

Appendix D

Infrastructure, Services and Trends

Alameda County Goods Movement Plan

Task 2c: Infrastructure, Services, and Trends

final memorandum

prepared for

Alameda County Transportation Commission

prepared by

Cambridge Systematics, Inc.

final memorandum

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1.0 Introduction

This report provides an overview of what drives goods movement demand in Alameda County currently, and how this will likely change in the future. It also provides a profile of the multimodal freight infrastructure system that supports the movement of goods. Much of this work was built from work already completed for the San Francisco Bay Area Freight Mobility Study (prepared by Cambridge Systematics for Caltrans District 4) and the California State Rail Plan, with supplemental analysis done to provide more geographically specific data that is most relevant for the Alameda County context. Much of the available information on freight flows and freight-flow trends that were available for this report are only available for the region as a whole, but this information still provides a basis for assessing trends that will impact Alameda County. In subsequent tasks of this project, this information will be refined to perform analyses that are even more specific to Alameda County.

This report consists of these sections:

- **Section 1.0 - Introduction;**
- **Section 2.0 - Demographic and Freight-Flow Trends** - This section focuses on the discussion of economic and demographic drivers of goods movement, which is fundamental to the understanding of the importance of goods movement in Alameda County; and
- **Section 3.0 - The Multimodal Goods Movement System** - This section provides a comprehensive infrastructure profile of the highway, rail, maritime, and air cargo infrastructure that makes up the goods movement system in Alameda County. The Alameda County goods movement system includes global gateways, interregional corridors, the intraregional core system, the urban goods movement system which is comprised of the network of urban arterials and local roads, and last mile connectors.
- **Section 4.0 - Key Demand Trends** - This section summarizes some of the major trends that will impact goods movement demand and planning needs in the future.

2.0 Demographic and Freight-Flow Trends

Goods movement in Alameda County, as elsewhere in the Bay Area, can be thought of as consisting of three major markets: 1) international trade; 2) domestic trade; and 3) urban goods movement. Goods movement in each of these markets makes use of multimodal transportation infrastructure that operates as a seamless system supporting the different goods movement markets and functions. Each element of this infrastructure may support multiple markets. This infrastructure is described in more detail in Section 3.0 of this report.

The factors and trends that drive demand in each of Alameda County's goods movement markets involve a combination of internal and external economic and demographic characteristics as summarized below.

1. **International trade** - By several measures, the San Francisco Bay Area is one of the most important international gateways in the United States (U.S.). In 2011, two-way trade valued at \$119.1 billion moved through the San Francisco Customs District, making it the second most important gateway in California and 10th most important in the U.S. The largest share of this in the Bay Area moves through two primary gateway facilities - San Francisco International Airport (SFO) and the Port of Oakland's seaport. The Port of Oakland is the 5th busiest container port in the U.S.,¹ handling over 2.3 million twenty-foot equivalent units (TEU) in 2012. The Port of Oakland is critical not only to the Bay Area economy, but also to all of Northern California and other states such as Utah and Nevada, as the principal international trade gateway for export products from these regions. In fact, the Port of Oakland is the only major container port in California where exports exceed imports, an indicator of the Port's critical importance to exporters from the Bay Area and elsewhere in the Central Valley who export a wide variety of agricultural, and manufacturing products as well as to overall transpacific trade circulation (a typical container ship transpacific route involves ships bringing imports from Asia to the San Pedro Bay Ports, then bringing empty containers to the Port of Oakland to receive exports that return to Asia in an effort to maximize revenue).

¹ Port of Oakland, Maritime Comprehensive Truck Management Program, adopted on June 16, 2009.

The Port of Oakland's role as a key international gateway is affected by many factors: growth is influenced heavily by factors including the population and general economy of Alameda County, the Bay Area, and neighboring regions (which drives demand for containerized consumer imports and supplies); growth in the export economies of neighboring counties (especially the agricultural producers of the San Joaquin Valley and the wine producers of the North Bay) and exporters of bulk commodities (including waste and scrap) and high-value products (including precision instruments and biomedical supplies) produced in Alameda County and Santa Clara County; and trends in global supply chains and logistics practices that also impact the competitive position of the Port relative to other international gateways in North America. Thus, understanding a combination of local economic and demographic trends as well as a number of general trade and logistics trends is important to understanding how international trade will impact the County's freight transportation system in the future.

2. **Domestic trade** – Domestic, interregional trade in the Bay Area is the largest contributor to freight transportation demand by weight and value.² Alameda County contributes a significant share of this domestic trade. To a large extent, this trade involves consumer products and industrial inputs that are produced or handled/processed elsewhere in the U.S. and supports both Alameda County's and the Bay Area's large and growing consumer markets. Many major regional distribution centers that mix international goods and domestic goods for distribution to consumers in Alameda County are located in the Northern San Joaquin Valley. Since the largest population centers in Alameda County are located along the I-880 corridor, goods moving to these population centers need to traverse the County, often via I-580 to I-880. While many traditional manufacturing industries, such as heavy equipment manufacturing, are leaving the Bay Area, Alameda County still has a number of strong manufacturing clusters and is also experiencing growth in advanced manufacturing and high-technology production (such as biomedical instrumentation and supplies). These businesses distribute products all over the U.S., and internationally. Alameda County is also the site of the region's largest domestic air cargo hub, at Oakland International Airport (OAK). In 2012, Oakland Airport handled about 41 percent of Bay Area air cargo.³ In order to understand growth in demand for domestic trade transportation and its impacts on the county's transportation system and economy, it is therefore important to understand general population and demographic trends, as well as to understand the continuing evolution of the region's manufacturing economy.

² According to analysis performed in the San Francisco Bay Area Freight Mobility Task 5 Report, 2014, using FAF3 data.

³ Caltrans, California Air Cargo Groundside Needs Study, July 2013.

3. **Urban goods movement** – As a major population and commercial center, Alameda County relies heavily on local urban goods movement that occurs completely within the County to provide basic consumer products, food, packages, and parcels to residents and businesses. Much of this urban goods movement uses the local arterial truck routes to access a variety of destinations throughout the County. While often overlooked in regional- and state-level freight transportation studies, planning for this urban goods movement as part of overall strategies to manage passenger and goods transportation is a critical element in any countywide goods movement plan. In order to understand growth in demand for urban goods movement and its impacts on the region’s transportation system and economy, it is also important to understand general population and demographic trends, and how they relate to the continuing evolution of the region’s consumption patterns.

The remainder of Section 2.0 of this report provides background on some of the critical economic and demographic characteristics and trends in Alameda County that are driving demand for goods movement services. It also describes the role that goods movement plays in the County’s economy in terms of jobs and output in the industries that are most reliant on freight transportation. Included in this discussion is a description of how the region’s population and demographic trends are related to land use patterns and how this in turn contributes to impacts of freight transportation on particular communities within the County. This is followed by a discussion of the freight flows in the County, and explains the degree to which international and domestic trade impact the Bay Area and selected elements of Alameda County’s transportation infrastructure, as well as documenting trends in these freight flows as they are likely to develop and change in the future. The discussion of freight flows also takes into account a variety of factors external to the County that will impact the County’s transportation system.

2.1 OVERVIEW OF BAY AREA AND ALAMEDA COUNTY POPULATION, DEMOGRAPHICS, ECONOMY, AND LAND DEVELOPMENT PATTERNS

The nine-county Bay Area region (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma) was home to more than 7.1 million people in 2010 and provided jobs for almost 3.4 million people who live in the Bay Area and neighboring counties.⁴ As such, the Bay Area boasts one of the largest economies in the U.S. The Bay Area ranks 19th in the world when

⁴ *Plan Bay Area*, 2010 estimates developed by the Association of Bay Area Governments (ABAG), 2013.

compared to national economies, with a Gross Regional Product (GRP) of \$539 billion in 2011.⁵ As measured by total economic output⁶, Alameda County is the third largest economy of all Bay Area counties, with economic output equivalent to 15 percent of the region's total output.⁷ Alameda County's rank as third among Bay Area counties in terms of economic output provides only a partial picture of its economic importance because the counties that rank higher do so because of the high value of their production per employee (i.e., much of the value of Santa Clara's economic output is from computer development and design and much of the value of Contra Costa's output is from high value petroleum products). Alameda County accounts for 20.5 percent of regional employment (including both goods movement-dependent and service industries) and is anticipated to have the fastest growth in the overall job market in the region from 2010 to 2040.⁸ As will be discussed later, Alameda County is one of the leading counties in the region in terms of goods movement-dependent industries that drive demand for goods movement services. The County also provides most of the critical goods movement infrastructure that the rest of the region relies upon to bring goods to and from international and national marketplaces.

Over the past 20 years, the Bay Area has experienced modest growth in population and employment that is expected to continue through 2040 (see Table 2.1).

⁵ Ibid, ABAG.

⁶ Output measures the value of all goods and services delivered in the economy, including intermediate consumption (inputs). GRP is defined as the market value of all final goods and services within a region in a given period of time, and does not include intermediate consumption, thus it is generally smaller than output.

⁷ Regional and county GRP and output estimates were developed from the county input-output tables in the IMPLAN economic model, Minnesota IMPLAN Group (MIG), 2012.

⁸ *Op cit.*, ABAG.

Table 2.1 Bay Area Population, Employment, and Housing Projections, 2010 to 2040

Category	2010	2040	Growth 2010-2040	Percent Change 2010-2040
Population	7,150,740	9,299,150	2,148,410	+30%
Jobs	3,385,300	4,505,220	1,119,920	+33%
Households	2,608,020	3,308,110	700,090	+27%
Housing Units	2,785,950	3,445,950 ^a	660,000	+24%

^a 2010 and 2040 values include seasonal housing units.

Source: ABAG, 2013.

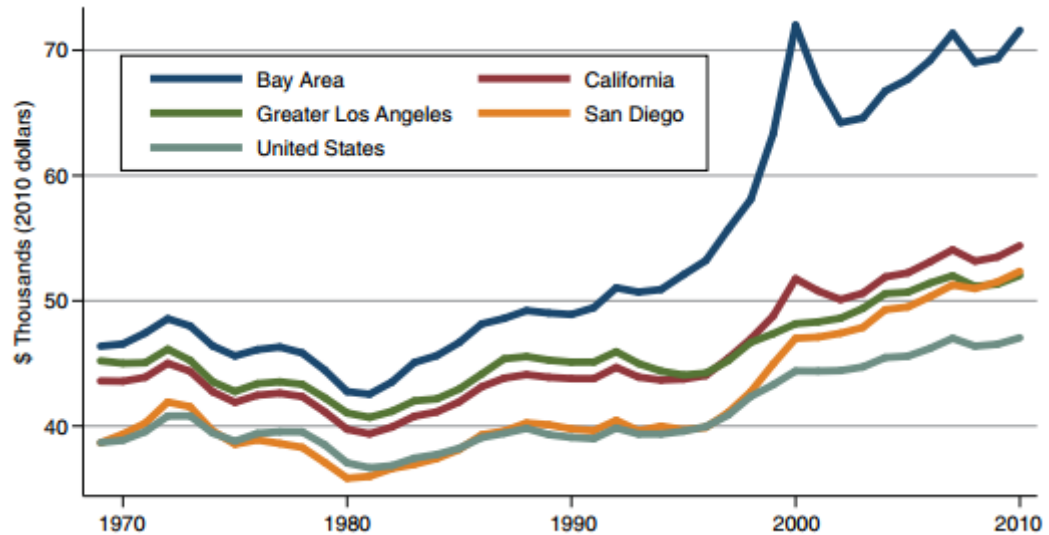
According to the Bay Area Council Economic Institute, population has grown from just over 6 million persons in 1990 to about 7.2 million in 2011, which is a modest 0.78 percent per year growth and slower than the national average of 1.07 percent. According to forecasts by ABAG, the Bay Area will add 2.1 million residents between 2010 and 2040, and will remain California’s second largest population and economic center (see Table 2.1). According to ABAG’s *Plan Bay Area* forecasts, Alameda County represented 21.1 percent of the Bay Area’s population in 2010; and this share is expected to increase to 21.4 percent by 2040, with the County expected to add 477,754 residents, which is behind only Santa Clara County in terms of population growth in the region. Alameda County will also experience the second largest growth and rate of growth in housing units, indicating a relatively active construction market over the same period.

The Bay Area also has high per capita income. Figure 2.1 shows that average wages in the Bay Area have been consistently higher than those of other regions of California and the U.S. during the last two decades. According to data and forecasts prepared by the California Department of Transportation (Caltrans),⁹ in 2010, per capita income in Alameda County was also well above the California average and is expected to experience higher rates of growth than the rest of the State on average. This picture of growth in population, housing units, and incomes suggests increasing levels of goods movement demand in Alameda County and the surrounding Bay Area, which will have a significant focus on consumer goods that will be manufactured and distributed from outside of the area. As will be described later, this should contribute to import growth at the Port of Oakland, distribution traffic from warehouses and distribution centers largely located in the Northern San Joaquin Valley, and significant amounts of

⁹ Caltrans Long-Term Socioeconomic Forecasts by County, 2011, http://www.dot.ca.gov/hq/tpp/offices/eab/socio_economic_files/2011/Alameda.pdf.

retail goods delivery and small parcel package movements through Oakland Airport and on local arterial routes and on the urban goods movement network.

Figure 2.1 Average Wages



Source: The Bay Area, A Regional Economic Assessment, October 2012. Data from Bureau of Economics; Calculations by Bay Area Council Economic Institute.

Looking at regional demographics, there are two trends in particular that are likely to have an impact on goods movement demand or create issues that may need to be addressed in the context of goods movement planning. The first is the continued aging of the region's population. According to forecasts in *Plan Bay Area*, residents of the Bay Area who are 65 years of age or older will increase from 12 percent of regional population to more than 22 percent by 2040. This is likely to increase demand for health services and related products. The aging population may also contribute to demand for more concentrated land development patterns that provide access to nearby services for seniors who are no longer able to drive. This trend is one of many trends that have led the region to support more dense residential and commercial development. Collectively, these trends are adding pressure on existing urban goods movement corridors, and will create land use challenges as many of the locations of existing industrial land supply are under pressure to upgrade to higher value uses.

The second trend shows that in spite of growing per capita income, very low and low income residents of the Bay Area are expected to increase from 40 percent to 43 percent of regional population. Opportunities to provide good paying jobs for this segment of the population will be critical to the overall economic health of the region. Goods movement dependent industries and the logistics sector can be a source of these types of jobs, though as the region's manufacturing and logistics sectors become more and more automated, the demand for goods movement services may continue to grow at the same time that employment in these industries is stagnant or even declines. The nature of employment in these

industries may also become higher-skill requiring more training. This suggests a need for continued attention to workforce development as a component of goods movement strategies.

As noted above, the trend towards more compact urban development in the central Bay Area and the movement towards higher value uses in areas that form the historical industrial centers of Alameda County (or lands abutting these industrial centers) is presenting several problems that affect goods movement:

- Loss of industrial land to upgraded uses
- Conflicts between goods movement uses and adjacent residential and commercial development
- Competing transportation uses on major arterial corridors.

While the first two issues have been explored to some extent in MTC's 2008 study of goods movement and land use,¹⁰ the issue of competing uses on arterial corridors is just beginning to be explored. Plan Bay Area's integrated transportation-land use strategy features a focus on Priority Development Areas (PDA), defined as:

Priority Development Areas (PDAs) are locally-identified, infill development opportunity areas within existing communities. They are generally areas of at least 100 acres where there is local commitment to developing more housing along with amenities and services to meet the day-to-day needs of residents in a pedestrian-friendly environment served by transit. To be eligible to become a PDA, an area had to be within an existing community, near existing or planned fixed transit or served by comparable bus service, and planned for more housing.¹¹

While the PDA's in Alameda County have minimal direct overlap with industrially zoned land, the freeway and arterial corridors that serve the PDAs are often truck routes that either serve industrial zones nearby the PDAs or that provide retail goods and supplies to residences and commercial businesses in the PDAs. The locations of major bus routes on arterials that also serve as major truck routes are another characteristic of the PDAs.

¹⁰ *Goods Movement/Land Use Project for the San Francisco Bay Area*, prepared for MTC by Hausrath Economics Group, Inc., in association with Cambridge Systematics, Inc. and The Tioga Group, Inc., December 2008.

¹¹ ABAG FOCUS program web site, <http://www.bayareavision.org/initiatives/prioritydevelopmentareas.html>.

In recent analysis conducted by the Pacific Institute¹², it has been shown that many of the industrial areas along the I-880 corridor and particularly in the vicinity of the Port of Oakland seaport, and Oakland Airport have some of the highest concentrations of very low and low income communities in the region and show evidence of significant existing public health risks. These risks include increased rates of asthma, cancer and shorter life expectancy. Resolving the potential conflicts between the desire for improved goods movement mobility and economic growth, compact development and encouragement of transit, bicycle, and pedestrian travel, and the need to protect the public from health risks and address environmental justice concerns will continue to be a major focus in coordinating goods movement, land use, general transportation, and environmental planning in the County.

The Bay Area economy has always been known for its innovation, particularly in the high-technology sector. The economy is continuing to shift away from manufacturing towards the service sector, especially professional, technical, and information services; and this will impact goods movement demand leading to a higher level of small package movements and less emphasis on long-haul movements of manufactured products. Another key driver of goods movement in the Bay Area is the strength of the local tourism and travel industry. Between 1990 and 2011, the accommodation and food services industry and the arts, entertainment, and recreation industry increased their combined share of Bay Area employment from 9.4 percent to 11.7 percent¹³.

Despite the shifts in the Bay Area economy to greater concentration in professional and technical services and travel and tourism, the industrial makeup of the economy remains diverse, and this contributes to goods movement demand from a variety of different sectors. As will be described in more detail in the following section, Alameda County plays a critical role in the region in some of the more traditional economic sectors that generate demand for goods movement services, such as manufacturing, construction, wholesale and retail trade, and freight transportation service provision. The County has a diverse manufacturing sector that includes high-technology industries such as electronics, precision instrumentation, and medical supplies, but also includes more traditional manufacturing in metal products, food products, and machinery. Manufacturing employment in the County is expected to decrease between 2010 and 2040 (in absolute terms), but output is likely to increase as the

¹² *At a Crossroads in our Region's Health: Freight Transport and the Future of Community Health in the San Francisco Bay Area*, Pacific Institute with the Ditching Dirty Diesel Collaborative, December 2011.

¹³ Bay Area Council Economic Institute, *One Bay Area Regional Economic Assessment*, 2012.

industry applies advanced manufacturing processes¹⁴ to produce more with relatively less labor inputs. According to the Bureau of Labor Statistics, nationally, the productivity for the manufacturing sector has steadily increased by 2.2 percent annually from 2003 to 2013.¹⁵

What do all of these population, demographic, and economic trends mean for the Bay Area and Alameda County?

- **Growing consumer demand** – Growth in population and income will likely increase demand for consumer products that are manufactured primarily outside of the region. This will mean more imports through the Port of Oakland and the region’s airports. It will also increase the need to accommodate delivery trucks on local streets.
- **Continued growth in small parcel and package delivery** – The growth in consumer demand, coupled with the shift in the types of businesses that will drive the regional economy, means more small parcel and package delivery on intraregional corridors and the urban goods movement system. Growth in e-commerce will also contribute to this trend.
- **Evolving manufacturing sector with growth in advanced manufacturing and population support industries** – Manufacturing employment will stabilize and decline slightly, but the application of advanced manufacturing processes will allow traditional sectors to expand their output and demand for goods movement services. In addition, expanding population will increase demand for construction materials, food products, clothing, and other products that are carried on truck and rail.
- **Concentration of goods movement activity in corridors already overwhelmed with passenger travel demands** – Development patterns and their overlap with existing goods movement activity centers could create conflicts if not properly planned for. Given the nature of some of the drivers of local goods movement demand, this could create increasing spatial as well as temporal conflicts between goods movement and people on arterial corridors, transit and passenger rail and in local business districts.
- **Public health and environmental justice concerns** – Growth in demand for goods movement activity will affect all communities with freight activities

¹⁴ Advanced Manufacturing is “a family of activities that (a) depend on the use and coordination of information, automation, computation, software, sensing, and networking, and/or (b) make use of cutting edge materials and emerging capabilities enabled by the physical and biological sciences, for example nanotechnology, chemistry, and biology. This involves both new ways to manufacture existing products, and especially the manufacture of new products emerging from new advanced technologies.” Source: http://www.manufacturing.gov/whatis_am.html

¹⁵ Calculated from the Major Sector Productivity and Costs, Bureau of Labor Statistics.

and will create public health risks unless thoughtful integrated transportation and land use planning and development strategies and advanced technologies are applied to mitigate impacts, with meaningful community involvement. This growth in demand can also create economic opportunities. Programs to ensure that these benefits, including good paying jobs to low income residents are equitably distributed throughout the County and the region should be an important part of goods movement planning.

Goods movement is providing many benefits to the region and Alameda County by supporting industries that are major contributors to the economy. Goods movement is also a source of job diversity, especially in Alameda County. The importance of goods movement to the regional economy is discussed in the following section. As already noted, goods movement demand is also driven by external economic factors, and these are discussed later in the section of this report addressing regional freight flows.

2.2 GOODS MOVEMENT AND THE ECONOMY

It is often useful to describe the importance of goods movement to a region's economy by looking at the share of the economy associated with "goods movement-dependent" industries. These are industries that either produce goods for sell or for whom transportation access to markets is a critical aspect of their business operations, such as the construction industry. These goods movement-dependent industries include manufacturing, retail trade, wholesale trade, construction, transportation/warehousing, and agriculture, and they rely heavily on the goods movement system. By contrast, non-goods movement-dependent industries, or service industries do not rely on goods movement to operate their business (such as banks and hospitals), though they do depend on shipments of parcels and/or equipment. Understanding the freight transportation demands created by these critical goods movement-dependent industries requires an understanding of their growth trends and their supply chains. Baseline and future economic forecasts for the Bay Area and Alameda County are gathered from ABAG's latest projections for *Plan Bay Area*. The approach to distributing the Bay Area total employment by industry sector to the county level uses the same methodology that was used to estimate county-level employment for *Plan Bay Area*.¹⁶

¹⁶ The final *Plan Bay Area* report provides estimates of current and forecast employment by industry sector for the entire region, and these provided regional control totals that are presented in this report. *Plan Bay Area Final Forecast of Jobs, Population, and Housing (July 2013)* presents the methodology used to develop the initial forecast and the allocation of industry sector employment (current and forecast) that was developed by the Center for the Continuing Study of the California Economy using long-term county-level socioeconomic forecasts by Caltrans. Since the county-level data were not reported in any of the *Plan Bay Area* reports, Cambridge Systematics applied the

Footnote continued

As Table 2.2 shows, Alameda County currently makes up 22 percent of the employment in goods movement-dependent industries in the nine-county Bay Area (based on place of employment), which is slightly higher share than its total employment and its share of population. This share will grow to 23 percent of the region's employment in goods movement-dependent industries by 2040. Growth in goods movement-dependent industries will be more moderate than overall employment growth for both Alameda County and the region as a whole.

Table 2.3 illustrates the share of employment and industrial output in manufacturing contributed by each manufacturing subsector for Alameda County and the Bay Area. What is immediately apparent is that in 2011, for the Bay Area as a whole, computer and related equipment represented almost 30 percent of manufacturing employment and more than 47 percent of manufacturing output. While much of this employment and output is attributable to computer manufacturers located in the Bay Area (primarily in Santa Clara County), the actual production activities for these companies takes place overseas. If the computer manufacturing sector is excluded, Alameda County represents 25 percent¹⁷ of regional employment in manufacturing.

Table 2.2 Employment Projection of Alameda County Industries, 2010 and 2040

Industries	2010			2040			CAGR	
	Alameda	Bay Area	% Total	Alameda	Bay Area	% Total	Alameda	Bay Area
Agriculture and Natural Resources	0.9	24.6	4%	0.9	22.7	4%	-0.2%	-0.3%
Construction	31.7	142.3	22%	52.6	225.3	23%	1.7%	1.5%
Manufacturing	66.4	336.3	20%	54.5	310.7	18%	-0.7%	-0.3%
Transportation & Utilities	26.0	98.7	26%	38.1	127.4	30%	1.3%	0.9%
Wholesale	27.8	123.9	22%	36.2	145.4	25%	0.9%	0.5%
Retail	75.5	335.9	22%	95.7	384.4	25%	0.8%	0.5%
Financial	28.8	186.1	15%	42.8	233.8	18%	1.3%	0.8%
Professional Services	112.2	596.7	19%	186.5	973.6	19%	1.7%	1.6%
Information	15.3	121.1	13%	17.7	157.3	11%	0.5%	0.9%
Health and Education	95.6	447.7	21%	115.4	698.6	17%	0.6%	1.5%
Leisure	79.3	472.9	17%	107.3	660.6	16%	1.0%	1.1%
Government	130.2	499.0	26%	164.2	565.4	29%	0.8%	0.4%
Total Goods Movement-Dependent Industries	228.3	1,061.7	22%	278.0	1,215.9	23%	0.7%	0.5%
Total Non-Goods Movement Dependent Industries	461.4	2,323.5	20%	633.9	3,289.3	19%	1.1%	1.2%

Center for Continuing Study of the California Economy (CCSCE) methodology and the Caltrans data to develop the Alameda County sector-level employment data and forecasts presented in this report.

¹⁷ IMPLAN, 2011.

Source: ABAG Plan Bay Area Economic Forecasts; Factors from CCSCE; and Cambridge Systematics Analysis.

Note: CAGR = Compound Annual Growth Rate

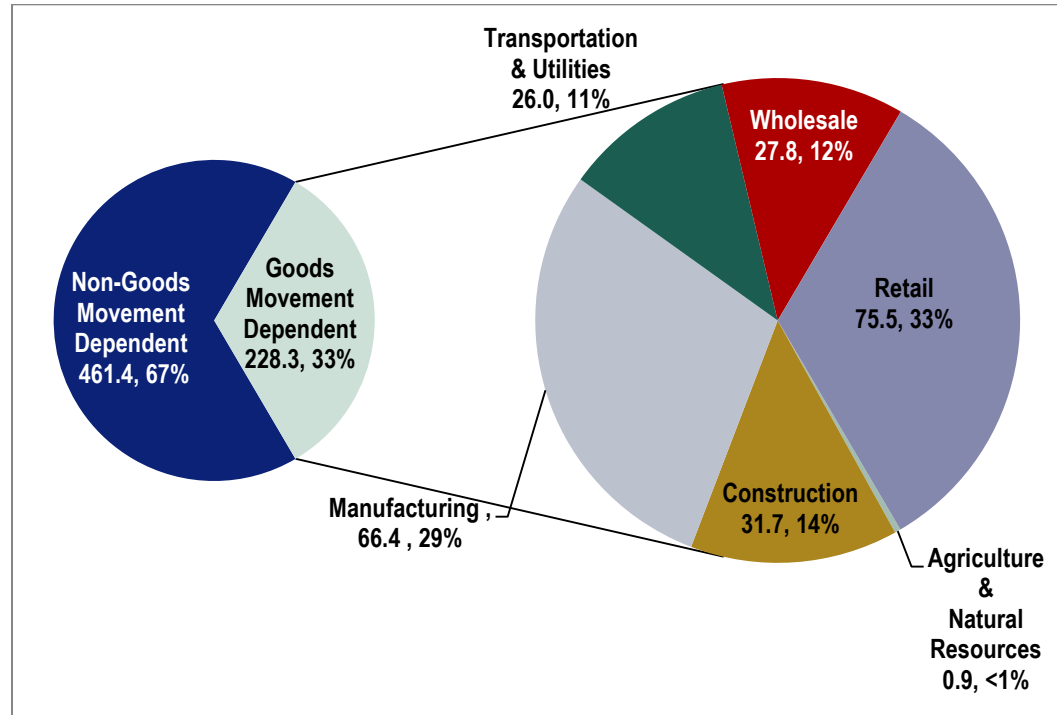
Table 2.3 Manufacturing-Sector Employment and Output Shares in Alameda County and the Bay Area, 2011

	Alameda County		Bay Area	
	Employment	Output	Employment	Output
Chemical Products	6.8%	12.5%	6.8%	6.6%
Computer and Related Equipment Products	12.8%	27.8%	29.6%	47.2%
Electronic Instrument Products	13.9%	9.1%	13.8%	5.1%
Food, Beverage, and Tobacco Products	15.2%	12.3%	13.0%	5.4%
Furniture and Related Products	2.2%	0.7%	1.4%	0.2%
Machinery	8.1%	6.7%	5.4%	2.2%
Medical Equipment and Supplies	7.0%	4.1%	4.5%	1.3%
Metal Products	11.3%	4.9%	8.0%	2.1%
Motor Vehicle Products	2.4%	4.3%	3.8%	2.3%
Other Miscellaneous Manufactured Products	2.6%	1.2%	1.5%	0.3%
Petroleum and Coal Products	0.6%	9.1%	2.5%	25.4%
Plastics and Rubber products	6.5%	3.5%	3.1%	0.8%
Textile Products	2.5%	0.6%	1.8%	0.2%
Wood and Paper Products	8.1%	3.1%	4.8%	0.9%
Total	100.00%	100.00%	100.00%	100.00%

Source: IMPLAN: Economic Impact Analysis 2011 and Cambridge Systematics analysis.

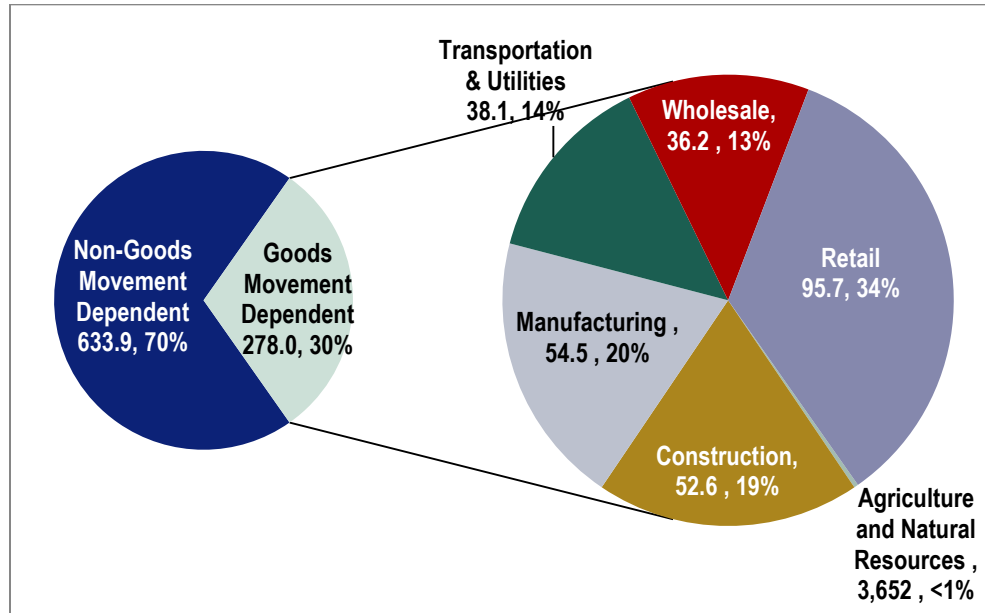
Figure 2.2 shows employment in goods movement-dependent industries in 2010, Figure 2.3 shows employment in these industries in 2040, and Figure 2.4 shows the growth of employment from 2010 to 2040 for Alameda County. These figures illustrate the importance of goods movement-dependent industries in the County, which represented one-third of all jobs in 2010 and a slightly lower percentage share expected in 2040. The growth in employment in the transportation and utilities sector and the construction sector in Alameda County are particularly notable as major sources of truck activity. The growth in transportation employment underscores the role that the County plays in providing freight transportation services in the region: Alameda County provided 26 percent of the region's jobs in this sector in 2010; and this share is expected to grow to 30 percent in 2040.

Figure 2 Employment in Goods Movement-Dependent Industries
in Alameda County, 2010
Thousands of Employees



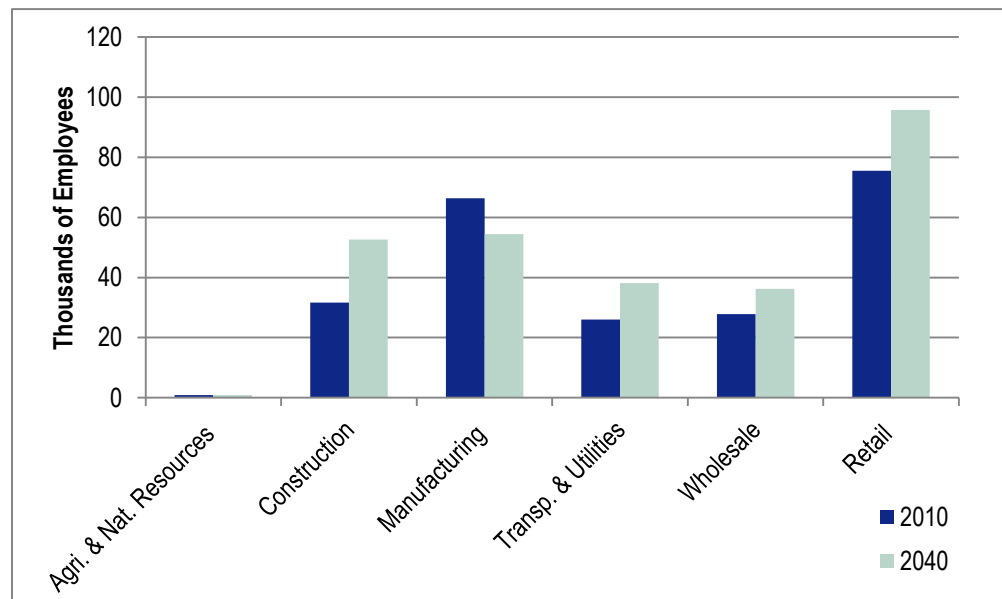
Source: ABAG Plan Bay Area Economic Forecasts; factors from CCSCE; and Cambridge Systematics Analysis.

Figure 3 Employment in Goods Movement-Dependent Industries in Alameda County, 2040
 Thousands of Employees



Source: ABAG Plan Bay Area Economic Forecasts; factors from CCSCE; and Cambridge Systematics Analysis.

Figure 4 Employment in Goods Movement-Dependent Industries in Alameda County, 2010, 2040



Source: ABAG Plan Bay Area Economic Forecasts; factors from CCSCE; and Cambridge Systematics Analysis.

Table 2.4 Number of Jobs that Do not Require a College Degree, May 2012

MSA	All Occupations	Goods Movement Occupations	Percentage of Jobs in Goods Movement
Napa MSA	15,726	1,941	12%
Oakland-Fremont-Hayward MD	240,880	38,411	16%
San Francisco-San Mateo-Redwood City MD	199,330	24,048	12%
San Jose-Sunnyvale-Santa Clara MSA	189,886	26,536	14%
Santa Rosa-Petaluma MSA	45,233	6,464	14%
Vallejo-Fairfield MSA	30,751	4,820	16%
Total	721,807	102,219	14%

Source: Wages and Employment Data from Occupational Employment (May 2012) and Wage (2013 – First Quarter) Data, California EDD; Educational-Level Data from BLS.

Note: Job occupations that do not require a college degree are selected if more than 90 percent of the jobs in that occupation do not require a college degree.

Goods movement jobs can contribute to job diversity, which has been identified as a regional challenge.¹⁸ There are many jobs in the transportation, warehousing, and logistics industries that do not require high levels of education and are often discussed as potential replacements for declining manufacturing employment. In light of the share of jobs in this industry in Alameda County and the projected growth in these jobs, it is useful to examine the role these jobs play in the County’s economy. Table 2.4 shows the number of jobs by Bay Area Metropolitan Statistical Area (MSA) in occupations for which at least 90 percent of workers do not have a college degree. Across the region, goods movement occupations that have these lower educational requirements constitute 14 percent of the total jobs in occupations that do not require a college degree. In Oakland-Fremont-Hayward, goods movement jobs represent 16 percent of jobs with low educational requirements. Table 2.5 presents average hourly wages for some of these goods movement occupations by MSA, indicating that a number of these occupations pay near to or above the median hourly wages for all occupations. Additionally, the Moving to Work in the Bay Area initiative¹⁹ has identified “industries of opportunity” which are those industries that provide: a high percentage of living-wage jobs; have relatively low educational barriers to entry and provides job security for many positions; provide a significant number of career-ladder positions; have a significant number of job openings anticipated; are expected to drive regional economic growth; and are near high quality

¹⁸ Bay Area Prosperity Plan, www.onebayarea.org/regional-initiatives/Bay-Area-Prosperity-Plan.html

¹⁹ Moving to Work in the Bay Area, www.moving2work.org/brief3.html

transit. Both Advanced & Food Manufacturing and Transportation and Logistics have been identified industries where these opportunities exist.

In summary, this section has shown some of the economic trends for industries within the Bay Area and Alameda County that contribute the greatest share of demand for goods movement services. It shows that these industries are important to the region and to the County's economy, and that many of these sectors are growing, although often not as rapidly as other sectors of the economy. It also shows that these industries play an even greater role in the economy of Alameda County than in the region as a whole. It shows that goods movement occupations are an important source of job diversity in the region and in the County.

Table 2.5 Median Hourly Wages and Number of Jobs of Goods Movement Occupations that Do Not Need College Degree, First Quarter 2013

Occupational Title	Napa MSA	Oakland-Fremont-Hayward MD ²⁰	San Francisco-San Mateo-Redwood City MD	San Jose-Sunnyvale-Santa Clara MSA	Santa Rosa-Petaluma MSA	Vallejo-Fairfield MSA	Bay Area Jobs that Do Not Need a College Degree
Cleaners of Vehicles and Equipment	\$10.4	\$10.1	\$11.8	\$11.8	\$11.4	\$9.4	7,640
Crane and Tower Operators		\$32.2	\$39.3	\$36.5	\$35.3	\$38.7	240
Excavating and Loading Machine and Dragline Operators		\$28.7	\$32.8	\$26.8	\$33.6	\$22.7	270
Industrial Truck and Tractor Operators	\$19.0	\$20.3	\$19.1	\$18.0	\$16.1	\$14.8	7,590
Laborers and Freight, Stock, and Material Movers, Hand	\$12.5	\$13.3	\$13.5	\$14.3	\$13.1	\$13.6	40,170
Machine Feeders and Offbearers		\$15.1	\$14.8	\$15.5	\$13.7	\$9.1	360
Material Moving Workers, All Other		\$20.2	\$26.3	\$22.0		\$24.7	540
Packers and Packagers, Hand	\$11.0	\$10.8	\$11.5	\$10.3	\$9.8	\$10.1	13,770
Pump Operators, Except Wellhead Pumps		\$19.9					-
Refuse and Recyclable Material Collectors	\$24.2	\$24.0	\$28.0	\$24.0	\$20.5	\$12.5	2,950

²⁰ The Oakland-Fremont-Hayward MD includes all areas within Alameda County, including the Tri-Valley Area.

Truck Drivers, Heavy and Tractor-Trailer	\$21.1	\$20.9	\$23.0	\$21.5	\$22.3	\$21.2	17,030
Truck Drivers, Light or Delivery Services	\$16.5	\$16.2	\$15.8	\$15.0	\$17.2	\$14.3	16,600
All Bay Area Occupations	\$18.0	\$22.6	\$24.7	\$26.0	\$18.8	\$18.7	3,226,630

Source: Wages and Employment Data from Occupational Employment (May 2012) and Wage (2013 – First Quarter) Data, California Employment Development Department (EDD).

Note: The occupations highlighted in blue are those that do not need a college degree at the 90 percent level, which are also high paying (more than the median in most/all MSAs).

2.3 FREIGHT-FLOW PATTERNS AND TRENDS

The previous sections described population, demographic, and economic trends and patterns within the Bay Area and Alameda County that contribute to goods movement demand and economic impacts. This section focuses on freight-flow patterns and trends, recognizing that many of these patterns and trends are driven by factors external to the County and the region. To the extent that Alameda County provides much of the significant goods movement infrastructure in the Bay Area, understanding these external trends and patterns is important to understanding how goods movement in the County is likely to change in the future.

The primary available source of freight-flow data is the Federal Highway Administration’s (FHWA) Freight Analysis Framework (FAF)²¹ national commodity flow database and forecast. FHWA FAF3 is a database of origin-to-destination commodity flows in tonnages and dollars, which provides data for 2007, 2011 and projections at five-year intervals up to 2040. It was developed using the national 2007 Commodity Flow Survey (CFS) and various other data sources for sectors not included in the CFS, including farm, fishery, logging, construction, services, retail, household and business moves, municipal solid waste, crude petroleum and natural gas products. The 2007 freight flow matrix is constructed and used as the starting point for a set of future year freight forecasts, projecting shipment volumes and values out to year 2040.

FAF forecasts are a reasonable extrapolation of current trends, but do not reflect major shifts in the national economy, future capacity limitations, or changes in transportation costs and technology. An extensive system of economic models is used to convert national consumption patterns and foreign trade into purchases among industries and then into volumes of commodities reflected in those purchases. Current percentages carried by each mode for each commodity are

²¹ www.fhwa.dot.gov/planning/freight_planning/talking_freight/10talking.cfm, Talking Freight Seminar presentations on FAF3

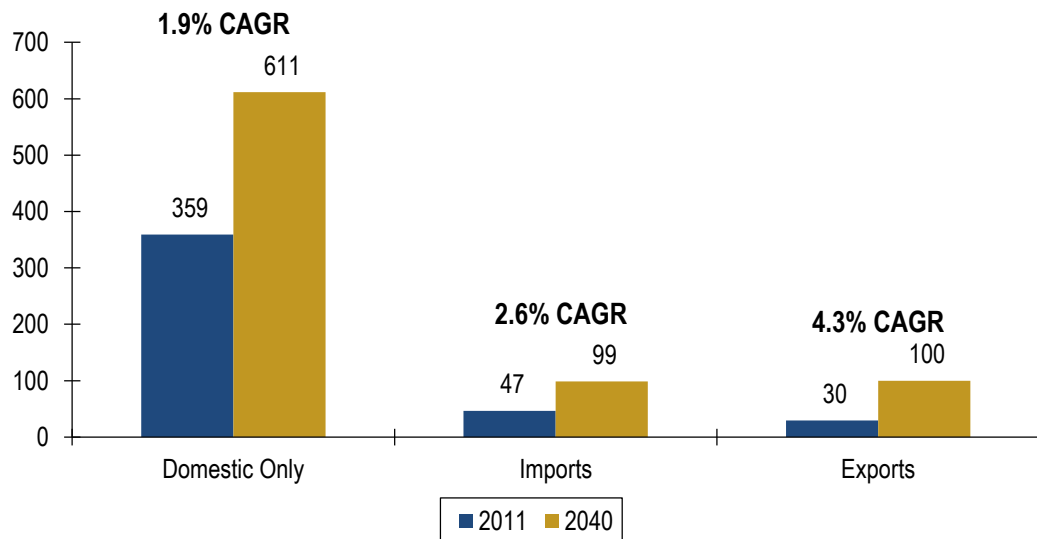
then applied to the forecasted mix of commodities to obtain future modal shares of freight movement.

The most geographically disaggregate data available from FAF is data for the Bay Area as a whole. Additional work will be done later in this study to understand how these regional and national freight-flow patterns can be disaggregated to show a county-level picture of freight movement. While this county-level analysis is not available for this report, the regional data can be used to provide some inferences regarding freight flows in Alameda County.

Goods Movement Demand by Trade Type

Figures 2.5 and 2.6 show the breakdown of current and future freight flows in the Bay Area by trade type in terms of both tonnage and value. What is immediately apparent from these graphs is that domestic freight flows are dominant by any measure, and this is not expected to change in the future. Most of this domestic trade is moved by truck and the types of commodities that are dominant are described later in this section.

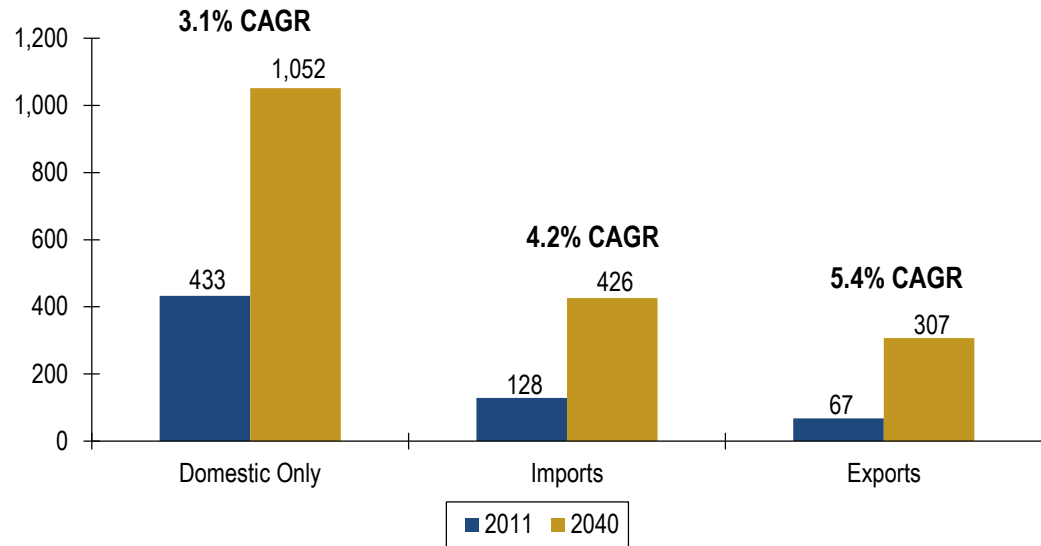
Figure 5 Bay Area Freight-Flow Volumes by Trade Type, 2011 and 2040
Millions of Tons



Source: FAF3.

Note: CAGR = Compound Annual Growth Rate

Figure 6 Bay Area Freight-Flow Values by Trade Type, 2011 and 2040
 Billions of Dollars



Source: FAF3.

Note: CAGR = Compound Annual Growth Rate

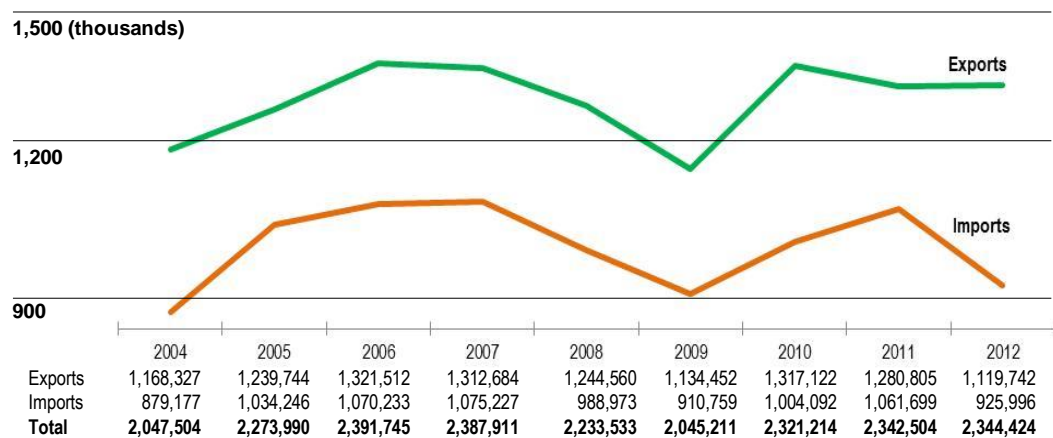
What is also shown is that international trade is an important and fast growing component of the overall freight picture in the Bay Area. According to FAF, in 2011, exports represented 6.8 percent of total freight movement in the Bay Area in terms of tonnage and 10.7 percent in terms of value; and imports represented 10.7 percent of total freight movement in the Bay Area in terms of tonnage and 20.4 percent in terms of value. For Alameda County, the share of international trade is likely higher than the Bay Area as a whole, due to the presence of the Port of Oakland.

By 2040, exports and imports will grow noticeably as the region continues its growth as an international gateway. Specifically, between 2011 and 2040, the export CAGR is 4.3 percent by tonnage and 5.4 percent by value (Figures 2.5 and 2.6), whereas the CAGR in the same period for the overall flow is 2.2 percent. This expected growth in exports indicates the growing importance of links between the Port of Oakland and the San Joaquin Valley, where much of the relatively higher weight agricultural export traffic originates. Most of these agricultural exports move through Alameda County via the I-205/I-580/I-238/I-880 corridor. Other regionally produced export commodities, such as wine and medical supplies and instrumentation, are also expected to continue their growth. On the other hand, imports will grow at a slower rate at a CAGR of 2.6 percent by tonnage and 4.2 percent by value (Figure 2.4 and 2.5), although at a higher rate than domestic trade. To some extent, the slower growth in imports, which include a significant share of

consumer products imported from Asia, also reflects the more limited inland distribution region for the Port of Oakland as compared to the Southern California ports, and the slower growth in Northern California population as compared with Southern California. Growth in rail services at the Port of Oakland could expand the Port’s reach to the hinterland of the U.S., which could affect growth in both imports and exports as an alternative to both the Southern California ports and the Pacific Northwest ports.

Figure 2.6 shows historical cargo volumes at the Port. Cargo volumes peaked at the Port in 2006 at approximately 2.39 million TEU, and then declined through 2008 due to the recession. Since 2009, cargo volumes at the Port have increased steadily and are now approaching prerecession levels. Figure 2.7 also shows that, unlike the Ports of Los Angeles and Long Beach, exports exceed imports at the Port of Oakland. Table 2.6 shows the top containerized export and import commodities at the Port of Oakland, and provides a sense of the importance of the Port to the region, the State, and the nation. It should be noted that in addition to the containerized trade shown in Table 2.6, the Port of Oakland also handles bulk and liquid bulk imports and exports (such as pulp and waste paper and iron and steel scrap) which are not captured by the container volume statistics presented in Table 2.6 because bulk goods are not shipped by container. In total, maritime trade through the region’s seaports represents approximately 48 percent of total international trade in the region with most of the remainder being high-value imports and exports shipped by air.

Figure 7 Container Cargo Volumes at the Port of Oakland
Annual Port Growth in TEU



Source: 2012 to 2013 Maritime Handbook, Port of Oakland.

Table 2.6 Containerized Imports and Exports at the Port of Oakland for Calendar Year 2012
In Millions of Dollars

Top Exports by Commodity Value		Containerized Value	Top Imports by Commodity Value		Containerized Value
1	Fruits and nuts	\$2,581	1	Machinery	\$3,782
2	Meats	\$2,300	2	Electronics	\$3,495
3	Machinery	\$801	3	Apparels	\$2,657
4	Wine and spirits	\$778	4	Wine and spirits	\$1,539
5	Rare earth minerals	\$548	5	Furniture and bedding	\$1,487
6	Medical instruments	\$514	6	Coffee, tea, spices	\$960
7	Vehicles	\$412	7	Plastics	\$886
8	Cereals	\$378	8	Toys/sports equipment	\$847
9	Dairy products	\$373	9	Vehicles	\$842
10	Foodstuffs	\$334	10	Medical instruments	\$585
11	Inorganic chemicals	\$329	11	Iron and steel	\$550
12	Electronics	\$300	12	Rubber products	\$525
13	Organic chemicals	\$293	13	Footwear	\$459
14	Cotton	\$287	14	Wood products/charcoal	\$417
15	Sugar and confectionery	\$277	15	Paper and paperboard	\$319
	All others	\$3,736		All others	\$5,685
Total		\$14,241	Total		\$25,035

Source: 2012 to 2013 Maritime Handbook, Port of Oakland.

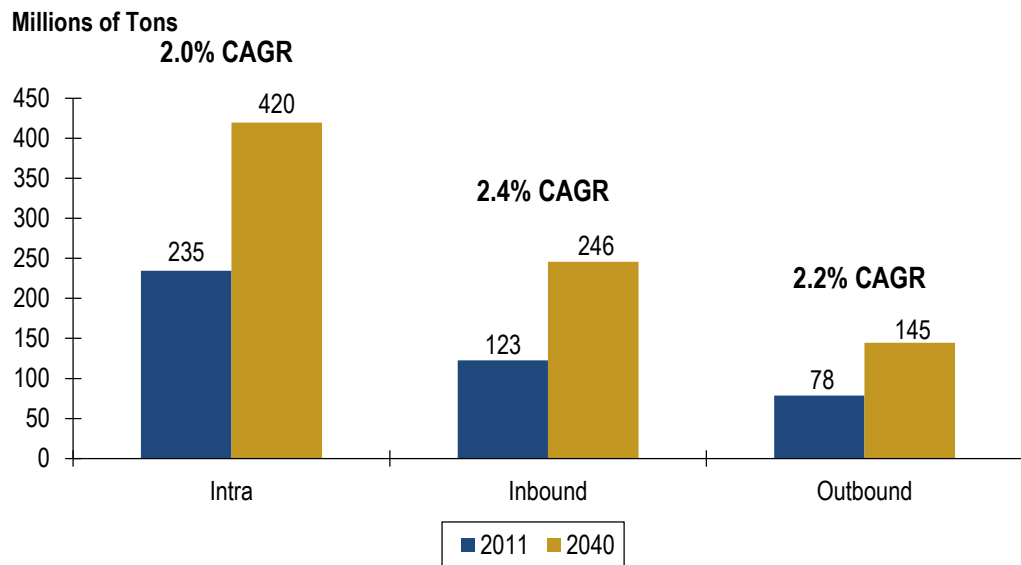
Imports at the Port of Oakland are a mix of supplies to critical industries (e.g., machinery, plastics) and consumer products that are consumed in California and other states in the Southwestern U.S. Many of these products move from the Port to warehouse and distribution facilities in the San Joaquin Valley with a significant fraction returning to the Bay Area for ultimate consumption.

Goods Movement Demand by Movement Type

As shown in Figure 2.8, in 2011, the predominant freight flow by weight in the Bay Area was intraregional commodity flows (i.e., flows that have both an origin and a destination within the region). These short-haul freight movements include movements among closely allied manufacturing clusters, which form local supply chains – including consumer goods moving from local warehouse and distribution facilities to retailers and wholesalers, heavy construction materials that are produced and consumed locally (such as sand and gravel or concrete), and waste and scrap materials moving to/from transfer facilities and recycling industries. Intraregional freight flows also include locally produced

products that are moved to the seaports and airports for export, or from the region’s seaports and airports to local consumers and industries. On a regional basis, the share of total freight flows comprised by intraregional flows is decreasing as the region is becoming a net consumer of goods produced outside of the region. This trend should be similar for Alameda County although perhaps not as pronounced because of the presence of a fast growing population and a relatively stable manufacturing sector.

Figure 8 Bay Area Freight-Flow Volumes by Movement Type, 2011 and 2040



Source: FAF3.

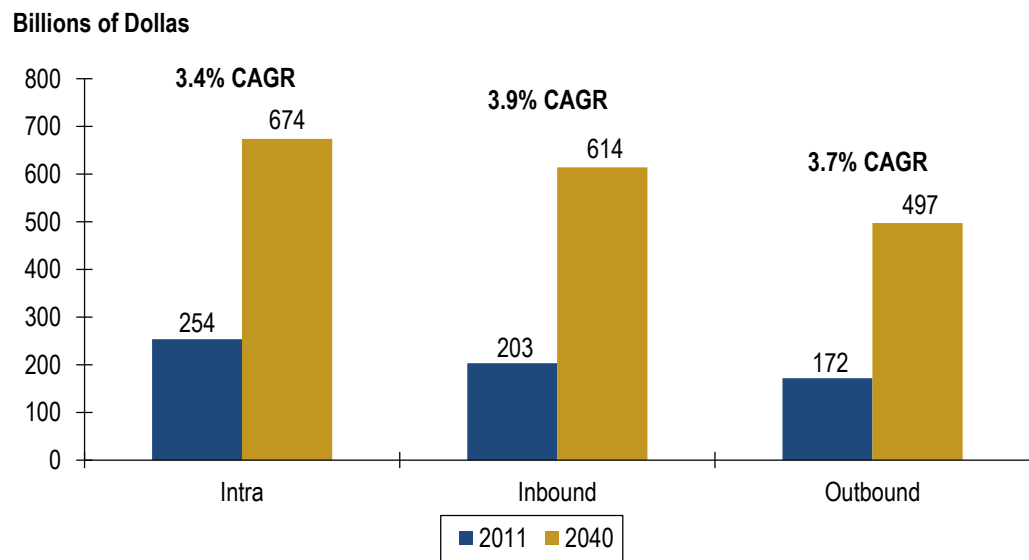
Note: CAGR = Compound Annual Growth Rate

Inbound commodities to the Bay Area account for 28 percent (123 million tons) by weight of total non-through flows, indicating that the region is a net consumer of goods that are shipped into the region from other parts of California and from other parts of the country. The inbound flows include supplies for local industries, consumer goods distributed from Central Valley warehouses, and products shipped into the region’s ports and airports for export. About 78 million tons (or 18 percent) of goods are transported outbound from the region; mostly destined for areas outside of California. This is a combination of goods produced by local manufacturers and products moving through the region’s international gateways but destined for locations in other parts of the country.

Figure 2.9 shows the same commodity flows in terms of value. While intraregional shipments still represent the largest share of the total cargo value shipped, the value of inbound and outbound flows combined form a much larger share of total freight flows as compared to their share of tonnage, making up

59.6 percent of total freight flows in 2011. This can be explained to a large extent by the high value of products that are typically traded between the Bay Area and other parts of the country; and that the highest tonnage of intraregional freight flows is lower value per ton construction products, such as nonmetallic minerals, sand, and gravel (which tend to move short distances to serve local markets). This share should be similarly observed for Alameda County. In terms of value, the growth rates are much higher for all movement types as compared to growth in tonnage. Intraregional movement will grow at a CAGR of 3.4 percent, inbound movement will grow at a CAGR of 3.9 percent, and outbound movements will grow at a CAGR of 3.7 percent annually (Figure 2.9). The higher growth rates in terms of value as compared to tonnage reflect a continuing shift to high-value manufacturing and consumption from an increasingly affluent population in the Bay Area, which will be true for Alameda County.

Figure 9 Bay Area Freight-Flow Values by Movement Type, 2011 and 2040



Source: FAF3.

Note: CAGR = Compound Annual Growth Rate

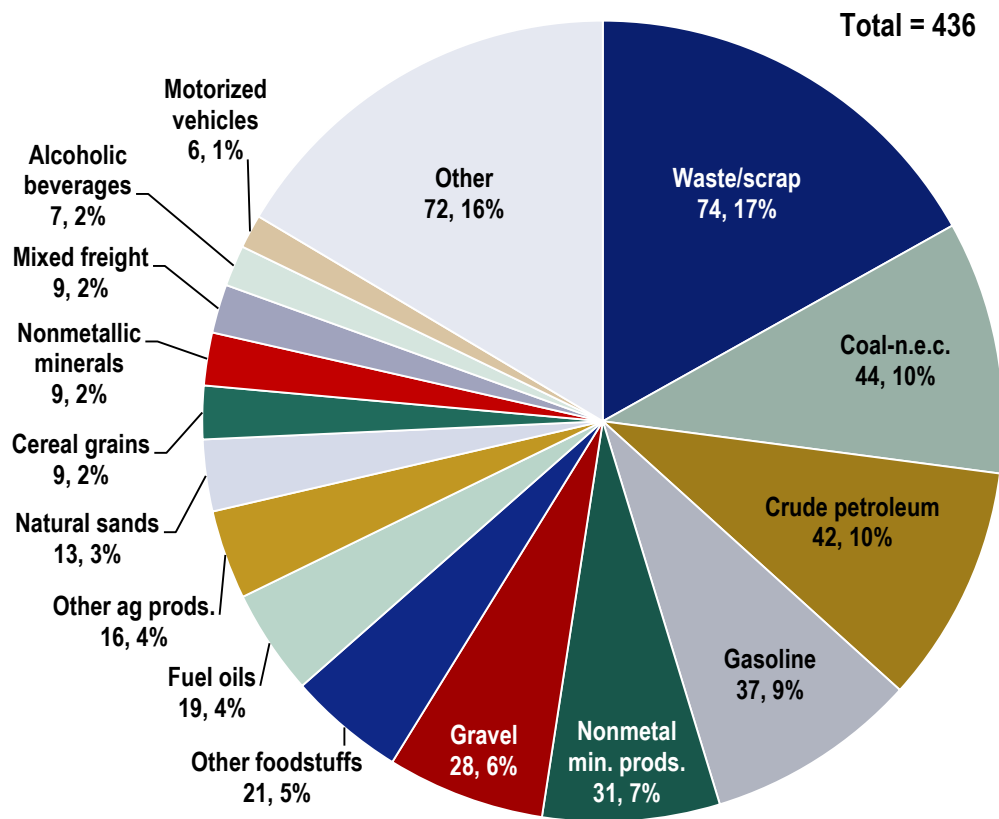
Goods Movement Demand by Commodities

In the Bay Area in 2011, the top commodities by tonnages moved include waste and scrap, petroleum and coal n.e.c²² (mainly petroleum products), crude petroleum, and gasoline, as shown in Figure 2.10. These liquid bulk commodities

²² Coal not elsewhere classified also includes petroleum products. In the Bay Area, the commodity in this category is mostly refined petroleum products.

are to a large extent moved through pipelines. A number of these commodities will be used or produced in Alameda County (sand and gravel for construction, mixed freight [containerized consumer products], and foodstuffs); and a number of these commodities are major international trade commodities that will move through the Port of Oakland (waste/scrap for export, agricultural products, nonmetallic minerals, mixed freight, alcoholic beverages)²³.

Figure 10 Bay Area Freight-Flow Volumes by Commodities, 2011
 Millions of Tons



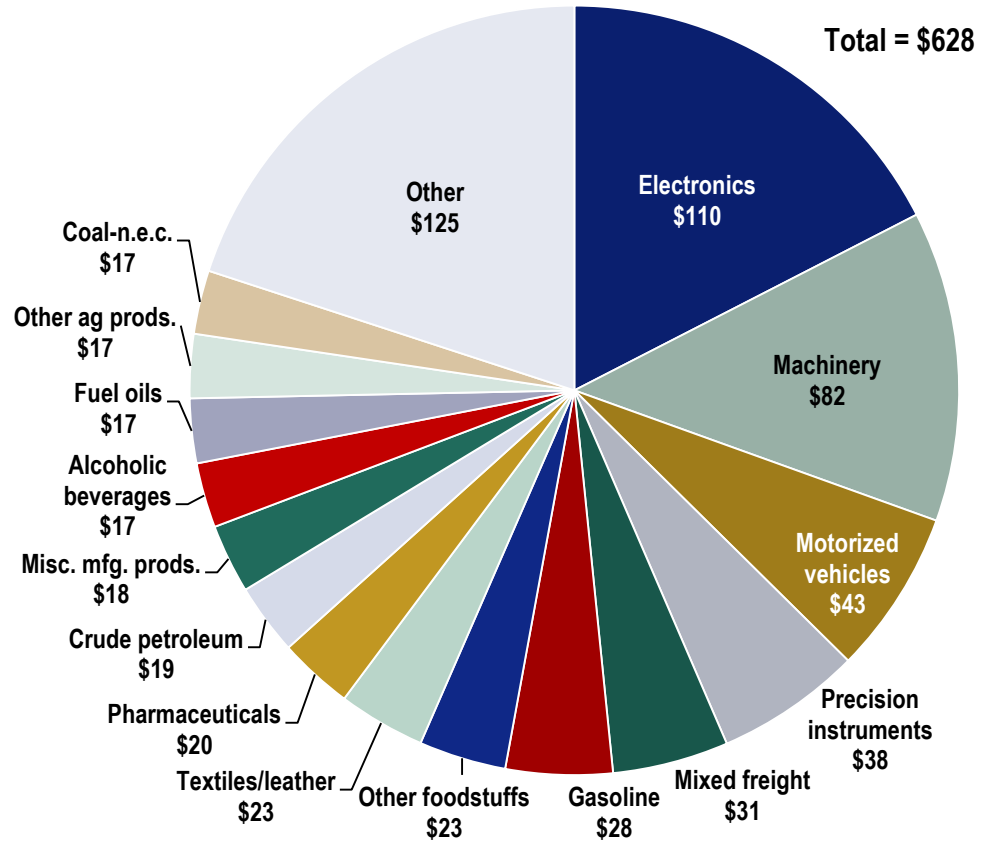
Source: FAF3.

In terms of value (Figure 2.11), top commodities moved represent a significantly different picture, as electronics, machinery, and motorized vehicles dominate,

²³ These observations are made through understanding of the County's economy. The commodities discussed would have consumption levels in direct relationship to the population and business of the region. Commodities moving through the Port of Oakland are also part of Alameda County. For instance, waste and scrap is generated locally in the County proportional to its population share, and it is also exported overseas through the Port of Oakland.

since they are much more valuable on a per-unit weight basis. In Alameda County, electronics, machinery, precision instruments, foodstuffs, and pharmaceuticals are all products that are manufactured locally that will move on the County's goods movement system. Agricultural products, on the other hand, will have a smaller share compared to the rest of the Bay Area.

Figure 11 Bay Area Freight-Flow Values by Commodities, 2011
Billions of Dollars



Source: FAF3.

The analysis from this section indicates that domestic goods movement will continue to be the most important type of goods movement in the future, and that since most of these domestic trade is moved on trucks, providing efficient and reliable highway connections will be important. Further, international trade, though has smaller shares than domestic trade, will grow at a faster rate (and this is particularly true given the importance of the Port of Oakland), and therefore, connectivity and accessibility to trade gateways will also be important.

3.0 The Multimodal Goods Movement System

The goods movement system is comprised of a series of interconnected infrastructure components. While the system is often described in terms of its modal components, it must function as an integrated whole with efficient intermodal connections. For instance, shippers and receivers of goods look at the end-to-end performance of the regional goods movement system to determine how well it meets their needs. This includes consideration of costs to use the system, the throughput and velocity of goods moving through the system, and the reliability of the system.

The goods movement system in Alameda County (see Figure 3.1) consists of private and public sector components that in many cases are also used for the movement of passengers. The core of the goods movement system consists of major truck routes (refer to Section 3.1 for definition), Class I rail mainlines (operated by the Union Pacific Railroad (UP) and the Burlington Northern and Santa Fe Railway (BNSF), the principal international water trade gateway at the Port of Oakland, the principal domestic air cargo gateway at Oakland Airport, near-dock intermodal rail facilities, and a marine highway between Port of Oakland and Port of Stockton. These goods movement system components also form much of the core goods movement system for the San Francisco Bay Area. The County's core system is complemented by various other state and local truck routes. Each of the modal components and current demand in traffic volumes are discussed in detail in the sections that follow.

In addition to the goods movement system within Alameda County, the County also has access to several freight facilities in the neighboring counties and regions (especially the rest of the San Francisco Bay Area and the Central Valley), including the principal international air cargo gateway at San Francisco International Airport, Mineta San Jose International Airport, rail yards for transporting automobiles (primarily in Contra Costa and Solano Counties), marine terminals and inland ports, and warehouse facilities in the Central Valley.

Nearby Contra Costa and Solano Counties are also home to several oil refineries²⁴ (e.g., Phillips-66 refinery at Rodeo, Chevron refinery at Richmond, Shell refinery at Martinez, Valero refinery at Benicia, etc.) that receive crude oil by pipelines, rail and ships, and send out refined by-products in trucks and

²⁴ <http://energyalmanac.ca.gov/petroleum/refineries.html> (last accessed on April 23, 2014)

ships. Crude oil pipelines run through the eastern edge of Alameda County, whereas trucks carrying various fuels serve gas stations, ports, rail yards, airports and recreational boat facilities all across Alameda County.

Figure 12 Alameda County Multimodal Freight System



Source: Caltrans District 4 Geographic Information System (GIS) Dataset, as of July 2013.

Note: The above map shows only the state truck routes. City-designated truck routes in Alameda County are described under Section 3.1 of this report.

3.1 TRUCK HIGHWAY SYSTEM

The Alameda County roadway network consists of about 4,146 miles of public roads, which is 18.7 percent of the total miles of public roads in the Bay Area and 2.4 percent of the total miles of public roads in California. This system consists of 204 miles of interstate and other state highways, 542 miles of county roadways, 3,237 miles of city roadways, and the rest is maintained by Federal and other agencies. In the Bay Area, the County ranks second to San Francisco City and County in terms of public roadway network density – with 5.6 public road miles per square mile of land area.²⁵

Commercial vehicle operations are allowed on only a portion of the available public roads, and these are referred to as truck routes in this report.

State Truck Routes (Highways)

Infrastructure

Caltrans District 4 has identified a highway network on which trucks compliant with the Federal Surface Transportation Assistance Act (STAA) of 1982²⁶ and/or California legal trucks²⁷ are allowed, as shown in Figure 3.1. Some of the state highways have special restrictions (e.g., prohibitions for hazardous materials (hazmat), and/or time of the day during which operation is allowed). California legal trucks may also use local “truck routes” as approved and signed by local governments.

The state truck routes are classified in this report as “major state truck routes” or “other state truck routes” based on truck volumes (also as shown in Figure 3.1). Major truck routes (highways) were identified using Caltrans’ definition²⁸: A

²⁵ Highway Performance Monitoring System, 2012 California Public Road Data, Table 5, 2012 Mileage of Maintained Public Roads in Each County by Type of Jurisdiction.

²⁶ The Federal STAA regulates the allowable width and length of commercial motor vehicles; however, there is no Federal vehicle height requirement. The weight and length limits are applicable to a designated “National Network” (NN) of highways, as authorized by the STAA and specified by 23 U.S. Code of Federal Regulations 658. In addition, based on Assembly Bill (AB) 866 of 1983, Caltrans evaluated the State’s highways, and designated certain state routes as “Terminal Access” (TA) highways that have geometric standards high enough to accommodate STAA trucks.

²⁷ The California Vehicle Code (CVC) Sections 35400 on length regulation, 35100 to 35111 on width regulation, 35250 on height regulation, and 35550 to 35558 on weight regulation together define a California legal truck. These are applicable to all state highways.

²⁸ Current proposal presented to CFAC as of September 20, 2013.

major state truck route is a route/highway segment that has bidirectional average annual daily traffic for trucks with three or more axles (truck AADT with 3+ axles) greater than 3,000 trucks. The major truck routes mainly consist of segments of I-80, I-880, I-580, I-680, I-238, I-980, and State Route 92 (SR 92). 100 percent of the major truck routes within the Alameda County belong to the STAA National Network. Other state truck routes consist of the remaining portions of the state truck route network. Of these, in terms of miles of roadway, 8% belong to the STAA National Network, 31% belong to STAA Terminal Access, 43% are California Legal Network, and 18% are California Legal Advisory Routes.

In Alameda County, the state truck routes with special restrictions are along portions of I-580, SR 24 Caldecott Tunnel, SR 260 Webster and Posey Tunnels, along SR 84, and on the Bay Bridge. More details about the specific type of restriction can be seen in Appendix A to this report.

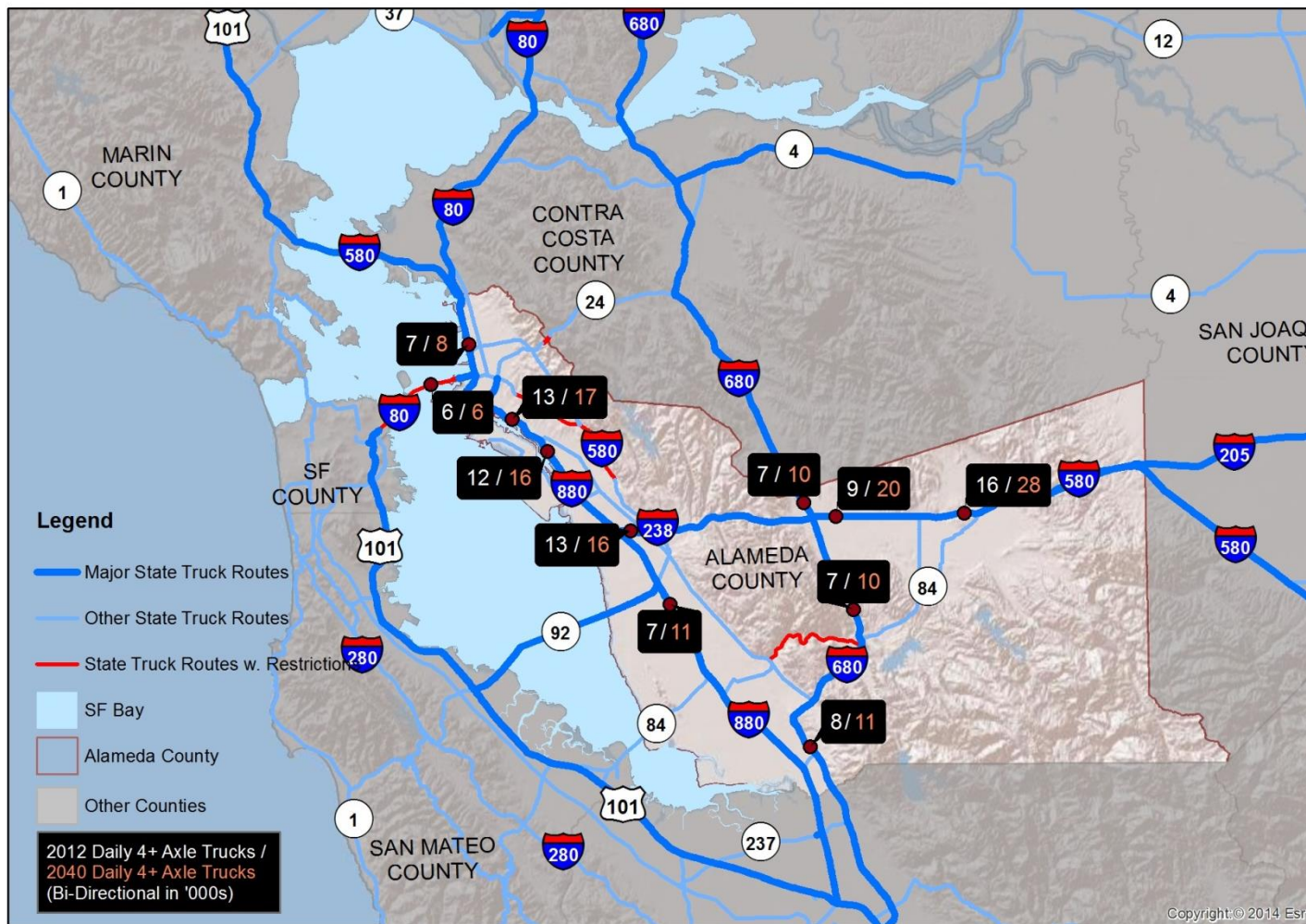
Existing Traffic Volumes

In terms of truck traffic, I-880 and I-580 have the highest overall truck traffic volumes in the County and the highest volumes of heavy trucks (with 4 or more axles) in 2012 (Figure 3.2). I-580 is the primary interregional truck corridor. I-880, in addition to providing access to the Port of Oakland and Oakland Airport, is also one of the core intraregional highways moving goods within the region to major population centers in the East Bay.

Most of the major truck routes in the County are also heavily traveled auto corridors. Auto and truck traffic have different speed characteristics and maneuverability, which can lead to traffic conflicts and even unsafe conditions, especially at interchanges, due to weaving, and lane reduction or lane change situations. I-80 across the Bay Bridge and north of the I-880 junction, I-880, I-580, and I-680 in particular carry very high commuter auto and truck traffic in the County.

Heavy trucks, with four axles or above, have a greater impact on highway congestion, create unique operational challenges, and create more damage and wear on pavement. As shown in Figure 3.2, interstates with the highest heavy truck volumes include I-880, I-238, and I-580.

Figure 13 Average Daily Heavy (4+ axle) Truck Volumes on State Truck Routes in Alameda County, 2011 and 2040
 Thousands of Trucks



Source: Caltrans District 4 GIS Dataset, as of July 2013; Caltrans Truck and Total Traffic Counts, 2012, MTC travel model truck volume growth rates.

Truck-Based Goods Movement Infrastructure for Cities in Alameda County

Alameda County has 14 incorporated cities and several unincorporated communities. Outreach to all of the cities and communities was conducted to collect truck-based goods movement inventory information from these cities. While all of the entities responded, Table 3.1 summarizes the survey results, indicating which cities provided information regarding truck counts, and also whether they have any information on truck routes.

Table 3.1 Summary of City Truck Data and Truck Route Survey Results

City Name	Truck Counts Received?	Truck Routes Received?
Alameda	No	Yes
Albany	No	Yes
Berkeley	No	Yes
Dublin	Yes	Yes
Emeryville	No	Yes
Fremont	Yes	Yes
Hayward	Yes	Yes
Livermore	Yes	Yes
Newark	No	Yes
Oakland	No	Yes
Piedmont	No	No
Pleasanton	No	Yes
San Leandro	Yes	Yes
Union City	Yes	Yes
Alameda County (Unincorporated)	No	Yes

Source: Cambridge Systematics.

For cities that have provided either truck counts or truck routes information, a more detailed inventory is provided below and where available, includes information on:

- The city-designated truck routes;
- Locations of major freight facilities and/or industrial land use zoning and parcels information;
- Average daily and/or peak truck and/or total traffic volumes; and
- Other relevant information.

In addition, the information below describing each of the cities is presented in descending order by city population, as seen in see Table 3.2.

Table 3.2 Population and Population Density Estimates of Cities in Alameda County that Responded to Outreach Requests, 2012

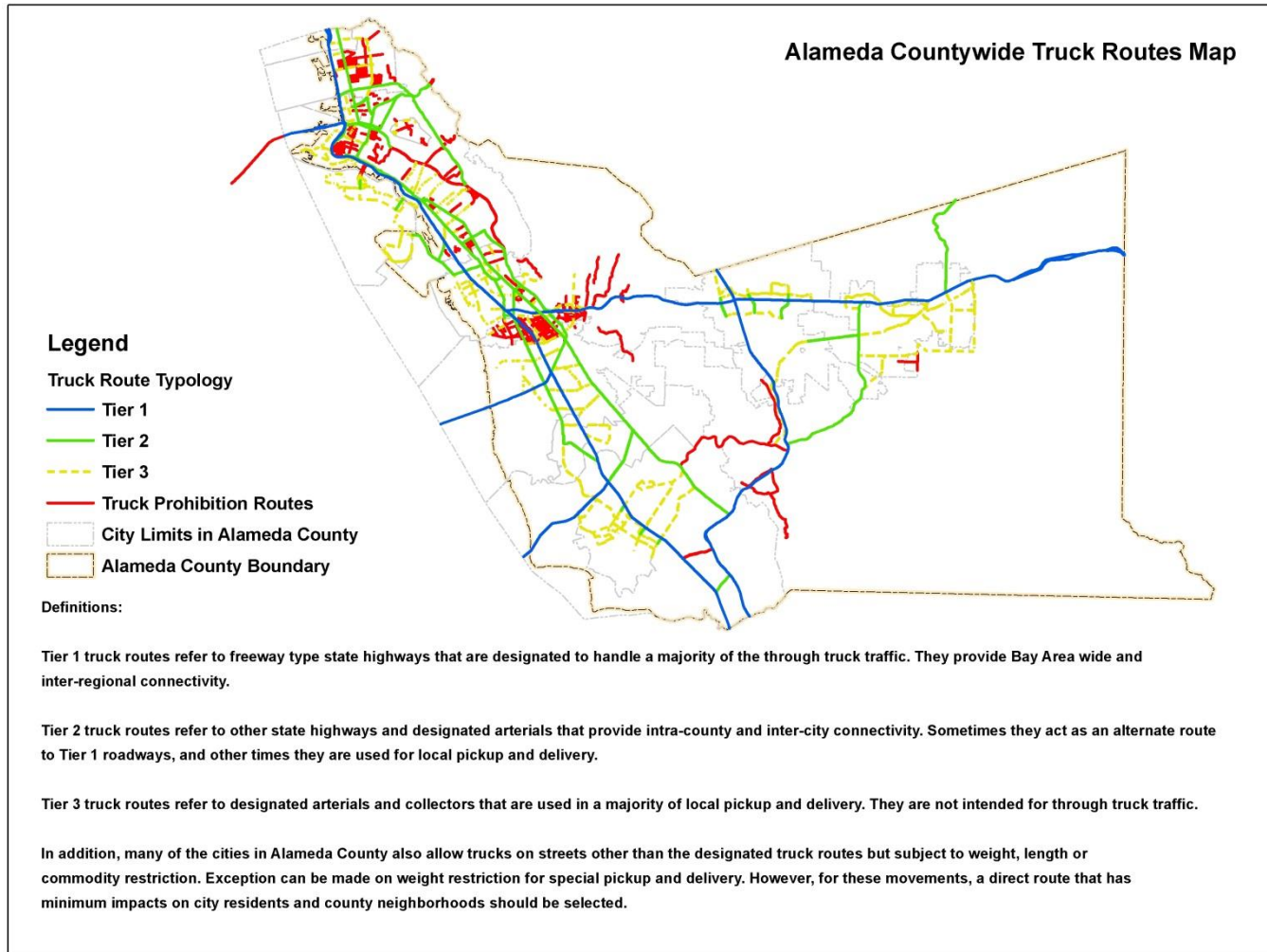
Geography	2012 Population Estimate	Rank by Population	2010 Land Area (in Square Miles)	2012 Population Density Estimate ^a	Rank by Population Density
Alameda	75,641	7	10.61	7,129	5
Albany	18,979	12	1.79	10,603	2
Berkeley	115,301	4	10.47	11,013	1
Dublin	48,775	10	14.91	3,271	11
Emeryville	10,256	14	1.25	8,205	3
Fremont	221,986	2	77.46	2,866	14
Hayward	149,392	3	45.32	3,296	10
Livermore	83,547	6	25.17	3,319	9
Newark	43,621	11	13.88	3,143	12
Oakland	400,740	1	55.79	7,183	4
Piedmont	10,970	13	1.68	6,530	6
Pleasanton	72,338	8	24.11	3,000	13
San Leandro	86,890	5	13.34	6,513	7
Union City	71,763	9	19.47	3,686	8
Unincorporated Areas	143,761	Not ranked	423.77	836	Not ranked
Alameda County Total	1,553,960		739.02	2,103	

Source: U.S. Census Bureau: State and County QuickFacts. Available at <http://quickfacts.census.gov/> (last accessed February 13, 2014).

^a 2012 Population density was estimated by dividing the 2012 estimate for Population by the 2010 Land Area.

Based on the data collected, a complete County Truck Routes Map is developed, as shown in Figure 3, which also include restricted routes. City-specific truck route maps, where available, are provided in Appendix B.

Figure 14 Truck Routes and Restrictions in Alameda County



Source: Truck Routes Information from various cities; Caltrans District 4 GIS Dataset, as of July 2013.

Note: This Alameda County sub-area includes all local truck route data available to date.

City of Alameda

Among the enumerated list of cities in Table 3.1, the City of Alameda is the fifth most densely populated city in the County. This “Island City” occupies two islands as well as a section of the mainland. The island portion of the City can be accessed through three bridges from Oakland (Park Street, Fruitvale Avenue, and High Street bridges) and two one-way tunnels – Posey and Webster Street.

As mentioned earlier, the tunnels have a restriction that trucks are not allowed to carry hazardous materials/waste. The City has some shopping facilities along Webster Street and Otis Drive, both of which are truck routes (see Appendix B for a map of this City’s truck routes). Aside from these, based on aerial photographs, Ralph Appezato Memorial Parkway (formerly Atlantic Avenue), Main Street, and Clement Avenue are important truck routes.

City of Dublin

City of Dublin has room to grow due to its significant undeveloped land capacity and large infill sites.²⁹ The low population density (see Table 3.1) is indicative that the City has more suburban characteristics. Aerial photographs indicate that the City has large retail stores, such as Target, Lowe’s Home Improvement, food and entertainment complex at Hacienda Crossings and numerous light manufacturing and small-scale businesses located between Dublin Boulevard and I-580.

The City provided peak-period traffic counts on several truck routes (see Appendix B for a map of this City’s truck routes). Using the 2013 peak-period traffic counts at the intersection of Dublin Boulevard and Hacienda Drive, the hourly traffic volume in the peak direction on Dublin Boulevard was determined as 950 vehicles; whereas, the hourly traffic volume in the peak direction on Hacienda Drive was determined as about 780 vehicles. Based on 2012 vehicle classification counts during peak period³⁰, the ratio of peak hourly heavy vehicle volumes as a percentage of peak hourly total traffic volume was determined for the Dublin Boulevard as about 3.3 percent, where as that on Hacienda Boulevard was found to be about 2.4 percent.

A similar analysis for Dougherty Road (just north of Dublin Boulevard) using 2012 vehicle classification counts during peak period, indicated the hourly traffic volume in the peak direction on Dougherty Road was about 1,950 vehicles, and

²⁹ <http://dublinca.gov/DocumentCenter/View/3930> (last accessed on April 23, 2014)

³⁰ Please note that the peak period for general traffic may not coincide with the peak for truck traffic. Cities restrict deliveries to early hours (around 5 am) on certain streets which during the day have heavy movement of cars, bikes and pedestrians. So, the percentage of daily heavy vehicle volumes are likely to be higher than shown.

the ratio of peak hourly heavy vehicle volumes as a percentage of peak hourly total traffic volume was about 2.3 percent.

However, it is noted that there are several large vacant parcels that are yet to be developed in the City. If industrial or commercial development continues, the traffic volumes on the city streets would likely rise above the existing levels, along with increases in truck volumes.

City of Fremont

Among the cities enumerated in Table 3.1, the City of Fremont is the second most populous city in Alameda County. However, the City ranks the lowest in terms of population density, indicative of a more suburban development pattern and large amounts of protected open space within city limits along the bay. Although goods movement activities are not as complex as in the City of Oakland, the retail industry to support the population is large and there are several large industrial areas, including the Tesla electric vehicle production facility in the City of Fremont. In addition, due to BART extension, Warm Springs and South Fremont are poised for major transit oriented development that will likely attract a young and diverse workforce.³¹

Goods movement facilities are spread along the City's truck routes (see Appendix B for a map of this City's truck routes) of Mowry Avenue, Automall Parkway, Fremont Boulevard, and Warm Springs Boulevard. These are also heavily traveled auto corridors with average daily two-way traffic volume in 2010 on Mowry Avenue and Auto Mall Parkway of about 46,000 and 38,000 vehicles just east of I-880³².

City of Hayward

There are a number of industrial and light manufacturing parcels in the western and southeastern parts of the City of Hayward.

The City has designated about 15 truck routes to serve goods movement within the City. Industrial Boulevard/Industrial Parkway serves most of these locations. Other roads serving the industrial land uses are Whipple Road, Winton Avenue, and Clawiter Road. Hesperian Road is a parallel arterial to I-880.

According to the City, Winton Avenue carries about 30,000 or more vehicles in both directions just west of I-880, which gets split into two west of the Winton Avenue/Clawiter Road intersection. Industrial Parkway carries just fewer than 30,000 vehicles in both directions east of I-880. In terms of truck percentages of

³¹ <http://www.fremont.gov/DocumentCenter/View/21154> (last accessed on April 23, 2014)

³² <http://www.fremont.gov/index.aspx?NID=869> (last accessed on February 13, 2014).

all trucks medium- and heavy-trucks (Class 4 and above³³), it is as high as 13 percent on Winton Avenue between Clawiter Road and Hesperian Boulevard. Industrial Parkway and Whipple Road just east of I-880 also have similar, high truck percentages (about 12 percent).

City of Livermore

City of Livermore is at the rim of the development in Alameda County, and if BART is extended, the growth in the City is likely to become more transit oriented harnessing workforce potential. The City wants to leverage its science and technology centers, namely, Lawrence Livermore National Laboratory and Sandia National Laboratory. The City also identified economic centers in the City that are current focus areas for job development. These include large retail outlets, such as Costco; Bloomingdale's Outlet Center; food processing industries, including Sara Lee Foods, U.S. Food Service, and Wente Vineyards Restaurant; construction-related industries, such as RGW Construction Inc., Valmark Industries Inc., Peterson Painting Inc.; and medical equipment and healthcare industries Alere Home Monitoring (a physician and surgeons equipment and suppliers manufacturer); and Valley Memorial Hospital. Aerial photographs show that the majority of the goods movement-related facilities are located along Las Positas Road, First Street, Vasco Road, and Greenville Road.

The City considers these four roads and some others as "suggested roadways for local delivery," and requires all through trucks with weight more than 3 tons to remain on I-580 and SR 84 (see Appendix B for a map). Based on the most recent traffic data³⁴, the average daily traffic on First Street reaches 32,000 to 36,000 vehicles in both directions just south of I-580; whereas, the average daily traffic on Vasco Road is about 28,000 vehicles in both directions south of Las Positas Road. In comparison, Las Positas Road and Greenville Road have smaller traffic volumes. Greenville Rd carries 10 percent daily trucks while First Street and las Positas Road have more modest percentages of trucks. Isabel Avenue (SR-84), Jack London Blvd, El Charro Road, North Canyons Parkway, and Tesla Road also serve as goods movement facilities..

³³ Gross vehicle weight rating (GVWR) is is the maximum operating weight/mass of a vehicle as specified by the manufacturer including the vehicle's chassis, body, engine, engine fluids, fuel, accessories, driver, passengers and cargo but excluding that of any trailers. GVWR is used to classify trucks into 8 classes. Classes 1-3 trucks that have GVWR less than 14,000 pounds are considered light trucks, Classes 4-6 that have GVWR between 14,000 pounds and 26,000 pounds are considered medium trucks and Classes 7 and 8 that have GVWR greater than 26,000 pounds are considered heavy trucks.

³⁴ City of Livermore - 2012/13 Summary ADT Counts, Available at: <http://www.cityoflivermore.net/civicax/filebank/documents/9402/> (last accessed on February 13, 2014).

City of Newark

The City of Newark is located adjacent to the San Francisco Bay. It has a relatively low population and population density. Aerial photographs indicate that the City has a large shopping mall near I-880/Mowry Avenue interchange; and numerous freight businesses along Cherry Street between Central Avenue, and Mowry Avenue, including Oak Harbor Freight, Western Pacific Pulp and Paper, Ronbow Materials Corporation, Five Star Lumber, Golden State Lumber, and Zimmerman Window Manufacturing.

The City provided average daily traffic (ADT) counts on several truck routes (see Appendix B for a map of this City's truck routes). In 2012, the highest ADT were seen on Mowry Avenue near the interchange with I-880 of about 34,000 vehicles in both directions, Cherry Street between Mowry Avenue and Central Avenue carried about 25,000 vehicles in both directions, and Thornton Avenue between I-880 and Cedar Boulevard carried about 42,000 vehicles in both directions.

City of Oakland

As seen in Table 3.1, the City of Oakland is the largest in terms of population and land area, and highly urbanized as indicated by the population density. This creates a complex set of population-based goods movement business activities through retailers set in well-developed neighborhoods.

The City also is home to the Port of Oakland and Oakland Airport. The seaport is located in West Oakland, whereas, the airport is located about five miles south of downtown Oakland. Aside from these, warehousing (city land use code: '4100'), light industrial (city land use code: '4200'), and heavy industrial (city land use code: '4300') facilities are located in Oakland:

- Swenson Development II LLC and A&B Properties are among the largest operators of warehousing facilities in the City;
- Stephens & Stephens VIII LLC, CEP Coliseum Investors LLC, and Catellus Development Corporation are the owners of some of the largest combined light industrial areas;
- Schnitzer Steel Products of California Inc.; and
- General Electric Company are the larger among heavy industrial facilities in terms of area.

In addition, the City also has major commercial activities in downtown Oakland, the waterfront district of Jack London Square, and the Coliseum area that need trucking service on a regular basis.

The City has designated about 40 streets as truck routes. Of these, 7th Street, Maritime Street, and Middle Harbor Road provide "last-mile" access to the seaport. Hegenberger Road, Doolittle Drive, and Earhart Road provide "last-mile" access to the airport.

Most of the downtown and West Oakland streets do not allow trucks that are over 4.5 tons. Similar restrictions are also present on some streets in the eastern parts of Oakland. The I-580 restriction on trucks more than 4.5 tons is one of the reasons for designating several connector roadways between I-880 and I-580 as truck routes in the eastern parts of Oakland, including 73rd Avenue, High Street, and Fruitvale Avenue.

In April 2011, the Oakland Redevelopment Agency led a joint planning effort along with the Port for a master planned development of both the Port and City of Oakland (City)-owned Oakland Army Base (“OAB”) lands. In Phase 1 of this redevelopment, the City plans to build more than 1,000,000 square feet of cargo, trade and logistics distribution warehouses (also called *Oakland Global Trade & Logistics Center*), a bulk marine terminal capable of handling 2 million additional metric tons of bulk commodities, and recycling center on its OAB lands. The work includes new roadways, utilities, truck parking and other infrastructure improvements to serve these operations. The City has entered into development agreements with Prologis and California Capital & Investment Group (“CCIG”) for the bulk terminal and warehouse sites. The City is negotiating with two recycling companies and a trucking company for the remaining portion of its OAB redevelopment. There are also partnerships with Labor Unions and the West Oakland community.^{35,36}

City of Pleasanton

The City of Pleasanton is the second least densely populated city. The City’s General Plan identifies Stanley Boulevard/First Street/Sunol Boulevard as a truck route.

The City’s industrial uses are not concentrated in any one part of this City. Also, a majority of the land uses in this City are nonindustrial. The average daily traffic on Sunol Boulevard is about 20,000 vehicles in both directions. There were no vehicle classification counts made at this location.

City of San Leandro

The City of San Leandro has a very intensely developed land area. It is the seventh highest in terms of population density. As seen in Figure 3.3, the western part of the City is mostly zoned for industrial land uses; however, there are some residential, retail, and recreational uses as well. In addition to industrial uses, the City identified several large retail outlets, such as Costco, Home Depot, and Walmart, that are goods movement-oriented uses located both north and south of Davis Street between I-880 and Doolittle Drive. The City is

³⁵ http://www.portofoakland.com/pdf/maritime/oab/oab_projUpdate_02132014.pdf
(last accessed on April 23, 2014)

³⁶ Email communication from Doug Cole, City of Oakland dated March 13, 2014.

also very close to the Oakland Airport. Aerial photographs show that the western parts of the City provide large warehousing facilities and truck terminals.

In addition to Davis Street and Doolittle Drive, Hesperian Boulevard, Marina Boulevard, Merced Street/Wicks Boulevard, Farallon Drive, Alvarado Street, and Washington Avenue are other important truck routes in this City.

In terms of traffic volumes provided by the city, Doolittle Drive north of Davis Street is heavily traveled with about 25,000 daily vehicles in both directions, and Washington Avenue carries about 20,000 daily vehicles in both directions.

Based on vehicle classification counts provided by the City, on Davis Street, three or more axle trucks made up about 7 percent of the total traffic of about 24,000 vehicles in both directions. On Hesperian Boulevard just east of I-880 in this City, although the total traffic volume was slightly lower at about 20,000 daily vehicles in both directions, the same percentage of 7 percent of three or more axle trucks were recorded.

City of Union City

Union City is ranked eighth in terms of population density. The City identified several transportation and warehousing-related industries in the City, including Nagra Trucking; Safety Trucking; Santillana Trucking; Southwest Transportation Systems Inc.; Toor Trucking Company; Lagasse, LLC; Pen Bullet Express/UC Warehouse; Sunlogistics Inc.; and Xo Moving System, Inc.

A majority of the industries in the City are concentrated at the center of the City, east of I-880 and are bounded by Alvarado-Niles Road in the south and Whipple Road in the north, both of which are designated truck routes (see Appendix B for a map of this City's truck routes). The "last-mile" access to these industries is provided by the truck route of Central Avenue.

In addition to this, aerial photographs indicate that there are some industries in the northern part of the City bounded by Whipple Road in the south, the city boundary in the north, and I-880 in the east. On the other hand, Decoto Road, also this City's designated truck route, has some retail developments along its length.

The City provided existing traffic counts on Alvarado-Niles Road that indicated, on an average weekday in 2012, Alvarado-Niles Road just east of Central Avenue (between Central Avenue and Western Avenue) carried a total traffic volume of about 34,000 vehicles in both directions. In another vehicle classification count a little west to Central Avenue (between Medallion Drive and Hop Ranch Road), the counts also showed that, on an average weekday, three or more axle trucks made up about 4 percent of the total traffic volume on Alvarado-Niles Road.

The City provided existing traffic counts on Whipple Road from 2010. This showed that the total traffic on this road west of I-880 and east of Union City

Boulevard is also about 19,000 vehicles in both directions. There were no vehicle classification counts made at this location.

Lastly, the City also provided existing traffic counts on Decoto Road from 2013; this showed that the total traffic on this road west and south of Mission Boulevard (SR 238) is about 19,000 vehicles in both directions. There were no vehicle classification counts made at this location.

3.2 FREIGHT RAIL SYSTEM

The freight rail system in Alameda County consists of privately owned rail lines that are operated by Class I railroads, a short line railroad, and rail classification yards (or rail yards), including intermodal terminals and rail classification yards (for carload traffic). A significant portion of the tracks that the freight trains use is also shared with passenger rail services.

The County does not have a rail classification yard that can handle automobiles. However, it has access to such rail yards in neighboring counties, including Port of Richmond's Point Potrero Marine Terminal, Port of Benicia's automobile yard, and UP's automobile yard at Milpitas.

The freight rail system and its traffic volumes in Alameda County, along with the associated rail terminology, are described in more detail as follows.

Freight Rail System Components

Class I Rail Lines

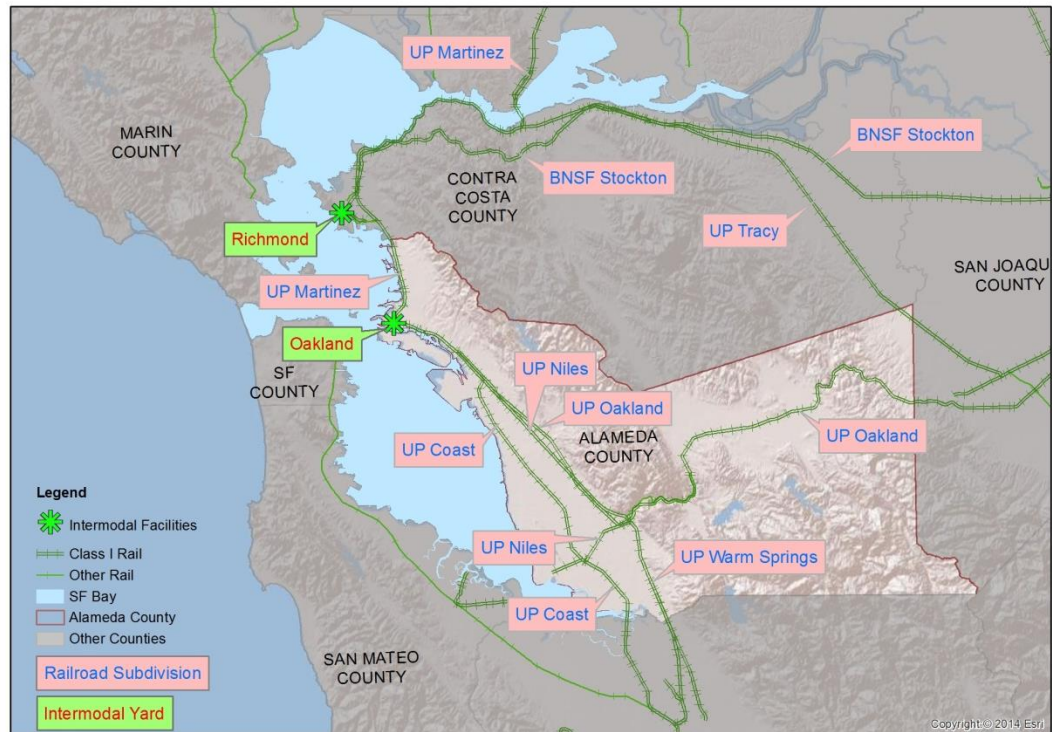
According to the Surface Transportation Board (STB), a Class I railroad is a railroad with annual operating revenue of \$250 million or more (in 1991 dollars).³⁷ Class I railroads are regulated by the STB and subject to the Uniform System of Accounts. UP and BNSF are Class I railroads operating in the County that provide connectivity to most of North America.

While UP runs trains on multiple tracks owned by the railroad, BNSF does not own a rail mainline (which they also operate) within the County's boundary; instead the railroad, through an agreement, operates on one of the UP's mainlines between Oakland and the County boundary. UP's multiple tracks include rail mainline segments or subdivisions: 1) Martinez (Oakland to the boundary of Alameda County); 2) Coast (Elmhurst (neighborhood in East Oakland near the intersection of 98th Avenue and San Leandro Street) to the boundary of Alameda County via Newark); 3) Niles (West Oakland to Newark via Niles Junction); and 4) Oakland (Melrose (neighborhood in East Oakland near the intersection of High Street and San Leandro Street) to the boundary of

³⁷ Source: <http://www.stb.dot.gov/stb/faqs.html> (last accessed on February 13, 2014).

Alameda County via Niles Junction). In addition, UP owns San Jose Subdivision (Niles Junction to boundary of Alameda County), but it is currently used as a branch line. The rail network in and around Alameda County is shown in Figure 3.5.

Figure 15 Rail Network in and around Alameda County





Source: Metropolitan Transportation Commission (MTC), Caltrain, BART, California High-Speed Rail Authority, 2006 San Francisco Bay Area Regional Rail Plan.

Short Line Rail Lines

A short line railroad or Class III railroad, according to the STB, is a railroad with an annual operating revenue less than \$20 million (in 1991 dollars). In addition, the Association of American Railroads also defines short line railroads as one of the following: 1) local railroads are line-haul railroads operating less than 350 miles of rail line; or 2) switching and terminal railroads are either jointly owned by two railroads for the purpose of transferring cars between railroads or operate solely within a facility or group of facilities.³⁸ In Alameda County, there had historically been only one short line railroad, the Oakland Terminal Railway (OTR), which is a switching and terminal railroad jointly owned by UP and BNSF and operates near the Port of Oakland. The OTR is being dissolved and a new short line, the Oakland Gateway Rail Enterprise (OGRE) will be offering service to the industries formerly served by the OTR. OGRE is a joint venture comprised of West Oakland Pacific Railroad, LLC (WOPR); California Capital & Investment Group, Inc. (CCIG); and Ports America Group, Inc. In addition to serving customers formerly served by the OTR, OGRE is seeking to expand the

³⁸ http://www.aslrra.org/about_aslrra/faqs/ (last retrieved on February 13, 2014).

rail-served customer base on the City portion of the Oakland Army Base and will be providing switching services to the Port's new OAB railyard.

Rail Classification Yards

A rail classification yard is an assortment of tracks, at which traditional railroad activities occur, such as assembling trains and sorting and redistribution of railcars and cargo. Railcars in yards are moved by gravity or by specially designed yard locomotives called switchers. Rail yards can be classified based on the type of trains handled as: 1) intermodal terminals - for containers or truck trailers on flat cars or specialized intermodal cars; 2) rail classification yards for carload traffic - for grain, coal, and similar bulk commodities moving in unit trains, or general merchandise commodities moved in box cars and tank cars; and 3) automobile yards - for assembled automobiles, vans, and trucks moving in multilevel cars.³⁹

Alameda County has two intermodal terminals: UP's Railport - Oakland and BNSF's Oakland International Gateway (OIG). These terminals handle cargo not only from/to Port of Oakland but also domestic cargo.

UP's Railport is a 110-acre intermodal terminal located near the Port of Oakland. The Oakland yard handles intermodal containers at the Port, and with the use of drayage trucks, offers connections to regional warehouse facilities, where containers are unloaded, sorted, consolidated, and sometimes stored for short periods of time. Railport's current capacity is 450,000 lifts annually.⁴⁰ A lift, in rail terminology, is the process of moving a container or trailer to and or from a rail car. Capacity of an intermodal terminal can be measured in terms of the maximum number of container lifts that can practically be handled over a time period, typically a year.

BNSF's OIG is an intermodal terminal completed in 2002, located near the Port of Oakland. OIG for BNSF also performs a similar function of handling intermodal containers and offering connections to regional warehouse facilities as Railport - Oakland for UP. OIG has a current capacity of 300,000 lifts annually. The construction of OIG eliminated the 12-mile trip over local roads between the Port and BNSF's former intermodal terminal at Richmond.⁴¹

There are several short branch lines (also called spurs) and siding tracks to the mainline that are used not just for passing but also as rail yards, in the Cities of Oakland, San Leandro, Hayward, Union City, Fremont, and Livermore over which UP intermittently sends/receives rail traffic.

³⁹ Caltrans Office of System and Freight Planning, Glossary for freight planning, July 2012.

⁴⁰ California Rail Plan, May 2013.

⁴¹ California Rail Plan, May 2013.

Shared-Use Rail Corridors

Passenger railroads operate on corridors owned with freight railroads in Alameda County through a trackage rights agreement between the passenger rail authority and the host freight railroad, as well as an operations agreement between the passenger rail authority and the passenger rail operator. For example, the Capitol Corridor Joint Powers Authority (CCJPA) has made a trackage rights arrangement with the freight railroad UP and contracts with Amtrak to operate the Capitol Corridor passenger rail service.

The shared-use of tracks has the benefit of gaining maximum utilization of track assets without the need to invest in redundant capacity for passenger and freight operations. However, sharing track can affect operations and can reduce flexibility in train scheduling, as well as introducing potential delays and safety issues due to freight-passenger conflicts. Therefore, agreements are also made between the passenger railroads and the host freight railroad to maintain a good on-time performance. Again for example, the CCJPA has made provision of incentive payments to UP upon achieving a targeted on-time performance. The shared-use corridors in Alameda County (Figure 3.65) include:

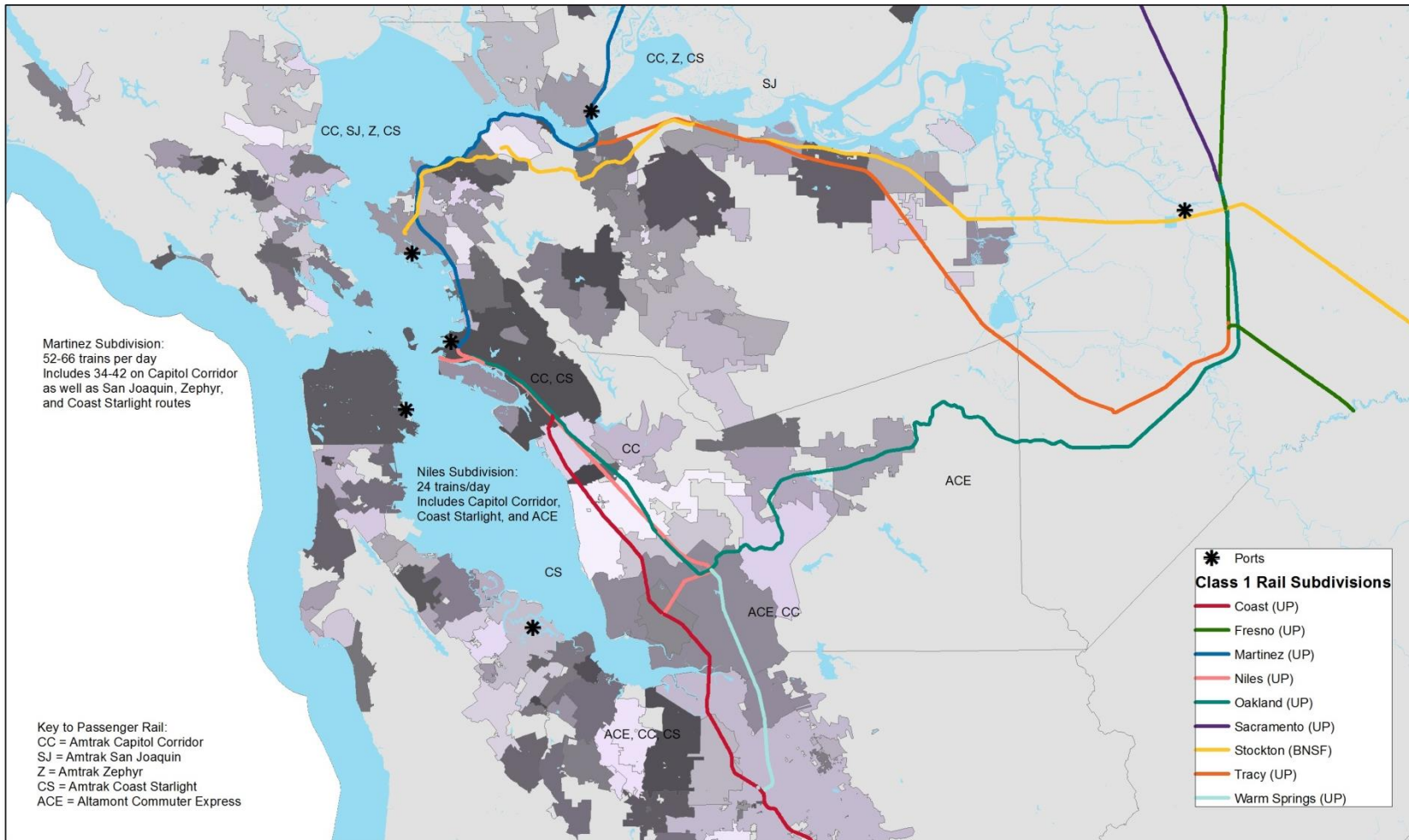
- **Capitol Corridor:**

- Between Oakland and the county north and south boundaries - UP and BNSF freight rail shares tracks with the passenger rail services of *Amtrak Capitol Corridor*, *Amtrak Coast Starlight*, *Amtrak Zephyr*, and *Amtrak San Joaquin*;
- Between Oakland and Niles - UP freight rail shares tracks with the passenger rail services of *Amtrak Capital Corridor* and *Amtrak Coast Starlight*; and
- Between Niles and the county boundary - UP freight rail shares tracks with the passenger rail services of *Amtrak Capitol Corridor*, *Amtrak Coast Starlight*, and *Altamont Corridor Express*.

- **Altamont Corridor:**

- Between Niles and the county boundary - UP freight rail shares tracks with the passenger rail service of *Altamont Commuter Express (ACE)*.

Figure 16 Shared Use Rail Corridors in Alameda County



Source: Caltrans Earth, train volume information from California State Rail Plan, May 2013.

Freight Rail Lines Traffic Volumes

In terms of train volumes, Table 3.2 and Figure 3.7 below indicates the most recent estimates of daily train volumes on freight rail lines in and around Alameda County. Freight train volumes are the highest on the UP Martinez Subdivision, especially between Oakland and boundary of Alameda County, as this is the portion that carries traffic into/away from the Port of Oakland. This is also a highly used passenger corridor as both Amtrak and the Capitol Corridor operate trains over this line. The freight train volumes are more moderate on the freight rail line over Altamont Pass and the freight rail line parallel to I-880 and adjacent to the coast.

Table 3.2 Daily Train Volumes in and around Alameda County and the San Francisco Bay Area, 2012

Rail Subdivision ^a	From	To	Class I Freight Rail Services	Freight Daily Trains ^b	Passenger Daily Trains ^c	Total Daily Trains
Coast	Santa Clara	Niles	UP	8	22	30
Martinez	Sacramento	Martinez	UP	18	34	52
Martinez	Martinez	Richmond	BNSF, UP	18	42	60
Martinez	Richmond	Emeryville	BNSF, UP	24	42	66
Martinez	Emeryville	Oakland	BNSF, UP	24	40	64
Niles	Niles	Oakland	UP	8	16	24
Oakland	Niles	Stockton	UP	4	6	10
Peninsula	Santa Clara	San Francisco	UP	1	86	87
Stockton	Stockton	Port Chicago	BNSF	10	8	18

Source: California State Rail Plan, May 2013.

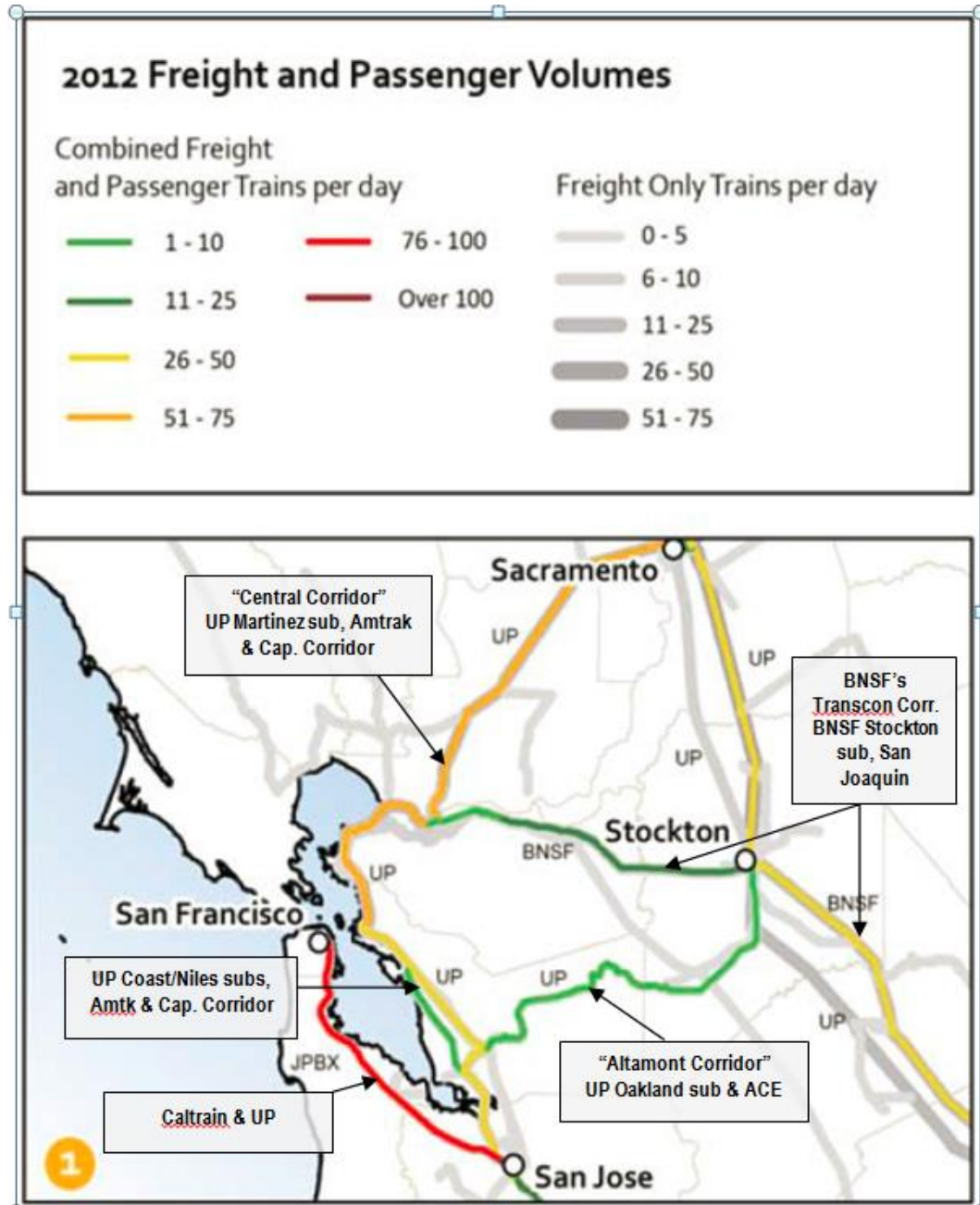
Notes:

^aA rail subdivision is a defined rail segment that railroad companies use to manage their rail system.

^bFreight Daily Trains are based on 2010 BNSF train counts data, UP train counts and 2007 Carload Waybill based train volume estimates.

^cPassenger Daily Train are based on Passenger Rail Service Weekday Schedule published online in 2012.

Figure 17 Daily Train Volumes on Freight Rail System in and around Alameda County, 2007 and 2012



Source: California Rail Plan, May 2013.

Note: The freight train volumes shown in this exhibit are year 2007 daily estimates. Passenger volumes are current as of August 2012.

3.3 DEEPWATER SEAPORT AND WATERWAY SYSTEM

The water-based transportation system in Alameda County consists of the Port of Oakland, which has multiple marine container terminals, a marine breakbulk terminal, and a barge waterway system between Port of Oakland and Port of Stockton.

Due to lack of terminal facilities at the Port of Oakland, automobile imports and other bulk cargo such as coal, grains, ore, cement, and petroleum products are moved through marine terminals and ports in the neighboring counties to Alameda County, including Port of Richmond; Port of Benicia; and marine oil terminals at Richmond, Carquinez, Benicia, and Martinez. However, bulk terminals and connecting rail infrastructure is being developed at the Port of Oakland on the site of the former Oakland Army Base and this will create new capability to handle export bulk cargo in the near future.

The water-based transportation system in Alameda County is described in more detail as follows.

Port of Oakland

Port Infrastructure

The Port of Oakland in Alameda County is the largest container port in Northern California. The Port currently has 8 container terminals, 18 deepwater berths, and 36 container cranes; 30 of which are Post-Panamax size.⁴² Post-Panamax is the size of a ship that is more than 13 containers, but less than 18 containers wide. The Port has a main channel depth of 50 feet, which is sufficient to handle Post-Panamax size ships. The Port also has a breakbulk cargo terminal (Burma Road Terminal, Berth 7), which is located in the Outer Harbor waterway.⁴³ The Port is primarily served by I-880 and I-80; the two Class I railroads; and 10 miles of short line track operated by Oakland Terminal Railway, warehouses, and two nearby intermodal terminals as discussed earlier. 7th Street, Maritime Street, and Middle Harbor Road provide “last-mile” access to the seaport.

On the other hand, breakbulk cargo is noncontainerized, general cargo of nonuniform sizes, often transported on pallets or in boxes, sacks, drums, or bags. These cargoes require labor-intensive loading and unloading processes. Examples of breakbulk cargo include iron, machinery, coffee beans, logs, and woodpulp.

⁴² <http://www.portofoakland.com/maritime/operations.aspx> (last accessed on February 13, 2014).

⁴³ World Port Source: http://www.worldportsource.com/ports/commerce/USA_CA_Port_of_Oakland_231.php (last accessed on February 13, 2014).

Port Traffic Volume

In terms of traffic volumes, the Port mainly handles containerized cargo and some breakbulk cargo. The Port is the fifth busiest container port in the U.S.⁴⁴, handling more than 2.3 million TEUs in 2012, and almost 99 percent of the containerized goods moving through Northern California⁴⁵. The Port differs from California's other two large container ports (the Ports of Los Angeles and Long Beach) because it handles a greater share of exports as compared to imports.

Marine Highway 580 (M-580)

Aside from the seaport, marine highway 580 (M-580) or California's Green Trade Corridor is a container on barge marine highway service owned and operated by the Port of Stockton, established in July 2013 in cooperation with the Port of Oakland, through multiple grants from all levels of government. Two barges are operating between the ports and their schedule depends on the cargo demand; each barge move is capable of removing 350 trucks off the highways (with a combined capacity of 720 TEUs). Target exports include agriculture products, waste paper, scrap metals, wine and tomato paste. Target imports include fertilizer, retail products and wine.⁴⁶

3.4 CARGO AIRPORT

Oakland International Airport (OAK) is located in Alameda County, and acts as the principal domestic air cargo gateway not just for the County, but for the entire Bay Area.

County residents and businesses also move air cargo through the principal international air cargo gateway at San Francisco International Airport and to a limited extent through Mineta San Jose International Airport.

Some more details about the infrastructure and traffic volumes at Oakland Airport are below.

⁴⁴ Port of Oakland, Maritime Comprehensive Truck Management Program, adopted on June 16, 2009.

⁴⁵ <http://www.portofoakland.com/maritime/factsfigures.aspx> (last accessed on April 23, 2014)

⁴⁶

http://dot.ca.gov/hq/tpp/offices/ogm/CFAC/Stockton_08_16_2013/PortofStocktonPresentation_MarkTollini_rev1.pdf

Oakland International Airport (OAK)

Airport Infrastructure

Oakland Airport is located five miles south of downtown Oakland. It is owned and operated by the Port of Oakland. The airport has 4 runways, and the longest runway is 10,001 feet long. The largest carrier, Federal Express (FedEx), occupies 250,000 square feet of sorting, distribution, and warehouse space at Oakland Airport. U.S. Customs and Border Protection officials are located on-site. The Oakland Foreign Trade Zone, located 1.5 miles away, consists of 500,000 square feet of buildings. The Airport is primarily served by I-880. Hegenberger Road, Doolittle Drive, and Earhart Road provide “last-mile” access to the airport.

Airport Traffic Volume

Oakland Airport is the principal domestic air cargo gateway in the Bay Area. In 2012, Oakland Airport handled about 55 percent of the Bay Area air cargo, which is about 501,813 metric tons, of which 96 percent was domestic cargo and mail.⁴⁷ A majority of the air cargo is also due to freighter operations.

The FedEx regional hub processes up to 100,000 pounds (280,000 packages) of freight each day and has its own import clearance center. Primary air freight destinations for air cargo shipped from Oakland Airport are domestic with high frequency along the U.S. West Coast and transcontinental to cargo hubs – Memphis (FedEx) and Louisville (United Parcel Service (UPS)), and international service to Asia/Pacific.⁴⁸

⁴⁷ Caltrans, *California Air Cargo Groundside Needs Study*, July 2013.

⁴⁸ Caltrans District 4 Fact Sheet on Oakland International Airport, available at: http://www.dot.ca.gov/hq/tpp/offices/ogm/fact_sheets_index.html (last retrieved on October 15, 2013).

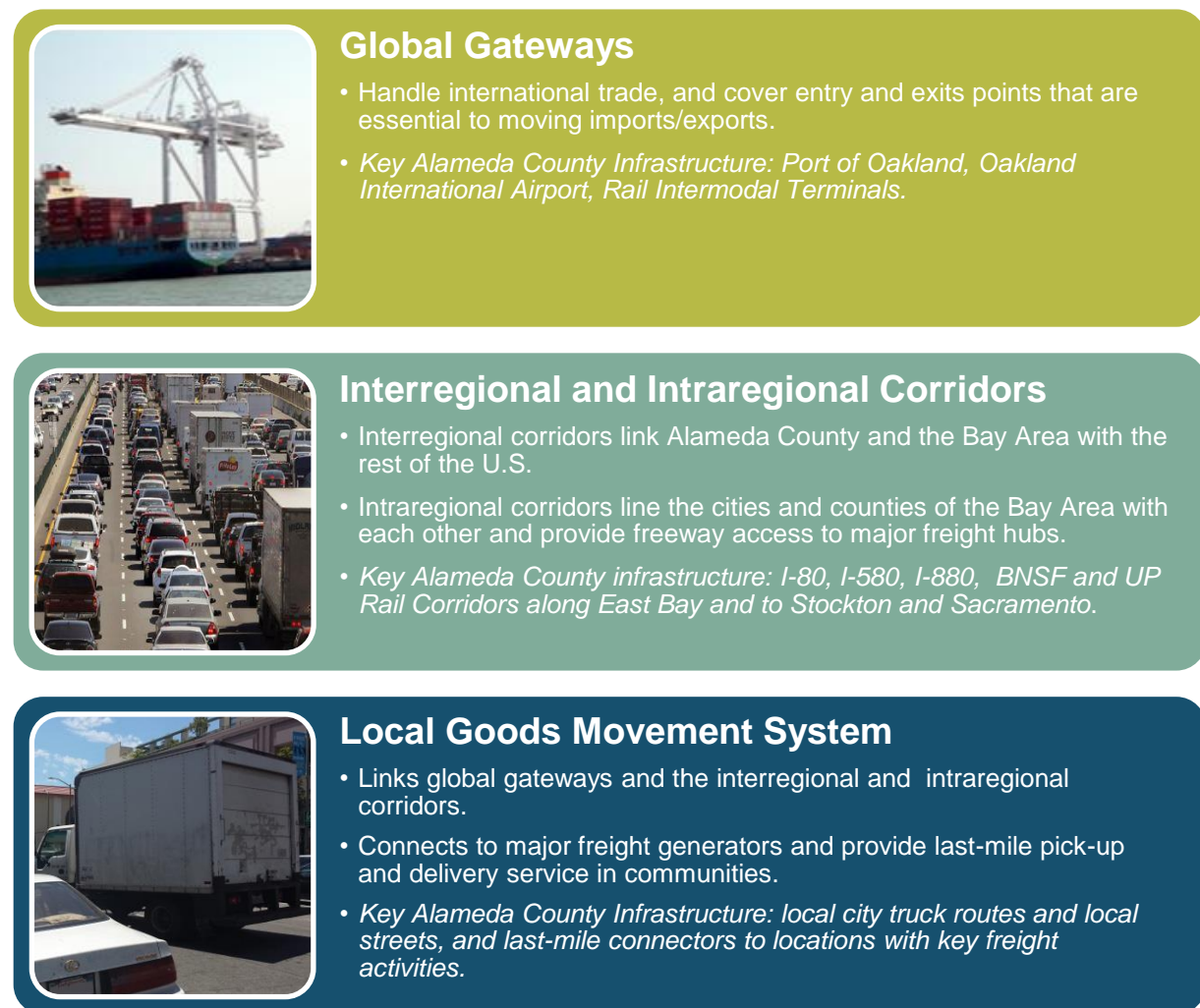
4.0 Key Demand Trends

This section summarizes some of the major trends that will impact goods movement demand and planning needs in the future. A number of these trends have been identified in previous sections, but they are summarized here to provide focus for future planning activities.

Trends are presented in this section in relation to a set of goods movement functions that described how goods movement activities and infrastructure are organized. By presenting the goods movement system in terms of functions, the discussion of trends is more consistent with the way users think of the system, and also provides a focus on intermodal connections and the way the modes are linked together to meet the needs of industry supply chains.

This section describes each of the five functions of the Alameda County goods movement system and key trends, as well as demand drivers associated with each function. It should be kept in mind that within each of these functional categories, there is the potential for overlap. For example, many of the Global Gateways are located in or near urban areas, so their connectors are part of the urban goods delivery network. The intraregional core system can be used for interregional deliveries if a shipper happens to be located along an intrastate connector. A graphic illustrating the functions and key Alameda County infrastructure within each function is shown in Figure 4.1.

Figure 18 Goods Movement System Functions



4.1 GLOBAL GATEWAYS

The global gateways that make up Alameda County’s freight transportation system include the major maritime facilities at the Port of Oakland and, to a more limited extent, Oakland Airport that handles international as well as domestic air cargo. This functional category refers to the County’s international trade infrastructure. It does not include all assets that are used to handle international trade; rather it covers those entry and exit points that are essential to moving high volumes of international goods into and out of the County.

Growth Drivers and Key Trends

With international trade growing at a faster rate than domestic trade, the Port of Oakland is slated to see growth that exceeds background economic growth.

Furthermore, with recent and projected investments in its rail connections, the Port of Oakland is a viable gateway alternative for shippers located around the country, and will continue to compete directly with the other West Coast gateways, including Prince Rupert (British Columbia), Seattle and Tacoma, and Los Angeles and Long Beach. While west coast ports in Mexico are also options for goods destined for the U.S., the Port of Oakland most directly competes with other U.S. and Canadian ports due to travel time benefits to the port, and ultimately to goods' final destination. The rate of growth at the Port depends in large part on the comparative success of competitor ports, such as the San Pedro Bay and Puget Sound ports, as well as potential diversion of cargo to the East and Gulf Coasts via the expanded Panama Canal.

The Port of Oakland expects continued growth in exports with cargoes such as agricultural products, instrumentation and medical supplies, and wine as major high value products. There is also expected to be significant growth in exports of scrap and waste products. The Port is looking to provide opportunities for growth in bulk products, consistent with growth in waste/scrap, mineral ores, and agricultural products. On the import side, the Port of Oakland can continue to be a gateway for products ultimately destined for Northern California and parts of Nevada and Utah. But its ability to grow beyond these markets will depend to some degree on expansion of rail facilities and access to modern transloading⁴⁹ facilities for importers.

In the 1990s, air cargo in the Bay Area was led by high-technology domestic parcel traffic based on a just-in-time paradigm that had resulted in robust growth. With the shift of the Silicon Valley from hardware to software driven industry, the need for domestic air parcels declined, leading to a flat line of demand for much of the 2000s that turned sharply negative during the recession. Current projections show that domestic air cargo will resume at a modest, yet sustained, growth; and that international air cargo will grow at a faster pace.

Right sourcing and near-shoring⁵⁰ may change goods movement demand. The degree to which Port of Oakland and Oakland Airport freight volumes from Asia and the Indian Subcontinent will change is unclear. However, as sourcing shifts to North America and Latin America, volumes could decline if the need for maritime or air freight (replaced by rail or truck) decreases.

⁴⁹ Transloading of international cargo involves the direct transfer of the contents of a marine container into a domestic 53-foot rail or truck container (or trailer) by a logistics service provider (LSP) at a transload facility.

⁵⁰ Right sourcing is the placement of a business' components and processes in localities and countries that provide the best combination of cost and efficiency. Near-shoring is the transfer of businesses to companies in a nearby country, often sharing a border with your own country

Over the past decade, big box retailers and large importers of fast moving consumer goods have adopted transloading as a supply chain strategy. Transloading refers to the process in which a logistics service provider (LSP) transfers the contents of an import container directly into a 53-foot domestic truck or rail container in a warehouse near a gateway port for onward movement to a U.S. inland point. The primary benefit that transloading offers to beneficial cargo owners (BCO)⁵¹ is the reduced cost of inland transport, since the contents of three 40-foot marine containers can be transloaded into two 53-foot domestic containers.

The growth of transloading creates an economic opportunity for the regions in which it occurs. Historically, goods imported through the Port of Oakland were often shipped to transload facilities in the San Joaquin Valley due to absence of such facilities in the Bay Area. The Port and the City of Oakland have been working with private entities to develop the Oakland Global Trade and Logistics Center within the former Oakland Army Base, which is planned to include a new intermodal rail terminal, bulk marine terminal, 30 acres of truck parking and service areas, 2 million square feet of new warehousing space, and a new recycling center. It is likely that, in the future, BCOs in this sector will increasingly choose to transload cargo in these near-port facilities for onward movement to stores and customers beyond the Rocky Mountain states. If the Port of Oakland is successful in improving rail service and this, in turn, can be linked with other strategies to attract first port of call service from ocean carriers, it may be possible to increase import transloading opportunities at the new warehouse space at the Oakland Army Base. In addition, logistics service providers that serve export customers at the Port of Oakland may also conduct transloading operations to de-consolidate export loads, particularly of agricultural products.

In addition to the economic opportunities that transloading can create, transloading trends may mainly affect the Port of Oakland and its inland access routes in two primary ways. First, if there are insufficient transloading facilities close to the Port, transloading will likely continue occurring in San Joaquin Valley warehouses, creating more truck traffic along the I-580/I-205 corridor and I-880. Second, if BCOs and LSPs continue to expand the use of transloading as a logistics strategy, it will be critical for the Port of Oakland and its partners to expand transloading facilities in order to effectively compete with other West Coast ports. A risk associated with expanding transloading warehouse capacity, however, is that BCOs may increasingly decide to move their cargoes from Asia to eastern markets via the Panama Canal and make those investments obsolete.

⁵¹ A BCO refers to an importer that takes control of their cargo at the point of entry and does not utilize a third-party source or freight forwarder.

4.2 INTERREGIONAL CORRIDORS

A number of highway routes and parallel rail routes are classified as interregional corridors because their primary, though not exclusive, function is to move freight between regional economic centers. There are two major multimodal interregional trade corridors serving the region, both of which are located in large part in Alameda County: 1) the Central Corridor and 2) the Altamont Corridor, as shown in Figure 4.2.⁵²

I-80 forms the highway core of the Central Corridor, which connects Alameda County to Sacramento and northern tier states across the U.S. It should be noted that I-80 also performs functions as an intraregional corridor for some of its segments within Alameda County. The Central Corridor also includes UP rail connections along the Martinez Subdivision and BNSF connections, where it has trackage rights on the Martinez Subdivision continuing on to the Stockton Subdivision, and connections further south to the BNSF's TRANSCON line, which links to the rest of the nation.

The major truck routes of I-880/I-238/I-580 form the highway core of the Altamont corridor. UP also has rail connections via the Oakland Subdivision along the Altamont Corridor, although these are not used intensively for freight rail transport. In addition, the M-580 Marine Highway between Ports of Oakland, Stockton, and West Sacramento also acts as an interregional corridor that provides alternatives to shipping goods on highways and rail.

Growth Drivers and Key Trends

Interregional corridors are especially important because interregional freight movements represent a higher share of total value than intraregional movement in the Bay Area. Interregional movements are growing faster than intraregional flows, both by tonnage and value. The products moving to and from the Bay Area tend to be high-value products. Trucks will continue to service the majority of demand for interregional freight movement, but international intermodal rail cargo is expected to experience high levels of growth coming out of the Port of Oakland. The ability to handle increasing volumes of imported intermodal cargo could be an important factor in the Port of Oakland's ability to meet its growth potential. Outbound rail traffic to the rest of the country will overtake inbound by 2040, and this is driven almost entirely by growth in port-related intermodal traffic moving from the Port of Oakland to the interior U.S. Moving freight from truck to rail will continue to be an important strategy to reduce highway congestion and air quality impacts.

The continued relocation of distribution facilities out of Alameda County to places further east and the flows of products to the region from these distribution

⁵² MTC, *Bay Area Goods Movement Strategy*, 2008.

facilities by truck are going to continue to put greater pressure on already congested and limited connections. In the case of imported products destined for local consumers, distribution from San Joaquin Valley distribution centers means that there is both a truck move to the distribution centers from the Port of Oakland, as well as a second truck move back into the County for distribution.

Figure 19 Altamont and Central Corridors in Bay Area



Source: Caltrans District 4 Geographic Information System (GIS) Dataset, as of July 2013; Cambridge Systematics Analysis.

4.3 INTRAREGIONAL CORE SYSTEM

The intraregional core network serves the corridors within Alameda County with the highest concentration of population corresponding to the highest share of demand. It also provides primary access to the major goods movement facilities, including the Port of Oakland, Oakland Airport, rail yards, and warehouse/industrial districts and connections to the interregional corridors. A lot of intraregional movements occur on the interregional corridors as well. The intraregional core system includes I-880 and I-80, as well as I-680, I-238, and SR 92. Because this system serves intraregional movement, which is dominated by truck movements, it is composed exclusively of highways. While interregional corridors such as I-80 and I-580 are main conduits for connecting the County to the rest of the country, they also serve intraregional purposes of travel to some degree.

Growth Drivers and Key Trends

The intraregional core system corridors, which already handle a substantial amount of intraregional traffic, must share capacity with international trade. Freight-flow data shows that intraregional flows represent more than 50 percent of total flows in terms of tonnage, but this category of freight is growing at a slower rate than interregional flows. Despite the slower rate of growth, intraregional trade will still contribute to growth in total truck traffic on these corridors. As such, Alameda County will likely continue to see conflicts between trucks and automobiles. Heavy bulk commodities, such as waste/scrap, sand and gravel that move on most of the major intraregional corridors, will create pavement deterioration issues due to truck weights associated with carrying these materials.

4.4 URBAN GOODS MOVEMENT SYSTEM

The urban goods movement system refers to networks of city streets that are needed to move freight to its final destination. These roads are typically local truck routes that facilitate local pickups and deliveries. The urban goods movement system primarily serves residential and commercial areas and provides connections to the retail outlets and office buildings. The urban goods movement system is one of the functional elements of the Alameda County's goods movement system that is least understood. As discussed in Section 3.1 above, the urban goods movement system in Alameda County is made up of truck routes in the cities, as well as major arterial corridors that connect throughout the County. Because the urban goods movement system consists primarily of arterial corridors owned and operated by these cities, and the truck routes are designated and managed by these local governments, there has been

no comprehensive characterization of this system. A major concern for this system is discontinuities at jurisdictional boundaries and the lack of countywide plans to manage the major urban goods movement arterial corridors.

Growth Drivers and Key Trends

Growth in the County’s consumer base will continue to create demands on the urban goods movement system. In addition, increasing densification of development patterns, particularly along transit routes and further encouraged by the designation of PDAs in the County, will likely increase conflicts between trucks and other users along the major arterial corridors of the urban goods movement system if not properly addressed in PDA and goods movement plans. Much attention has been given in recent years to developing “Complete Streets” guidance for how best to integrate auto, transit, bicycle, and pedestrian uses in constrained urban rights of way, but consideration of truck uses in the same corridors has often been missing. Street design guidance, signalization and signage, signal coordination, and intelligent transportation systems (ITS) strategies will all need to consider the interaction of trucks with other street users in future local planning in order to ensure efficient operation of the urban goods movement system.

In addition, increases in e-commerce sales can also increase demand/strain on the urban goods movement system. Consumers are increasingly purchasing via the Internet as opposed to visiting bricks and mortar retail stores. Sellers ship these orders in the form of small packages via one of the integrators – UPS and FedEx – by expedited airfreight or ground, depending upon the delivery timeframe desired by the consumer and level of shipping costs the consumer is willing to pay. Sellers are fulfilling these e-commerce orders from their own distribution centers or stores, or through the distribution centers of resellers like Amazon.com. This results in a decrease in package size and an increase in the volume of small packages moving through the integrator network. The increase in Internet sales can mean an exacerbation of delivery issues like inadequate delivery van parking space in concentrated urban centers; but, on the positive side, also more volume through the region’s airports thus supporting jobs and the local economy.

4.5 LAST-MILE CONNECTORS

Last-mile connectors are generally local truck routes that are a subset of the urban goods movement system described previously. In addition, there are certain rail spurs and branch lines that provide connections to specific goods movement facilities (most often ports and industrial sites). These truck and rail facilities provide the connections between major freight facilities (such as seaports, airports, intermodal terminals, industrial parks, and major warehousing clusters) and the rest of the goods movement system.

The relative importance of different last-mile connectors can change with demand. Local freight generators can designate their own last-mile access connectors that address individual needs. It is important to understand last-mile connectors not as a static system, but rather as a changing set of assets that will have different degrees of importance to different parties. The major last-mile connectors within Alameda County carry a disproportionate share of total freight. Even minor delays impacting last-mile connectors can become problematic.

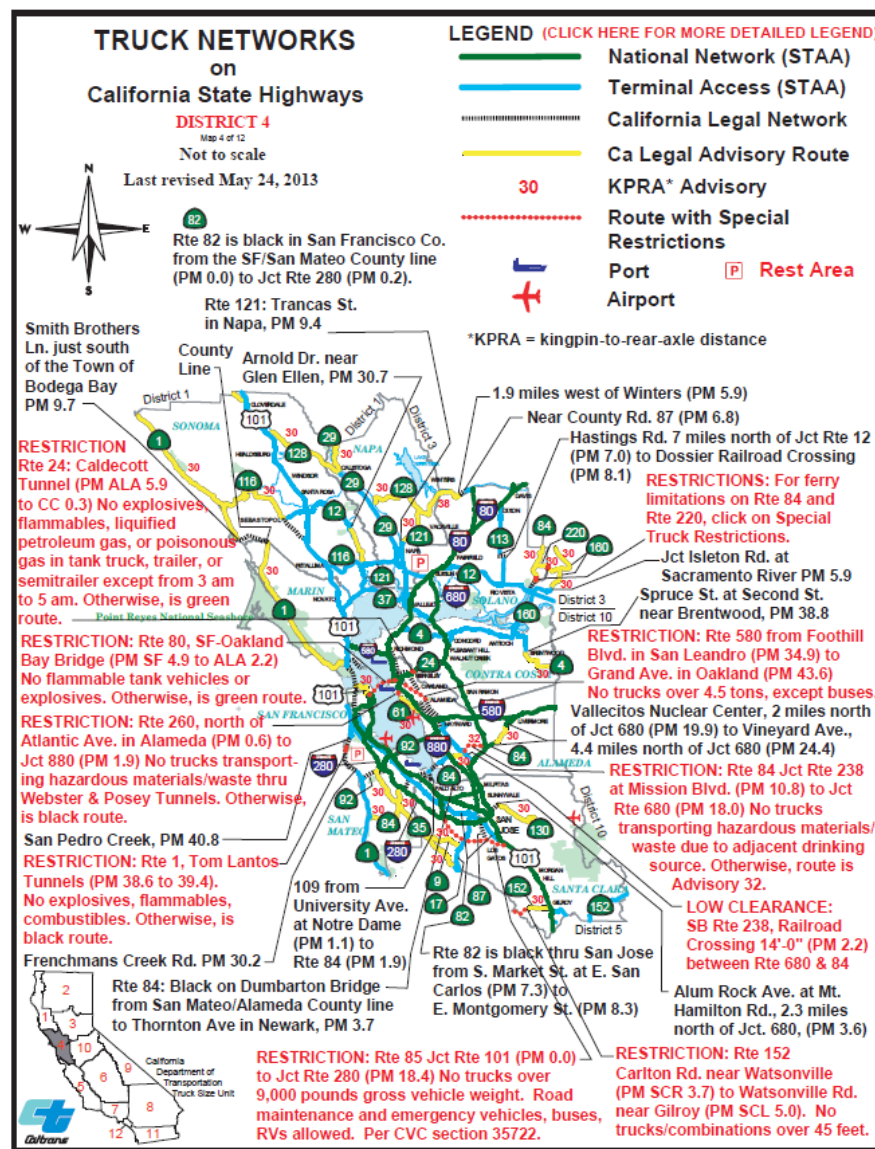
Growth Drivers and Key Trends

Demand can quickly overwhelm supply for last-mile connectors when new capacity is brought on-line; for example, the addition of new marine or air cargo terminal capacity. More intensive utilization of existing terminals, for example due to seasonal peaks, can also test last-mile connectors.

When the Federal government worked with states during designation of the National Highway System (NHS), there were a series of NHS intermodal connectors that were designated; and under the provisions of the Moving Ahead for Progress in the 21st Century Act (MAP-21), these connectors are eligible for increased Federal share of funding. However, there has been little effort to review and refine the NHS intermodal connector system over time and to update it with new information about last-mile connectivity needs. Since last-mile connectors are generally city streets or industrial rail spurs, they may be the least well-maintained element of the goods movement system. As demand on global gateways, interregional corridors, and intraregional core networks increases, there will be impacts (such as deterioration of pavement conditions, and bottlenecks) on the last-mile connectors that serve each of the major facilities that are connected to the major gateways and corridors in the region..

A. State Truck Routes and Restrictions in Caltrans District 4

Figure 20 State Truck Route Network and Restrictions

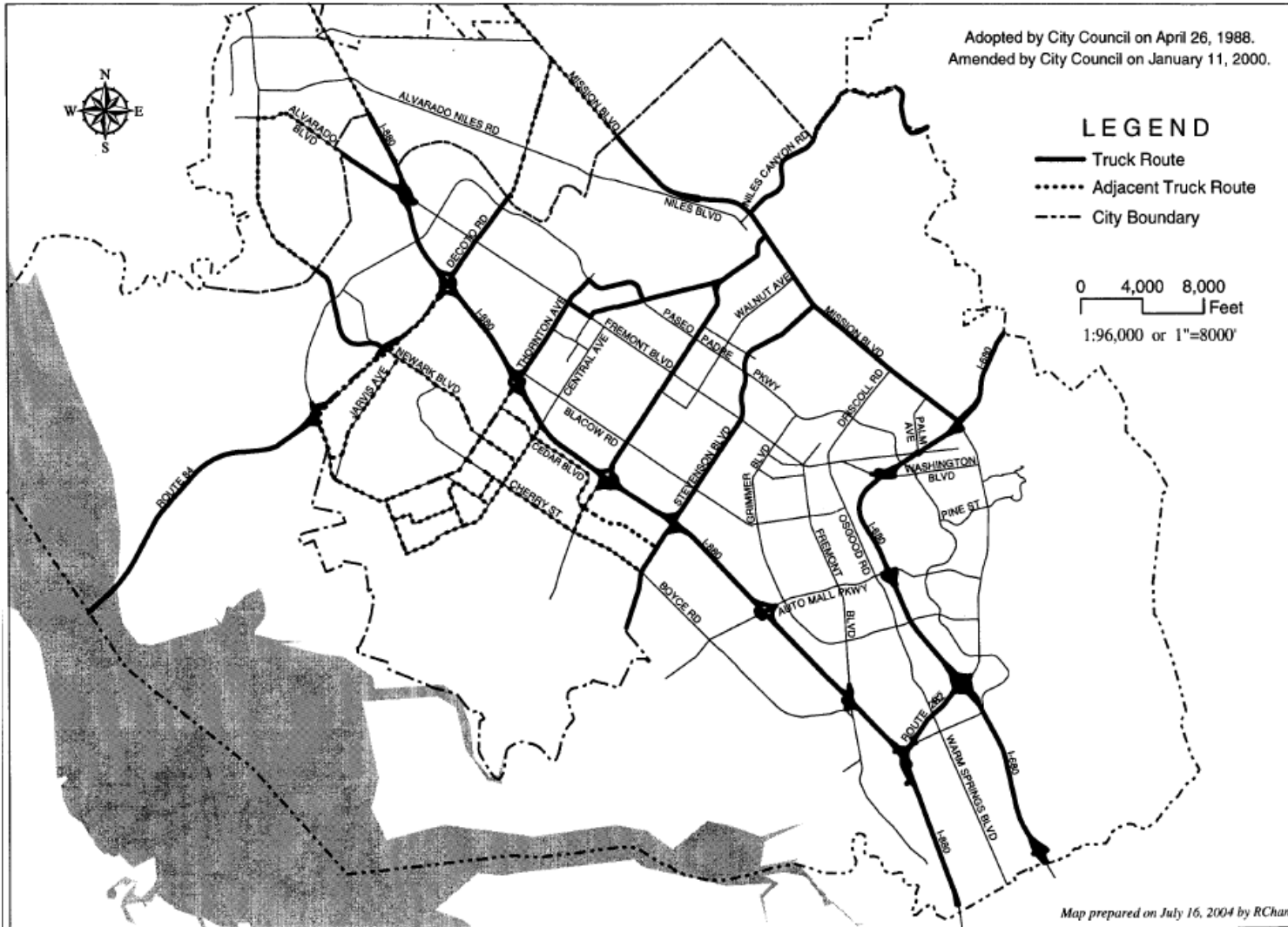


Source: <http://www.dot.ca.gov/hq/traffops/engineering/trucks/truck-length-routes.htm#step-2>
 (last accessed on February 12, 2014).

B. Truck Routes Maps for Some Cities in Alameda County

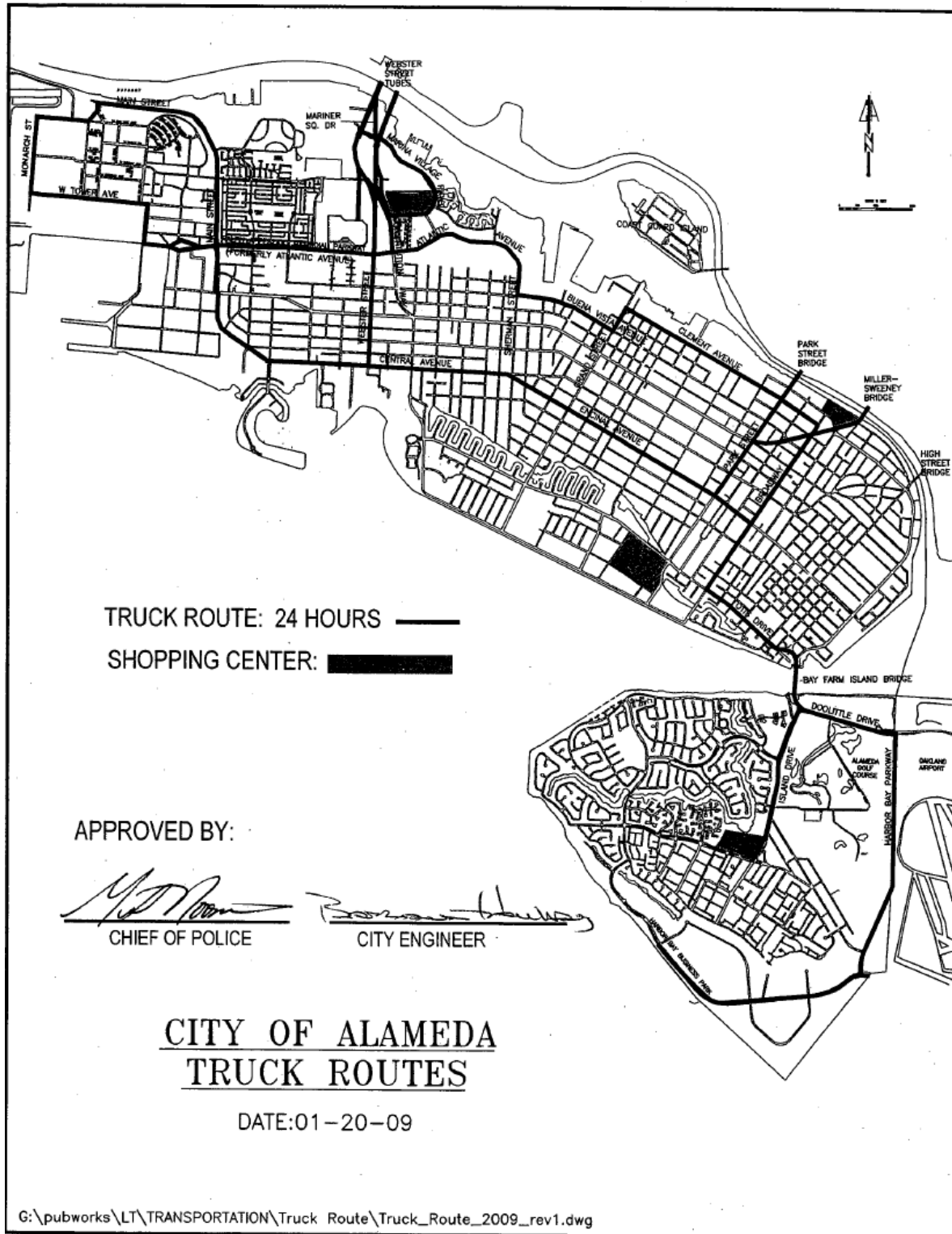
Figures B.1 through B.6 show the truck route maps for the following cities in Alameda County: Fremont, Alameda, Livermore, Union City, and Dublin.

Figure 21 City of Fremont Truck Routes



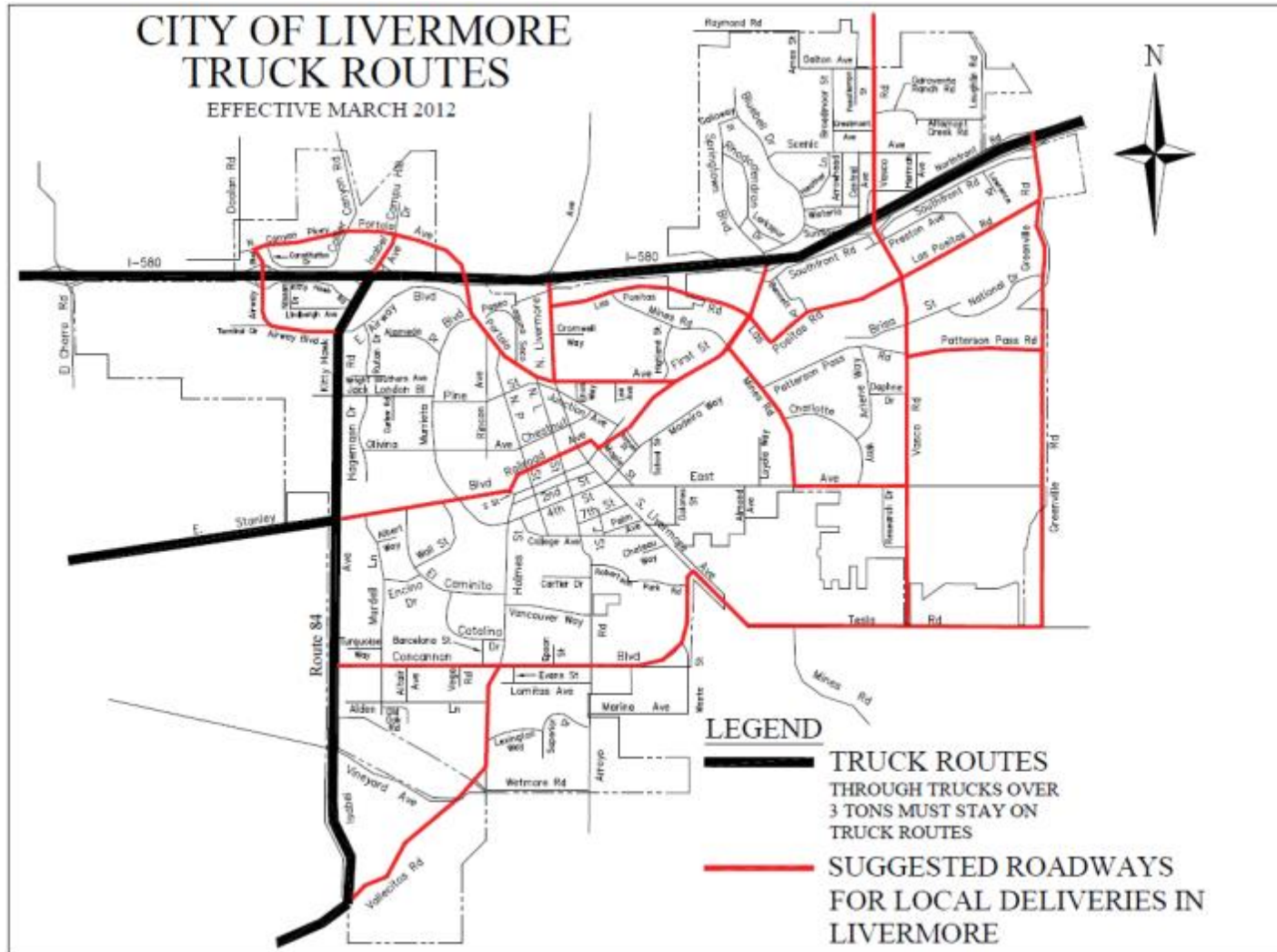
Source: <http://www.fremont.gov/index.aspx?NID=599> (last accessed on February 13, 2014).

Figure 22 City of Alameda Truck Routes



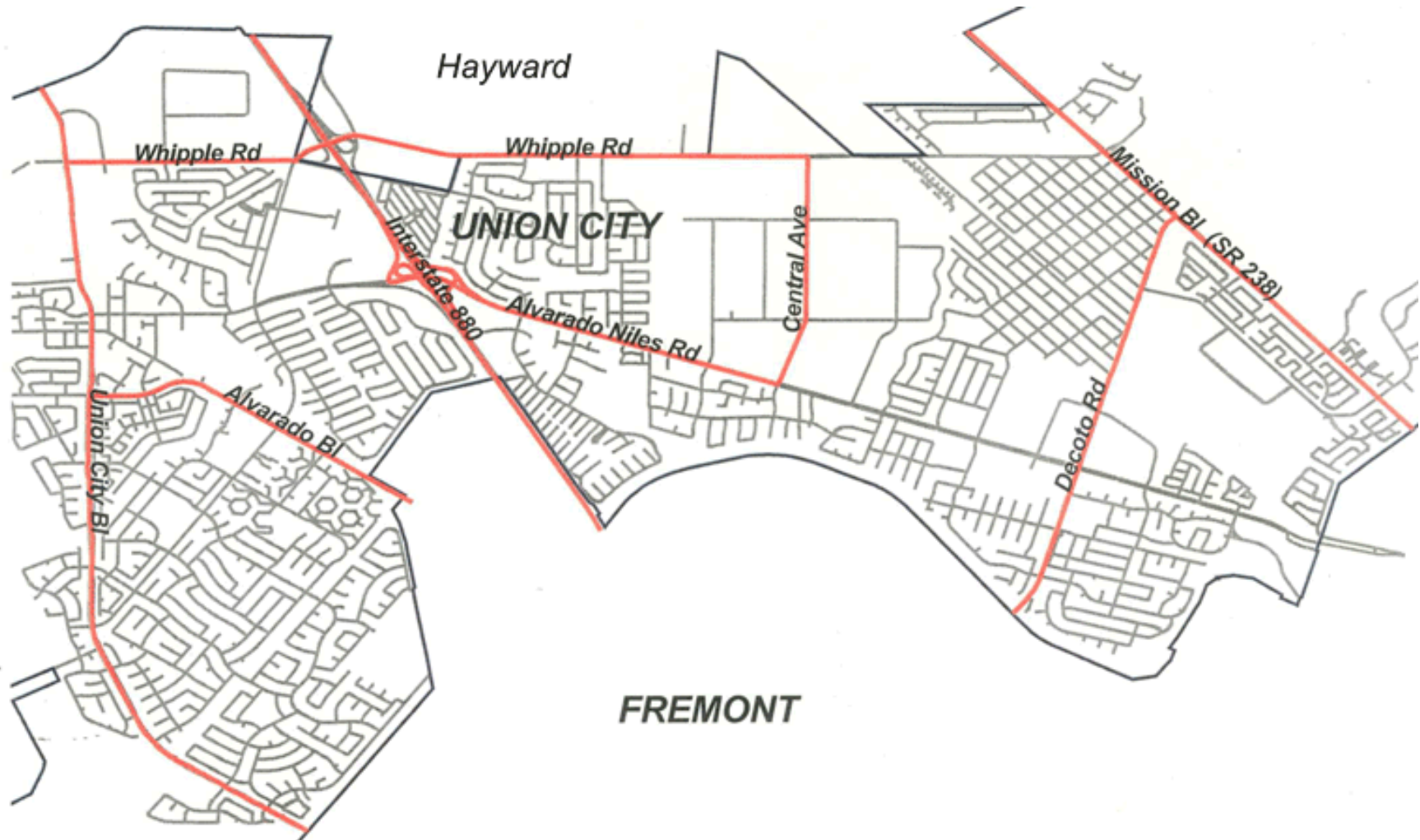
Source: City of Alameda.

Figure 23 City of Livermore Truck Routes



Source: City of Livermore.

Figure 24 Union City Truck Routes



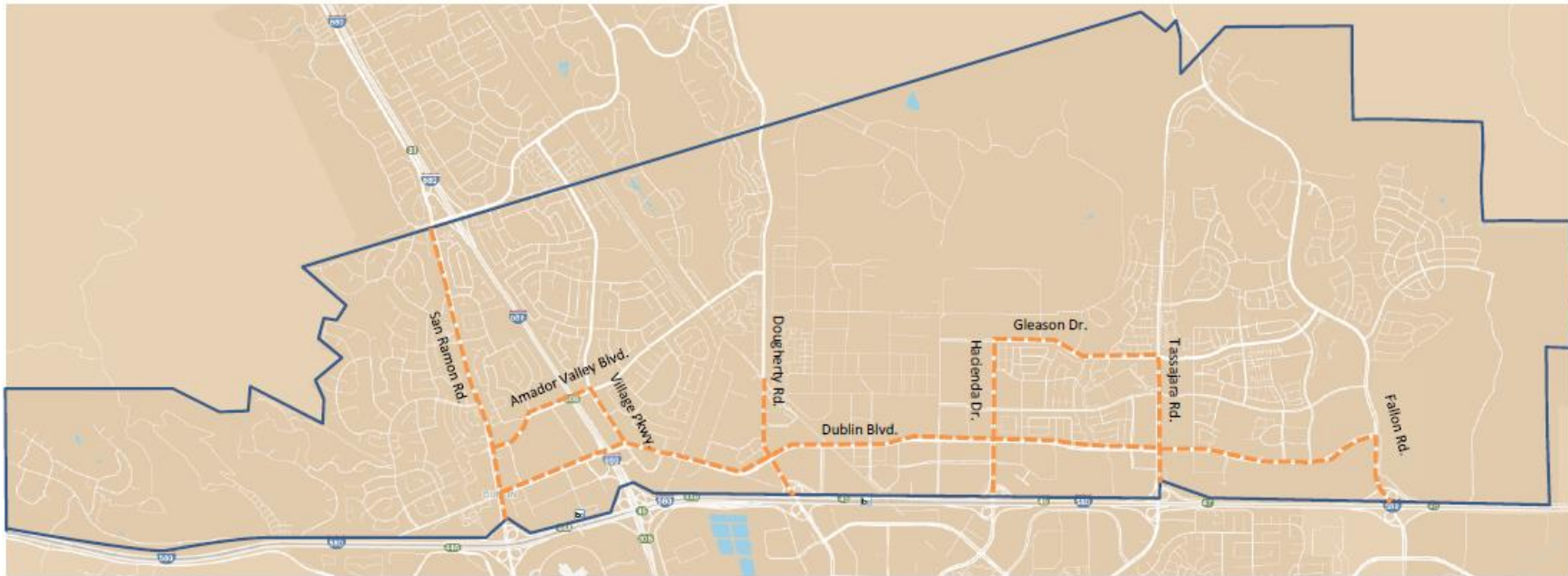
Source: Union City.



Figure 25 City of Dublin Truck Routes



CITY OF DUBLIN TRUCK ROUTE MAP

JANUARY 2014

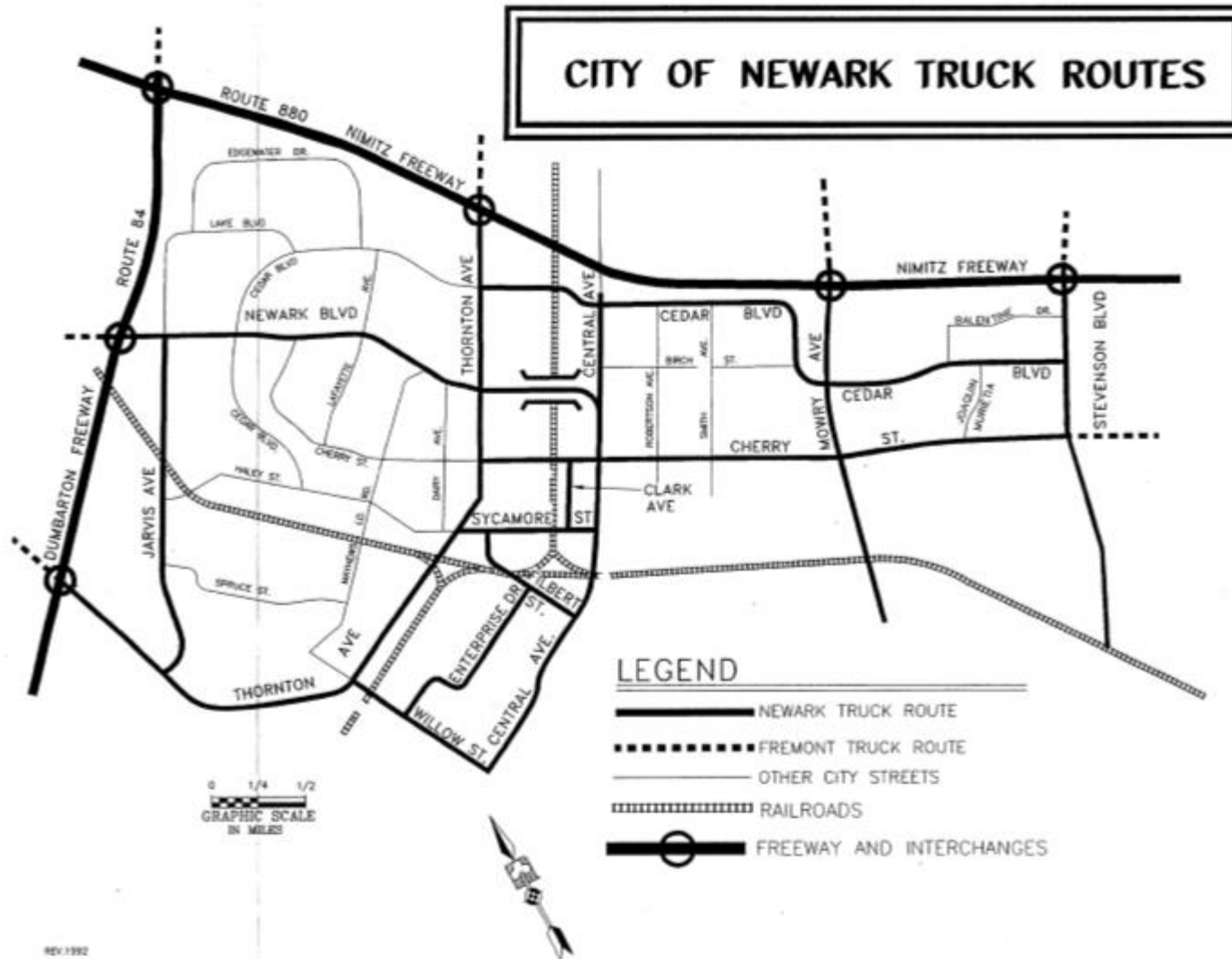


TRUCK ROUTE 
CITY LIMITS 

GARY HUISINGH, PUBLIC WORKS DIRECTOR: _____

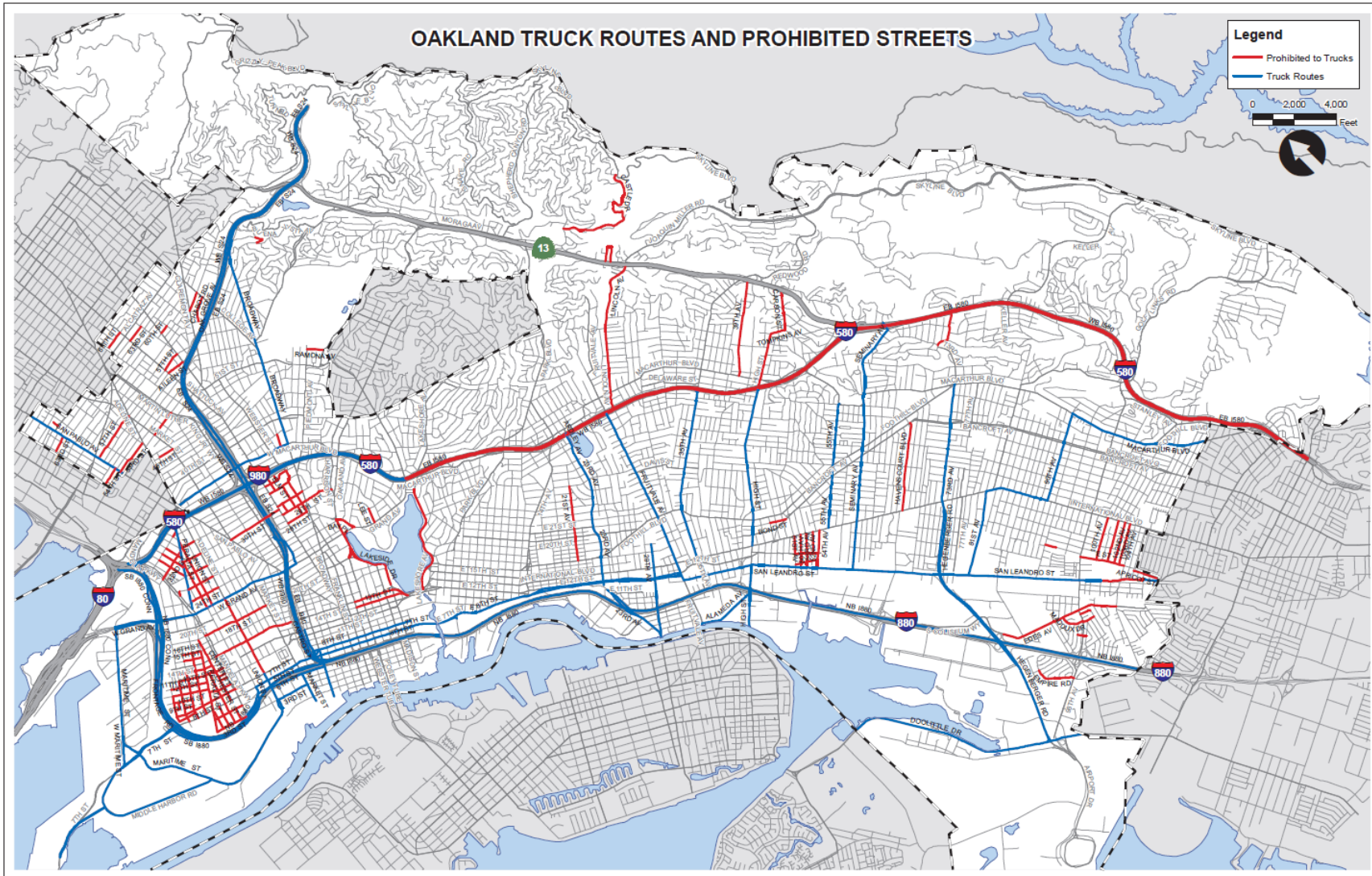
TOM MCCARTHY, CHIEF OF POLICE: _____

Figure 26 City of Newark Truck Routes



Source: City of Newark.

Figure 27: City of Oakland Truck Routes



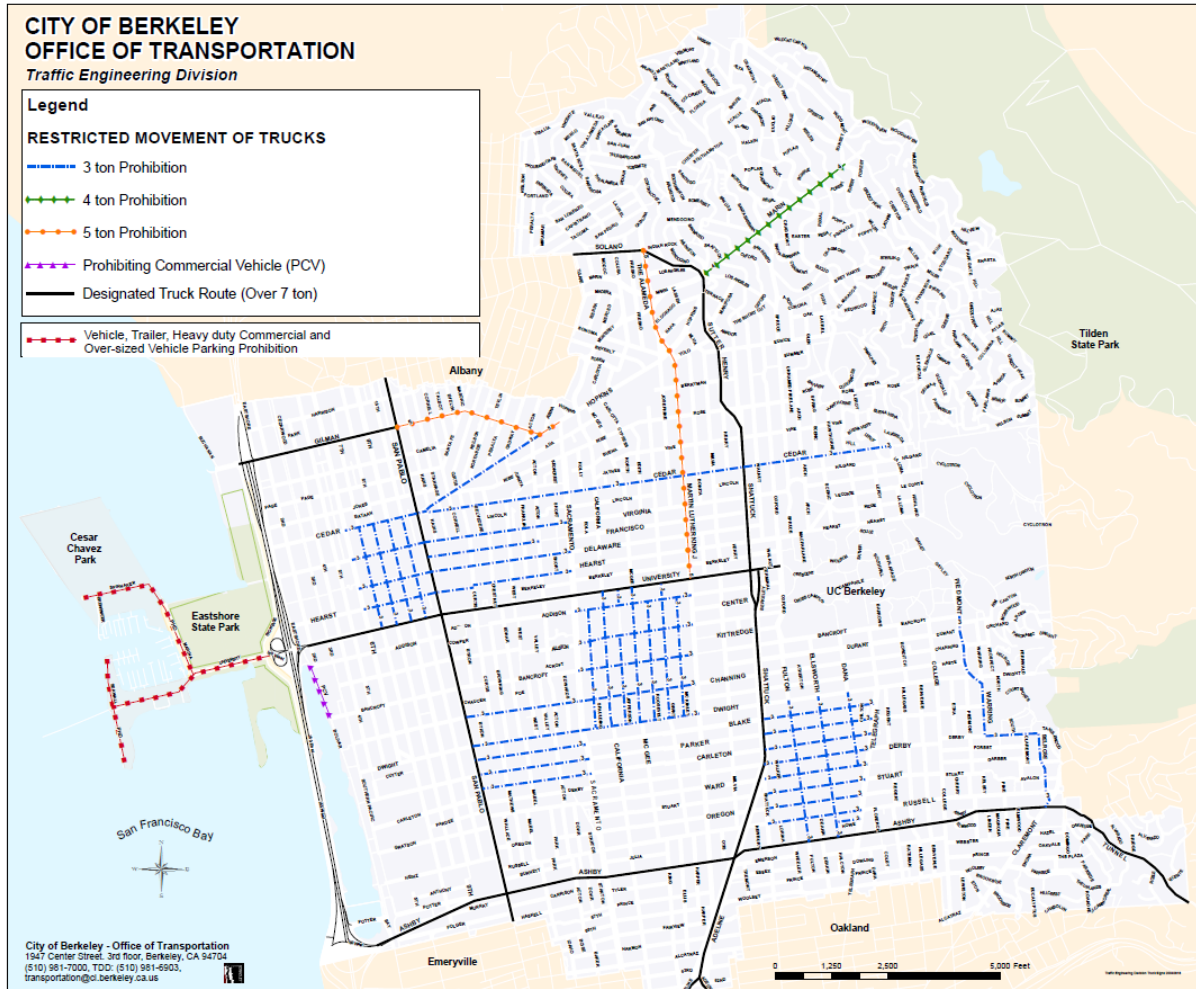
Source: City of Oakland (map created June 1, 2010)

Figure 28: City of Oakland Recommended East Oakland Truck Route Modifications



Source: East Oakland Truck Route Assessment Report (2014)

Figure 29: City of Berkeley Truck Route Map



Source: City of Berkeley