

---

## CHAPTER 3.4

# COMMUNITY AND ENVIRONMENTAL CONTEXT

The movement of freight is an essential part of our economy and provides needed goods, services, and employment for our communities. Nevertheless, freight transportation also has negative impacts.

Many local communities are impacted by freight transportation-related air pollution, noise, and traffic congestion. Large, heavy-duty vehicles such as trucks, trains, and cranes traditionally use diesel fuel, and cargo ships use bunker fuel on transoceanic voyages. In addition to large vehicles, the industry also uses a wide variety of smaller equipment, such as individual refrigeration units on truck trailers, forklifts, and onboard ship equipment that runs continuously or for long periods of time on diesel fuel. The emissions generated by diesel fuel consumption include diesel soot, other particulate matter (PM), nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), and other air pollutants that cause health and environmental problems. Children, the elderly, the pregnant and prenatal, and those in poor health are particularly impacted.

**FIGURE 61. BASEBALL GAME, PORT OF LOS ANGELES NEAR VINCENT THOMAS BRIDGE**



*Source: California Air Resources Board*

## BALANCING ECONOMIC BENEFITS WITH ENVIRONMENTAL COSTS

The environmental impacts of freight transportation vary by location. In many cases, freight-related activities are located in or adjacent to low-income or otherwise disadvantaged communities. The impacts and the potential solutions are highly dependent on the specific location of the freight activities. Mitigating the air quality issues and exposure to toxic diesel PM will require a long-term vision that includes specific actions needed to attain the vision. To accomplish this, we must call on California's freight industry as a strong partner in meeting these challenges and continue to ensure that the freight transportation system is reliable, efficient, supports a prosperous economy, and contributes to a health environment.

## DISADVANTAGED COMMUNITIES HIT HARDEST

Community impacts from the freight industry, emissions from freight vehicles/equipment being a primary concern, have been longstanding issues. Recent studies show direct correlation between the proximity of community residents to heavy freight industry activity and increased incidence of serious resident health problems such as asthma, other respiratory ailments, cancer, cardiovascular disease, and premature death.<sup>88</sup> The impacts are not limited to health concerns; issues such as noise, traffic congestion, water quality, blight and aesthetics, and vibrations from heavy vehicles also affect the quality of life in many communities.

The freight industry is widely distributed within California along and near truck and rail corridors, rail yards, warehouse districts, sea and airports, intermodal transfer facilities, agricultural processing plants, and industrial and manufacturing facilities. Therefore, the impacts from the freight industry are also widely distributed. The worst effects are often borne by the communities residing near freight corridors and facilities, while the benefits of freight movement are shared by a larger population at the regional, state, or national level. Housing and schools are often located near, or immediately adjacent to, freight facilities—with the communities surrounding the freight network typically being minority, low income, and disproportionately impacted by environmental pollution. Many of California's most densely populated communities also have the greatest amount of freight activity. The connection between location and exposure impacts prompted the California Air Resources Board (ARB) to develop recommendations for locating new sensitive land uses in its Air Quality and Land Use Handbook.<sup>89</sup> This handbook includes recommendations for minimum distances of sensitive land uses – such as residences, schools, day care centers, playgrounds, and medical facilities – from highways and high-traffic roads, distribution centers, rail yards, and port facilities.

## PUTTING CENSUS DATA TO WORK

Widely available demographic analysis tools applied to US 2010 Census data enable project, corridor, subregional and regional analyses of “disadvantaged” communities based on a variety

of data sets (attributes), including income, number of housing units, age, ethnicity and other attributes that typify environmental justice populations that have been traditionally underrepresented in planning processes. Merging the data with mapping software provides a geographic representation of selected community attributes in relation to the freight system. Refining the analysis to examine a specified distance (buffer) from a freight corridor or other freight facility can provide planning-level information regarding potentially impacted community members that corresponds to the selected attribute and housing locations close to freight facilities.

The maps contained in Figures 62 through 64 provide examples of two attributes (median household income and number of housing units) that were applied in three regions of the State that have high freight volumes and high populations. Census Blocks that overlap with the specified buffer distance, (for the accompanying maps either 600 or 1,000 feet as reported on the maps) are included in their entirety, even though many of the Census Blocks extend beyond the buffer distance. This is necessary because available data at the mapping scale does not allow determination of specifically where, within the Census Blocks, people live. Such detailed information would be more appropriate at the project level. Very large Census Blocks are typically either sparsely populated or are an intact facility, such as an airport, seaport, or military base.

Disadvantaged communities can be represented by many attributes. For the purpose of the “Low Carbon Transit Operations Program,” the “Transit and Intercity Rail Capital Program,” and other programs financed by the Greenhouse Gas Reduction Fund, disadvantaged communities are defined by the California Environmental Protection Agency (CalEPA), in accordance with Senate Bill 535 (De Leon, Chapter 830, Statutes of 2012). CalEPA used the CalEnviroScreen tool to assess areas that are disproportionately affected by multiple types of pollution and areas with vulnerable populations. CalEnviroScreen includes numerous indicators in two broad categories – “burden of pollution,” which includes exposures and environmental effects, and “population characteristics,” which includes sensitive populations and socioeconomic factors. Additional information on the census tracts that have been defined as Senate Bill 535 disadvantaged communities is available at: <http://www.calepa.ca.gov/EnvJustice/GHGInvest/>.

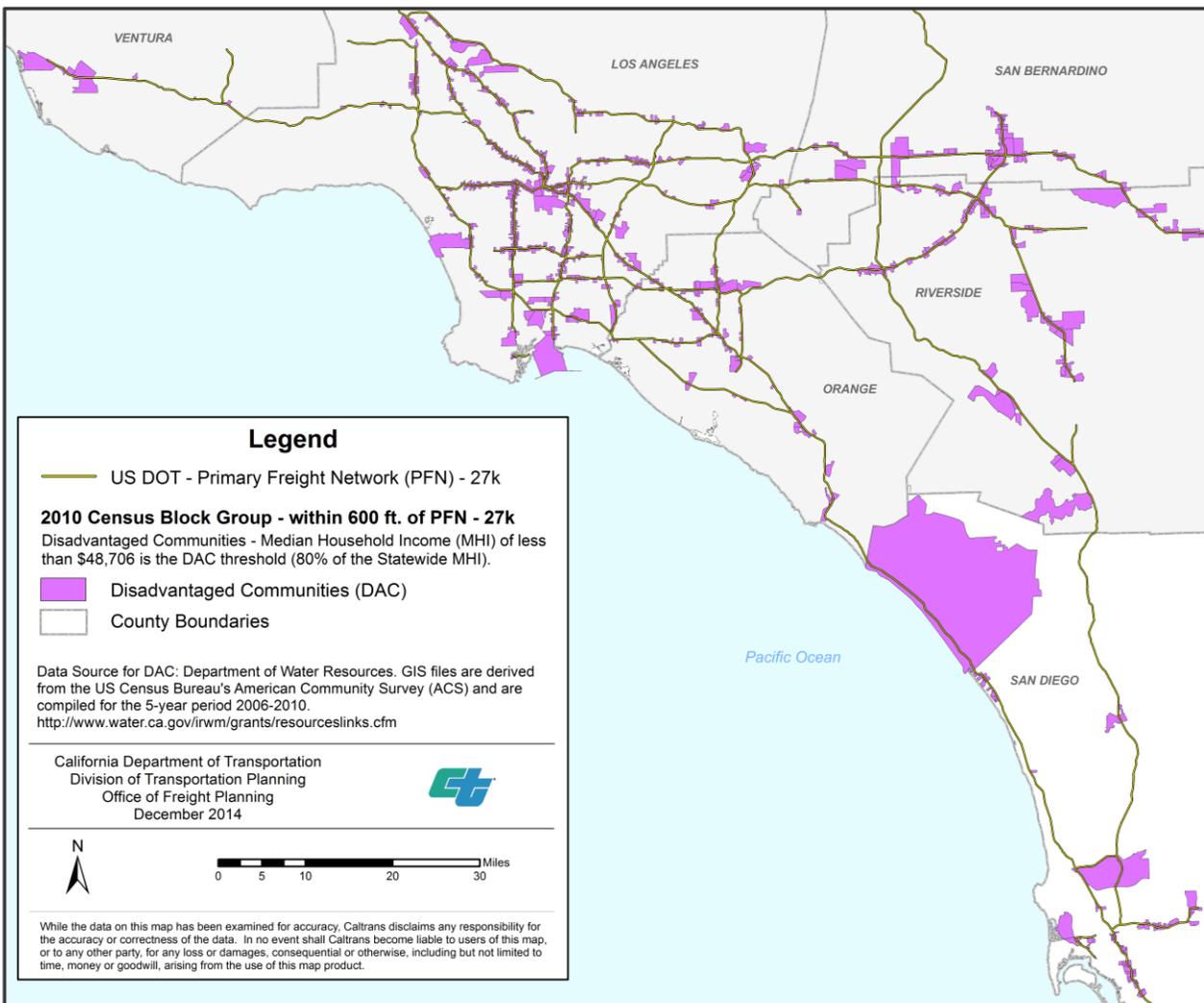
For purposes of demonstrating the analysis method for the CFMP; we selected median household income for Census Blocks located within 600 feet of the proposed federal Primary Freight Network in Southern California and the San Francisco Bay Area. We also selected the number of housing units located within 1,000 feet of Class I railroad tracks in the San Diego region. We could have also selected education level, employment, age, or other attributes. This information is important because it reveals whether low-income households are disproportionately located close to freight-related emission sources. Where low-income households are high in number within an impacted area, those areas may need (or require)

additional analytical studies in the planning and project development processes to identify and address freight impacts and mitigations. The potential benefits to communities for conducting such analyses is enormous and would be a worthy topic for a large study involving multiple agencies and stakeholders, a task that is beyond the scope, resources, and schedule of this Plan.

Analysis of community vulnerabilities to freight-related impacts is needed when developing corridor plans and individual projects and is appropriately done when preparing the respective environmental document for the corridor plan or project. It is also valuable for the CFMP to generally identify the statewide proximity of housing and population to high volume freight facilities. Having this broad view helps to emphasize the importance of addressing residential exposure to negative impacts from those facilities. To illustrate the issue, Caltrans used the California portion of the proposed 27,000-centerline-mile national Primary Freight Network (PFN) as the focus of analysis. Using 2010 US Census data, we identified how many housing units and the total population are located in 2010 Census Blocks (Block) that have at least a portion of the Block located within 1,000 feet of the PFN. California's preliminary portion of the proposed PFN is approximately 2,784 centerline miles of highway. We found that there are approximately 752,000 housing units in Census Blocks located within 1,000 feet of the California portion of the PFN, along with approximately 2,144,000 people. Of course, the total freight system is much more extensive than the PFN facilities and so the total number of housing units and total population within 1,000 feet of all high volume freight facilities is much larger than these figures. Therefore, reducing or eliminating harmful emissions from vehicles and equipment that traverse California's larger freight network provides direct benefit to millions of California residents of all ages, ethnicities, and incomes.

As discussed elsewhere in the CFMP, the widespread implementation of new technologies, energy sources and operations practices will be essential to reducing and eventually eliminating many of the negative impacts from the freight industry. Great progress has already been made and current programs are building on those successes to garner greater impact reductions. Where it is found that disadvantaged communities suffer disproportionately high levels of impacts, those communities may be particularly well suited for the early implementation of improved approaches to impact reduction. Such communities may also be well suited for proactive efforts to improve the environment, not just reactive efforts related to traditional freight projects. In its letter to the US DOT regarding the proposed national Primary Freight Network, the California State Transportation Agency (CalSTA) recommended that community and environmental improvement projects be specifically eligible for federal freight funding. This is an aspect of the California Freight Mobility Plan vision of "ensuring a prosperous economy, social equity, and human and environmental health."

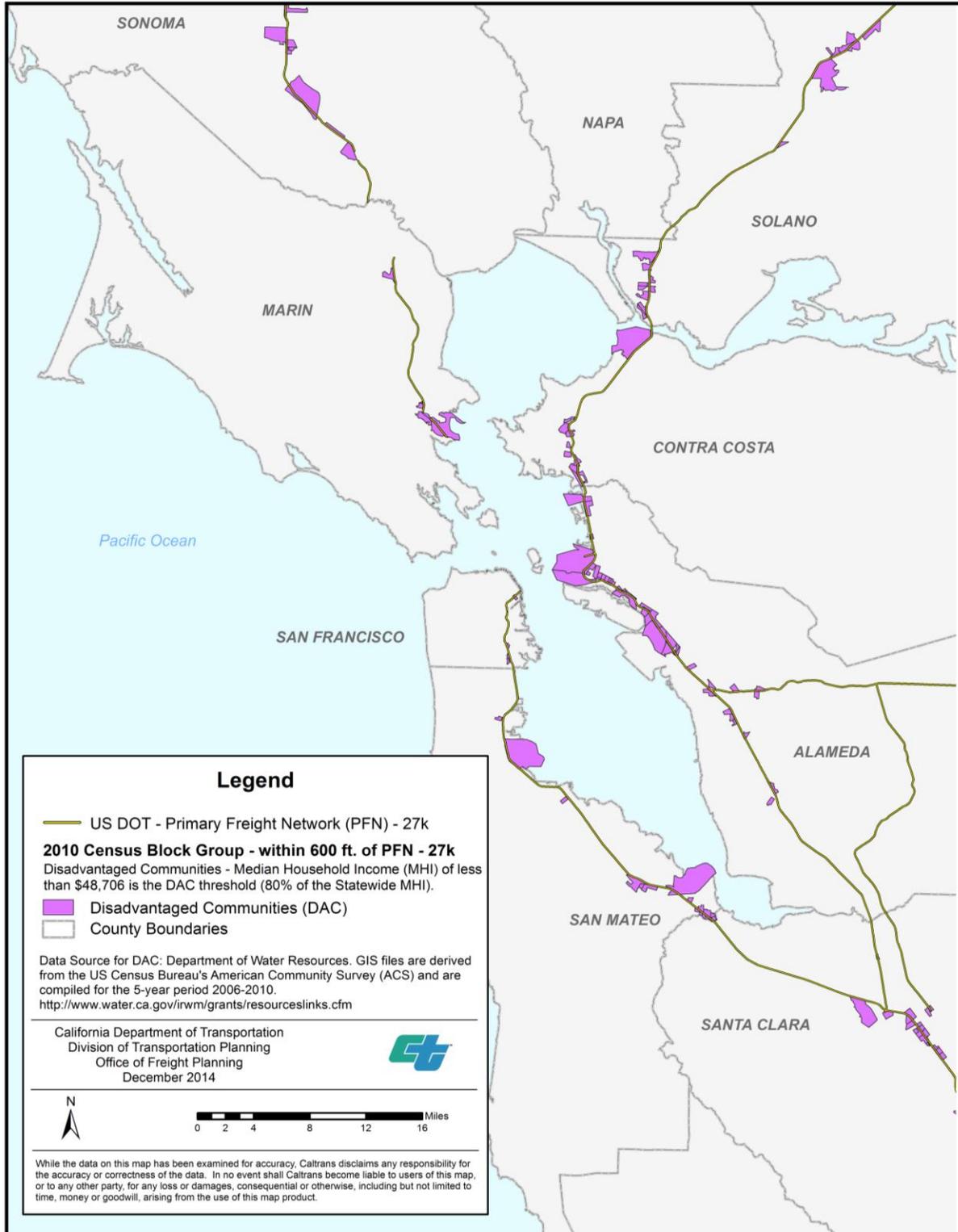
**FIGURE 62. PRIMARY FREIGHT NETWORK WITH DISADVANTAGED COMMUNITIES  
SOUTHERN CALIFORNIA REGION**



Source: Caltrans, Division of Transportation Planning (DOTP)

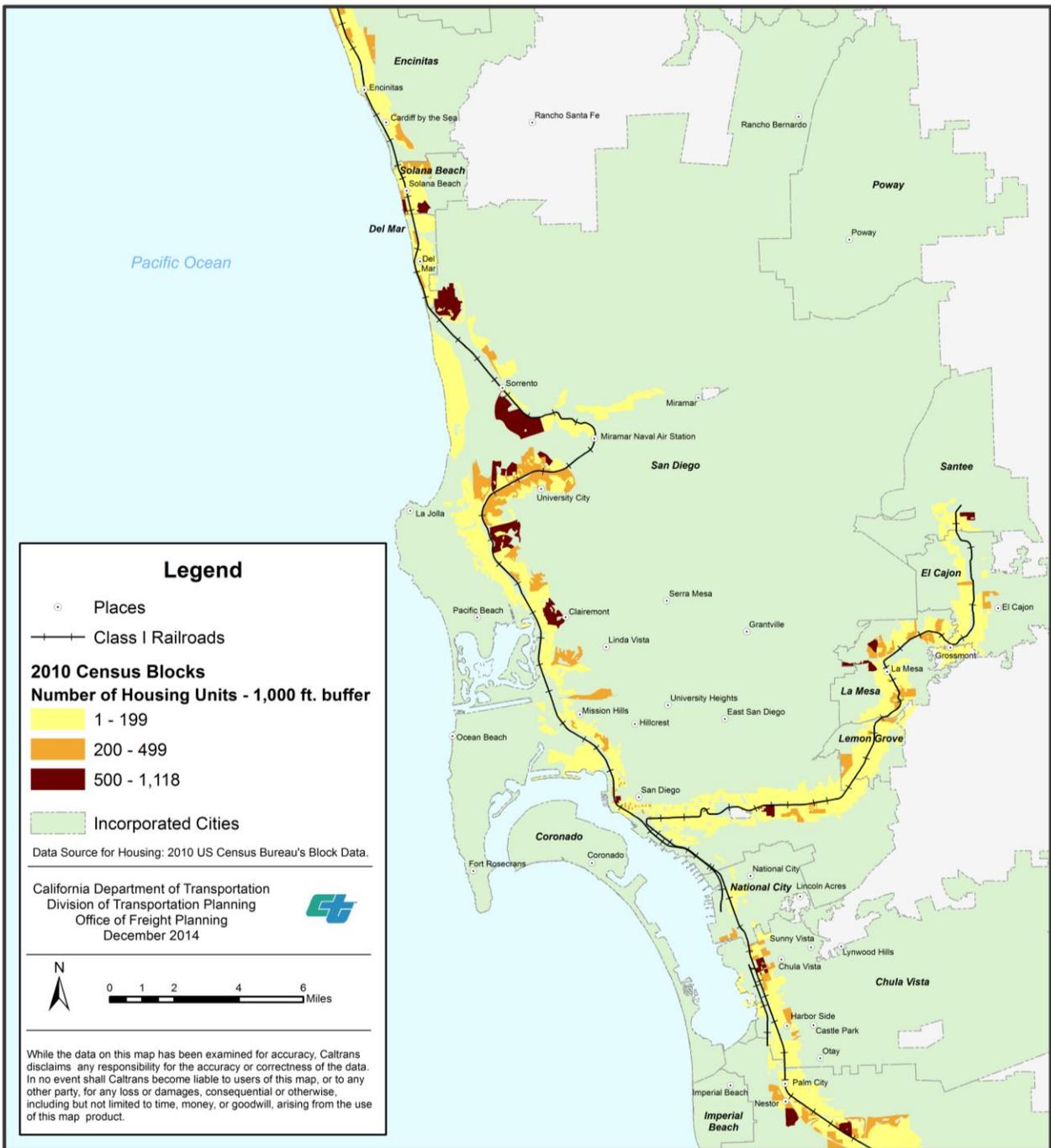
The depicted highway corridors are included in the US DOT proposed national Primary Freight Network. These highways have among the highest truck volumes in the nation. Some of the corridors have a continuous series of US Census Blocks with Median Household Income of less than \$48,706, or 80 percent of the statewide Median Household Income, thus earning the designation “disadvantaged.”

FIGURE 63. PRIMARY FREIGHT NETWORK WITH DISADVANTAGED COMMUNITIES – SAN FRANCISCO BAY AREA



Source: Caltrans, Division of Transportation Planning (DOTP)

FIGURE 64. PRIMARY FREIGHT NETWORK AND HOUSING UNITS – SAN DIEGO REGION



Source: Caltrans, Division of Transportation Planning (DOTP)

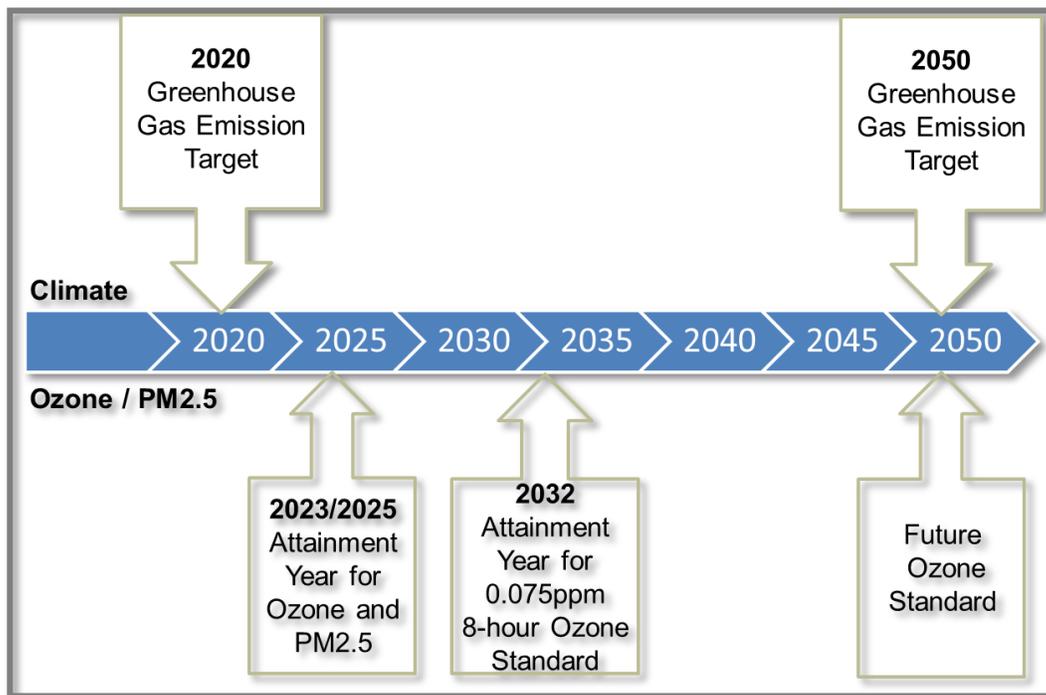
## AIR QUALITY AND CLIMATE CHANGE

Transportation is the largest contributor to greenhouse gas (GHG) emissions, with transportation sector tailpipe emissions accounting for about 38 percent of all emissions. It is the state’s primary source of smog creation and toxic air pollution. Emissions from freight equipment represents about 10 percent of statewide GHG emissions, about 70 percent of

statewide diesel particulate matter (PM) emissions – a toxic air pollutant and the component of black carbon that is a powerful, short-lived climate pollutant – and about 45 percent of statewide NOx emissions.<sup>90</sup>

In addition to the Federal Clean Air Act that establishes emission targets and requires states to adopt enforceable plans to achieve and maintain air quality standards, California has long been known for its own stringent air quality standards. In recent years, the State passed legislation setting the context for needed emission reductions and improvements to community health, as displayed in Figure 65 below. The Global Warming Solutions Act of 2006 (AB 32, Nunez)<sup>91</sup> requires California to reduce GHG emissions to 1990 levels by 2020, and to maintain and continue reductions beyond 2020. Governor Brown reaffirmed California’s commitment to reduce GHG emissions 80 percent from 1990 levels by 2050 in Executive Order B-16-2012<sup>92</sup> by establishing a parallel transportation sector target. Mandatory regional criteria pollutant reduction targets will be established in the 2016 State Implementation Plan (SIP), with expected reductions on the order of 90 percent below 2010 levels in the South Coast and similar reductions in the San Joaquin Valley by 2032 in order to meet the national ambient air quality standard for ozone in 2032.

**FIGURE 65. AIR QUALITY AND CLIMATE CHANGE PLANNING HORIZONS**



In 1998, California identified diesel exhaust PM as a toxic air contaminant based on its potential to cause cancer, premature death, and other health problems. Fine particulate matter (PM2.5) is particularly damaging to human health. The most vulnerable segments of the population are

children, whose lungs are still developing, and the elderly, who may have other serious health problems. Ongoing research continues to evaluate the exposure and serious health effects of diesel PM.

The ARB is the California state agency charged with developing regulations, strategies, and programs to reduce the emission of smog-forming pollutants, toxics, and GHG emissions from mobile sources such as automobiles, trucks, construction equipment, and other vehicles. The ARB works in partnership with local air districts that have additional responsibilities to reduce emissions. The ARB, along with its air district partners, administers grant and incentive funding to assist trucking and freight operators in purchasing cleaner-than-required vehicles/equipment or complying with regulations sooner than required. In addition, ARB, along with the California Pollution Control Financing Authority, administers a loan assistance program that provides participating financial institutions with incentives to make loans to small businesses for compliant trucks, buses, and retrofit devices. These funding programs were discussed in depth in Chapter 1.4. They include the Carl Moyer Program, Proposition 1B Goods Movement Emission Reduction Program, the ARB Air Quality Improvement Program (AQIP), and the California Energy Commission's (CEC) Alternative and Renewable Fuel and Vehicle Technology Program.

MAP-21<sup>93</sup> sets national performance goals for the Federal-Aid Highway Program in seven areas, including environmental sustainability. To evaluate progress in meeting the goals, the United States Department of Transportation (US DOT) must establish performance measures in the seven areas including traffic congestion and on-road mobile source emissions. In addition, US DOT is tasked in the national freight strategic plan with identifying best practices for improving the performance of the national freight network and mitigating the impacts of freight movement on communities. Many of the programs being implemented in California can serve as best practices for other states to consider implementing and even for national programs.

## **OTHER COMMUNITY IMPACTS**

Beyond the impact of emissions, freight transportation also produces noise, undesirable nighttime lighting, vibrations and traffic congestion, all of which affect the quality of life in communities surrounding freight facilities. Each of these needs to be addressed within the context of the communities where they occur and through larger programs that seek to reduce impacts across many communities or address a specific cause at the source. Such impact reduction projects should be eligible for funding from freight program sources, not just as mitigations for new projects but also as improvements for existing problems.

## POSITIVE IMPACT ON JOBS

To better understand community perspectives regarding freight impacts, Caltrans conducted a series of focus groups in early 2013, with representatives from concerned community groups (See Appendix G - Stakeholder Survey Report). Focus groups were held in Fresno, Oakland, Los Angeles, and San Bernardino. During the sessions, it was found that most respondents agreed that negative effects of freight include impacts to health, noise, air quality, traffic, vibration, pavement damage, and disproportionate impacts to environmental justice communities. Participants also identified positive effects from the freight industry, particularly in relation to job creation and employment. The majority of participants believed that areas for improvement include efficiency, safety, green technology, collaboration with the public and environmental justice communities, and rail improvements. Although it was recognized that efforts are being made to varying degrees to address sustainability goals, participants suggested that more should be done using green technology, innovative funding, more rail systems, double-tracking existing rail lines, and choosing rail over trucks for long-distance hauling.

## ENVIRONMENTAL IMPACTS BY TRANSPORTATION MODE

### MARITIME

The 11 publicly owned California deep water seaports and their maritime industry partners are committed to reducing the environmental impacts associated with the maritime industry and have implemented strategies to reduce emissions, including clean air programs, shoreside power options, ship speed reduction, and other environmental initiatives. The privately owned cargo port at Benicia and other privately owned marine terminals are also taking action to reduce impacts.

In 2006, in an effort to reduce emissions and improve air quality, the Ports of Los Angeles and Long Beach<sup>10</sup> (San Pedro Bay Ports) established the Clean Air Action Plan (CAAP).<sup>11</sup> The Plan includes milestones, goals, and recommendations for air quality improvements. CAAP committed the ports to reduce emissions of diesel particulate matter (PM), nitrogen oxides (NOx) and sulfur oxides (SOx). The Plan was updated in 2010 to include new goals and strategies to reduce port-related health risks and emissions based on clean air targets set by state and federal regulatory agencies. Between 2005 and 2012, the POLA/POLB have reduced truck emissions by over 90 percent and total diesel particulate matter from all port area sources (trucks, trains, cargo handling equipment, vessels, and watercraft) by about 90 percent. The POLA/POLB, in conjunction with industry, are continuing to implement zero-emissions technologies and equipment, such as electrified cranes, battery electric trucks, and shoreside electricity for vessels when at berth.

Over the past several years, the San Pedro Bay Ports have been evaluating various zero-emissions technologies for potential application at the ports. Although the ports' environmental mitigation programs have achieved tremendous success, emissions forecasting indicate that the currently known emission reduction strategies will not be adequate to achieve the goals of the San Pedro Bay Standards in the future. Therefore, the Board of Harbor Commissioners for the ports of Los Angeles and Long Beach adopted a roadmap for zero emissions in 2011, to provide direction for moving toward the identification, evaluation, and integration of zero-emissions technologies. The short-term goal is to determine if zero-emission technologies are feasible for the ports and, if so, demonstrate innovative technologies that can be adopted for more efficient and greener movement of cargo. The ultimate goal is to handle the anticipated cargo throughput growth with pollution-free technologies and strategies.

The San Pedro Bay Ports are also working with the Zero-Emission Truck Regional Collaborative, comprising the two ports and other regional agencies with zero-emissions truck initiatives, including Los Angeles County Metropolitan Transportation Authority, Gateway Cities Council of Governments, Southern California Association of Governments, the South Coast Air Quality Mitigation District, and Caltrans. The purpose of the Regional Collaborative is to ensure that zero-emissions initiatives remain a priority of the region, are aligned with policies, and harness the power of collaboration to optimize advocacy and project efforts.

As a part of the Maritime Air Quality Improvement Plan (MAQIP)<sup>94</sup>, the Port of Oakland has committed to reducing seaport-related diesel health risks by 85 percent from a 2005 baseline by the year 2020. The Port of Oakland has a Comprehensive Truck Management Program (CTMP)<sup>95</sup> that requires the Port's drayage trucks to meet the specified emission requirements established by ARB in effect in January of each year.

The smaller niche or specialty ports have also established short- and long-term strategic air quality implementation plans. These plans identify projects and programs that will keep the Ports in compliance with environmental regulatory commitments and also identify projects and programs that encourage pollution prevention and natural resource protection.

In addition to producing air emissions, oceangoing vessels, if not properly managed, can also have adverse impacts on California's marine and onshore environments. Ballast water systems used to stabilize and improve maneuverability of vessels are integral to shipping operations. However, ballast water discharged or exchanged in a different port from the port where it was taken can cause problems by introducing non-indigenous species to the environment.

The Marine Invasive Species Program was established in 1999 by the California State Lands Commission to prevent non-indigenous species from being released from commercial vessels into California waters. The program was reauthorized and expanded in 2003 with the Marine Invasive Species Act. To provide continued protection to the marine environment, the State

Water Resources Control Board is coordinating with the State Lands Commission to develop appropriate performance standards for treating ballast water from ships.

## FREIGHT RAIL

The two Class I railroads serving California, UPRR and BNSF, have signed two voluntary agreements with ARB to address air quality issues. In the first, signed in 1998, the railroads voluntarily agreed to utilize a specified level of clean locomotives by 2010 in the South Coast Air Basin. The second, signed in 2005, commits the railroads to implementing a statewide idling reduction program, performing health risk assessments at all major rail yards, conducting smoke tests on locomotives, and coordinating with communities.<sup>96</sup>

Beginning in 2015, new locomotives will be required to meet Tier 4 emissions standards, which reduce NOx emissions by 76 percent and PM emissions by 70 percent compared to current Tier 3 standards. These locomotives, which rely on exhaust after-treatment technologies and engine improvements to achieve the more stringent standards, are starting to be deployed. The US EPA projects that by 2023, 34 percent of the nationwide Class I line-haul fleet will be Tier 4. The South Coast Air Quality Management District (SCAQMD) has recently proposed an emission control measure that calls on the ARB to pursue enforceable mechanisms within its authority to achieve 95 percent or greater introduction of Tier 4 freight locomotives in the South Coast Air Basin by 2023. This could potentially be achieved through a MOU similar to the one signed by the ARB and freight railroads in 1998 that lead to early introduction of Tier 2 and Tier 3 locomotives. A similar commitment has been offered by the Southern California Regional Rail Authority (SCRRA) for early introduction of Tier 4 locomotives in passenger service. Recent rail fleet purchases for use on State-supported passenger services have included Tier 4 locomotives.

To further reduce emissions, railroads are also implementing low-emissions technologies, including cleaner-burning locomotive engines, multiple smaller engines (GenSets), and natural gas as a fuel source. Natural gas, in particular, may be a viable near-term fuel option that can be implemented in stages. Additionally, UPRR and BNSF have implemented the use of electric wide-span cranes at some intermodal transfer facilities and have proposed use of the cranes at other facilities. It is not yet feasible to install/retrofit these cranes at all intermodal facilities, however. These cranes produce zero on-site emissions and can capture regenerative power each time they lower a load, but they are still dependent on electricity production from off-site facilities.

## TRUCKING

Trucking is the most frequently used freight mode in California, moving approximately 82 percent (by weight) of all goods.<sup>97</sup> More than 80 percent of all communities depend solely on trucks for freight delivery.<sup>98</sup> The ARB estimates approximately 100,000 drayage trucks operate statewide. Nearly 20,000 of these frequently service ports and rail yards.

Through advancements in engine technology and fuel refinements, new diesel truck engines produce 98 percent less PM and NOx emissions than similar engines manufactured before 1990. Sulfur emissions from diesel engines have been reduced by 97 percent since 1999. California's in-use restrictions for on-road trucks are the toughest in the nation. Applicable regulations include the Truck and Bus Regulation, Drayage Truck Rule, Tractor-Trailer Greenhouse Gas Reduction Measure, Periodic Smoke Inspection Program, Emission Control Label, and Commercial Vehicle Idling. These regulations and programs have helped California achieve the lowest-emissions truck fleet in the nation and perhaps even the world. The long-term goal is to transition the California truck fleet to zero- or near-zero on-road emissions by 2050, with substantial participation from the interstate truck fleet as well. It is expected that as California implements emissions reduction programs and supports deployment of new engines and fuel types, other states and countries will follow, as was the case with automotive emissions reduction programs. The resulting improvements in economies of scale would help to reduce the per-unit cost of vehicle replacement for all states.

Incentive programs help offset some of the economic impacts from these regulations. These programs include vouchers for the purchase of approved electric and partial hybrid electric vehicles, price reductions for Class 7 or 8 natural gas trucks, and funds for modernizing existing fleets. However, the majority of cost of the regulation is borne by the private-sector trucking industry.<sup>99</sup>

## AIR CARGO

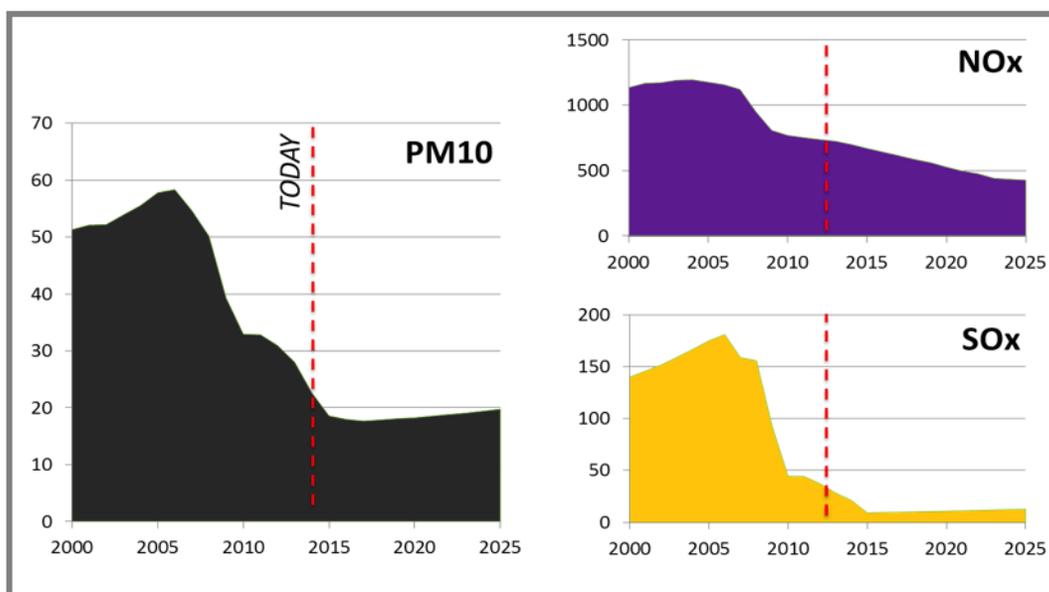
Air cargo is the most polluting method for freight movement per unit of transported freight, particularly for GHGs.<sup>100</sup> As such, the industry is implementing a number of emission reduction measures including lighter-weight aircraft, more efficient external fan engines, and operational changes or flight paths that consume less fuel. The Environmental Protection Agency (EPA) has implemented the Federal Aviation Administration Continuous Lower Energy, Emissions, and Noise (CLEEN) program<sup>101</sup> to achieve NOx emission reductions from new aircraft. This program includes three levels of emission reductions in NOx and greenhouse gas in an increasing percentage of new aircraft engines between 2015 and 2035.

Since air cargo aircraft and passenger aircraft with belly cargo provide services within the State and travel to other states and countries and are regulated by federal law and international agreements, aircraft-related impact reduction initiatives are beyond the scope of this Plan. However, there are groundside initiatives that reduce air cargo related impacts, including the use of natural gas and electric powered ground equipment, the replacement of fueling trucks with pipelines that deliver fuel directly to the aircraft gate, and aircraft idling reduction protocols that are sometimes supported by plugging the aircraft into a power source (similar to shore power for marine vessels) so that engines can be shut off but onboard aircraft power systems remain functional.

## EMISSION REDUCTIONS IN PROGRESS

California has already made significant progress in reducing emissions from its freight system. Since 2005, through regulations, incentives, enforcement agreements, seaport and industry initiatives, project mitigation, and land use decisions, California has reduced diesel PM emissions – along with the associated health risks – by 70 percent at the largest ports and 50 to 70 percent at the highest-risk rail yards. However, more needs to be done to continue to reduce the impacts from air pollution – diesel PM at the local level, ozone at the regional level, and GHGs at the global level.

**FIGURE 66. PROGRESS IN REDUCING FREIGHT EMISSIONS IN CALIFORNIA WITH EXISTING PROGRAMS (TONS/DAY)**



Source: ARB January 2014

## LOOKING FORWARD

Even with the accomplishments to date, additional improvements are still needed to meet air quality mandates. To achieve the State’s multi-pollutant emission reduction goals over the long-term, California will need to transition from the existing diesel/petroleum-dependent freight system into a system that is dominated by zero- and near-zero-emissions engines and motors.

For this to be possible, California must ensure the parallel development of the necessary supporting fueling and energy distribution infrastructure. This transition must support continued viability of the freight industry and the numerous economic sectors that depend on it. The State, through an integrated State agency effort, is committed to a broader sustainable freight that is intended to guide the transition of California’s freight system to a sustainable

freight system. As a result, criteria should be developed and used to prioritize and fund select freight projects identified in and implemented under the CFMP. These projects should each contribute toward meeting the goals of the transition to a zero/near-zero emission system as applicable.

In addition to these issues, as well as modal, and facility-specific initiatives, California will continue to rely on the California Environmental Quality Act (CEQA)<sup>102</sup> and the National Environmental Protection Act (NEPA)<sup>103</sup> to provide the necessary environmental process for analyzing freight-related projects and programs for their impacts and mitigation. These State and federal laws ensure that construction and infrastructure projects in California receive scrutiny, and that significant environmental impacts, project alternatives, and mitigation measures are addressed in a public manner and with the opportunity for public input.

FIGURE 67. PUBLIC ACCESS, PORT OF OAKLAND



Source: Steve Boland, "CalUrbanist" at Flickr.com, #5508009597