3A. Existing Freight System Assets

California has one of the most extensive, complex, and interconnected freight systems in the nation. With a rich history of freight infrastructure development dating to the opening of the first transcontinental railroad in 1869, California's freight network has become a vital economic force that connects the state to the rest of the country and the world. According to the California Chamber of Commerce, California's economy is the 5th largest in the world, poised to become the 4th, and the State's freight network plays a major role in securing its global economic position.[36]

In 2021, California exported to 226 foreign markets, valued at approximately $175.12 billion,[37] up from $155.9 billion in 2020 and $173.8 billion in 2019.[38] The freight system also facilitates commerce internally. The State's current core freight system is comprised of 1 private and 11 public deep-water seaports, numerous private port and terminal facilities, 12 airports with major cargo operations, 2 Class I railroads and 27 short line railroads operating over approximately 6,500 miles of railroad track, approximately 5,800 miles of high traffic volume Interstate and State highways, seven existing and one future commercial land border ports of entry (POE) with Mexico, intermodal transfer facilities, approximately 19,390 miles of hazardous liquid (includes crude oil, refined petroleum products, and other highly volatile liquids) and natural gas pipelines, a vast warehousing and distribution sector, and numerous local connector roads that complete the "last mile."

Maintaining and modernizing this extensive freight system requires continuous investment. Ports and their navigation channels must be dredged for ever larger ships; railroad track must be upgraded to handle heavier loads and faster trains; highway pavement must be strengthened to handle more trucks with more cargo; airports must balance passenger and air-freight demands; and innovative technologies must be developed and applied across the entire industry to improve efficiency and reduce costs. California must meet these daunting needs while also ensuring community and environmental impacts are avoided, minimized, or mitigated. At the same time, California must also meet the challenge of maintaining international competitiveness and retaining millions of freight related jobs.

Figure 3.1: Major Freight Facilities in California. (Source: Caltrans, 2023)

California's freight assets include an extensive inventory of infrastructure that is essential for supporting the multitude and diversity of freight dependent industries within the state. The smooth functioning of California's complex freight system depends on a series of interconnected facilities working in concert with one another. Each system component is typically owned and

operated by a different public or private organization, often in competition with other organizations that have similar facilities. Seaports compete against each other for domestic and international business. The Class I railroads that serve California are the nation's two largest railroads and are competitors, yet they also often coordinate their operations to safely share the same track. And like the railroads, each trucking company is in competition with many other trucking and logistics firms and owner/operators. **Figure 3.1** highlights California's major freight facilities.

Freight Highway Assets

NATIONAL HIGHWAY SYSTEM (NHS)

According to the FHWA, the National Highway System[39] consists of roadways important to the nation's economy, defense, and mobility. The NHS includes the following subsystems of roadways (note, a specific highway route may be designated on more than one subsystem):

- Interstate: The Eisenhower Interstate System of highways retains its separate identity within the NHS.
- Other Principal Arterials: These are highways in rural and urban areas which provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility.
- Strategic Highway Network (STRAHNET): This is a network of highways which are important to the United States' strategic defense policy and which provide defense access, continuity and emergency capabilities for defense purposes.
- Major Strategic Highway Network Connectors: These are highways which provide access between major military installations and highways which are part of the Strategic Highway Network.
- Intermodal Connectors: These highways provide access between major intermodal facilities and the other four subsystems making up the National Highway System. Within California, there are currently 122 miles.[40]

NATIONAL HIGHWAY FREIGHT NETWORK IN CALIFORNIA

The National Highway Freight Network (NHFN) consists of the following subcategories: The Primary Highway Freight System (PHFS) including routes and connectors, portions of the Interstate System not part of the PHFS (non-PHFS), Critical Rural Freight Corridors (CRFC), and Critical Urban Freight Corridors (CUFC). The CRFCs and CUFCs are important freight corridors that provide critical connectivity to the NHFN. **Table 3.1** shows the four California freight systems and their respective total lengths in miles. The full list of routes and facilities that comprise the various systems is presented in **Appendix D**.

One of the more dynamic components advised through Federal statue is the process of designating the critical corridors initiated by Metropolitan Planning Organizations (MPO) for CUFCs and initiated by Caltrans for CRFCs. Designating CUFCs and CRFCs is a collaborative effort and all miles must be certified by the FHWA. For the CUFC/CRFC Designation Process, refer to **Appendix E**.

Table 3.1: National Highway Freight Network in California

Freight System	Total Length (Miles)
California Primary Highway Freight System (PHFS)	3126.28
California Non-PHFS Interstate Highway	352.12
Critical Urban Freight Corridors	192.3
Critical Rural Freight Corridors	101.2

As stated above, California has a vast inventory of freight assets, allowing the State to support various freight dependent industries and making it a top competitor with neighboring states such as, Oregon, Nevada, and Arizona. **Table 3.2** compares California's PHFS miles, Truck VMT, and Rail Miles with its neighboring states.

Table 3.2: California's Freight Movement Compared to Neighboring States

State	PHFS (Miles)[41]	Truck VMT* (% of State's total VMT)[42]	Rail Miles[43]
California	3126.28	20.9%	4,828
Oregon	775.32	32.1%	2,382
Nevada	572.79	21.4%	1,193
Arizona	1025.62	24.9%	1,820
Truck VMT are listed as a percentage of the respective State's total VMT.			

Intermodal connections are an essential consideration in the discussion of freight movement within California. These connections provide access to intermodal facilities where transloading of freight occurs between multiple modes, allowing for the least amount of handling and overall delay. Intermodal connectors are generally associated with airports, seaports, rail yards, and warehousing facilities where the transfer of freight is completed on-site. The access to and from these intermodal facilities is typically located along local roadways which connect to Interstate and State Highway freight corridors and serve as the "last mile" for freight movement.

Often these local arterials and roadways have not been designed to accommodate the largest combination vehicles and are not designated Surface Transportation Assistance Act (STAA) routes. The STAA directs US DOT to create the National Network (NN) where States would be required to allow the operation of tractors with single and double trailers; it covers about 150,000 miles.[44] Additionally, they are not engineered to accommodate the amount of Average Annual Daily Truck Traffic (AADTT) that exists on the roadway either. Despite this, some of the roadways have among the highest AADTTs in the state. Many of the environmental and community impacts from freight can be most prevalent along these local intermodal connectors shown in **Table D.2** in **Appendix D**. In addition, **Table D.4** in **Appendix D** lists California's freight intermodal connectors organized by type (truck/rail, truck/pipeline, port terminal, and airport) designated

on the NHS.

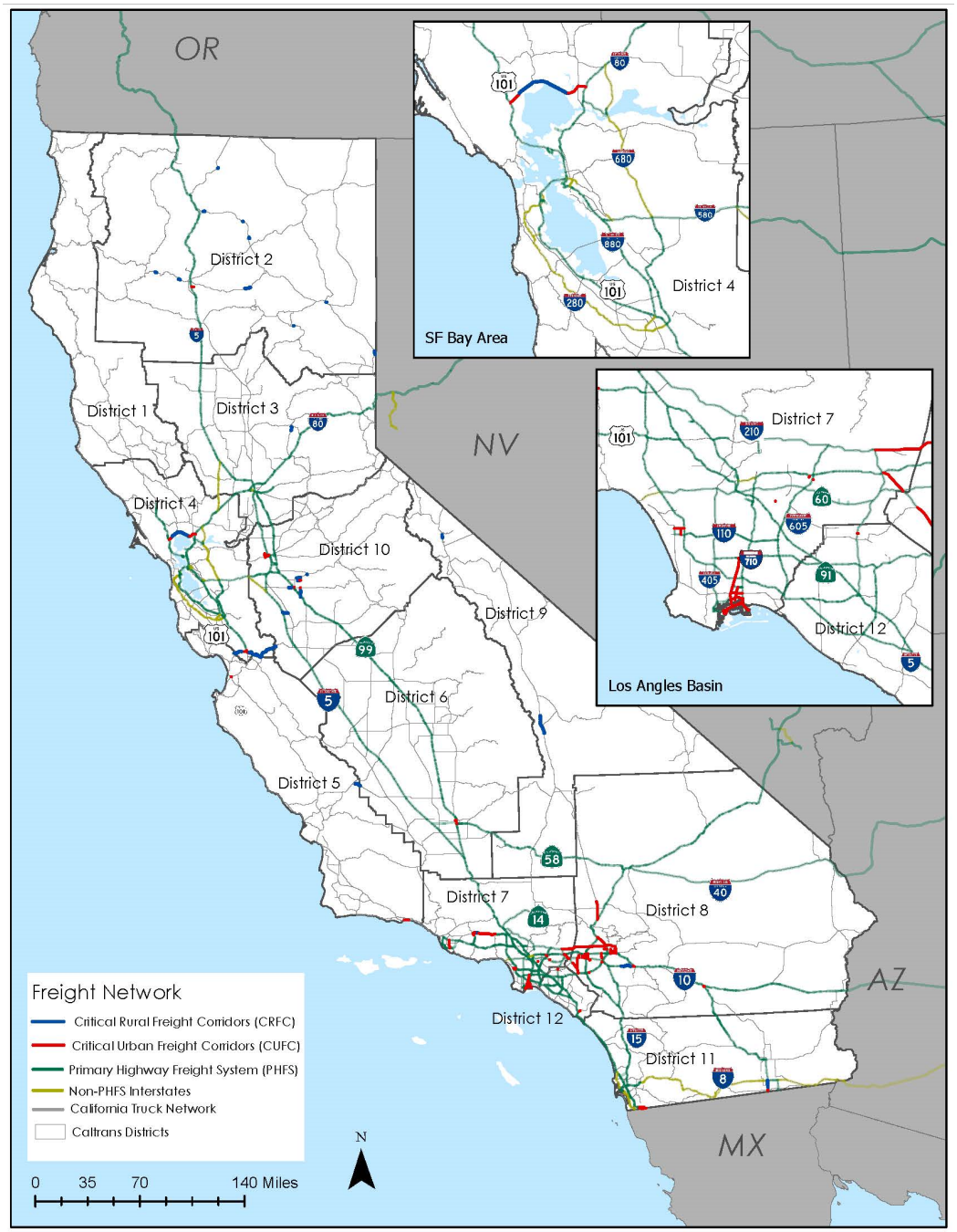

Figure 3.2: National Highway Freight Network and CA Freight Network in California. (Source: Map produced using data from FHWA Freight Management and Caltrans, 2022)

Interregional Transportation Strategic Plan (ITSP) 2021

The ITSP provides guidance for the identification and prioritization of interregional transportation improvements. Projects identified are eligible for Interregional Transportation Improvement

Program (ITIP) funding. The 2021 ITSP expanded the analysis from focusing on ITIP investment in interregional highways and intercity rail to analyzing the entire interregional transportation system regardless of funding source. The purpose of the ITSP is to be a guiding document for all investments in the interregional transportation system. The 11 ITSP Strategic Interregional Corridors comprise a subset of legislatively designated interregional routes, known as the Interregional Road System (IRRS). California's IRRS includes key corridors for the movement of freight and people within the state and is currently considered Caltrans' priority for the allocation of interregional funds. **Figure 3.3** shows all Strategic Interregional Corridor areas identified on California's Highway Freight Network. [45]

Although Caltrans has designated the Strategic Interregional Corridors for funding priority, funding has not kept pace with the costs of meeting growth demands and improving system performance and safety; the estimated cost to improve selected locations on this highway system in most of the 11 Strategic Interregional Corridors is in excess of $10 billion.[46] The 2021 ITSP identifies I-5, SR 99, and I-10 as having some of the highest truck volumes in the nation outside of urbanized areas. These routes have higher than average volumes of large, long-haul trucks using all lanes for travel and passing, which creates potential safety and capacity problems for interregional travelers who also use those routes.

Trucking is the most commonly used mode for California's freight transportation and trucks transport almost all freight and services during some point within the supply chain. For this reason, the trucking industry is one of California's most valuable freight assets, particularly for the "first and last mile" of a trip. California must continue to develop, maintain, and operate a safe, efficient, and reliable freight transportation network to accommodate the truck volumes necessary to move freight within the state.

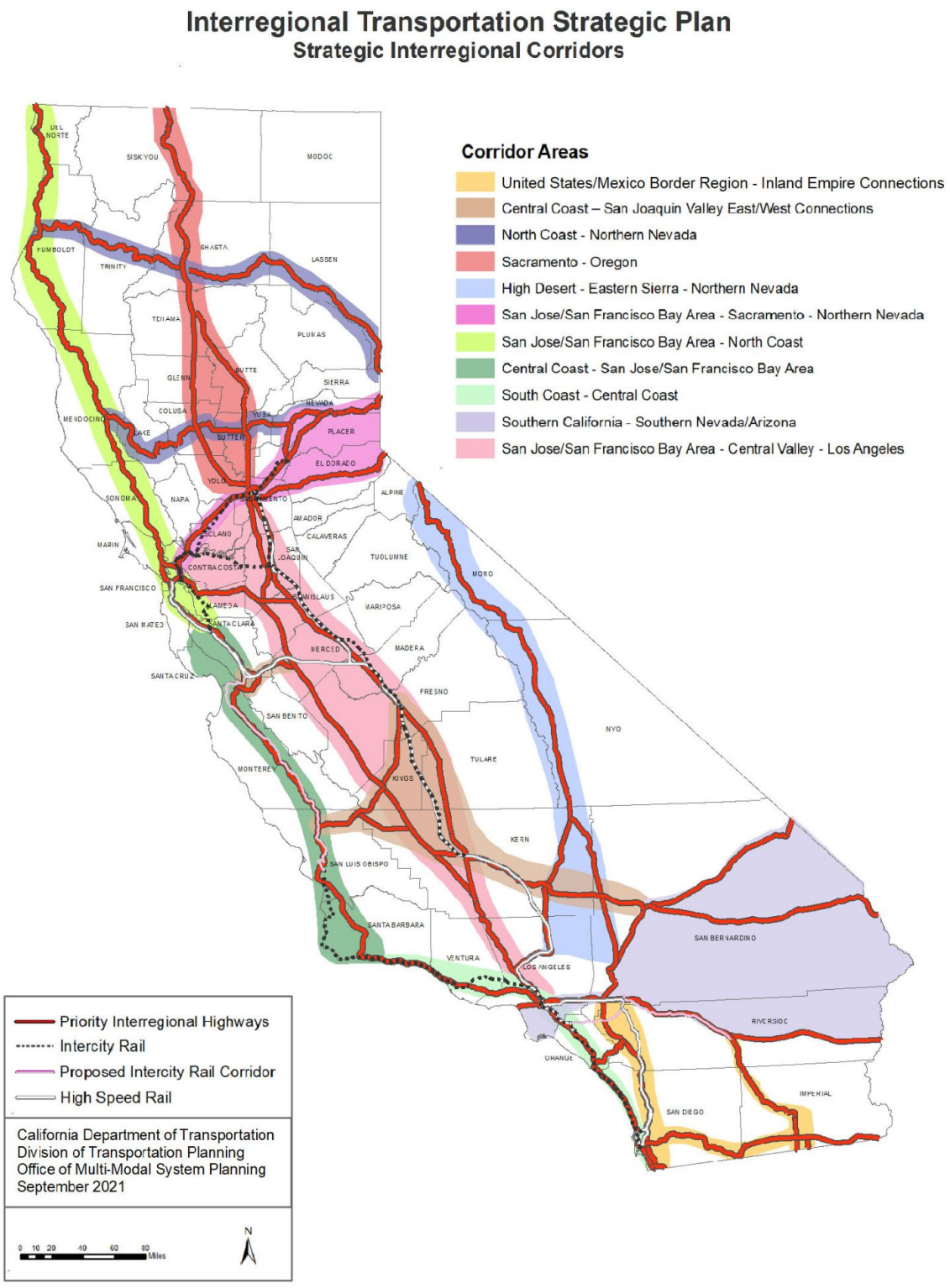

Figure 3.3: Strategic Interregional Corridors. (Source: Caltrans, Interregional Transportation Strategic Plan 2021)

INTERNATIONAL BORDER CROSSINGS

In 2019, US Congress approved the United States-Mexico-Canada Agreement (USMCA) signed by President Trump in 2020. The agreement updates the North American Free Trade Agreement (NAFTA), which governed more than $1.2 trillion worth of trade among the three nations. The USMCA will create more balanced, reciprocal trade that supports high-paying jobs for Americans and grows the North American economy. Some highlights of the agreement include:

- Creating a more level playing field for American workers, including improved rules of origin for automobiles, trucks, other products, and disciplines on currency manipulation.
- Benefiting American farmers, ranchers, and agribusinesses by modernizing and strengthening food and agriculture trade in North America.
- Supporting a 21st Century economy through new protections for U.S. intellectual property and ensuring opportunities for trade in U.S. services.

California and Mexico share over 130 miles of international border, consisting of the southernmost portions of San Diego and Imperial Counties. This California-Baja California region represents the largest integrated economic zone along the U.S. Mexico Border.[47] According to the California Chamber of Commerce in 2019, Mexico became the United States' top trading partner. Since NAFTA was signed in 1994, trade between the two countries has increased by more than 225%. Following the signing of USCMA, cross-border trade flows have increased to more than $68 billion in the California-Baja California region alone – a figure amounting to more than $1 million of goods and services traded per minute.[48,49] The commercial land border ports of entry (POEs) are the main arteries for freight movements between the two nations. California's multimodal state freight system includes all of the existing and future commercial land border POEs between California and Mexico, which include Otay Mesa (SR 905), Otay Mesa East (SR 11) - a future commercial land border POE currently under construction, Tecate (SR 188 and SR 94) in San Diego County, and Calexico East (SR 7) in Imperial County. **Figure 3.4** provides information for California-Mexico land border POEs.

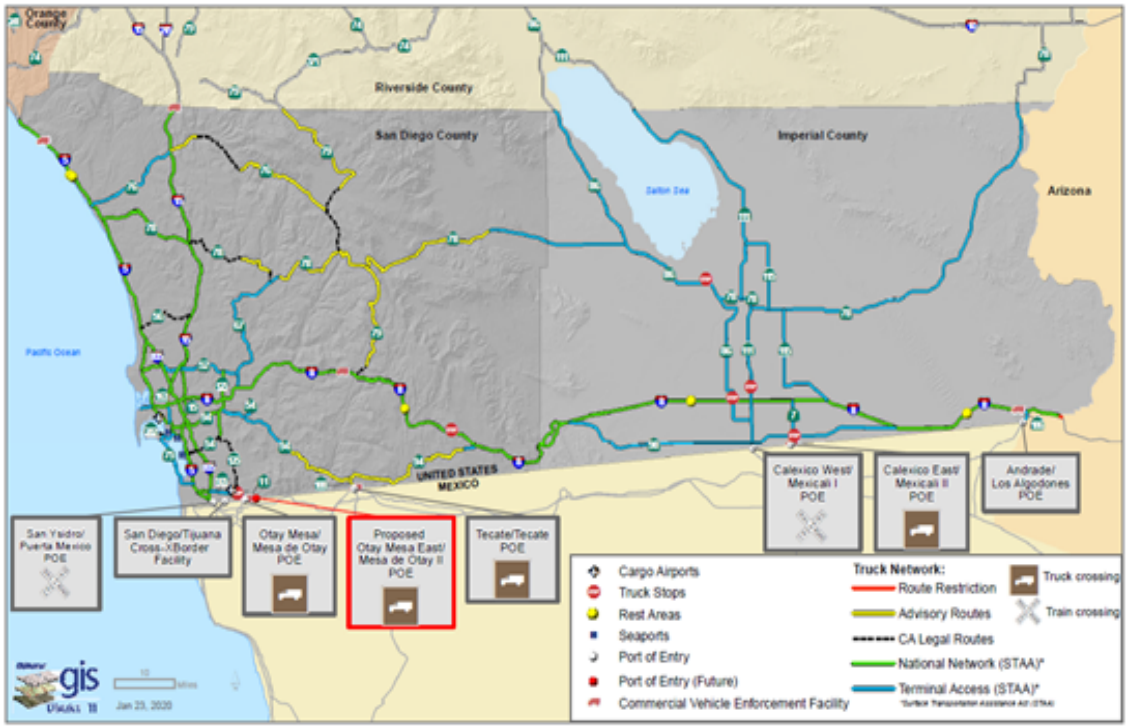

Figure 3.4: Major Freight Facilities along the California-Baja California Border (Source: Caltrans 2023)

Otay Mesa POE in San Diego County and the Calexico East POE in Imperial County are the two main California-Mexico freight gateways. The Otay Mesa POE is the third busiest commercial land border POE on the U.S.-Mexico border by trade value and the busiest commercial land port in California. Major commodities transported between California and Mexico through the POE include plastic; rubber; pulp; paper; allied products; electronics; electrical machinery, equipment, and supplies; automobiles and light duty trucks; food; grain products; and farm products. Projections for northbound commercial vehicle volumes in the California-Baja California region estimate 178% overall growth from 1.2 million in 2015 to nearly 3.4 million in 2040. About 27% of the future total (about 900,000) is expected to be processed at the future Otay Mesa East facility, while Otay Mesa, Calexico East, and Tecate are anticipated to process the remaining 50%, 20%, and 3% of the 2040 annual total, respectively.[50]

The future Otay Mesa East POE represents two decades of work that has brought together state, federal, regional, and local stakeholders. A tolled highway (SR 11) will provide access to the future Otay Mesa East POE on the California side with construction of the final segment breaking ground Summer 2022 and expected completion in 2024. The POE is expected to generate a benefit-cost ratio of 10 to1, meaning for every dollar spent on the project there would be $10 in benefits to California realized. This new POE will help reduce freight and passenger traffic congestion at the San Ysidro, Otay Mesa, and Tecate POEs, as well as provide additional capacity for future growth by providing a new alternative for freight operators traversing the California-Mexico border. The POE will be the nation's first transformative land POE to integrate a suite of innovative technologies designed to improve regional security and safety, bolster

binational economic productivity and goods movement, provide resiliency to the border transportation network, reduce greenhouse gas emissions, and enhance health in surrounding environmental justice communities.

ROADWAY BRIDGES

According to the Caltrans 2021 State Highway System Management Plan, California's SHS includes approximately 13,246 lane miles of bridges and tunnels[51]. These highway bridges have an average age of 48 years. New bridges are designed with an expected design life of 75 years. Bridge health is critical to freight movement because bridge closures can redirect trips – lengthening travel time, wasting fuel, reducing efficiency, and delaying emergency deliveries and services. Detailed information about bridge performance and vertical clearance restrictions is presented in **Chapter 3B**.

TRUCK PARKING

According to the FWHA report 'Jason's Law Truck Parking Survey Results and Comparative Analysis,' California is one of three states in the nation with the lowest rates of commercial vehicle truck parking spaces per 100,000 miles of daily combination truck VMT. The lack of available truck parking is a national safety concern, observed most notably in the number of crashes involving a parked truck. **Figure 3.5** shows the number of crashes involving a parked truck between 2014 and 2018 and **Figure 3.6** shows where those crashes occurred statewide. Demand for truck parking continues to increase as industries pivot from brick-and-mortar stores to online shopping and home delivery-- straining an already over-burdened goods movement system.

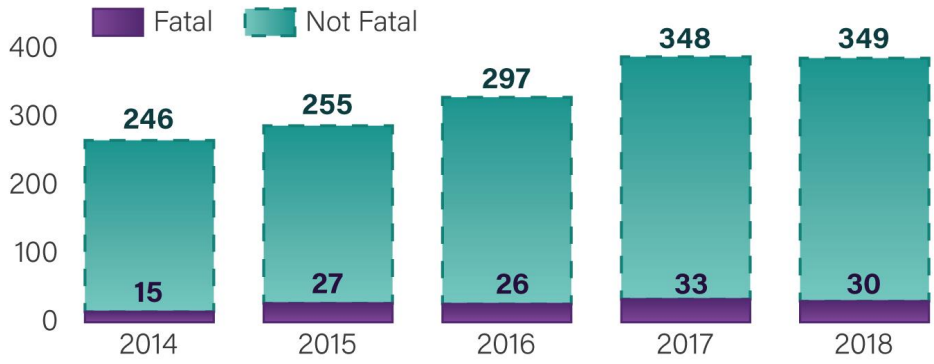

Figure 3.5: Statewide Crashes Involving a Parked Truck, 2014-2018. (Source: California Statewide Truck Parking Study, 2022)

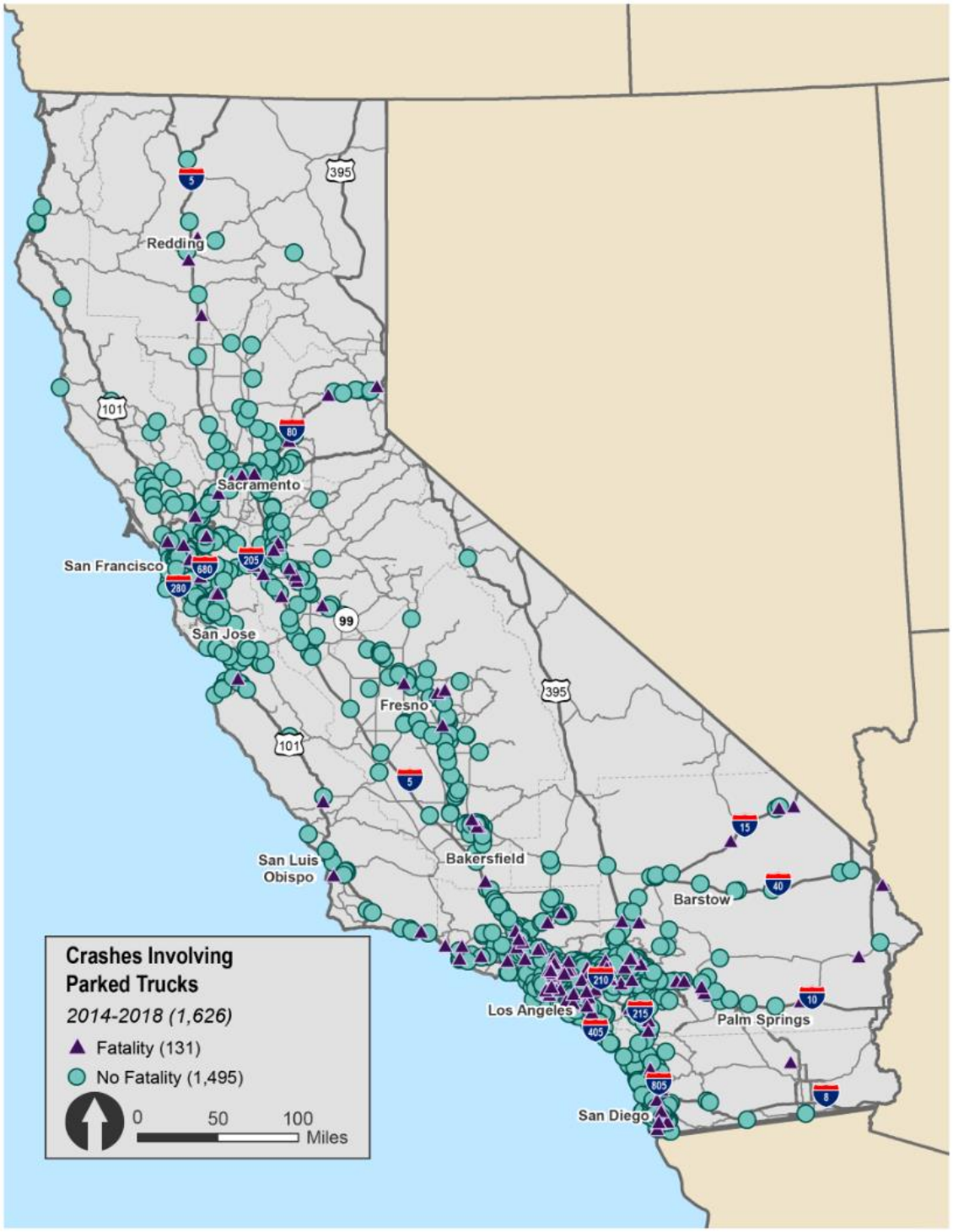

Figure 3.6: Statewide Crashes Involving a Parked Truck, 2014-2018. (Source: California Statewide Truck Parking Study, 2022)

In addition to safety concerns, truck drivers searching for parking leads to unnecessary fuel consumption and contributes to air and noise pollution and greenhouse gas (GHG) emissions. These effects are exacerbated in neighborhoods and cities that experience frequent truck parking in undesignated areas, many of which are equity priority communities (EPCs).

Demand for truck parking continues to increase as industries pivot from brick-and-mortar stores to online shopping and home delivery, straining an already over-burdened goods movement system. California has high levels of truck parking in absolute terms but has low levels relative to truck VMT, NHS miles, and GDP; and also has notable shortages at private truck stops.[52]

According to the MAP-21 Section 1401, more popularly known as Jason's Law, DOTs are required to address the national truck parking shortage at public and private facilities along U.S. highways. FHWA conducted the first round of the Jason's Law Truck Parking survey in 2015.[53] The survey identified several parking indicator metrics to evaluate the supply and demand for truck parking in each state. However, California has very high demand for truck parking, and about 40 percent of truck drivers indicated that they perceive a shortage of truck parking in the state. California ranked in the lower quartile among all states for five metrics:

- Public Spaces per 100K Daily Truck VMT
- Private Spaces per 100K Daily Truck VMT
- All Spaces per 100K Daily Truck VMT
- Public Spaces per 100 miles of NHS
- Spaces per Million GDP

According to the California Statewide Truck Parking Study, 264 of the 274 public and private truck parking sites in California have parking data available. Of those, about half are nearing, at, or over capacity meaning that at least 70% of the available spaces are full during peak demand (see **Figure 3.7**). Truck parking demand is typically highest overnight, and facilities often are at or over capacity during these hours. Statewide, the peak hour for truck parking is from 12:00 a.m. to 1:00 a.m., although the peak hour varies by specific locations. **Table 3.3** shows the peak hour truck parking space shortage or surplus by Caltrans district.

Figure 3.7: Demand at Designated California Truck Parking Locations. (Source: California Statewide Truck Parking Study, 2022)

Table 3.3: Peak Hour Truck Parking Space Shortage or Surplus by District

District	Parking Supply	Total Parking Demand (Designated and Undesignated)	Peak Hour Shortage or Surplus	Shortage or Surplus as a Percentage of Supply
1- North Coast	87	20	67	77%
2- Redding	1,220	1,096	124	10%
3- Sacramento	1,032	1,601	-569	-55%
4- Bay Area	983	1,491	508	-52%
5- Central Coast	334	371	-37	-11%
6- Central Valley	3,249	2,797	452	14%
7- Los Angeles	661	1,532	-871	-132%
8- Inland Empire	3671	5,538	-1,867	-51%
9- Eastern Sierra	448	476	-28	-6%
10- Stockton	2,020	2,310	-290	-14%
11- San Diego	1,185	938	247	21%
12- Orange County	35	157	-122	-350%
Total	**14,925**	**18,329**	**-3,404**	**-**
Source: California Statewide Truck Parking Study (2022)				

The analysis corridors for the California Statewide Truck Parking study, for which ATRI GPS data were collected, are the primary corridors traveled by trucks, nevertheless they represent a small portion of all roadways in the State. Stakeholder input and anecdotal evidence indicates that a large amount of undesignated parking occurs on many other roadways, private land, vacant lots, or other non-roadway locations but that was not quantified as part of this study. While ATRI provides an accurate and a rich dataset, they do not represent all trucks traveling through California. **Table 3.4** shows a sample of truck counts taken at weigh-in-motion (WIM) count sites in the State and the ATRI GPS truck counts at those same locations and during the same time periods. The ATRI data capture between eight and 38 percent of all trucks on the road at the selected locations. The average percent capture is 25 percent, which is an expansion factor of four. For example, if ATRI data indicate 20 trucks in their database parked at a particular location, it is estimated that approximately 80 trucks, or four times the number of trucks in ATRI's database, likely parked there. An expansion factor of four was used for all locations except those in District 11 (San Diego) where the Study used an expansion factor of five. Based on validation of the data in that district, the ATRI data appeared to capture less of the trucks in that region. In a similar study in Texas, a slightly lower percent capture also was found along the border region.

Table 3.4: American Transportation Research Institute Data Capture

WIM Location	WIM Count	ATRI Count	Total % ATRI Capture
Devore NB (I-215)	244,194	92,755	38%
Hayward NB (I-880)	310,815	91,543	29%
Bowman EB (I-80)	228,166	64,874	28%
Indio EB (I-10)	352,959	88,986	25%
Redding NB (I-5)	304,797	75,763	25%
Cholame EB (CA-46)	141,267	34,971	25%
Artesia EB (91)	384,628	94,277	25%
Vacaville EB (I-80)	349,638	81,540	23%
Tulloch EB (120)	21,659	4,657	22%
Balboa NB (I-15)	206,150	40,387	20%
Fresno NB (99)	636,659	116,243	18%
Elmira NB (I-505)	81,879	12,495	15%
Poggi NB (I-805)	169,603	14,934	9%
Leucadia NB (I-5)	461,996	35,808	8%
Source: Caltrans WIM data and ATRI data. Analysis by Cambridge Systematics (2021).			

The Federal Hours of Service (HOS) and Electronic Logging Devices (ELDs) requirements have further exacerbated the need for parking that is consistently available, safe, and provides basic amenities. **Chapter 4A** discusses HOS and ELD requirements in more detail.

In response to this critical need for additional truck parking, Caltrans initiated a truck parking advisory committee (TAC) in 2017 to identify needs and priority areas. The TAC consists of drivers, small and large fleets, beneficial cargo owners, and several CFAC members. Caltrans led a survey of TAC members, Caltrans Districts, and regional agencies. The survey results lacked detail on where the most critical truck parking needs are in the state. The survey highlighted the need for Global Positioning Systems (GPS) data or similar types of data to be able to determine exactly where drivers are experiencing shortages, where unauthorized and/or unsafe parking is occurring, and where demand for parking exists. Given this need for data, Caltrans initiated a comprehensive California Statewide Truck Parking Study to identify existing truck parking shortages and new potential locations, and to develop public and private partnerships for enhanced truck parking supply and dissemination of truck parking availability information. **Table 3.5** shows the distribution and demand of truck parking locations by each Caltrans district, and **Table 3.6** provides additional details regarding these locations. The plan was completed in February 2022.

In addition to gathering crucial truck parking data, the study also developed a prioritized demand factor to analyze it. In this analysis, major freight corridors across the state were divided into segments that could be more easily assessed. For each segment, the total number of trucks

parked at designated and undesignated locations within the segment at the statewide peak hour was subtracted from the total number of designated truck parking spaces. The shortage or surplus was then normalized by dividing it by the segment length. For example, a 10-mile segment with 20 designated truck parking spaces, 23 trucks parking at designated locations, and 7 trucks parking in the ROW (undesignated parking) would have a shortage of 10 spaces, or one space per mile. **Figure 3.8** shows the results of this analysis. Note that all segments shown in color (green, yellow, or red) have a truck parking supply gap. The colors indicate how severe the need is compared to all segments in the state. While urbanized areas like Los Angeles, Sacramento, and the Bay Area have some of the highest clusters of need, every Caltrans District includes corridors with high unmet parking demand.

Table 3.5: Demand at Designated Locations by District

District	Number of Locations	Number of Spaces	24-Hour Demand	Percent of 24-Hour Demand	Peak Utilization (Peak Demand/Supply)
1—North Coast	7	87	9	3%	3%
2—Redding	28	1,220	1,806	11%	72%
3—Sacramento	24	1,032	1,970	10%	91%
4—Bay Area	23	1,033	229	5%	57%
5—Central Coast	11	334	545	3%	82%
6—Central Valley	51	3,307	5,508	19%	76%
7—LA	10	661	861	4%	49%
8—Inland Empire	50	3,671	8,105	19%	103%
9—Eastern Sierra	11	448	1,183	4%	100%
10—Stockton	33	2,020	4,117	13%	90%
11—San Diego	25	1,185	1,098	10%	44%
12—Orange County	1	35	2	0.4%	4%
Total	274	15,033	25,407	100%	81%

Source: ATRI. Analysis by Cambridge Systematics (2021).

Figure 3.8: Truck Parking Prioritized Demand Factor. (Source: California Statewide Truck Parking Study, 2022)

Table 3.6: Public and Private Trucking Related Units

Ownership	Number of Locations	Percent of Locations	Number of Spaces	Percent of Spaces
Public	86	31%	1,209	8%
Commercially Owned: National Chain Truck Stops	60	22%	8,496	57%
Commercially Owned: All Other	128	47%	5,328	35%
Total	**274**	**100%**	**15,033**	**100%**
Source: California Statewide Truck Parking Study (2022)				

ALTERNATIVE FUELING LOCATIONS

At the national level, the FHWA has designated alternative fuel corridors to establish a national network of alternative fueling infrastructure along the National Highway System. As of 2021, FHWA has nominated portions or segments of 134 Interstates and 100 US highways and state roads, covering more than 166,000 miles of the NHS throughout 49 states and the District of Columbia.[54]

At FHWA's behest and owing in part to a statewide commitment to renewable energy and the reduction of greenhouse gas emissions, alternative fueling locations have proliferated throughout California, and many are available for use by trucks on California's Highway Freight Network. **Figure 3.9** shows the locations of alternative fueling locations by fuel type.

At the time of this plan being written, the California Transportation Commission (CTC) was preparing a Clean Freight Corridor Assessment, required by SB 671. This assessment will identify six corridors in California and the infrastructure needed to support zero emission freight vehicles. More information about this assessment is provided in **Chapter 4A: Trends, Issues, and Opportunities**.

WEIGH-IN-MOTION SCALES AND TRUCK ACTIVITY MONITORING SYSTEM

As of 2022, California has 144 weigh-in-motion (WIM) scales in operation throughout the state. WIM devices are designed to capture and record axle weights and gross vehicle weights as vehicles drive over a measurement site as opposed to requiring vehicles to come to a complete stop to measure their weight. California's WIM locations provide 24-hour traffic information, including axle weights and gross weights, axle spacing, vehicle classification, speed, and overall length. This data is subsequently used to inform pavement studies, highway monitoring and capacity studies, accident rate calculations, and load factor calculations for structures. **Figure 3.10** shows the location of California's WIM locations.[55]

Figure 3.9: California Alternate Fuel Corridors and Fueling Stations. (Source: Data from FHWA HEPGIS and U.S. Department of Energy Alternative Fuels Data Center 2018)

Figure 3.10: California Weigh-In-Motion Stations and Truck Activity Monitoring Stations. (Source: Data from Caltrans Division of Traffic Operations 2018)

Figure 3.11: Freight Locomotives, BNSF & UPPR

Freight Rail Network

The freight railroad system in California is comprised of two Class I railroads and 27 Class III railroads, commonly referred to as "short line" railroads. This freight rail network supports the operations of industries throughout the state and links California with domestic, interregional, and international markets. Railroads are grouped into three classes, based on their annual operating revenue[56]:

- Class I - $943.9 Million or more
- Class II - Less than $943.9 Million but more than $42.4 Million
- Class III – Less than $42.4 Million

In 2019, total operating revenue nationally for Class I railroads was approximately $74.3 billion[57]. In 2019, railroads in California handled 158.9[58] million tons of commodities. There are no Class II railroads operations in California currently. **Figure 3.12** shows California's Class I and Class III freight railroads.

Figure 3.12: Railroad Ownership in California. (Source: Caltrans, State Rail Plan 2023)

The two Class I railroads operating in California are the Union Pacific Railroad (UPRR) and the BNSF Railway Company (BNSF). UPRR is the largest railroad in California by number of employees, payroll, and track-miles in operation. UPRR operates an expansive network of rail lines that serves diverse regions of California, including the agriculturally rich San Joaquin Valley, the Port of Oakland, the San Francisco Bay Area, and the Los Angeles metropolitan area. UPRR also provides strategic freight rail movement to California's Central Coast as it parallels the US 101 corridor. For its carload services, UPRR operates two system classification yards at West Colton in Southern California and Roseville in Northern California, three regional yards in Lathrop (San Joaquin County), Commerce (Los Angeles County), and Yermo (San Bernardino County), and a rail port in Oakland (Alameda County). UPRR also has shared use of the on-dock rail terminals at the Port of Los Angeles (POLA) and Port of Long Beach (POLB) with BNSF. UPPR operates nearly 3,292 miles of track within California and handled over three million carloads in California in 2017.[59] **Table 3.7** includes the key operating characteristics for UPRR.

The BNSF Railway Company is the largest intermodal carrier in the U.S. and is the product of mergers and acquisitions of nearly 400 different railroad lines, including two major railroads (Burlington Northern Railroad and the Atchison, Topeka and Santa Fe Railway). Within California, BNSF operates on more than 2,000 track miles. In 2017, there were nearly 2 million BNSF carloads originating and terminating in the state. Major BNSF freight hubs include 11 carload yards, five dedicated intermodal terminals, and the shared on-dock rail facilities at the POLA and POLB. Along with the on-dock terminals at the POLA and POLB, significant BNSF's intermodal facilities in California include off-dock terminals at the Hobart Yard near downtown Los Angeles, the San Bernardino Intermodal Yard, and the OIG near-dock terminal in Oakland. California serves as a gateway to BNSF's Transcontinental Corridor, which links the POLA and POLB with Chicago.[60] **Table 3.7** includes the key operating characteristics for BNSF.

Table 3.7: Class I Railroad Operating Characteristics in California

Name	Employees	Payroll (Millions of Dollars)	Tracks Miles Owned	Track Miles with Tracking Rights	Total Miles Operated	Originating Carloads	Terminating Carloads
BNSF	3,655	$283.8	1,149	965	2,114	1,948,082	1,982,279
UPRR	4,783	$462.8	2,773	515	3,292	1,537,094	1,594,670
Source: Caltrans California State Rail Plan 2018							

SHORT LINE RAIL

To shippers, the ability to use short line railroads means lower transportation costs, more flexible local service options, and a greatly expanded market reach for local products through their Class I railroad partners. Without short line railroads, businesses would be forced into more expensive truck transloads (freight transfer between modes or from smaller to larger trailers) that typically take place in large cities adding more trucks on an already congested metropolitan highway system. Short line railroads' direct access to industrial, mining, commercial, and agricultural processing facilities enables the shipment of loads that are too heavy for trucks to transport over the roadway. For many companies, access to short line railroads is essential to their business viability.

California has 27 active short line railroads (two of which are primarily operating passenger trains). This includes 20 short lines and seven switching and terminal railroads which collectively operate over 1,600 route-miles. **Table 3.8** lists California's short line and switching and terminal railroads.

Table 3.8: Short Line Railroads in California

Local Railroads	Standard Carrier Alpha Code	Total Miles Operated
Arizona & California Railroad	ARZC	297 (83 in CA)
California Northern Railroad Company	CFNR	250
Central California Traction Company	CCT	16
Central Oregon & Pacific Railroad	CORP	362 (65 in CA)
Goose Lake Railway	GOOS	105 (90in CA)
Los Angeles Junction Railway Company	LAJ	64
Modesto and Empire Traction Company	M&ET	50
Napa Valley Railroad Company	NVRR	21
Northwestern Pacific Railroad Company	NWP	61
Oakland Global Rail Enterprise	OGRE	15
Pacific Harbor Line	PHL	59
Quincy Railroad Company	QPR	3
Richmond Pacific Railroad Corporation	RPRC	12
Sacramento Valley Railroad	SAV	7
St. Paul and Pacific Railroad Company	SPP	31
San Diego & Imperial Valley Railroad	SDIY	33
San Francisco Bay Railroad	SFB	5
San Joaquin Valley Railroad Company	SJVR	371
Santa Cruz, Big Trees & Pacific Railway	SCBG	9
Saint Paul & Pacific Railroad	SP&P	32
Santa Maria Valley Railway	SMVRR	14
Sierra Northern Railway	SERA	68
Stockton Terminal and Eastern Railroad	STE	25
Trona Railway Company	TRC	31
Ventura County Railroad Company	VCRR	9
West Isle Line, Inc.	WFS	5
Oakland Terminal Railway	OTR	10

TOTAL		**1615**
Source: Caltrans, Short Line Rail Improvement Plan, 2021		

PASSENGER RAIL OPERATING ON FREIGHT RAIL LINES

In addition to freight trains, the freight rail network also accommodates the operation of passenger trains throughout the state. In the past, the main freight rail lines had excess capacity to allow the use of passenger trains with little impact to the freight service. Passenger service volumes along these shared-use rail corridors have expanded, along with expansion of freight volumes, resulting in a primary railroad network that is more congested. Many current shared-track operations involve passenger services operation over tracks owned by BNSF and UPRR. These operations include all three State-supported routes (portions of the Pacific Surfliner, San Joaquin and Capitol Corridor) and the four Amtrak long-distance trains operating in the state, as well as several commuter services such as Metrolink, Caltrain, and the Altamont Corridor Express.

ON-DOCK AND NEAR-DOCK RAIL

On-dock and near-dock rail facilities play an integral role in the movement of cargo from the dock to rail yards. On-dock facilities are located within a marine port terminal, allowing containers to be moved directly from the dock to the railcar. On-dock terminals handle a significant number of containers (1.84 million lifts in 2010) with volumes projected to reach 6.3 million lifts by 2035. Through its elimination of truck drayage, on-dock rail intermodal transfer is perhaps the most efficient way to handle trainloads of international intermodal containers. Near-dock terminals (facilities that are within a five-mile radius of the port terminal) are essential for providing additional container handling capacity that minimizes long-distance drayage trips. Off-dock intermodal facilities are rail yards located more than five miles from port terminals. Off-dock intermodal facilities provide substantial capacity for handling port-related (international) containers as well as domestic containers (both transloaded international cargo and pure domestic cargo) and trailers. Containers that are transferred from ships to train via truck drayage are almost all routed to out-of-state locations. There is a concerted effort in California to reduce drayage trips to rail yards and to move the activity as close to the ports as possible.

INTERMODAL RAIL TERMINALS

The freight rail network in California includes a number of significant intermodal rail terminals. 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 rail traffic is associated with the Port of Oakland, POLA, and POLB; a sizeable but smaller volume is related to wholly USMCA traffic. Intermodal service is typically described as either container on flat car (COFC) or trailer on flat car (TOFC). In California, all primary intermodal corridors have sufficient vertical clearances for double-stack service. Double stacking is not possible with TOFC. This inability to double-stack is due to the lack of structural strength of truck trailers. **Table 3.9** identifies the facility characteristics for the intermodal terminals within California. **Chapter 6B** discusses planned intermodal rail facilities throughout the state.

SHORT-LINE RAILROAD INFRASTRUCTURE

In 2021, sixteen short line railroads operating in California were surveyed, and they identified over $130 million in infrastructure, over $15 million in equipment, and over $23 million in facility needs. Top issues impacting the industry include track conditions and the state-of-good repair, lack of funding to maintain rail lines properly, and new business opportunities for each railroad.[61]

Table 3.9: Existing Intermodal Rail Facility Characteristics

Name	Facility Type	Railroad	Existing Yard Capacity (Lifts)
City of Industry	Off-Dock	UPRR	232,000
East Los Angeles	Inland	UPRR	650,000
Hobart	Off-Dock	BNSF	1,700,000
Intermodal Container Transfer Facility (ICTF)	Near-Dock	UPRR	760,000
Los Angeles Transportation Center (LATC)	Off-Dock	UPRR	340,000
POLA-POLB On-Dock Intermodal Facilities	On-Dock	BNSF/UPRR	2,257,775
San Bernardino	Inland	BNSF	660,000
Lathrop	Inland	UPRR	270,000
Oakland International Gateway (OIG) – Joint Intermodal Terminal (JIT)	Near-Dock	BNSF	300,000
Rail port-Oakland	Near-Dock	UPRR	450,000
Stockton/Mariposa	Inland	BNSF	300,000
Total			**7,619,775**
Source: Caltrans California State Rail Plan, 2018			

Seaports

Seaports are the lynchpin of California's international trade. They are California's freight gateways to the world. California has 12 deep-water seaports that can accommodate transoceanic vessels, of which 11 are publicly owned and one, the Port of Benicia, is privately owned. This includes two inland water ports that have access to the ocean via the Sacramento/San Joaquin Delta. Each port has different navigable channel and berth depths so the sizes of ships and ship draft that can be accommodated vary by port. All of the ports, with the exception of the Port of Humboldt, utilize on-dock or near-dock rail infrastructure in conjunction with their terminal operations.

The four largest deep-water seaports in California are Los Angeles, Long Beach, Oakland, and San Diego. All four seaports are included within the top 50 U.S. Containership Ports in 2018 (see **Table 3.10**). In addition to containerized freight, these seaports handle a variety of cargo, including petroleum coke, crude oil, break bulk, bulk, heavy equipment, machinery, roll-on/roll-

off cargos, and many others. Please refer to the Pacific Merchant Shipping Association West Coast Trade report for the most current data.

Table 3.10: California's Four Top Ranking Containership Ports in North America, 2020

Port	Rank	Domestic	Export	Import	Total
Los Angeles	1	46,633	1,376,075	5,027,888	6,450,596
Long Beach	2	347,066	1,155,381	4,228,028	5,691,810
Oakland	7	165,691	795,769	1,014,879	1,916,005
San Diego	32	0	3,051	73,504	76,555
TOTAL		**559,390**	**3,330,276**	**10,344,299**	**14,134,966**
Source: U.S. Army Corps of Engineers – U.S. Waterborne Container Traffic by Port/Waterway in 2020					

The POLA, number one in national container volume, and the POLB, number two in national container volume, together make up the largest container port complex in the U.S. They are often referred to as the San Pedro Bay Ports. The San Pedro Bay Ports and the Port of Oakland—California's third largest seaport and the nation's seventh largest container port—have sufficient depths to accommodate the largest vessels currently in operation and even larger vessels that are being developed. The remaining seven deep-water seaports are smaller in size and scale, specializing in the transport of specific types of cargo such as dry bulk, break bulk, liquid bulk, construction materials, fresh fruit and produce, automobiles, or other commodities. **Table 3.11** contains some key characteristics of each seaport.

Table 3.11: Public and Private Deepwater Seaports

Seaport	Channel Depth	Acres	Rail Access	Highest Value Exports	Highest Value Imports
San Diego	42 feet	6,000*	On-Dock	Machinery, Metals, Autos/ Parts, Heavy Equipment, Food Products	Vehicles, Perishables, Construction Materials, Heavy Equipment
Long Beach (POLB)	76 feet	3,520	On-Dock	Petroleum Coke and Bulk, Waste Paper, Chemicals, Scrap Metal	Crude Oil, Electronics, Plastics, Furniture, Clothing
Los Angeles (POLA)	53 feet	4,300	On-Dock	Wastepaper, Animal Feeds, Scrap Metal, Fabric, Soybeans	Furniture, Apparel, Automobile Parts, Electronic Products
Hueneme	35 feet	375	Near-Dock	Autos, Produce, General Cargo	Autos, Produce, Liquid Fertilizer, Bulk Liquid
Redwood City	30 feet	120	On-Dock	Iron Scrap	Aggregates, Sand, Gypsum
San Francisco	38-40 feet	1,000+	Near-Dock	Tallow, Vegetable Oil	Steel Products, Boats/ Yachts, Wind Turbines,

					Project Cargo, Aggregate, Sand
Oakland	50 feet	1,300	Near-Dock	Fruits and Nuts, Meats, Machinery, Wine and Spirits	Machinery, Electronics, Furniture, Plastic Ware, Tiles
Richmond	38 feet	200	Near-Dock	Vegetable Oils, Scrap Metal, Coke, Coal, Aggregate, Zinc, Lead	Autos, Petroleum (crude/ refined), Bauxite, Magnetite, Vegetable Oils
Stockton	35 feet	2,000	On-Dock	Iron Ore, Sulfur, Coal, Wheat, Rice, Machinery, Petroleum Coke, Safflower Seed	Liquid Fertilizer, Molasses, Bulk Fertilizer, Cement, Steel Products, Ammonia, Lumber
Benicia	38 feet	645	On-Dock	Petroleum Coke	Automobiles
West Sacramento	30 feet	480	On-Dock	Agricultural and Industrial Products	Agricultural and Industrial Products
Humboldt Bay	38 feet	-----	N/A	Logs, Wood Chips	Logs, Petroleum, Wood Chips

Source: Southern California Association of Governments – Comprehensive Regional Goods Movement Plan and Implementation Strategy, 2013 *Acreage includes land and water

California's seaports are extraordinary multimodal places that have a tremendous mix of public and private entities, each with its own set of industry responsibilities. This requires efficient interaction between the public and private sectors to meet the needs of the ports. Additionally, the seaports and their intermodal connectors heavily support the movement of military and freight cargo. The Ports of Long Beach, San Diego, Oakland and Hueneme. are designated as Strategic Commercial Seaports. Ports of Los Angeles and Richmond are designated as Alternate Strategic Commercial Seaports These Strategic Seaports are integral part of the National Port Readiness Network (NPRN)[62].

The strength of California's seaports depends on a complex public private partnership approach for investment in both capital and operational improvements within the seaport complex, including compliance with environmental and safety regulations. Generally, California's seaports are owned by public port authorities who develop port facilities which are then leased to private marine terminal operators and stevedoring companies who load and unload cargo from ships. Marine terminals load and unload cargo from ships at-berth and then receive or discharge that cargo to and from landside trucking and rail operations. This requires a tremendous amount of coordination among all of the parties involved. All parties must work together toward improvements in efficiency and productivity to minimize delays in the supply chain, stay competitive in both the national and global economies, and to reduce and eliminate the environmental and community impacts of freight from these critical freight facilities. However,

Figure 3.13: Port of Long Beach, Vincent Thomas Bridge

not all ports operate this way. The Port of Hueneme, for example, is not a landlord port and controls its own terminals.

In addition to the 11 publicly owned deep-water seaports, California has one private deep-water seaport, the Port of Benicia, and a multitude of privately owned and operated, both large and small scale, port and terminal facilities which help to facilitate maritime freight movement along California's coast, and to and from interstate and international markets. These private freight facilities handle a variety of cargo that include dry bulk materials, metals, bulk liquids, construction materials, vehicles, electronics, crude oil, petroleum products, and many others.

Airports

There are more than 200 airports that participate in the movement of airfreight in the state of California. Air cargo is shipped both domestically within the U.S. and internationally to global markets. Air cargo is usually high-value and particularly time sensitive. The amount and value of freight transported through each airport differs dramatically. The California Multimodal State Freight system includes the 13 busiest airports with major cargo operations by volume as detailed in **Table 3.12**.[63] All but two of California's largest airports with major cargo operations saw growth from 2013 to 2018. The total cargo operation by the top cargo airports increased by over 36 percent overall. The key challenges facing California's air cargo include modal shifts to trucking, competition with airports at other states, the shifting of manufacturing from Asia back to North America (and Europe), and the alternative maritime shipping routes that influences supply chains for air cargo-related goods.

Table 3.12: Major Cargo Operations Enplaned and Deplaned (Tons)

California's Top Air Cargo Airports	Rank	2013	2018	2021	% Change from 2018
Los Angeles International Airport (LAX)	4	1,917	2,444	2,972	122%
Ontario International Airport (ONT)	9	461	826	956	116%
Oakland International Airport (OAK)	12	556	670	698	104%
San Francisco International Airport (SFO)	20	400	628	582	93%
Sacramento International Airport (SMF)	38	74	127	167	131%
San Diego International Airport (SAN)	45	162	192	146	76%
Sacramento Mather Airport (MHR)	63	55	77	836	1086%
Stockton Metropolitan (SCK)	86	N/A	45	64	142%
Hollywood Burbank Bob Hope Airport (BUR)	-	55	55	54	98%

San Jose International Airport (SJC)	101	47	61	36	59%
Fresno-Yosemite International (FYI)	108	12	11	17	155%
Long Beach Airport (LGB)	122	26	24	16	67%
Santa Ana (John Wayne) Airport (SNA)	118	18	20	16	80%
Total		**3,783**	**5,180**	**6,560**	**179%**
Source: National airport ranks from Federal Aviation Administration, 2021. https://www.faa.gov/sites/faa.gov/files/2022-08/cy21-cargo-airports_0.pdf					

According to the California Air Cargo Groundside Needs Study, "The numbers indicate that the top airports at which cargo activities are currently focused should have the individual capacity to address their own future cargo growth.[64] Although some new development or redevelopment will eventually be needed, there are no specific projects currently identified by the airports as critical to accommodating long-term cargo growth." While the capacity of California's largest cargo airports appears to be able to handle modest increases in freight movement in the near-term, the importance of ground transport of freight to and from the cargo airports is a key consideration. Local roads provide access to airport cargo facilities and transportation to nearby cargo handling and transloading facilities is accomplished. Many of these roads were not designed to accommodate 53-foot trailers and are located in dense, high traffic areas that are dominated by passenger vehicles.[65]

Pipeline Network

The U.S. EIA reports that California ranks fifth in the nation in crude oil production and ranks third (January 2017) in petroleum refining capacity, accounting for approximately five percent of production capacity and 10 percent of U.S. refining capacity.[66] California's crude oil and refined petroleum network consists of crude oil and petroleum product pipelines, refineries, terminals, and petroleum ports. The crude oil pipelines connect California's production areas to the refining centers in Los Angeles, the Central Valley, and the San Francisco Bay Area. These refineries are then connected through petroleum product pipelines to refineries and terminals throughout the U.S. Most gasoline imports into California enter by ship via the San Pedro Bay Ports and the San Francisco Bay Area Ports.
According to the U.S. EIA, California is second in the nation in the use of natural gas.[67] California's natural gas is largely delivered through the Western Region Natural Gas Pipeline Network.

The main conduits of natural gas to California are the El Paso Natural Gas Company system and the Transwestern Pipeline Company system in the southern regions of the state, and the Gas Transmission Northwest Company's interstate system in the northern regions of the state. The southern region systems originate in Texas and parallel each other as they traverse New Mexico and Arizona to deliver large portions of their capacity to California's largest natural gas companies at the California eastern border. The northern region system delivers Canadian natural gas through Washington and Oregon to California's northern border. California's natural gas network consists of pipelines, along with the processing plants, terminals, and storage facilities that support the transportation of this important energy resource. The intrastate

transportation and distribution of natural gas in California is dominated by three main providers, the California Gas Transmission Company (CGT) (3,477 miles), the Southern California Gas Company (SoCal) (1,887 miles), and the San Diego Gas and Electric Company.

Future study is needed to determine which elements of the pipeline network should be included in the California Multimodal State Freight System. **Figure 3.14** and **Figure 3.15** depict California's crude oil and petroleum pipelines and facilities, and the natural gas pipelines and facilities.[68]

Figure 3.14: California Petroleum Pipelines and Facilities. (Source: U.S. Energy Information Administration, 2018)]

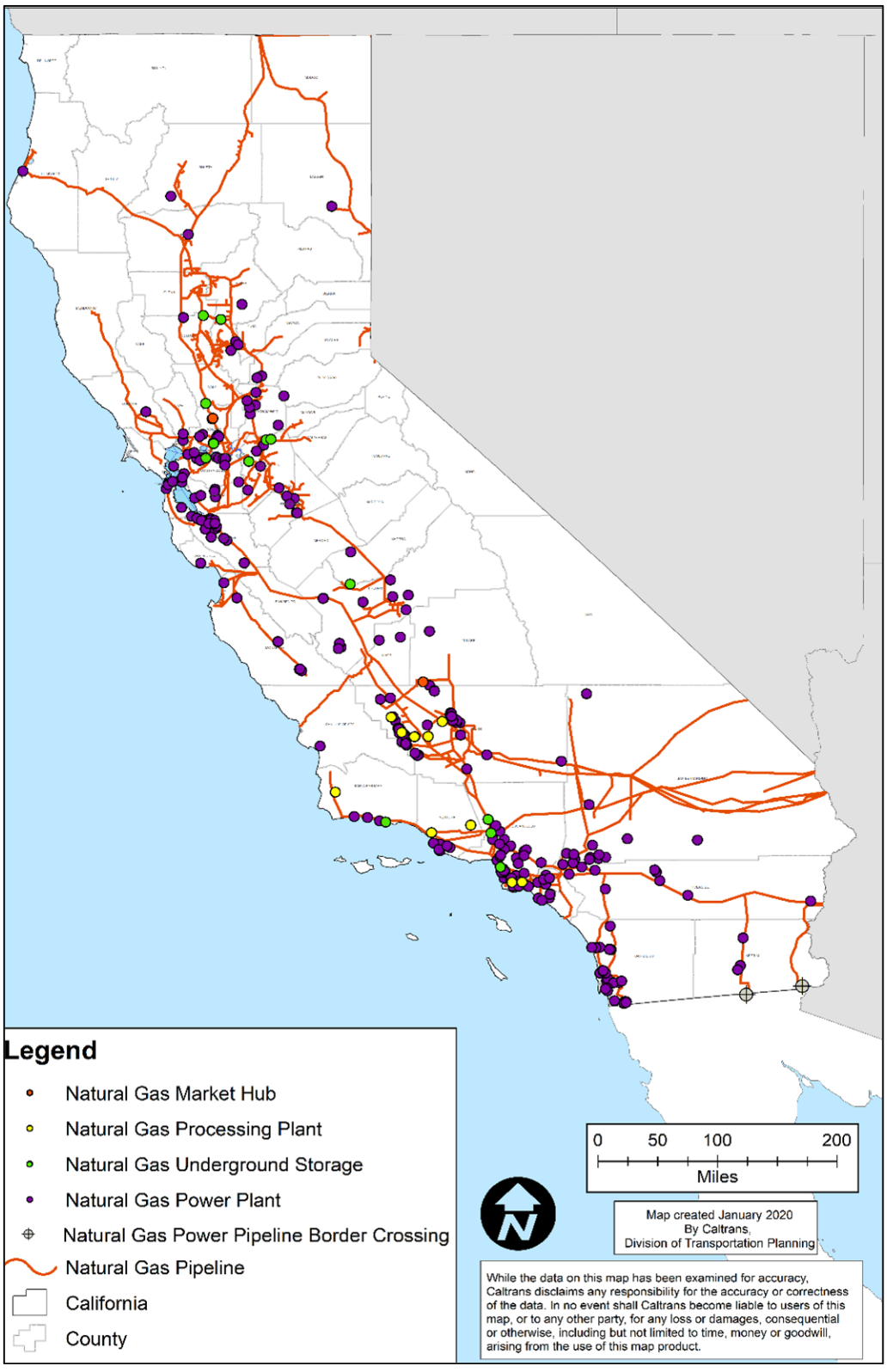

Figure 3.15: California Natural Gas Pipelines and Facilities. (Source: U.S. Energy Information Administration, 2019)

Military Freight

California's transportation network plays a major role in national security. California's numerous highways, railroads and ports are used for researching, designing, developing, and applying a variety of technologies to be used for national defense. **Figure 3.16** illustrates the location of California's Military Installations, ports and roadway network used to transport military equipment across the state. The State continues to work with Highways for National Defense (HND), Railroads for National Deference (RND), and Ports for National Defense (PND). HND has a mission to ensure that national defense is served by adequate safe and efficient public highway systems. They are also responsible for identifying and integrating the defense needs of the public highway systems. HND establishes policy and provides guidance on the safe use of public highway systems by Department of Defense (DOD) assets. The DOD develops and updates the Strategic Highway Network (STRAHNET) and STRAHNET connectors. Additional activities coordinated by HND relating to military freight include defense regulation on permitting and maintaining a directory partner organization contacts from military services/installations, Federal Highway Administration, State Departments of Transportation, American Association of state highway and Transportation Officials (ASHTO), and Transportation Research Board (TRB).

The STRAHNET is a system of about 62,400 miles of highways that is spread through the entire United States, including the interstate system. An additional 1,800 miles of STRAHNET connectors link over 200 military installations, seaports, and airports through the U.S. All together STRAHNET and all the connectors define the total minimum public highway network necessary to support defense deployment needs. The STRAHNET's Power, Projection, Platform (PPP) routes include about 5,000 miles of public roadways that are the most critical to support the deployment of DOD equipment. 18 designated PPP installations are spread through the U.S. designed to deploy military forces to seaports of embarkation (SPOE'S) during a national emergency. California has one PPP Installation located at Camp Pendleton and one PPP SPOE designation at the Port of San Diego.

The DOD regularly coordinates with Federal Highway Administration (FHWA) and Caltrans to address identified issues that affect the efficient movement of military goods traversing STRAHNET and PPP routes. Issues that have been identified in coordination with the DOD include permitting for the movement of oversized and overweight military equipment, traffic bottlenecks, system reliability, and bridge vertical clearance. All of which can negatively affect military mission performance and efficiency, but also disrupt convoy integrity. It is critical that the STRAHNET and PPP routes are adequately designed to accommodate the intended defense need and that the conditions of these roadways are safe and efficient to allow for rapid deployment of military equipment when needed.

The military also utilizes Strategic Rail Corridor Network (STRACNET). STRACNET is the minimal network of key commercial rail lines (33,000 route miles of high-density commercial lines) supplemented by defense connector lines (4,700 miles) serving installations throughout the United States.

STRAHNET and STRACNET are part of a national defense system that also includes strategic and alternative seaports that are designated within the National Port Readiness Network (NPRN). The Ports for National Defense (PND) mission is to provide information necessary to identify and use U.S. strategic seaports, minimize military impact on U.S. commercial seaports, facilitate DOD focus on maintaining readiness of ports required to enable the military to effectively deploy.

Partner organizations include MARAD, Coast Guard, Port Authorities, and rail operators. California has seven strategic and alternative seaports.

These strategic networks and facilities are in place to serve the DOD's potential need for large scale rapid deployment of military equipment by road and rail from major military installations to strategic seaports. Ensuring constant collaboration between DOD, Caltrans and local governments is critical in supporting effective and efficient military deployments of goods and equipment.

Figure 3.16: California Military Installations and Ports. (Source: US Surface Deployment and Distribution Command 2022)

Warehousing and Distribution Facilities

The warehousing and distribution sectors are essential to supporting the efficient movement of freight within and through the state, and the success of these sectors directly impacts the economic competitiveness of the State and the nation. **Figure 3.18** shows the concentration of warehouses and major wholesale distributions across the state. Southern California has by far the highest concentration of high cube and multi-purpose warehouses.

In the Southern California Association of Governments (SCAG), 'Industrial Warehousing in the SCAG Region' report, SCAG identifies itself as the 16th largest economy in the world with a regional gross product of approximately $820 billion, and "goods movement-dependent industries make up about 35 percent of this total."[69] With one of the largest clusters of logistics centers in North America, the warehousing and distribution sector is particularly important to freight movement in Southern California, occupying approximately 1.17 billion square feet of existing warehousing land.[70] As of April 2018, there were approximately 34,000 warehouses in the SCAG region and 338 million square feet of undeveloped land that could be used to develop new warehouses and distribution centers.[71]

While the majority share of California's warehousing and distribution activities occur in Southern California, specifically in the areas near the POLA and POLB, further east in the Inland Empire (San Bernardino and Riverside Counties), and near the POE by the California-Mexico Border, significant facilities in other parts of the state as well, particularly the northern San Joaquin Valley. More information on warehousing can be found in **Chapter 2 and Appendix C**.

Figure 3.17: Amazon Fulfillment Center

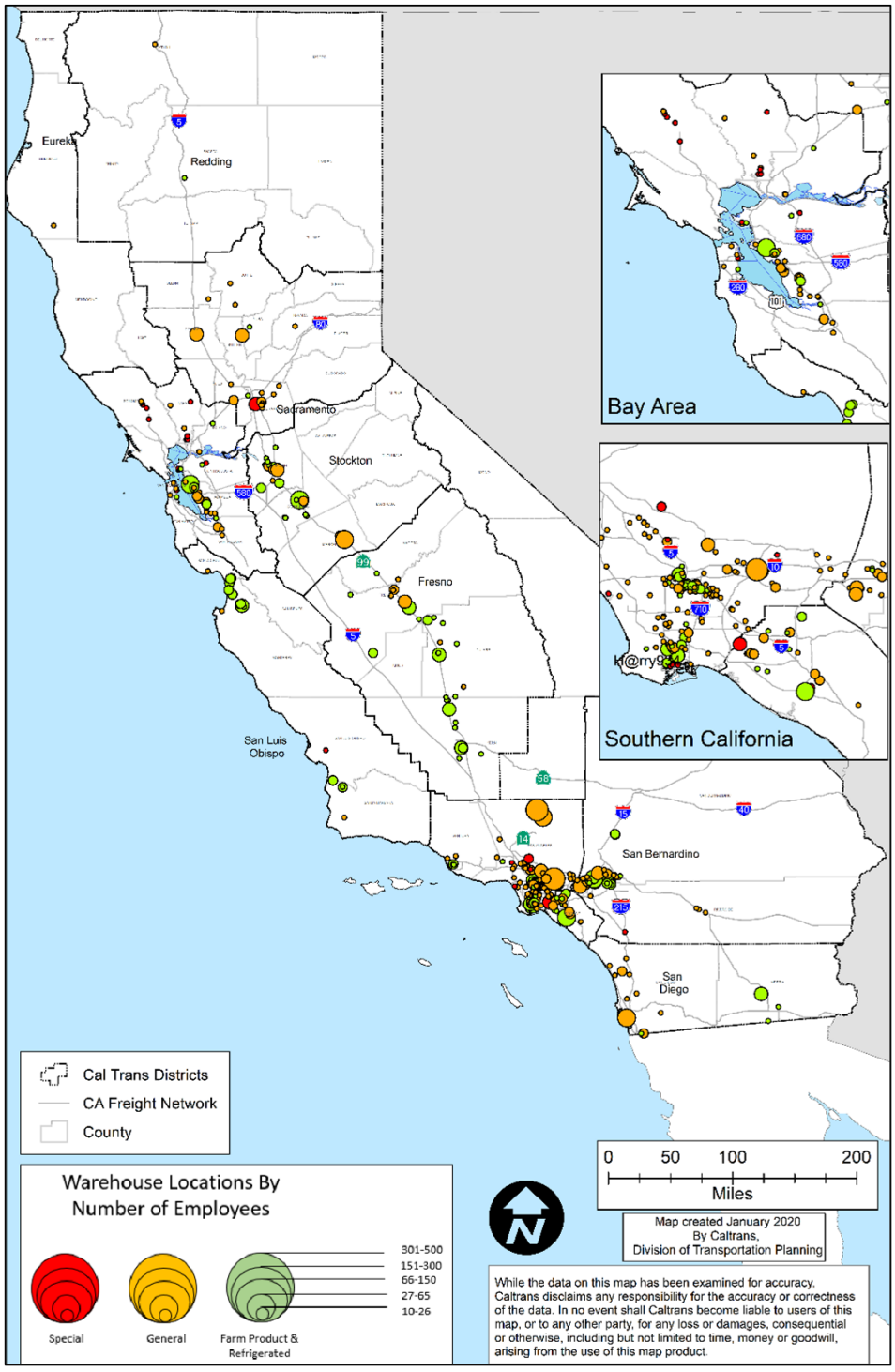

Figure 3.18: Major Warehouse and Distribution Centers in California. (Source: Census Data, California Statewide Freight Forecasting Model database)