Appendix I

Needs Assessment Case Studies

ALAMEDA COUNTY GOODS MOVEMENT PLAN

Case Studies

Technical Memorandum

prepared for

Alameda County Transportation Commission

prepared by

Cambridge Systematics, Inc.

with

Fehr & Peers

technical memorandum

ALAMEDA COUNTY GOODS MOVEMENT PLAN

CASE STUDIES

prepared for

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Date

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1.0 INTRODUCTION

While the Task 3c: Needs, Issues and Opportunities included extensive data on a countywide level to assess the needs of the local truck route system, there are a number of issues where there are limited countywide data and where a more detailed analysis of a small area can provide insights into problems and potential solutions. This more detailed look at some these issues can help inform local jurisdictions on the causes and extents of the issues and also inform local jurisdictions on the types of strategies that can be used to address the issues.

In order to provide this more detailed assessment, five case studies are developed throughout Alameda County (one of the case studies is more regional and scope and includes portions of West Contra Costa County as part of the update to the regional goods movement plan). The purpose of the case studies is to highlight specific local issues that are likely to be experienced in other parts of the County. They were selected to highlight particular issues and particular local contexts (for example, differences between urban and rural goods movement issues). Each case study is based on readily available data from the local jurisdiction, interviews with stakeholders, and visual observation of the conditions identified by the stakeholders. These case studies also include recommended strategies to address the identified issues. These case studies are documented in this technical memorandum, and they include:

- **West Oakland.** This case study is important because of the significance of this particular Global Gateway and is transferable to other major port/rail/major industrial centers in the County and the region. The focus of this study is on the following issues:
  - Local access and circulation issues around marine terminal and supporting truck service sites at the Port of Oakland (including safety, lack of capacity contributing to queuing, poor signage and striping, access management, connectivity to the freeway);
  - Modal conflicts around the Port and Army Base (e.g., bike and pedestrian paths, railroad crossing problems); and
  - Neighborhood impacts (truck route design and enforcement, truck parking, land use conflicts).
- **International Boulevard/E 14th St.** This case study is transferrable to other major arterials and multimodal corridors with "Main Street" parking and loading issues, and will illustrate selection of primary and secondary truck routes connecting major cities. The focus of this study is on the following issues:
  - Potential modal conflicts on a "Complete Street" (bus rapid transit (BRT) primarily, but also bike and pedestrian); and P

  - Truck access to retail and commercial businesses (truck circulation, geometrics, parking/loading);
  - Truck route designation/preferred routings and east-west connectors (e.g., truck route usage on San Leandro Street vs. International, connections between the two truck routes and the freeway); and
  - Cross-sections and operational treatments.

- **Central County Industrial Access.** This case study involves more cross-jurisdictional coordination issues and access to industrial areas with potential neighborhood impacts. This case study focuses on areas such as Hesperian and Union City Boulevards, Clawiter, Doolittle, and the Industrial/880 interchange. This case study could be transferable to any of the remaining industrial areas in the County and region. The issues include:
  - Connectivity from the freeway to industrial areas,
  - Diversion from I-880 to local streets and roads, and
  - Spillover impacts on adjacent neighborhoods.

- **I-80 Corridor Rail Impacts.** This is a regional case study that crosses county boundaries and addresses issues associated with a corridor with high-freight and passenger rail activity and growth potential linked to Global Gateway expansion and increased domestic freight rail traffic. This case study is transferable to any rail corridors through urbanized areas with high levels of residential and commercial development and growing freight and passenger rail volumes. The issues addressed include:
  - Noise impacts, emissions impacts, and potential solutions;
  - Disruption of access and traffic flows leading to high levels of congestion during train passages;
  - Physical barrier to pedestrian and bicycle circulation through the community and other route or distance-sensitive travel modes, such as local transit (and impact on this development type); and
  - Safety associated with crossing the tracks, particularly for pedestrians at both designated and illegal crossing points.

- **Tesla Road.** This case study is transferable to similar rural access routes (e.g., Vasco Road, Patterson Pass Road) and other parts of the Region (North Bay). The focus of this study is on the following issues:

- Conflicts between truck access to major business activity (wineries) and commuter access to freeways along high-speed rural road (cross-section alignment, access management, driveway consolidation);
- Safety issues related to truck and auto interactions; and
- Impacts of growth in a relatively undeveloped corridor with growth drivers for truck and auto traffic (capacity).

Each of the case studies are discussed in detail in sections below. A summary of these case studies in show in **Table 1.1**.

Table 1.1 Summary of Case Studies

Case Study	Case Study Key Issues Highlighted
West Oakland/Port Impacts	Freight impacts on local communities
International Blvd/ E 14th St	Complete Streets/modal conflicts
I-80 Corridor Rail Impacts	Rail growth and grade crossing impacts
Central County Industrial Access	Inter-jurisdictional issues, parking impacts and truck traffic along truck routes in industrial areas
Rural Access – Tesla Road	Access to agricultural businesses from high speed rural roads and related safety and traffic disruption issues

2.0 WEST OAKLAND AND PORT DEVELOPMENT

Protecting public health and preventing adverse local community impacts from freight transportation, while also pursuing an economic development goal is a challenging topic in goods movement planning. This requires simultaneous consideration of local community needs, economic growth driving factors, traffic and engineering design factors, environmental factors, and even human factors such as driver behavior. Alameda County Transportation Commission (ACTC) and Metropolitan Transportation Commission (MTC) of the San Francisco Bay Area recognize this topic as a challenge in some urbanized areas.

The urbanized area of West Oakland was selected as a case study area through discussions with ACTC and MTC. The key impetus for the case study is to recognize the challenging juxtaposition of the Port of Oakland, and related industries, as a major economic driver and the local community which is affected by goods movement activities. The Port of Oakland, the rail yards and businesses in West Oakland are important drivers for the economy of the whole Bay Area and the megaregion, they also cause environmental and health impacts on neighboring communities. Such impacts have prompted various studies to be conducted in the past decade to understand the issue of local community impacts from freight transportation, as well as progress made in addressing them. Because of the planned Oakland Army Base Redevelopment project, known as Oakland Global, there have also been various traffic and environmental studies done for the West Oakland area. Because of the importance of this issue to the region as well as the many efforts and studies carried out in recent years, a case study in West Oakland provides us with more detailed understanding of not only the issues in the area, but also the progress made to-date to address the issues.

Information was gathered on the case study area by the following ways: a) conducting a review of available documents and reports, and analysis of available data; b) outreach to a local community needs and interests advocacy group; c) outreach to the Port of Oakland and its stakeholders; d) outreach to the City of Oakland staff; and e) a field visit by Cambridge Systematics.

This case study provides a review of current and future issues of growth and development of Port related activities and local community impacts from freight transportation in West Oakland with the intent to identify solutions related to planning for growth in goods movement while protecting public health and preventing adverse local community impacts. The case study evaluated the following goods movement-community issues:

- Air quality
- Operational efficiencies at the Port of Oakland

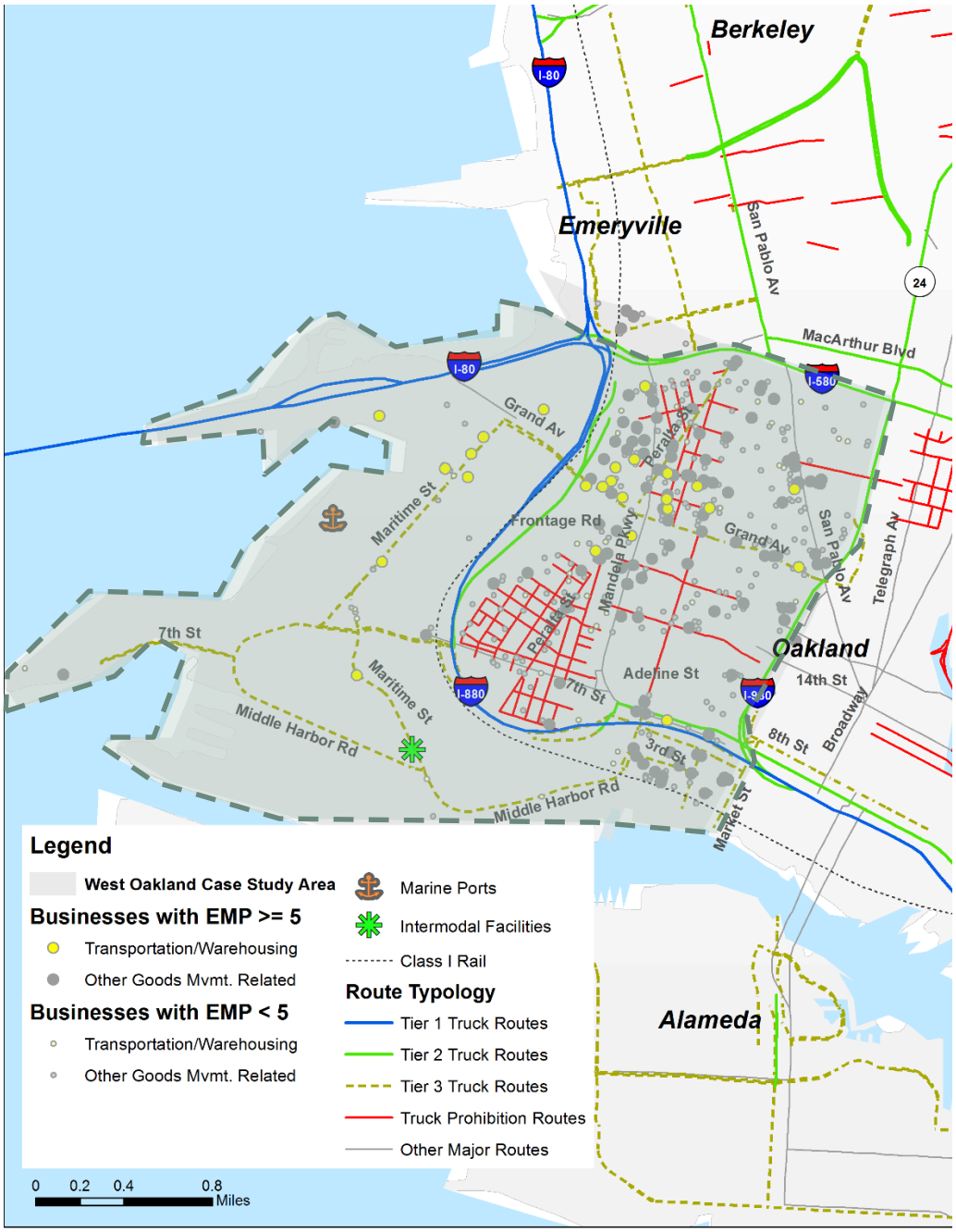
- Parking issues
- Local roadway issuing, including conflicts with other modes, signage, pavement conditions, signage and enforcement

Evaluation of these issues and identification of potential solutions provides some transferrable practices that could be applied to other urbanized areas in Alameda County and the MTC planning region that involve similar issues and can benefit from similar solutions.

2.1.1 Background

The case study area as shown in **Figure 2.1** consists of West Oakland and adjacent major transportation facilities – Port of Oakland, intermodal railroad yards and their support facilities.

Figure 2.1 West Oakland Case Study Area and Goods Movement Related Business Locations Map



Source: MTC 2014 Traffic Analysis Zones (TAZs) GIS data; ACTC's Truck Routes and Truck Prohibition Routes GIS Database; ESRI Streets Map; and 2014 Dun&Bradstreet Raw Data.

Note: (a) Other goods movement related business is assumed to belong to one of the following industry sectors: construction, agriculture, forestry, mining, utilities, manufacturing, wholesale trade, or retail trade identified based on North American Industry Classification System (NAICS) 2-digit industry sector code found in the D&B data. The data on business locations from the D&B data is only indicative of the existing relative density, the locations were not validated for currency. b) Route typology are as defined in Task 2C report for the Alameda County Goods Movement Plan and MTC Regional Goods Movement Study. Other major routes were added to show some important roads in the case study area that are not designated as either truck routes or truck prohibition routes.

West Oakland is the geographical area surrounded on all four sides by freeways, Interstate 880 (I-880) in the west and south, Interstate 580 (I-580) in the north, Interstate 980 (I-980) in the east, and the rail tracks in the south and west areas.

For nearly one and half century (since 1869), West Oakland has been a terminus of transcontinental railroad across the U.S. Although a deep water port was established at West Oakland as early as in 1874, the container port era began only in 1962. These facilities were responsible for the early settlement in West Oakland and establishment of industries that provided jobs.

World War II became a key turning point in West Oakland history. Prior to the war, most of West Oakland was designated for industrial uses, and people worked where they lived as communities. However, after World War II, several economic changes shaped the land uses and quality of life in West Oakland, which were typical of urbanized areas with a large port facility in the U.S. in the same period:

- proliferation of automobiles;
- construction of interstate system;
- advent of containerization; and
- decades of heavy manufacturing industries moving out to suburban locations and overseas in search of better economics.

The above changes resulted in West Oakland losing several high-paying jobs, which moved to other parts of the Bay Area and the world. Poverty and crime heightened over time.

Also in the post-war period, large scale infrastructure projects in West Oakland brought some atypical changes to West Oakland. The projects include Cypress Freeway segment of Interstate 880 (I-880), and a new main Post Office in the 1960s, construction of elevated Bay Area Rapid Transit (BART) tracks in the 1970s. These projects repeatedly displaced people in West Oakland and thus disrupted their community way of life.

Today, West Oakland has a population of about 70,200 with average household income of about $52,000 and median household income of just about $35,8001, therefore, is still a low-income urbanized area. It has a stigma of high crime rate. It is primarily residential, and has approximately 270 acres of land for industrial use within a total of 1,900 acres of West Oakland overall, that is only about 14%. The industrial uses include mainly recycling, container storage, trucking-related services. In addition, there are also substantial amounts of commercial land

[1111] http://www.sfrealtors.com/US/Neighborhood/CA/West-Oakland-Demographics.html (last accessed on December 3, 2014). Note: Demographic information is aggregated from data for the zip codes of 94612, 94607 and 94608.

uses, including offices, restaurants and retail stores. The other problems that the above changes created was that of urban blight and brownfield challenges.[2]

The goods movement related businesses in the case study area access the interstate system through a designated set of truck routes, which include Maritime Street, Middle Harbor Road, Frontage Road, 7th Street between west of Frontage Road and between I-880 N ramp and Adeline Street, West Grand Avenue, Adeline Street between 3rd Street and 7th Street, 3rd Street between Adeline Street and Market Street, 5th Street between Adeline Street and ramp to I-880 S, 8th Street between I-880 N ramp and Market Street, Market Street south of 8th Street, and Peralta Street north of West Grand Avenue. There are several weight based truck prohibition routes (e.g., Vehicles exceeding four and one-half tons prohibited use on Adeline Street between 7th Street and West Grand Avenue), which are concentrated mainly in the southwestern corner and northern parts of West Oakland. Occasionally, for the purposes of loading / unloading, other major routes including Mandela Parkway, 7th Street between Adeline Street and Frontage Road, and San Pablo Avenue are used.

2.1.2 Role of Goods Movement in the Case Study Area

The port and the rail yards provide significant economic benefits to the City of Oakland, Alameda County and the MTC region as a whole. The port currently handles over 2 million twenty-foot equivalent units (TEUs) of containers and about 99 percent of the international containerized cargo handled at all ports in Northern California.[3] In addition to their direct impacts, the beneficial cargo owners (BCOs), and trucking companies and independent owner/operators accessing the port and the rail yards pay (or self-pay) wages and also expend on a number of ancillary services, such as freight forwarding and logistics service providers, transloading facilities, truck parking facilities, warehouses (for both regular containers and temperature-controlled containers), bulk storage areas, truck fueling stations, food courts / restaurants, and truck and container spare parts / repair centers. These in turn generate further economic benefits.

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[2] Department of Planning and Building, City of Oakland, *West Oakland Specific Plan*, Final Plan, June 2014. Available at: http://www2.oaklandnet.com/Government/o/PBN/OurOrganization/PlanningZoning/OAK028334 (last accessed on December 3, 2014)

[3] http://www.portofoakland.com/maritime/factsfigures.aspx (last accessed on December 3, 2014)

There are other truck-intensive businesses such as U.S. Postal Service, East Bay Municipal Utility District (EBMUD), Svenhard's Bakery, etc. in West Oakland that do not serve the port but also make job and local tax revenue contributions.[4]

The City of Oakland and the Port of Oakland are implementing the Oakland Global (formerly, Oakland Army Base development) project, while the city is also implementing West Oakland Specific Plan (WOSP). Although both the project and the plan are primarily meant for economic development, they are strongly influenced by environmental, public health and other community considerations.

Oakland Global is a redevelopment project over 360 acres of former army base, the first phase consists of three components: (1) public improvements including soil stabilization, environmental remediation, construction of new utilities, roadways and rail improvements (lead track, manifest and support yard), warehouse retention, and 7 acres of truck parking, (2) private improvements including OMSS' development of an ancillary maritime support service center for truckers serving the Port, (3) integration of development with the development of the planned Gateway Park and adjoining amenities, (4) disposition and development agreements with California Waste Solutions and Custom Alloy Scrap Sales for the development of approximately 22 acres of the North Gateway Area of the army base, and (5) establishment of special assessment district to fund the maintenance of the public improvements.[5,6]

In the second phase of the Oakland Global project, the Port is planning to build a new intermodal rail terminal, new trade and logistics facilities, and a grade separation project at 7th Street. However, this phase of the Oakland Global project is subject to availability of funding.

The City of Oakland staff[7] expects that the benefits of the Oakland Global project to be: (a) relocating polluting recycling businesses away from West Oakland to Oakland Army Base to minimize public health impacts; (b) adding landside rail infrastructure as a more fuel efficient and environmentally-friendly alternative to trucking; (c) providing logistics services targeting local shippers/receivers and their commodities; (d) creating living wage local employment opportunities for Oakland residents at expanded existing rail yards, new rail yards, a new trade and logistics center and during construction; and (e) contributing to local tax revenue. The

[4] Department of Planning and Building, City of Oakland, *West Oakland Specific Plan*, Final Plan – Chapter 1 - Introduction, June 2014. Available at: http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak049121.pdf (last accessed on December 3, 2014)

[5] http://www2.oaklandnet.com/Government/o/CityAdministration/d/NeighborhoodInvestment/o/OaklandArmyBase/ (last accessed on December 3, 2014)

[6] http://www.portofoakland.com/pdf/maritime/oab/oab_projUpdate_02132014.pdf (last accessed on December 3, 2014)

[7] Stakeholder interviews with City of Oakland staff on October 23, 2014 and October 30, 2014.

project is expected to add approximately 2,800 project construction jobs, as well as approximately 2,000 permanent waterfront jobs. Construction careers requirements were incorporated into the project development agreement, which ensures 50 percent of the jobs will go to the city residents, 25 percent of the jobs will go to disadvantaged families, 20 percent of the jobs will be apprentice type, "ban the box," that is, prohibits unnecessary exclusion of workers with history of involvement with the criminal justice system, and high-road job-quality assurances, including wages, benefits, and training.

The port is expecting that completion of Oakland Global project phase 2, particularly construction of intermodal rail terminal and 7th Street grade separation projects, would need substantial public investment or strong growth in rail activity through Oakland. The port is expecting that new trade and logistics buildings can bring new shippers/receivers and new cargo to increase ocean-shipping activity and associated seaport revenues. Particularly, the location of the trade and logistics buildings within the port's overweight corridor will save shippers ocean shipping costs by reducing the number of containers required for ocean transportation.

The City of Oakland conducted a 2012 initial study / addendum for the Oakland Global project that provides projected growth traffic, under a scenario that the phase 2 of Oakland Global project is completed.[8] According to these projections, if there is strong trade growth, either as a result or irrespective of new trade and logistics buildings, then an intermodal rail capacity expansion can help absorb the trade growth. The port expects that the additional intermodal rail capacity would increase intermodal rail usage and reduce the truck impacts.

The West Oakland Specific Plan was intended for: (1) providing a set of comprehensive, multifaceted strategies for facilitating the development of vacant and/or underutilized commercial and industrial properties within West Oakland's Opportunity Areas[9], (2) acting as a tool for supporting, attracting and facilitating developments that provide jobs and services needed by the West Oakland community and the city of Oakland at large.[10]

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[8] City of Oakland, Oakland Army Base Redevelopment Project – Initial Study/Addendum – Appendix B – Transportation and Traffic Outputs, 2012, Available at: http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak035064.pdf (last accessed on December 3, 2014)

[9] An "Opportunity Area" for purposes of the West Oakland Specific Plan project is an area containing numerous large, vacant and/or underutilized commercial and industrial parcels that are not developed to the intensity of land uses allowed by current zoning. They are strategically located such that development of key sites within the Opportunity Area can significantly encourage development of other properties in the surrounding environment.

[10] http://www2.oaklandnet.com/oakca1/groups/ceda/documents/agenda/oak038213.pdf (last accessed on December 3, 2014)

More specifically, the plan was developed as a partnership between the City, Redevelopment Successor Agency (erstwhile Redevelopment Agency), affected property owners and adjacent business and residential communities. The plan identified development challenges to assist the City refine its economic development planning for the area by targeting specific area needs. The plan provided a concise, consistent way to communicate the preferred development strategies for the Opportunity Areas and thus acted as a marketing tool to attract developers to key sites within the Opportunity Areas.

An important aspect of the City of Oakland's West Oakland Specific Plan is that it provides Commercial Industrial Mix zoning districts in West Oakland. These provide buffering and transitions between industrial and residential zones, while imposing strict limits on recycling and truck-intensive uses. This helps preserve industrial areas of West Oakland for a wide range of commercial and industrial establishments, support Port operations and expansion by providing land for Port services, locates high impact industrial uses away from residential areas; and allows industrial or large scale commercial retail uses on sites with direct access to the regional transportation system.[11] In other words, this also helps reduce the need for heavy trucks to traverse through local or neighborhood streets.

2.1.3 Relevance to other areas

The case study area is undergoing a major (over $100 million) economic development in a local, densely populated community. The case study area provides some best practices in these situations such as: a) providing local employment and livable wage opportunities; b) setting targets and mitigation measures related to public health; and c) relocating businesses when incompatible with neighboring land uses. The economic and public health challenges in West Oakland have some commonalities with other areas in Alameda County and the MTC region. The goods movement project solutions to address these challenges while also supporting economic development activities are therefore also relevant.

2.2 Specific Issues

The specific issues faced around the West Oakland Area are detailed below. While all of these issues exist today, additional improvements planned as part of the Army Based Redevelopment project as well as other impact reduction strategies (all included in subsequent memos of this project) are aimed to reduce these impacts. Further, it is important to note that some issues that are of great importance to West Oakland are bigger than goods movement, though goods movement is one of several contributing factors (e.g. air quality).

[11] http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak049124.pdf (last accessed on December 3, 2014)

2.2.1 Air Quality and Public Health Challenges

In 2005, diesel PM ambient concentrations in West Oakland were almost three times higher than the average background diesel PM levels in the San Francisco Bay Area. The overall cancer risk in West Oakland due to all sources was about 860 per million; port-related activity contributed a cancer risk of about 250 per million (about 29 percent); while the Union Pacific rail yard about 40 per million (about 5 percent)[12]. On-road heavy-duty trucks made the largest contribution to the overall potential cancer risk levels in the West Oakland community; followed by ships, harbor craft, locomotives, and cargo handling equipment.[13]

For these reasons, Port of Oakland and the railroads partnered with the Bay Area Air Quality Management District (BAAQMD) and the California Air Resources Board (CARB) in setting an emissions reduction target of 85 percent by 2020 from a 2005 baseline and implementing air quality improvement strategies such as construction of shore power infrastructure, providing "no idling" signage along port roadways; purchase of new cleaner technology-based trucks, purchase of new cleaner technology-based locomotives and use of cleaner (reduced sulfur) fuels.[14]

Independent owner operators (IOO) are entrepreneurial drivers who own, maintain and drive their own tractors. In 2009, they formed about two-third of the fleet of trucks servicing the port. In the case of the port drayage, they contract with an LMC to haul freight on a trip-by-trip basis. In early years of the implementation of the CARB regulations, economic challenges were faced by independent owner operators (IOO) in complying with clean truck program of the port. Stiff competition in the port drayage trucking sector impeded the ability of LMCs and IOOs to accumulate the resources necessary to upgrade their trucks.[15] Although the port drayage fleet has been mostly upgraded, the financial impacts of the upgrades will continue to be felt by businesses for a few more years.

Looking at the port emissions inventories in 2005 and 2012, although twenty-foot equivalent (TEU) container volumes have increased by a total of 3 percent between 2005 and 2012, overall diesel particulate matter (DPM) emissions have decreased by 70 percent for that same period. Of

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[12] The numbers are revised values based on West Oakland Truck Survey conducted in late 2008 and early 2009, through a partnership between the Bay Area Air Quality Management District, West Oakland Environmental Indicators Project (WOEIP), and consultants Sonoma Technology, Inc. and Wiltec.

[13] Bay Area Air Quality Management District, Improving Air Quality & Health in Bay Area Communities, Community Air Risk Evaluation (CARE) Program Retrospective & Path Forward (2004-2013), Final Report, April 2014.

[14] Port of Oakland, *Maritime Air Quality Improvement Plan (MAQIP) Progress Report Meeting – Key Outcomes*, Final Memorandum, November 19, 2013.

[15] Beacon Economics. Comprehensive Truck Management Program – Economic Impact Analysis. Final Report for Port of Oakland, April 2009.

the overall 70 percent reduction, DPM emissions from drayage trucks have decreased from 16 tons in 2005 to 2 tons in 2012, which represents an 88 percent reduction. Similarly, DPM emissions from ocean-going vessels have decreased from 209 tons DPM in 2005 to 57 tons DPM in 2012, which represents a 72 percent reduction. DPM emissions from locomotives have also decreased from 2 tons in 2005 to 0.3 tons in 2012, which represents a 77 percent reduction. The port is on track to exceed the 85 percent reduction target by 2020.

Although rail does not contribute to cancer risk levels in West Oakland at the same level as trucks, rail is expected to account for the largest growth in freight volumes due to the improvements from the Oakland Global project. [16] Hence, it is important to understand the progress on the rail front similar to the truck front.

Railroad operations are typically described in terms of two different types of operation, line-haul and switching. Line-haul refers to the movement of cargo over long distances, while switching refers to short distance hauling of rail cars within the rail yard for assembling and disassembling line haul trains. Locomotives used for line-haul operations are typically large, powerful engines of 3,000 to 4,000 hp or more, while switch engines are smaller, typically having 1,200 to 3,000 hp. The line-haul operations have both local and regional air quality impacts, while the switching operations have only local air quality impacts.

The reduction in locomotive emissions between 2005 and 2012 came as a result of multiple reasons: (a) rail activity was lower in 2012 than in 2005; (b) the line-haul locomotive fleet has been upgraded through normal attrition, resulting in reduced fleet average emission rates; and (c) a low sulfur fuel replaced average sulfur fuel – the benefits of this can vary between 11-28 percent reduction in emissions for a GE 4-stroke Engine depending on the notch[17] in train operation.

In the inventories, no changes in fleet characteristics for switching were assumed between 2005 and 2012. These reasons are not sufficient to believe that the locomotive emissions will reduce under projected rail traffic. Based on the 2012 Port of Oakland emissions inventory, the rail yards at West Oakland still operate Tier 0-2 switcher engines that may need to be retrofitted to current Federal standards[18], which is Tier 3 transitioning to Tier 4. This requires the port, BAAQMD and

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[16] City of Oakland, Oakland Army Base Redevelopment Project – Initial Study/Addendum – Appendix B – Transportation and Traffic Outputs, 2012, Available at: http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak035064.pdf (last accessed on December 3, 2014)

[17] A notch is one of the several available settings in controlling the speed / power / torque of the traction motors of a locomotives.

[18] Under the Federal Clean Air Act, U.S. EPA has sole authority to adopt and enforce locomotive emission standards. Under U.S. EPA's rules, this preemption also extends to the remanufacturing of existing

CARB to encourage the railroads on the implementation of Federal regulations as quickly as possible. The port, BAAQMD and CARB should also try to get better information from the railroads on the progress made on engine idling of line-haul locomotives and switchers at rail yards. There is still a large potential in terms of reducing emissions of diesel particulate matter and NOx due to rail movements.

In addition to emissions impacts, proximity to freight infrastructure and operations also cause other adverse effects on health from noise, vibration, and light. This can lead to discomfort, lack of sleep, anxiety and a variety of other stress-induced health problems. Proximity to freight causes these issues and while this study does not look at this explicitly, they persist given their proximity to trucks and the port.

2.2.2 Operational Inefficiencies and Related Issues

There are three potential sources of inefficiency in port's drayage system – dispatch policies of licensed motor carrier (LMC), marine terminal inefficiencies, and driver inefficiency. Based on interviews with LMCs[19], the biggest issue at the Port of Oakland was determined as marine terminal inefficiencies, resulting in long queuing outside the gate area. According to a LMC serving the port, the total turnaround times (from the time of joining the queue to the time leaving the gate) at the Ports of America and SSA terminals on average range between 1-2 hours, while they are shorter in the other terminals. When combined with limited port hours (8 am to 5 p.m.) and port hours for "double-cycling"[20] (generally, 8 am to 3 p.m.) and traffic congestion over the interstate system, this results in an average which is close to 2 turns[21] a day, as opposed to the average close to 3 turns a dayseen a decade ago. On rare occasions, even one turn a day at these terminals are witnessed. A minimum of 2 turns a day is required to meet the trucker costs.

Staff from the Port of Oakland[22] indicated that the port is trying to become "the first port of call" for imported cargo to Northern California. However, issues of marine terminal inefficiencies and

locomotives. In April 2007, U.S. EPA released a proposed locomotive rulemaking that would reduce Tier 0 locomotive NOx emissions by 20 percent and Tier 0-3, remanufacture and new standards, to reduce PM by 50 percent. The ARB is relying on U.S. EPA to expeditiously require the introduction of the next generation or Tier 4 locomotive emission standards that requires Tier 4 locomotives to be built with diesel particulate filters and selective catalytic reduction. Combined, these exhaust after treatment devices are expected to provide up to a 90 percent reduction in NOx and PM emissions beginning in 2015-2017.

[19] Stakeholder interviews with private trucking companies on February 3, 2014 and February 27, 2014.

[20] "Double-cycling" refers to the act of dropping a container and picking another container in the same move.

[21] Turn is the activity of a truck entering the port and leaving the port while picking a load, dropping a load or performing both activities. In case of multiple turns in a day, the truck should also be able to reach the location of the shipper/receiver of the load between the turns.

[22] Stakeholder interview with Port of Oakland staff on October 10, 2014.

restricted hours of service mentioned above eliminate some of the competitive advantage that could otherwise be present. There are also likely other reasons why BCOs are not currently using Port of Oakland as their first port of call for imports that relates to the structure of their supply chains.

As a secondary effect to the excessive queuing at the above mentioned terminals, the truck access to the port and rail yards faces a roadway capacity issue. There is blockage on lanes turning into the terminals, which leads to reduced lane capacity on Maritime Street near Ports of America Terminal and Middle Harbor Road near SSA Terminal.

The delays and service cut-offs at the port also result in dangerous operations and bad driver behavior. Drivers tend to speed both inside the port area and on port roadways, often cut the lines into the entry gate to marine terminals (see **Figure 2.2**), and take illegal U-turns and run stop signs on port roadways. Not all of the times, the bad driver behavior is associated with the delays inside Port Area, nevertheless such operations need to be discouraged from all vehicles and cargo safety consideration (see "local safety" discussion in this section. Speed humps are already placed on Middle Harbor Road to curtail driver speeds.

We found that the enforcement of truck violations and bad driver behavior in the case study is mainly the responsibility of the port police and the City of Oakland Police, however, both agencies have staffing limitations. The enforcement is done at sparse and irregular intervals. There is currently just one city police officer responsible for the entire West Oakland for truck violation enforcement, which may be highly insufficient. This results in sparse and irregular enforcement. There is a need to educate truck drivers about safety impacts of truck violations on the community, and encouraging good driving behavior.

Figure 2.2 Trucks Cutting the Line on Middle Harbor Road near the SSA Terminal Entry Gate

Source: Port of Oakland Site Visit on October 1, 2014.

2.2.3 Port related Overnight Parking Facilities Issues

The port hours are from 8 am to 5 pm on weekdays. The last chance to join the entry queue is around 4:30 pm, and trucks arriving after this are not served by the marine terminal operator. Truckers do not always reach the Port before the service cut-off for the day. The trucks arriving late, ideally should be parked in an overnight parking facility provided by the port or other legal parking areas. The Port of Oakland has an overnight parking facility and the Oakland Global project will add additional truck parking acreage, however many trucks park on the median of the port roadways (see **Figure 2.3**) in order to maintain their position in the queue the next working day. These trucks are not idling, so their cargo does not likely require temperature-control. Although the roadways providing access to the port are not heavily used (mostly trucks accessing the rail yards, and few autos and bikes accessing the marine terminals, rail yards and Middle Harbor Shoreline Park) in the late hours and night time, this potentially adds risk and liability cost related to theft to beneficial cargo owners (BCOs) and the LMCs, and therefore should be avoided. This indicates the lack of effectiveness of port related overnight parking facilities. Potential solutions for guaranteeing queue position for the next morning should be explored in order to encourage operators to use the provided overnight truck parking facilities rather than queuing in the median overnight. Perhaps numbers could be issued to trucks arriving after hours, with these numbers referencing marked spaces in the queue to move into the next morning before opening hours.

Figure 2.3 Trucks Standing on Median of Middle Harbor Road in After Hours of Port Service

Source: Port of Oakland Site Visit on October 1, 2014.

2.2.4 Local Roadways Conflicts of Freight Planning with Planning for Other Modes Issue

Although not comprehensively studied in this case study, a particular example is cited to illustrate the issue. On Adeline Street, north of Grand Avenue, local businesses have pickups / deliveries handled by trucks parked curbside. With the implementation of bike routes planned for West Oakland, the general purpose lanes are expected to have reduced lane width to accommodate a bike path. Further, the shoulder width will be reduced, making it difficult for trucks to park without blocking the bike path. The businesses at this location have expressed concern over the future pickup/delivery activities. There are likely similar examples on other parts of the case study area.

2.2.5 Local Roadways Pavement Condition and Markings Issues

City of Oakland's three-year average street Pavement Condition Index (PCI) is currently 60 (on a 100-point scale) and falling. Oakland's pavement condition is ranked 98th among 109 Bay Area jurisdictions, while the Bay Area average is 66. Oakland's streets are currently on an 85-year paving cycle instead of the 25-30 year industry-preferred cycle. Oakland's current backlog of street repairs is $443 million and growing.[23] In this situation, there is a need to identify truck

[23] http://www2.oaklandnet.com/Government/o/PWA/index.htm (last accessed on January 27, 2015)

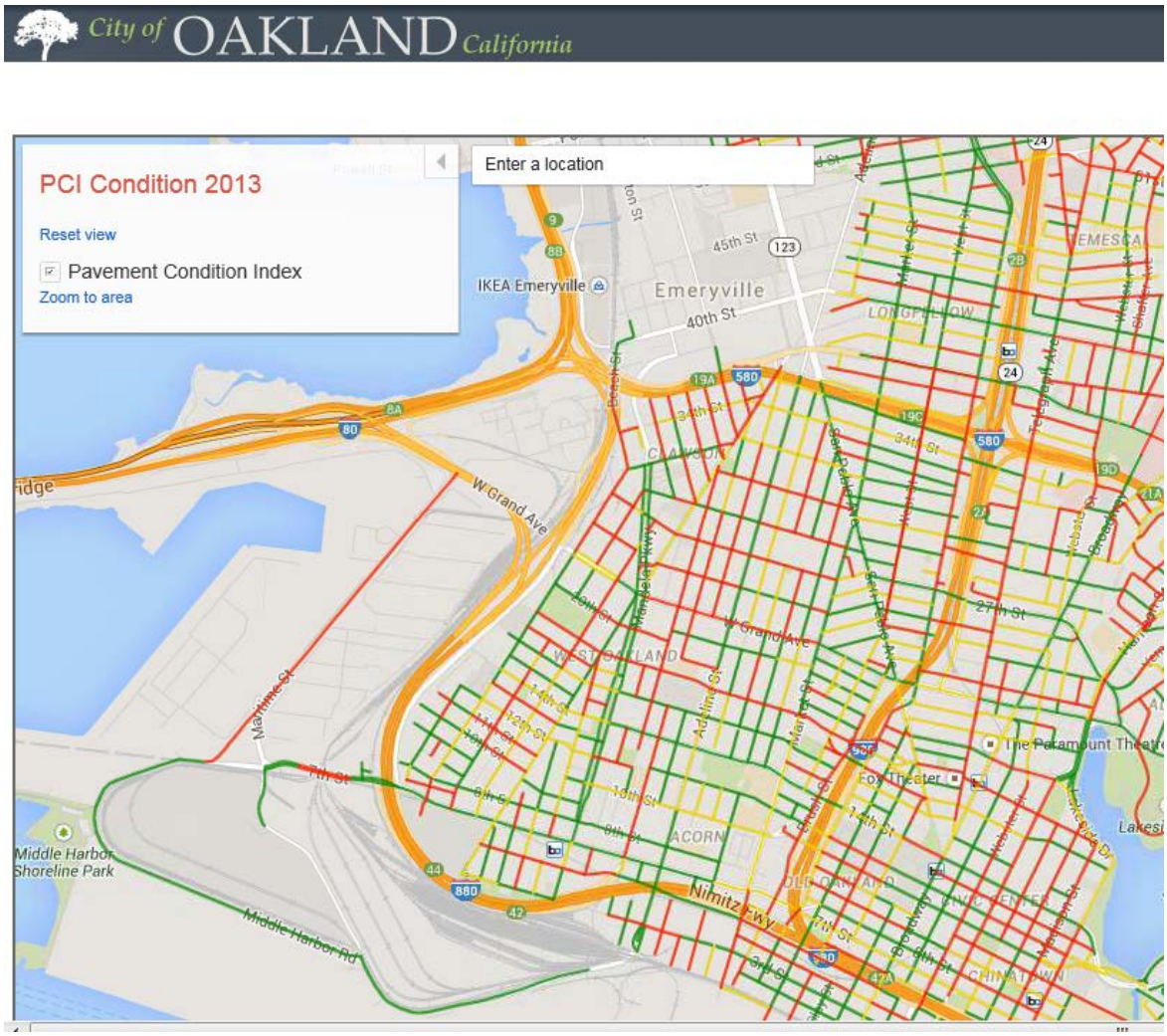
routes that provide access to a majority of goods movement related businesses, and strengthen them for increasing their life span.

Pavement strength is critical to good quality truck access. When designated truck routes are not built with appropriate truck load as design load or truck-intensive use (or number of repetitions) this can lead to early surface failures, such as cracking, rutting, potholes and roughness. Poorly maintained roadways can result in additional wear and tear costs to all vehicles, damage to shipments, noise impacts to neighborhoods, etc.

Figure 2.4 shows the 2013 pavement condition in the case study area. Pavement Condition Index (PCI) is a numerical index between 0 and 100 which is used to indicate the general condition of a pavement. PCI is determined by a manual inspection process, done on site by professional pavement inspectors. Inspectors score a section of roadway by conducting a detailed examination of pavement features such as the surface failures. The map shows very poor / poor pavement condition (PCI values < 50) in red, fair / good pavement condition (50≤ PCI < 70) in yellow and very good / excellent pavement condition (PCI ≥ 70) in green. Pavement conditions change with time, and pavement overlays could have been completed for some of the roads shown in the map. Looking at some of the key truck access roads, we notice that Maritime Street north of 7th Street and 7th Street underpass have poor pavement condition. The pavement condition on West Grand Avenue is poor east of Mandela Parkway and fair / good west of Mandela Parkway. A majority of the streets around the Grand Avenue and Mandela Parkway intersection, which has the most number of truck-intensive businesses has poor pavement condition. 3rd Street between Adeline Street and Market Street too has poor pavement condition.

In addition to pavement condition, pavement markings on certain streets were not visible on some streets. **Figure 2.5** shows some locations of poor pavement condition and markings in the case study area.

Figure 2.4 Pavement Condition Index (PCI) on City Roadways in the Case Study Area, 2013



Source: City of Oakland PCI Web Tool, Available at: http://www2.oaklandnet.com/Map/PCI/index.htm, last accessed on January 27, 2015.

Note: The graph shows the raw data from the original survey dates without any adjustments. The map shows very poor / poor pavement condition (PCI values < 50) in red, fair / good pavement condition (50≤ PCI < 70) in yellow and very good / excellent pavement condition (PCI ≥ 70) in green.

Figure 2.5 Poor Pavement Condition and Markings at Various Locations in the Case Study Area

Source: Port of Oakland Site Visit on October 1, 2014.

2.2.6 Local Signage, Traffic Signal and Enforcement Issues

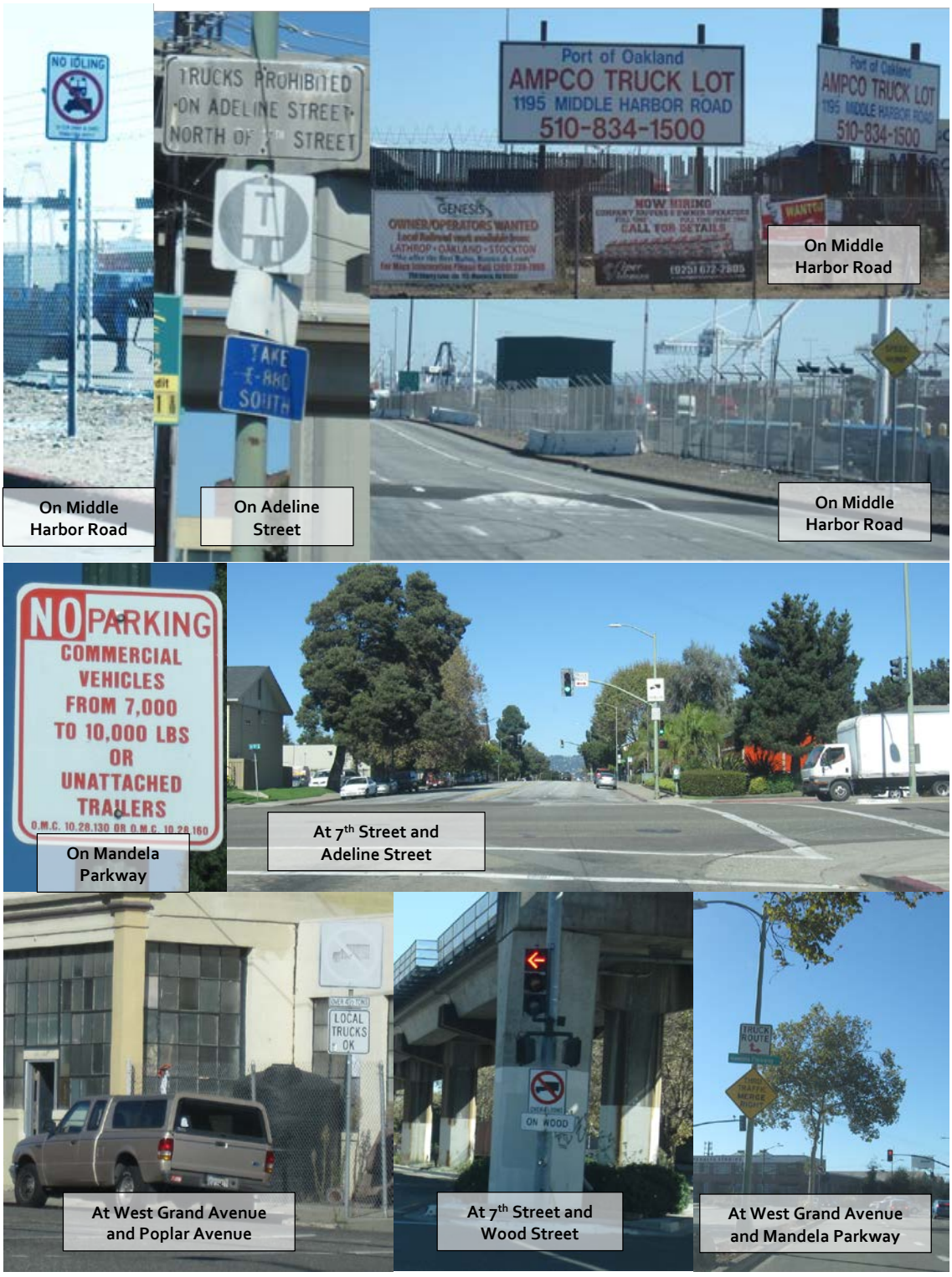
Truck routes and truck prohibition routes information for the case study area in a map format is available for download at the Port's website as "West Oakland Truck Routes Brochure," other information signage including idling regulation, weight limits, and parking location and restriction, are also posted on the local streets (see **Figure 2.6**). Some of these signs need to be replaced as the information is faded and difficult to read. A detailed inventory of the signage by condition was not conducted in this case study.

A detailed inventory of the traffic signals and their timing plans was not conducted in this case study. So, the issues such as signal visibility, adequacy of clearance times for trucks, adequacy of turning radius for trucks, etc. were not determined. However, a safety issue at one of the signalized intersections is studied as listed under "local safety issues".

A detailed identification of the typical traffic violation locations was not conducted in this case study. So, the issues such as specific truck parking needs, turn movement needs, etc. were not determined. However, as shown in **Figure 2.7**, at some of the locations in the case study area

illegal or "non-conventional" parking, stopping and turns were noticed during the site visit. As mentioned under "efficiencies inside port area and related issues" the enforcement is irregular and highly insufficient. There is a need for better enforcement.

Figure 2.6 Truck Traffic Information related Signage in the Case Study Area



Source: Port of Oakland Site Visit on October 1, 2014.

Figure 2.7 Illegal or "Non-Conventional" Parking, Stopping and Turns in the Case Study Area

Source: Port of Oakland Site Visit on October 1, 2014.

2.2.7 Local Safety Issues

The railroad operators have to ensure that maintenance of way on yard and lead tracks in the case study area are being carried out to appropriate Federal Railroad Administration (FRA) track standards to avoid derailments or track failure.

Truck-involved daytime crash information for the case study area over a 5-year period from Jan 1, 2008 to Dec 31, 2012 was visualized as shown in **Figure 2.17** based on Berkeley's TIMS tool which

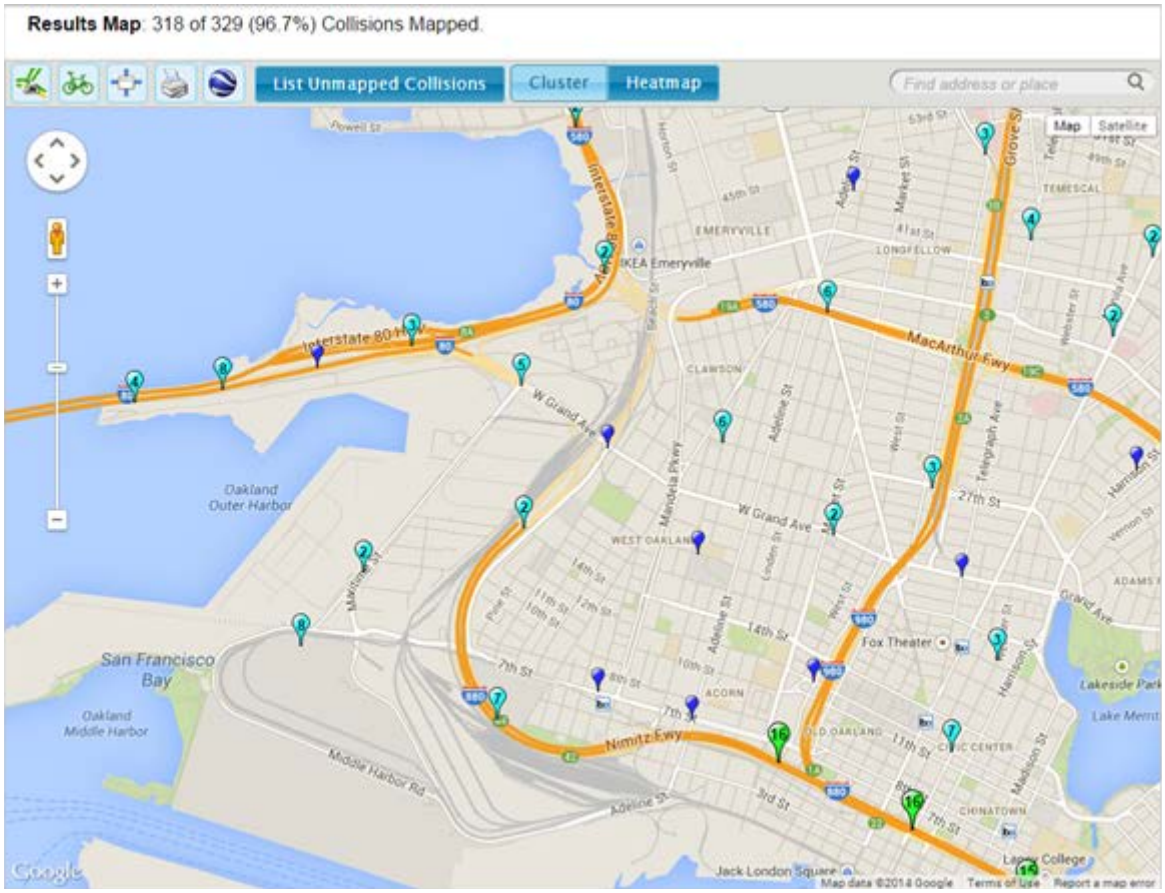
in turn is based on SWITRS data for highways and City streets. No truck involved crashes were noticed in the truck prohibition routes in West Oakland. Truck-involved crashes were noticed as follows: a) between 25 and 30 of them along I-880 very near I-980 in both directions taken together; b) 12 along I-80 on the approach to Bay Bridge Toll Plaza; c) 8 at 7th and Maritime Street intersection; and d) 5 at W Grand Ave/Maritime Street intersection and ramps to I-880. These are hot spots that are of importance to the case study area. Other clusters are distributed among multiple streets and not likely indicating a particular problem with a particular street/intersection/ramp/highway, e.g., I-580 cluster between I-980 and I-80 of 6 crashes include 3 on I-580, 2 on Adeline St and 1 on 35th St, so average crashes per year would be less than 1.

Considering the intersection of 7th Street and Maritime Street (see **Figure 2.8**) there are multiple issues. First, it was noticed that this location is compounded by a nearby at-grade rail crossing and reduced visibility for the trucks approaching from the south leg due to columns of an elevated structure for BART train service. Trucks and autos try to outrun a slow moving train to either move in to the storage area between the at-grade crossing and traffic signal, or sometimes even clear the intersection. Second, the westbound movements on 7th Street that need to turn into Ports of America and TraPac terminal entry gates that are located west of the intersection start forming a line on the right lane prior to the intersection. The trucks on the right lane block two movements, the westbound right turning traffic as well as southbound right turning traffic. The signal clearance times are longer than expected, and there are safety hazards in cutting the right lane. Third, the north leg of Maritime Street is split into two parts, the western part (alongside the U.S. Customs and Border Protection office) meets 7th Street intersection at a highly skewed angle, the visibility for trucks turning both eastwards and westwards onto 7th Street have limited visibility, due to the skew angle and line formed in the right lane of 7th Street.

There are likely other intersection safety issues in the case study area that are not determined in this case study.

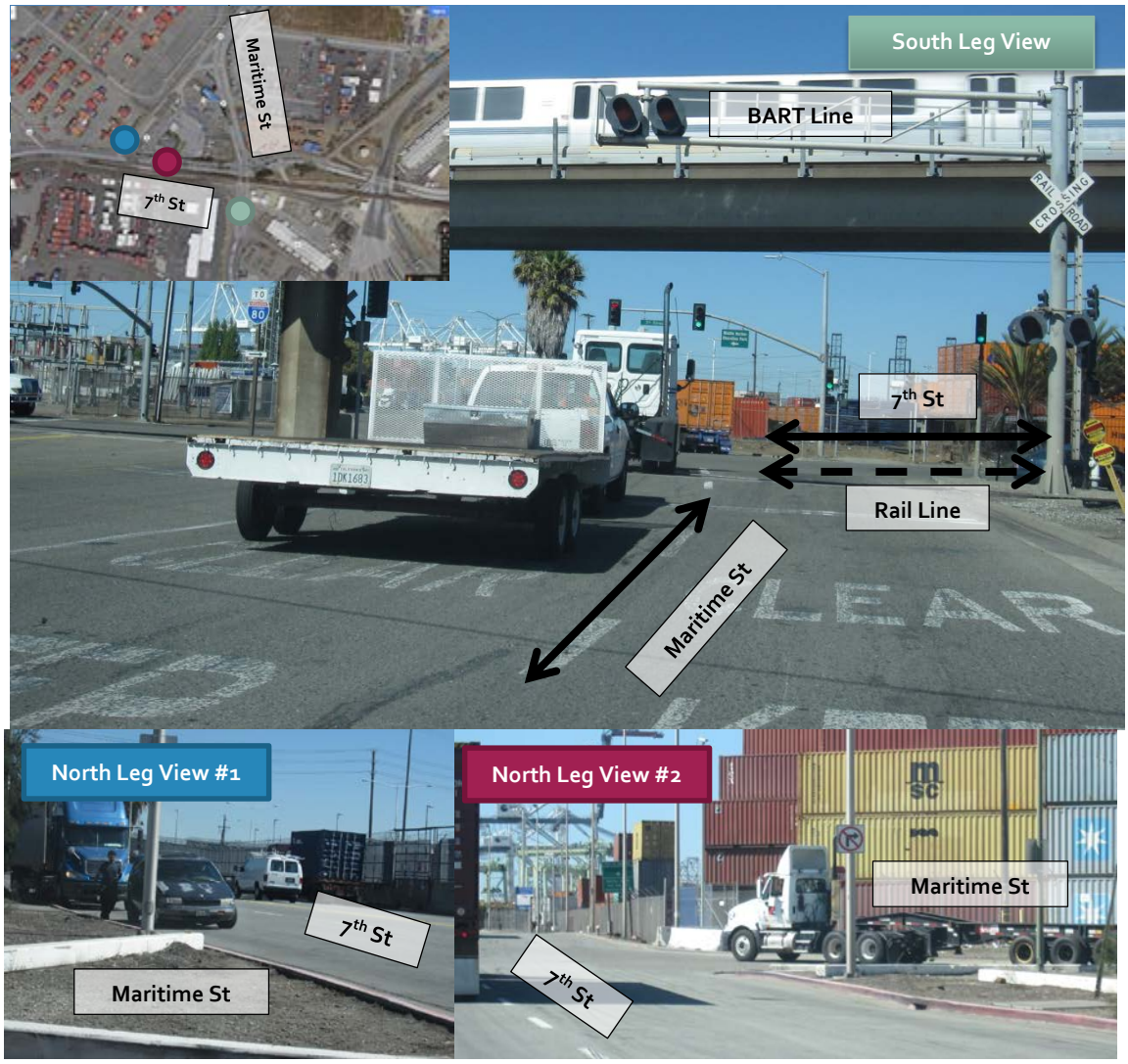
An additional safety issue was noted in terms of conflict between bike path and truck movements. 3rd Street between Adeline Street and Market Street is heavily used by trucks (see **Figure 2.9**), and has curb side parking to serve businesses. The conflicts form a potential safety hazard. An alternate route to the bike path between Adeline Street and Market Street can help eliminate the safety hazard.

Figure 2.8 Truck involved Daytime Crashes in the Case Study Area, Jan 1, 2008 to Dec 31, 2012



Source: University of California at Berkeley, Transportation Injury Mapping System, available at: http://tims.berkeley.edu/login.php?next=/tools/gismap/index.php (last accessed on January 27, 2015)

Figure 2.9 Maritime Street and 7th Street Intersection views – Potential safety issues



Source: Port of Oakland Site Visit on October 1, 2014.

Figure 2.10 3rd Street between Adeline Street and Market Street – Potential safety conflicts

Source: Port of Oakland Site Visit on October 1, 2014.

2.3 Summary of Issues and Suggested Potential Solutions

Table 2.2 below summarizes the issues discussed in this section and provides potential solutions to address the issues. Details of the solutions and their effectiveness are discussed in subsequent project memos.

Table 2.1 Summary of Issues and Solutions

Topic	Issues	Solutions
Air Quality and Public Health	Contribution to larger air quality and public health issues in West Oakland from truck, rail and port activities	• Clean Truck Policy and Program Collaboration that provides incentives to encourage adoption of clean truck technologies • Freight Corridors Community Enhancement and Impact Mitigation Initiative to fund impact mitigation in West Oakland neighborhoods*** • An Initial Demonstration Followed by Targeted Incentives to Promote Adoption of Zero And Near-Zero Emissions Truck Technology for Port Drayage • Targeted Programs to Encourage Use of Zero-Emission Trucks and Cargo Handling Equipment Particularly in the I-80, I-880, and I-580 Corridors • Near-Zero and Zero-Emission Goods Movement Technology Advancement Program • Rail and Terminal Emission Reduction Program • Clean Truck Policy and Program Collaborative (Joint Working Group with Regulatory Agencies, Freight Industry Representatives, and Public Agencies)
Operational Inefficiency	Excessive Queuing outside Port Gates area, traffic backup on I-880 and excessive congestion on port access roads	• Strategies to improve port operations including night gates • Port of Oakland ITS projects that will include FRATIS demonstration • ITS Improvements to Address Queuing at Interchanges along I-880 and on Local Streets to Port Of Oakland
Ineffective overnight truck parking facilities	Inappropriate parking, using roadway medians overnight to maintain queueing position for next day rather than provided parking facilities, potential for theft, conflict with other modes, additional light and noise pollution and additional fuel wastage and air pollution	• Army Base Redevelopment Project that will include additional parking. • Truck services at Oakland Army Base assessment after Phase I truck services at the Army Base has been implemented • Issue queuing numbers pegged to marked spaces in the queuing area to trucks arriving after hours so they can guarantee their position for the next morning before driving on to the provided overnight parking facilities.
Conflict with other modes	Reduced path for trucks due to Bike Planning	• Programs and policy guidance and funding program for implementation of truck route management, trucking parking, , as well as for complete streets initiatives that would provide standards for separation of uses

Pavement Conditions	Poor pavement conditions on Maritime and 7th Street, as well as other access roads to the port	• 7th Street grade crossing separation • Middle Harbor Road Improvements
Signage	Poor truck route signage causing illegal parking or routing choices exacerbated by poor enforcement.	• Freight signage guidance program
Safety	At-grade crossings at 7th street pose significant safety issue for trucks and autos and also with bikes.	• 7th Street grade crossing separation

3.0 INTERNATIONAL BOULEVARD/E 14TH STREET

3.1 General Background and Issues

This case study focuses on the International Boulevard corridor through the cities of Oakland and San Leandro. The Alameda Contra Costa Transit (AC Transit) and the respective cities plan to implement bus rapid transit (BRT) in a dedicated right-of-way along the corridor that will take general traffic lanes out of use by trucks and other vehicles. With the planned BRT project and the existing opportunities for regional transit access via Fruitvale and San Leandro BART stations, International Boulevard is intended to become a transit-oriented land use and transportation corridor. The BRT project will also make accommodations for pedestrians and bicyclists that will constrain certain areas presently available for truck circulation and parking. Engineering plans are under development for the reconstruction of the corridor for high quality Bus Rapid Transit service and pedestrian and cyclist comfort and convenience. In view of the challenges associated with accommodating goods movement along with all of the other modal priorities, International Boulevard was selected as a case study location by ACTC staff and the goods movement study team. This case study includes a review of goods movement issues through the corridor, particularly those associated with the BRT project, and measures to address those issues. It highlights those issues that are representative of and transferable to similar situations elsewhere in the county.

International Blvd is a mixed use corridor, including industrial and warehousing as well as high density housing and commercial areas. All modes of transportation are required to support local communities and businesses. Multimodal transportation facilities for walking, biking, transit and goods movement present challenges for creating safe and effective facilities for pedestrians, bicycles, buses and automobiles while retaining capacity for trucks and goods delivery. Many challenges include conflicting goals in use of the right of way (ROW) such as street width, parking

and other cross-section elements, intersection design, lane configurations, and signal priorities. Concerns from the community vary and include issues related to:

- **Businesses**: Effective truck movements along corridor, available parking for goods loading and delivery, roadway design suited for truck movements, and safe and convenient customer access.
- **Transit Access**: Optimizing access to the new bus rapid transit as well as existing AC Transit bus routes.
- **Bike and pedestrian safety**: Improving bike and pedestrian safety, both for access to transit and local businesses as well as through travel.

3.1.1 Background

This case study focuses on truck and goods movement aspects of a six mile segment of the International Boulevard BRT project, from downtown Oakland to downtown San Leandro. As shown in **Figure 3.1**, the study corridor connects Oakland from International Boulevard at 1st Avenue, at the southern edge of Lake Merritt to downtown San Leandro near Davis Street (SR-121/61).

This corridor is one of the most disadvantaged areas in the region and is a designated community of concern for investment of multimodal infrastructure as well as affordable housing resources and economic development. It passes through the some of the lowest income census tracts in the Bay Area. In fact, the census tract adjacent to the Coliseum BART station is the poorest tract in all of Alameda County. East Oakland is also the highest crime area in all of Alameda County, with murder rates highest on the eastern end of the corridor, while the central and western sections of the corridor experience the highest rates of street prostitution in Alameda County. Since the 2010 Census, the western end of the corridor has seen an increase of higher-income households, displacing long-tenured low-income households farther east or out of the corridor altogether.

As a multimodal corridor, International Boulevard provides access to the Fruitvale and San Leandro BART stations, and accommodates several AC Transit bus lines as well as providing for pedestrian circulation and general traffic and goods movement. International Boulevard is AC Transit's highest ridership corridor, with several of the busiest AC Transit bus stops, currently serving 24,000 daily boardings on lines 1 and 1R, the second and third busiest routes. Line 1R, a rapid bus line, operates with signal priority along International and line 801 operates overnight service. The planned BRT line will operate alongside existing bus service on the corridor.

Land use along the corridor is majority commercial (38 percent), followed by 35 percent residential, 17 percent institutional and 10 percent industrial land uses. ABAG and MTC 2040

forecasts estimate an additional 4,500 residential units and 6,700 jobs along the corridor. Pedestrian circulation is vital to the commercial businesses along the corridor, particularly north of 55th Avenue and south of 73rd Avenue/Hegenberger Expressway, where the surrounding land use is predominantly residential. Pedestrian circulation includes locally generated pedestrian activity as well as pedestrians arriving by transit and vehicular access. Parking along the corridor includes approximately 1,500 stalls, mainly unmetered, of which 5 percent are designated for persons with disabilities. Overall parking occupancy is highest from 4 p.m. to 8 p.m., when retail and commercial activity is high.

The BRT project includes extensive bus, pedestrian, bicycle and parking improvements to the corridor. The project planning and design process is also making critical modifications to accommodate goods movement and deliveries to corridor businesses. Historically, International Boulevard has provided sufficient capacity for truck and vehicular traffic, as well as bus service. Traffic volumes recorded in 2012 show daily volumes are approximately 22,000 to 25,000 vehicles per day, with truck proportions of overall daily traffic ranging from 2 percent south of 44th Avenue and up to 8 percent north 42nd Avenue.

Constructing BRT facilities includes the conversion of traffic lanes to dedicated BRT lanes, reducing the width available for general traffic and trucks. It also adds passenger amenities such as lighting, information kiosks, seating areas, and transit signal prioritization, resulting in the loss of some curbside parking. BRT will be implemented in three different configurations:

- Mixed-flow bus lanes and curbside stations on International Boulevard (northbound) and East 12th Street (southbound) from 1st Avenue to 12th Avenue in Oakland. This configuration will remove one of the four travel lanes and convert one lane into a shared bus/mixed-flow lane.

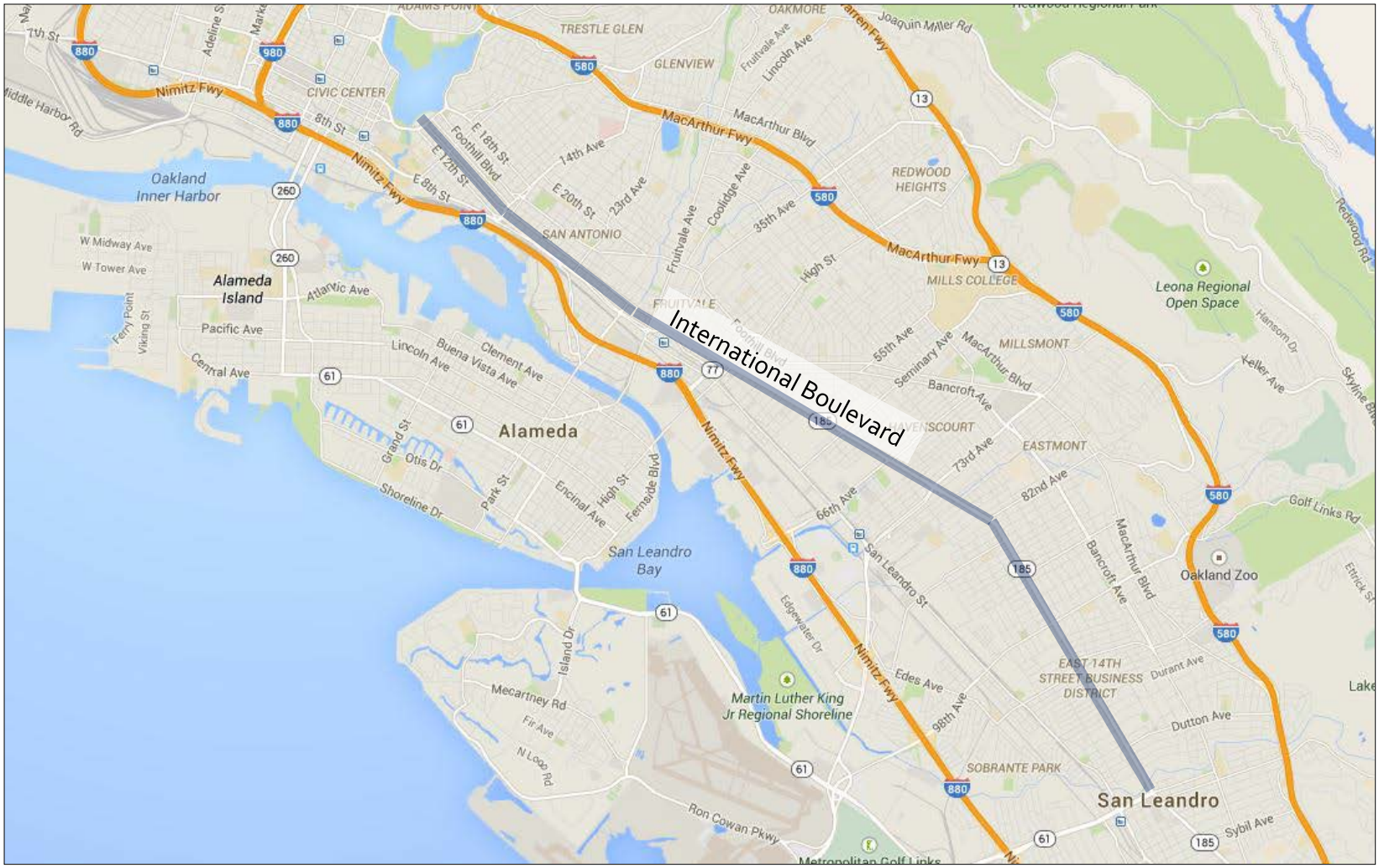
- Mixed-flow bus lanes and curbside stations on International Boulevard (northbound) and East 12th Street (southbound) between 12th Avenue and 14th Avenue. On International Boulevard, one southbound lane will be removed and two lanes in both directions will be converted to a shared BRT/mixed flow traffic lane. On East 12th Street, one southbound lane will be converted into a shared bus/mixed flow lane.

- Median dedicated bus lanes and stations from 12th Avenue through Davis Street (SR-61/112) in San Leandro. This will remove two of the four lanes presently available for traffic and truck movement along International.

A related objective is to promote 12th and San Leandro streets located to the west of International Boulevard as a more effective route for trucks with similar connectivity to local and regional truck routes. This objective is achieved by adding signage directing trucks to the alternate route and making improvements to transitions and roadway geometry to accommodate truck movements.

This case study highlights how the planning and design of the International BRT project is addressing conflicts between its multimodal goals and the needs for effective goods movement and deliveries along the corridor.

Figure 3.1 International Boulevard Truck Routes Case Study Corridor



Map data ©2012 Google, Sanborn

3.1.2 Role of Goods Movement in the Corridor

Commercial businesses constitute the largest land use along the corridor, which also passes through residential and industrial areas. The primary function of goods movement along the corridor is to serve local commercial and industrial facilities on the corridor. As measured in 2012 by Caltrans, truck traffic between 44th/High Street and the San Leandro Border averages 80 percent single unit trucks and 13 percent four-axle trucks. The vast majority are small trucks delivering consumer goods to retail, services, and office facilities, utilizing International Boulevard primarily to reach corridor businesses and secondarily as a throughway to connect to other major arterials. International Boulevard runs parallel to I-880 to the west, a major truck route carrying the highest volume of truck traffic in the Bay Area. To the east is I-580, which carries the second-highest volume of truck traffic in the region. Most through truck traffic uses those freeways and avoids International Boulevard.

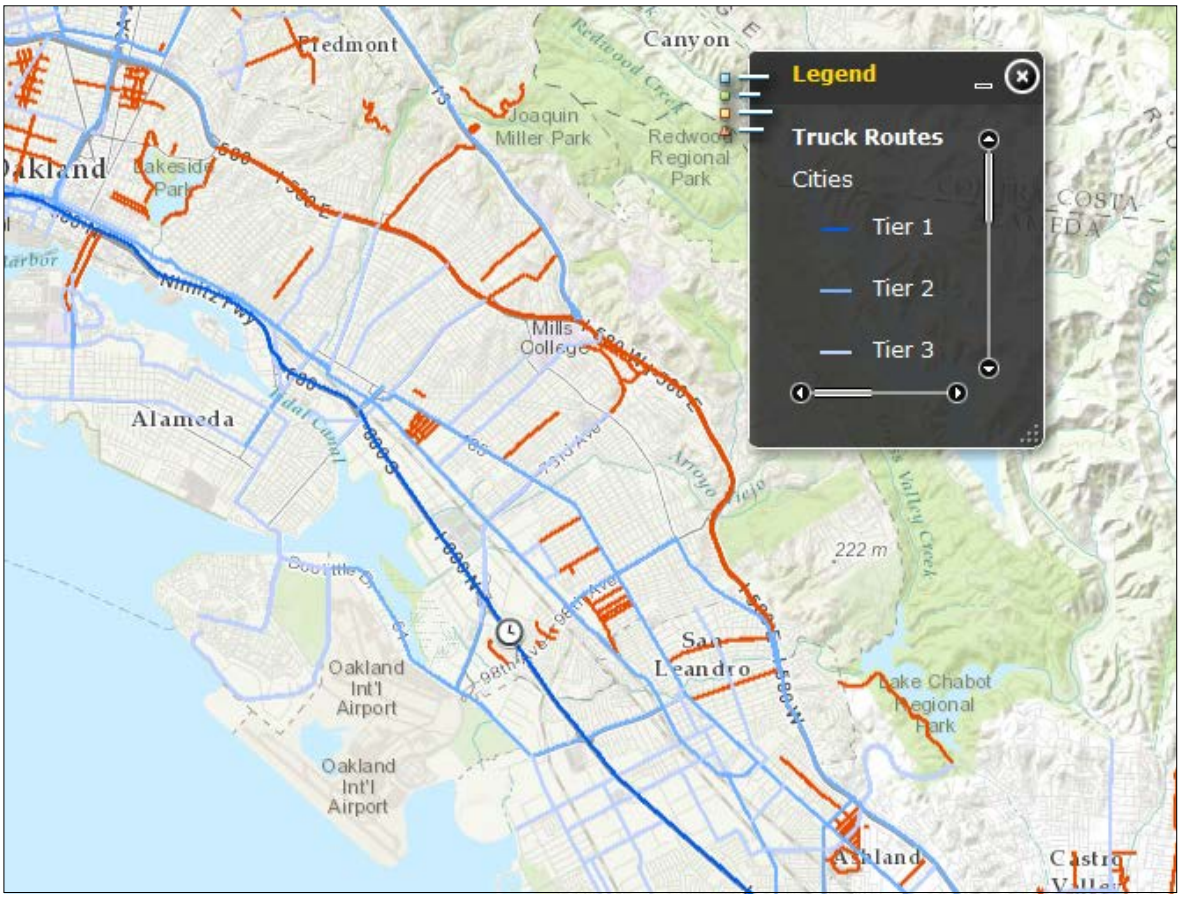
Figure 3.2 illustrates the parallel and intersecting truck routes. North of High Street, International Boulevard is not a designated truck route but allows truck traffic. South of High Street, the corridor becomes a designated state truck route (Tier 2 and medium blue in the figure). San Leandro Street, located west of the corridor, designated a city truck route (also Tier 2), can act as a complimentary route.

Truck Route System

- Tier 1 truck routes refer to state highways that are designated to handle a majority of the through truck traffic. (Dark blue in Figure 3.2)
- Tier 2 truck routes refer to other state highways and designated arterials that provide intra-county and intercity connectivity and last-mile connection. (Medium blue in Figure 3.2)
- Tier 3 truck routes refer to designated arterials and collectors that are used for a majority of local pickups and deliveries. (Light blue in Figure 3.2)

In addition, there are restricted routes (orange in Figure 3.2) in many of the cities. The routes may be subject to weight, length, or commodity restriction. Some routes, such as I-580 in Oakland, may be Tier 1 while also having certain restrictions.

Figure 3.2 Designated Truck Routes surrounding International Blvd



3.1.3 Relevance to other areas

The nature of these issues is common to other communities with similar, or even lesser, amounts of goods movement related truck activity. International Boulevard is an example of a commercial corridor with goods movement needs that is also an important multimodal corridor. A trend towards emphasis on transit efficiency, transit oriented development and multimodal Complete Streets along commercial corridors will result in conflicts with goods movement needs. The issues and proposed solutions defined in this case study can provide guidance to communities seeking to balance the needs of a commercial corridor with other multimodal objectives.

3.2 Specific Issues

Specific issues that arise with respect to truck activity along International Boulevard in Alameda County include:

- **Degraded operating conditions for trucks** as street cross-sections and intersection configurations and control are redesigned to improve accommodations for transit, pedestrians and cyclists along the corridor

- **Disruption of truck access and deliveries** for corridor businesses as curbside loading zones are reduced and relocated
- **Maintenance of access capacity** for major truck traffic generators
- **Inefficient flow of goods through the area** with compromised routing options for local and regional connectivity.

Transitioning a commercial corridor into a transit oriented corridor creates specific conflicts for the business community and for the efficient movement of goods. For the business community, the main concern is to maintain goods access to businesses with nearby loading and unloading zones. Construction of center-lane bus stop platforms and new pedestrian bulb outs results in reduced street widths, traffic capacity and speeds and reduced parking and loading zones. These concerns need to be taken into account when reconfiguring the corridor to include capacity for commercial and non-commercial parking.

Design consideration needs to be given to truck movements, such as lane width, turning radii, and reasonable access to important roadways. These issues arise as the corridor replaces two travel lanes with a center-running bus lane, center islands for bus stops, pedestrian bulb outs for safe crossings, and as the design restricts left-turn movements to avoid conflicts with buses. As a commercial corridor, International Boulevard represents an example of how coordinated planning for multiple modes can address these issues and create a safe and efficient roadway for all users.

The issues concerning maintenance of capacity include general capacity and number of lanes, as well as the needs of special facilities with high trucking demand. The reduced number of lanes in the corridor creates a demand for access to alternative routes for trucks. Capacity for trucks matters for warehouses and industrial facilities, as their trucking needs differ from consumer goods markets in terms of truck size and frequencies. These facilities would benefit from access to alternative routes, reducing the dependency on International Boulevard. Factors such as weight limits, route continuity, and truck maneuverability impact the ability for alternative trucking routes to support International Boulevard.

3.3 Potential Solutions and Strategies

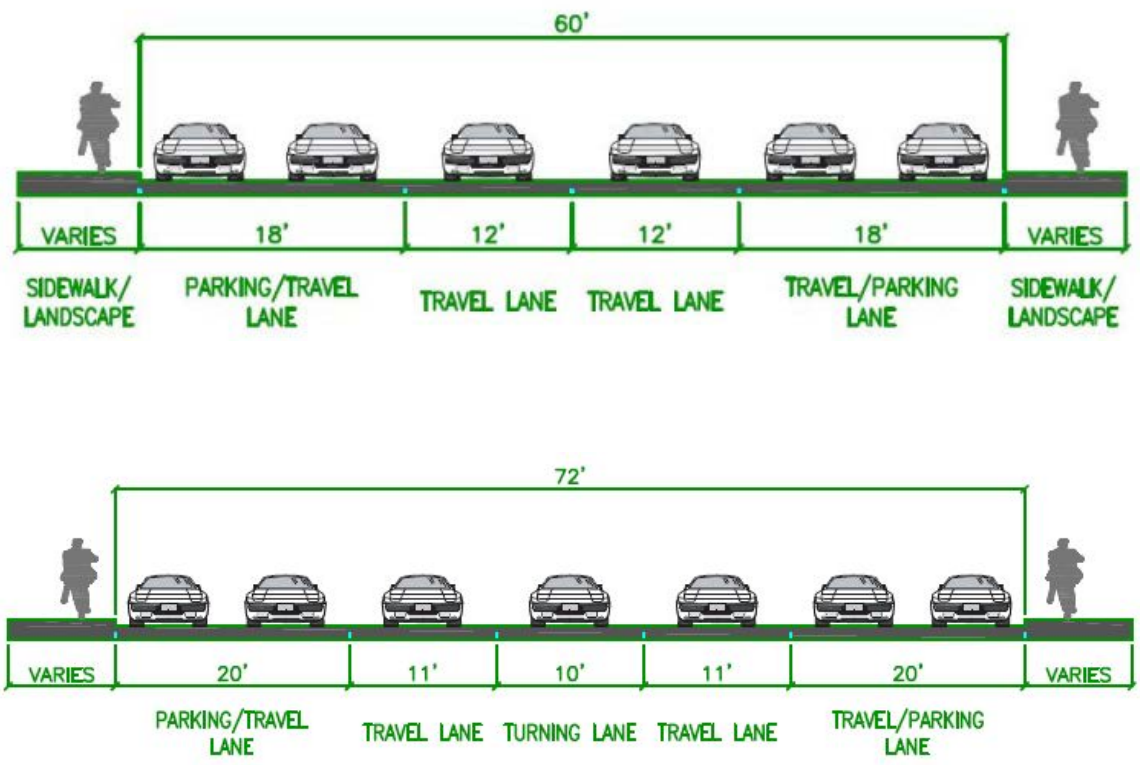
The issues described above will affect similar efforts by other cities as they attempt to create multimodal streets in downtown areas and transit corridors and to implement context sensitive Complete Street designs along streets used by trucks. The following examples demonstrate how issues related to goods movement in multimodal corridors are addressed in the context of International Boulevard.

3.3.1 Street Cross-Section

Potential Issues for Goods Movement

International Boulevard is being reconfigured to accommodate BRT and a growing number of pedestrians. **Figure 3.**3 shows the different existing street cross-sections on International Blvd. The multimodal modifications include converting two of the existing four travel lanes to dedicated bus lanes in the majority of the corridor, eliminating or signal-controlling left-turns at most intersections, and adding center bus boarding islands. With BRT, the corridor will consist of two 11 feet travel lanes, two 11 feet bus-only lanes, bike lanes in some locations, and curbside parallel parking, shown in **Figure 3.4** (covers two pages). Speed limits will be reduced from 35 mph to 25 mph for enhanced pedestrian safety and traffic calming. Sidewalk bulb outs will be installed at intersections to improve pedestrian access to bus stops, restricting right-turn movements for trucks larger than 30 feet, illustrated in **Figure 3.5**.

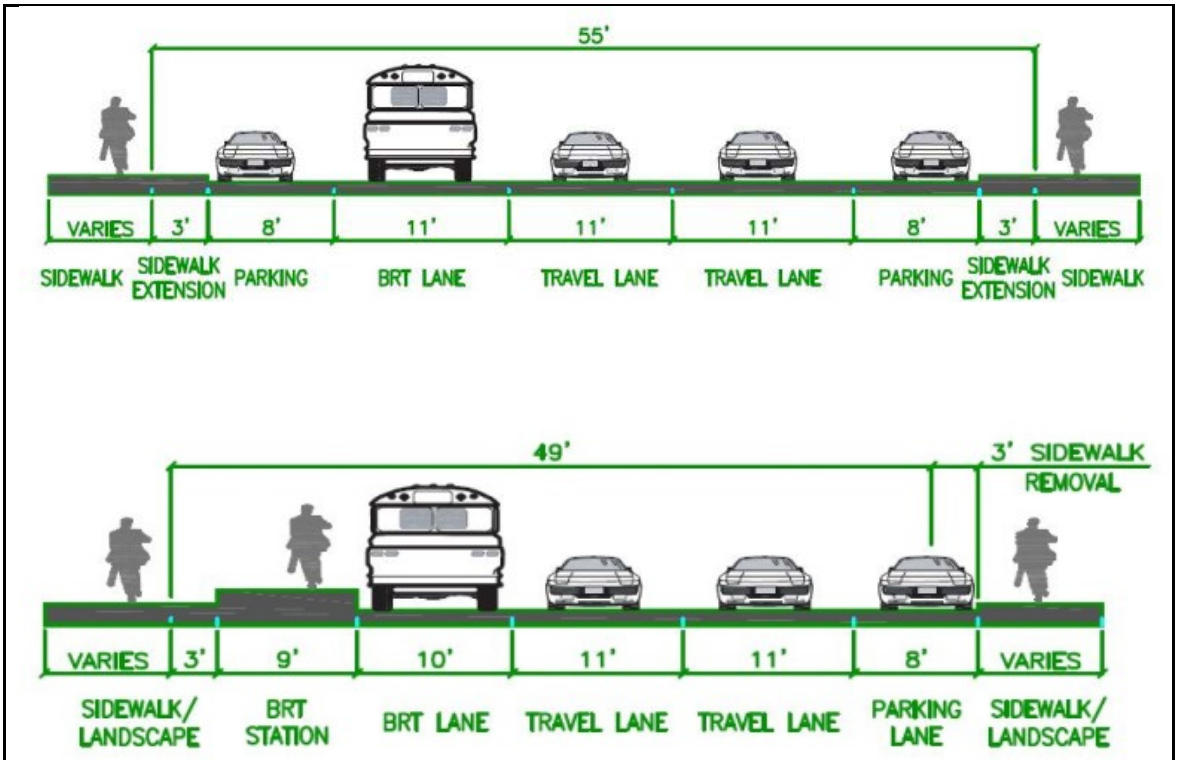
Figure 3.3 Existing Lane Cross-Sections

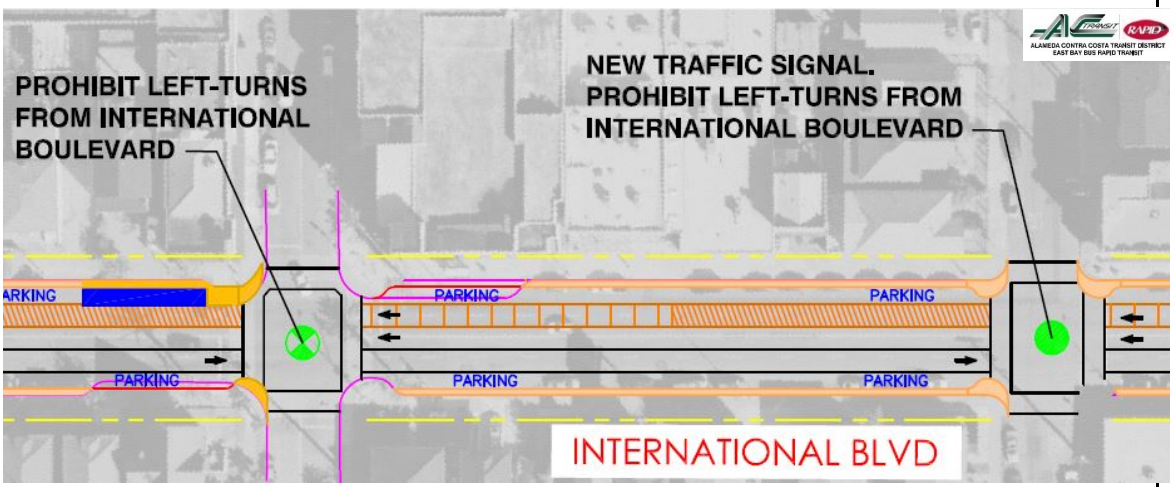


Four 12-ft Traffic Lanes and Shared 18-ft Curbside Travel and Parking Lane:

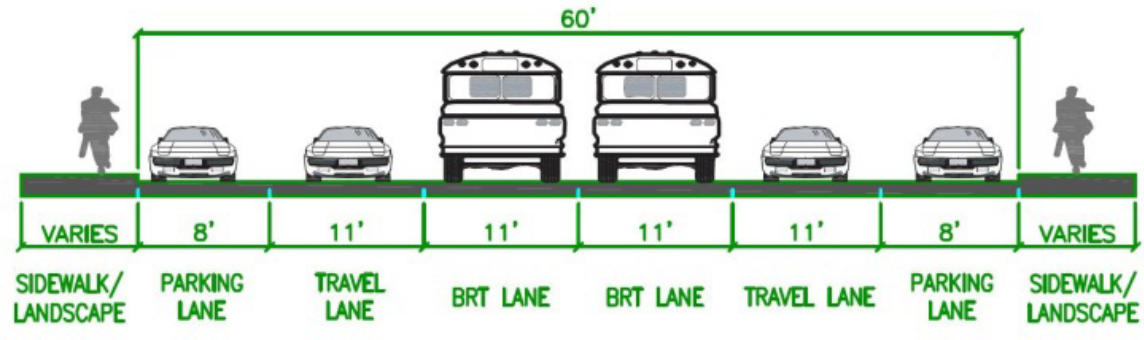
Midblock Design (top) and Intersection Design with 11-foot Turning Lane (bottom)

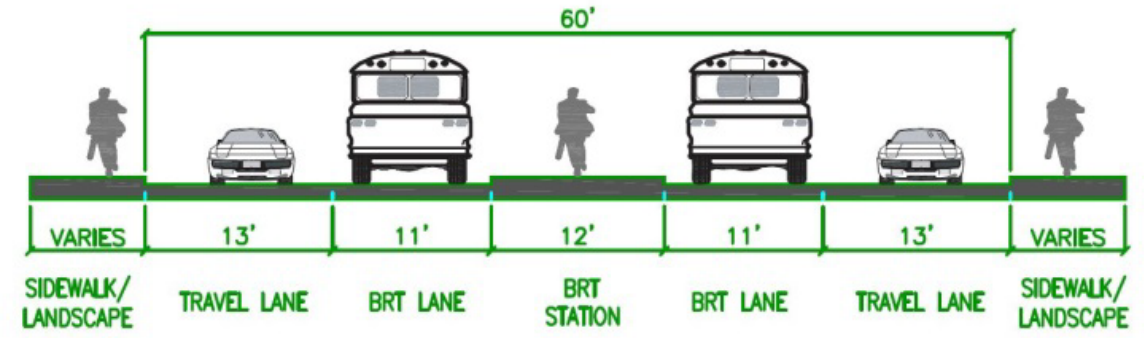
Figure 3.4 Lane Cross-Sections

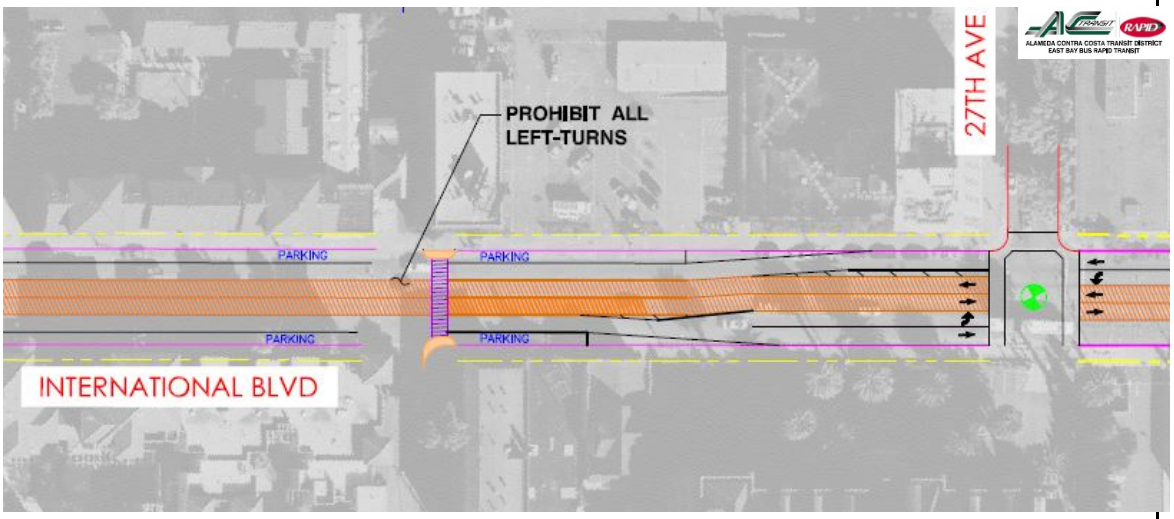




After BRT Conditions with Side Running BRT (orange) and Curbside Stations (blue) and Intersection Bulbouts







After BRT Conditions with Median Transitway with Protected Left Turn Lanes

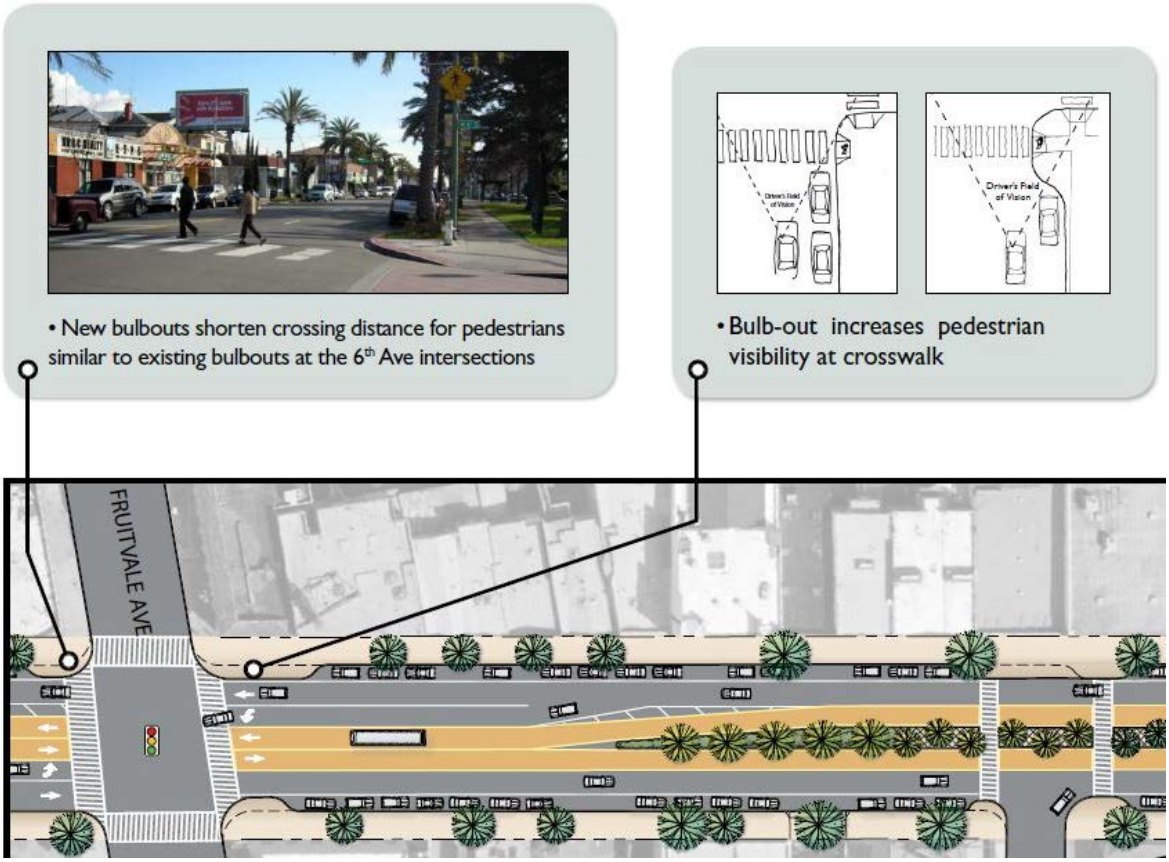
Mitigation

According to the 2012 Caltrans *Truck Traffic Census*, the vast majority of truck traffic along International is single unit trucks, which will be able to make turning maneuvers where bulb outs are constructed. Where bus stops are not present, larger trucks will make right-turn movements unimpeded. Left-turn movements will be limited to streets designed for larger trucks with protected left turn lanes and no bulb outs. Protected left-turns will be provided at the following intersections: 5th, 8th, 14th, 22nd, 27th, 29th (northbound only), Fruitvale Avenue, 35th, 38th (southbound only), 39th (northbound only), 42nd/High, 46th, 50th, 52nd, 57th, Seminary, 66th/Havenscourt, 69th, 73rd/Hegenberger, 78th, 81st, 82nd, 85th (northbound only), 90th (southbound only), 92nd (northbound only), 94th, 98th, 100th (northbound only), 104th (southbound only), 105th (southbound only), Bristol, and Durant. These left-turn-enabled intersections will be adequately spaced to provide regular opportunities for left turn access along the corridor and located to allow truck turns at all intersecting truck routes and streets accessing the parallel freeways.

The addition of a Class II bicycle path from 54th Avenue and San Leandro will create an additional demand on street cross section width, though it will increase the effective curb radius facilitating turning movements of large trucks. Along narrower segments, a potential mitigation will be to construct the pavement surface without a seam between street pavement and drainage gutters so that cyclists can comfortably and safely use the full width of the bicycle lane. Pedestrian bulb-outs designs will provide sufficient maneuvering room for single unit trucks of less than 40-foot length.

Another potential mitigation is the proposed East Bay Greenway, a Class I facility that will provide an alternate route to International Blvd and San Leandro St for bicyclists and pedestrians, decreasing conflicts with buses and trucks.

Figure 3.5 Proposed Pedestrian Bulb-out on International Boulevard and Fruitvale



3.3.2 Loading zones and parking

Potential Issues for Goods Movement

Along International Boulevard, the BRT project will reduce existing parking and modify truck loading zone location and design to accommodate pedestrian bulb outs, center boarding islands, and protected left turn lanes.

Mitigation

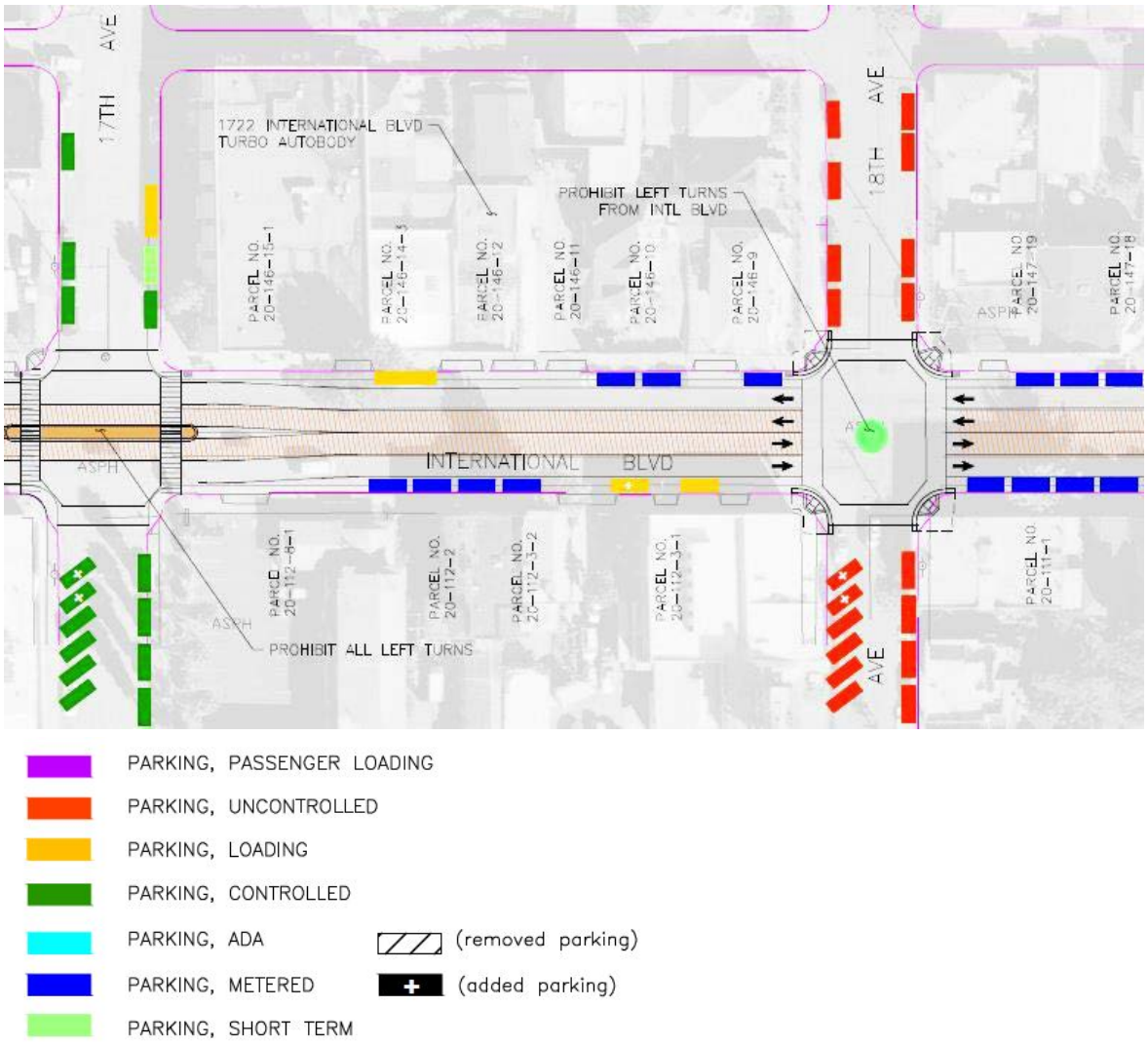
Truck access and deliveries are maintained at the near and far side of intersections, primarily through reducing the number of existing parking spaces. Far side loading zone lengths will be increased from the existing 15 feet to 40 feet with a 10-foot red zone between the crosswalk and the loading zone. Trucks using loading zones located at the far side of an intersection can utilize the intersection when maneuvering into the loading zone without impacting traffic flows in the lane. When the far side loading zone is preceded by a pedestrian bulb out, the zone is extended to 50 feet to aid maneuverability. Near side loading zones are 50 feet with 20 feet red curb

between the loading zone and the crosswalk, which provides enough space for a single-unit truck to back into the zone when needed.

New loading zones are to be placed on the same block as existing loading zones and as close to a 1:1 replacement as possible. When not possible, side street loading zones are designated to prevent double parking of trucks in travel lanes. Additionally, these elongated 40 and 50 feet loading zones will accommodate the needs of single panel trucks, which compose the majority of truck traffic along International Boulevard.

The lengthened loading zones along with the bulb outs and bus stop platforms would reduce curb parking for autos along International. Measures planned to mitigate this loss include adding spaces on the side streets and in the rear of International Boulevard-fronting businesses. **Figure 3.6** illustrates one example of modified curbside and side street parking. Commercial loading, shown in yellow, includes one side street location and three curbside parking locations. Non-commercial parking is provided on International Boulevard and on side streets, shown below in blue (metered), red (uncontrolled) and green (controlled).

Figure 3.6 Preliminary Parking Configuration with Median Transitway



Parking is added to replace customer parking lost on International, within 250 feet from the original location where possible and no more than 500 feet. In cases where the needed additional on-street parking cannot be provided within these distances, the project planning and design team intends to identify off-street parking sites in addition to installing angled parking on side streets to increase nearby parking availability (**Figure 3.6** above). Along segments where parking utilization is typically above 75 percent during the day, uncontrolled parking will be converted to controlled and metered parking to increase turnover and the number of business customers that can be accommodated in the reduced overall supply. **Table 3.1** summarizes the preliminary parking space replacement proposal associated with the International Boulevard BRT project.

Table 3.1 Preliminary Parking Replacement Inventory

	Existing	Added	Removed	Total
Uncontrolled	1,807	13	298	1,522
Controlled	655	126	237	544
Short-Term Controlled	22	1	10	13
Metered	499	61	138	422
Commercial Loading	39	1	10	30
Passenger Loading	31	0	5	26
ADA	15	1	3	13
Total	3,068	203	701	2,570

3.3.3 Access to major truck generators—Gatorade site example

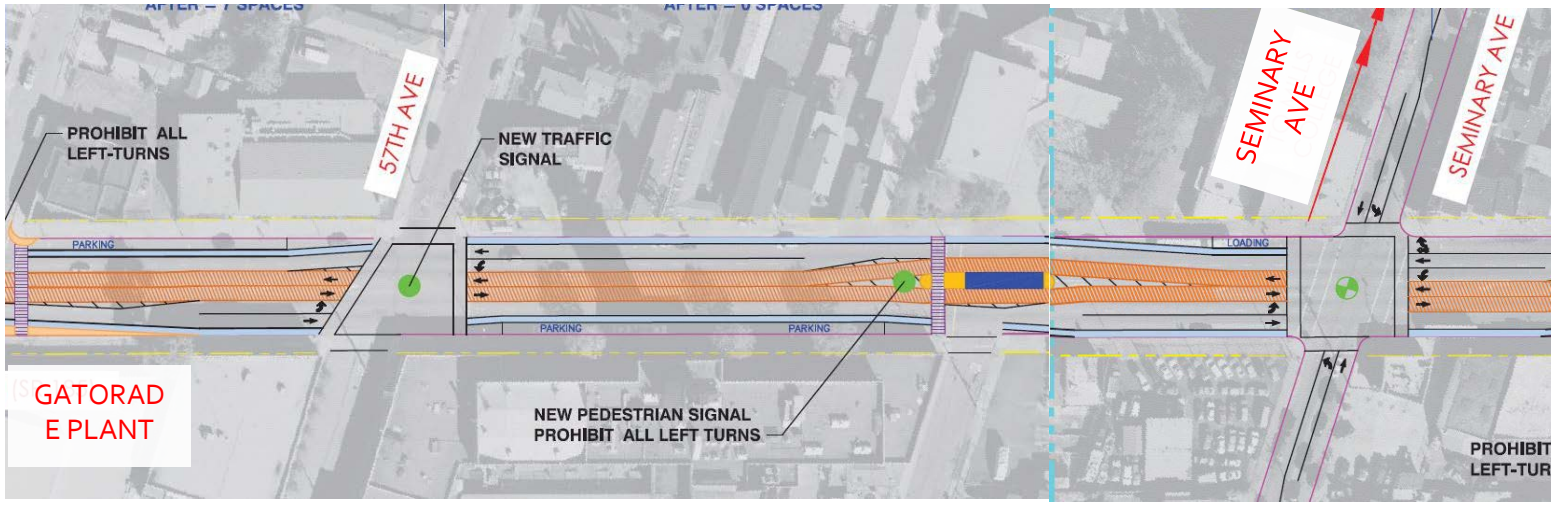
Potential Issues for Goods Movement

In addition to small businesses and mixed uses, land use along International Boulevard includes large parcels for warehousing and industrial uses. One such example is the Gatorade Plant located north of 57th Avenue. When Gatorade facility was operational, trucks used the median as temporary staging, including queueing in the northbound left turn lane at 57th and between the 57th and 58th intersections. Retaining the long left-turn pockets on International at 57th would reduce the length of the back-to-back left-turn lane for the adjacent Seminary Road, a higher volume intersection providing access to the Seminary Hills neighborhood in South Oakland. Increasing left-pocket length for truck staging would result in regular queuing and congestion at Seminary Road. San Leandro Street is not a viable alternative route for trucks to access 57th Avenue and the Gatorade Plant because of the railroad parallel to San Leandro Street (Oakland Subdivision). Even if a new 57th Avenue access was constructed across the railroad, conflicts between trains and trucks would cause more significant delays than conflicts on International.

Mitigation

To accommodate both truck and traffic needs a new traffic signal will be installed providing protected left-turn phasing on International for truck access to the Gatorade plant on 57th Avenue. This will allow trucks to clear the intersection faster rather than waiting long periods for gaps in traffic. Meanwhile, a mid-block left-turning lane on International for 58th Avenue will be removed. See these changes illustrated in **Figure 3.7** below. In cases where roadway capacity allows, parking will also be eliminated to provide space for a bike lane, thus accommodating plant access for trucks while prioritizing multimodal uses. Truck staging will be expected to occur on 57th Avenue and the plant property.

Figure 3.7 Protected Left Turns with Back-to-Back Left Turn Pockets on 57th Avenue and Seminary Avenue



3.3.4 Role of International Boulevard as a Truck Route

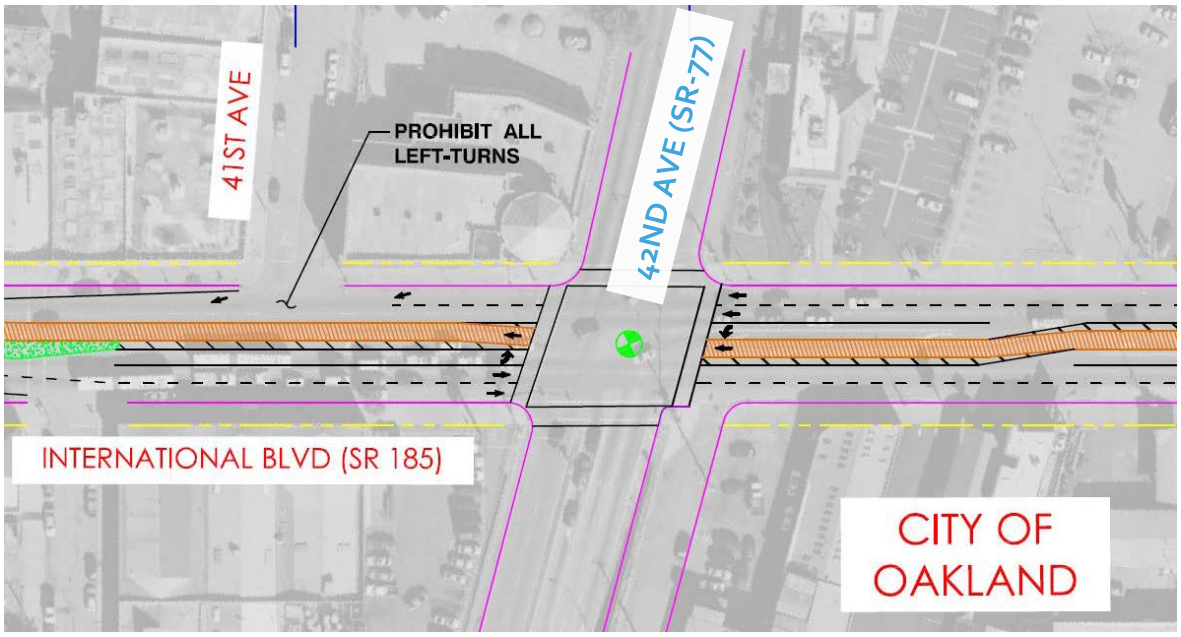
Potential Issues for Goods Movement

The designation of International Boulevard as a BRT route and multimodal corridor and the related design modifications raise challenges for its role as a truck route. The emphasis on transit, pedestrian, and bicycle modes should be accomplished with mitigations that allow it to serve local goods access and delivery needs. Multimodal design can result in new constraints to truck movements. Travel lanes will be reduced from four to two and lane widths reduced from 12 feet to 11 feet. The speed limit will be reduced from 35 to 25 mph. The center BRT lane will eliminate turning movements at some intersections and require signal-protected left-turns at others to prevent vehicles from turning left in front of through bus traffic. Design mitigations will need to prevent International Boulevard from becoming a barrier to east/west truck travel due to the loss of left-turning movements. The reduced capacity and efficiency available for through trucks along International Boulevard will also raise the importance of having effective parallel truck routes for longer distance north/south travel.

Mitigation

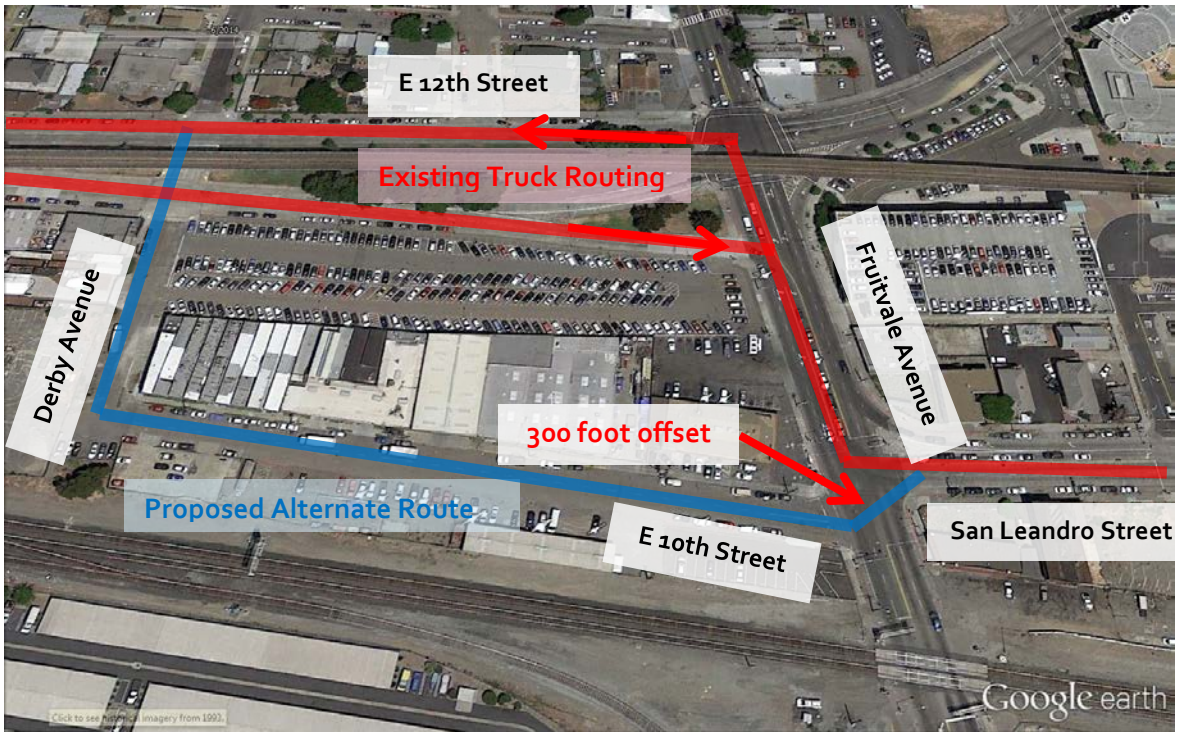
Signal-protected left turns will be placed at International Boulevard's intersections that warrant special accommodations, such as high traffic volumes, truck maneuverability needs, and access to major roadways. The intersections include 5th Avenue, 14th Avenue, 22nd Avenue, Fruitvale Avenue, 42nd/High Street, 73rd/Hegenberger Road, and 98th Avenue. International Boulevard intersections with those streets will include two travel lanes, no parking and protected left turn lanes, as shown in **Figure 3.8** below.

Figure 3.8 Signalized Left Turn for Protected Access to Major East-West Route, SR-77



Parallel and to the west of International Boulevard, San Leandro Street and 12th Street are each designated truck routes through commercial and industrial areas with good freeway connectivity. With the implementation of BRT on International Blvd, steps will be taken to allow trucks to more efficiently use the San Leandro and 12th Street corridor. At present, a discontinuity exists at Fruitvale Avenue where 12th Street and San Leandro Street intersect Fruitvale at locations that are off-set by about 300 feet. To make that transition from San Leandro St to 12th St, trucks currently make a difficult series of turns on narrow lanes shared with other vehicles, shown in **Figure 3.9**.

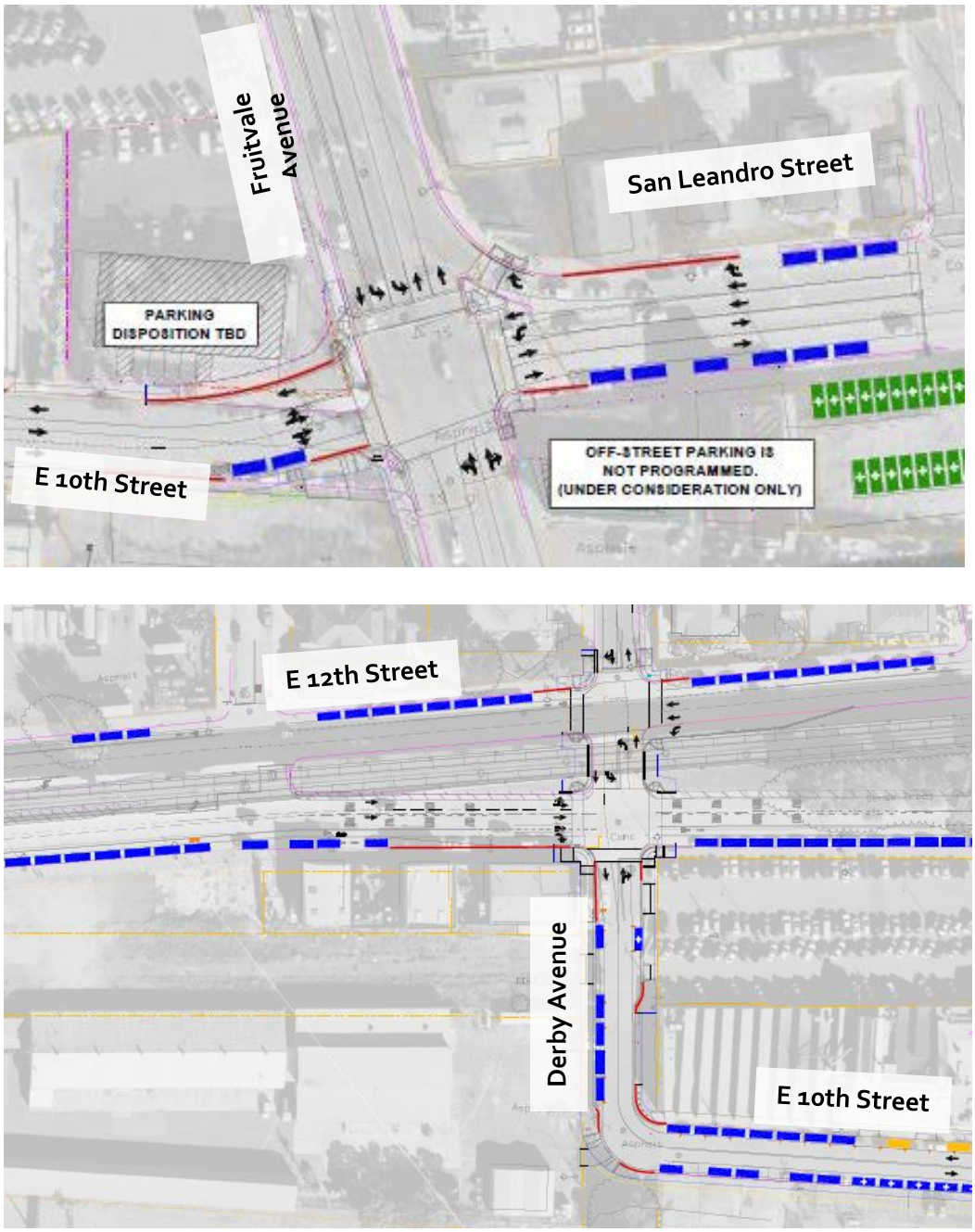
Figure 3.9 Existing Conditions at Fruitvale Avenue



To address this issue, E 10th Street will be realigned to meet San Leandro Street. The intersection of E 12th Street and Derby Avenue will also be improved, creating an additional controlled intersection to E 12th Street. **Figure 3.10** below shows the planned improvements that would create a smoother connection between San Leandro and E 12th Street, via the intersections of Fruitvale/E 10th Street and E 10th Avenue/Derby Avenue for through truck movements.

An additional potential mitigation would be to install signage on nearby truck routes to direct trucks to San Leandro Street and 12th Street for north/south travel in order to minimize through trucks on International and provide more direct routing for trucks diverting from I-880 during extreme congestion conditions on that freeway.

Figure 3.10 Planned Improvements with Realignment of E 10th Street with added metered (blue) and controlled parking (green)



Another truck route discontinuity on San Leandro Street is found where it tunnels under 105th Avenue. Due to the tunnels' limited width and vertical constraints San Leandro Street is not designated a truck route between 98th Avenue and the San Leandro northern border. Unless the discontinuity at 105th can be removed, the preferred alternative is I-880 and SR-61 to access downtown San Leandro. However, trucks continue to travel into downtown San Leandro via International Boulevard, including specialty trucks for food services and supermarkets. A

potential mitigation would be to investigate the feasibility and cost of improving the vertical and horizontal alignment of San Leandro Street tunnel under 105th Avenue to accommodate large trucks.

3.4 Summary of Issues and Suggested Potential Solutions

Lots of issues and solutions are discussed in this case study. The following table summarizes the strategies and what issues they address.

Table 3.2 Summary of Issues and Solutions

Topic	Issues	Solutions
Truck access and parking	Inadequate curbside loading and unloading zones accessible to businesses. Current zones lengths, typically 15 feet, can't accommodate trucks backing into the zone. Some informal loading zones will be converted into parking or a median transit lane.	Include end-block loadings zones and lengthening existing zones from 15 ft to 40 ft. Add side street loading zones for longer trucks and to replace informal loading zones. Identify additional lots and side-street spaces for car parking.
Coordinated planning, conflicts with other modes	Corridor reconfiguration to accommodate dedicated transit lanes and pedestrian and bicycle circulation compromise truck maneuverability. Examples include narrower traffic lanes, bulb outs. Difficult truck routing though corridor with fewer traffic lanes, lower speeds, and restricted left turns.	All intersections designed to accommodate single-unit truck turning movements. Key intersections with local and regional access along and across corridor to be configured for larger truck turns and protected left turns. Side streets provide reasonable routing alternatives to bypass difficult intersections.
	Truck route discontinuity on San Leandro Street at 105th Ave limits the ability of the street to serve as an alternative to International Blvd for trucks traveling between Oakland and San Leandro.	Undertake feasibility, impact and cost studies to inform decision on whether to expand existing 13'6" vertical clearance and cross section of undercrossing to allow San Leandro to serve as a truck route and reduce reliance on International Boulevard. Program funding if deemed an acceptable project by affected jurisdictions and agencies.
Lack of alternatives	Reduced capacity for truck volumes due to the loss of one of two travel lanes, affecting travel delays and reliability.	Improvements at key locations on San Leandro Street truck route as a parallel truck alternative Identify alternative truck route routes and signing to help reduce use of International as a truck route
Local industry truck traffic conflicting with local residential auto traffic	Large trucks used by industrial facilities will conflict with needs of neighboring commercial and residential land uses.	Intersections designed with back-to-back left turn pockets to accommodate residential and industrial needs on adjacent intersections.

Topic	Issues	Solutions
Last-mile connections	Prohibiting left-turns limits the number of routes available to trucks. Continuous truck routes intersecting and parallel to the corridor are needed to supplement the corridor. Alternative routes require design and connectivity improvements to support International Boulevard.	Protected left-turns strategically placed at key intersections that connect to major regional and local roadways. Small side-streets can be used for routing. San Leandro, a parallel route with connections to other major roadways, is being improved to provide supplemental capacity. Realignment of E 10th and improvements to Derby improve conditions on a parallel truck route.
Use of Information Technology/ITS	Trucks will travel farther to find a permitted left-turn; signalization and priority will determine the ease of that travel.	The existing transit signal priority system creates steady traffic progression for all vehicular traffic.

4.0 I-80 Corridor Rail Impacts

4.1 General Background and Issues

Railroad traffic through built-up and developing areas directly impacts the mobility, safety, and lifestyle of the community and can create environmental concerns. Issues include noise impacts, diesel emissions, and barrier effects between activities on two sides of the tracks, obstacles to pedestrian and bicycle paths, obstacles to transit access, and congestion, delays and collisions on at-grade crossings. The Union Pacific and BNSF rail lines along the I-80 corridor through northern Alameda County exemplify all of those issues. Community concerns about freight and passenger rail activity in the corridor are well documented, including noise, traffic disruption and limits on mobility and safety concerns for pedestrians, cyclists and other travel modes. Without proper planning, these issues could worsen as rail traffic associated with the Port of Oakland and other generators are projected to increase the number of daily freight trains in the corridor by more than 40 percent over the next ten years, accompanied by up to 30 percent increases in passenger rail activity.

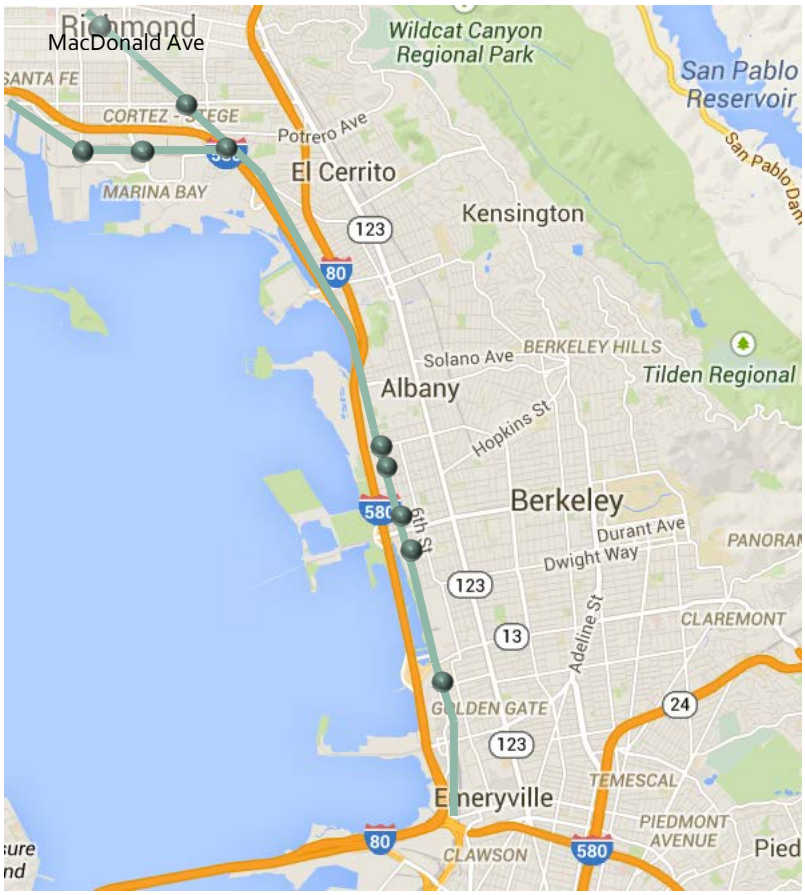
This case study addresses the I-80 railroad corridor through the cities of Emeryville, Berkeley and Albany and southern and central areas of Richmond. The case study location was identified through discussions with ACTC and MTC staff and contacts with city representatives. This section includes a review of background information on railroad issues through the corridor and measures that could address them, with particular focus on issues and measures that are transferable to similar situations elsewhere.

4.1.1 Background

The study area extends along the UPRR and BNSF rail lines from the southern border of Emeryville, through Berkeley and Albany, to beyond McDonald Avenue in Richmond. The corridor includes at-grade crossings on the UPRR mainline (shared with BNSF) at 65th, 66th and 67th Streets in Emeryville; Bancroft Way, Addison St, Hearst Ave, Virginia St, Cedar St, Camelia St, and Gilman St in Berkeley, and Cutting Blvd in Richmond. In addition, the BNSF branch line in Richmond intersects at grade at Meade St, Regatta Blvd, Marina Way, Harbor Way, Wright Ave, Cutting Blvd (twice), Canal Blvd, Garrard Blvd (twice), Richmond Ave, and Richmond Parkway (twice).

This corridor has historically been a predominately industrial and lower-income area, but has undergone significant transformation in recent years. The Emeryville redevelopment converted large swaths of that city to high intensity big box retail developments generating high levels of traffic. With the arrival of several high wage employers such as Pixar Studios, AAA, and Art.com, Emeryville has also become a job center and a hot housing market, with new high density market rate apartment complexes going in and associated small businesses and restaurants popping up, all in close proximity to the railroad. West Berkeley south of University Ave and directly adjacent to the railroad continues to be largely light industry, repair shops, and live work "maker" units, with low and middle income residential a little further away from the railroad. North of University Ave to Gilman, the land use continues to be largely light industry with warehousing, but now with high end retail at the 4th St district and higher income residential slightly farther away. The Albany section of the corridor passes through predominately big box retail and high density housing for the university, as well as being locked in between the Interstate freeway and the Bay. In Richmond, the corridor splits in two, with the northern section going into the heart of the city, surrounded by predominately lower-income residential areas, and institutional and commercial land uses. The western spur goes through a historically industrial area that is being converted to high density residential and governmental uses.

Figure 4.1 I-80 Freight Rail Case Study Corridor and At-Grade Crossings



Corridor — At-Grade Crossings ● (some representing multiple nearby crossings)

Train movements along the UPRR line total 24 freight trains and 42 Capitol Corridor and San Joaquin passenger trains per average weekday. The BNSF Richmond Pacific Branch line serves the Port of Richmond and Chevron refinery and other industrial uses in and near point Richmond. It includes several marshalling areas and trains that regularly reposition long slow moving trains that can lead to street blockages lasting 20 minutes at several locations.

Figure 4.2 UPRR Grade Crossings in Emeryville

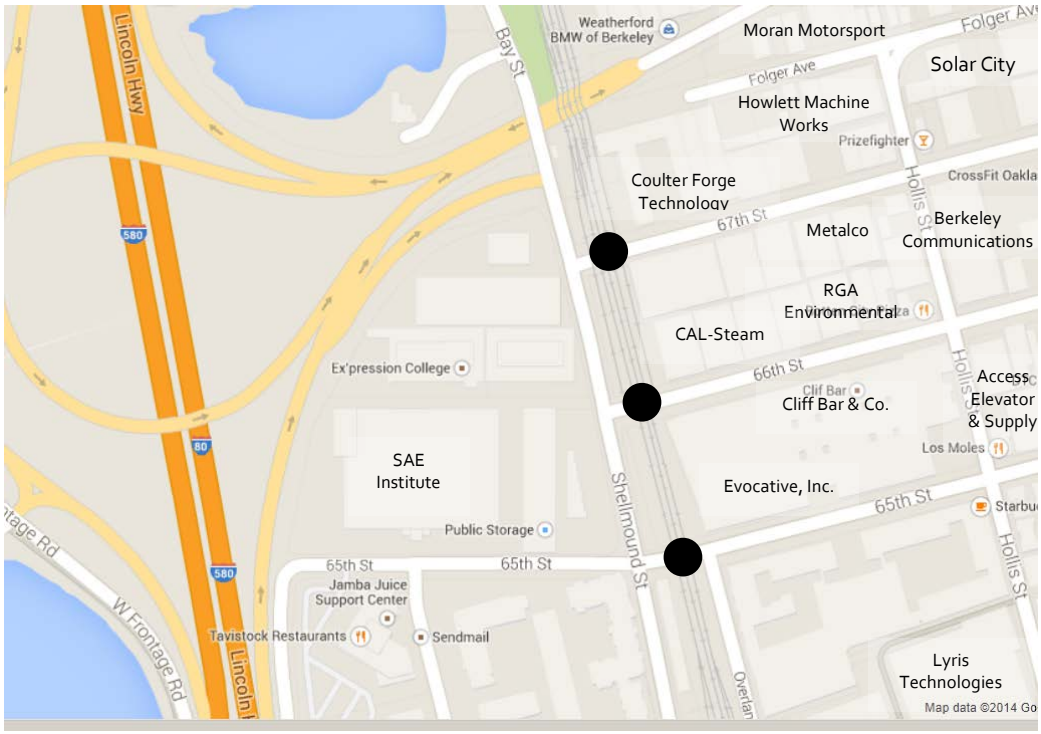
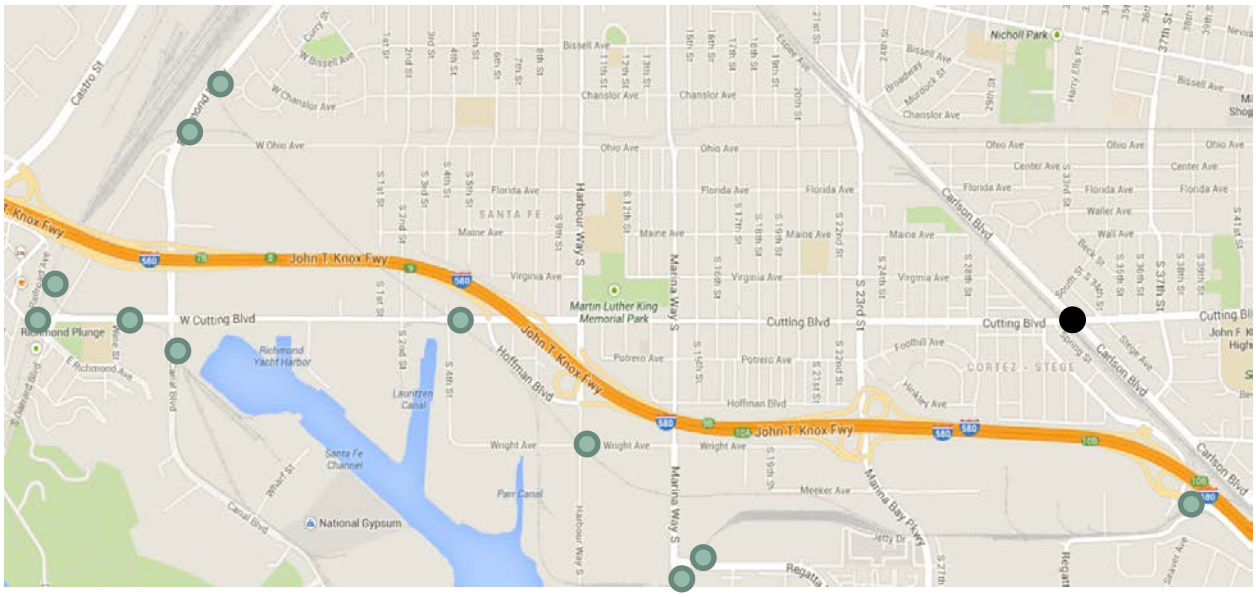


Figure 4.3 UPRR Grade Crossings in Berkeley

Figure 4.4 UPRR and BNSF Crossings in Richmond



Legend: UPRR ● and BNSF ●.

4.1.2 Role of Goods Movement in the Corridor

As the primary rail access route to the Port of Oakland and to other rail and truck intermodal hubs, freight movement through the corridor is crucial to Bay Area and national goods movement. The Port of Oakland, just to the south of the corridor, is the only international container trade gateway for Northern California. It is the leading U.S. export gateway on the West Coast and is the fifth-ranked U.S. seaport by containerized cargo movements.

The Port of Richmond serves as an import node for several Asian auto manufacturers with prospects of adding others as Chinese imports become more prominent. It also functions as a yard for merchandise and bulk commodity trains.

With the combined usage by freight and passenger traffic, UPRR line presently operates at about 88 percent of capacity. UPRR projects a 4 percent annual growth rate for freight train volumes over the next ten years which will severely affect grade crossings and noise impacts as well as Capitol Corridor and San Joaquin passenger rail on-time performance. Passenger service itself is projected to grow by 2 to 6 trains a day. To mitigate the effects of rail capacity limitations on the line, UPRR may consider using the route through Oakland and Union City to Stockton via Niles Junction as a reliever route. However, that line also has capacity and operational constraints.

The Bay Area Regional Rail Plan recommends upgrades to the I-80 line to address the expected capacity shortfall. It recommends expanding the UPRR and Capitol Corridor line to three or four main tracks over the long term to maintain the critical freight connection to the Port of Oakland

while still accommodating passenger service. The upgrade would allow heavy DMU passenger trains to share tracks with freight on an expanding number of mainline tracks. While this solution would alleviate some of the rail capacity constraints along the lines making it possible to expand train frequencies to meet the projected 40 percent increase in ten years and further increases beyond, it would also increase the frequency of noise impacts and at-grade crossing disruptions on the surrounding community.

4.1.3 Relationship to other areas

The nature of these issues is common to other communities exposed to similar, or even lesser, amounts of rail activity. Mainline railroad corridors bisect Oakland, San Leandro, Hayward, Union City, Newark, Fremont, Pleasanton and Livermore among others. The regional emphasis in Plan Bay Area on growth in Priority Development Areas (PDA), often adjacent to rail transit corridors, will place additional pressure on addressing conflicts between concentrations of residents and business and the movement of trains through increasingly dense and sensitive areas. The evaluation of issues and proposed solutions defined in this case study may prove valuable to these other communities in Alameda County and the Bay Area confronting continued growth in freight or passenger rail traffic.

4.2 Specific Issues

Specific issues that arise with respect to rail activity through Emeryville, Berkeley, Albany and Richmond include:

- **Noise impacts** of train horns at grade crossings disrupting quality of life for nearby businesses and residents during both day and nighttime hours.
- **Disruption of access and traffic flow** through the community, and high congestion levels during train passages
- **Physical barrier** to pedestrian and bicycle circulation through the community and other route- or distance-sensitive travel modes such as local transit
- **Safety** associated with crossing the tracks, particularly for pedestrians at both designated crossings and at illegal crossing points between

From the standpoint of the local budgeting, capital improvements programming and implementation, the potential mitigations for these issues encounter the following challenges:

- **Prohibitive costs** associated with most potential improvements, ranging from “quiet zone” measures and grade separations to trenching the railroad alignment.

- **Property acquisition and accessibility challenges** associated with land uses adjacent to potential grade separations. Surrounding properties may be adversely affected from construction of grade separations – e.g., a street-facing business now faces a pillar for a small bridge and is less visible/viable.

- **Authority** and process to get remedial actions approved

4.2.1 Noise Impacts

The cities of Emeryville, Berkeley and Richmond have each conducted "quiet zone" studies to assess the means through which to mitigate train noise at grade crossings. The primary impact arises, not from the noise of trains rumbling along the tracks, but from the sound of train horns that alert drivers, pedestrians and cyclists at gated crossings. Trains are required by State and Federal law to sound their horns as they approach grade crossings, but the Federal Railroad Administration allows local jurisdictions to establish Quiet Zones at locations at which sufficient on-site safety measures are installed. The Quiet Zone measures include four-quadrant crossing gates to block drivers from both straight and diagonal track crossings and can also include in situ wayside horns triggered by train approaches that focus warning sounds on the affected drivers rather than broadcasting them over a wider area as is the case with train-mounted horns. Example pictures of these Quiet Zone measures are shown below.

Figure 4.5 Examples of Quietzone Measures

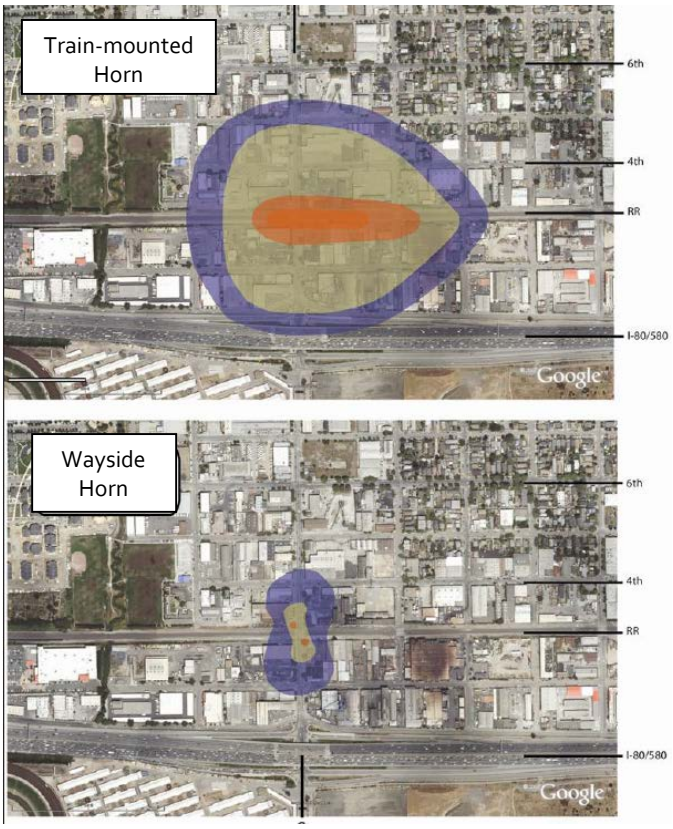
Standard Crossing

Wayside Horns

Four-Quadrant Gates

Figure 4.5 illustrates the wide-area range of noise impacts from traditional train-mounted horns on the first map versus the significantly smaller area impacted from wayside horns focusing warning signals on affected traffic in the second map. In each map, the orange represents the highest decibel level impact, with yellow/green representing moderate impacts and the blue/purple representing the extent of the weaker impacts.

Figure 4.6 Reduction in Community Noise Impacts with Wayside Horns



Auto traffic volumes at Berkeley's seven crossings are projected to increase by 35 percent over the next 15 years, concurrent with an even greater increase in train counts. Gilman Street in particular is projected to increase from about 20,000 vehicles a day to over 25,000. However, because of property access and acquisition issues and proximity to planned upgrades to the Gilman/ I-80 freeway interchange, Berkeley had to relinquish potential grant money to construct a railroad grade separation. The total cost of the grade separation program would be over $10 million, and the City cannot anticipate when the project may be funded. Berkeley's presently recommended solution is to keep all seven of its grade crossings open to provide a wider range of crossing options to disperse the traffic between and to equip all of its grade crossings with 4-quadrant gates to restrict unsafe traffic crossings as trains approach. Berkeley also proposes to install wayside horns at the Gilman crossing to focus horn warnings on the approaching traffic and eliminate wide-area noise impacts that radiate from train-mounted horns.

Berkeley's prospects at Gilman also affect Albany, as the sound of train horns approaching Gillman directly impact sensitive residential areas in Albany just north of its border with Berkeley.

Richmond has an ongoing program of identifying and implementing quiet zone improvements in response to resident complaints. It has implemented both wayside mitigations and train maneuvering restrictions in high activity areas in the southern part of the city near Marina Bay

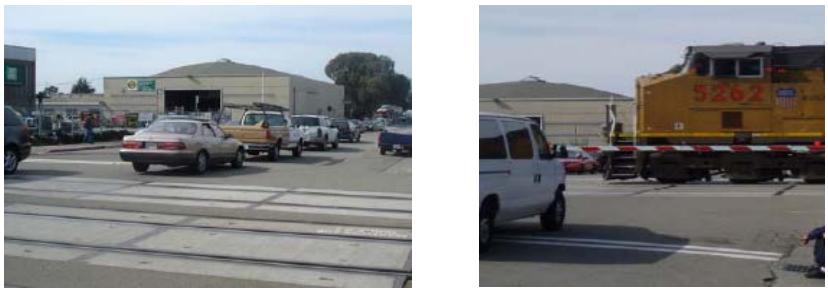
and Point Richmond where frequent train maneuvers occur related to the Port and Chevron refinery. City staff performs most of the needs assessment, feasibility assessment, design and construction management. The City's FY2014 Capital Improvement Program allocates almost $180,000 for Quiet Zone studies.

4.2.2 Disruption of Access and Traffic Flow

The Quiet Zone treatments described above address the most critical of the cities' needs related to grade crossing conditions at present. The added safety of the four quadrant gates and the wayside horns reduce risks associated with grade crossings and allow the cities to retain all of their existing at-grade crossing points for reasonable distribution of traffic loads and queuing.

As the number of trains increase in the future, however, disruption of mobility within the cities will also increase without further measures taken to implement grade separations. Increasing numbers of trains, and the associated queues of auto traffic, will also affect air quality emissions and the potential for unsafe behavior born of impatience of drivers, pedestrians and cyclists. Figure 4.7 shows an example of this type of disruption.

Figure 4.7 Grade Crossing Disruption



Crossing Congestion

Emeryville, Berkeley and Richmond have each considered constructing grade separations at their most critical traffic crossings, including 65th Street, Gilman and Cutting/Carlson, respectively. However, the substantial cost and controversy surrounding acquisition and access controls on abutting properties (adjacent properties could lose land or driveway access to accommodate the footprint of a grade separation, depending on the site specific characteristics) have prevented action. One planned regional improvement, reconstruction of the Ashby/ I-80 interchange, would provide an alternate accessible grade separated railroad crossing for Emeryville, possibly allowing it to eliminate one or more of its existing at-grade crossings. . Richmond's Capital Improvement Program designates about $600,000 in traffic signal and channelization (turning lane redesignation and queue length extensions) improvements at the Cutting/Carlson grade separation in lieu of a grade separation.

Physical Barrier

The physical presence of the railroad, the restriction of crossings to protected at-grades and grade separations, and the frequent passage of trains create a barrier to community interaction and to cross-town access for auto traffic, pedestrians and cyclists. In the absence of new grade separations, increasing train activity will noticeably worsen the situation.

Emeryville proposes to construct a new pedestrian grade separation south of Powell, connecting the Bay Street commercial development and the central part of the city, but funding is uncertain. It has several grade separated pedestrian crossings in other parts of the city, and retention of the three at-grade crossings in the northern part of the city will preserve reasonable pedestrian crossing options.

Aside from the possible Gilman improvement, Berkeley does not anticipate adding any grade separations for pedestrians or cyclists due to its relatively low concentrations of land uses on either side of the tracks, although Albany has expressed interest in a crossing near its border with Berkeley for pedestrian and cyclist access between University Village housing and the commercial activities west of the railroad.

Richmond has developed a specific plan calling for walkable, accessible urbanization of the area along the Bay and the Richmond Pacific BNSF rail branch. The plan proposes several multimodal crossings of the railroad, although the timing of the development and circulation improvements is uncertain.

4.2.3 Safety and Environment

Roadway intersections with rail crossings create conflict points between vehicles, bicyclists, pedestrians, and train traffic. This is especially true for at-grade crossings where railways and roadways intersect at the same level. Safety concerns regarding at-grade crossings leads the FRA to endorse converting all at-grade crossings to grade-separated crossings, thereby removing potential conflicts between motorists, pedestrians, cyclists and trains. The American Association State Highway and Transportation Officials (AASHTO) "Policy on Geometric Design of Highways and Streets," 2011 Edition, Chapter 10 and the Railroad-Highway Grade Crossing Handbook provide measures (or warrants) that determine whether grade separation should be considered[24]. Generally, AASHTO warrants for grade-separation are based on the assessment of truck and traffic volumes and speeds, complementary strategies such as upgrading pedestrian access, and the capability to coordinate funding sources and multiple agencies. Formal warrants specify thresholds for grade-separated crossings but also note that any location with a high

[24] American Association of State Highway and Transportation Officials. A Policy on Geometric Design of Highways and Streets. AASHTO. Washington, D.C. 2011.

collision rate and high train and traffic volumes can warrant a conversion to a grade-separated crossing[25].

The assessment of safety is related to the rate of collisions based on the volume of traffic on the roadway and railways. Accident experience at the crossings in the four cities is summarized in the following table.

	Rail-Related Accidents at Grade Crossing 2000-2014			
City	Total	Vehicular	Truck	Pedestrian and Bicycle
Emeryville (3 crossings)	3	2	1	0
Berkeley (7 crossings)	9	5	1	3
Albany (no at grade crossings)	0	0	0	0
Richmond (Cutting)	16	12	2	2

The Cutting /Carlson crossing experienced three fatalities during the period, one each in 2003, 2008, and 2014. The Cutting/Carlson fatality rate of about one every five years compares with a fatality rate about one every eight years for the seven Berkeley crossings combined. In the past forty years, fatalities have occurred in Berkeley at Gilman, Camelia, Addison and Bancroft.

The Cutting/Carlson intersection area with the railroad is a high traffic area for autos and pedestrians. A high density of residential and educational land uses exist in the immediate area, along with some commercial and industrial uses. Two quadrant safety gates do exist, but these are easily driven around by impatient autos and there are no physical barriers limiting the movement of pedestrians.

The rail alignment in Berkeley is located between and parallel to 2nd and 4th Street, along 3rd Street. The corridor is not a public right-of-way, and access is restricted with concrete barriers and fences at most crossings. Some parcels have no access except 3rd Street, resulting in trespassing vehicles on the railroad at risk for collisions. Rail related pedestrian accidents in Berkeley and Albany have primarily been a result of people walking along or across the tracks at non-designated locations, often by cutting or scaling the protective fences along the right-of-way. Addison is a designated bikeway and a connector to a pedestrian/bike bridge over Interstate 80.

Three rail crossings in Emeryville are located east and parallel to Shellmound Road, intersecting with 65th, 66th and 67th Streets. 65th Street is signalized and all three crossings are equipped with

[25] http://safety.fhwa.dot.gov/xings/com_roaduser/07010/sec05.htm

two quadrant gates. The City of Emeryville General Plan supports the conversion of at least one rail crossing between Ashby Avenue and Powell Street, which includes 65th, 66th, and 67th streets, into a grade-separated crossing[26]. However, the costs and property impacts of grade separations have brought greater attention to "quiet zone" safety and noise impact reduction measures.

Emeryville and Berkeley have completed quiet zone studies within the past six years. Emeryville's Capital Improvements Plan contains a $5 million line item for quiet zone improvements at 65th, 66th and 67th in FY 16/17, but less than one percent of the cost has an identified funding source. Berkeley's quiet zone improvements would cost at least $10 million and are also presently unfunded. Richmond funds quiet zone improvements on an as-needed basis, but its priorities have focused on frequent and long-duration crossings on the BNSF line near residential neighborhoods of Point Richmond and Marina Bay.

Within the four cities, the grade crossings with the highest delay and disruption to local circulation are Cutting Boulevard in Richmond, Gilman in Berkeley and 65th Street in Emeryville, all of which experience considerable congestion, delay to emergency vehicles and vehicle queuing, and associated air quality impacts. At Gilman, queues during peak hours can block vehicle movements along frontage roads and I-80 freeway ramps and 4th Street intersections.

The table below presents several of the FHWA delay- and exposure-based warrants for railroad grade separations in situations where costs can be justified based on the life-cycle benefits. For the three highest volume/high accident crossings in the corridor, exposures and delay exceed at least three of the warrant thresholds, justifying economic and engineering assessment of the life-cycle cost of grade separations.

	FHWA Railroad-Highway Grade Crossing Warrant Thresholds		
Location of UPRR at-grade crossings	Crossing exposure threshold, all trains, over 500,000	Crossing exposure threshold, passenger trains, over 400,000	Vehicle delay, over 30 hours per day
Cutting/Carlson	2,560,0000	1,760,000	51.2
Gilman	924,000	616,000	42.4
65th	581,400	448,800	45.6

Note: Numbers listed are the product of AADT (daily car traffic) and the number of trains per day at the crossing.

Community concerns have also been expressed on environmental issues of emissions of GHG and criteria pollutants and dangers of crude oil transport. The rail alignment through the corridor is essentially straight in terms of both horizontal and vertical curvature, making derailments

[26] 2009 Emeryville Draft General Plan Environmental Impact Report, http://www.ci.emeryville.ca.us/DocumentCenter/Home/View/665

unlikely. However, increased train frequency, comingling of freight and passenger trains, at-grade intersections and pedestrian-accessible right-of-way raise concerns about the risk of accidents and spills and the need for community information and emergency preparedness.

4.3 Potential Solutions and Strategies

The issues described above and the efforts by the cities of Emeryville, Berkeley, Albany and Richmond to address them demonstrate a need for a more coordinated and well sponsored approach to mitigating freight rail impacts on local communities. The three principal strategies recommended to address the issues of these cities and other similarly affected areas of the county are:

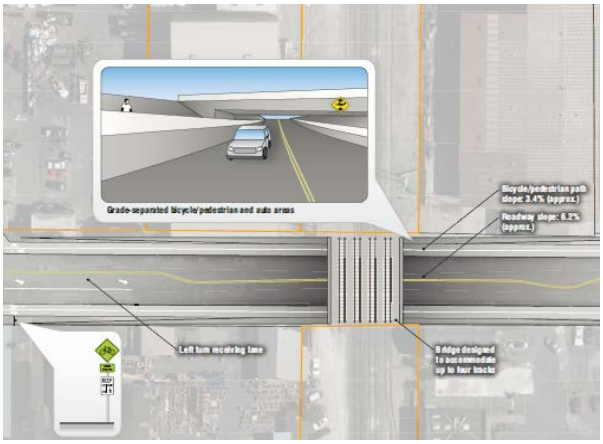
1. **Quiet Zone implementation for Short/mid-term solutions** – funding assistance toward implementing proposed Quiet Zone improvements in or adjacent to Emeryville, Berkeley, Albany and Richmond and other affected communities. Mitigation of primary safety concerns could be accomplished through installation of four quadrant gates at high accident crossings: Cutting/Carlson, Addison Street, and 65th/Shellmound Street, and through placement of Selective Exclusion Signs[27] at crossings to indicate turning restrictions as well as physical barriers to eliminate vehicles, bikes, and pedestrians on 3rd Street in Berkeley.

2. **Grade separation analysis for Mid/long-term solutions** – warrants analysis for potential grade separation or trenching corridor segments as train movements are projected to increase. The process would serve as a pilot program and demonstration of an approach to addressing similar issues in other locations. Where there are multiple at-grade crossings nearby, this analysis could include converting some crossings into cul-de-sacs so as to prioritize safety and efficiency through a single grade separated crossing.

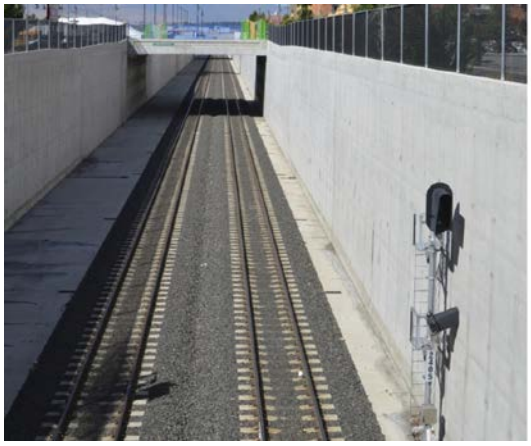
3. **Community Impact Mitigation Fund** – establishment of a countywide or regional program oriented toward prioritization and funding mitigation of community impacts associated with increased freight rail activity in major corridors. Financial partnership from UP/BNSF should also be explored, considering the operational benefits and reduced liability they would benefit from as a result of treatments. Depending on the level of impact, measures could include Quiet Zone implementation, pedestrian and cycle grade separations, vehicular and multimodal separations. Planned upgrades to related infrastructure include substantial improvements to the freeway interchanges at Ashby and Gilman included in the 2014 *Alameda County Transportation Expenditure Plan* and the Measure BB funding program approved by voters on November 4, 2014. The interchange upgrades would include grade separation of Gilman and a grade separated crossing opportunity for north Emeryville along

[27] 2009 Edition FHWA MUTCD, Part 4.

Ashby. These solutions would have significantly lower costs than trenching the railroad through the two cities.



Street Grade Separation



Rail R/W Trench

4.4 Summary of Issues and Suggested Potential Solutions

Lots of issues and solutions are discussed in this case study. The following table summarizes the strategies and what issues they address.

Table 4.1 Summary of Issues and Solutions

Topic	Issues	Solutions
Noise Impacts	Train horns at grade crossings disrupting quality of life for nearby businesses and residents during both day and nighttime hours.	Quiet Zone implementation for Short/mid-term solutions Community Impact Mitigation Fund
Disruption of access and traffic flow	Disruption of access and traffic flow through the community, and high congestion levels during train passages Increasing rail disruption of critical community circulation links: Cutting, Gilman, 65th	Grade separation analysis for Mid/long-term solutions
Physical Barrier	Physical barrier to pedestrian and bicycle circulation through the community and other route- or distance-sensitive travel modes such as local transit	Grade separation analysis for Mid/long-term solutions

Topic	Issues	Solutions
Safety	Accidents at grade crossings in case study communities: average less than 1 per year. Exception is high rates at Cutting Boulevard and Addison Avenue	Grade separation analysis for Mid/long-term solutions

5.0 CENTRAL COUNTY INDUSTRIAL ACCESS

5.1 General Background and Issues

Recent studies have identified several important issues associated with industrial access in Central Alameda County, including truck route continuity, truck parking, and through-truck traffic.

Analysis for earlier phases of the Alameda County Goods Movement Plan, reported in the Task 3c memorandum *Identify Gaps, Needs, Issues and Deficiencies*, found several instances of truck route discontinuities in Central County adversely affecting industrial access and truck traffic impacts. Recent discussions with public works and enforcement staff at the cities of San Leandro, Hayward and Union City have confirmed and clarified the issues. Examples of connectivity issues include Whipple Road near the Union City/Hayward border and San Leandro Street near the Oakland/ San Leandro border. Such gaps limit inter-jurisdictional truck connectivity between freight generators, the availability of reliever routes during freeway congestion, and access to major industrial districts. Truck routing through residential areas and other sensitive land uses generates noise, emissions and other truck-related impacts on local residents and businesses.

There are also several primary Central County freight corridors where recurring congestion results in poor levels of service for passenger cars, high-frequency bus lines, and goods movement. Examples include Mission Boulevard connecting Hayward and Union City with Newark and Fremont, and Hesperian Boulevard connecting Union City, Hayward and San Leandro.

The 2008 *Truck Parking Facility Feasibility and Location Study* prepared for ACTC (then ACCMA) and Caltrans found a shortage of truck parking in the County and that public agencies receive numerous complaints from local residents and businesses about inappropriate truck parking on local streets. This is especially the case along the I-880 and 238 corridors through the central part of the County. The report cited a lack of suitable sites for truck stops and truck parking, and it recommended that ACTC (ACCMA) adopt guidelines for developing truck parking facilities and to accommodate truck parking in land development processes.

Since 2008, conditions are generally observed to have gotten even worse due to the rebounding economy and the 2013 change in Federal rules on truck driver service-hour rules that reduce lengths of driver work weeks and work days and increase rest periods. The longer downtime

requires more truck parking per truck, and the resulting loss in productivity of each truck presses trucking companies to deploy more trucks.

This case study addresses industrial access issues in San Leandro, Hayward and Union City as they relate to overall goals of the *Alameda County Goods Movement Plan*, and it identified measures that could both address those specific issues and would be representative of strategies that could apply elsewhere in the county where similar situations exist.

5.1.1 Background

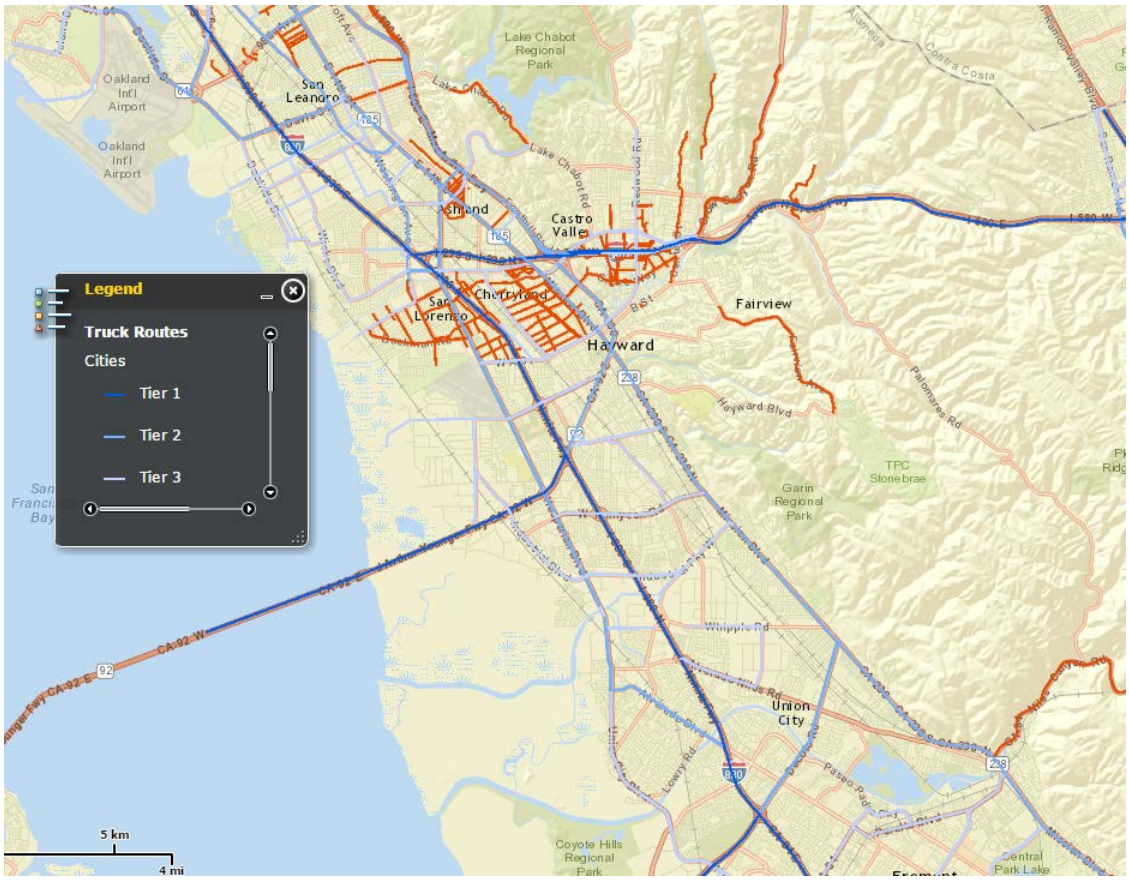
San Leandro, Hayward and Union City all experience goods movement issues associated with truck routing and circulation around major goods movement activity centers and truck parking and cut-through impacts on neighborhoods. Existing truck routes and restrictions don't fully address these impacts.

Recent conversations with representatives with all three communities confirm findings of prior studies on impacts including:

- Lack of key truck route connections that result in truck use of other streets, resulting in impacts on local land use and other transportation modes
- Truck parking in neighborhoods related to both local industrial access and to the communities' locations near major goods movement freeway junction and routes between global entries and regional gateways.
- Truck diversion from I-880 and overuse of arterial routes including Hesperian and Union City Boulevards and Doolittle Drive.

These situations raise issues related to connectivity between freight generators and the freeways as well as route continuity between jurisdictions. They indicate a need for inter-jurisdictional coordination on both truck routing and parking impacts.

Figure 5.1 Truck Routes in Central Alameda County



Source: http://ags.camsys.com/ACTCGoodsMovement/; Information from various cities in Alameda County and compiled by Cambridge Systematics.

5.1.2 Role of Goods Movement in the Corridor

Central Alameda County and the cities of San Leandro, Hayward and Union City are home to a significant portion of the county's industrial activity. The area is at the hub of the interregional trucking network, adjacent to the major freight freeway junction at I-880 and I-580/238, linking the region's global entries at the Port of Oakland and Oakland International Airport with regional trucking gateways to the Central Valley and along the California coast. Freeway capacity constraints within the area result in delays to truck shipments and in truck diversion and overuse of arterial routes.

5.1.3 Relevance to other areas

The issues addressed in this case study are similar in nature to those found in other areas of Alameda County and the Bay Area. The strategies identified below to address them are, in general terms, transferrable to those other situations. Examples of comparable conditions include freeway diversion to surface streets in communities along the I-580 corridor in the Tri-Valley area, and industrial access issues along the I-880 corridor in southern Alameda County

communities of Newark and Fremont, and truck parking and route continuity concerns in west Oakland.

5.2 Specific Issues

Specific issues that arise with respect to industrial access in San Leandro, Hayward and Union City include:

- Truck route continuity – including inter-jurisdictional connectivity, lack of contiguous industrial access opportunities, and routing through sensitive areas
- Truck parking – both for local needs and regional needs
- Truck diversion from freeways – related to freeway operational performance and suitability of reliever routes

As they relate to study goals, these issues create challenges with respect to environmental equity, freight related crashes, travel time delay, multimodal connectivity and redundancy, conflicts with passenger modes and land use compatibility.

5.2.1 Truck Route Continuity

In Central Alameda County, the multiplicity of industrial areas and freight corridors, adjacent areas of sensitive land uses and high levels of recurring congestion raise challenges to providing integrated and connected freight mobility and access. Some freight generating locations and goods movement corridors need better network connectivity, freight route access and redundancy. This includes all-directional freeway access and interchange capacity issues along I-880 through Union City and Hayward, through connection along Whipple Rd to Mission Blvd in Union City, lack of an overweight corridor connectivity between Oakland and San Leandro as shown in **Figure 5.2**. It also includes impacts associated with truck routes that pass through residential neighborhoods and other non-compatible land uses along Hesperian Boulevard and International Boulevard and others as noted in **Figure 5.3**. Truck route continuity through San Leandro, Hayward and Union City and adjoining Oakland and Newark involve cross-jurisdictional coordination issues as well as local last mile access to industrial areas.

Figure 5.2 Locations of Discontinuities in Central County Inter-City Truck Routes

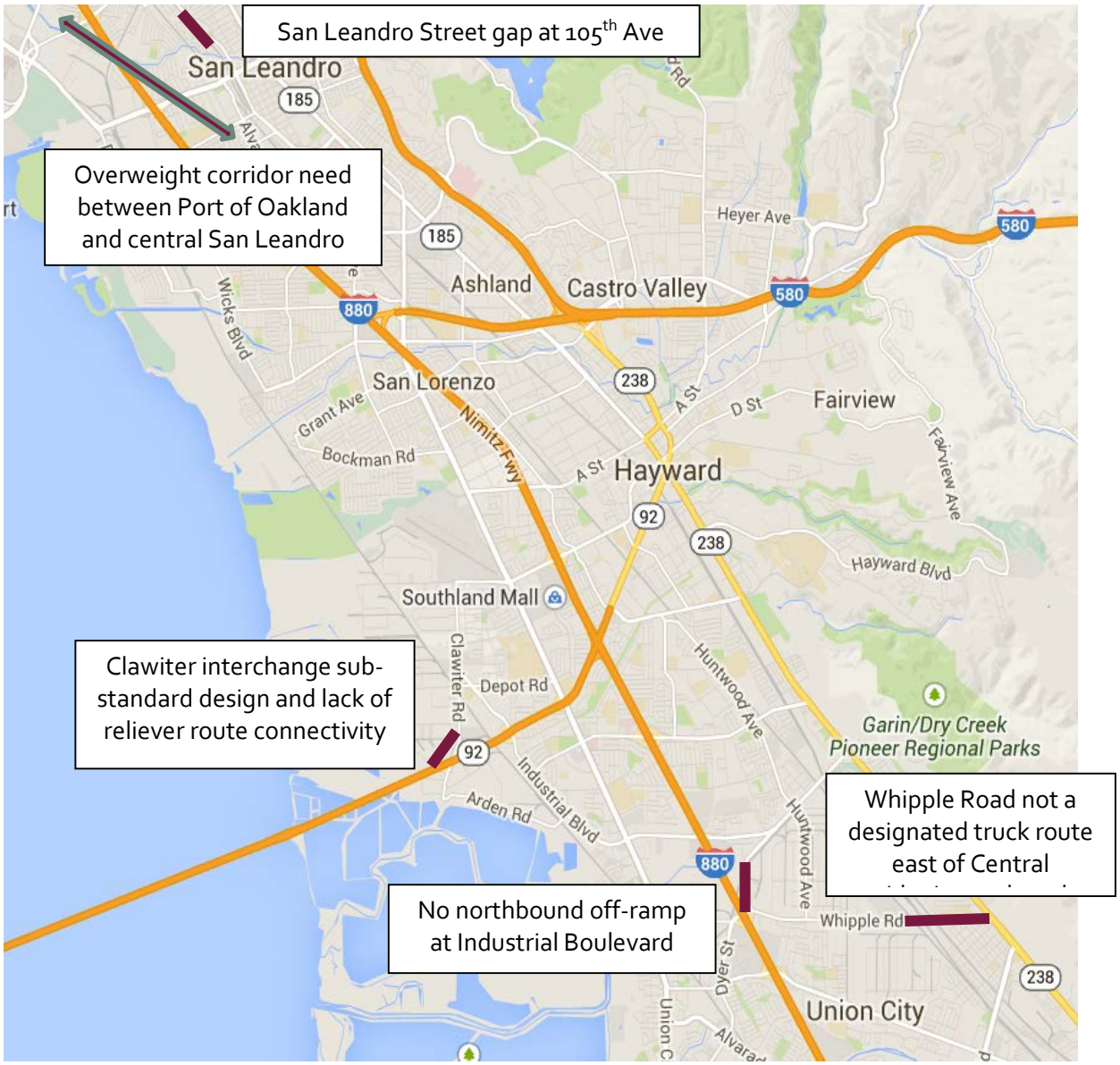


Figure 5.3 Examples of Central County Inter-City Truck Routes with High Proportions of Residential Frontage

5.2.2 Truck Parking

A primary issue affecting Central County communities is truck travel through and parking within local neighborhoods. Principal causes include the lack of sufficient temporary and long-term truck parking both regionally and countywide to support interregional travel, and a lack of legal local parking near services and industrial areas. Conditions that contribute to the problems include:

- Truck driver preference for locations along freeway corridors, including I-880 and 238, that connect major freight generators and regional gateways.
- New Federal rules that limit the number of hours a driver can drive per day, per week and between breaks that increase truck down time and require a greater number of truck parking spaces. They also force trucking companies to increase their fleet size to make up for lost productivity per truck

- Insufficient truck parking and services at the Port of Oakland
- Lack of a coordinated public or private effort to provide truck parking at suitable locations.

The 2008 ACTC study found countywide and community-by-community truck parking problems. Recent discussions with representatives of Central County cities confirmed that the identified problems persist. The specific locations and magnitudes of the problems vary due to economic conditions and parking enforcement levels, but residents, business owners and City Councils continue to be concerned about the issue.

Locations recommended in the 2008 truck parking study within their cities no longer seem feasible or reasonable in the opinions of current city public works staff. The magnitudes and locations and the nature of truck parking problems within their cities are also changing as a result of enforcement practices and the reemerging economy. Overall problems continue, and increased general demand for truck parking related to changes in Federal rules call for that an update to the 2008 designation of suitable new truck parking locations.

5.2.3 Truck Diversion from Freeways

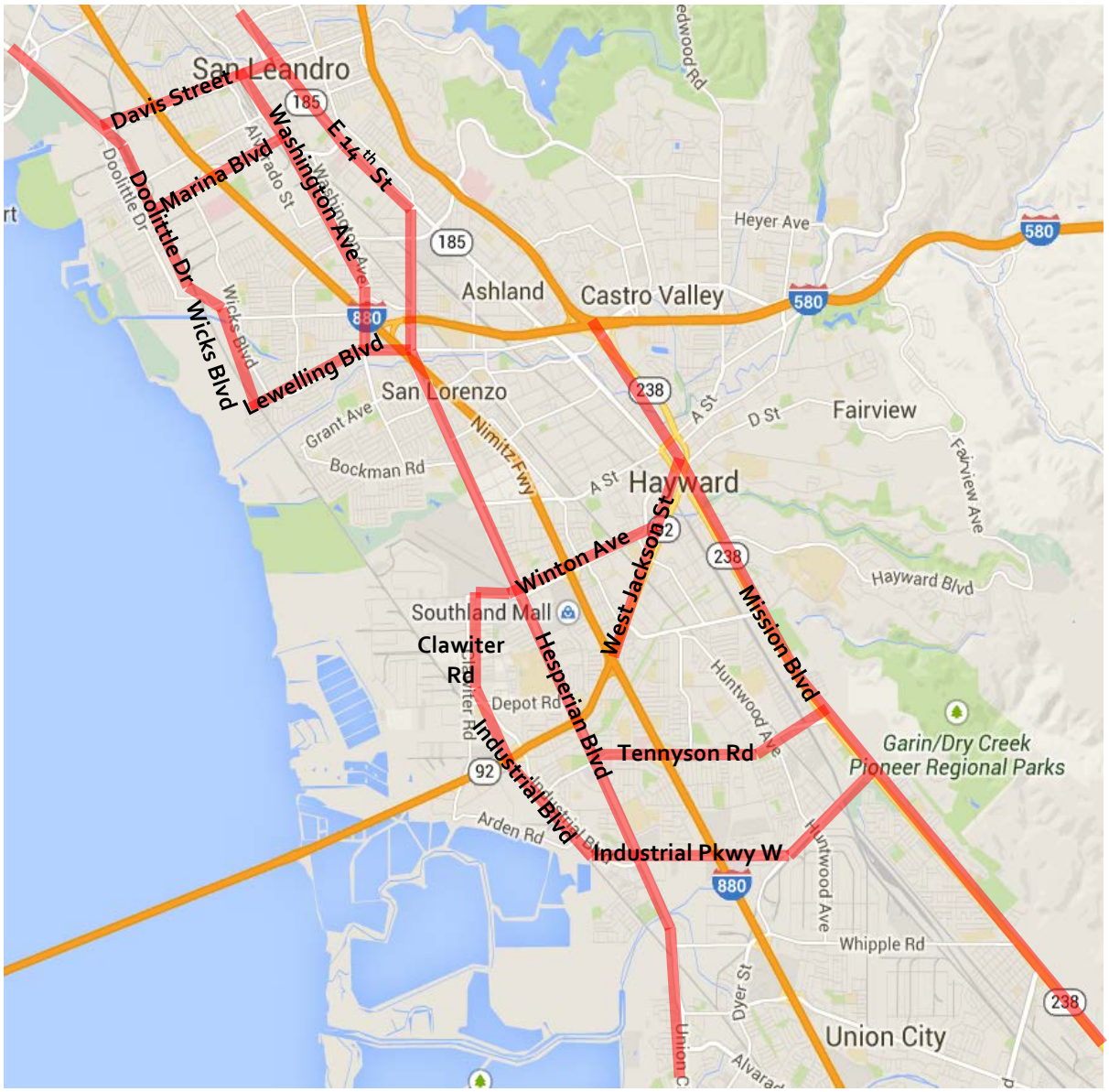
Central County truck routes that operate at poor levels of service include Hesperian Boulevard, International Boulevard, and Mission Boulevard. Diversion of trucks and other traffic from I-880 contributes to this congestion. Truck volumes generated by local industrial areas as well as diversion of through trucks to city streets affect both north/south routes such as Hesperian in Hayward and east/west connectors such as Davis Street in San Leandro. **Figure 5.4** illustrates these and other diversion corridors in Central Alameda County. As shown in **Figure 5.4**, freeway diversion affects the major Tier 2 truck routes[28] including Mission, Hesperian, Industrial and Union City Boulevards. It also affects secondary access routes including Clawiter Rd, Doolittle Drive, Wicks and Lewelling Boulevards, and the freeway interchanges and cross connectors providing access to those routes.

The San Leandro police and engineering and transportation departments report recurring heavy congestion on truck routes paralleling 880 (Doolittle Drive, Washington Avenue, Merced Street, Wicks Blvd) and cross-connectors (Davis Street, Marina Boulevard). San Leandro's police department commercial enforcement officer also reports regular heavy congestion on Marina Boulevard and Merced Street and a recent major truck-related accident where they intersect.

- [28] Tier 2 truck routes refer to other state highways and designated arterials that provide intra-county and intercity connectivity and last-mile connection to the Port of Oakland and Oakland International Airport (OAK). Sometimes, they act as an alternate route to Tier 1 roadways, and other times they are used for local pickup and delivery.

Specific land use compatibility issues in San Leandro include Marina Blvd near Merced Street where the new Kaiser hospital adjoins preexisting industrial and manufacturing building supply businesses with heavy trucking needs. The situation represents an example of conflicts between established industrial activities and new land uses adjacent or along access routes.

Figure 5.4 Primary Truck Surface-Street Diversion Routes from I-880 in Central Alameda County



5.3 Potential Solutions and Strategies

ACTC and MTC and other regional and local agencies have identified a number of transportation programs and individual capital projects that would help address the Central County industrial access issues described above.

5.3.1 Truck Route Continuity

Truck route continuity issues include

- Connectivity from the freeway to industrial areas,
- Diversion from I-880 to local streets and roads, and
- Spillover impacts on adjacent neighborhoods

The Central County goods movement strategy should include the truck route gap closures, reliever routes, and selective roadway widening to achieve a network strategy with multiple access ways to industrial areas. The network would enable area freeways and primary local truck routes to support one another in providing freight mobility while minimizing impacts on non-designated routes and sensitive land uses. **Table 5.4** lists examples of opportunities to provide reliever routes or diversion opportunities within the Central County truck route network.

Table 5.1 Opportunities for Truck Reliever Routes

Truck Route	Reliever Route Opportunity
International Blvd	San Leandro Street, with resolved discontinuities at Fruitvale through BRT project design and 105th Ave
Hesperian Blvd	Industrial Blvd, with improved connectivity to I-880 through added northbound off-ramp and other improvements. Widening of Union City Blvd
Mission Blvd (SR 238)	To provide additional on/off opportunities, Whipple road widening and extension of truck route designation to fully connect Mission with I-880 and Hesperian, and/or I-880 to Mission connection constructed just south of Decoto Road.
Davis St (SR 112)	San Leandro Street, with resolved discontinuities at Fruitvale and 105th Ave to provide effective north/south options, and improvements to other east/west and north/south connectors such as Marina, and Coliseum Way/ 50th Avenue.

As discussed above in Section 5.3.1, and portrayed in Figure 5.3, truck diversions can lead to travel on truck routes that are adjacent to residential areas and other sensitive land uses. One benefit of developing these reliever routes is that they can often provide more continuity and capacity on the truck routes that are most appropriate for heavy truck traffic, helping to reduce land use conflicts on existing routes. Table 5.1 above lists two prime examples: San Leandro Boulevard provides an alternative to through truck travel near community businesses and

residences and the multi-modal uses of International Boulevard, and Industrial Boulevard can help reduce conflicts along Hesperian Boulevard. Land use considerations could be used as a factor when prioritizing the gap closures and other infrastructure improvements necessary to develop these reliever opportunities.

In addition to physical infrastructure improvements, policy level strategies to address truck route continuity issues include: planning programs, guidelines, and use accommodations and restrictions at both the countywide and local levels. These objectives can be consistent with integrated land use and transportation planning at a regional, subregional, community and corridor level. The Plan Bay Area Sustainable Communities Strategy and Regional Transportation Plan should guide growth and strategic transportation investments toward a pattern that allows industrial areas and global gateways and freight corridors to function with minimal impact on sensitive community land uses. Corridor studies and coordinated local planning should address existing conflicts and impacts and set a template that accommodates future growth without generating new conflicts.

Community General Plans should place additional emphasis on consistency between their respective Land Use and Circulation Elements. The circulation element should include policies and guidelines for designated truck routes on cross-section design, truck loading zones, and accommodation of access to major truck generators.

Related strategies include:

- Development and dissemination of guidelines for land use planning in industrial areas.
- Land use planning that avoids placing residential designations and schools along routes that serve as access to industrial areas or diversion routes during periods of freeway congestion
- A coordinated countywide truck parking plan to provide needed capacity adjacent to freeways and industrial access routes
- Greater enforcement of truck restrictions after ensuring access to major freight traffic generators and parking.
- Land use planning that places appropriate uses along freight rail corridors and that minimize the potential for such corridors to create barriers to driving, walking or cycling access to homes and local businesses
- Rail grade separations and quite zones to minimize freight rail impacts on surrounding land uses

Transportation infrastructure improvements will also be necessary to reduce congestion on freeways and major arterials. Freeway strategies include Integrated Corridor Management and the Freeway Performance Initiative, addition of auxiliary lanes and improved interchanges. Arterial operational improvements include railroad grade separations, improved interchanges, selected road widening and traffic signal coordination.

Other local strategies can be used to enhance the truck route network, including interchange prioritizations, widening, and grade separation projects. In addition, in San Leandro, completion of overweight truck connections from the Port of Oakland to central San Leandro will also be important. The City of Oakland has initiated a truck route study that should address of heavy weight truck route continuity. In addition to these measures to enhance the truck route network in Central County, the following strategies are recommended to help reduce truck routing through residential and other sensitive areas:

- Locating truck parking and fueling in industrial areas or along freeways away from residential neighborhoods
- Ensuring that truck services are available in industrial areas and on routes through less sensitive land uses
- Truck prohibitions on neighborhood collectors that connect to truck routes and signing on preferred truck routes to encourage use of new or improved routes without residential exposure
- Improving operational efficiency and connectivity on alternate truck routes such as International Blvd, Hesperian, Mission Blvd

5.3.2 Truck Parking

A recommended approach to address truck parking issues in Central County should begin with an update of the 2008 ACTC truck parking feasibility study to account for the 2013 driver hours of service rules, changes in port activity and the economy, and feasibility of developing parking sites previously identified. ACTC should assume leadership in the initiative and also involve MTC, Caltrans, BAAQMD, the trucking industry, cities and local community groups to gather input on the issue of truck parking in Alameda County and to implement the recommendations of the updated study truck parking study and the countywide goods movement program.

Other leadership and guidance that ACTC could provide include:

- A public information campaign on the truck parking issue and coordination of local efforts to adopt guidelines for locating and developing truck parking facilities and for consistent and effective monitoring and enforcement of truck parking limits across jurisdictional boundaries

- Guidance in setting self-sufficient truck parking requirements in new land development and redevelopment

- Exploring shared use parking agreements with property owners with significant available parking (e.g. big box retailers overnight, Caltrans carpool parking lots overnight).

To address one of the primary causes of truck parking in western and central Alameda County the responsible agencies should ensure that additional truck parking and services and operational efficiencies are implemented to reduce delays at the Port of Oakland and the Oakland Army Base.

5.3.3 Truck Diversion from Freeways

Strategies to address truck diversion onto local streets include integrated freeway corridor management programs, such as that currently under study on I-880 in Oakland and San Leandro, and application of the regional Freeway Performance Initiative to Central County routes. The programs would bring ITS infrastructure, arterial management, incident management, emergency preparedness, traveler information to the corridors. They would also improve truck route operating conditions by reducing freeway delays and balancing demand to available capacity on surface streets and freeways.

The MTC *I-880 Integrated Corridor Management* (ICM) Project plans to relieve congestion and improve safety through ITS and operational strategies coordinated across the inter-jurisdictional network of freeways and arterials. The project includes a coordinated freeway and arterial incident management strategy and equipment and protocols to manage traffic diversion from the freeway to corridor arterials through Oakland and San Leandro, including routing vehicles back to the freeway as soon as feasible. One example of the beneficial effects of the project would be the existing Doolittle-Farralon-Wicks-Lewelling diversion route west of 880 along which diverted cars and trucks impact local streets and residential areas.

Additional delay reduction strategies include capital projects to improve freeway capacity and interchange operations, such as the following RTP projects along I-880:

- A Street interchange

- West Winton Ave interchange

- Auxiliary lanes between A Street and Paseo Grande

- Auxiliary lanes between Whipple and Industrial Parkway West

Also recommended is the application of ITS technologies to manage truck, transit and auto flows on arterials at the local and corridor level such as Hayward's adaptive signal timing and transit signal priority project on Hesperian Boulevard.

5.4 Summary of Issues and Suggested Potential Solutions

Lots of issues and solutions are discussed in this case study. The following table summarizes the strategies and what issues they address.

Table 5.2 Summary of Issues and Solutions

Topic	Issues	Solutions
Truck route continuity	• Local truck routes inter-jurisdictional discontinuities on San Leandro St, Whipple, Clawiter/Industrial, Merced • Conflicts with high frequency transit lines and bicycle modes on Mission, International, Hesperian • Land use conflicts in industrial corridors including Whipple, Hesperian, International • Geometric constraints include San Leandro Street at 105th, freeway interchange constraints at 880 and Industrial Blvd and other interchanges	• Capital projects to close truck route gaps, build railroad grade separations, improve freeway interchanges, add auxiliary lanes. I-880 Integrated Corridor Management Project • Proposed capital projects to close gaps and add reliever routes on San Leandro St, Whipple, Clawiter/Industrial, Oakland overweight routes • Proposed capital projects to improve capacity and efficiency on I-880, Industrial Blvd, Clawiter, San Leandro St
Truck parking	• Countywide shortage of truck parking impacts local neighborhoods and businesses with parking and traffic in all three cities • Air and noise and other community impacts associated with truck traffic and parking on local streets	• Countywide or regional truck parking study update; implementation of needed supply at truck generators and along freeways
Truck diversion from freeways	• Excessive diversion of trucks and traffic to arterials parallel to I-880, particularly through San Leandro	• I-880 Integrated Corridor Management Project and planned local ITS projects such as Hesperian adaptive signal timing to address excessive diversion to arterials • Proposed capacity and truck gap closure projects as mentioned above

6.0 TESLA ROAD CASE STUDY

6.1 General Background and Issues

This case study addresses Tesla Road in eastern Alameda County as an example of issues for truck access on high speed rural roads. The case study location was identified through discussions with Alameda CTC and Alameda County staff, site reconnaissance by Fehr & Peers, and review of data on traffic speeds, counts of trucks and general traffic, and accident records for the corridor. Tesla Road addresses conditions pertinent to a two-lane rural facility that serves both heavy regional commuter traffic and local agricultural businesses that face seasonal variation in the timing of goods movement.

This section includes a review of background information, a general description of the role and function of goods movement in the study area, the relationship of corridor issues to the overall study goals and issues representativeness and transferability of the corridor issues to other part of the County.

6.1.1 Background

Tesla Road is a two-lane rural, property-access road in eastern Alameda County with 12-foot travel lanes and approximately 10-foot wide paved shoulders. A bike lane runs along the paved shoulder on either side of the road. The study corridor extends along Tesla Road approximately 2.75 miles from just east of Concannon Road to the intersection of Tesla and Greenville Road and provides access to multiple wineries as shown in **Figure 6.1**.

Figure 6.1 Tesla Road Case Study Corridor

As the figure displays, eight vineyards are served by the study corridor, employing approximately 200 to 400 total employees. Just over 20 percent of the Livermore Valley Wine Country vineyards are located directly along this segment of Tesla Road, and several others are located within a close proximity to the study area.

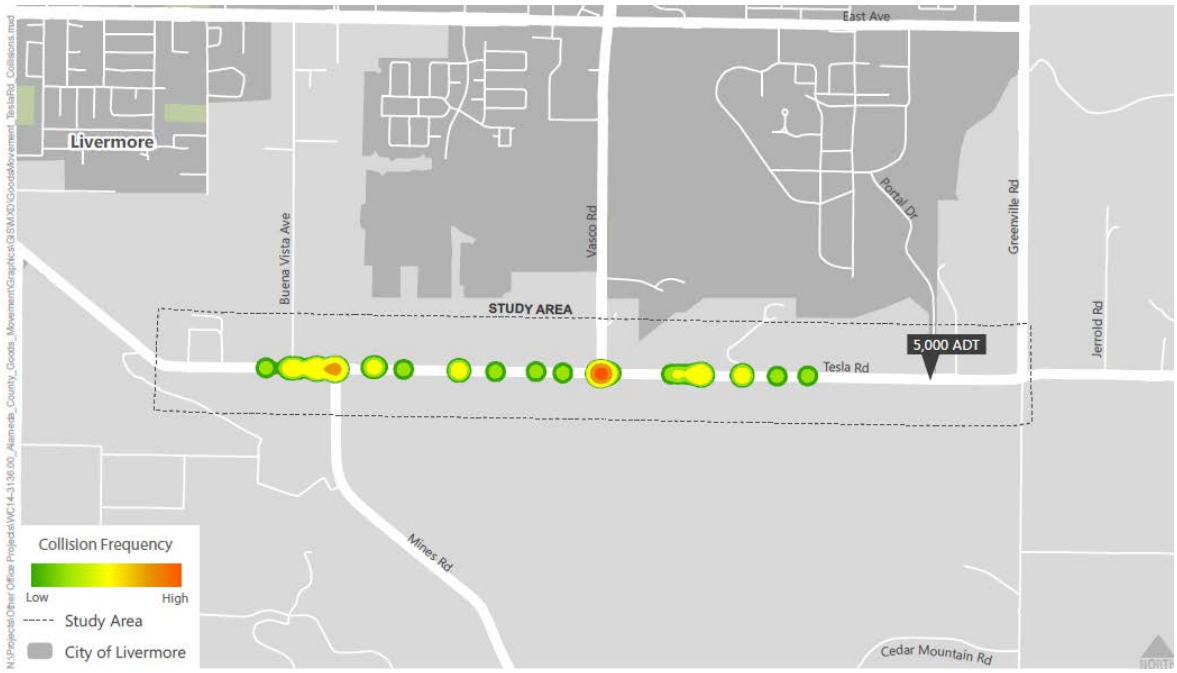
Aside from signalized intersections at Mines Road and South Vasco Road, intersections within the corridor are controlled by side-street stops, so that traffic flow along Tesla is largely uninterrupted and traffic speeds are high. Speed surveys conducted in 2009 reported the 85-percentile speed as 56 mph.

Discussions with vineyard staff revealed that seasonal peaking/harvesting occurs between the months of August and October. The traffic data, collected in late August, should therefore reflect peak year vehicle and truck volumes. Daily traffic volumes were collected by Fehr & Peers on Wednesday August 27th and Thursday, August 28th 2014. The volumes showed that overall traffic volumes on Tesla are moderate to high for a two lane road, recorded at 10,000 average daily traffic (ADT) for the two days. The weekday traffic volumes peaked around 5:00-7:00 AM with an hourly volume of nearly 900 vehicles in the westbound direction and about 1,000 vehicles total for both directions, constituting 10 percent of the ADT. Trucks with three or more axles account for approximately 1 percent of total traffic with peak truck volumes occurring in the early morning, similar to commuter vehicle peaking. Truck volumes remain relatively low throughout the day ranging from 1-10 trucks per hour, with 8-10 trucks during peak hours. **Figure 6.2**

illustrates the location of count data. According to winery staff, trucks deliver throughout the day and typically on weekdays.

Accident history from the last five years (2008-2013) was obtained from SWITRS, the California Statewide Integrated Traffic Records System. A three-year collision summary was also provided by Alameda County Public Works. The safety history on Tesla indicates an accident rate of approximately 30 percent caused by a turning vehicle either making a left or right turn. Rear-end collisions are the most frequent collision type, making up a total of 44 percent of all collisions that occurred between 2011 and 2013. The location of collisions is illustrated on **Figure 6.2.** Each crash location is represented with a colored circle, where the color indicates the number of crashes tallied at that location. The colors range from green for a single collision at a location, to yellow for 2 to 3 collisions, and red for 5 or more collisions at the same location in the six-year period. Areas where the colors blend together into a continuous shape (such as west of Mines Road) indicate that there are numerous multi-crash locations that are very close to each other but not in exactly the same place. The figure shows that the areas with the highest number of incidents are located at the Vasco Road and Mines Road intersections, with numerous other incident clusters at or near vineyard driveways, where turning movements are more frequent. Signal warrants should be evaluated at these driveway locations where turning movements and collision rates appear to be high.

Figure 6.2 Traffic Volume and Collision Data



6.1.2 Role of Goods Movement in the Corridor

Tesla Road's primary goods movement function is access to the seven wineries along the corridor segment. Additionally, land along Tesla is occupied by a tree farm, land used for grazing, and an equipment yard for a tree surgery company. Lawrence Livermore National Laboratory and Sandia Laboratory are located north of Tesla Road between Greenville road and Vasco Road. Counts and observation of trucks east of Greenville Road and over the Altamont Pass to San Joaquin County showed low truck volumes indicating that the road has a minor if any role in interregional goods movement. However, as a "last mile connector" to the Alameda County wine industry, Tesla Road represents an essential transport link in the county's economy.

Discussions with wineries along Tesla revealed some potential for expansion and growth. General traffic volumes are projected to grow 6.7 percent annually in the next 10 to 15 years, based on County traffic forecasts. According to the Alameda County 2014 Transportation Expenditure Plan for the City of Livermore, additional transportation projects that will affect Tesla Road in the coming years include freight corridor improvements on I-580, interchange improvements, and improvements to major commute corridors in the area, which may draw through traffic and/or trucks off of Tesla. .

The South Livermore Valley Specific Plan, which includes the land-uses on and around Tesla Road, emphasizes the desire to maintain a rural, agricultural character in the South Livermore Valley. Therefore, the plans intent is to maintain the existing rural street and street standards as much as possible, rather than upgrading to more urban streets.

6.1.3 Relevance to other areas

The physical characteristics and function of Tesla Road are representative to those found on other rural roads in Alameda County and elsewhere in the Bay Area. Farm and agribusiness access for large vehicles often conflicts with high speed passenger car traffic on rural roads such as Tesla. Addressing safety and disruption at uncontrolled driveways and intersections represents an issue on roads such as Patterson Pass Road and Vasco Road, and potential solutions for Tesla should be transferrable to these other examples.

6.2 Specific Issues

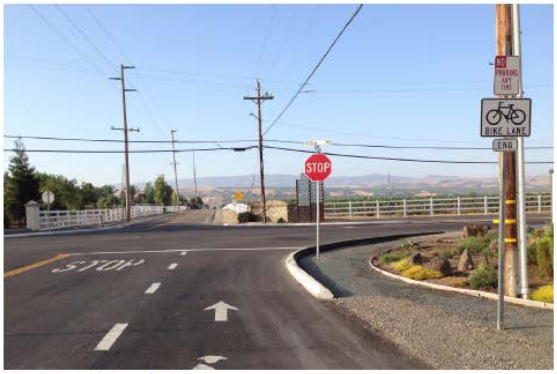
Specific challenges confronting goods movement along Tesla Road relate to truck access and egress at the many wineries along the corridor. Heavy trucks serving the wineries have to enter and leave Tesla via unsignalized intersections without street widening in the form of protected turn pockets or acceleration/ deceleration lanes. The speed differential between through-moving passenger cars traveling at over 50 mph and trucks slowing to make turns, waiting to turn left across opposing traffic, or accelerating from driveways cause safety concerns for both

general traffic and business access. Collision history shows a large percentage of traffic incidents are related to turning vehicles or rear-end collisions, some of which occur at vineyard driveways.

Alameda County staff also expressed concerns with the lack of turn lanes and the high incidence of rear-end collisions, particularly in view of the mix of commuter vehicles and trucks, and conflicts due to the bicycle lanes.

Figure 6.3 Illustrating Issues

Existing Cross Section



Bike Lane on Greenville Road

Truck Stopped along Tesla Road

Truck Traffic on Tesla Road

6.3 Potential Solutions and strategies

Based on our evaluation of the current characteristics along Tesla Road, as well as the issues and opportunities that currently exist, we recommend the following to help improve goods movement conditions along the study corridor.

1. Investigate the warrants, feasibility, cost and benefits of driveway consolidation or truck access via Mines Road with intersection channelization and signals to serve the cluster of wineries just east of Mines Road (Tesla Vintners, Steven Kent Winery, and Wente Vinyards)

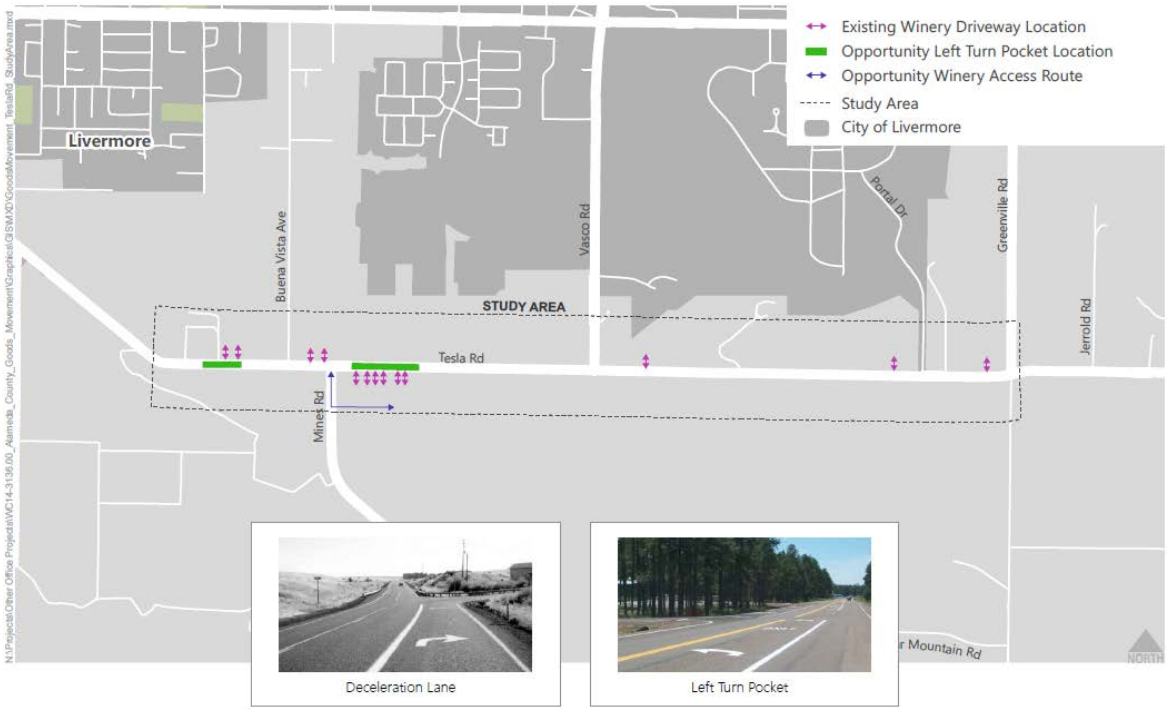
2. Determine driveway locations where truck traffic is high and conduct warrant analysis to determine where left-turn pockets should be installed.

3. Study the costs and benefits of installing truck deceleration lanes at Concannon Vineyard truck entrance and the Wente Vineyards driveway where truck access may be more frequent.

4. Conduct a performance speed zone study to determine whether slower speed limits are needed along the corridor between Livermore Avenue and Vasco Road where number of winery access points is high. Supplement speed study with traffic engineering judgment to determine whether unsafe conditions exist that aren't apparent to drivers. Include speed reduction warning signs and truck access signs. Conduct necessary studies to determine appropriate signage location and frequency.

5. Schedule truck arrivals and departures during off-peak hours of the day. Currently peak vehicle volume and truck volume occur at the same time (5:00-8:00 AM).

Figure 6.4 Illustrating Solutions



6.4 Summary of Issues and Suggested Potential Solutions

Lots of issues and solutions are discussed in this case study. The following table summarizes the strategies and what issues they address.

Table 0.1 Summary of Issues and Solutions

Topic	Issues	Solutions
Roadway Capacity/ Geometry	Two-lane road with paved shoulder. No left-turn pockets or right-turn deceleration lanes except at signalized intersections. Bike lane provided on shoulder. Access to multiple uncontrolled driveways directly on Tesla Road	Add left-turn pockets and deceleration lanes provide reduced turning-movement conflicts between through vehicles and trucks accessing wineries
Truck access	Trucks access wineries directly via driveways along Tesla Road. Some wineries provide separate truck entrance. No on-street parking along Tesla, however trucks seen using dirt shoulder occasionally. Some signage for winery truck entrances, speed limits, and trailer crossings	Driveway consolidation at wineries with access via Mines Roads reduces truck conflicts on Tesla Road where vehicle volumes are higher. Increased signage to warn drivers of truck access points.
Safety	High percentage of rear-end collisions associated with left and right-turn movements	Reduced speeds along corridor and increased changeable warning signage will improve rear-end incident rates