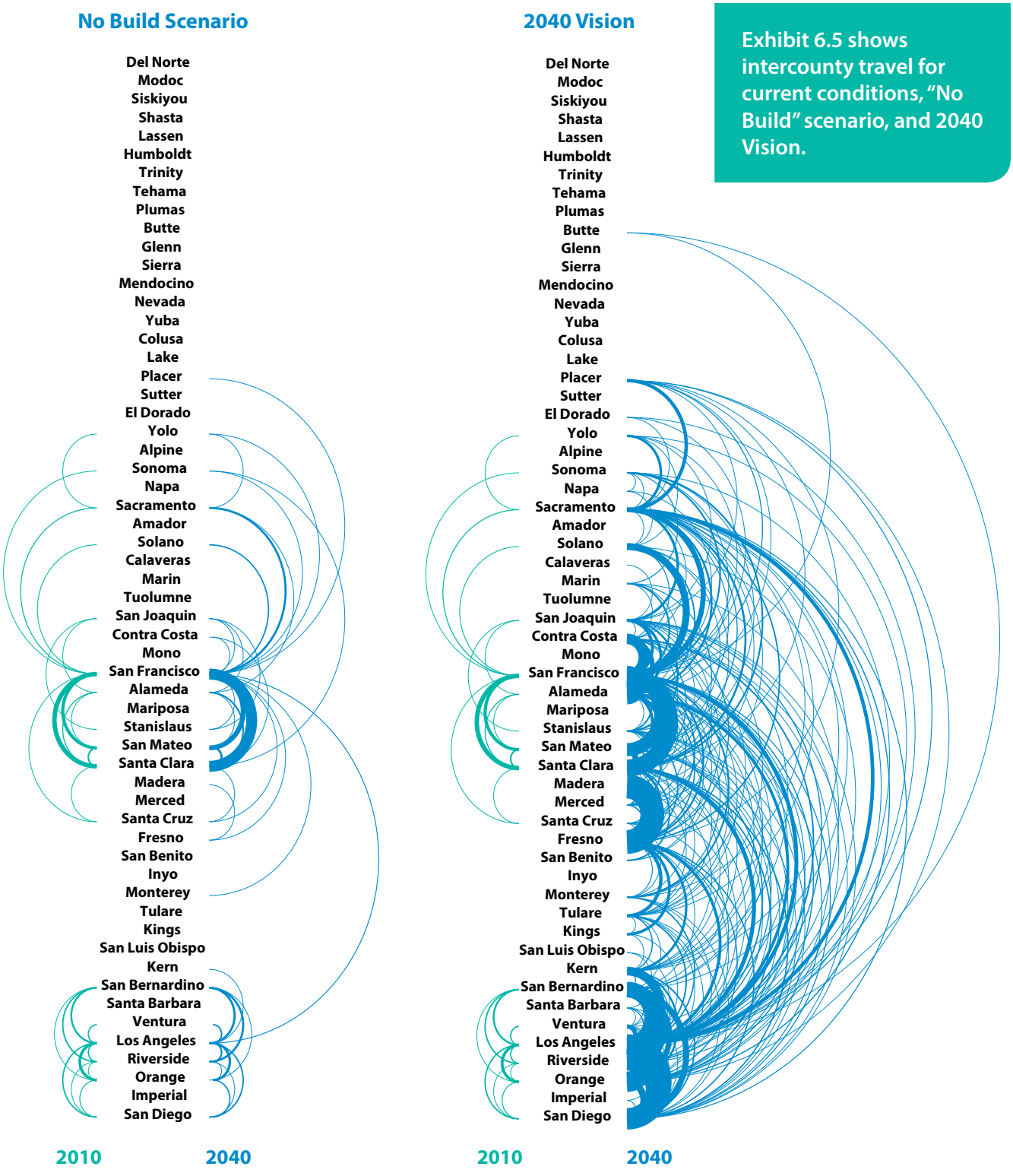


Exhibit 6.5: County-to-County Ridership Demand "No Build" vs. 2040 Vision [211]

211 Includes routes with a minimum of 500 trips per day (both directions) with at least one leg on passenger rail service. Transit trips are not shown.

The "No Build" Scenario

California has already made significant investments in passenger rail, and has one of the most robust statewide rail networks in the nation. Many rail services across the state have seen tremendous amounts of ridership growth, and there have been increasing concerns regarding overcrowding, infrastructure constraints, and efficient schedule operations to meet peak demand. Based solely on population growth, 2040 ridership in the "No Build" scenario is expected to increase by approximately 50,000 per day.

2040 Vision

As detailed in Chapter 2, statewide travel is forecast to continue to increase across all travel modes, including passenger rail, highway, and air travel. Highway travel VMTs are increasing, and California's highways are already the most congested in the nation. The status quo will only result in increased congestion, longer travel times, and an overall loss in economic productivity. As part of the environmental analysis detailed in subsection 6.3.4, Californians are expected to drive an additional 150 million miles per day. It is imperative that the passenger rail network investments meet the needs of additional travel demand to avoid further degradation of the traffic network and environment. Full integration of the state rail network is expected to meet an additional passenger demand of approximately 90 million passenger miles of daily travel.

Land Use

A good land use plan is a good transportation plan because it will efficiently organize development to minimize travel distances and the need for expensive public infrastructure to connect development. However, a good transportation plan is a good land use plan because it organizes the movement of people and goods around high-value nodes that signal where development should be concentrated to maximize efficient use of the public investment. This Rail Plan is a long-term, strategic transportation plan that coordinates and maximizes use of highly efficient infrastructure. It provides key incentives and guidance to regional and local levels, the market, and private citizens to organize land use and development around the state's key transportation hubs (identified in the 2040 Vision) in a way that can reduce sprawl, contribute to equitable economic development, and minimize environmental impacts.

Rail Capacity and Congestion

Carrying so many passengers throughout the state on the intercity and local rail system, as is projected in the 2040 Vision, will result in large numbers of passenger miles being served by the rail system instead of the highway system. The 2040 Vision results in an additional 90 million passenger miles per day on the rail system, exclusive of urban transit. This is equivalent to the rail network accommodating 1.5 times the current daily traffic volumes of the entirety of I-5, from the Oregon state line to the border with Mexico. Likewise, it would accommodate the equivalent of 1.8 times the current daily traffic volume on Highway 101 from the Oregon state line to Los Angeles.

Significantly, the projected growth of 90 million passenger miles per day on rail accounts for nearly a third of all projected growth in passenger miles over this period. Although this does not account for urban transit ridership, many of the trips will use local transit for first- or last-mile connections. Because of the longer nature of intercity, regional, or statewide train trips, urban transit systems stand to additionally benefit from travelers using the system in off-peak hours.

6.3.3 Freight Rail Effects and Benefits

The planned investments in freight rail would generate a range of public and private benefits. In this case, "public benefits" refer to net increases in public goods.[212][213] Public benefits from freight rail investments can accrue in several ways: they increase the efficiency of the freight system, reducing travel times, costs, and emissions of existing trips. The freight rail efficiency and capacity improvements can attract trips away from other modes, primarily trucks, potentially saving costs, emissions, and time, as well as improving safety of those trips relative to their original mode. These diversions can also lower congestion, positively impacting emissions and safety on the roadway networks generally. The investments can also make a region more competitive economically, attracting development from other regions. These benefit transfers from one geographic area to another are not always counted as net benefits, and benefit tabulation varies by methodology.

"Private benefits" accrue to either shippers or railroads, or in many cases both. Shippers can potentially benefit from freight rail investments in the form of business cost reductions, access to service, service reliability, and transit time, while maintaining the competitive edge of the region. Railroads can potentially benefit from system velocity improvements, reduced delay, reduced yard dwell time, increased revenue traffic, and improved rolling stock use and resulting labor productivity.

The remainder of this section discusses how freight rail investments create public and private benefits. It is organized around the five categories of freight rail investments identified in Chapter 5: trade corridor investments, economic development and short-line investments, grade-crossing improvements, terminal and yard capacity investments, and short-haul rail investments. For each investment category, the general type of benefit (i.e., public or private) is identified, along with the specific gains accrued from that investment. In many cases, freight rail investments yield both public and private benefits.

Trade Corridor Investments

The shorter, more reliable travel times associated with many of the proposed investments decrease the cost of goods movement by rail. Although these cost savings are private benefits, the growth in tax revenue resulting from subsequent increased profits is public. Likewise, if private firms use these cost savings to hire more workers, then the tax revenue from these workers would be a public benefit.

Lower freight costs could also attract existing economic activity away from other regions. This is a benefit transfer, although if activity is diverted to California or the United States from other states or countries, the transfer is a net benefit for California or the United States. Calculations of these net benefits should account for any subsequent increase in emissions or safety costs resulting from the shift in activity.



212 Public goods are by definition nonexcludible and nonrivalrous. Cowen, Tyler, P*ublic Goods*, The Concise Encyclopedia of Economics (2008), accessed 2017.

213 There can be overlap between both components of this definition. For example, lower maintenance costs could be characterized as an increase in a public good (well-maintained roads), or as public-sector cost savings.

Public Benefits

Perhaps the most significant public benefit that could result from trade corridor investments is the potential to divert freight traffic from highways to rail. By decreasing the average and variation of freight rail travel time, trade corridor investments improve overall reliability. As a result, these investments can potentially spur a diversion of freight trips to rail from highway; which, in turn, can alleviate congestion for the general public on highways. Public benefits are equivalent to the monetary value of time multiplied by the reduction in hours traveled. An analogous mobility benefit can occur for passenger rail travelers traveling on shared freight and passenger rail lines that undergo improvements.

Reduced truck miles traveled due to a shift in freight traffic from truck to rail also has a public safety benefit in the form of lower crash risks on the state's highways. Public costs associated with crashes can include medical costs, public property damage, foregone tax revenue given lost productivity, and intangible costs such as a diminished quality of life. Shifting freight traffic to rail reduces the opportunities for conflict between passenger vehicles and freight vehicles.

There are also public benefits to trade corridor investments in the form of mobility improvements and roadway maintenance costs. Public mobility benefits are generated through lower fuel costs both for passenger vehicles and for public passenger rail operators, which experience less congestion and therefore higher fuel efficiency. The state's highways can experience lower maintenance costs when freight truck traffic is diverted to rail.

As part of its *Comprehensive Regional Goods Movement Plan and Implementation Strategy*, the Southern California Association of Governments (SCAG) estimated the economic impacts of freight rail investments in the region. SCAG estimated that grade separations, rail, and intermodal improvements would contribute $2.9 billion to gross domestic product (GDP) in public-sector activities over the 2021-to-2045 time period. Public sector activities include government-related work (e.g., permitting, project management, planning, and design) that would be required to facilitate these investments.

Private Benefits

Trade corridor investments would potentially yield a number of benefits to both California railroads and shippers in the areas of competitiveness and system maintenance. Trade corridor investments would allow railroads to operate at higher velocities and increase operating efficiency. This improved service performance would make freight rail service in California more competitive, potentially increasing its market share as goods shift from trucks to rail. Furthermore, these types of investments would bring the rail system to an overall better state of repair as capacity and operational upgrades necessitate the replacement of aging components of the rail infrastructure with state-of-the-art components.

For Southern California, SCAG estimated that the private-sector economic impact of freight rail investments would yield a $64.2-billion contribution to GDP over the 2021-to-2045 time period. Furthermore, SCAG estimated that freight-dependent industries would be the biggest beneficiaries in terms of economic output and job creation. These include the transportation and warehousing, construction, administrative and waste services, manufacturing, and wholesale trade industry sectors.



At the statewide level, the California trade corridors that are likely to most benefit from these investments are identified by the state's top trading partners by total tonnage, as shown in Exhibit 6.6. Illinois is the state's top trading partner, accounting for more than 29 percent of total tonnage in 2013. Both the UPRR and BNSF networks connect California to Illinois. There are currently more than $8 billion worth of trade corridor investments planned for the Southern California, Central Valley, and Northern California regions, which largely define the BNSF and UPRR routes through California toward Illinois. These investments will improve the overall LOS between California and its most important rail trading partner, and yield direct benefits to the private sector.

More than $7.3 billion (nearly 92 percent) of the $8 billion in planned trade corridor investments occur in Southern California. These investments will help improve the overall LOS on the portions of the BNSF and UPRR networks that connect California to Texas, the state's second most important trading partner by total tonnage. Texas accounts for 16.5 percent of California's total rail tonnage. Also along this route is Louisiana, which accounts for 3.1 percent of California's total tonnage. Not only do California's Class I rail carriers benefit from these investments in the form of direct infrastructure upgrades, shippers who transport goods along these routes benefit in terms of lower transportation costs (as captured by decreased travel times and improved reliability).

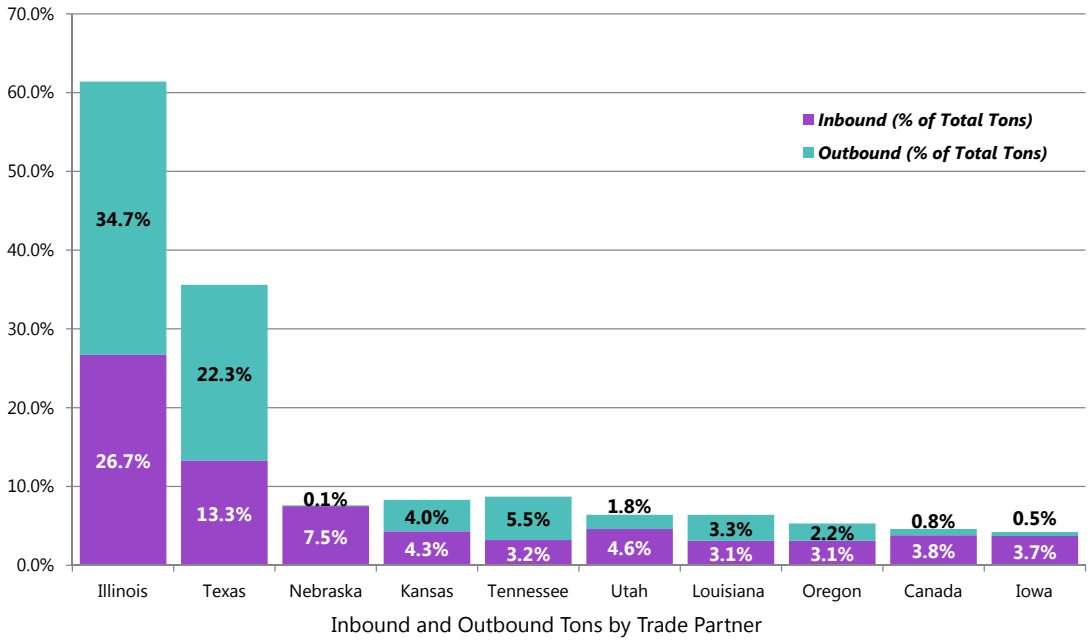


Exhibit 6.6: Trends: California's Top Ten Trading Partners by Rail



Grade Crossings

The benefit most commonly associated with grade-crossing investments (either their separation or the closure of a roadway) is the reduction in highway traffic delays, followed by safety improvements. Although often presented as a public-sector benefit, improved safety is actually both a public- and private-sector benefit, albeit with modest impact. By eliminating interaction between trains and roadway users, the possibility of train-roadway user incidents decreases. Crossing safety enhancements improve the workplace safety of rail employees, and reduce the railroad's exposure to the legal and financial liabilities associated with crashes—such as worker's compensation, injuries to motorists or pedestrians, and damages to property.

Safety benefits are also derived from investments in technological upgrades to grade crossings. These include four-quadrant gates, extended cantilever arms, median barriers, in-pavement LED lights, barrier gates, stationary or wayside horns, and devices that instantly report active warning system failures via cellular technology. In 2014, the North Carolina Department of Transportation installed sensors atop crossing gate masts at certain grade-level crossings. The sensors can detect whether a vehicle is trapped within a four-quadrant gate, and lift the gates so that the vehicle can move to safety. The private sector benefits from investments like these, just as it benefits from the closure or separation of a crossing.

Public Benefits

Grade-crossing improvements accrue benefits differently than the other categories. They are specifically aimed at both rail and roadway users, including motor vehicles, bicycles, and pedestrians. They improve safety, a public good, across modes. Grade separations can also directly reduce roadway traffic congestion and emissions, in addition to making rail somewhat more efficient. SCAG's Comprehensive Regional Goods Movement Plan and Implementation Strategy examined certain grade separations and found that travel time and reliability (i.e., mobility) benefits to highway users constituted 65 percent of their overall benefits.[214] Safety benefits accounted for 34 percent of the benefits, and vehicle operating cost and emissions benefits each accounted for less than 1 percent of the benefits. The estimated monetary value of grade separation projects in the SCAG region is given in Table 6.7.



Table 6.7: Value of Economic Benefits of Grade Separation in the SCAG Region

Region	Travel Time and Reliability	Vehicle Operating Costs	Safety Costs	Emission Costs
SCAG	$414.1	$3.3	$219.6	$1.9

In Million Dollars, 2012
Source: SCAG, Comprehensive Regional Goods Movement Plan and Implementation Strategy, Appendix U (2012).

214 SCAG, *Comprehensive Regional Goods Movement Plan and Implementation Strategy*, accessed 2017.

Private Benefits

Private benefits associated with grade-crossing investments are the operational cost savings resulting from the closing of a crossing. Grade crossings require the installation and maintenance of safety equipment, including warning signs, flashing lights, crossing gates, and the signal control box and associated equipment to operate the crossing. Installing a crossing signal system can cost $250,000 or more.[215] Maintenance costs are also considerable, because BNSF is reported to spend approximately $45 million annually on crossing signal maintenance and repair.[216] With the closing or separation of a crossing, the railroad minimizes the cost of maintaining and operating this equipment.

It is important to note, however, that there are also private-sector costs associated with grade crossing improvements. In the case of a separation, the railroad still has some financial responsibility for the construction and/or maintenance of the resulting civil works. Only in the case of a closure does the railroad realize the full financial benefit of the safety improvements.



Short-Line Program

For industries that rely on bulk commodities (such as coal, gravel, and base metals) as inputs to the production process, rail access via short lines can be critical to their operations. Industries that produce heavy machinery or otherwise large, cumbersome equipment also require direct rail access, because these types of products are difficult to efficiently transport by truck over long distances. For example, the Pacific Harbor Line, serving POLA and POLB, lists among its customers companies representing the building materials, plastics, and petroleum manufacturing industries.[217] These industries ship and receive commodities such as steel products, liquid gas and petroleum products, and plastic pellets. Therefore, short-line rail investments directly benefit shippers and receivers in those types of industries.

Public Benefits

Short-line investments can contribute to economic competitiveness and attract investment from businesses that rely on short-line access. This would represent new economic activity to the state if these firms relocate from outside of California or are new businesses.

A related potential public benefit of short-line investments is the retention of businesses that may be forced to relocate if access is lost. Although it is difficult to measure the benefit of an event that did not occur, it stands to reason that preventing businesses that rely on short-line rail access from leaving the state would save a number of jobs, and the associated local economic activity that results from workers spending their wages.

California's short-line railroads have approximately 150 locomotives, of which approximately 100 are pre-Tier 0. Incentive funding has helped replace older locomotives with lower-emitting locomotives at several short-line railroads.[218]

215 Indiana Department of Transportation, accessed 2017.

216 Cotey, A., "Grade crossing equipment, technology help railroads continue quest to improve crossing safety," Progressive Railroading, January 2014, accessed 2017.

217 Pacific Harbor Line, Inc., accessed 2017.

218 CARB.

Private Benefits

The analysis of rail flows discussed in Chapter 2 found that one in five shipments (19 percent of total tonnage and 18 percent of rail carload traffic) originate on a short line; and one in 12 shipments (8 percent of total tonnage and 7 percent of carloads) end their journeys on a short line. The agricultural, chemical, and building material industrial sectors all represent significant users of the short-line rail system. Therefore, the amount of private-sector economic activity facilitated by California short lines is significant.

Short lines that cannot handle loaded car weights of up to 286K require shippers to either load a railcar to less than its maximum capacity, or to transload to truck at a location that can handle the heavier load. Investments that upgrade California's short lines to the 286K standard would benefit shippers by removing the additional transportation costs associated with transloading and sub-maximum railcar loading. Short-line railroads also benefit from these improvements, because they are direct investments on the short-line system, and help their ability to attract and retain business.

Similarly, upgrading California's short lines to the FRA Track Class 2 standard, which permits freight train speeds up to 25 mph, will also directly benefit shippers and railroads. Class 2 track allows carriers to operate at higher speeds (the maximum speed allowable on a Class 1 track is 10 mph), providing a productivity increase for the railroad and a decrease in transportation costs, except in the case of very short routes. Although investments in line rehabilitations and bridge and tunnel improvements do not effectively expand capacity in the same manner as improvements that yield speed and weight-capacity gains, they do bring the system to an overall better state of repair. In addition, points at which bridges, tunnels, or tracks are in poor condition represent chokepoints in the system. Repairing these components of the short-line system will improve the overall LOS of short-line operators.

Short-Haul Program

Public Benefits

The primary public benefit to short-haul rail investments is the diversion of freight traffic from highways to rail, which results in reduced highway maintenance costs and related improvements in air quality and congestion. A 2011 report estimated that rail was three times more fuel-efficient than trucking per ton-mile.[210] The same report projected 2,020 grams per ton-mile of carbon dioxide (CO_2) emissions of 209 for trucks, and 44 for rail (21 percent of the truck emissions rate). There is widespread interest in shifting more cargo from truck to rail to relieve road congestion and reduce GHGs. However, as truck technologies become cleaner, such a shift may lead to increases in certain criteria pollutants emissions, according to CARB. There is agreement in the industry that collaborative research should be done to study potential solutions and alternatives. This trend demonstrates a need for locomotive engines to be equipped with more advanced control technologies, and for a coordinated commitment to addressing this challenge.[219]

The aforementioned University of California Berkeley study found that short-haul rail intermodal service from the San Pedro Bay ports to the Inland Empire could yield a 180 percent reduction in emissions, if marine containers alone shift to rail. The air quality improvements could be even greater if a portion of domestic containers also shifted. In addition to air quality improvements, the study estimated that with a successful short-haul intermodal service, up to 2.6 million drays per year between the ports and the Inland Empire would be removed from busy Southern California's freeways. The significant funding for trade corridors as a part of SB 1 provides an opportunity to fund these critically important short-haul improvements.

219 CARB.

Private Benefits

The University of California Berkeley study found that the large nationwide original equipment manufacturers operating national distribution centers in the Inland Empire would be the primary customers of short-haul rail service, and therefore, the primary beneficiaries. Another group of potential beneficiaries comprises the retailers operating import warehouses and regional distribution centers in the Inland Empire. The same groups of shipping customers would likely benefit from short-haul rail service in the Bay Area.

Another private-sector benefit is the potential that a successful short-haul rail service would create for the private development of an inland port. The co-location of warehousing, distribution, and other logistics-related industries with intermodal rail service has been a key feature of several prominent large-scale logistics developments over the past decade. Importantly, these developments are some distance away from traditional seaport areas. The developments include the Virginia Inland Port, Alliance Texas Logistics Park, and CenterPoint Intermodal Centers in Illinois and Missouri. It is conceivable that many of these same development opportunities would be possible with the successful implementation of short-haul rail service. The San Joaquin Council of Governments' *California Inter-Regional Intermodal System* report identified the potential for industrial development as an important benefit of the successful implementation of short-haul service.

Terminal and Yard Capacity

Terminal expansions help to increase capacity at terminals that may be nearing constrained conditions. The University of California at Berkeley study, *Rail Transport and Containerized Imports Using California Ports: Past, Present, and Future*, found that rail intermodal volumes at Los Angeles Basin terminals were near or exceeding peak 2006 volumes.[220] Over this period, rail intermodal terminals throughout the Los Angeles Basin exhibited lift volumes that were, on average, 90 percent of peak 2006 levels. The only exception was the period from 2009 to 2010, during which the United States was experiencing a severe recession. Importantly, Inland Empire terminals exceeded the 2006 peak by 15 percent. The acquisition of terminal capacity in the Inland Empire is a significant impediment to short-haul rail service in Southern California.

Terminal expansions and access improvements could also help to improve regional access to freight rail. These expansions benefit California railroads by allowing them to achieve a higher LOS. In turn, decreased travel times and improved reliability would make rail service more competitive with trucks for statewide and multi-state freight movements for some commodities. This enhanced competitive position would yield a public benefit of decreased trucking activity on already busy highways. The private benefit would include increased revenue from new customers. However, capacity improvements at a single terminal or terminals in a single state are not likely to significantly decrease travel times or improve reliability for long-haul movements unless those improvements remove a severe bottleneck.

New terminals have the potential to open up additional markets that are currently not served by rail due to capacity constraints or distance from existing terminals. Such an expansion benefits both the public sector (in the form of increased economic activity and shipping options) and the private sector (in the form of increased market competitiveness). For example, the previously cited University of California at Berkeley freight rail case study examined the potential to shift perishable produce from truck to rail; the perishable market was one in which rail was once very competitive in California.[221] Although the Berkeley study primarily focuses on the public sector benefits to shifting perishable produce to rail, it also discusses the private sector benefits to rail service. According to studies from TAMC[222] and the Association of Monterey Bay Area Governments,[223] farmers in the Salinas Valley sometimes struggle to acquire reliable truck service.

220 Leachman, R., *Rail Transport of Containerized Imports Using California Ports: Past, Present and Future*, (2016).

221 Seeherman, J., and M. Hansen, *Freight Rail Case Study: Case Study #1 (Opportunity), Perishable Produce* (2016).

222 Monterey County Transportation Agency, Grower-Shipper Association of Central California. Rail Feasibility Study (2008).

223 Association of Monterey Bay Area Governments. Salinas Valley Truck to Rail Intermodal Feasibility Study (2011).

The lack of adequate truck service motivated the region to explore the feasibility of intermodal rail service. The studies concluded that there was reasonable demand to locate an intermodal ramp in the region, because it could generate 180 to 200 domestic refrigerated containers per day. The studies also found that Salinas Valley perishables would not be harmed by the switch from truck to rail. In fact, some perishables (such as broccoli and iceberg lettuce) would experience transportation cost savings. As illustrated by the case study of perishable produce, new terminals that are strategically located have the potential to capture new customers, and allow rail carriers operating in California to tap into new markets.

Public Benefits

Terminal expansions and new terminals could improve regional access to rail, and open up additional markets to rail service. In the event that freight traffic shifts from truck to rail, this shift could result in public benefits in the form of decreased pavement damage and GHG emissions, among others. The freight rail case study conducted by researchers at the University of California examined the potential to shift perishable produce from truck to rail. The scenario entailed rail-moving a full 75 percent of the state's top three crops currently moved by rail (carrots, oranges, and potatoes)—a large increase for rail compared to trucks.[224] The study estimated benefits of at least $45.5 million per year due to reduced pavement damage ($4.8 million), GHG reduction ($11.6 million), health care savings related to local pollution reduction ($2.8 million), and crash reduction ($26.4 million). This was the study's conservative benefit estimate; the potential healthcare savings ranged from $2.8 million to $77.0 million.

Private Benefits

The private benefit to terminal improvements represents a direct financial investment into infrastructure that is largely privately owned and maintained. Terminal investments (i.e., expansions, access improvements, and new construction) better position railroads to compete with other modes and capture larger shares of the market. However, these types of investments are costly and sometimes publicly unpopular, because they require the acquisition of land, and would generate new traffic through the selected community. The investment of public dollars would represent not only a cost benefit to railroads planning terminal expansions or new terminals, but also a show of public support for expanded freight capacity.

6.3.4 Key Environmental Effects

Freight and passenger rail implementation can bring tremendous positive environmental and economic benefits to the state. They can also impact communities and the natural environment. The most common effects include contribution to air pollution and GHG emissions, and physical impacts such as noise and light pollution.

Sea-Level Rise

Human activity has impacted the climate for some time. GHG emissions—including those coming from coal and oil (or fossil fuels) burnt to generate electricity and power motor vehicles, planes, ships, and trains—trap solar energy from reflecting back into space, thereby warming the earth's atmosphere (hence the term "greenhouse"). Warmer temperatures in turn melt glaciers and ice sheets, and the runoff flows into the oceans, causing sea levels to rise.

As GHG emissions have increased since the Industrial Revolution in the early 19th Century, the rate of sea-level rise has accelerated. Sea levels rose 2.4 inches during 19th Century and 7.5 inches in the 20th Century,[225] and the pace is not expected to slow anytime soon. For example, in the San Francisco Bay Area, projections of sea-level rise to Year 2100 appear in Table 6.8.

224 Seeherman, Joshua and Mark Hansen, *Freight Rail Case Study – Case Study #1 (Opportunity), Perishable Produce*, University of California Berkeley Institute of Transportation Studies (2016).

225 Geophysical Research Letters, Svetlana Jevrejeva, J. C. Moore, A. Grinsted, and P. L. Woodworth, *Recent global sea level acceleration started over 200 years ago?*, 2008.

Research undertaken by engineers and geologists at the United States Geological Survey (USGS) and published in early 2017 shows that between about 30 to 70 percent of southern California beaches from Santa Barbara to San Diego may become completely eroded by 2100 under scenarios based on 1 to 2 meters of sea-level rise.[226] This is not only potentially detrimental to the coastal habitats, but to the $18-billion coastal tourism industry.

The cost of maintenance associated with near-term (less than 20 years) sea-level rise is already proving significant, but the cost of adapting coastal rail routes to the effects of mid- and long-term seal-level rise, and potentially extreme sea-level rise (10 feet or more this century) could be catastrophic and even require wholesale abandonment and relocation of some rail corridor segments. Coastal rail corridors are commonly the first, or second, line of development adjacent to the sea, particularly in central and southern California. If reactive, emergency-based hard-armoring measures are constructed to protect corridors in place, beach loss may result. Thoughtful, long-term adaptation planning for sea-level rise is necessary to identify alternatives, including relocation of corridors where opportunities to do so exist, that would protect transportation corridors as well as California's popular beaches and other coastal resources.

Financial investments in increased rail system capacity and efficiency will, therefore, capture multiple layers of direct and indirect benefits, but must also be planned in light of emerging climate change threats. This interplay between cause and effect of transportation system emissions on our climate, and sea-level rise impacts on the transportation systems, suggests the high return California can expect from appropriate planning and investments in the rail network improvements as envisioned in the Rail Plan.

Table 6.8: Sea-Level Rise Estimates for San Francisco Bay

Year	Most Likely Projections	Upper Range
2030	6 inches	12 inches
2050	11 inches	24 inches
2100	36 inches	66 inches

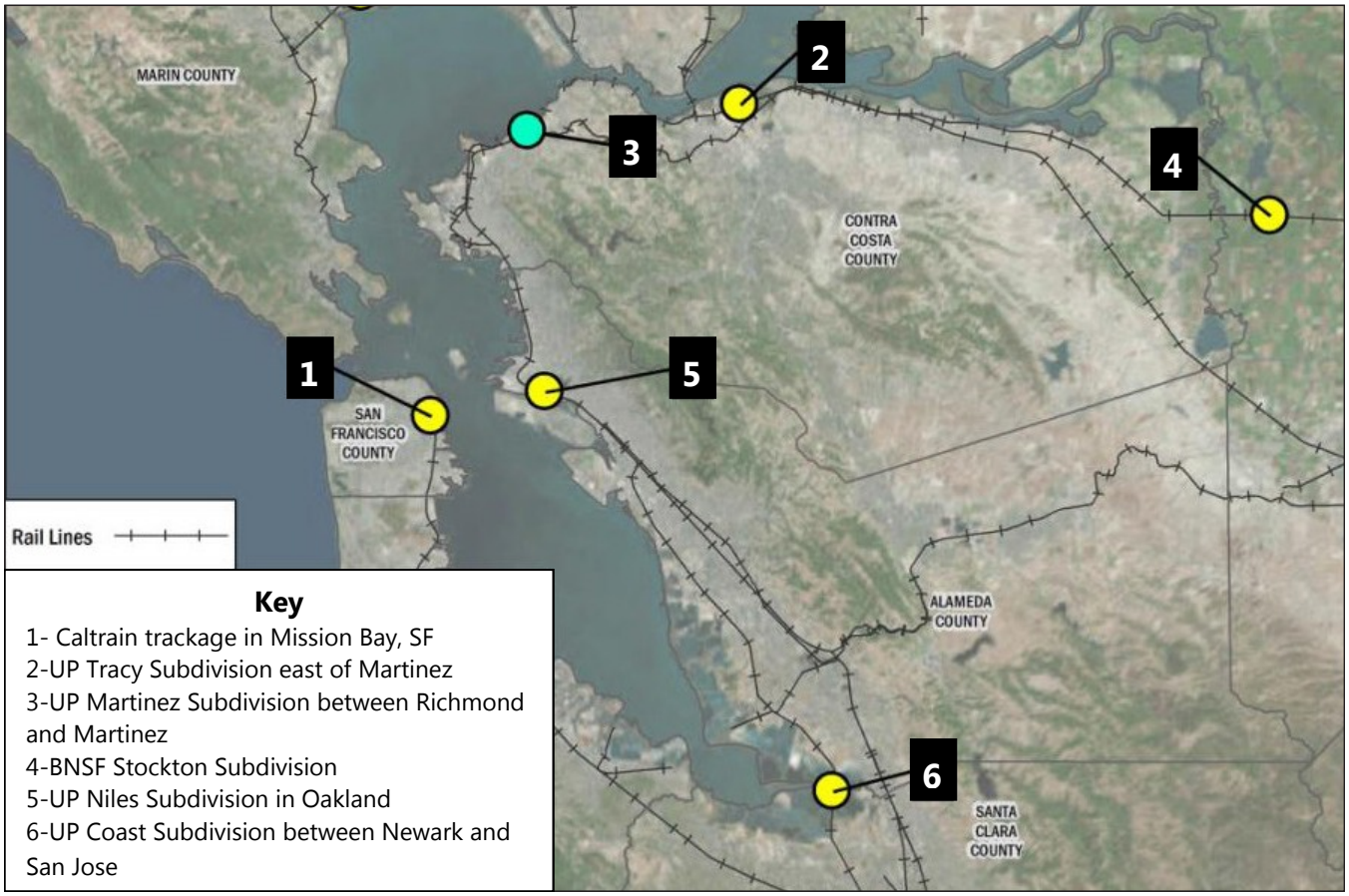
Source: Sea-Level Rise for the Coasts of California, Oregon, and Washington, Past, Present, and Future, National Research Council, 2012.



226 California Coastal Commission, personal communication, December 2017.

Railroad Lines at Risk

Sea-level rise is putting California's infrastructure, including railroads, at risk. The risk to railroads comes largely in two forms: flooding of trackage in low-lying areas in San Francisco Bay and San Pedro Bay; and higher and fiercer storm surges eroding coastal bluffs that support rail lines atop them, such as those found along the Central Coast and in San Diego County. Several busy main lines and terminal trackage that appear to be at risk later in this century are shown in Exhibit 6.7 and Exhibit 6.8.

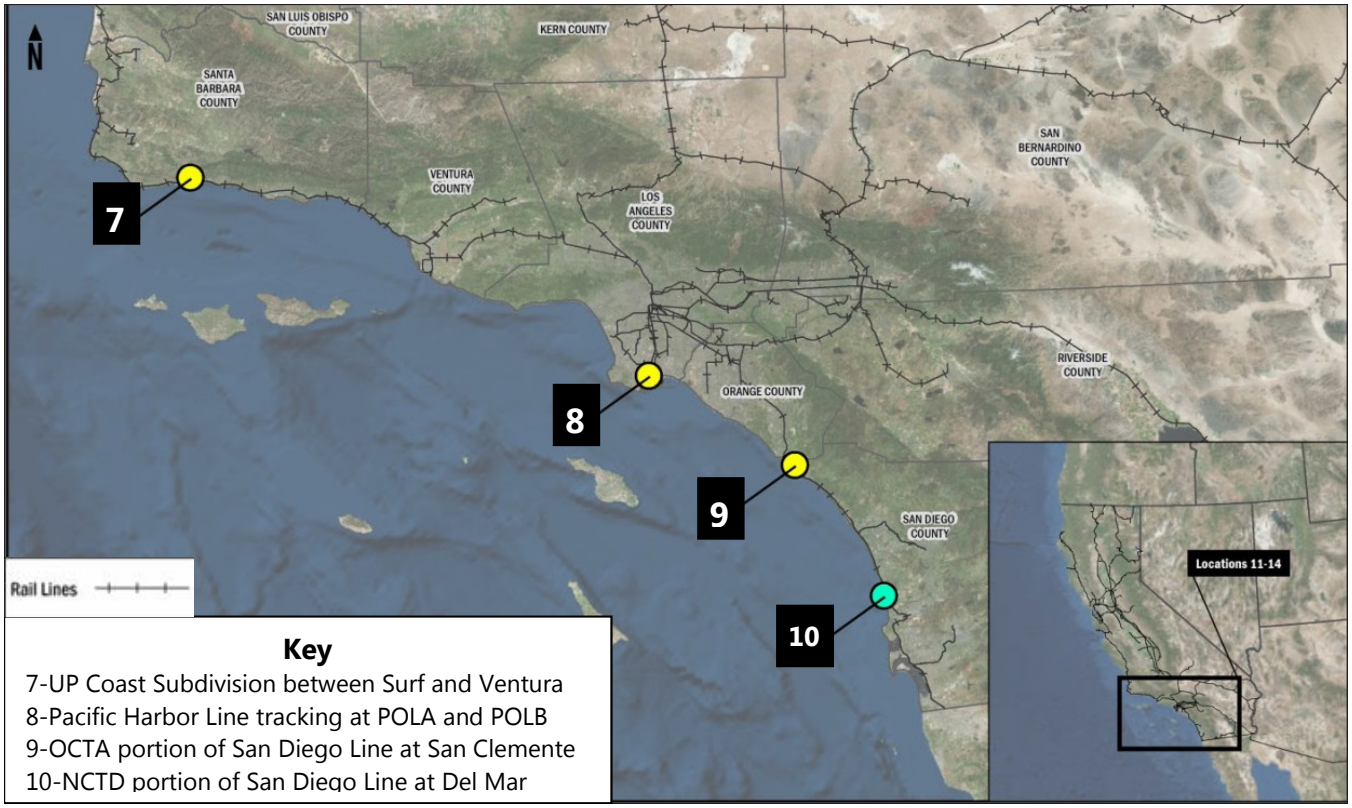


Sources: Inundation: NOAA 2012; Basemaps: ESRI 2017; Rail Lines: State of California.

Exhibit 6.7: Major Rail Line the Bay Area at Risk from Sea-Level Rise

Major Rail Lines in the Bay Area at Risk from Sea-Level Rise and not pictured in map include:

- SMART-owned line San Rafael to Petaluma
- SMART-owned line parallel to SR 37
- UP Martinez Subdivision between Benicia and Fairfield
- UP Coast Line along Elkhorn Slough



Sources: Inundation: NOAA 2012; Basemaps: ESRI 2017; Rail Lines: State of California.

Exhibit 6.8: Major Rail Lines in Central and Southern California at Risk from Sea-Level Rise

Both freight and passenger rail traffic (intercity and commuter) will be affected. Ensuring protection and resiliency from sea-level rise could include raising track, relocating rail lines to higher ground, and implementing water barriers such as dykes and berms. All solutions have pros and cons.

In the sections that follow, two locations with illustrative impacts of sea-level rise are discussed: the UPRR Martinez Subdivision at Rodeo in Contra Costa County; and the Del Mar Bluffs in San Diego County. The locations of these spots are identified by the greenish-blue dots in Exhibit 6.8.

Martinez Subdivision at Hercules

The UPRR's Martinez Subdivision is the busiest rail link between Central California and the Bay Area. In all, 70 to 80 trains traverse the line on weekdays. Most of the traffic is intercity passenger traffic, via the *Capitol Corridor* and *San Joaquin Corridor* trains, and Amtrak's long-distance *California Zephyr* and *Coast Daylight* trains. The line is also UPRR's primary freight route in and out of the Bay Area.

Exhibit 6.9 shows the impact of sea-level rise in 2100, with the inundation of the UPRR route at Hercules along the North Bay. The segments of the line in red indicate segments that are at risk of inundation. Solutions would include raising the track above the anticipated flood levels.



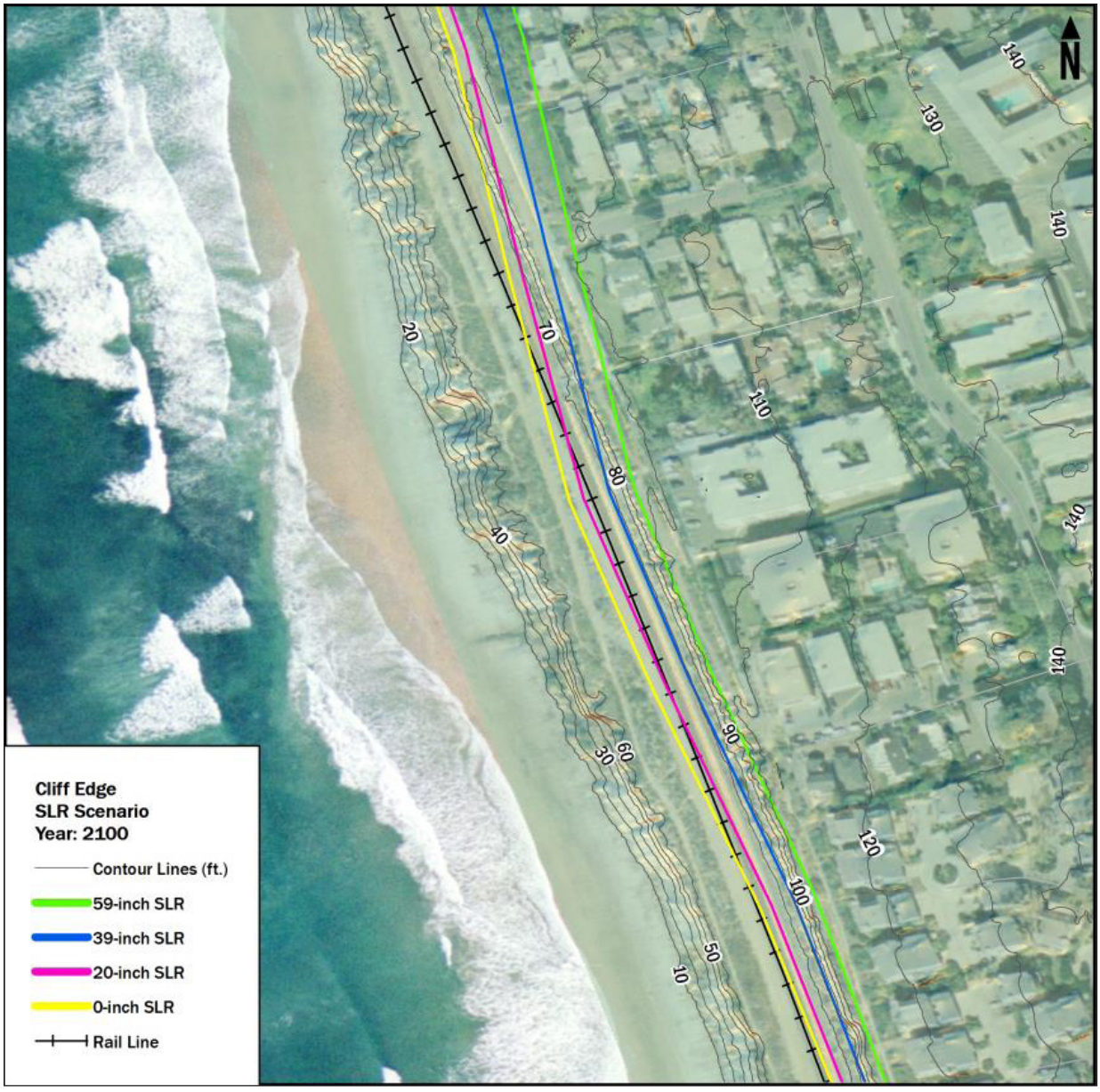
Sources: Streets, Contra Costa County 2017; Rail Lines: State of California.

Exhibit 6.9: Inundation of the UPRR Martinez Subdivision at Hercules

Del Mar Bluffs

The portion of the San Diego Line in San Diego County is owned by the NCTD, which purchased it from the former Atchison Topeka and Santa Fe Railway (now part of the BNSF) in the late 1980s. The line hosts *Pacific Surfliner* Corridor trains, COASTER commuter trains, and BNSF freight service. A section of the line runs across the Del Mar Bluffs above the Pacific Ocean. On weekdays, about 50 trains, mostly passenger, traverse the Del Mar Bluffs.

As seen in Exhibit 6.10, sea-level rise will accelerate erosion of the bluffs, threatening stability and the viability of the route. Indeed, erosion by 2100 could eliminate the rail line completely, as well as adjacent homes, absent preventative measures.



Sources: LiDAR Surface for Contours: NOAA Coastal LiDAR; SLR Retreat Lines: Coastal Storm Modeling System: USGS; Rail Lines: State of California.

Exhibit 6.10: Erosion of the Del Mar Bluffs in San Diego County

United States Environmental Protection Agency Criteria Pollutants

According to the U.S. EPA, there are six criteria pollutants that can affect human health, the environment, and property: reactive organic gases (ROG), particulate matter (PM), carbon monoxide (CO), NO_x, sulfur dioxide, and lead.[227] Freight and passenger rail operations emit CO, NO_x, ROG, and PM. The increased presence of these criteria pollutants has been linked to a variety of poor health conditions. These conditions may include:

- reduced lung function;
- asthma and other respiratory illnesses;
- increased cancer risk; and
- premature death (especially in vulnerable groups such as children and the elderly).

Emissions from rail activities also lead to ozone formation. Ozone is formed when emissions of NO_x chemically react with ROG under conditions of heat and sunlight. Ozone is linked to public health impacts, including chest pain, coughing, throat irritation, and congestion. Long-term exposure can worsen existing afflictions like asthma or bronchitis, or even lead to permanently scarred lung tissue.[228]

PM is divided into two subcategories: PM less than 10 microns in diameter (PM_{10}) and PM less than 2.5 microns in diameter ($PM_{2.5}$). Numerous studies have linked PM exposure to public health issues, including irregular heartbeat, asthma, decreased lung function, and increased respiratory ailments that can lead to premature death.[229]

Greenhouse Gas Emissions

Freight emissions comprise close to one-third of transportation GHG emissions in the United States. These emissions have grown by more than 50 percent since 1990.[230]According to the U.S. EPA, there are six key transportation-related GHG emissions that affect public health and welfare:

1. CO_2
2. Methane (CH_4)
3. Nitrous oxide (N_2O)
4. Hydrofluorocarbons (HFC)
5. Perfluorocarbons (PFC)
6. Sulfur hexafluoride (SF_6)

GHG emissions contribute to climate change. They are linked to regional and atmospheric changes that can exacerbate acid rain, ozone depletion, and damage to crops, plants, and property.

Emissions Analysis

The previous sections illustrate that improved rail services and HSR would reduce automobile and truck VMT throughout California. VMT reductions lead directly to reduced emissions of CO_2 and key mobile source pollutants.[231] Air quality emissions were forecast for years 2020, 2025, and 2040 using the CARB Emissions Factor (EMFAC) model,[232] coupled with the VMT forecasts.

Freight locomotive emissions forecasts are based on projected ton-miles traveled, coupled with emissions rates published by U.S. EPA,[233] and Locomotive Technology distributions available from CARB.[234] Passenger locomotive emissions were forecast by scaling CARB's emission inventory[235] by the estimated change in passenger miles of travel.

Passenger locomotive emissions were calculated for 2040 by scaling CARB's 2015 emissions inventory

227 U.S. EPA, *Urban Air*, 2016.

228 U.S. EPA, *Ozone Pollution,* 2016.

229 U.S. EPA, *Health*, 2016.

230 FHWA, Freight and Air Quality Handbook, May 2010.

231 The Rail Plan analysis included ROG, NO_x, CO, PM_{10}, and $PM_{2.5}$.

232 The 2018 Rail Plan analysis used the EMFAC 2011 model.

233 U.S. EPA Emission Factors for Locomotives, Office of Transportation and Air Quality, EPA-420-F-09-025, April 2009.

234 Nicole Dolney and M. Malchow, Locomotive Inventory Update: Line Haul Activity, CARB tech distribution ref. (Presentation), November 7, 2014, CARB, accessed 2016.

235 CARB, Emission Inventory Activities, CARB (2016).

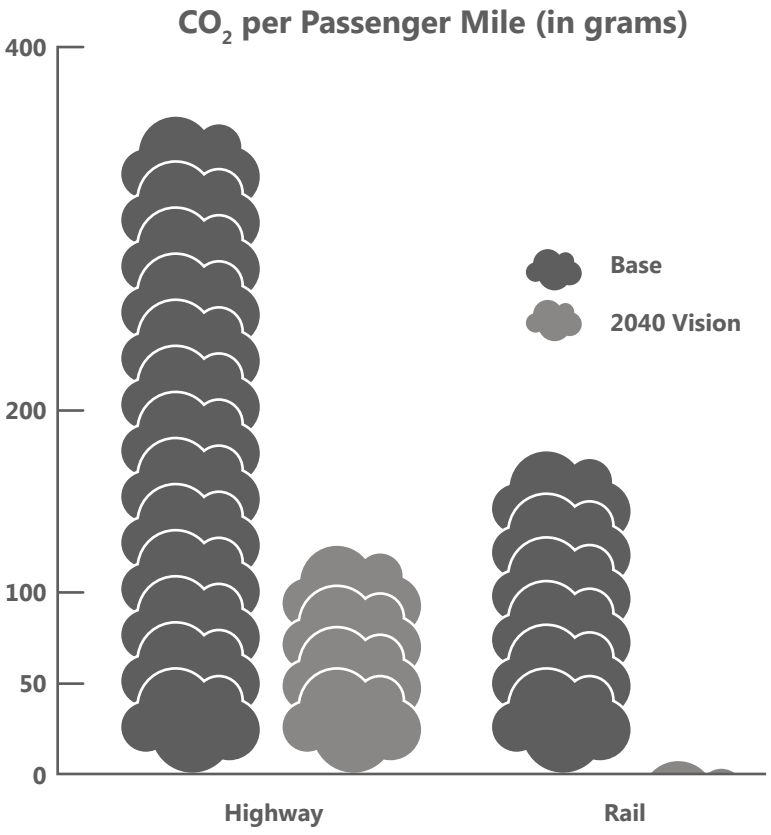
based on passenger miles traveled, then adjusting for electrification. Scaling CARB's original estimate accounted for anticipated locomotive upgrades over the next 20 years, but not the benefits of the additional electrification in the Rail Plan. About 93 percent of the passenger miles traveled are on services that are assumed to be electrified, based on the Rail Plan, and the passenger locomotive emissions are reduced proportionately. Therefore, the data reflect both upgraded diesel passenger locomotives and electrification.

Table 6.9 compares the CO_2 emissions from passenger rail service to on-road passenger vehicles, and shows the substantial emission reduction benefits of the Rail Plan. The 2020 baseline passenger train service emits about 2.4 times less CO_2 per passenger mile of travel than on-road motor vehicles. With the Rail Plan, that advantage grows to nearly 20 times less CO_2 per passenger mile of travel from passenger trains relative to on-road passenger vehicles.

Table 6.9:
Grams CO_2 per Passenger Mile of Travel by Mode

Region	2020	2040 with CSRP
On Road Passenger Vehicles (g/PMT)*	302	179
Passenger Locomotives (g/PMT)	127	9

* Based on assumed vehicle occupancy of 1.2 passengers per vehicle.
g/PMT = grams per passenger mile traveled





Offer a convenient and reliable alternative to private vehicle travel



Increase electric and zero emission trains



Provide alternative to truck transport of containerized cargo

Table 6.10 summarizes statewide air quality emissions by analysis year and passenger rail corridor. The column titled "No Action Emissions" shows total statewide on-road mobile source emissions by pollutant and analysis year. "No Action" assumes that the Rail Plan is not adopted. The remaining columns indicate emissions reduction attributable to both on-road mobile sources and locomotives in each passenger rail corridor, arising from the modeled planning scenarios. Each row shows emission reductions for the indicated year; the values are not cumulative between years.

Table 6.10: Annual Statewide Emission Reduction

No-Action Emissions (Tons/Day)				Change in Locomotive and On-road Emissions with the Rail Plan (Tons/Day)					
Year	On-Road	Loco-motives	Total (On-Road and Loco-motives)	Bay Area and N. Calif.	Greater LA and LOSSAN South	LOSSAN North and Central Coast	Las Vegas HSR and Inland Empire	Central Valley	Statewide Total
CO_2									
2020	470,828	8,101	478,929	(718)	(1,742)	(233)	(216)	(1,351)	(4,259)
2025	454,565	8,682	463,247	(1,077)	(2,612)	(349)	(324)	(2,026)	(6,389)
2040	405,777	10,424	416,201	(2,154)	(5,225)	(699)	(648)	(4,052)	(12,778)
2040 High	405,777	10,992	416,769	(2,154)	(5,225)	(699)	(648)	(4,052)	(12,778)
ROG									
2020	356.56	5.91	362.47	(0.29)	(0.65)	(0.08)	(0.09)	(0.50)	(1.60)
2025	294.35	6.30	300.65	(0.43)	(0.97)	(0.12)	(0.13)	(0.75)	(2.40)
2040	107.73	7.47	115.20	(0.87)	(1.94)	(0.24)	(0.26)	(1.50)	(4.81)
2040 High	107.73	7.85	115.57	(0.87)	(1.94)	(0.24)	(0.26)	(1.50)	(4.81)
NO_x									
2020	892.06	110.69	1,002.75	(0.70)	(0.34)	0.36	0.23	(0.67)	(1.11)
2025	723.03	118.02	841.05	(1.05)	(0.51)	0.54	0.35	(1.01)	(1.67)
2040	215.93	140.02	355.95	(2.09)	(1.03)	1.09	0.70	(2.01)	(3.34)
2040 High	215.93	147.16	363.09	(2.09)	(1.03)	1.09	0.70	(2.01)	(3.34)
CO									
2020	2,892.97	20.24	2,913.21	(1.74)	(4.37)	(0.67)	(0.69)	(3.17)	(10.65)
2025	2,354.50	21.59	2,376.09	(2.62)	(6.56)	(1.00)	(1.03)	(4.76)	(15.97)
2040	739.10	25.63	764.73	(5.23)	(13.12)	(2.00)	(2.06)	(9.52)	(31.94)
2040 High	739.10	27.11	766.21	(5.23)	(13.12)	(2.00)	(2.06)	(9.52)	(31.94)
PM_{10}									
2020	76.17	3.79	79.96	(0.16)	(0.36)	(0.05)	(0.05)	(0.29)	(0.91)
2025	74.26	4.05	78.30	(0.24)	(0.54)	(0.07)	(0.07)	(0.44)	(1.36)
2040	68.52	4.80	73.32	(0.48)	(1.08)	(0.14)	(0.14)	(0.88)	(2.72)
2040 High	68.52	5.06	73.58	(0.48)	(1.08)	(0.14)	(0.14)	(0.88)	(2.72)
$PM_{2.5}$									
2020	41.29	3.67	44.96	(0.07)	(0.15)	(0.01)	(0.02)	(0.12)	(0.37)
2025	37.98	3.92	41.90	(0.11)	(0.22)	(0.02)	(0.02)	(0.19)	(0.56)
2040	28.06	4.65	32.71	(0.22)	(0.44)	(0.04)	(0.05)	(0.37)	(1.12)
2040 High	28.06	4.90	32.95	(0.22)	(0.44)	(0.04)	(0.05)	(0.37)	(1.12)

Sources: AECOM, T. Kear Transportation Planning and Management, Inc., and Cambridge Systematics Inc., 2017.

The service plan assumptions, detailed in Chapter 4, are projected to reduce statewide emissions, but at a magnitude of only about 3 to 4 percent for all of the pollutants except NO_x. NO_x is reduced by about 1 percent, despite 88 million daily passenger miles diverted to rail from highways and an increase of 92 million daily passengers miles on rail as a result of Rail Plan investments. Reductions are largest in the regions directly served by the improvements to the rail system, and for corridors served by HSR. Calculation details are provided in Appendix A.

This emissions analysis reflects vehicle travel reduction due to mode shifts from personal vehicles to passenger rail, and residual congestion reduction from this mode shift. Additional emission reduction might arise from: 1) improved rail system efficiency through reduced locomotive idling and improved locomotive fuel economy; 2) reduced aircraft operations from air-to-rail modal shifts; 3) reduced vehicle acceleration and deceleration from highway bottleneck elimination; and 4) shifting of freight from trucks to trains.

Rail Mode Share

Current: 0.34%



2040 No Build: 0.52%



2040 Vision: 6.8%



- 88 million daily passenger miles diverted to rail from highway
- Overall daily increase of 92 million passenger miles by rail

Exhibit 6.11: Rail Mode Share Shift in 2040 Vision

6.4 Implementation

6.4.1 Coordinating Rail Policies and Plans

The 2022 project list and service goals were developed by reviewing recent and ongoing strategic, vision, and service plans published by stakeholder passenger rail agencies and service providers around the state. Those plans were used to identify near-term goals, and to begin the implementation planning toward the 2040 Vision.

Existing Rail Plans

Those plans include, but are not limited to:

- ACE*forward*, 2015
- Amtrak FY2015 Budget and Business Plan, 2015
- Amtrak Strategic Plan 2014-2018
- BART Sustainable Communities Operations Analysis, 2013
- Bay Area Council Economic Institute – The Northern California Megaregion, 2016
- Caltrain Strategic Plan, 2014
- Capitol Corridor Business Plan, 2015
- CCJPA Business Plan FY 2015-2017
- CCJPA Vision Plan, 2014
- CHSRA 2016 Business Plan
- CHSRA 2018 Business Plan
- CTC Annual Report to the California Legislature, 2014
- FRA Southwest Multi-State Rail Planning Study, 2014
- LA Metro Long-Range Transportation Plan, 2009
- LOSSAN Rail Corridor Agency Business Plan FY 2015-2017
- Metrolink Ten-Year Strategic Plan
- Monterey Bay – 2035 Metropolitan Transportation Plan/Sustainable Communities Strategy, 2014
- NCTD Comprehensive Strategic Operating and Capital Plan FY 2016
- Sacramento Regional Transit District – Strategic Plan 2015-2020
- SCAG – RTP/Sustainable Communities Strategy, 2012
- SFMTA Strategic Plan FY 2013-2018
- SJJPA 2015 Business Plan
- TAMC 2014 Monterey County RTP
- VTA – VTP2040

6.4.2 Environmental Policy

Freight and passenger rail implementation can bring tremendous positive environmental and economic benefits to the state. They can also impact communities and the natural environment. The most common effects include contribution to air pollution and GHG emissions, and physical impacts such as noise and light pollution.

As mentioned in Chapters 1 and 3, in recent years, California has enacted several laws and executive orders to reduce climate-change–inducing GHG emissions through efficient land use and transportation planning, increased energy efficiency, and other actions.

Executive Order S–3–05, signed in 2005, established state GHG emission reduction targets to reduce California's contribution to global climate change. The Global Warming Solutions Act, AB 32, signed into law in 2006, expanded on these goals. It requires that California's GHG emissions be reduced to 1990 levels by the year 2020 (Chapter 488). AB 32 is a multi-sector, interdisciplinary approach to reducing GHG emissions in the state. In accordance with its responsibilities under AB 32, CARB adopted a *Scoping Plan* in December 2008 (readopted in August 2011) that quantified the statewide GHG emission reduction target, and identified reductions that would result from specific programs. This included the HSR project, which is expected to reduce GHG emissions by 1 million metric tons annually in CO_2 equivalent. Other related legislative bills outline individual regulations for specific sectors.

Land Use

SB 375—the Sustainable Communities and Climate Protection Act of 2008—promotes integrated transportation and land use planning to reduce GHG emissions from passenger vehicle travel, and help California meet AB 32 goals. SB 375 requires CARB to develop regional GHG emissions reduction targets for passenger vehicle travel, setting benchmarks in 2020 and 2035 for each of the state's 18 MPOs. SB 375 requires that California's MPOs each draft an SCS as part of their RTP, which describes the transportation and land use strategies the MPO regions will use to meet the regional GHG emissions reduction targets established by the CARB.

Although SB 375 has a regional focus, SB 391 highlights the critical roles that Caltrans and other State agencies play in addressing interregional travel issues, including the reduction of GHG emissions associated with interregional travel. The California Interregional Blueprint defines strategies to address interregional travel needs, while ensuring that CTP 2040 identifies statewide policies and investment priorities needed to support the State's GHG emission reduction goals. These goals include reducing GHG emissions to 80 percent below 1990 levels by 2050, as called for in Executive Order S-3-05.

Freight

Executive Order S-32-15, signed in 2015, directs State agencies to develop an integrated freight plan that will increase efficiencies and reduce air and GHG pollutants. The executive order called for the completion of a Sustainable Freight Action Plan by July 2016 and includes the following participating agencies: CARB, Caltrans, California Energy Commission, and the Governor's Office of Business and Economics. The Action Plan is a comprehensive planning effort to integrate investments, policies, and programs across agencies to help realize a sustainable freight vision. The executive order mandates that "to ensure progress toward a sustainable freight system, these entities initiate work [beginning 2015] on corridor-level freight pilot projects within the State's primary trade corridors that integrate advanced technologies, alternative fuels, freight and fuel infrastructure, and local economic development opportunities." The cross-agency and corridor-level planning focus presents an opportunity for the Rail Plan to strengthen the policies and help deliver the actions needed for realizing the sustainable freight vision. Caltrans has begun attending the Sustainable Freight Interagency partners meetings to coordinate implementation between the Rail Plan and the Sustainable Freight Action Plan as a way to maximize the efficiency of the state rail system, while reducing emissions from the freight sector.

Future Planning Studies

The Rail Plan is ultimately an iterative strategic document. It will be updated every 4 years, scaled and adjusted as the state rail network is built out, and as market factors and other key indicators—such as climate change—dictate. Undoubtedly, the scope and detail of specific services and projects will continue to be refined in future revisions to this document. Ongoing planning studies are particularly important to integrating networks to ensure that the right investments are being made, in the right markets, at the right time. When done properly, thorough and consistent planning will guide State policymakers and regional stakeholders through the ongoing process of optimizing current investments, and scaling appropriately toward an effective and integrated regional and statewide network.

While capital rail improvements and studies across the state are ongoing, the Rail Plan intends to conduct planning studies with the help of local and regional partners in the rail planning regions. These studies are to be completed in the near-term (2022) time horizon for possible project implementation, either in the mid- or long-term time horizons.

Statewide

- **Statewide Grade Separation Corridor Prioritization Study.**
  Although Caltrans and the CPUC put out an annual lists of prioritized grade-separation projects, an additional study or criteria is needed to consider grade separations not as stand-alone safety or traffic relief projects, but rather as rail-corridor-based projects. When organized and pursued strategically as part of an identified corridor, grade-separation projects can dramatically improve rail capacity and passenger service.

- **Statewide Inter-Agency Service Integration Plan**
  The 2040 Vision describes in great detail the types and intensities of services to be provided in various corridors around the state. However, more study is needed to make recommendations on rail governance and service integration to ensure that the various rail providers can proactively align and scale their services as the statewide network comes online. This research will evaluate what existing institutions are already in place and how best various partner agencies can use their established expertise to collaborate and establish project prioritization. The State supports collaborative efforts to move forward with implementing the Rail Plan vision without reinventing organizational structures and creating cumbersome institutions. Future inter-agency service integration planning will inform how the state can continue to work to be a better partner in implementation.

- **Study of Potential Future Freight Rail Impacts Related to "Self-Driving" Trucking Technology**
  The Rail Plan is written in a dynamic time for new technology in the trucking industry. A number of private-sector efforts are underway to bring various self-driving or driverless vehicle technologies to trucking. These technologies are in relatively early stages of development, and exist on a spectrum from advances in driver assistance like automatic braking capabilities, to "platooning," where one or more driverless trucks automatically follow a traditional human-driven truck, to full automation of truck operations. The ultimate adoption and scalability of these technologies is unknown, but could have major impacts on the freight rail industry, including potential traffic diversions. A comprehensive study is needed to understand the opportunities and challenges these technologies may present for the rail industry; where and how the technology would be applicable in ways that compete or complement freight rail; potential impacts on highway maintenance resulting from new trucking volumes (some arising from diversions from rail); and the ways in which the State can plan for infrastructure investments accordingly.

6.4.3 Land Use Coordination

On the state level, there is proposed legislation, SB 827 (Weiner): Planning and zoning: transit-rich housing bonus, which seeks to incentivize dense, mixed-income housing within a half-mile of transit stations and within a quarter-mile of high-quality transit corridors. This type of land use and transportation coordination seeks to provide more housing for the housing-strapped state, while locating the housing close to transit access. This is intended to simultaneously decrease congestion and increase mobility options for mixed-income level residents. This is only one proposal, but it is an example of commitment by local and state leaders to better connect land use and transportation to create more housing in such a way that supports successful transit and rail systems. This type of legislation will maximize livability, affordability, equity ,and mobility.

Station Area Planning

Station area planning is a specific type of land use planning that should necessarily integrate different modes of transportation, as well as different types of access (i.e., on foot or on a bicycle) and mobility needs. Stations are the first point of contact for users exiting the rail system and a potential hurdle for entry for new users if the station and the surrounding areas are not designed to attract and accommodate all travelers.

One opportunity to deliver multimodal connectivity hubs is to engage with regional partners to pursue Sustainable Transportation Planning Grants. These planning grants include plans and studies for connectivity, multimodal transportation, transit hubs and station areas, corridors, and active transportation. They can help fund planning that

seeks to improve station area access and the overall user experience. The Sustainable Communities grants identify mobility deficiencies, including the needs of disadvantaged, often transit-dependent, communities. The Strategic Partnership grants encourage collaboration between regional partners and the State to address statewide and interregional transportation deficiencies. Both grant opportunities seek to better coordinate funding and planning to deliver a sustainable transportation system, and are well suited to help implement elements of the Rail Plan that require nuanced regional collaboration.

Delivering attractive, multifunctional, and easy-to-use stations and surrounding areas will require ongoing work with local and regional partners. At the station itself, the State is pursuing various actions to improve station functionality, including: coordinating implementation of Toward an Active California and the Rail Plan to provide guidance for bike parking at stations; co-locating hubs to improve bus connections; and planning for up to a mile radius around stations to improve safety and access for active transportation. The State supports the Smart Mobility Framework and working with entities who own stations and the land around stations to provide sustainable, equitable, multimodal connectivity hubs. Where HSR is co-located with other rail and transit services, the work the CHSRA is doing to develop a vision for station communities will help guide implementation. The state supports their vision that HSR stations will be about more than connecting transportation modes. These stations can become station communities and provide enhanced connectivity and economic opportunities for travelers and communities alike. Specific guidelines for all stations and station areas in the statewide rail network will be included in forthcoming implementation planning documents, and will be location- and context-specific. Decisions will be based on local community input during the project development process.

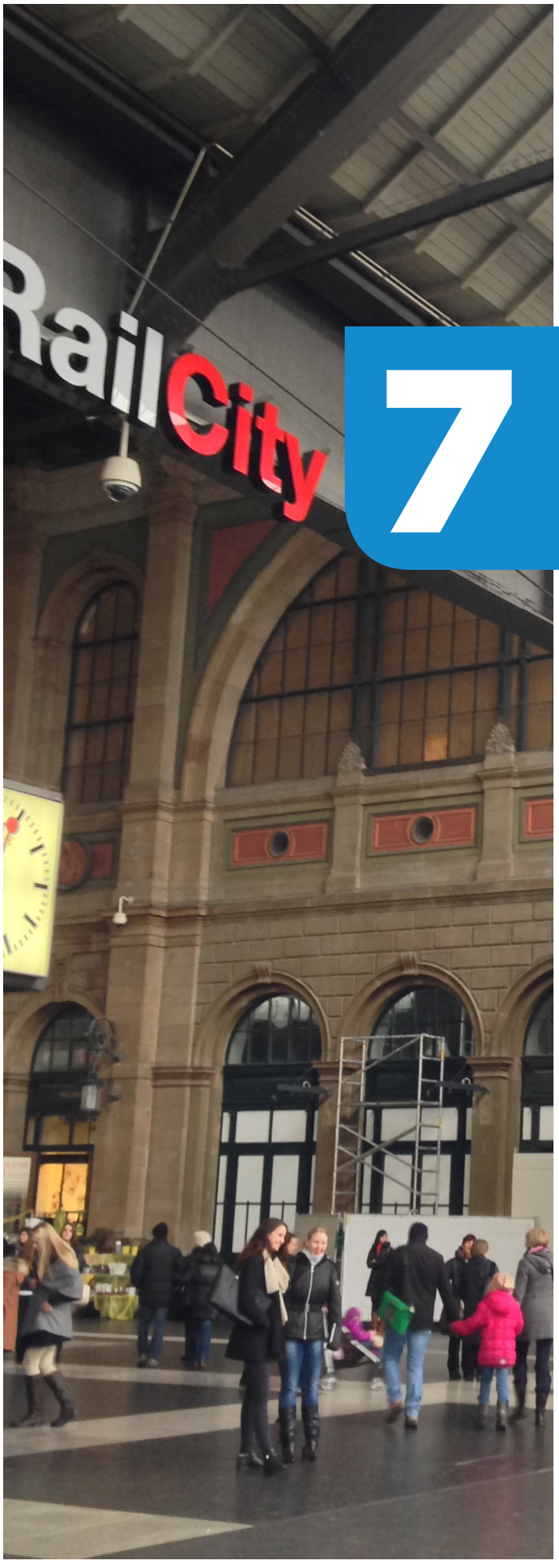
6.4.4 Public-Private Partnerships

Rail services that approach or exceed self-funding for operating specific services can be attractive for private operators looking to enter public-private partnership with government to take on some of the operating risk of providing passenger rail service, for the opportunity to earn a return on investment through fare revenues. For example, the Napa Valley Transportation Authority and the Napa Valley Railroad are exploring public-private partnership opportunities to better serve future passenger service along the rail line. Through a diverse range of options, governments can engage private partners via concessions, operating agreements, and other arrangements that offload some of the risk involved in operating investments, and capture further service efficiencies, while protecting taxpayers and delivering services that meet the service goals defined in the Rail Plan.

6.4.5 Positive Train Control

PTC implementation is a state and federal priority and impacts both passenger and freight lines. The Class I railroads are implementing PTC largely at their own expense, and installation is well underway in California and elsewhere. However, PTC poses costly challenges to some short lines that are handling hazardous materials, or more commonly must operate over PTC-equipped Class I main lines. The $100,000-plus cost of retrofitting older locomotives that are typical of short-line fleets is beyond the financial ability of many carriers.

Some passenger rail operators, like Metrolink, have led the way with PTC installation; Metrolink has become the first commuter rail operator in the nation to implement the advanced safety technologies. SMART became the first rail line in the United States to open with a fully outfitted PTC system. However, not all operators are as far along, and the 2018 deadline to install PTC is near. To ensure the safety of passengers, crews, and commodities, the State has formed a task force to monitor and enforce PTC implementation for Amtrak and the railroads by the end of the year.



7 Public Outreach

Planning for rail is much different than planning for street and highway systems. As the previous chapters have detailed, the State largely does not own the infrastructure; there are many public and private players involved in planning services and improvements on the infrastructure; and there are additional hurdles, including first-mile/last-mile connections, that create barriers to rail access.

Because of this, early, continuous, and meaningful engagement with rail stakeholders and the public was imperative to the creation and future success of the Rail Plan. This chapter summarizes public outreach for the Rail Plan, provides an overview of the methods and specific steps used to engage the general public and interested stakeholders, and describes outreach and consultation with Native American Tribes.

7.1 Public and Agency Participation Approach

The development of a visionary, integrated statewide rail network required equally robust and comprehensive outreach to ensure that the State's vision developed in a manner consistent with regional plans and priorities. In developing a new statewide vision for both passenger and freight rail, Caltrans engaged stakeholders and the public through early and thoughtful outreach to achieve a measure of consensus for a statewide rail network that not only integrated passenger rail for a seamless customer experience, but defined the State's goals for investing in freight rail infrastructure. The effort involved a complex passenger and freight rail planning process for the State to establish a Vision (detailed in Chapter 3) for a statewide passenger rail network that addresses multi-modal connections between rail, intercity bus, and transit service. The Rail Plan was closely coordinated with other statewide planning efforts, and incorporates several iterations of public and agency input and feedback.

To ensure a comprehensive outreach strategy, the study team developed a Public Involvement and Stakeholder Outreach Plan (PISOP) and a Native American Tribal Coordination and Outreach Plan (NATCOP). These documents outline the methods, goals, and objectives for outreach to stakeholders for the Rail Plan.



7.1.1 Public Involvement and Stakeholder Outreach Plan

The PISOP for the Rail Plan sets forth the public involvement strategies and tasks to support and further develop the plan. Caltrans designed the outreach tasks, outlined in the PISOP, to promote an ongoing discussion with the Rail Plan stakeholders, to allow Caltrans to proactively engage, listen to, and inform the stakeholders, and address their questions and concerns throughout the process.

The primary purpose of the PISOP was to obtain meaningful opinions, comments, and suggestions on the Rail Plan from interested and affected parties throughout the state. The PISOP aimed to establish ownership and support for rail transportation, consistent with the Caltrans commitment to public involvement and engagement, as stated in the 2013 Public Participation Plan. Public outreach focused on engaging key stakeholders and the California public to help shape the Rail Plan by providing input on issues, including the various types of rail service (intercity passenger rail, commuter rail, HSR, and freight rail), state policies, system operations, community impacts, environmental considerations, and funding. The public outreach process gathered and disseminated input on service for the existing and proposed intercity passenger rail corridors, and for HSR.

The goal was to conduct a transparent and inclusive planning process that was fully integrated and consistent with existing and ongoing Caltrans and statewide planning efforts, and that engaged stakeholders early in the process.

The goals for the public outreach program in support of the development of the Rail Plan are listed below:

- Ensure that the statewide rail community and interest groups understand Caltrans' role in state rail planning and its vision for the state and feel engaged in its development.
- Conduct a transparent, inclusive, and inviting outreach campaign that leads to the development of a comprehensive Rail Plan.
- Ensure that the messaging regarding the Rail Plan is consistent with the plans and programs of the CHSRA.
- Implement an outreach program whose messaging is consistent with other statewide planning documents.

The outreach program objectives are listed below.

- Increase awareness of the Rail Plan in Caltrans districts and improve public awareness through collaborative efforts that capitalize on existing communication programs.
- Provide easily understood, concise, and multi-lingual project information that fosters project education and garners public interest and input.
- Apply recognizable project branding, and foster relations with media venues that will serve as long-term public portals for obtaining statewide rail information.
- Ensure that environmental justice, Native American, and other disenfranchised groups are part of the public process.
- Create an opportunity for key stakeholders to provide valuable input that improves decision-making and leads to better project delivery.
- Improve statewide stakeholder communication and collaboration between the various rail corridors.
- Communicate Caltrans' key messages of safety, mobility, delivery, stewardship, service, and sustainability.
- Communicate how the State is responding to Senate Bill 391 legislation[236] and GHG targets and associated legislation.
- Develop and implement a communication framework that moves the Rail Plan project toward approval by necessary agencies with support from the general public.

7.1.2 Native American Tribal Consultation and Outreach Plan

The NATCOP sets forth strategies and tasks to ensure timely inclusion of Native Americans in the overall development process for the Rail Plan. The guiding approach was to ensure effective, transparent, and mutually informative Native American consultation, and to maintain consistency with existing, successful methods and outreach efforts implemented by Caltrans.

The outreach goals pursued by NATCOP in support of the development of the Rail Plan are listed below:

- Conduct early, timely, and comprehensive outreach and government-to-government consultation.
- Appoint three Native American representatives from different parts of the state to be members of the Rail Plan SAC.
- Ensure that Native Americans are aware of and understand Caltrans' role in state rail planning, and its vision for the state.
- Implement a complementary and coordinated outreach program with ongoing tribal, regional, statewide, and interstate planning efforts, to the extent feasible.

In addition to the outreach goals, NATCOP objectives included, but were not limited to, those listed below.

- Provide easily understood and concise project information that fosters project education and garners Native American input.
- Establish recognizable project branding and media venues that will serve as long-term portals for Native American groups to obtain statewide rail information.
- Ensure that Native Americans are part of the public process, while fostering ongoing government-to-government consultation.
- Create opportunities for interested Native Americans to provide valuable input that improves the decision-making and leads to better project delivery.

236 SB 391 requires Caltrans to update the CTP every 5 years to show how to achieve statewide GHG reduction consistent with Executive Order S-3-05.

7.1.3 Public Noticing and Commenting Process

To ensure a robust noticing program, the study team used both traditional and Internet-based noticing for the public meetings in support of the release of the Draft Rail Plan. Caltrans sent email notifications to the stakeholder list, and issued press releases at key milestones, including the launch of the planning process, the launch of the project website, and the start of the public review period of the Draft California State Rail Plan.

The comment process included a project email address (RailPlan@dot.ca.gov) and Rail Plan website comment form (www.californiastaterailplan.com). The Rail Plan survey (results in Appendix A.7), the online Interactive Map, and the public workshops held in fall 2017 provided opportunities for public comment.

7.1.4 California State Rail Plan Website

The California State Rail Plan website was launched in January 2016, to provide a central location for the public to find informational materials, notices regarding upcoming California State Rail Plan milestones, media links, and the early engagement survey, and to have an opportunity to submit comments. The website provides general information regarding the Rail Plan's purpose and process; contact information; and informational materials such as Native American listening session summaries, factsheets, and survey summary reports. The Rail Plan website can be accessed at www.californiastaterailplan.com.



7.1.5 Rail Plan Factsheet

Caltrans developed and distributed a factsheet (Exhibit 7.1) and presentation materials during development of the Rail Plan, to communicate key concepts and elements considered in the plan. Documents were published and made available on the Rail Plan website, at outreach events such as SAC meetings and public review draft meetings, and for presentations made by staff.



CALIFORNIA STATE RAIL PLAN

2018 california state rail plan

CONNECTING CALIFORNIA...BETTER

Caltrans is beginning work on its new 2018 Rail Plan which will provide an exciting new framework for California's rail network and set the stage for new and better rail and community connections in the State for the next 20 years and beyond.

The creation of a railroad network in California in the 19th century connected us to the rest of the nation with what was then the highest-speed form of transportation. Continued rail investments in the 20th century helped California's rapid economic development. For the 21st century, California is again poised to put "high speed" back in rail, and achieve a modernized and integrated rail system to improve both freight and passenger transportation.

Rail Can Provide
SIGNIFICANT SOLUTIONS TO TODAY'S TRANSPORTATION CHALLENGES:

- Rail provides a safe, quality and efficient transportation choice for Californians who collectively take billions of trips to millions of destinations each year
- Rail provides a cost-effective, and often best-value, investment in transportation infrastructure that minimizes impacts on our communities and supports economic growth.
- Rail can alleviate significant levels of highway and air transportation congestion in our highly urbanized state. Especially considering that our population is expected to grow to nearly 50-million by 2040.
- Rail, including electrified rail, is an effective way to help achieve the state's greenhouse gas emission targets and achieve other air quality benefits.

What is the
2018 CALIFORNIA STATE RAIL PLAN?

The 2018 Rail Plan will present a vision and strategies for California's future passenger and freight rail network that will guide state investments supporting implementation of an integrated rail network. It also fulfills state and federal rail plan requirements. The Rail Plan is not being developed in a vacuum - it is an important element in the comprehensive examination of statewide transportation investment strategies tied to the 2040 California Transportation Plan which seeks to build on regional initiatives for curbing greenhouse gas emissions and climate change by coordinating statewide planning for all transportation modes, including air, roads and highways, local and regional public transit, and passenger and freight rail.

See the website **www.californiastaterailplan.com** for more information.

THE RAIL PLAN'S MISSION

The mission of the 2018 Rail Plan is to provide a safe, sustainable, integrated, and efficient California rail network that successfully moves people and goods while enhancing the State's economy and livability.

WHAT WILL BE DIFFERENT
from the 2013 Rail Plan?

The 2018 Rail Plan is more ambitious than previous Caltrans rail plans, as it will provide a vision for a more comprehensive integration of freight and passenger rail – with a focus on better timed connections and more transportation options. The 2018 Rail Plan will also address how rail can help achieve statewide greenhouse gas emissions mandates.

STAKEHOLDER ENGAGEMENT

Caltrans convened a Stakeholder Advisory Committee in November 2015 as a technical working group to provide input and expertise in the development of the California State Rail Plan. The committee meets quarterly through August 2017, and includes passenger rail operators, planning agencies, freight rail interests, Tribal Nations, private railroads, ports, transit operators, and neighboring states. Advocacy groups representing environmental, disadvantaged community, livable community/active transportation and agricultural interests have also been invited to participate. A full roster of participating agencies is available on www.californiastaterailplan.com/about

In addition, Caltrans developed a focused Native American outreach program for the 2018 Rail Plan which includes appointing three Native American tribal representatives to the Stakeholder Committee, tribal listening sessions early in the formal process, formal consultation options for the draft 2018 Rail Plan, and providing and obtaining regular updates from the Native American Advisory Council.

CONTACT US

E-mail:
Railplan@dot.ca.gov

Website:
www.californiastaterailplan.com

2018 california state rail plan

PROJECT SCHEDULE

July 2015	Preparation of the 2018 Rail Plan began
Early 2016	A public survey will be available online at the Rail Plan website for individuals to provide early input on rail issues and opportunities
Spring 2017	A draft of the Rail Plan will be available to the public for review and provide feedback during a public comment period
Mid-2018	The final Rail Plan will be released, including responses to public comments

How you can **GET INVOLVED**

This Rail Plan planning process is being designed to allow for early and meaningful public participation throughout, with several options for input and feedback.

- Sign up to receive e-mail updates and notifications on the Rail Plan planning process
- Provide comments through the website's online comment form
- Participate in the online survey, which will be available in early 2016
- Attend public meetings, and provide feedback on the Draft Plan during the Public Comment Period in March and April of 2017
- Bookmark the website and check it often for updates

For more information on how to participate in the planning process, visit the project website at **www.californiastaterailplan.com**.

Exhibit 7.1: Factsheet

7.1.6 Early Engagement Survey

As part of the effort to develop the Rail Plan, Caltrans released a survey in January 2016 seeking public input early in the planning process. The survey was available through the Caltrans website and was distributed to an extensive mailing list for the Rail Plan, through organizations and rail providers represented on the California State Rail Plan SAC, press releases, and Amtrak and Caltrans social media sites. The survey received a total of 2,189 responses between January 27, 2016, and March 4, 2016.

The goal of this survey was to obtain input from a large range of current and potential rail riders in California to help guide the development of the Rail Plan, which will present a vision for California's future passenger and freight rail network; and to address strategies to achieve a modernized and integrated rail system.

The survey inquired about respondents' current use of California rail, their opinions on the current state of California rail, and their highest priorities for improving California rail in the future. Additional optional demographic questions helped garner general information on respondents' affiliations, age, gender, income, race, and contact information. Providing that information allowed them to enter them a raffle for a $50 Amtrak gift card; five winners from across the state were randomly selected.



The top priorities and themes revealed in the survey responses are discussed below.

- Expanding coverage and increasing service for passenger rail were the top two priorities for improving passenger rail, and the top two factors preventing people from using rail regularly. Additional priorities included improving transfers, connections with local transit, reliability, and on-time-performance.
- The majority of respondents choose rail because they enjoy riding the train, and because the train is often cheaper than driving or flying.
- The respondents use or would like to use rail for a variety of different reasons, from leisure travel to commuting.
- The highest priority for safety improvements was to improve crossings with grade separations.

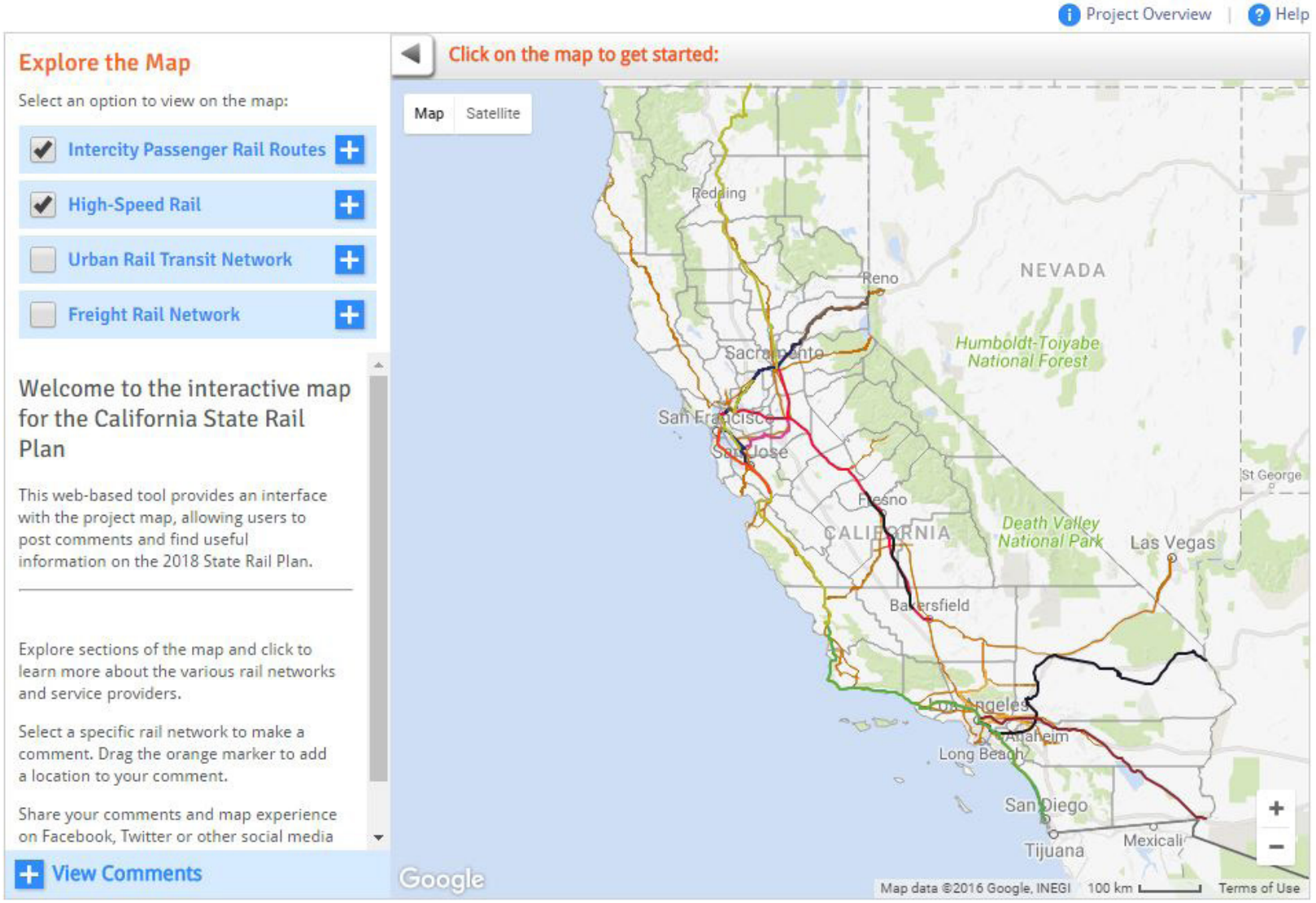
A detailed summary of the survey results (Exhibit 7.2) was posted to the Rail Plan website (www.californiastaterailplan.com), and is included in Appendix A.

7.1.7 Interactive Map

An online Interactive Map (Exhibit 7.3) was developed by Caltrans to illustrate the existing statewide rail network, the 2040 rail vision, and the network integration of the Rail Plan. The Interactive Map is available online at www.californiastaterailplan.com, and can also be accessed directly at http://csrp.civicresource.com/projects/2040/. The Interactive Map is a tool to educate project stakeholders and garner public input. Users can zoom into specific areas of interest—such as statewide rail corridors, rail routes, transit stations, and cities—and provide geo-coded comments, and share them via social media. Due to the strategic, programmatic nature of the Rail Plan, the interactive map does not depict detailed information regarding planned alignments for new rail facilities identified in the Rail Plan.



Exhibit 7.2: 2018 California Rail Plan Survey Summary Report



This tool allows users to explore various rail networks and service providers throughout California, and submit comments for consideration in the development of the California State Rail Plan.

Exhibit 7.3: Online Interactive Map

7.1.8 Network Integration Strategic Service Planning Engagement

Customized "term sheets" of regional and statewide service goals and delivery options were created to organize strategic planning in a network- and corridor-based approach. Term sheets are discrete descriptions of service goals and options for capital improvements in a given corridor that build toward the integrated statewide network defined in the 2040 Vision. Of particular importance, term sheets articulate geographically specific goals and delivery options as scalable, operator neutral, and necessarily integrated with local planning initiatives. In practice, term sheets are a useful tool for engaging stakeholders and refining implementation strategies in an iterative process. Chapter 4 provides a detailed description of the established service goals. Chapter 6 outlines delivery options and capital costs.

To engage passenger rail agencies and other stakeholders with the term sheets, Caltrans organized meetings across the state, based on relevant geography and expertise. Feedback from these discussions was integrated through an iterative process, and ultimately aggregated into refined service goals and related capital costing in the 2040 vision.

Caltrans conducted 29 NISSP agency meetings. A list of these meetings is presented in Appendix A.



Caltrans staff held numerous public workshop meetings throughout the state, including at San Bernardino Santa Fe Depot Metrolink Station.

7.2 Stakeholder Involvement in State Rail Plan Preparation

Int the outreach process for the Rail Plan, the primary goals were to develop a plan integrated with other public-sector transportation plans, and to recognize and address the issues and concerns of key stakeholders. Accordingly, as part of the Rail Plan's development, the team consulted other statewide and regional planning documents. As noted in Chapter 1, these included federal and state plans, as well as regional plans generated by MPOs and RTPAs. Furthermore, as noted in this chapter, the outreach conducted for the Rail Plan included regional public transportation planners, freight and passenger rail operators, environmental and community advocates, and Native American representatives. Lastly, input on the Rail Plan has been sought from the neighboring states of Arizona, Oregon, and Nevada.

7.2.1 Stakeholder Advisory Committee

The SAC was convened by Caltrans in November 2015 as a technical working group to provide input and expertise in the development of the Rail Plan. The purpose of the SAC was to provide Caltrans with policy guidance and technical information on all aspects of the Rail Plan.

The Rail Plan SAC included representatives from diverse groups, including passenger rail operators, planning agencies, freight rail interests, Tribal Nations, private railroads, ports, transit operators, and neighboring states. Advocacy groups representing environmental, disadvantaged communities, livable community/ active transportation, and agricultural interests also participated on the committee.

Caltrans met with the SAC periodically to provide updates on their progress in developing the Rail Plan, and to gather input from various agencies, organizations, and other stakeholders on the content of the Rail Plan. Notes summarizing topics discussed at the SAC meetings can be found in Appendix A.

This SAC roster consists of representatives from the agencies and organizations listed in the following sections:

State and Federal Partner Agencies

- California Department of Transportation
- California State Transportation Agency
- California High-Speed Rail Authority
- Federal Railroad Administration
- California Transportation Commission
- California Air Resources Board
- California Public Utilities Commission
- California Governor's Office of Business and Economic Development

Passenger Rail and Transit

- Amtrak
- Capitol Corridor Joint Powers Authority/ Northern California Rail Partners
- San Joaquin Joint Powers Authority/Altamont Corridor Express
- Los Angeles-San Diego-San Luis Obispo Rail Corridor Agency Joint Powers Authority
- Los Angeles County Metropolitan Transportation Authority
- Caltrain
- Sonoma-Marin Area Rail Transit
- North County Transit District
- Southern California Regional Rail Authority
- California Transit Association

Freight Rail

- Union Pacific Railroad
- BNSF Railway
- California Short Line Railroad Association
- Genesee & Wyoming Inc.
- California Association of Port Authorities/ California Airports Council
- Pacific Merchant Shipping Association

Regional Planning

- California Association of Councils of Governments
- Metropolitan Transportation Commission
- Southern California Association of Governments
- San Joaquin Valley Regional Policy Council
- Sacramento Area Council of Governments
- San Diego Association of Governments

Advocates

- The Nature Conservancy
- California Farm Bureau Federation
- Local Government Commission

California State Agencies and Neighboring States

- Arizona Department of Transportation
- Nevada Department of Transportation

Tribal Representatives

- Northern California Tribal Chairmen's Association
- Central California Tribal Chairmen's Association
- Southern California Tribal Chairmen's Association

Additional Network Integration Strategic Service Planning Agency Engagement

- Placer County Transportation Commission
- Alameda County Transportation Commission
- Santa Cruz County Regional Transportation Commission
- San Benito Council of Governments
- Transportation Agency for Monterey County
- San Luis Obispo Council of Governments
- Santa Barbara County Association of Governments
- San Bernardino County Transportation Authority
- Metrolink
- San Diego Metropolitan Transit System

In addition to serving as a body for providing input and expertise for the Rail Plan, the SAC also served as a channel for disseminating information to the public. The Rail Plan outreach team coordinated with the SAC to provide updates, surveys, and opportunities to comment on the Rail Plan, using each stakeholder's contact lists and constituencies. For example, the study team disseminated the early engagement online survey to all members of the SAC, who were then able to publicize the survey to their respective groups. This resulted in an overwhelmingly successful response, with the public survey garnering nearly 2,200 responses in just over a month.

7.2.2 Interstate Coordination

The railroad network and the flow of goods and passengers on trains routinely cross state boundaries, as well as international borders. Many freight and passenger rail corridors serve multiple western states and Mexico. For example, proposed HSR services would link Los Angeles with Las Vegas and Phoenix. Therefore, the Rail Plan should coordinate with neighboring states and Mexico, where applicable.

Arizona

CalSTA met with the Arizona Department of Transportation in Phoenix on June 21, 2016, for the purpose of discussing coordination between the states. Arizona is currently beginning the process of updating its 2011 State Rail Plan, in conformity with FRA guidance. Both California and Arizona discussed the potential study of HSR services between Los Angeles and Phoenix, and interim strategies to improve services while HSR was being studied. Arizona agreed to be a member of the California State Rail Plan SAC, and has been an active participant in the meetings through teleconferencing.

Mexico

Caltrans and CalSTA have coordinated with SANDAG in an effort to examine better ways to improve public transportation and intercity passenger rail services to San Diego, with connections to the international border at Tijuana, as part of the network integration planning process. Caltrans and CalSTA met with SANDAG in San Diego on July 13, 2016, to discuss these network integration strategies. SANDAG is an active member of the SAC.

Nevada

Caltrans and CalSTA have coordinated with the Nevada Department of Transportation and Nevada High-Speed Rail Commission on future HSR connections between California and Nevada. The Rail Plan supports the implementation of HSR between Los Angeles and Las Vegas. Caltrans is also coordinating with Nevada to provide intercity connections to Reno. Nevada agreed to be a member of the Rail Plan SAC, and has been an active participant in the meetings through teleconferencing.

Oregon

Caltrans submitted the Draft 2018 California State Rail Plan to the Oregon Department of Transportation to provide the State of Oregon with an opportunity for review and comment.

7.2.3 Rail Partners Working Group

The ad hoc Rail Partners Working Group was formed to review technical approaches and methods for developing the NISSP. The ad hoc Rail Partners Working Group consisted of representatives from Caltrain, CCJPA, COASTER, LOSSAN JPA, Metrolink, SJJPA, SMART, NCTD (operator of COASTER and SPRINTER), and the CHSRA.

The ad hoc Rail Partners Working Group convened three times during the development of the Rail Plan. The first meeting was conducted on September 1, 2015. The purpose of this first meeting was to acquaint the ad hoc Rail Partners Working Group with the concepts and benefits of an integrated passenger rail network that focuses on the customer experience, and is oriented toward service enhancement and delivery; and to subsequently seek the group's comments and suggestions as the network integration planning proceeded. Presentation materials included system connectivity maps and vision scenarios. The group was invited to provide feedback to inform the further refinement of integrated network planning scenarios.

The second meeting of the Rail Partners Working Group was a series of breakout sessions by geographic region, conducted in Northern and Southern California, and designed to concentrate on further refinement of the service delivery maps developed in response to comments from the initial introductory meeting. These meetings occurred in Sacramento and San Diego in January 2016.

The third meeting was held in Los Angeles in April 2016, timed to coincide with the California Rail Summit.[237] The purpose of this meeting was to present preliminary vision statements, supported by planning principles used to articulate the vision. Initial freight forecasts and a discussion of the market assessment tool were provided, in addition to rough estimates of potential changes in ridership. A case study from Toronto was presented by an invited speaker working on the GO Transit network integration with VIA Rail and the Toronto Transit Commission. The benefits of electrification and more frequent service were discussed. The ad hoc Rail Partners Working Group were concerned that the baseline ridership forecast was not in alignment with existing passenger counts.

The outcome of these meetings informed methods and analytical processes, and resulted in the development of a final passenger rail vision that included the integrated rail service scenarios that would be presented to the SAC.

237 The California Rail Summit was a meeting of leaders in the rail industry, held to discuss the modernization and integration of passenger rail service in California.

7.2.4 Freight Railroad Coordination

Planning an integrated statewide rail network that allows for seamless travel of people and goods necessarily required a coordinated strategy between passenger and freight rail. At the beginning of the Rail Plan development, the team began formulating a strategic framework for new freight rail policies and programs, and worked with the Caltrans Office of Freight Planning to coordinate input for other Caltrans modal plans. The California SFAP, which is a multi-agency effort being undertaken in response to the Governor's Executive Order B-32-15, July 2015, provided an early opportunity for the State to better define its policies for investing in rail freight infrastructure. Accordingly, Caltrans coordinated development of a rail freight policy framework for the SFAP that is carried forward into the Rail Plan.

The development of the Freight Vision (Chapter 5) was an integral part of the freight element for the final Rail Plan, and required additional external coordination. Throughout the development of the Rail Plan, Caltrans held meetings with Class I and short-line freight railroads to review the freight methodology, and request input on the development of the freight element. Fourteen meetings with various freight railroads were conducted in 2016; a complete list of these meetings is provided in Appendix A.

California Freight Advisory Committee

Caltrans, in collaboration with CalSTA, established the CFAC in response to guidance provided in the federal transportation legislation, MAP-21. Consistent with MAP-21's guidance, the CFAC consists of "a representative cross-section of public and private sector freight stakeholders, including representatives of ports, shippers, carriers, freight-related associations, the freight industry workforce, the transportation department of the State, and local governments."

7.2.5 Native American Stakeholder Involvement

The purpose of the Native American outreach and government-to-government consultation process was to ensure opportunities to meet with, brief, obtain comments from, and consult with Native Americans. This process required:

- integrating Native Americans in the public process;
- holding Native American–specific outreach meetings; and
- developing a clear process for government-to-government consultation.

The focus of the outreach to Native Americans and government-to-government consultation with Native Americans and tribal communities was on listening sessions and formal consultations.

The study team coordinated with Caltrans' Native American Liaison Branch to identify existing Native American meetings, and to coordinate Native American outreach. The groups, meeting types, and logistics for both Native American outreach and government-to-government consultations included:

- the Native American Advisory Committee (NAAC) (Caltrans has committed to providing regular Rail Plan updates to the NAAC);
- the Northern California Tribal Chairmen's Association;
- the Central California Tribal Chairmen's Association;
- the Southern California Tribal Chairmen's Association;
- SANDAG, Interagency Technical Working Group on Tribal Transportation Issues (SANDAG Tribal Working Group); and
- the Reservation Transportation Authority.

Native American Advisory Committee

On August 12, 2015, Caltrans met with the NAAC to present a proposed timeline for Native American engagement for the Rail Plan. The sequence that was proposed is presented below.

- Initiate Native American engagement: August 2015 (with periodic updates).
- Convene the California State Rail Plan SAC: October 2015.
- Prepare Native American listening sessions and webinars: Spring 2016.
- Invite Native American Tribes to consult on the Rail Plan before draft development: 2016.
- Invite Native American Tribes to consult on the Draft California State Rail Plan: January 2017.
- Prepare the Draft 2018 California State Rail Plan: October 2017.
- Convene public workshops on the Draft 2018 California State Rail Plan: Fall 2017.
- Issue the Final 2018 California State Rail Plan: September 2018.

The study team also presented the following maps, which show where California tribal lands, the intercity and HSR networks, and the BNSF and UPRR operations routes intersect (Exhibit 7.4).

The NAAC noted that early engagement with the NAAC is positive, but offered further input on Native American engagement for the Rail Plan, indicating that the State should:

- provide regular updates on the development of the Rail Plan;
- effectively engage with tribes and offer government-to-government consultation before the release of the Draft 2018 California State Rail Plan;
- coordinate with the Northern, Central, and Southern California Tribal Chairman's Associations to fill the Native American positions on the SAC; and
- coordinate engagement efforts with scheduled tribal meetings.

Native American Listening Sessions

The Rail Plan outreach team held three listening sessions in different regions of the state to establish meaningful dialogue with California Native American Tribes about the Rail Plan, and to identify the concerns and priorities of tribal communities. These listening sessions were held in Redding, San Diego, and Sacramento, California. The Sacramento listening session also provided the opportunity for Native American participants to join remotely by webinar during the listening session. The Caltrans Native American Liaison Branch liaisons also shared the materials from these listening sessions at meetings with tribes, including the SANDAG Tribal Working Group. These listening sessions were held in partnership with the CHSRA and the SFAP, in response to Native American requests for joint informational meetings for related Caltrans activities.

These listening sessions were an important component of early engagement. They were held in preparation for a first round of invitations for government-to-government consultation on the Rail Plan. The listening sessions fostered project understanding and informed Native American Tribes and individuals of opportunities for early engagement in the Rail Plan. They offered Native American Tribes an opportunity to showcase regional issues of concern involving the Rail Plan and rail systems. Tribal participants' feedback from these listening sessions is summarized below. Transcripts and detailed summaries of these sessions were made available on the California State Rail Plan website (www.californiastaterailplan.com). A detailed summary of input provided at the Listening Sessions is provided in Appendix A.

Native American Formal Consultation

Engaging Native American Tribes was an important part of achieving the Rail Plan's mission to provide a safe, sustainable, integrated, and efficient California rail network that successfully moves people and goods, while enhancing the state's economy and livability. Pursuant to a number of federal and state laws, Caltrans formal consultation provides prior notice to tribes of at least 45 days. Caltrans invited tribes to consult on the Rail Plan 60 days in advance of the release of the Draft Rail Plan for public review. Consultation was offered to approximately 113 tribes through a formal letter on January 1, 2017, and a subsequent follow-up formal letter on October 12, 2017. For a list of the tribes that received consultation, see Appendix A.

Native American Outreach Effects

Several Native American Tribes responded to the Rail Planning team's outreach efforts, expressing concerns for cultural resources that may be affected as a result of rail project development. Although the Rail Plan itself is not a project for which effects to resources would occur, future rail development in the state will be guided by the Rail Plan's vision, values, and objectives. Given the tribes' concerns for potential effects to cultural resources, this plan seeks to emphasize the need for tribal coordination by future project proponents early in the project planning and development process. Such tribal outreach and coordination for any proposed rail development project is critical to the early identification of tribal heritage resources, and increases the likelihood that these resources will be avoided and/or given proper treatment and mitigation, as part of the project decision-making process.

Tribal outreach and consultation is required under state and federal law as part of the project environmental review process. Namely, under the California Environmental Quality Act, tribal consultation and recognition of tribal expertise for the protection of Tribal Cultural Resources is required in accordance with AB 52. Under the National Historic Preservation Act (36 CFR Part 800), agency officials must take into account the effects of their undertaking on historic properties (including tribal heritage resources). In addition, agency officials must make a reasonable and good faith effort to identify any Native American Tribes that might attach religious and cultural significance to historic properties in the area of potential effects, and invite them to consult on the project. The goal of the consultation under the National Historic Preservation Act is to identify historic properties potentially affected by the undertaking; assess the undertaking's effects; and seek ways to avoid, minimize or mitigate any adverse effects on historic properties. Future project proponents receiving state or federal funds or assistance would be subject to these state and federal laws pertaining to tribal consultation and historic preservation.

7.2.6 Rail Plan Public Workshops

The Draft 2018 California State Rail Plan was released on October 11, 2017, and commenced a 60-day public review period. During that time, Caltrans held seven public workshops throughout the state to disseminate information and engage the public.

The seven public workshops were held in Sacramento, Oakland, Fresno, San Luis Obispo, San Bernardino, Los Angeles, and San Diego, and more than 350 people attended the public workshops. In addition, Caltrans hosted a statewide webinar to allow for further participation, and more than 200 people took part in the online presentation.

During the public comment period, the public had the opportunity to make comments in person, online, or via email. In total, Caltrans received 626 public comments on the Draft 2018 State Rail Plan. Between the end of the comment period on December 11, 2017, and the release of the final Rail Plan, Caltrans worked to read, organize, and respond to all of the public comments received.



This page intentionally left blank.

Caltrans

2018 california state rail plan

www.californiastaterailplan.com