

Health Impact Assessment of the Port of Oakland



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Cover photo

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Executive Summary

Port growth

West coast ports play an important role in the movement of goods in the United States. It is estimated that 50% of U.S. goods come in through California’s three biggest ports: Los Angeles, Long Beach, and Oakland. Collectively, they handle an estimated \$300 billion a year in trade. These ports and the number of shipments they process are growing at a tremendous rate. For instance, the number of containers processed at the Port of Oakland has increased on average 6% per year over the past decade.

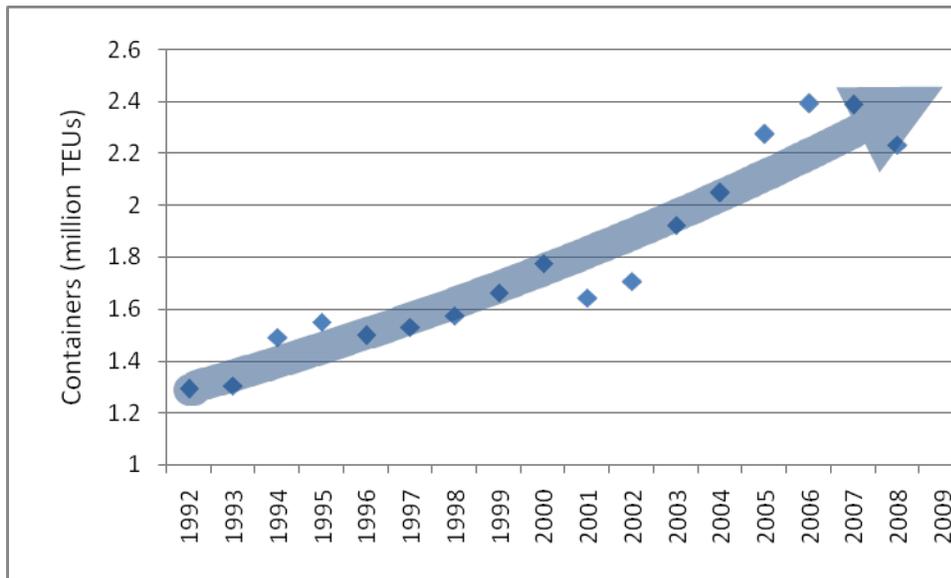


Figure 1. Growth trend for containerized shipments at the Port of Oakland¹

Within California there is increasing awareness that the growth of freight transport must be balanced with environmental health concerns. The state’s Goods Movement Action Plan recognizes not only the economic importance of ports, but also their potential to harm the environment and public health. The potential adverse impacts of port growth need to be assessed and mitigated, especially since many pre-existing health conditions make port communities vulnerable to the cumulative impacts of port growth.

Vulnerable port communities

The West Oakland community is vulnerable due to the prevalence of factors that adversely influence health²:

¹ Data Source: Port of Oakland, 2007

² Alameda County Public Health Department, West Oakland, Community Information Book Update, October 2005.

- 61% of households earn an income less than \$30,000 in 1999, compared to 26% for Alameda County as a whole.
- In 2004, approximately 9.1% of Oakland residents age 16 or older were unemployed, compared to 6.0% in the County as a whole.
- 34% of West Oakland residents ages 25 and over did not have a high school degree, compared to 18% in the county as a whole.
- Racial disparities exist for health determinants such as poverty, home ownership, educational attainment, vaccinations, likelihood of living near liquor stores and fast food outlets³.

Moreover, West Oakland residents are vulnerable due to the prevalence of poor health conditions:

- The mortality rate for all causes of death in West Oakland was 50% higher between 2000 and 2003 than the rate for Alameda County as a whole.
- Racial disparities exist for health outcomes such as birth outcomes, and hospitalizations for diabetes, heart disease, stroke, and cancer.

A comprehensive Health Impact Assessment

The focus of recent health risk assessments of the Port of Oakland has been on narrow health pathways. In our review of past environmental impact assessments conducted for projects that grow the Port and/or change land use in the neighborhood, we noticed analyses of air quality, traffic, noise, hazardous waste, and land use, but very little in terms of linking these health issues together, or presenting mitigations that comprehensively address the inter-related issues.

This report presents the findings of a Health Impact Assessment (HIA) of Port of Oakland growth conducted by students and faculty at UC Berkeley, with guidance from the West Oakland HIA Working Group. The working group was made up of residents, local HIA practitioners, and other stakeholders. The assessment evaluated the impact of ongoing Port growth on the health of the West Oakland community, placing emphasis on how the Port affects health through multiple inter-related pathways. Findings from the HIA are meant to inform the recurring planning activities and decisions of the City, Port, and community.

Health Impact Assessment

Health Impact Assessment (HIA) is a systematic process that evaluates the health impacts of a proposed policy, plan, program, or project. The assessment helps the public and decision-makers understand the health consequences of the proposal, and make informed choices that protect and promote health.

The Port can play both a positive and negative role in the health of West Oakland. As a growing industry, it can provide job training and employment opportunities, which can potentially reduce unemployment, poverty, and crime. The Port can also indirectly affect other businesses and land use in the neighborhood. For instance, many of the businesses, truck traffic, and industrial land use exist in West Oakland because of proximity to the port. Trucks are not only present on Port property, but also

³ The Alameda County Public Health Department, 2008, Life and Death from Unnatural Causes: Health and Social Inequity in Alameda County – Executive Summary.

http://www.acphd.org/AXBYCZ/Admin/DataReports/unnatural_causes_exec_summ.pdf

travel through the community in order to reach warehouses and other industries located in the neighborhood.

Trucks that travel to and from the port and within the community are associated with a number of inter-related health issues. Trucks emit diesel particulates, which are associated with respiratory and cardiovascular health, cancer, and general mortality – which not only impacts residents, but also the drivers of the trucks. Trucks also emit noise – much more so than normal automobiles – which can cause stress and annoyance, disrupt sleep, impact the school performance of children, and cause myocardial infarctions. Furthermore, increased numbers of trucks in the community can translate to increased risk of truck collisions with other vehicles, bicyclists, and pedestrians. Trucks can also impact broader transportation issues, such as blight, road wear, parking issues, social cohesion, and physical activity.

There are other land uses in the community that generate truck traffic other than the Port. For instance, there are also trucks from post office and other businesses in the community. Moreover, there are many vehicles on surrounding freeways also contribute to community air pollution and noise. Similarly, there are other sources of noise, such as BART and trains, which contribute collectively to community noise. Ultimately, all of these sources cumulatively affect the health of West Oakland.

West Oakland residents bear the cumulative burden of all these pathways. Due to the juxtapositioning of residential with industrial land use, residents are exposed to an onslaught of multiple environmental hazards. Poor health from one pathway (for instance, exposure to noise) may make residents more susceptible to the impacts of another aspect (for instance, air pollution).

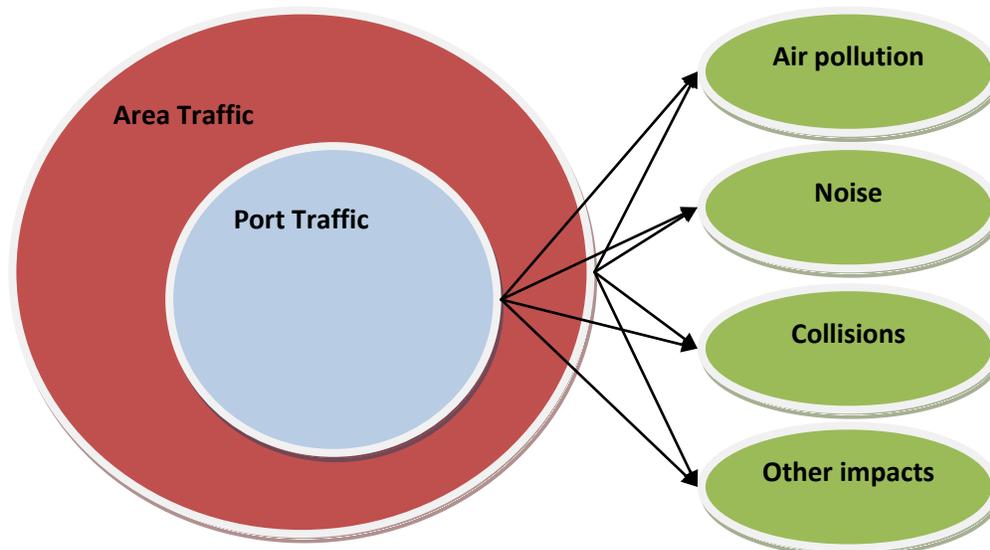
There may be feedbacks in these pathways that contribute to the vulnerability of the residents. For instance, the presence of the port, industrial land use, trucks, and poor social and environmental conditions may alter the presence of healthful land use and services. These factors might affect the retail environment, which in turn could affect nutritional health, physical activity, local economy, social cohesion and environmental quality.

Our findings

We found for **traffic**:

- Air pollution-related health impacts are underestimated by CARB's health risk assessment of the Port due to the additional impact of surrounding freeway and within community traffic. CARB's PM_{2.5} emissions for West Oakland may be underestimated by 22%. Using roadway air dispersion model, we found that annual mortality may be 52% higher than the level estimated in the CARB assessment (or approximately 4 deaths per year). Moreover, there is some evidence suggesting that pre-existing conditions may make West Oakland residents more vulnerable to the effects of air pollution.
- An estimated 1 to 2 lung cancer deaths among the 2500 truck drivers that work in West Oakland.
- Although diesel emissions are expected to fall by approximately 75% from truck emissions regulations by the year 2020, the attributable mortality from traffic air pollution will only decrease by 50% because regional traffic will likely remain stable.

- Vehicle traffic in combination with BART and train traffic results in the majority of West Oakland residents being exposed to noise levels in excess of 75 dB Ldn. We estimated that currently greater than 1 in 3 residents are likely to be highly annoyed by noise, 8 myocardial infarction deaths (15% of all myocardial infarction deaths) per year may be associated with noise exposure, and one third of residents may be at risk of sleep disturbance. Compared to a standard of 60 dB, current noise levels may result in a 29% impairment in recall and reading and a 4% impairment in recognition and attention, which may have considerable consequences on the cognitive development of West Oakland children.
- The rate of non-fatal injury from truck-pedestrian collisions in West Oakland is almost 6 times higher than the rest of Oakland. The rate of fatal injury from truck-pedestrian collisions in West Oakland is almost 4 times higher than the rest of Oakland.
- Truck traffic may affect other aspects of health in the community, including blight from trucks parking in the community, and potential detriment to physical activity on streets, social cohesion, and road wear.



We found for **land use** in West Oakland:

- There are land use conflicts that places residential next to industrial use.
- Based on an analysis of three reference points in the community, on average 53% of common retail services were available within a 0.5 mile walking distance, suggesting a lack of retail vitality in West Oakland.
- Proximity to the Port tends to adversely affect median and mean property values.
- Port Operations contribute positively to the retail environment by creating niche markets for transportation-related retail services, but may adversely crowd out the market for more common services.
- Industrial land uses may create an inhospitable atmosphere for retail viability. While this is not the main reason that business owners cite for failing to locate in Oakland, it is a partial contributor to the lack of a thriving retail environment in West Oakland, as it may contribute to a negative perception of public safety.

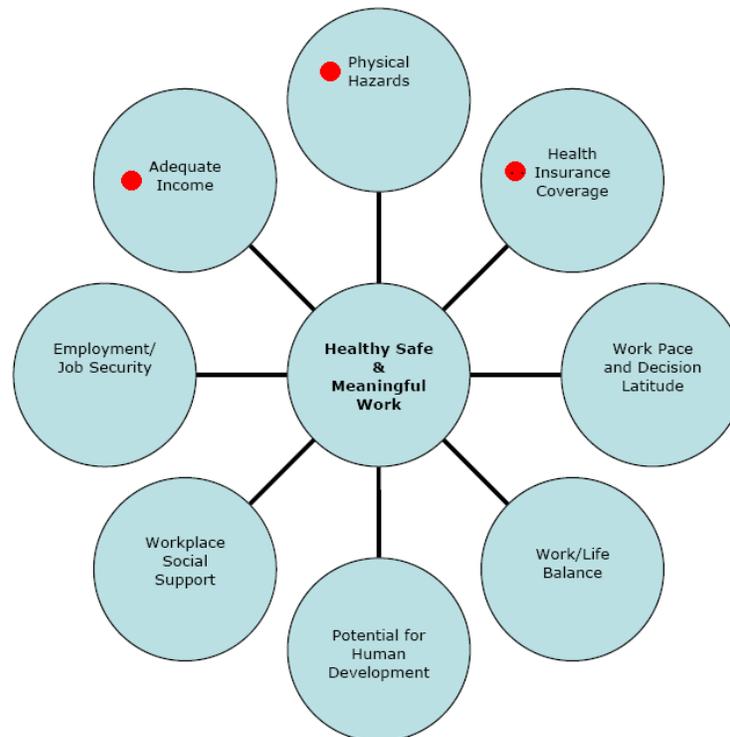
- The Port may support an underground retail economy that serves port-related needs, but also indirectly affects retail viability through traffic, noise and attractiveness of the area.

Retail Categories and Examples Related to Health (■ Unhealthy land use, □ Healthy land use)

<i>Food Retail</i>	<i>Other Retail Goods</i>	<i>Services</i>
<ul style="list-style-type: none"> □ Full-service Supermarket □ Small Grocery Stores □ Convenience Stores □ Farmers markets □ Restaurants □ Cafes ■ Fast Food Establishments ■ Liquor Stores ■ Bars 	<ul style="list-style-type: none"> □ Pharmacies □ Bookstores □ Specialty Shops □ Hardware Stores □ Auto Supplies 	<ul style="list-style-type: none"> □ Dry Cleaners □ Laundromats □ Banks & Credit Unions □ Check Cashers □ Beauty Salons □ Hotels/Motels □ Maintenance Services □ Entertainment □ Auto Repair

We found for the Port’s **labor opportunities**:

- The Port had employment positions that provided good wages that were above the Basic Family Budget Wage, and also provided good health and wellness benefits.
- It was unclear the educational and skill requirements for these positions, and the degree to which local hiring (specifically West Oakland residents) fulfill these positions.
- Port OSHA records indicate decreasing incidence of injuries and illness among its workers.
- The Port, through programs like MAPLA, provides for good local hiring goals for contractors. Many of the interviewed contractors do not use the Port to assist them in recruiting local, but rely heavily on unions providing local hire.
- The Port provides other indirect employment, including both independent and private employee truck drivers. Drivers face elevated health risks from diesel pollution as mentioned above for traffic impacts. Independent truck drivers may be vulnerable to these impacts due to the lack of health insurance, or other employment benefits that may protect them from occupational health and safety hazards.



From "Tales of a City's Workers: A Profile of Jobs and Health in San Francisco"

Mitigations

Recent regulation of Port-related air pollution emissions, and ongoing City-Port planning activities can serve as the foundation for comprehensive solutions that address the multi-faceted nature of health in West Oakland. While the individual chapters of the report provide a more extensive list of recommended mitigations, here we present some of the more cross-cutting solutions:

1. Future truck route planning should explicitly consider multiple health impacts, including air pollution, noise and vibration during the day and night time. Roadway improvements should be considered to increase safety by lowering speeds, provide traffic calming for residential streets, and create greater buffers between vehicles and pedestrians. Routes should be located to avoid sensitive receivers (e.g., schools and parks), and possibly a future pedestrian-friendly retail corridor. Such planning should provide for increased signage, education, and enforcement of routes. A concerted planning effort should address all aspects of trucking, including routing, parking, idling, and truck driver health and services. Future truck monitoring should be done to determine counts, time-activity patterns, and compliance with regulations. Residents should have a telephone hotline, so that they can play a more active role in Oakland Police's enforcement of truck violations. Leverage planning, education, street improvement, and enforcement activities to create more employment opportunities for the community.
2. Explore the co-benefits of including noise emissions reductions with ongoing air pollution emissions regulations to retrofit and/or replace trucks.

3. Respond to community needs for healthy retail services by creating usable commercial corridor, which would include, for example, a grocery store. Conduct a more detailed retail needs assessment for the area. New developments, including Port growth activities, should contribute to a mandatory economic development fund, which can be used to cultivate a retail industry, small business financing mechanisms to promote local healthy businesses, conduct land use and transportation planning activities, and possibly create land use buffers that separate residents from environmental hazards.
4. New sensitive land use (e.g., residences and schools) should also consider air pollution and noise impacts through filtration and insulation. We note programs like the Oakland Airport Noise Mitigation that funded replacement windows in land use areas most impacted by noise. Such programs may be implemented through local hiring.
5. The Port can play a more active role in reducing West Oakland's high unemployment rate through better outreach and West Oakland-specific local hiring. As the Port grows, it should consider additional ways, including West Oakland-specific philanthropy, in which it can improve the social conditions of West Oakland by reducing crime, improving education (training, internships, and scholarships), and funding local research and implementation of clean technology.
6. The City may consider ways to divert increasing tax revenue through port growth to West-Oakland specific community services.
7. The Port can find ways to improve its operations. Efficiency at the port may translate to better jobs, reduced injury rates, and fewer environmental health impacts. Improving operations includes working with the trucking community to improve driver health, education, and assistance with meeting mandated emissions reductions.

These mitigations are by no means exhaustive, but are meant to stimulate constructive thinking on future solutions that can improve multiple aspects of health as the Port of Oakland continues to grow.

Introduction and Scope

Chapter 1

Introduction

West coast ports play an important role in the movement of goods in the United States. It is estimated that 50% of U.S. goods come in through California's three biggest ports: Los Angeles, Long Beach, and Oakland. Collectively, they handle an estimated \$300 billion a year in trade. Ports also are important to local and regional economies. For example, the Port of Oakland (the 4th largest container seaport in the U.S.) employs 650 people, supports an estimated 14,000 jobs, and generates over \$1.4 billion in business revenue.

These ports and the number of shipments they process are growing at a tremendous rate. The Port of Oakland, the subject of this report, is similar to other west coast ports in that it is faced with the issue of how to modernize and expanding its operations in order to handle the ever increasing international trade. Containerized shipments have been growing on average 6% per year over the past decade.

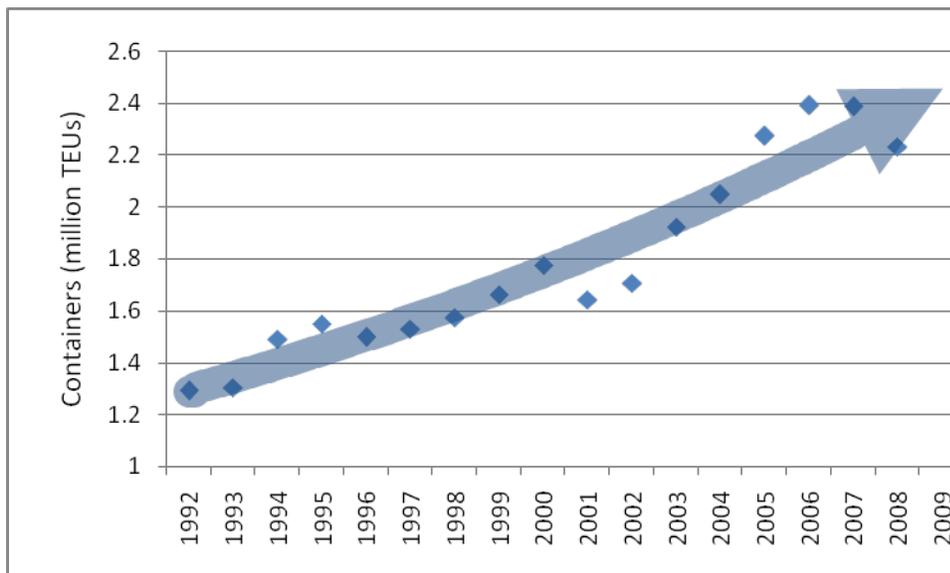


Figure 1. Growth trend for containerized shipments at the Port of Oakland⁴

In response to this growth, the Port has completed numerous planning processes. We reviewed recent environmental impact assessments (EIA) associated with port growth:⁵

- Disposal and Reuse of Fleet and Industrial Supply Center, Oakland (FISCO)
- Vision 2000 Maritime Development

⁴ Data Source: Port of Oakland, 2007

⁵ Wright, G. and Sluka, P. 2007, Needs Assessment for Port Health Impact Assessment – A Review of past Port of Oakland EIRs and key environmental issues and mitigation measures proposed (unpublished data).

- Berths 55-58
- Joint Intermodal Terminal
- Oakland Army Base Area Redevelopment Plan

The analysis of these EIAs revealed a common theme: Port growth may adversely impact the environment and human health if not adequately mitigated. The EIAs often considered air quality, traffic, noise, hazardous waste, and land use – with no health effects analyses. Moreover, numerous mitigations were offered to alleviate the environmental impacts. Yet, most of these mitigations were temporary pilot projects subsidized by the Port of small scope (e.g., retrofitting a limited number of diesel truck engines) that may not continue without external and longer-term planning and funding. Moreover, the mitigations were typically narrow in scope, not recognizing the inter-relationships between health issues. Additionally, in these assessments, it was often difficult to determine the outcome of these mitigations. For instance, were the mitigations actually implemented? Was there any evaluation of the mitigations? Was there any attempt to seek continued funding for mitigations?

Although the EIAs tend to focus on the impacts of air pollution, there has not been much connection between these impacts and broad range of health disparities experienced in the West Oakland community, where the port is located. Yet, an increasing number of studies have begun to shed light on many of the health disparities faced by communities living near ports:

- The report “Paying with our Health: the Real Cost of Freight Transport in California” by the Pacific Institute⁶
- The televised PBS documentary “Unnatural Causes”⁷
- Alameda County Public Health Department research on health and social inequities⁸

The Alameda County Health Department’s report provides some understanding of the magnitude and scope of the problems faced by West Oakland residents. West Oakland faces disparities in both health determinants and outcomes. Compared to a white child in the Oakland Hills, an African American born in West Oakland is:

- 7 times more likely to be born into poverty
- 2 times as likely to live in a home that is rented
- 4 times as likely to have parents with only a high school education or less
- As a toddler, 2.5 times more likely to be behind in vaccinations
- By 4th grade, 4 times less likely to read at grade level
- Live in an environment with 2 times the concentration of liquor stores and more fast food outlets
- As adolescents, 5.6 times more likely to drop out of school and less likely to attend a 4-year college

⁶ The Pacific Institute, 2006, Paying with our Health: the Real Cost of Freight Transport in California.

⁷ <http://www.pbs.org/unnaturalcauses/>

⁸ The Alameda County Public Health Department, 2008, Life and Death from Unnatural Causes: Health and Social Inequity in Alameda County – Executive Summary.

http://www.acphd.org/AXBYCZ/Admin/DataReports/unnatural_causes_exec_summ.pdf

In terms of health the West Oakland resident would be:

- 1.5 times more likely to be born premature or low birth weight
- As adults, 5 times more likely to be hospitalized for diabetes, 2 times as likely to be hospitalized for and to die of heart disease, 3 times more likely to die of stroke, and 2 times as likely to die of cancer
- Live 15 years shorter.

It is unlikely that this broad array of health disparities exist as a result of a singular narrowly defined health pathway.

Health Impact Assessment

Health Impact Assessment (HIA) describes the methods and tools used to inform policy-makers about how policies, plans, programs, or projects can affect health, health behaviors, and social resources necessary for health.^{9 10} Internationally, many countries use HIA to help direct public policy in ways that prevent disease and illness, potentially reducing significant economic costs of health care services. In the United States, public health agencies in diverse cities such as San Francisco, Riverside, Denver, and Minneapolis, and Philadelphia are increasingly investing in strategies to influence the "built environment" to improve population health and reduce health inequities.¹¹ In the United States, HIA has both a role within traditional Environmental Impact Assessment (EIA), as well as, a standalone process. HIA provides a framework for evaluating environmental, social, and economic factors using the lens of human health, to estimate benefits as well as adverse consequences, and consider the distribution or equity of effects.

HIA has not been applied to entire issue of freight transport in the United States. Such an HIA would be difficult, as the complete lifecycle of goods from manufacture, shipment, storage, sale, and would involve identifying and analyzing numerous pathways through which each of these steps might impact health. Yet, the increasing globalization of goods and freight transport motivates increased scrutiny and awareness of how this phenomenon and its growth affect the health of our society.

While the scope of an HIA on the growth of freight transport may be too large, analyses of particular steps in the lifecycle of goods are feasible. A comprehensive assessment of growth the Port of Oakland operations on the health of the West Oakland community is feasible, and is of great concern given the health disparities in this population.

The goal of the Port HIA is to evaluate the cumulative impacts of the port on the health of health of West Oakland residents.

9 Quigley R. Health Impact Assessment. International Best Practice Principles. International Association of Impact Assessment 2006.

10 Cole B, Wilhelm M, Long P, Fielding J, Kominski G. and Morgenstern H. 2004. Prospects for Health Impact Assessment in the United States: New and Improved Environmental Impact Assessment of Something Different? Journal of Health Politics, Policy and Law 29 (6): 1153-1186.

11 National Association of City and County Health Officials (USA).

A broad analysis of the Port of Oakland's health impacts is consistent with recent movement away from narrowly defined health risk assessments to consider cumulative impacts when evaluating Environmental Justice problems at the State and Federal level.^{12,13,14,15} Our HIA acknowledges that the Port and its activities may act through numerous pathways to affect the health and well-being of a community, which may already face numerous challenges with respect to socio-economic and health disparities. This broader cumulative viewpoint is an important distinction from current Health Risk Assessments (HRA) that largely focus on single exposure and outcome pathways (for instance, just focusing on exposure to diesel exhaust and cancer).¹⁶

This HIA was conducted by UC Berkeley Health Impact Group (UCBHIG), which consists of students in the UC Berkeley HIA graduate course with faculty guidance (<http://ehs.sph.berkeley.edu/hia/>). We followed an HIA procedure of screening, scoping, assessment, reporting, and presenting future monitoring needs. In the spring of 2007, UCBHIG developed a preliminary scope of research issues for HIA of Port operations in response to a request from representatives of the West Oakland Environmental Indicators Project and the East Bay Community Law Center's Economic Justice Clinic. UCBHIG considered the gaps in the regulatory environmental assessments of historic expansion projects required under CEQA, and outlined research questions and methods for an HIA of Port of Oakland growth. Based on that review, additional health impacts related to Port operations were identified that could be feasibly considered by students in the class.

The scope of this HIA considers the following issues:

- Air Quality
- Community Noise
- Transportation
- Retail Environment
- Labor

The HIA applies the following methods and strategies for analysis:

- Describing of potential pathways between the Port and health based on of the empirical and scientific literature on the relationships between the built environment and health
- Conducting field visits and observations of the area
- Interviewing key stakeholders and content experts
- Interviewing area residents and business people
- Interpretation, analysis, and mapping of available secondary data

¹² Sharma, D.C. 2006, Ports in a Storm, Environmental Health Perspectives 114(4): A222-A231.

¹³ Trade, Health & Environment Impact Project, "Moving Forward" A conference of health solutions for communities impacted by trade, ports, and goods movement, Carson Community Center, Carson, CA, December 1, 2007.

¹⁴ October 2004 Cal/EPA EJ Action Plan

¹⁵ Risk Assessment Forum, U.S. Environment Protection Agency, 2003, Framework for Cumulative Risk Assessment, EPA/620/P-02/001F, Washington D.C.

¹⁶ California Environmental Protection Agency, Air Resources Board, 2008, Draft – Diesel Particulate Matter Health Risk Assessment for the West Oakland Community.

<http://www.arb.ca.gov/ch/communities/ra/westoakland/documents/draftsummary031908.pdf>

- Collecting environmental data on air quality, noise, and pedestrian environments
- Applying quantitative health effects forecasting tools, where available

At the outset of this HIA, UCBHIG made a commitment through clearly defined principles of collaboration to the West Oakland HIA Working Group – a steering committee made up of West Oakland residents, HIA practitioners, the Alameda County Health Department, and other stakeholders to perform this assessment. It has taken time to edit and refine the student analyses to live up to our commitment to the Working Group.

We ask readers to keep in mind that HIA is a developing practice in the U.S. While substantial evidence supports the pathways analyzed in this report, and good evidence helps us judge the general direction of likely effects, it is not always possible to estimate the magnitude of effects quantitatively or with precision. We have attempted to be cautious to not overstate the certainty and precision of any predictions. We also strive to be comprehensive and balanced in pointing out benefits, potential harms and potential opportunities. We hope that this document contributes to the field of HIA in the U.S.

Overall, HIA is intended to support the consideration of health issues by the public and policy makers. While we do not claim to provide definitive answers to all of the questions raised, we do aim for this HIA to provide useful and constructive framework and perspective to those concerned with decisions that relate to port growth and its broad health impacts on communities.

Air Quality

Chapter 2

Summary

The purpose of this Health Impact Assessment chapter is to evaluate the cumulative health impacts of poor air quality and community noise on the health of West Oakland residents. Port and rail operations, related industrial land use in the area, and traffic within and along the surrounding freeways all contribute cumulatively to potential air quality impacts upon residents of West Oakland. Given the types of sources, local hot spots of pollutions for area sources may exist for particulate matter, nitrogen oxides, carbon monoxide and carcinogens. Exposure to Diesel engine exhaust has long been a community concern, particularly given the predominant use of diesel fuel for off-shore vessels and heavy trucks that frequent the port and industry throughout the neighborhood. There is concern over estimated cancer risks from diesel exhaust¹⁷, as well as over other health effects associated with poor air quality.

Recently, the California Air Resources Board (CARB) completed an emissions inventory and health risk assessment of the diesel PM for the West Oakland Community which accounted for emissions on local streets and cancer and non-cancer health outcomes.¹⁸ This Air Quality Chapter both reviews CARB findings and evaluates cumulative impacts in consideration of area traffic sources of cumulative exposure and population vulnerabilities. This chapter recommends mitigations to limit the growth of exposure expected with port growth.

The analysis aims to answer the following questions:

1. What are the sources and magnitude of cumulative air pollution health impacts in West Oakland?
2. To what extent does port growth impact air pollution health effects in West Oakland?

Recommendations

1. Support the enforcement of ARB's regulation for drayage trucks which is expected to reduce their emissions by approximately 85%.
2. Support the allocation of Proposition 1B funds and evaluation of other funding opportunities for the implementation of ARB's regulation for drayage trucks.

¹⁷ Community Risk Evaluation Program: Phase I Findings and Policy Recommendations Related to Toxic Air Contaminants in the San Francisco Bay Area, 3 (Bay Area Quality Management District, September 2006) ("The highest diesel PM emissions occur in the urban core areas of eastern San Francisco, western Alameda, and northwestern Santa Clara Counties"), *available at*: http://www.baaqmd.gov/CARE/documents/care_p1_findings_recommendations_v2.pdf.

¹⁸ California Environmental Protection Agency, Air Resources Board, Diesel Particulate Matter Health Risk Assessment for the West Oakland Community, 2008. *Available at* <http://www.arb.ca.gov/ch/communities/ra/westoakland/westoakland.htm>

3. Provide and support the relocation of core trucking services on to Port property.
4. Increase enforcement and penalties for trucks on prohibited routes.
5. Limit truck idling within Port terminals to 30 minutes or less.
6. Provide electrified parking spaces to reduce unnecessary idling.
7. Obtain surface street measurements of average count of automobiles and trucks operating through West Oakland major arteries for more accurate noise and air pollution exposure modeling
8. Consider subsidizing indoor air ventilation and filtration in residential units along truck routes and within 500 feet from the I-880 freeway.
9. Initiate long-term land use planning with attention to industrial-residential buffers to reduce industrial sources of emissions from residents,
10. Provide equitable strategies for local businesses to be able to relocate and/or adopt improved air pollution reduction technologies.

Background

Community concerns regarding air pollution from the Port of Oakland have focused largely on the use of diesel engines that are used to power offshore vessels, port equipment, drayage trucks, and trains and the known role of diesel particulate matter (a component of diesel engine exhaust) as a carcinogen.

Diesel exhaust is composed of a mixture of gases and particles such as carbon monoxide, nitrogen compounds, sulfur compounds, and many other toxic and/or carcinogenic compounds like formaldehyde, acetaldehyde, acrolein, and benzene [10, 16]. Approximately 80 – 95% percent of particles in diesel exhaust are less than 1 micron in size making them easily inhaled deeply into lungs [10].

The California Air Resources Board (ARB) has identified diesel engine exhaust as a toxic air contaminant and known carcinogen. Diesel emissions have also been shown to cause coughs, headaches, lightheadedness, and nausea. Acrolein, an air pollutant found in diesel exhaust, has been shown to cause irritation to the eyes, nose, throat and lungs, and thereby can exacerbate asthma symptoms. Diesel particulate matter can therefore have acute short-term impacts and a disproportionate effect on sensitive receptors (such as the elderly, children, people with illnesses, or others who are especially sensitive to the effects of air pollutants). Children are particularly vulnerable to diesel soot because their lungs are still developing and they breathe more air per body weight than adults.¹⁹

¹⁹ *Diesel Pollution Primer: soot formation, emissions, dispersal, and health effects* (Union of Concerned Scientists), available at: http://www.ucsusa.org/clean_vehicles/big_rig_cleanup/life-of-soot-diesel-pollution-emissions-and-health-effects.html.

In addition, diesel particulate matter is one of many sources of particulate matter in the community, including non-diesel motor vehicles in the area which is associated with non-cancer health outcomes, as well. Particulate matter (PM) is a mixture of materials including “smoke, soot, dust, salt, acids, and metals” [15]. Sources of PM include motor vehicles, stoves and fireplaces, dust from construction, landfills and agriculture, wildfires, industry, and windblown dust. Particulate matter of public health concern includes those that can be inhaled deeply into the lungs. These include those of 10 microns in diameter (PM₁₀) and finer particulates such as those 2.5 microns in size (PM_{2.5}). Smaller particles can stay suspended for long periods in the air and contribute both to near-source as well as regional air pollution. Exposure to high levels of air pollution (not just diesel PM) has been associated with many adverse health outcomes, including increased mortality. Fine particulate matter is associated with premature mortality, cardiovascular disease, and asthma.

Motor vehicles emissions contain both diverse particulates as well as ozone precursor compounds such as nitrogen oxides (NO_x). The pollutant NO₂, an important indicator of vehicle traffic, has been associated with numerous adverse health outcomes, however, its effect has been difficult to separate from other air pollutants. Tropospheric ozone is formed in the atmosphere from chemical transformation of nitrogen oxides (NO_x) in the presence of volatile organic compounds (VOC) and sunlight. Ozone, a respiratory irritant, is associated with increased emergency room visits for asthma and impaired development of the lungs.

Table 1. Ambient Air Quality Standards, California and Federal [17]

Pollutant	Averaging Time	Concentration	
		California	Federal
PM ₁₀	24 hr	50 ug/m ³	150 ug/m ³
	annual mean	20 ug/m ³	---
PM _{2.5}	24 hr	---	35 ug/m ³
	annual mean	12 ug/m ³	15 ug/m ³
Carbon Monoxide	8 hr	10 mg/m ³	10 mg/m ³
	1 hr	12 mg/m ³	23 mg/m ³
Nitrogen Dioxide	1 hr	56 ug/m ³	---
	annual mean	338 ug/m ³	100 ug/m ³
Sulfur Dioxide	24 hr	105 ug/m ³	365 ug/m ³
	annual mean	---	80 ug/m ³

There are numerous factors that mediate the relationship between sources of air pollution and exposure to humans, including the number and location of pollutant sources, the emissions rate, resident proximity, wind speed and direction and building ventilation.

Increasing evidence suggests that vulnerability factors can affect the cumulative magnitude of health impacts from exposure to air pollution. Pre-existing disease age, gender, race, socioeconomic status,

healthcare availability, educational attainment, housing characteristics, and genetic differences may affect a population's response to and ability to cope with air pollution health impacts^{20 21}.

The air pollution impacts of maritime ports and the freight transport industry are the subject of growing research and policy debate. The Pacific Institute's report entitled "Paying with Our Health: The Real Cost of Freight Transportation in California", which was produced soon after the state released its Goods Movement Action Plan, describes many of the environmental impacts associated with freight transport.²² It includes an overview of research on the industry's health impacts conducted by the California Air Resources Board (ARB). ARB estimates freight transportation accounts for 30 percent of statewide NOx emissions and 75 percent of diesel PM emissions. Further, the industry is annually responsible for 2,400 premature deaths, 2,830 hospital admissions, 360,000 missed workdays, and 1,100,000 missed school days. The report indicates these health impacts are concentrated in communities that are freight transport hubs, such as those in close proximity to seaports or rail yards. These impacts disproportionately affect lower income and minority populations and are particularly severe for communities in which distribution centers are clustered, and those located near freeways and heavy truck corridors.

The proximity between a community and sources of air pollution, particularly vehicle traffic pollution, is a justifiable cause for concern. Air pollution monitoring research has confirmed that exposure to particulate matter, nitrogen dioxide, and soot is much higher within 200 meters of freeways and other busy urban roadways. Epidemiologic studies have found consistent associations between living in proximity to a busy roadway and respiratory disease symptoms and lung function measures.^{23 24} A recent review by the Health Effects Institute points to a wealth of research that ties traffic-related air pollution to numerous health effects, with the strongest evidence supporting the association between traffic-related air pollution and exacerbation of asthma symptoms.²⁵

For the above reasons, estimating the health impacts of drayage truck emissions has been one of the focuses of port risk assessments. CARB left such an assessment out of its April 2006 risk assessment of the Ports of Los Angeles and Long Beach. However, they estimated the health impacts from off-port

²⁰ C. Arden Pope, Douglas W. Dockery, 2006, Health Effects of Fine Particulate Air Pollution: Lines that Connect, *J. Air & Waste Manage. Assoc.* 56:709–742.

²¹ Anna Makria, Nikolaos I. Stilianakis, 2008, Vulnerability to air pollution health effects, *Int. J. Hyg. Environ.-Health* 211 (2008) 326–336.

²² *Paying with Our Health: the Real Cost of Freight Transport in California*, at 3, The Pacific Institute, November of 2006.

²³ Brauer M, Hoek G, Van Vliet P, Meliefste K, Fischer PH, Wijga A, Koopman LP, Neijens HJ, Gerritsen J, Kerkhof M, Heinrich J, Bellander T, Brunekreef B. Air pollution from traffic and the development of respiratory infections and asthmatic and allergic symptoms in children. *American Journal of Respiratory and Critical Care Medicine.* 2002;166:1092-1098.

²⁴ Mikkelsen J., Effect of vehicular particulate matter on the lung function of asthmatic children in Fresno CA. Unpublished Manuscript.

²⁵ HEI Panel on the Health Effects of Traffic-Related Air Pollution, Special Report 17 – Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects, 2009. Available at <http://pubs.healtheffects.org/view.php?id=306>

drayage truck emissions in a subsequent localized health risk assessment.²⁶ This assessment considered the 70-year potential cancer risk associated with exposures to diesel PM emissions from drayage trucks operating on the I-710 freeway near the ports of Los Angeles and Long Beach. CARB indicated that the resulting analysis was generally applicable to other California freeways near maritime ports. For their analysis they conducted air dispersion modeling to estimate the ambient concentrations of diesel PM as a function of the total diesel truck traffic, speed, and emissions along the I-710 freeway. Standard risk assessment procedures were then used to estimate the potential cancer risks.

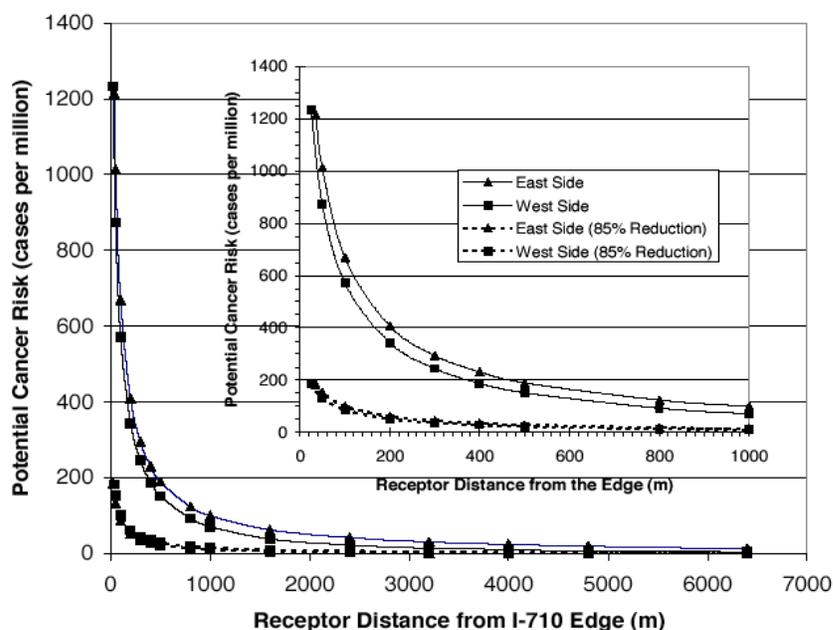


Figure 1. Risk associated with proximity to diesel PM from the CARB I-710 study

CARB's I-710 analysis found that the cancer risk was greater than 500 in a million for areas that parallel and are within 200 meters of the freeway. The risk level decreased with distance from the freeway, falling to below 50 in a million at 2 km from the freeway. The 10 in a million risk level occurred at approximately 4 to 7 km from the freeway. The magnitude of these distances found in the southern California risk assessment suggest that truck traffic on surrounding freeways and truck routes may similarly impact the health of other port community residents.

The Port of Oakland, currently the fourth busiest port in the United States, predicts its ongoing expansion will lead to a substantial influx in business and a concomitant demand on port operations, thereby increasing its environmental and community health impacts.²⁷ For a number of years the Port

²⁶ Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Regulation of Drayage Trucks, Stationary Source Division, Project Assessment Branch, at 6-7, California Environmental Protection Agency, Air Resources Board, October 2007, *available at*: <http://www.arb.ca.gov/regact/2007/drayage07/drayage07.htm>.

²⁷ Port of Oakland website, *available at*: http://www.portofoakland.com/enviro/m/prog_04a.asp, ("Expansion of the Port's Marine Terminals under the VISION 2000 program will increase the number of

has been the focus of scrutiny due to its perceived environmental impact upon the West Oakland Community. The majority of this scrutiny has concerned air quality, and specifically, diesel PM emissions from the drayage trucks that carry containers to and from the port. ARB estimates that approximately 2,800 drayage trucks service the Port of Oakland on average several times a week or more.²⁸ Drayage trucks are almost universally large class 8 trucks that feature more powerful engines required to haul containers. The Port of Oakland moved 2.4 million containers last year, which translates to approximately 10,000 truck trips per day to and from the Port.²⁹ This number is expected to double by the year 2020, according to the port's estimated growth figures.³⁰ Further, over 1,400 truck trips are made each day between the Port and distribution centers located in West Oakland.³¹ It is safe to assume that the number of truck trips in the community will also increase substantially with the Port's expansion.

Assessment of Air Pollution Health Impacts from Port Activities

This analysis of air quality impacts builds on existing exposure assessment and hazard assessment work conducted in the West Oakland community. We document existing assessments including the recent 2008 CARB health risk assessment of diesel-exhaust emissions and then we consider how port-attributable effects may act cumulatively with air pollution impacts other major traffic sources on

trucks, cargo handling equipment, and ships operating at the Port as well as the air emissions produced by these types of vehicles”).

²⁸ Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Regulation of Drayage Trucks, Stationary Source Division, Project Assessment Branch, at 3, California Environmental Protection Agency, Air Resources Board, October 2007, *available at*: <http://www.arb.ca.gov/regact/2007/drayage07/drayage07.htm>.

²⁹ Swati R. Prakash, Program Director at The Pacific Institute, Testimony before the California Assembly Committee on Labor and Employment and Assembly Select Committee on Ports, October 16, 2007, *available at*: www.pacinst.org/publications/testimony/Prakash%20testimony%20Swanson%20hearing.pdf.

³⁰ URS Greiner Woodward Clyde, Berths 55-58 Project — Draft Environmental Impact Report, prepared for Port of Oakland, December 1998.

³¹ Memorandum from Stephen B. Reid, Manager, Emissions Assessment Group, Sonoma Technology, Inc., to Dr. Phil Martien, Manager, Community Air Risk Evaluation Program, Bay Area Air Quality Management District, Documentation of emission estimation techniques for sources of diesel particulate matter (DPM) associated with truck-based businesses and construction projects in West Oakland, July 20, 2007, *available at*: http://www.baaqmd.gov/CARE/care_documents.htm (Of the 52 truck related businesses identified in the survey, we independently determined that 11 were port related distribution centers. According to the survey these distribution centers accounted for 1,436 daily truck trips to and from the port).

mortality impacts. Furthermore, we explore the mediating role of social position on risks and the particular hazards to residents in truck-related occupations.

The framework below reflects our conceptual understanding of how diverse local sources of air pollution contributes to health impacts in West Oakland residents. (Figure 2).

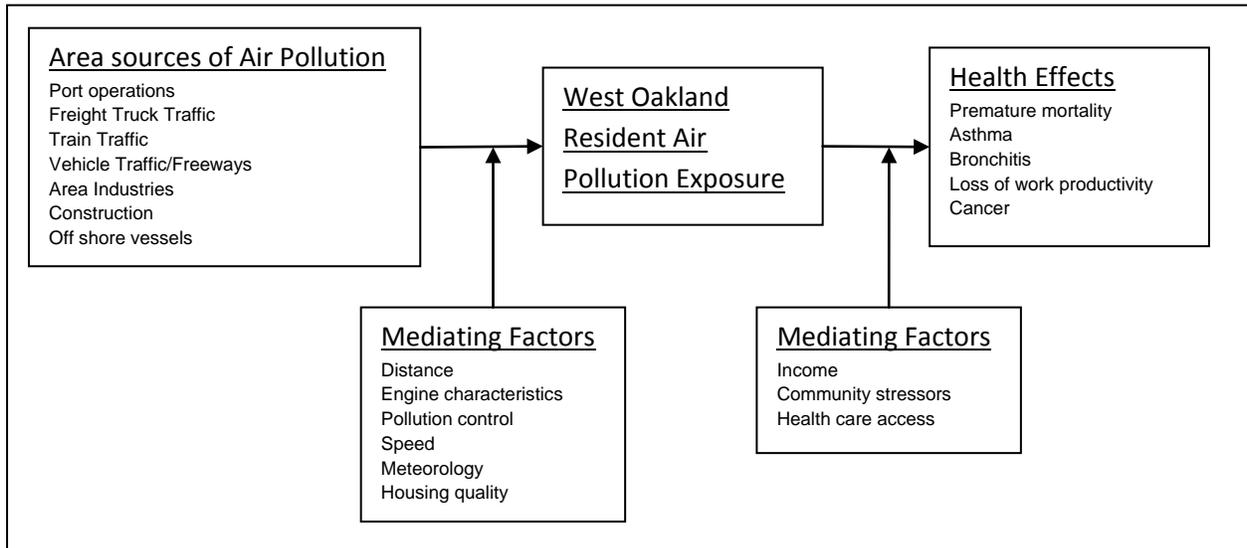


Figure 2. Scoping Pathway for Port-Related Air Pollution on Health Effects in West Oakland

Air pollution-related health outcomes in West Oakland

The life expectancy in West Oakland for the years 2000 to 2003 was 71.6 years, which is 7.3 years lower than Alameda county as a whole. The mortality rate for all causes of death in West Oakland was 1,130 per 100,000 people between 2000 and 2003, which is 50% higher than the Alameda County rate of 756 per 100,000.³² West Oakland children under 15 years of age were seven times more likely to be hospitalized for asthma than the average child in California [19]. Over a third of children and adults surveyed reported having asthma symptoms [18]. Data on lung cancer incidence is not currently available at the neighborhood level for West Oakland.

Perceptions of air pollution in West Oakland

There is a clear perception among community residents that the health of West Oakland residents has suffered from exposure to diesel particulate matter and that their disproportionate health outcomes are related to this exposure. In a recent health survey, the majority of West Oakland residents perceived the air quality in the community as “poor” or “very poor” [18]. Nearly a quarter were concerned with

³² Alameda County Public Health Department, West Oakland

environmental pollution. In a focus group session for this HIA, participants noted the constant cleaning of black soot from their window screens.

Air Pollution Emissions and Concentrations in West Oakland

A number of studies of air pollution have been conducted in West Oakland. The Port of Oakland initiated the West Oakland Particulate Air Quality Monitoring Program in April 1997 that measured PM at a port and a residential site. It should be noted that the residential measurements were made north of West Grand Avenue, and not within the residential neighborhoods in closer proximity to the port and bordering freeways. From 1997 to 2001, both PM₁₀ and PM_{2.5} values were slightly higher at the Port site.³³ PM_{2.5} and PM₁₀ at both sites never exceeded the federal standard, while PM₁₀ exceeded California state standards numerous times.

PM₁₀ Standard Exceedances (from Oakland Army Base FEIR)

Site	1997	1998	1999	2000
Port of Oakland	2	6	14	2
West Oakland	1	1	4	2

The Pacific Institute's diesel emissions inventory study in 2003 found that West Oakland had 11 times the amount of diesel emissions per square mile per year compared with Alameda county overall³⁴ and 95 times that of California (Figure 3).³⁵ Indoor air measurements found higher levels of air pollution as well.

Several environmental impact reports (EIRs)³⁶ on local projects, in particular the Oakland Army Base³⁷, Wood Street³⁸, Oak to Ninth³⁹ and Mandela to Grand⁴⁰ EIRs, have also assessed how construction and their projects would affect traffic air pollution in West Oakland.

CARB 2008 Risk Assessment

As discussed above, the most extensive study of port related air quality impacts was recently completed by CARB in December 2008. CARB conducted a Health Risk Assessment of diesel PM for the West Oakland community including a 3-part emissions inventory (Part I: maritime port-related, Part II: Union Pacific railyard, and Part III: other sources), air pollution dispersion modeling, and assessment of cancer and non-cancer health impacts. The major findings of the risk assessment included:

³³ Pacific-Institute, *Summary of Studies*. 2003, West Oakland Diesel Truck Emissions Reduction Initiative

³⁴ Pacific-Institute, *West Oakland Diesel Emissions Inventory and Air Quality Monitoring Study 2003*. West Oakland Diesel Truck Emissions Reduction Initiative.

³⁵ Pacific-Institute, *Clearing the Air- Reducing Diesel Pollution in West Oakland*. 2003.

³⁶ Pacific-Institute, *Summary of Studies*. 2003, West Oakland Diesel Truck Emissions Reduction Initiative

³⁷ City-of-Oakland-CEDA, *Oakland Army Base Area Redevelopment Plan – Final EIR*. 2002 2005: Oakland.

³⁸ City-of-Oakland-CEDA, *Wood Street Project Final EIR*. Feb 2005: Oakland.

³⁹ City-of-Oakland-CEDA, *Oak to Ninth Avenue Project- Final Environmental Impact Report*. Feb 2006: Oakland.

⁴⁰ City-of-Oakland-CEDA, *Mandela Grand Mixed Use Development Project EIR*, December 2006: Oakland.

1. West Oakland is exposed to diesel PM concentrations that are almost 3 times higher than the background concentrations for the region.
2. Estimated lifetime cancer risks from diesel engine exhaust are about 1,200 excess cancers per 1 million.
3. Non-Port and non-railyard sources are responsible for the majority of this excess risk.
4. Heavy-duty trucks constituted the largest contributor to diesel PM emissions.
5. The diesel PM risks not only affect West Oakland, but a large region of the Bay Area.
6. Regionally (not just West Oakland), it was estimated that diesel PM from the port alone would be responsible for 18 premature deaths, 8 hospital admissions for respiratory and cardiovascular problems, 290 cases of asthma related and other lower respiratory symptoms, and 15,000 minor restricted activity days in the year 2005.
7. Although planned emissions reductions will benefit the community by 2015, there will still be a large excess risk to West Oakland residents, and more action is needed to reduced emissions and their health impacts, particularly in light of continued Port growth.

This analysis had several limitations, four of which were acknowledged by CARB:

1. Uncertainty whether exposure-response functions were valid in this specific context.
2. Uncertainty about the validity of modeling results without available, feasible method to validate with directly measured diesel PM.
3. Limited activity data for the Part III truck inventory, including the lack of any origin-destination truck counts within the West Oakland community.
4. Limited data commercial harbor craft activity.

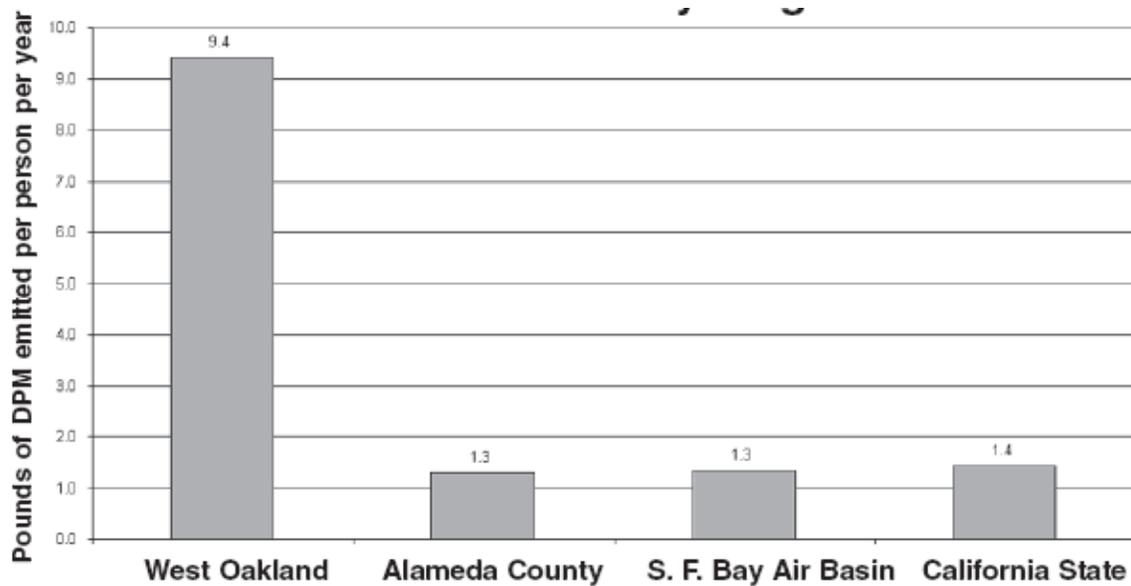


Figure 3: Average Diesel Particulate Emissions per Person by Region⁴¹

⁴¹ Pacific-Institute, *Clearing the Air- Reducing Diesel Pollution in West Oakland*. 2003.

Cumulative impact of roadway air emissions

Diesel exhaust from drayage trucks emissions contributes substantially to air pollutants in West Oakland. Yet even accounting for offshore vessels, port equipment, and trucks, there are other sources of air pollution in the community. Many industrial businesses are located in West Oakland, perhaps in part, due to proximity to the port and the land use zoning in the neighborhood. The railroad industry and trucking companies are clear examples of businesses that are not Port-owned or operated, but are an integral part of freight transport and are closely related to the Port. The large US postal sorting facility and numerous warehouses in the area exemplify industrial land use. Finally, the West Oakland community is surrounded by freeways, which add to local air pollution emissions. Collectively, all of these sources contribute to air pollution in West Oakland and act cumulatively to affect air pollution health impacts.

CARB's risk assessment considers only the impact from port' diesel exhaust sources in their assessment. The port's contribution to the community air pollution needs to be considered cumulatively in addition to other sources, including background regional air pollution concentrations and other non-port sources of diesel and non-diesel emissions. For example, freeways and other industrial land use in the West Oakland area result in considerable emissions. Based on Caltrans freeway traffic data from 2006, annual average daily traffic counts were over 200,000 vehicles per day, and only approximately 10% of these were trucks (I-880 at Oak St).⁴²

Diesel PM is only a fraction of total airborne fine particulate matter (PM_{2.5}). In fact, according to the CARB's EMFAC emissions inventory tool, in Alameda County where West Oakland is located, light duty autos, light and medium duty trucks, buses, and motorcycles all contribute to fine PM_{2.5} emissions. If we assume that on the road in and around West Oakland that collectively there are 9 additional classes of vehicles to every heavy truck (e.g., see Table 2), then CARB's PM_{2.5} emissions for West Oakland may be underestimated by 22%.

Table 2. Major traffic emissions categories

Vehicle class	Grams/veh-mi	Relative Vehicle count	Emissions Contribution
Light duty auto	0.008	7	0.008 x 7 = 0.056 g/mi
Light and medium duty truck/bus	0.070	2	0.070 x 2 = 0.140 g/mi
Heavy duty diesel truck	0.695	1	0.695 x 1 = 0.695 g/mi
Total			0.891 g/mi

EMFAC 2007, Alameda County, calendar year 2005, PM_{2.5}, 35 mph, 70 deg, 50% RH, vehicle model years 1965-2005. (0.08/0.695 = 11.5%) Light and medium duty trucks/buses is the average of the emissions for light duty trucks (T1 and T2), medium duty trucks, light HD trucks (T1 and T2), motorcycles, and buses.

While CARB was unable to assign traffic to freeways and local streets, we used Caltrans data to assign traffic to the freeway and STI emissions inventory cited in the CARB report to assign emissions to local streets. Freeway emissions are important given the prevailing winds, which may disperse particulate

⁴² California Department of Transportation, Traffic Data Branch, Traffic Volumes and Truck Traffic Data for 2006. Available at <http://traffic-counts.dot.ca.gov/>

matter across the community. Emissions on local West Oakland streets are important given the proximity of these emissions to residents. While the freeway emissions are based on actual counts, we had make considerable assumptions on the routing of traffic counts within the community. In most cases we routed the traffic along the truck routes and major arterials. Based on this emissions inventory, we modeled the traffic-attributable concentrations within West Oakland using the CALINE line source dispersion model (Figure 4). CALINE is a Caltrans and EPA-recommended model for assessing traffic-related air pollution exposures. While there is considerable uncertainty, particularly in the emissions on local streets, the model clearly suggests freeways and arterials contribute substantially to elevated fine particulate exposures for West Oakland residents. Moreover, while CARB's assessment did not present West Oakland-specific non-cancer health impacts, our model results suggest that substantial variation exists in fine particulate emissions and concentrations with hot spots and related health impact the health of those that live along the freeway and busy arterials. Our modeling results are consistent with fine particulate monitoring studies downwind of freeways, which led to CARB's land use guidance, which recommended against siting land use for sensitive populations next to busy roadways.⁴³

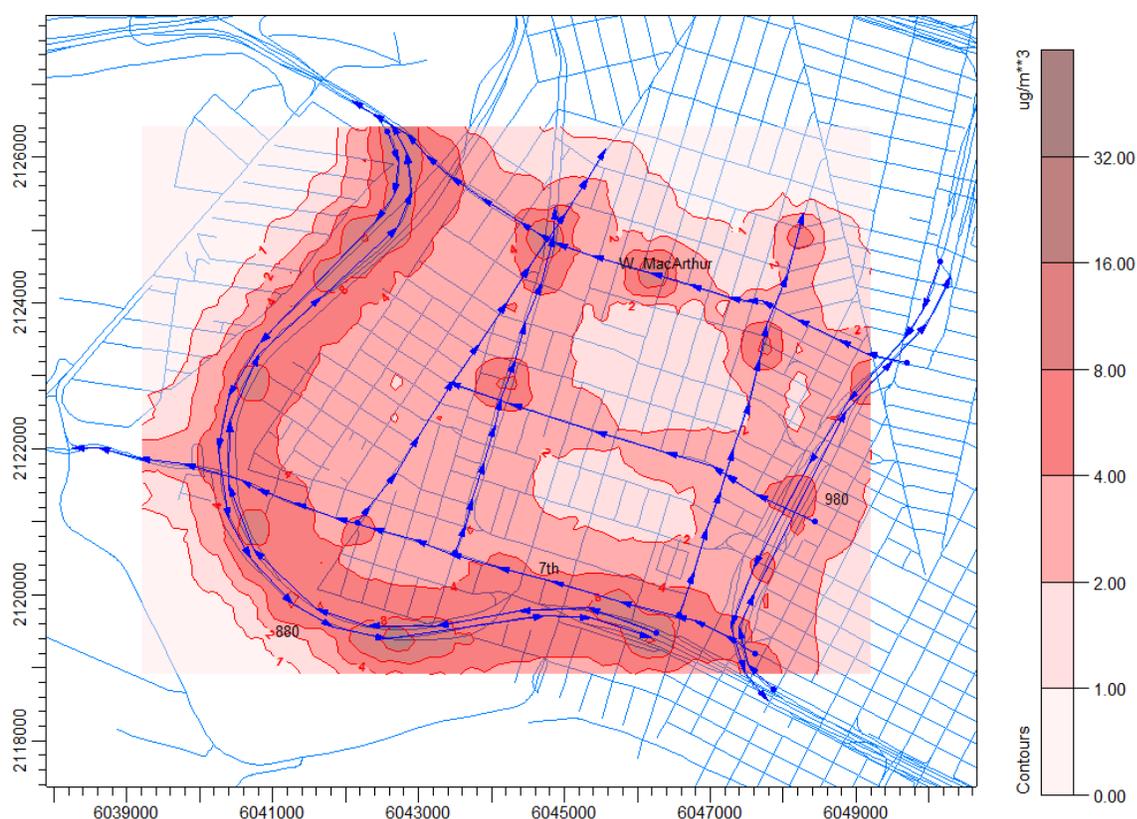


Figure 4. Estimated concentrations according to CAL3QHC dispersion model of PM_{2.5} emissions from estimates of non-port freeway and arterial traffic. (Assuming 4393 vehicles in each direction on 880, 1455 vehicles on 980 in each direction, 1122 vehicles on arterials, with average emissions rate of 0.891 g/veh-mi, modeled roadways are shown with blue arrows)

⁴³ California Environmental Protection Agency, California Air Resources Board, Air Quality and Land Use Handbook: A Community Health Perspective, 2005. Available at <http://www.arb.ca.gov/ch/handbook.pdf>

Particulate matter and other pollutant emissions from vehicles are associated with several non-cancer endpoints and total PM_{2.5} (not just the fraction from diesel engine exhaust). CARB (2002) uses concentration-response functions as shown below to estimate non-cancer health impacts of PM_{2.5} exposure:

$$\Delta y = y_0 (e^{\beta \Delta PM} - 1) \cdot \text{pop}$$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in PM

y_0 = baseline incidence rate per person

β = coefficient

ΔPM = change in PM concentration

pop = population of a particular group that a study considered

We can use CARB's exposure response equation (above) along with estimate PM 2.5 concentrations to illustrate the cumulative contributions of the port and area traffic to health impacts on mortality in West Oakland. For west Oakland the parameters in the concentration-response equation are as follows

y_0 = baseline incidence rate per person (0.00625 for Alameda County)

β = coefficient (0.0046257 for PM_{2.5})

ΔPM = change in PM concentration (see discussion below)

pop = population of a particular group that a study considered (22,000 for West Oakland)

We estimate port-attributable PM_{2.5} concentrations from data published in CARB's risk assessment. In their report, CARB's estimates the 22,000 people in West Oakland are exposed to a population averaged cancer risk level of 1187 per 1 million per 70 year lifetime. This hazard level would correspond to a diesel exhaust concentration of 3.96 $\mu\text{g}/\text{m}^3$ (for instance, $(1187/1,000,000) \times 3 \times 10^{-4}$ risk factor = 3.96). A reasonable assumption is that almost all of the diesel exhaust is in the PM_{2.5} fraction.

From our CALINE model (Figure 4), we see that on average above, street traffic largely adds from 2-4 $\mu\text{g}/\text{m}^3$ concentrations to the community. While exposure depends on residents' proximity to the roadway sources, the added concentrations are roughly equivalent to the port-related concentrations inferred from CARB's assessment.

Using CARB's exposure response function, a port-attributable PM_{2.5} concentration of 3.96 $\mu\text{g}/\text{m}^3$ translates into approximately 2.5 additional deaths per year in West Oakland. Cumulatively, the port and traffic together contribute approximately 5.96 $\mu\text{g}/\text{m}^3$ PM 2.5 ($\Delta PM = 3.96$ (from Port) + 2 (from area traffic) = 5.96 $\mu\text{g}/\text{m}^3$) predicting an attributable mortality of 3.8 deaths per year. This mortality estimate is 52% higher than the level estimated in the CARB assessment.

Consideration of Vulnerable Populations

Concentration-response functions are developed for the general population. However, various characteristics have been shown to influence susceptibility to, and ability to cope with air pollution

health impacts, including pre-existing disease age, gender, race, socioeconomic status, healthcare availability, educational attainment, housing characteristics, and genetic differences^{44 45}. One of the challenges of assessing health impacts for the West Oakland community using population exposure response functions is that the West Oakland population may be more sensitive or vulnerable to health impacts. The community has numerous social and environmental stressors, including poverty exposure to crime, noise, and inadequate access to healthy foods and health care.

We note in particular that CARB's assessment relied upon non-cancer concentration-response relationships from the Pope et al, 2002 study. In fact, the same study provides evidence that disadvantaged populations may be disproportionately affected by air pollution. Based on the American Cancer Society cohort conducted across 50 states, participants were asked a number of factors including education and diet. The risks associated with increased PM_{2.5} exposure for all-cause, cardiopulmonary, lung cancer, and all-other cause mortality were higher when adjusted for less education. For example, the relative risk for all cause mortality was approximately 8% higher among those with less than high school education when compared to those with education beyond high school. Adjusting the CARB concentration-response function for the modifying effects of social position would increase the attributable mortality due to both port-activities and to traffic sources.

⁴⁴ C. Arden Pope, Douglas W. Dockery, 2006, Health Effects of Fine Particulate Air Pollution: Lines that Connect, *J. Air & Waste Manage. Assoc.* 56:709–742.

⁴⁵ Anna Makria, Nikolaos I. Stilianakis, 2008, Vulnerability to air pollution health effects, *Int. J. Hyg. Environ.-Health* 211 (2008) 326–336.

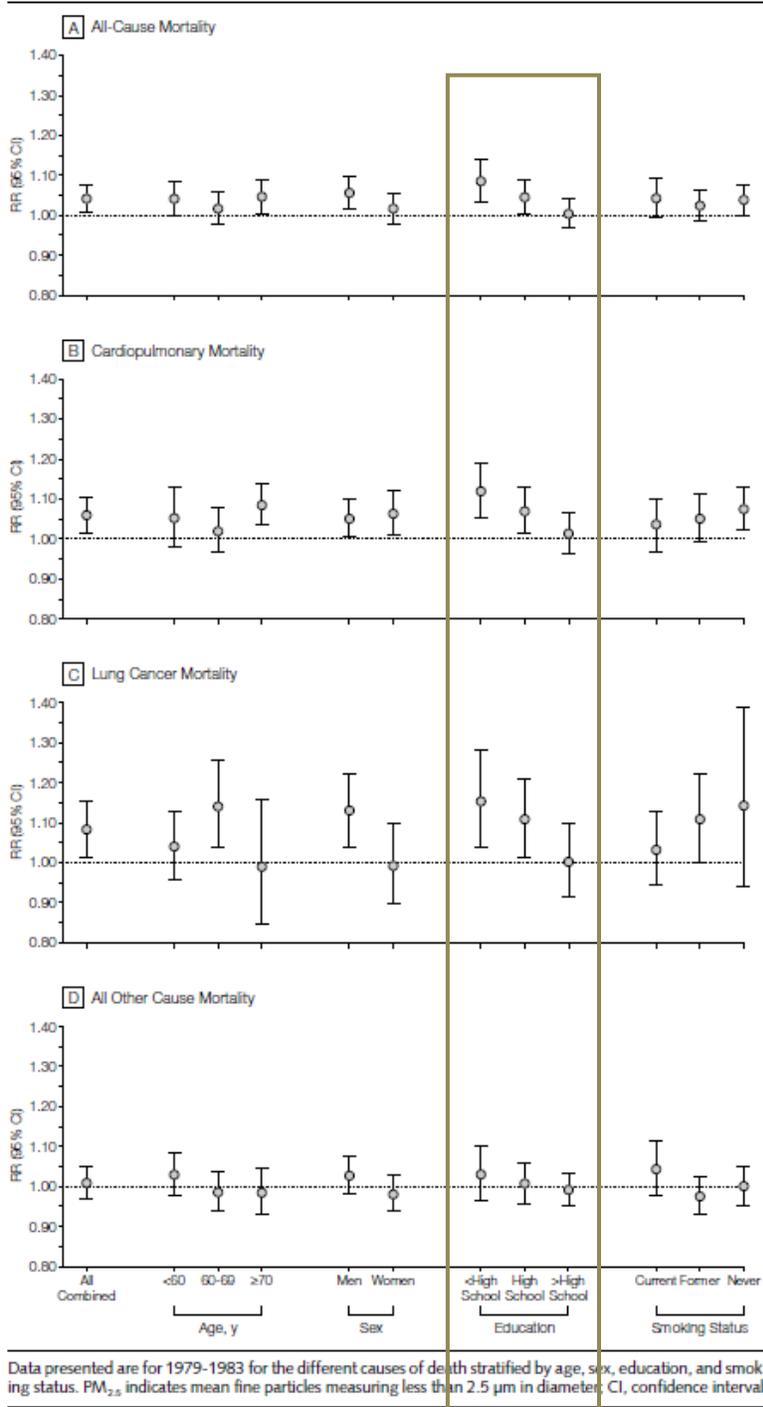


Figure 5. Adjusted mortality relative risks associated with 10 ug/m³ differences in PM_{2.5} concentrations. (From Pope et al., 2002)

Impact on Truck Workers

The exposure-response and concentration-response functions also do not capture occupational risks from port-related activities. If truck emissions constitute the greatest risk burden to the community, it is perhaps truck drivers and diesel equipment operators who bear the biggest burden of exposure to diesel particulates. Indeed, the scientific literature suggests high exposures to diesel exhaust occurs for truck drivers, bridge and tunnel workers, mineworkers, forklift drivers, railroad and dock workers, and garage workers.⁴⁶ Epidemiologic evidence from a study of the Teamsters Union suggests that diesel truck drivers have excess risks for lung cancer death compared to teamsters who did not drive trucks (OR= 1.89, 95% CI 1.04-3.42).⁴⁷ Similarly, a cohort study of over 55,000 railroad workers found excess relative risk for lung cancer that increased with years of exposure to diesel exhaust.⁴⁸ Meta-analyses have found that relative risks for lung cancer associated occupational diesel exhaust exposure to range from 1.35 to 1.47.⁴⁹ There is also some evidence to suggest that occupational exposure to diesel PM may be associated with bladder cancer.⁵⁰

Assuming CARB's assessment of the West Oakland risks are approximately correct with largely 500 in 1 million cancer risk, and odds ratios of the epidemiologic studies described above are based on a control population that has approximately background population exposures and risk, we can estimate the health impact of occupational exposures. For rare health outcomes such as cancers, the odds ratio may approximate the relative risk. For example, based on the meta-analysis described above, and the background rate of lung cancer deaths in Alameda County of 36 deaths per 100,000 in 2006, the risk to diesel exposed truck drivers may be 1.35 to 1.47 higher or 49 to 53 deaths per 100,000. Assuming a population of 2,500 truck drivers work in West Oakland⁵¹ we estimate that between 1 and 2 persons will die of lung cancer from their job driving a truck.

⁴⁶ Howard Frumkin and Michael J. Thun, Diesel Exhaust, *CA Cancer J Clin* 2001; 51:193.

⁴⁷ N K Steenland, D T Silverman and R W Hornung, 1990 Case-control study of lung cancer and truck driving in the Teamsters Union, *American Journal of Public Health*, 80(6), 670-674.

⁴⁸ Garshick E, Schenker MB, Muñoz A, et al. A retrospective cohort study of lung cancer and diesel exhaust exposure in railroad workers. *American Review of Respiratory Disease* 1988;137:820–825.

⁴⁹ Lipsett M, Campleman S. Occupational exposure to diesel exhaust and lung cancer: A meta-analysis. *American Journal of Public Health* 1999;89:1009–1017.

Bhatia R, Lopipero P, Smith AH. Diesel exhaust and lung cancer. *Epidemiology* 1998;9:84–91

⁵⁰ Health Effects Institute. Diesel Exhaust: A Critical Analysis of Emissions, Exposure, and Health Effects. A Special Report of the Institute's Diesel Working Group. Cambridge: Health Effects Institute, April 1995.

⁵¹ Over 150 Oakland Truckers and Residents Rallied to Fix the Broken Port Trucking System

<http://www.workingeastbay.org/article.php?id=349> stating that "About 2,500 port truck drivers in Oakland face sweatshop-like conditions."

Outlook for Air Quality in the context of Port Growth

CARB's report considered the impact of port growth on Port-related diesel PM-related cancer risks for the years 2005-2020. They note decreasing, but still substantial cancer risks (283 per 1 million) in 2020 despite planned reductions in truck emissions. It is important to note that this assessment of cancer risk focused on diesel engine exhaust and other mobile source air toxics (e.g., benzene) were not evaluated.

CARBs future forecasts do not consider changes in non-cancer health impacts. Moreover, substantial expected reductions in truck emissions may not reflect changes for non-diesel heavy truck vehicles. Passenger cars for example are estimated to continue to emit 0.008 grams per vehicle-mile to the year 2020. Moreover, a sizeable proportion of fine PM (20% in 2005 and 44% in 2020 of total vehicle PM_{2.5} emitted based on CARB's emissions database) comes from brake and tire wear. Emissions from brake and tire wear are not estimated to decrease in future years.

Assuming diesel emissions fall by approximately 75% as expected and non-PORT traffic remains stable, we estimate total excess mortality attributable to both the port and area traffic will remain 1.9 deaths per year in 2020 (a 50% reduction in mortality).⁵²

Attributing emissions to Port activities

CARB's emissions inventory for the Port spent considerable time in assessing the so-called Parts I, II, and III corresponding to different sources of diesel PM emissions. From the standpoint of community exposures, ultimately it is the cumulative risk estimates that matter (risks from part I + II + III). Moreover, it is the totality of port operations, railyard, as well as private truck companies and port-related businesses that need a comprehensive plan for emission reductions, rather than, for example, a plan that just targets the port, but not private trucking.

In public meetings on the CARB assessment, community stakeholders frequently expressed concerns over the accounting of the emissions inventory. Some felt it was misleading and inappropriate that the Part I port operations inventory only accounted for trucks insofar as their travel from the Port to the freeway onramp. The argument was that once they reach the freeway, these trucks do not suddenly become Part III non-port related.

Indeed, if we consider the bigger picture of freight transport generally, and the variety of businesses that are neither owned nor operated by the port, but yet contribute to the transport, processing, storage, and servicing of shipped goods, and/or cater to the workers of this industry, then in fact there are much of industry within West Oakland is arguably Port-related. For example, the US postal sorting facility on 7th street contributes over 1000 trucks counts per day based on STI's assessment. Oakland Maritime Support Services also contributes over 1000 truck counts per day. Would these businesses be

⁵² Using $(283/1,000,000) \times 3 \times 10^{-4}$ risk factor = $0.94 \mu\text{g}/\text{m}^3$ the concentration-response functions estimate 0.61 deaths per year in 2020 due to the port (or roughly 2 deaths every 3 years). Making a conservative assumption that non-Port traffic will not increase into 2020 and emissions for non-heavy diesel trucks will not be reduced, such that the concentrations attributable to freeway and traffic remain the same, the number of deaths attributable to both the port and area traffic is 1.9 deaths per year in 2020, or only a 50% reduction in mortality.

located in West Oakland if it were not for the presence of the Port of Oakland and general industrial land use zoning of the area?

Mitigations and Regulations to Reduce Diesel Truck PM Emissions

There have been many proposed mitigations to reduce diesel PM emissions associated with Port related truck traffic, all of which would presumably ameliorate, to varying degrees, the health impacts on West Oakland. Certain mitigation measures appear both justified and feasible. For example, the Pacific Institute recommends providing truck services, such as fueling, repair, and food and beverages at the Port in order to reduce reasons for trucks to enter the neighborhood.⁵³ Our own observations and conversations with truck drivers emphasized the need for basic services such as bathrooms and areas in which to sit while waiting between runs. The only ‘services’ that we observed were a few roadside vendors parked within the Port. Although it would be ideal to have a greater proportion of truck businesses located on Port property, even the provision of basic services would likely reduce truck trips through West Oakland at a nominal cost to the Port. Finally, where feasible, supporting the relocation of trucking services from West Oakland to Port property would enable the City to rezone properties within the neighborhood to exclude such uses as truck repair and fueling stations.⁵⁴

However, other mitigation measures, although clearly necessary, may be more difficult to implement. The main problem with port-related trucking is the trucks themselves. As a result of trucking deregulation in the early 1980s, legitimate trucking companies now face steep competition from firms that rely on independent owner operators driving old, polluting, often unsafe trucks with inadequate insurance. Although many commentators have recommended providing financial incentives to replace older trucks, California state government efforts to reduce diesel PM emissions through voluntary programs, i.e., the Carl Moyer Program, that provide grants for private owners to replace or rebuild high-polluting diesel engines suffer from a chronic lack of adequate funding.⁵⁵ Moreover, the “spotty experience” of the Port and BAAQMD with the Carl Moyer Program demonstrates that many truck owner operators live on such thin economic margins that they cannot afford to lose a few days income while their trucks are being upgraded free of charge.⁵⁶ Perhaps in recognition of the government’s limited capacity, the Goods Movement Action Plan puts the onus for change on industry; it recommends

⁵³ Clearing the Air: Reducing Diesel Pollution in West Oakland, A West Oakland Environmental Indicators Project Report by the Pacific Institute, at 8, November 2003.

⁵⁴ Clearing the Air: Reducing Diesel Pollution in West Oakland, A West Oakland Environmental Indicators Project Report by the Pacific Institute, at 7, November 2003.

⁵⁵ *Sick of Soot: Reducing the Health Impacts of Diesel Pollution in California*, xiv (Union of Concerned Scientists), available at: http://www.ucsusa.org/assets/documents/clean_vehicles/executive_summary.pdf.

⁵⁶ Swati R. Prakash, Program Director at The Pacific Institute, Testimony before the California Assembly Committee on Labor and Employment and Assembly Select Committee on Ports, October 16, 2007, available at: www.pacinst.org/publications/testimony/Prakash%20testimony%20Swanson%20hearing.pdf.

that industry participate in innovative financing and leasing arrangements to facilitate independent operators upgrading their equipment.⁵⁷

The latest CARB Health Risk Assessment, however, changes this stance, stating that emission reductions is a challenging task and depends on collective and innovative efforts at the community, local, State, federal and international levels... and that a variety of strategies are needed including regulatory efforts, voluntary and incentive programs, careful land-use decisions, and cooperative agreements. Moreover, there is a call to leverage Proposition 1B Goods Movement Emissions Reduction Program funds to accelerate PM emissions reductions. Finally, the assessment recommends implementing Infrastructure Cargo Fees, as done for the Ports of Los Angeles and Long Beach, specifically to help fund air quality improvements.

The Port of Oakland has had some limited success where it has entirely funded truck replacement. As a result of a settlement agreement, the Port of Oakland has been financing replacement of older trucks for the past two years. In April of 1999, the Port of Oakland settled with West Oakland Neighbors (WON) after WON challenged the adequacy of the Port's EIR concerning one aspect of its Vision 2000 plan, the development of new shipping berths.⁵⁸ Under the settlement agreement the Port committed \$8.975 million to fund ten air quality mitigation measures. Subsequently, three mitigation measures were abandoned due to infeasibility, and three others were completed. Of the four ongoing mitigations, one involves the replacement of older diesel trucks and/or engines.

The Port agreed to subsidize the retrofitting of diesel truck engines with cleaner burning models that satisfy California's emissions standards for new diesel engines or add-on exhaust treatment devices, including soot traps and catalytic converters. Since October of 2005, when the Port launched the program, 32 older, heavy-duty trucks have been scrapped and replaced with model 2000 or newer trucks. The Port has allocated an additional \$1.5 million to the truck replacement program.

Although the Port's truck replacement program is a small step in the right direction for West Oakland, new drayage truck regulations adopted in 2009 aim to reduce emissions and public exposure to diesel particulate matter (diesel PM), oxides of nitrogen (NOx), and other air contaminants through strict emission standards for in-use, heavy-duty diesel-fueled vehicles that transport cargo to and from California's ports and intermodal rail facilities.⁵⁹ These regulations which establish deadlines for updating engines and/or emissions control systems. Drayage trucks operating at California's ports and railyard facilities must be registered with CARB, and will be subject to field inspection. These changes are expected to produce an 85 percent PM emission reduction

⁵⁷ Goods Movement Action Plan, Prepared by Business, Transportation and Housing Agency and California Environmental Protection Agency, at V-15, January 27, 2005, *available at*: <http://www.arb.ca.gov/gmp/gmp.htm>.

⁵⁸ Summary Report to West Oakland Neighbors Vision 2000 Air Quality Mitigation Program, December 2006, *available at*: <http://www.portofoakland.com/envirom/publicat.asp>.

⁵⁹ Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed Regulation of Drayage Trucks, Stationary Source Division, Project Assessment Branch, at ES-2, California Environmental Protection Agency, Air Resources Board, October 2007, *available at*: <http://www.arb.ca.gov/regact/2007/drayage07/drayage07.htm>.

Additionally, promising mitigations measures were committed to in the Final Environmental Impact Report (FIER) for the Oakland Army Base Area Redevelopment Plan of July 2002. First, the City and Port committed to jointly funding and working together to create a truck management plan with the goal of reducing port-related truck traffic on local streets. This resulted in the Maritime Comprehensive Truck Management Program, adopted in June 16, 2009, which aims to address a number of truck issues, including supporting the State's emissions reduction regulations, improving safety, traffic and congestion, and operations. At its core are a truck registry program, enforcement of the new truck emissions regulations, participation in truck traffic and parking studies, improving operations at the gates (reducing idling, providing restrooms, and treating drivers with respect), improving stakeholder involvement and education, and providing business and workforce assistance. The plan describes partnership with the Bay Area Air Quality Management District to provide grants to retrofit and/or replace trucks to meet emissions regulations.

The plan also acknowledges that there is still much work to do, including participation in studies of truck traffic management to improve safety, minimizing wait times, and addressing illegal truck parking. Increasing parking penalties, reinvesting money from citations into truck-related facilities, improving signage, identifying enforcement trouble hotspots, finding new enforcement mechanisms, better coordination between the Port and the City on enforcement issues, and education are all mentioned as occurring over the next few years. While the Port has already funded two City enforcement officers, given ongoing enforcement needs, and the ambitious nature of the Truck Management Plan, additional resources may be needed, and the plan and its efficacy will need to be evaluated.

We have shown in our assessment that area traffic raises additional concern over the cumulative impacts of particulate emissions in and around West Oakland, and that in addition to substantial cancer risks in future projections to the year 2020, there are also considerable non-cancer health impacts that can be projected for the future. Moreover, these cumulative impacts are not just driven by the presence of the port, but by area traffic and industry. As stated by CARB, mitigation emission reductions require collective and innovative efforts at various government and community levels. We add to this, that a longer-term vision is required to reduce emissions in and around West Oakland, including equitable strategies for business and industries that emit air pollution to reduce their emissions and/or distance themselves from the residents of the community. This may involve longer range land use planning to create these buffer distances. In the case of traffic on the freeways, which contributes significant to the health impacts of West Oakland, it may be difficult to impossible to relocate the traffic, however, there can be a concerted effort to reduce vehicle counts and/or emissions generally in the Bay Area. A greater focus by regional transportation agencies on environmental justice impacts and mitigations on the West Oakland community should be considered. Included in this should be greater accounting of traffic within the community, which was by and large missing from the CARB assessment, and subject to uncertainty in our HIA.

Conclusions and Recommendations

CARB's risk assessment for diesel PM from Port Activities quantified considerable cancer risks to residents of West Oakland. Because CARB's assessment focuses only on diesel PM rather than all sources of PM, they likely underestimate non-cancer and cumulative air pollution health impacts for the community. This assessment shows considerable additional health hazards due to traffic along the

freeways and local streets. These risks will remain sizeable due to continued growth of port activities even in the face of planned mitigations. This HIA estimates that excess air pollution mortality will be only reduced by 50% by 2020 despite planned truck emissions reductions. Additional effective and verifiable mitigations to comprehensively reduce port emissions are needed. Given the confluence of freeways, railroad traffic, and heavy duty truck traffic and industrial land use, an air pollution risk reduction plans should a more comprehensive approach that include review of land use as well as transportation sources.

Our HIA identifies that research is needed to better quantify the inventory and activity of local truck traffic. There is also a need to consider concentration-response functions that better acknowledge the potential for community stressors and preexisting vulnerability to exacerbate health effects. Finally, health assessment could give greater consideration to occupational health impacts of those who work with diesel-operated machinery, such as truck drivers.

Recommendations

1. Support the enforcement of ARB's regulation for drayage trucks which is expected to reduce their emissions by approximately 85%.
2. Support the allocation of Proposition 1B funds and evaluation of other funding opportunities for the implementation of ARB's regulation for drayage trucks.
3. Provide and support the relocation of core trucking services on to Port property.
4. Increase enforcement and penalties for trucks on prohibited routes.
5. Limit truck idling within Port terminals to 30 minutes or less.
6. Provide electrified parking spaces to reduce unnecessary idling.
7. Obtain surface street measurements of average count of automobiles and trucks operating through West Oakland major arteries for more accurate noise and air pollution exposure modeling
8. Consider subsidizing indoor air ventilation and filtration in residential units along truck routes and within 500 feet from the I-880 freeway.
9. Initiate long-term land use planning with attention to industrial-residential buffers to reduce industrial sources of emissions from residents,
10. Provide equitable strategies for local businesses to be able to relocate and/or adopt improved air pollution reduction technologies.

Community Noise

Chapter 3

Summary

Noise exposures contribute cumulatively to health impacts on vulnerable residents exposed to multiple environmental stressors, including exposure to air pollution. Noise and air pollution also share emission sources, including heavy duty trucks, passenger vehicles, rail locomotives, and proximate industrial land uses. Community noise is related to a number of health impacts, including annoyance, sleep interference, hypertension, myocardial infarction, and impaired childhood learning.

The purpose of this Health Impact Assessment chapter is to evaluate the cumulative health impacts of community noise on the health of West Oakland residents. We set out to answer the following questions:

3. What are the cumulative sources and health impacts of noise in West Oakland?
4. How are these health impacts likely to change as a result of port growth?

Estimating existing noise exposures from transportation sources, the majority of West Oakland residents are exposed to ambient noise levels of 75 dB Ldn. Based on these exposures and established noise-health relationships, we estimated that currently greater than one in three residents are likely to be highly annoyed by noise, which has considerable bearing on stress and its associated health impacts. Focus group participants identified traffic and police helicopters as an additional source of noise annoyance for West Oakland. Also, we estimate that currently 8 myocardial infarction deaths (15% of all myocardial infarction deaths) per year may be associated with noise exposure. Approximately one third of residents may be at risk of sleep disturbance. Moreover, in terms of cognitive impairment, we estimate that West Oakland residents current experience a 29% impairment in recall and reading and a 4% impairment in recognition and attention over standard 60 dB residential land use, which may have considerable consequences on the cognitive development of children in this community. Exposures their health impacts are expected to increase with port growth.

Recommendations

1. A follow-up study should be implemented to test indoor residential and public building noise levels focusing on areas implicated by outdoor noise level data of 60dBA and above. A noise mitigation strategy – either at the sources and/ or the building should be developed to mitigate impacts on occupants experiencing average indoor levels above 45 dBA. Like the Oakland Airport Noise mitigation that funded replacement windows, consider the feasibility for retrofitting old homes that are disproportionately impacted by traffic noise with improved noise insulation.
2. Given the potential impacts of elevated noise on cognitive impairment, a more detailed noise assessment of schools and childcare facilities in the community is warranted.

3. Traffic noise should not be allowed to exceed city ordinances for commercial and industrial noise; this should be a noise mitigation goal which will require increased enforcement.
4. Improvements to truck air pollution emissions should also consider simultaneous testing and mitigation of excessive noise. DMV vehicle noise standards for post-1986 large trucks - 80dBA - should be mandated for all trucks operating to and from the Port of Oakland regardless of year of manufacture. Moreover, this standard should be evaluated in the context of environmental justice issues, and the confluence of truck traffic in communities such as West Oakland.
5. Other transportation options should be analyzed to minimize the use of trucks for cargo pickup and delivery. The amount of cargo being moved to SFO should be assessed to determine feasibility of water transport to and from this location, as well as any other locations in serviceable by water transport in the delta.
6. Traffic and police helicopter noise should be further investigated to determine any mitigation opportunities such as higher flights, fewer simultaneous flights, or restricted flight patterns.
7. Future truck route planning should explicitly consider noise and vibration impacts on the community, and particularly daytime versus nighttime impacts, which affect different aspects of health.

Background

The Pacific Institute's report "Paying with Our Health: The Real Cost of Freight Transportation in California" describes many of the problems associated with the modern freight transport industry.⁶⁰ While the report focuses on air quality impacts, it also mentions the potential health impacts from the noise of trucks, trains and airplanes that are involved in freight transport. Community noise is associated with a variety of health impacts, including increased annoyance and stress, increased risk of heart attacks, and effects children's mental health, reading comprehension, and school performance⁶¹. Noise can also cause sleep disturbances, which result in reduced productivity and work and school. Moreover, noise may disproportionately impacts the health of lower income and minority populations, which, as mentioned in the report, make up the communities near ports, distribution centers, and freeways and heavy truck corridors. Yet, there has not been a comprehensive assessment of noise health impacts for the Port of Oakland.

⁶⁰ *Paying with Our Health: the Real Cost of Freight Transport in California*, The Pacific Institute, November of 2006.

⁶¹ Stansfeld SA, Matheson MP: Noise Pollution: non-auditory effects on health. *British Medical Bulletin* 2003, 68:243-257.

Shield BM, Dockrell JE: The effects of noise on children at school: a review. *Journal of Building Acoustics* 2003, 10(2):97-106.

Passchier-Vermeer W, Passchier WF: Noise exposure and public health. *Environ Health Perspect* 2000, 108 Suppl 1:123-131.

Noise Annoyance

The most widely studied effect of environmental noise is subjective reports of annoyance⁶². A definition of annoyance is “a feeling of displeasure associated with any agent or condition known or believed by an individual or a group to be adversely affecting them”.^{63 64} Annoyance to noise may stem from many emotions, including anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, or exhaustion^{65 66 67}, though the degree to which noise results in annoyance may depend on the temporal pattern of noise (e.g., is it noisy in the middle of the night?), fear or other attitudes towards noise (e.g., gun shots in my neighborhood), and possibly whether the noise is associated with other environmental stressors (e.g., trucks, vibration, and air pollution).

Recent reports have estimated that 22% of the European population is annoyed or highly annoyed by noise (EC noise green paper) and as much as 17% of the population of San Francisco may be highly annoyed by traffic noise. The World Health Organization recommends 55 dB LAeq (16 hours) measured outdoor as the threshold value for serious annoyance.

Sleep Disturbance

Noise can make it difficult to fall asleep and maintain sleep. Noise-induced sleep disturbance may be manifested through awakenings, sleep state changes, delay falling asleep, and premature final awakening. While individual sleep needs vary, most healthy adults require 8 hours of sleep each night.⁶⁸ Lack of sleep may result in numerous downstream health impacts, including daytime sleepiness, fatigue, impaired endocrine and immune system, and psychological effects (deterioration of performance, reduced attention and motivation, diminishment of mental concentration and intellectual capacity).

⁶² Passchier-Vermeer W, Passchier WF: Noise exposure and public health. *Environ Health Perspect* 2000, 108 Suppl 1:123-131.

⁶³ Lindvall, T. and Radford, TP. (1973) Measurement of annoyance due to exposure to environmental factors. *Environ. Res.*, 6, 1–36.

⁶⁴ Koelega, 1987 In: H. Koelega, Editor, *Environmental annoyance: characterization, measurement, and control*, Elsevier, Amsterdam (1987).

⁶⁵ Job, R.F.S. (1993) The role of psychological factors in community reaction to noise. In *Noise as a Public Health Problem*, Vol. 3, pp. 47-79. Vallet, M. (ed.) INRETS: Arcueil Cedex, France

⁶⁶ J. M. Fields, R. de Jong, A. L. Brown, I. H. Flindell, T. Gjestland, R. F. S. Job, S. Kurra, P. Lercher, A. Schuemer-Kohrs, M. Vallet, T. Yano, GUIDELINES FOR REPORTING CORE INFORMATION FROM COMMUNITY NOISE REACTION SURVEYS, *Journal of Sound and Vibration*, Volume 206, Issue 5, 9 October 1997, Pages 685-695,

⁶⁷ COMMUNITY RESPONSE TO NOISE TEAM OF IC BEN (The International Commission on the Biological Effects of Noise), J. M. FIELDS, R. G. DE JONG, T. GJESTLAND, I. H. FLINDELL, R. F. S. JOB, S. KURRA, P. LERCHER, M. VALLET, T. YANO, RESEARCH TEAM AT RUHR UNIVERSITY, R. GUSKI, U. FELSCHER-SUHR, R. SCHUMER, STANDARDIZED GENERAL-PURPOSE NOISE REACTION QUESTIONS FOR COMMUNITY NOISE SURVEYS: RESEARCH AND A RECOMMENDATION, *Journal of Sound and Vibration*, Volume 242, Issue 4, 10 May 2001, Pages 641-679

⁶⁸ Van Dongen, HPA, Dingens, DF. Circadian rhythms in fatigue, alertness and performance. In MH Kryger, T Roth & WC Dement (eds.) *Principles and practice of sleep medicine* (3 rd ed.). WB Saunders, Philadelphia, 2000, P:391-399.

Sleep disorders have an impact on quality of life and on professional and personal behavior, education, absenteeism, risk of motor vehicle, work and domestic accidents.⁶⁹

Nighttime noise levels (L_{night}) have been related to sleep disturbance. The WHO Community noise guidelines recommend 30 dB LAeq (8 hours) indoor and 45 dB LAeq (8 hours) outdoor as the threshold value for sleep disturbance.

Cardiovascular impacts

Studies have shown increasing evidence for the association between community noise and ischemic heart disease.⁷⁰ There is also limited evidence for the association between community noise and hypertension. The biological pathway between noise and cardiovascular disease is based on noise-induced stress, and the triggering of hormones such as cortisol, noradrenaline, and adrenaline, which in turn may affect hypertension, blood lipids, and blood glucose, which are risk factors for cardiovascular disease. Long term exposure to environmental noise may therefore affect these risk factors. Given that air pollution also results in cardiovascular health impacts, there is currently great research interest in the cumulative impacts of air pollution and noise on heart disease.

Cognitive Impairment

Recent studies have assessed the relationship between noise and cognitive impairment on for different levels: reading, recall, recognition, and attention – all of which show consistent relationships with noise exposure⁷¹. Generally the impacts of noise on reading and recall are greater than those for attention and recognition. There is a hypothesis that chronic noise exposure can affect the cognitive development of children, and that this impairment will hamper the later learning ability and quality of life. However, most noise-induced cognitive impairment is not permanent, and thus it is unclear whether cognitive impairment results in long term disability.

Meta-analysis of epidemiologic studies has produced exposure-effect curves. For instance, the studies on recall and reading produce slopes of approximately 2% impairment per dB. Studies on recognition and attention produce slopes of approximately 0.25% impairment per dB.

⁶⁹ WHO Regional Office for Europe, Quantifying burden of disease from environmental noise: Second technical meeting report, Bern, Switzerland, 15 – 16 December 2005

⁷⁰ Babisch, W., Transportation Noise and Cardiovascular Risk Review and Synthesis of Epidemiological Studies Dose-effect Curve and Risk Estimation, Federal Environmental Agency, UMWELTBUNDESAMT, 2006.

⁷¹ Stansfeld SA, Berglund B, Clark C, Lopez-Barrio I, Fischer P, Ohrstrom E, Haines MM, Head J, Hygge S, van Kamp I, Berry BF: Aircraft and road traffic noise and children's cognition and health: a cross-national study. *Lancet* 2005, 365:1942-1949.

Mitigating factors for Noise

Noise levels decrease with distance, and can be mitigated via traffic management as well as with noise barriers (e.g., sound walls between roadways and housing). Improved housing with better insulated walls and windows may also help to mitigate exposures. Noise-related health effects often depend upon the intensity of noise, its temporal variation, frequency range, the perceived threat or lack of control associated with the noise, whether other stressors are present, and the degree which populations can adapt to the noise.⁷² Duration of residence in an area of high noise may also modify chronic health impacts.

Noise can have varying impacts on people of different income levels. European studies have documented higher noise exposures among low income populations.⁷³ Yet those that are more affluent may be more likely to complain about environmental noise.⁷⁴ Studies suggest that noise is just one of many physical and psychosocial stressors that work together to affect the socioemotional development of children living in poverty [34].

To better appreciate the impacts of noise on community residents, the following Table 1 from the World Health Organization (WHO) and London Health Commission provides some general guidelines regarding noise levels found in particular environments, and the health effects that may be relevant should these sound levels be exceeded. For comparison, Table 2 includes noise levels associated with common nuisances.

Table 1. Typical sound levels found in different environments and some relevant health effects if sound levels are exceeded.

Environment	Health effect	Sound level (dBA)	Time hours
Outdoor living areas	Annoyance	40 - 55	16
Indoor dwellings	Speech intelligibility	35	16
Bedrooms	Sleep disturbance	30 - 60	8

⁷² Stansfeld SA, Matheson MP: Noise Pollution: non-auditory effects on health. *British Medical Bulletin* 2003, 68:243-257.

Miedema HME, Vos H: Demographic and attitudinal factors that modify annoyance from transportation noise. *Journal of the Acoustical Society of America* 1999, 105:3336-3344.

Guski R: Personal and social variables as co-determinants of noise annoyance. *Noise Health* 1999, 1(3):45-56.

Job RFS: The influence of subjective reactions to noise on health effects of the noise. *Environment International* 1996, 22(1):93-104.

⁷³ Kohlhuber M, Mielck A, Weiland SK, Bolte G: Social inequality in perceived environmental exposures in relation to housing conditions in Germany. *Environmental research* 2006, 101(2):246-255.

⁷⁴ Whitfield A: Assessment of noise annoyance in three distinct communities living in close proximity to a UK regional airport. *International journal of environmental health research* 2003, 13(4):361-372.

School classrooms	Disturbance of communication	35	During class
Industrial, commercial and traffic areas	Hearing impairment, school performance, ischaemic heart disease	70	24

Table 2: Range of Human Hearing

Noise Source	Noise Level (dBA)
Jet takeoff (at 200 feet)	120-130
Fire engine siren (100ft), near stage at rock concert, table saw	110-120
Passing train (at platform)	100-110
Pile driver, jackhammer (at 50ft), airliner (under flight path)	90-100
Freeway traffic (110ft), passing truck, vacuum cleaner	80-90
Passing bus (on sidewalk), street traffic (100ft)	70-80
Dishwasher, AC unit, passing car (on sidewalk)	60-70
Normal conversation, light auto traffic (100ft), office setting	50-60
Typical living room, background music	40-50
In library or in bedroom at night, soft whisper	30-40
Rustling leaves	20-30
Human breathing	10-20

The City of Oakland and the State of California have regulations regarding permissible noise levels generated by industry and traffic. Noise issues relevant to proposed projects are addressed in Title 24 of the California Code of Regulations, the Noise Element of the City of Oakland's General Plan, and Oakland Noise Ordinance Standards. These are well-described in the Mandela Grand EIR.

The following table was taken from the December 6 2006 Mandela Bay EIR:

**TABLE IV.D-2
MAXIMUM ALLOWABLE RECEIVING NOISE STANDARDS FOR SPECIFIED LAND USES, dBA**

Receiving Land Use	Cumulative Number of Minutes in One-Hour Time Period ^a	Maximum Allowable Noise Level Standards (dBA)	
		Daytime 7:00 a.m. to 10:00 p.m.	Nighttime 10:00 p.m. to 7:00 a.m.
Residential, School, Child Care, Health Care, or Nursing Home, and Public Open Space	20 10 5 1 0	60 65 70 75 80	45 50 55 60 65
Anytime			
Commercial	20 10 5 1 0		65 70 75 80 85
Anytime			
Manufacturing, Mining, and Quarrying	20 10 5 1 0		70 75 80 85 90

^a The concept of "20 minutes in an hour" is equivalent to the L_{33,3}, which is a noise descriptor identifying the noise level exceeded one-third (33.3 percent) of the time. Likewise, "10 minutes in an hour," "5 minutes in an hour," and "1 minute in an hour" are equivalent to the L_{16.7}, L_{8.3}, and L_{1.7}, respectively. L_{max}, or maximum noise level, represents the standard defined in terms of "0 minutes in an hour."

SOURCE: Oakland Noise Ordinance No. 11895, 1996

The City of Oakland guidelines in the 2005 General Plan consider outdoor noise levels above 60 dBA only "conditionally acceptable," with levels above 70 dBA "normally unacceptable." The Noise Element section of the plan identifies the following interior noise levels acceptable for various land uses:

- 45dB: residential, hotels, lodging, institutional, theatres
- 50dB: professional offices, auditoria, meeting halls
- 55dB: retail, banks, restaurants, sports clubs
- 65dB: manufacturing, warehousing

Noise levels allowable per the Oakland Municipal Code Section 17.120 specifically mention Commercial and Industrial Operations.

Commercial Noise Level Standards. Maximum receiving noise level standards

Cumulative Number of Minutes Either Daytime or Nighttime – One hour period (dBA)	Anytime (dBA)
20	65
10	70
5	75
1	80
0	85

Manufacturing Noise Level Standards

Cumulative Number of Minutes Either Daytime or Nighttime – One hour period (dBA)	Anytime (dBA)
20	70
10	75
5	80
1	85
0	90

In addition to local ordinances, the state of California has a noise insulation standard which regulates the maximum allowable interior noise levels in all residential dwellings built since 1974 (except single family detached structures). The California Code of Regulations Title 24 Part 2 (California Building Code), limits indoor noise to 45 dBA DNL in any habitable room, with doors and windows closed, and requires an acoustical analysis of projects where exterior noise levels are above 60 dBA. If the interior noise levels require closed buildings, proper ventilation must then be put in place.

The World Health Organization has an on-line document which provides non-regulatory guidelines for community noise. (<http://www.who.int/docstore/peh/noise/Comnoise3.htm>) recommendations that special attention be given to:

- a. Noise sources in an environment with a low background noise level. For example, night-traffic in suburban residential areas.
- b. Environments where a combination of noise and vibrations are produced. For example, railway noise, heavy duty vehicles.
- c. Sources with low-frequency components. Disturbances may occur even though the sound pressure level during exposure is below 30 dBA.

If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise. If the noise is not continuous, sleep disturbance have been observed at 45 dB or less. This is particularly true if the background level is low. Noise events exceeding 45 dBA should therefore be limited if possible.

The state also has established regulations which set limits on noise levels at which cars, trucks and motorcycles can operate. Below are those levels allowed for larger vehicles:

California State noise limits on larger vehicles

GVWR-Pounds	Date of Manufacture	Noise Limit -dbA
Over 6,000	after 1967 and before 1973	88
Over 6,000	after 1972 and before 1975	86
Over 6,000	after 1974 and before 1978	83
Over 8,500	after 1977 and before 1982	83
Over 6,000 but not over 8,500	after 1977	80
Over 8,500 but not over 10,000	after 1981	80
Over 10,000	after 1981 and before 1988	83
Over 10,000	after 1987	80

Source: CA DMV

Assessment of West Oakland Cumulative Noise Impacts

Conceptual Pathways

Environmental noise in West Oakland comes from numerous sources. Some of these sources are directly related to the Port. For example, the Port truck and train traffic are sources of noise. Other vehicle traffic in and around the community as well as BART trains also contribute to noise in West Oakland.

The pathways to noise-related health effects are documented below for West Oakland:

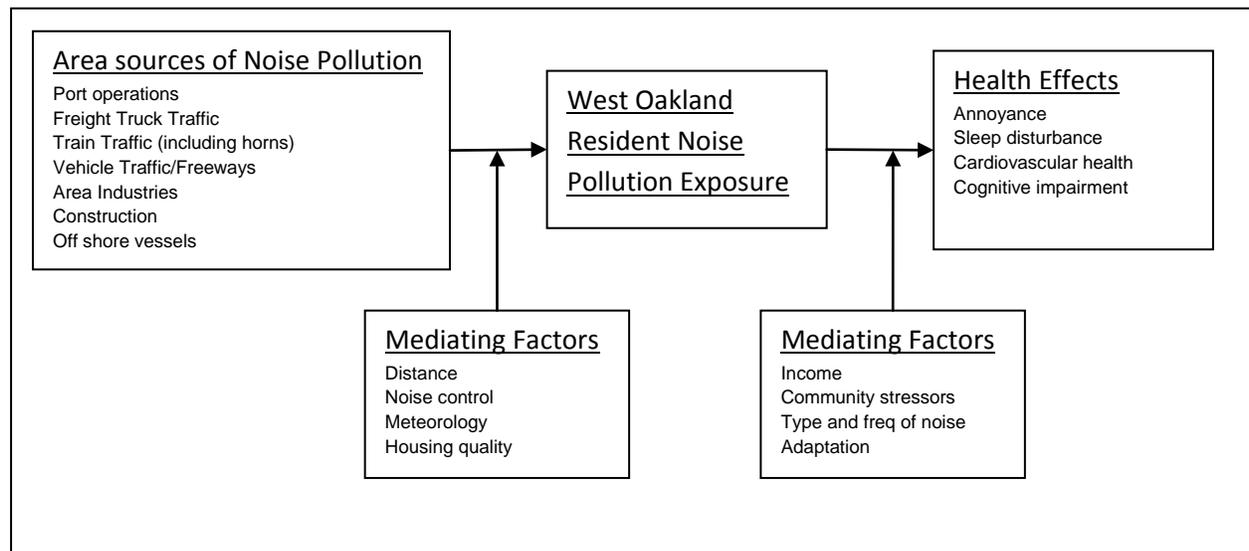


Figure 1: Pathway for Port-Related Noise Pollution on Health Effects in West Oakland

Existing conditions

In 2004 the City of Oakland hired noise consultants, Illingworth and Rodkin to perform an analysis on the city's noise environment which became incorporated into the Oakland's 2005 General Plan. The firm performed a city-wide noise monitoring survey, and found that the major noise sources in Oakland are transportation-related, including motor-vehicle traffic on major thoroughfares, railroad operations (including BART), and Oakland International Airport. They reported that industrial noise sources in West Oakland generate noise levels above their surroundings, but none sufficient to affect the overall noise environment.⁷⁵

They reported that the freeways are the main source of noise in the city, with I-580, I-880, I-980 and highways 13 and 24 generating the highest noise levels in excess of 70 L_{dn}. They reported BART noise levels of 85 dBA (at 100 feet) and Union Pacific train noise at 95 dBA, with horns at 110 dBA.

Local EIAs filed for development projects also provide ambient noise level data for the immediate area of the proposed projects. Attached in the appendix are readings taken for projects undertaken at Wood Street and Mandela Bay. They show numerous readings over 60 dBA.

Field visits to West Oakland identified some efforts to mitigate traffic noise impacts in the community. Signs direct trucks to prescribed truck routes. However, truck counts documented in the Air Resources Board Health Risk Assessment clearly indicate numerous trucks in mixed industrial and residential parts of West Oakland. Sound walls are present along Cedar Street next to the western section of the 880 freeway, which is a major route for Port trucks. There are also walls along South Prescott Park that is adjacent to the southern section of the 880 freeway.

Other sources of noise identified by focus group members included traffic helicopters in the morning reporting on accidents on the freeways leading to the Bay Bridge, and police helicopters at night.

Impacts of Port Growth on Noise Levels

We used various data sources to estimate current and future 2020 noise levels for West Oakland. CalTrans traffic count data were used to quantify both trucks and cars on the freeways surrounding the community. STI truck counts reported in the Air Resources Board Health Risk Assessment were used to estimate counts on local streets (with total traffic estimated by assuming 5% truck percentage). The CARB risk assessment was also used to determine the approximate average number of railroad trains passing through the community. BART schedules for the West Oakland Station were used to approximate the average hourly number of passing trains. These data are summarized in the Appendix.

Models were used to determine how the various sources of noise contribute to noise levels in the community (TNM for vehicles, and separately calibrated Schall 03 for railroad and BART trains). We modeled both the existing conditions (year 2005) and a future 2020 year scenario assuming the port continues to grow at an average 5% year, with truck traffic and railroad frequency growing equivalently by 5%. The results of these models are shown in Figures 2 and 3.

⁷⁵ Noise element City of Oakland General Plan, June 2005.

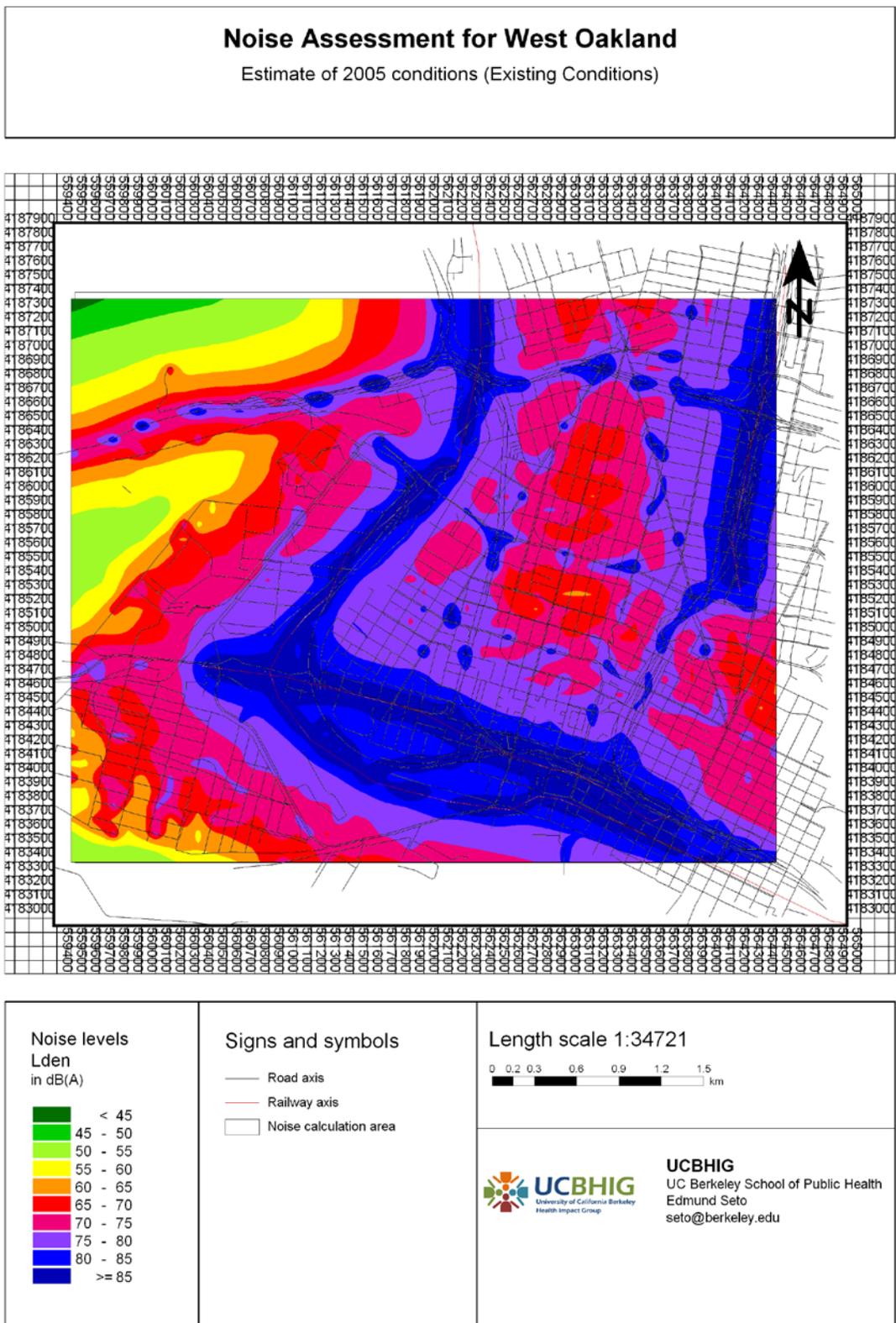


Figure 2. Modeled existing 2005 noise level conditions

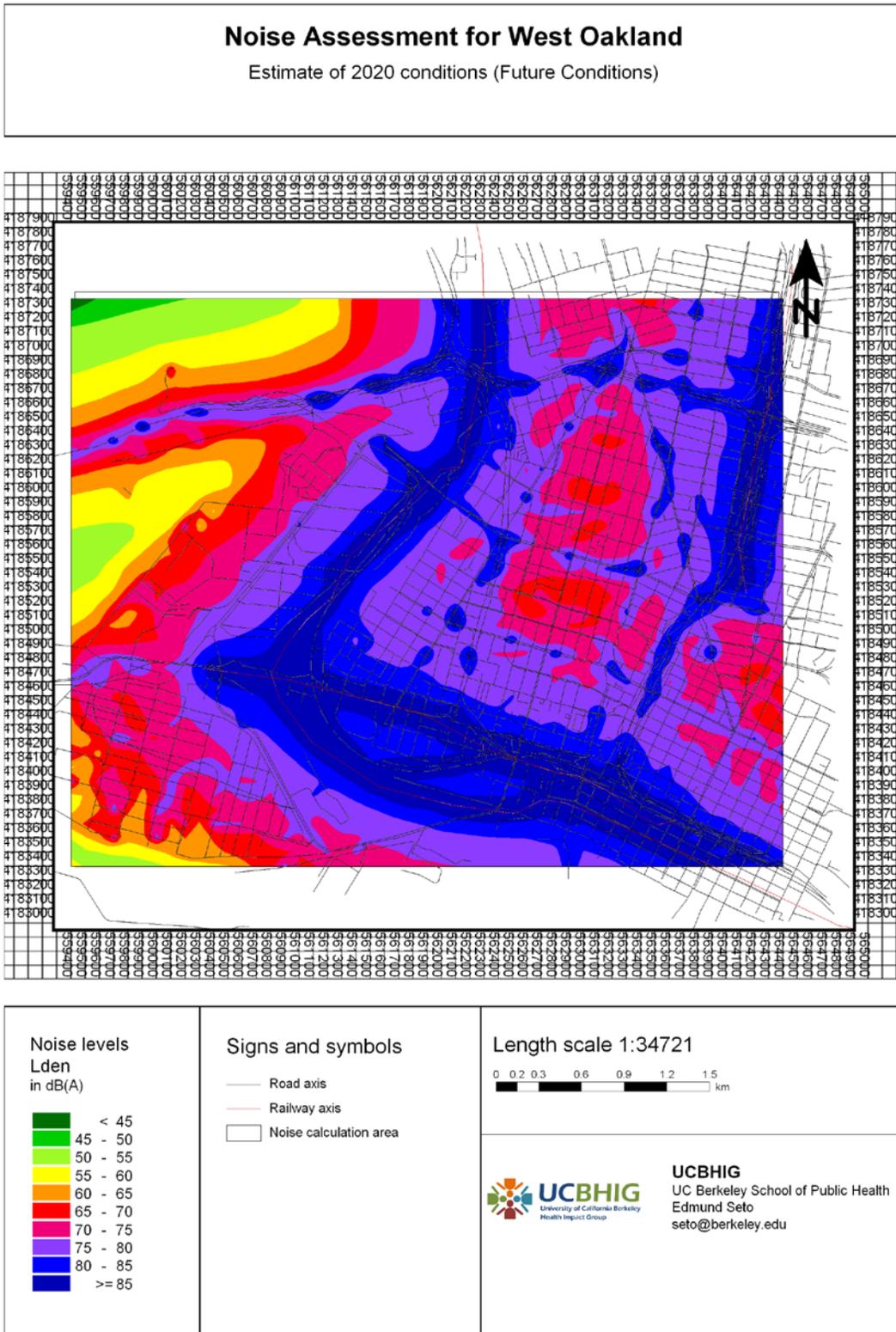
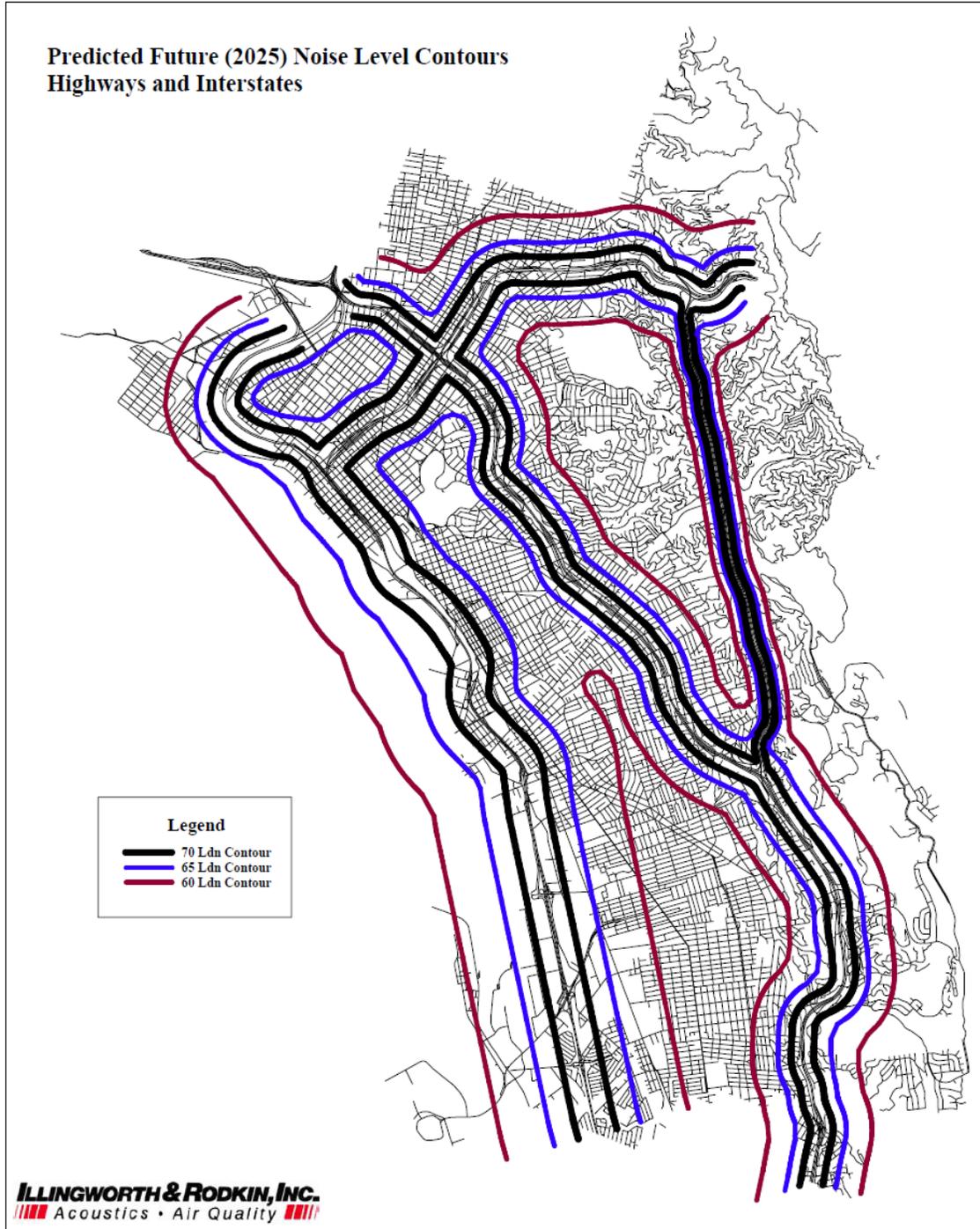


Figure 3. Modeled future 2020 noise level conditions



*Predicted L_{dn} values are worst-case estimates and do not take acoustical shielding from buildings or terrain into account.

Figure 3. Oakland City Noise Element future (2025) Noise Contour Map for Highways and Interstates

Our models clearly show pre-existing high levels of noise in West Oakland near the freeways and rail/BART lines. There are subtle increases in community noise levels under the assumption of

continued port growth, particularly increasing the size of the population exposed to 75-80 dB zone. These results are generally consistent with future noise projections in the city's Noise Element (Figure 3), which only consider freeway and highways, yet reveals that these sources have the potential for substantially elevated noise along these major roadways.

Below we estimated current and future health impacts associated with these noise levels. To do this, we overlaid 2000 block-level census population numbers over the noise contours and tallied the numbers of population at the block-level that are exposed to various levels of noise. We then applied four noise level-health effect relationships: annoyance, myocardial infarction, sleep disturbance, and cognitive impairment.

Table 3. West Oakland population exposure to various noise levels

dB	Existing conditions		2020 conditions	
	population exposed		population exposed	
60	247	1%	160	1%
65	2110	9%	1130	5%
70	6169	25%	4962	20%
75	9696	40%	11603	47%
80	4707	19%	5010	20%
85+	1520	6%	1584	6%
Grand Total	24449		24449	

Impacts on Subjective Annoyance

Based on the exposures in Table 3 and Mediema's relationship, we estimated that approximately 9000 persons (37% of population) are currently at risk of high annoyance, and this number is likely to increase to approximately 9500 (39% of population) by year 2020.

dB	Existing conditions			2020 conditions		
	Risk	Population		Risk	Population	
60	10%	25		10%	17	
65	16%	341		16%	183	
70	25%	1,526		25%	1,227	
75	37%	3,560		37%	4,260	
80	53%	2,488		53%	2,648	
85+	74%	1,123		74%	1,171	
		9,064	37%		9,506	39%

Impacts on Myocardial Infarction

Based on the exposures in Table 3 and Babisch's relationship, we estimated that approximately 8 people die each year in West Oakland from myocardial infarctions as a result of noise exposure. This number increases in year 2020 to 9 deaths per year.

Impacts on Sleep Disturbance

Based on the exposures in Table 3 and Mediema's relationship (exposure curve shifted 10 dB for Lnight levels), we estimated that approximately 29% of the community in West Oakland may be at risk of sleep disturbance, and that this number of will increase by 30% by year 2020.

dB	Existing conditions			2020 conditions		
	Risk	Population		Risk	Population	
50	13%	32		13%	21	
55	18%	371		18%	199	
60	23%	1414		23%	1137	
65	29%	2822		29%	3377	
70	36%	1701		36%	1810	
75+	44%	669		44%	697	
		7,008	29%		7,241	30%

Impacts on Cognitive Impairment

While we did not use baseline cognitive performance scores in our assessment, we note that the population averaged noise exposure under current conditions is approximately 74 dB. This is 14 dB higher than a 60 dB standard for residential land use. Based on this increase, and Hygge's relationship for cognitive impairment, we estimate approximately 29% impairment in recall and reading, and a 4% impairment in recognition and attention.

The population averaged noise level increases to approximately 75 dB by 2020, which is a 1 dB increase from existing conditions. We estimate additional 2% impairment in reading and recall, and 0.25% impairment for recognition and attention for those living in West Oakland in 2020.

Conclusions

Given the confluence of freeways, BART, railroad traffic, and heavy duty truck traffic there is substantial population exposure to unhealthy levels of environmental noise in West Oakland. Our modeled noise levels are highest along the train lines and major traffic routes, which are concentrated more in West Oakland than in other parts of the city or county, suggesting that West Oakland residents are disproportionately impacted by noise.

The majority of West Oakland residents living within the 75 dB Ldn contour. Based on these exposures and established noise-health relationships, we estimated that currently greater than one in three residents are likely to be highly annoyed by noise, which has considerable bearing on stress and its associated health impacts. Also, we estimate that currently 8 myocardial infarction deaths (15% of all myocardial infarction deaths) per year may be associated with noise exposure. Approximately one third of residents may be at risk of sleep disturbance. Moreover, in terms of cognitive impairment, we estimate that West Oakland residents current experience a 29% impairment in recall and reading and a 4% impairment in recognition and attention over standard 60 dB residential land use, which may have considerable consequences on the cognitive development of children in this community. Exposures their health impacts are expected to increase with port growth.

There are limitations to our assessment. In our models we did not account for existing or future noise controls. Indeed, as we mentioned above, some effort has already been made in terms of using sound walls to separate the noise from the major freeways from residents. In this respect, our impact assessment probably over-estimates the health impacts. Yet, our assessment does highlight the need for increasing attention being paid toward noise control, particularly for trucks which circulate the community, and trains, which may honk their 110 dB horns and result in signal crossing noise (factors that we did not assess in our model, and which lead to an underestimate of health impacts), or for noise from traffic and police helicopters, which was a complaint raised by residents in our focus groups.

Another limitation of our assessment was in assuming a constant West Oakland population in future projections of the health impacts of port growth. Indeed with recent residential land use projects being approved for West Oakland, and the shortage of housing generally within the City of Oakland, it is likely that more people will be exposed to high noise levels in this community, where there will continue to be land use conflicts between residential and industrial uses in the absence of any major vision towards long-term rezoning or traffic mitigation to alleviate noise impacts.

Recommendations

1. A follow-up study should be implemented to test indoor residential and public building noise levels focusing on areas implicated by outdoor noise level data of 60dBA and above. A noise mitigation strategy – either at the sources and/ or the building should be developed to mitigate impacts on occupants experiencing average indoor levels above 45 dBA. Like the Oakland Airport Noise mitigation that funded replacement windows, consider the feasibility for retrofitting old homes that are disproportionately impacted by traffic noise with improved noise insulation.
2. Given the potential impacts of elevated noise on cognitive impairment, a more detailed noise assessment of schools and childcare facilities in the community is warranted.
3. Traffic noise should not be allowed to exceed city ordinances for commercial and industrial noise; this should be a noise mitigation goal which will require increased enforcement.

4. Improvements to truck air pollution emissions should also consider simultaneous testing and mitigation of excessive noise. DMV vehicle noise standards for post-1986 large trucks - 80dBA - should be mandated for all trucks operating to and from the Port of Oakland regardless of year of manufacture. Moreover, this standard should be evaluated in the context of environmental justice issues, and the confluence of truck traffic in communities such as West Oakland.
5. Other transportation options should be analyzed to minimize the use of trucks for cargo pickup and delivery. The amount of cargo being moved to SFO should be assessed to determine feasibility of water transport to and from this location, as well as any other locations in serviceable by water transport in the delta.
6. Traffic and police helicopter noise should be further investigated to determine any mitigation opportunities such as higher flights, fewer simultaneous flights, or restricted flight patterns.
7. Future truck route planning should explicitly consider noise and vibration impacts on the community, and particularly daytime versus nighttime impacts, which affect different aspects of health.

Appendix

Noise Measurements from Mandela and Wood Street Project EIRs

Mandela Bay and Wood Street Project EIA Noise Reports	Measurement (dBA)
West St. North of West Grand	61.2
West St. South of West Grand	60.5
Mandela Pkwy South of 7th St.	71.1
18th St. East of Mandela	68.5
W. Grand Ave East of Poplar	71.2
West Grand Ave West of Adeline	71.2
14th St. East of Poplar	67.9
Mandela South of W. Grand	71.2
18th St. East of Mandela	68.5
18th St. East of Poplar	63.4
18th St. West of Poplar	60.4
Poplar North of 18 th	61.4
Poplar South of 18 th	61.4
34 Poplar North of 14 th	66.3
Poplar South of W. Grand	71.2
West Grand & Poplar	71.2
Mandela & 20 th	69.4
Mandela & East Poplar	70.6
Mandela and 18 th	68.5
Wood St. Between 12th/13 th	65.1
End of 16th, West of Wood	62.4
NE Corner Wood & 14th St.	68.6
SE Corner Pine & 11 th	59.9
Wood St Between 18th/20 th	68.7
Wood St. Between 7th/10 th	60.9
Wood St. Between 14th/15 th	55.6
Wood St. Between 18th/20 th	55.6
Frontage Road 10th/14 th	62.3
W.O BART	70-75

Noise Source Data and Assumptions

2005 CalTrans truck and vehicle count data were used to quantify freeway routes. Arterials truck counts were based on the STI inventory in the CARB risk assessment. By assuming a 5% truck percentage, we estimated the number of non-truck vehicles. Counts on remaining streets (residential streets) were estimated based on the counts in the Wood St and Mandela EIRs, as well as looking at truck counts in the STI inventory on and near non-arterial streets.

route	total AADT	truck AADT	auto AADT
I-580	224000	2848	221152
I-980	70500	4752	65748
I-880	214000	22898	191102
I-80	281707	6707	275000
arterials	54151	2708	51443
* from STI, 2007 inventory			
* assuming 5% truck percentage			
residential streets	4589	229	4360
* assuming 5% truck percentage			

Based on San Francisco 24 hour traffic count data, we determined 74% of traffic occurs during daytime hours (7:00 – 19:00), 13% occurs during evening (19:00 – 23:00), and 13% occurs during nighttime (23:00 – 7:00). AADT counts above were each multiplied by these percentages to estimate hourly counts for the TNM model.

For BART we determined the following number of cars for weekday schedules:

Weekday schedule

Pittsburg/Bay Point to SFO (Millbrae)	91
SFO (Millbrae) to Pittsburg/Bay Point	91
Fremont to Daly City	52
Daly City to Fremont	52
Richmond to Millbrae	55
Millbrae to Richmond	55
Dublin/Pleasanton to Daly City	75
Daly City to Dublin/Pleasanton	75

546 trains

equiv to approx $546/8 = 68$ trains/hour (both directions)

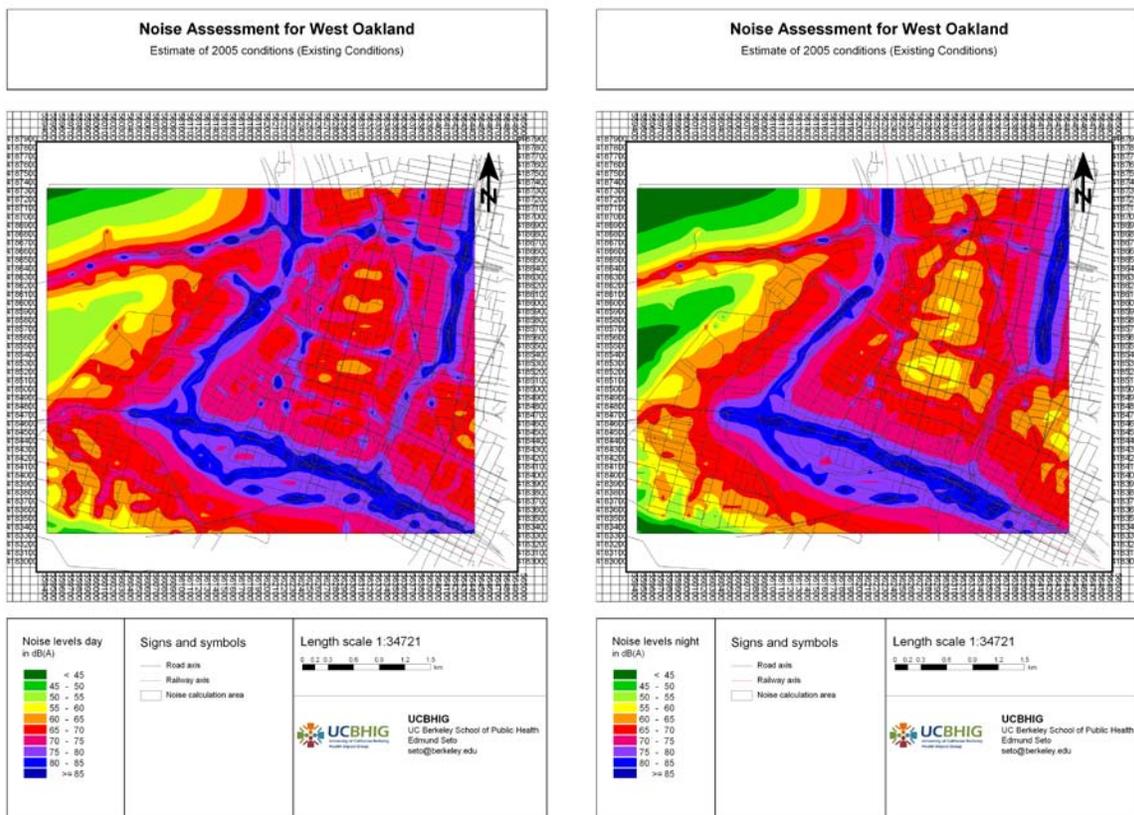
From the Oakland Noise Element's statement that a typical BART train produces 85 dBA noise level at a distance of 100 feet from the tracks, we calibrated a Schall 03 model to reproduce these levels. We then extrapolated this single-pass model to the approximate 68 trains per hour above.

For railroad trains, we determined from the CARB risk assessment that at the Union Pacific Railyard 13,411 trains went through in the year.

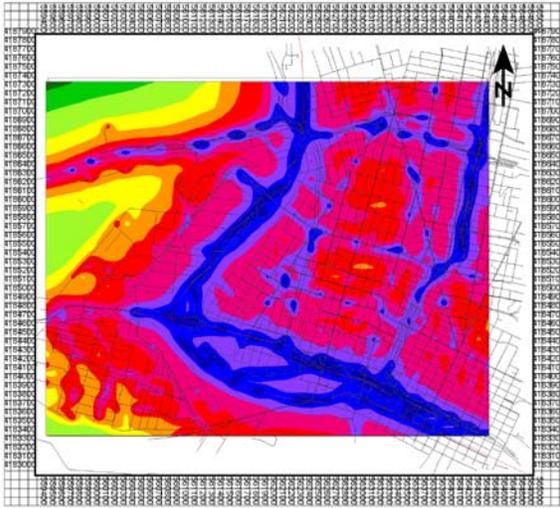
$$13,411 / 365 \text{ days} / 24 \text{ hours} = 1.5 \text{ trains/hour}$$

From the Oakland Noise Element's statement that a typical train traveling at 25 mph may produce noise levels which exceed 95 dBA at 100 feet, we calibrated a Schall 03 model to reproduce these levels. We then extrapolated to 2 trains during the day, but keeping 1 train during nighttime hours. From the Port's emissions inventory Part III Appendix A-1, locomotive activity was identified as early as 5 AM and as late as 11:20 PM on both weekend and weekdays, suggesting the potential for sleep disturbance. Note that the Noise Element also states that train horns may approach 110 dBA, and that brakes, coupling impacts, and crossing guard warnings are additional common sources of noise along a railroad corridor. These additional aspects were not modeled.

Modeled Daytime versus Nighttime Noise levels

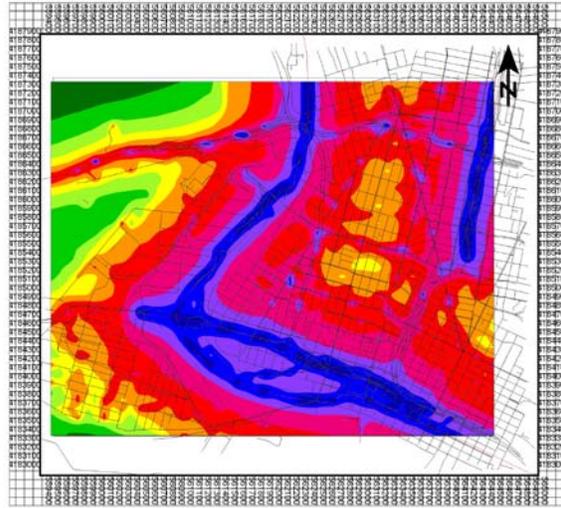


Noise Assessment for West Oakland
Estimate of 2020 conditions (Future Conditions)



<p>Noise levels day in dB(A)</p> <ul style="list-style-type: none"> ■ < 45 ■ 45 - 50 ■ 50 - 55 ■ 55 - 60 ■ 60 - 65 ■ 65 - 70 ■ 70 - 75 ■ 75 - 80 ■ 80 - 85 ■ >= 85 	<p>Signs and symbols</p> <ul style="list-style-type: none"> Road axis Railway axis Noise calculation area 	<p>Length scale 1:34721</p> <p>UCBHIG UC Berkeley School of Public Health Edmund Seto seto@berkeley.edu</p>
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Noise Assessment for West Oakland
Estimate of 2020 conditions (Future Conditions)



<p>Noise levels night in dB(A)</p> <ul style="list-style-type: none"> ■ < 45 ■ 45 - 50 ■ 50 - 55 ■ 55 - 60 ■ 60 - 65 ■ 65 - 70 ■ 70 - 75 ■ 75 - 80 ■ 80 - 85 ■ >= 85 	<p>Signs and symbols</p> <ul style="list-style-type: none"> Road axis Railway axis Noise calculation area 	<p>Length scale 1:34721</p> <p>UCBHIG UC Berkeley School of Public Health Edmund Seto seto@berkeley.edu</p>
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Noise – Annoyance Relationship

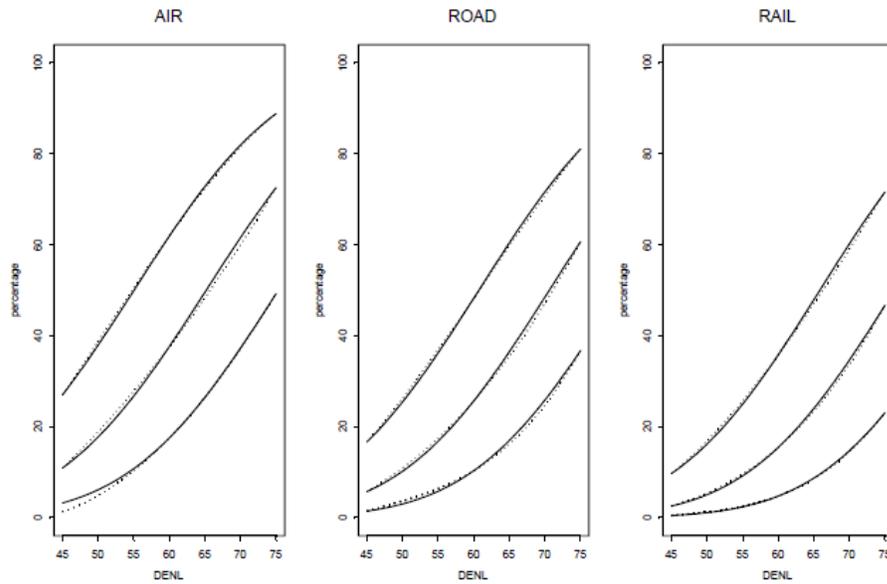


Figure 1: Exposure – response relationships for aircraft, road traffic and railways LA- A – annoyance; HA – Highly annoyance
 %LA - low annoyance (upper row), %A – Annoyance (middle row) and %HA Highly annoyance (lower row) as a function of DENL together with the 95% confidence intervals. The curves were found by fitting the model of the annoyance percentages to the data from field surveys. Source: Miedema et

Aircraft: $\%HA = -9.199 \times 10^{-5} (DENL-42)^3 + 3.932 \times 10^{-2} (DENL-42)^2 + 0.2939 (DENL-42)$;
 Road traffic: $\%HA = 9.868 \times 10^{-4} (DENL-42)^3 - 1.436 \times 10^{-2} (DENL-42)^2 + 0.5118 (DENL-42)$;
 Railways $\%HA = 7.239 \times 10^{-4} (DENL-42)^3 - 7.851 \times 10^{-3} (DENL-42)^2 + 0.1695 (DENL-42)$.

Meidema’s roadway equation was used for annoyance.

Noise –Myocardial Infarction Relationship

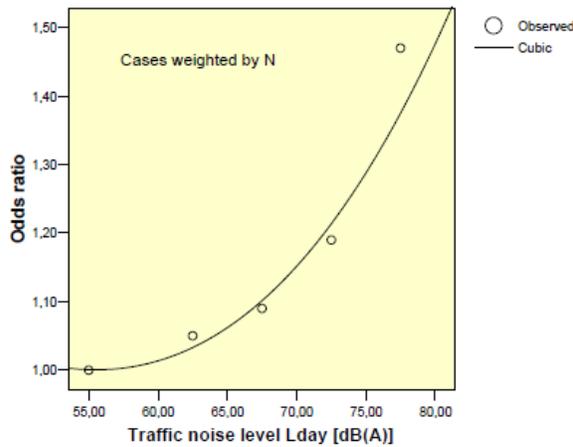


Figure 10. Polynomial curve fit (N-weighted data points) of the association between road traffic noise and incidence of myocardial infarction.

$$OR = 1.629657 - 0.000613 * Noise^2 + 0.000007356734623455 * Noise^3 ; R^2 = 0.96$$

(no significant linear term in the equation)

Babisch’s relationship from <http://opus.kobv.de/zlb/volltexte/2009/7655/pdf/2997.pdf> was used. Because the relationship is based on Lday rather than Lden, and as shown above, modeled Lday levels are approximately 5 dB lower than Lden, we shifted the exposure curves by 5 dB. We assumed the West Oakland CHD mortality of 225 per 100,000 (55 deaths/yr for the population size used in our assessment) was a reasonable approximation for the baseline myocardial infarction rate, with deaths being used as opposed to myocardial infarction incidence.

dB	Existing conditions				2020 conditions			
	OR	Pe	PAR%	Deaths	OR	Pe	PAR%	Deaths
55	1.00	1.0	0.00	0	1.00	0.7	0.00	0
60	1.01	8.6	0.10	0	1.01	4.6	0.06	0
65	1.06	25.2	1.49	1	1.06	20.3	1.20	1
70	1.15	39.7	5.59	3	1.15	47.5	6.62	4
75	1.29	19.3	5.20	3	1.29	20.5	5.52	3
80	1.47	6.2	2.86	2	1.47	6.5	2.97	2
			15.25	8			16.37	9

Noise – Sleep Disturbance Relationship

We used Miedema’s roadway percentage sleep disturbed relationship. Because the relationship is based on Lnight, and our models suggest that Lnight levels are about 10 dB lower than Lden, we shifted the exposure curve by 10 dB.

Effect	Indicator	Source	Exposure-response curves
Sleep disturbance motility (mean)	Lnight	Aircraft	$M_{night}=0.000192 \times (L_{night} - L_{diff1} - L_{diff2})^b$
Percentage			
highly sleep disturbed (HSD)	Lnight	Road	$\%HSD=20.8 - 1.05 L_{night} + 0.01486 L_{night}^2$
sleep disturbed (SD)			$\%SD=13.8 - 0.85 L_{night} + 0.01670 L_{night}^2$
A little sleep disturbed (LSD)			$\%LSD= -8.4 + 0.16 L_{night} + 0.01081 L_{night}^2$
highly sleep disturbed (HSD)	Lnight	Rail	$\%HSD=11.3 - 0.55 L_{night} + 0.00759 L_{night}^2$
sleep disturbed (SD)			$\%SD= 12.5 - 0.66 L_{night} + 0.01121 L_{night}^2$
A little sleep disturbed (LSD)			$\%LSD= 4.7 - 0.31 L_{night} + 0.01125 L_{night}^2$

Source: RIVM

Table2 Exposure response relationships which can be used to assess health effects of traffic noise in the European Region (sources: Miedema and Oudshoorn, 2001, Miedema et al., 2003; Van Kempen et al.,2002; Passchier-Vermeer et al., 2003))

Noise – Cognitive Impairment Relationship

Based on Hygge, S. (2005) in the Working paper for WHO technical meeting on quantifying disease from environmental noise, Stuttgart June 23-24, 2005, we used a the effect slopes of 2% impairment per dB for reading and recall, and 0.25% impairment per dB for recognition and attention.

Transportation

Chapter 4

Summary

Data available from the Statewide Integrated Traffic Records System (SWITRS) demonstrates that in Oakland there have been 45 pedestrian injury collisions with trucks between the years of 1996-2006 with 23% of these collisions occurring in West Oakland. The trucks are a significant presence in the West Oakland Community and the Port of Oakland is a major contributor to the level of trucks. Despite an established West Oakland Truck Route that directs trucks outside of the neighborhood residential areas; parked and moving trucks continue to be visible in the neighborhood. Research has demonstrated that high traffic volume and speed can result in reduced initiatives for outdoor activities such as walking and visiting parks, and for social interaction with neighbors. The Port is a significant source of truck traffic in West Oakland and may be partially responsible for these health impacts on the community.

The Seaport Air Emissions Inventory calculations show approximately 10,000 truck trips to and from the Port each weekday through West Oakland. Many of these trucks follow approved trucking routes, but others deviate through residential areas or drive to distribution centers in the area.

The rate of non-fatal injury from truck-pedestrian collisions in West Oakland is almost 6 times higher than the rest of Oakland. The rate of fatal injury from truck-pedestrian collisions in West Oakland is almost 4 times higher than the rest of Oakland.

West Oakland residents may be more reluctant to walk to destinations in their community due to truck traffic and/or poor pedestrian quality conditions. This can lead to an overall decrease in physical activity, which is detrimental to health. Social cohesion is also affected by truck traffic and poor pedestrian quality, as residents may be less likely to communicate with neighbors or utilize public spaces under these conditions.

Recommendations

1. Provide truck services, including food and restrooms, at Oakland Army Base to reduce neighborhood truck traffic.
2. Improve enforcement system of designated truck routes to keep trucks off of neighborhood streets.
3. Decrease truck traffic by increasing use of rail transport.
4. Implement a traffic calming program in residential neighborhoods to include vehicle lane narrowing, raised crosswalks, raised intersections and traffic circles, to prevent truck traffic from entering the area.
5. Provide countdown pedestrian signal heads, bulb outs, and center median refuge islands at high volume multi-lane intersections where cumulative traffic volume increases exceed 5%.
6. Provide pedestrian warning signs or lights at all crossings or cross walks without traffic signal lights.
7. Institute speed limit reductions to less than 20mph in mixed-use residential areas.

8. Widen sidewalks or provide buffers between sidewalks and vehicle lanes on busy roadways with significant pedestrian traffic.
9. Improve 'attractiveness' of pedestrian pathways by repairing sidewalks, improving landscaping, displaying public art, increasing public seating and planting trees.
10. Expand City Municipal Code Section 10.52.050, which stipulates that truck traffic over four and a half tons is prohibited between the hours of 11 pm and 6 am, to include all residential areas of West Oakland.
11. Expand City Municipal Code Section 10.52.060, which stipulates that truck traffic over four and a half tons is prohibited on certain roads, to include all residential areas of West Oakland.
12. Increase the number of posted signs that prohibit truck parking and truck traffic on residential streets off of the truck route.
13. Improve road maintenance of West Oakland neighborhood, including off-truck route roads and streets which have old railroad tracks imbedded in them.
14. Enforce parking laws by increasing the number of parking monitors in the neighborhood.
15. Increase the number of Oakland Police Department officers patrolling the neighborhood for truck violations and port security.
16. Implement and monitor a radio frequency identification device program for trucks, with a published timeline, to include tracking personnel to monitor deviations from approved truck route.
17. Implement a geo-fence around the residential sections of West Oakland, which will alert port monitoring personnel if a truck enters.
18. Update City Municipal Code Section 10.52.120, which stipulates local roads included in the truck route, to match port-published literature and the most current truck route.
19. Create a central truck-sighting hotline, so residents can report truck route violations.
20. Promote education of children as to benefits of physical activity, pedestrian risks in the neighborhood, and safe routes to school.
21. As city land use changes, build a buffer area between the industrial and residential areas of West Oakland, identify opportunities for safe pedestrian-only corridors that offer an excellent health-promoting environment, and opportunities for reducing traffic from outside of the community (e.g., reducing BART parking).

Background

With approximately 10,000 truck trips to and from the Port of Oakland each weekday, the Port is a large contributor to truck traffic in West Oakland neighborhoods.⁷⁶ The Port's cargo volume makes it the fourth busiest container port in the United States.⁷⁷ Approximately 65 percent of goods are shipped by truck, while the other 35 percent are moved by rail.⁷⁸ In addition, there are many Port-related

⁷⁶ Port of Oakland and Environ. "Seaport Air Emissions Inventory". 12/12/2007.

<http://www.portofoakland.com/environm/airEmissions_complete.pdf> p.5-3. This figure was calculated based on 260 weekday business days.

⁷⁷ "Port of Oakland - Maritime." 12/10/2007 <<http://www.portofoakland.com/maritime/factsfig.asp>>.

⁷⁸ Oakland Metropolitan Chamber of Commerce. Taking Stock of Oakland's Economy., 2007

trucking distribution centers in West Oakland that bring trucks into contact with residential neighborhoods.⁷⁹

While the Port is a significant source of traffic in West Oakland, there are additional industrial sources of vehicular traffic attributable to non-residents. The Union Pacific Railroad generates 3,508 truck trips per weekday. Other major sources of truck traffic in West Oakland include the U.S. Postal Service's mail sorting and distribution facility, Golden Bear Produce, and East Bay Municipal Utilities District, which together generate over 1,200 truck trips per day.⁸⁰ While these facilities are not directly related to the Port of Oakland, it can be reasoned that the existence of the Port influenced the location of the Union Pacific Railroad, the USPS center, and truck distribution centers. In this way, it has been the main driving force behind the neighborhood's evolution into an industrial center. Thus, the Port can be thought of as both a direct and indirect source of truck traffic in the neighborhood.

The West Oakland community is surrounded by freeways (Figure 1). To the north of the community is the MacArthur Maze (580-80) a major commuter route to San Francisco via the Bay Bridge. To the South and West is Nimitz (880-80), which is another commute route to Bay Bridge. To the East is the 980 freeway connecting 880 to 24 a corridor to other communities in the East Bay. The concentration of these freeways around the community not only make West Oakland a prime location as an industrial hub for shipping-related businesses, but regional truck and automobile traffic also route near to this community. Hence, West Oakland bears the cumulative burden of many sources and types of traffic.

79 Martien, Phil. West Oakland Diesel PM Emission Inventory: Truck-Related Businesses and Construction Projects. Ed. STI CARE Task Force., 2007. 12/12/2007.
<www.baaqmd.gov/CARE/documents/care_tf_wo_dpm_emiss_07_24_07.pdf>

80 Martien, Phil. West Oakland Diesel PM Emission Inventory: Truck-Related Businesses and Construction Projects. Ed. STI CARE Task Force., 2007. 12/12/2007.
<www.baaqmd.gov/CARE/documents/care_tf_wo_dpm_emiss_07_24_07.pdf>



Figure 1. West Oakland surrounded by freeways.

While there is considerable concern over the air pollution caused truck traffic, in this chapter we consider the broader health impacts of truck traffic. The Port has recognized its influence on neighborhood life, and has included in its Comprehensive Truck Management Plan an objective to mitigate the impact of port-related trucking on West Oakland.⁸¹ Currently, the Port financially supports two Oakland Police Department officers for commercial enforcement responsibilities, which include parking enforcement, patrolling Middle Harbor Shoreline Park, truck route enforcement, and Port security, among other responsibilities.

The City of Oakland has also recognized the impact of the Port's trucks on the West Oakland neighborhood. The City General Plan's Implementation Program for West Oakland stipulates the need to "expand and continue educational and enforcement efforts addressing illegal truck parking and operation that occur in residential areas."⁸²

While it is unlikely that the Port of Oakland has directly contributed to West Oakland's pedestrian environment besides through the presence of truck traffic, it can be conjectured that the Port's presence in the neighborhood has historically played a part in the overall industrial influence in the quality of the neighborhood. In addition, city resources allocated to maintaining public streets may be preferentially applied to the Port's truck routes over maintenance of other residential West Oakland

⁸¹ Wong, Joseph. "Comprehensive Truck Management Plan" Letter to Port Commissioner Kenneth Katzoff, Commissioner Mark McClure, and Commissioner David Kramer. 7 June 2007. <http://www.portofoakland.com/pdf/ctmp_01.pdf>

⁸² Community and Economic Development Agency of the City of Oakland. General Plan: Land Use and Transportation Element. Volume 1. March 1998. p192

streets, causing the latter to be overlooked. High truck traffic can adversely affect the health of a community, especially through vehicular collisions. Fear of vehicular collisions and general unease from the high traffic volumes can lead to decreased physical activity and poor social cohesion in a neighborhood.

Pedestrian Injuries

Prior to the 1970s, the United States was a world leader in traffic safety. However, over the past three decades, measured by the number of traffic deaths per million vehicles, the United States has slipped to 13th place, and is still sinking.⁸³ Nationally, for people aged one to 40, traffic injuries are the single greatest cause of disability and death. Over 42,000 people have died on U.S. roads since 2002. Pedestrians account for 11% of all motor vehicle deaths, and in cities with populations exceeding 1 million, they account for about 35%. Each year, 80,000 to 120,000 pedestrians are injured and 4600 to 4900 die in motor vehicle crashes. Children aged 5 to 9 years have the highest population-based injury rate, and people older than 80 years have the highest population-based fatality rate. Large trucks represent a significant portion of the motor vehicle collisions in the U.S. In 2005, 12 percent of all traffic fatalities involved a large truck.⁸⁴ In Alameda County, California, from 1996 to 2006, trucks were involved in 5% of all injury collisions.⁸⁵

Preventable Causes of Pedestrian Injuries

The rate of pedestrian injuries in an area is dependent on several environmental factors such as vehicle volume, vehicle type (truck vs. car), vehicle speed, pedestrian volume, roadway width, vehicle speed, pedestrian facilities (sidewalk width, driveway conflicts, buffers), intersection design (crossing distance, signal phasing and timing, corner radii, cross walk treatments, median islands, curb extensions), lighting, and weather.^{86 87 88 89 90} Neighborhood type is also a significant predictor of number of pedestrian

⁸³ Evans, L. A New Traffic Safety Vision for the United States. *AJPH* Sept 2003, Vol 93, No. 9 (1384-1386).

⁸⁴ Traffic Safety Facts – Large Trucks, 2005 - National Highway Traffic Safety Administration

⁸⁵ Collision data for Oakland was obtained from the Statewide Integrated Traffic Records System (SWITRS) for 1996-2006. This system is maintained by the California Highway Patrol (CHP), Caltrans, and the California Department of Motor Vehicles (DMV), and contains data on all reported vehicle collisions in California that occur on a public roadway. The dataset for an eleven year period was cleaned and imported into GIS. The vehicle collision data was then geocoded (assigning an x and y coordinate to an address so it can be placed on a map) by using the intersection of the primary and secondary street.

⁸⁶ La Scala EA, Johnson FW, Gruenewald PJ. Neighborhood Characteristics of Alcohol-related Pedestrian Injuries. *Prevention Science*. 2001; 2:123-134.

⁸⁷ Taylor M, Lynam D, Baruay A The effects of drivers speed on the frequency of road accidents. Transport Research Laboratory. TRL Report 421 Crowthorne, UK, 2000.

⁸⁸ Morrison DS, Petticrew M, Thomson H. What are the most effective ways of improving population health through transport interventions? Evidence from systematic reviews. *Journal of Epidemiology and Community Health* 2003;57:327-333.

injuries, with intersections in commercial and mixed use (residential and commercial) having increased risk compared with intersections in residential neighborhoods.⁹¹

Public health and transportation safety research consistently demonstrate that vehicle volume is an important and independent environmental cause of pedestrian injuries.^{92 93 94 95} For example, in a study of nine intersections in Boston's Chinatown, researchers calculated an increase of 3-5 injuries per year for each increase in 1000 vehicles.⁹⁶ The City of Oakland Pedestrian Master Plan also highlights the negative effect of high traffic volumes on safety.⁹⁷ A national study of pedestrian injuries and crosswalks that included data from Oakland also found that higher average daily traffic and multi-lane roads were significant and independent environmental risk factors for vehicle-pedestrian crashes in multi-variate analysis.⁹⁸

Vehicle speeds are the most important predictor of the severity of pedestrian injuries. Below 20mph the probability of serious injury or fatal injury is generally less than 20%; this proportion rapidly increases with increasing speed and above 35mph, most injuries are fatal or incapacitating.⁹⁹ With regards to sensitive populations, the elderly and the very young populations are more vulnerable to vehicle injuries while walking because of slower walking speeds or slower reaction times.

⁸⁹ Evidence shows that pedestrian and bicycle injuries vary with the 0.4 power of the proportion of trips made by walking or bicycle. Jacobsen PL. Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Injury Prevention*. 2003; 9: 205-209.

⁹⁰ Leden L. Pedestrian risk decrease with pedestrian flow. A case study based on data from signalized intersections in Hamilton, Ontario. *Accident Analysis and Prevention*. 2002; 34:457-464.

⁹¹ Judy Geyer, Noah Raford, David Ragland, and Trinh Pham, "The Continuing Debate about Safety in Numbers—Data From Oakland, CA " (December 1, 2005). UC Berkeley Traffic Safety Center. Paper UCB-TSC-RR-2005-TRB3.

⁹² LaScala EA, Gerber D, Gruenewald PJ. Demographic and environmental correlates of pedestrian injury collisions: a spatial analysis. *Accident analysis and Prevention*. 2000; 32:651-658.

⁹³ Roberts I, Marshall R, Lee-Joe T. The urban traffic environment and the risk of child pedestrian injury: a case-cross over approach. *Epidemiology* 1995; 6: 169-71.

⁹⁴ Stevenson MR, Jamrozik KD, Spittle J. A case-control study of traffic risk factors and child pedestrian injury. *International Journal of Epidemiology* 1995; 24:957-64.

⁹⁵ Agran PF, Winn DG, Anderson CL, Tran C, Del Valle CP. The role of the physical and traffic environment in child pedestrian injuries. *Pediatrics*. 1996; 98: 1096-1103.

⁹⁶ Brugge D, Lai Z Hill C, Rand W. Traffic injury data, policy, and public health: lessons from Boston Chinatown. *Journal of Urban Health* 2002; 79: 87-103.

⁹⁷ City of Oakland. Pedestrian Master Plan. Page 18.

⁹⁸ Zegeer CV, Steward RJ, Huang HH, Lagerwey PA. Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines. Federal Highway Administration, 2002.

⁹⁹ National Highway Traffic Safety Administration. Literature Review on Vehicle Travel Speeds and Pedestrian Injuries. Washington DC: USDOT, 1999.

Economic Costs of Pedestrian Injuries

Vehicle injuries to pedestrians have significant economic costs beyond their physical toll on victims. A recent analysis of California data concludes that in 1999, economic costs resulting from 5634 fatal and non-fatal vehicle injuries to pedestrians resulted in over \$3.9 billion in direct and indirect costs (\$692,000 per injury). California Highway Patrol estimates of economic costs of vehicle injuries to pedestrians disaggregated by injury severity are provided in the table below.

Pedestrian Injury Severity Economic Cost per Injury

Fatal Injury	\$ 2,709,000
Severe Injury	\$ 180,000
Visible Injury	\$ 38,000
Complaint of Pain	\$ 20,000

Relationship between Traffic/Pedestrian Environment and Physical Activity

Traffic volume and speed can serve as barriers to physical activity on residential streets.^{100 101 102} Lower traffic volumes and speeds tend to correlate with a perception of safety for pedestrians, and this perception often leads to more outdoor activities in the neighborhood.¹⁰³ According to the Federal Highway Administration, "high volumes of traffic can inhibit a person's feeling of safety and comfort and create a 'fence effect' where the street is almost an impenetrable barrier."¹⁰⁴

Besides volume and speed, additional traffic variables positively related to street walking include number of intersections, traffic calming measures, street connectivity, access to public spaces, well-maintained and well-lit sidewalks, traffic conditions that encourage maximum pedestrian visibility to drivers, high residential and commercial density, a proper balance of retail and commercial uses and residential uses, safety from crime, and the presence of well-marked bike lanes.^{105 106 107} Saelens has

¹⁰⁰ Centers for Disease Control and Prevention (CDC). "Barriers to Children Walking and Biking to School--United States, 1999." *MMWR.Morbidity and mortality weekly report* 51.32 (2002): 701-4.

¹⁰¹ Li, F., et al. "Multilevel Modelling of Built Environment Characteristics Related to Neighbourhood Walking Activity in Older Adults." *Journal of epidemiology and community health* 59.7 (2005): 558-64.

¹⁰² Transportation Alternatives. *Traffic's Human Toll: A Study of the Impacts of Vehicular Traffic on New York City Residents.*, 2006.

¹⁰³ Transportation Alternatives. *Traffic's Human Toll: A Study of the Impacts of Vehicular Traffic on New York City Residents.*, 2006.

¹⁰⁴ Zegeer, Charles V. et al. *Pedestrian Facilities Users Guide: Providing Safety and Mobility.*, 2000.

¹⁰⁵ Li, F., et al. "Multilevel Modelling of Built Environment Characteristics Related to Neighbourhood Walking Activity in Older Adults." *Journal of epidemiology and community health* 59.7 (2005): 558-64

¹⁰⁶ Ewing, Reid, and Richard Kreutzer. *Understanding the Relationship between Public Health and the Built Environment: A Report Prepared for the LEED-ND Core Committee.*, 2006.

shown that people walk on average 70 minutes longer in pedestrian-oriented neighborhoods.¹⁰⁸ According to a recent analysis on the transportation needs in West Oakland, surveyed community residents said that if streets feel safe and look attractive, they are more likely to walk instead of drive, and are more likely to walk further to a bus stop.¹⁰⁹

Another element of a community's pedestrian environment, the presence of parks in a neighborhood contributes to a physically active community. A 2004 report by the Institute of Medicine (IOM) found compelling evidence that the availability of parks and natural spaces "facilitate or constrain physical activity."¹¹⁰ Multiple studies, including many of those summarized in the IOM report, confirm that parks are desired destinations used for physical activity and that residential proximity to parks was a significant predictor of physical activity levels.^{111 112 113 114} A review of studies showed that access to places for physical activity combined with outreach and education can produce a 48% increase in the frequency of physical activity.^{115 116}

Relationship Between Physical Activity and Health

Physical fitness is a crucial component of a healthy lifestyle, and regular exercise can prevent heart disease, high blood pressure, colon and breast cancer, osteoporosis, diabetes, obesity, and overall mortality rates.¹¹⁷ Regular exercise also reduces depression and anxiety, improves mood, and enhances ability to perform daily tasks throughout a person's lifespan. The Centers for Disease Control and Prevention (CDC) recommends at least 30 minutes of moderate-intensity exercise five days per week.¹¹⁸ Integrating physical activity into daily life is one of the most sustainable interventions to fulfill a healthy

¹⁰⁷ Frank, L. D., M. A. Andresen, and T. L. Schmid. "Obesity Relationships with Community Design, Physical Activity, and Time Spent in Cars." *American Journal of Preventive Medicine* 27.2 (2004): 87-96.

¹⁰⁸ Saelens, B. E., et al. "Neighborhood-Based Differences in Physical Activity: An Environment Scale Evaluation." *American Journal of Public Health* 93.9 (2003): 1552-8.

¹⁰⁹ Moore Iacofano Goltsman, Inc. West Oakland Community-Based Transportation Plan., 2006.

¹¹⁰ Transportation Research Board Institute of Medicine of the National Academies. 2005. *Does the Built Environment Influence Physical Activity? Examining The Evidence*. National Academies of Science.

¹¹¹ Transportation Research Board Institute of Medicine of the National Academies. 2005. *Does the Built Environment Influence Physical Activity? Examining The Evidence*. National Academies of Science.

¹¹² Powell KE, Martin LM, Chowdhury PP. 2003. Places to Walk: Convenience and Regular Physical Activity. *American Journal of Public Health*. 93 (9): 1519-1521

¹¹³ Humpel N., Owen N., Leslie E. 2002. Environmental Factors Associated with Adults' Participation in Physical Activity A Review. *American Journal of Preventive Medicine*. 22(3): 188-199.

¹¹⁴ Takano T, Nakamura K, Watanabe M. 2002. Urban residential environments and senior citizens longevity in megacity areas: the importance of walkable green spaces. *J Epidemiol Community Health* 56:913-918.

¹¹⁵ Kahn EB. The effectiveness of interventions to increase physical activity. *American Journal of Preventative Medicine*. 2002; 22: 87-88.

¹¹⁶ This paragraph summarized from Oak to Ninth Avenue Health Impact Assessment (May 30, 2006).

¹¹⁷ Flournoy, Rebecca. *Regional Development and Physical Activity: Issues and Strategies for Promoting Health Equity*, 2002.

¹¹⁸ "Physical Activity for Everyone: Recommendations | DNPAO | CDC." 12/10/2007 <<http://cdc.gov/nccdphp/dnpa/physical/recommendations/index.htm>>.

exercise regimen.¹¹⁹ The CDC's exercise recommendation can be achieved by recreational exercise such as brisk walking, swimming, and dancing, as well as daily activities such as gardening, mowing the lawn and walking and biking for transportation. A recent study by Besser and Dannenberg documents that walking to and from public transportation can significantly contribute to the 30 minutes of regular exercise necessary to meet the physical activity objective of Healthy People 2010.¹²⁰

Many communities experience significant barriers to maintaining adequate levels of physical activity. Low-income people, particularly those living in communities of color, face disproportionately less access to recreational sites such as gyms, parks and playgrounds.¹²¹ Other common barriers to walking and biking include crime, long distances between the home and destinations, pedestrian safety from traffic hazards, and the quality of infrastructure for pedestrians and cyclists.

Relationship Between Traffic/Pedestrian Environment and Social Cohesion

Research has shown that traffic and pedestrian environment factors also influence social cohesion. A study conducted in New York City neighborhoods found that compared to those living on streets with low traffic volumes, residents living on higher volume streets harbor more negative perceptions of their block and possess fewer relationships with neighbors.¹²² Another study that went even farther and quantified pedestrian injuries concluded that areas with high concentrations of road traffic injuries in Cuernavaca, Mexico were characterized by the view that public roads serve the sole purpose of transportation and not of a communal space, uncooperative behavior among residents, and high levels of residential instability.¹²³

In his seminal 1980 study, Donald Appleyard looked at how traffic volumes on streets in San Francisco affected community life. People living on a street with lighter traffic had more friends and acquaintances on the street than did people living on a street with heavier traffic. Based on his research, Appleyard concluded that the risk of danger to children from traffic hazards is the biggest threat to residential and street life.¹²⁴

As part of a pedestrian environment, parks and open space serve a vital role in communities as a location for social interaction. For example, in a study conducted at a large public housing development in Chicago, Illinois, vegetated areas were found to be used by significantly more people and those

¹¹⁹ Oakland, City of. Pedestrian Master Plan. Part of the Land Use and Transportation Element of the City of Oakland's General Plan. 2007.

¹²⁰ Besser, L. M., and A. L. Dannenberg. "Walking to Public Transit: Steps to Help Meet Physical Activity Recommendations." *American Journal of Preventive Medicine* 29.4 (2005): 273-80.

¹²¹ Flournoy, Rebecca. *Regional Development and Physical Activity: Issues and Strategies for Promoting Health Equity.*, 2002.

¹²² Transportation Alternatives. *Traffic's Human Toll: A Study of the Impacts of Vehicular Traffic on New York City Residents.*, 2006.

¹²³ Inclan, C., M. Hijar, and V. Tovar. "Social Capital in Settings with a High Concentration of Road Traffic Injuries. the Case of Cuernavaca, Mexico." *Social science & medicine* (1982) 61.9 (2005): 2007-17.

¹²⁴ Appleyard, Donald. *Livable Streets.* London: University of California Press, 1981.

individuals were more likely to be engaged in social activities than similar areas without vegetation.¹²⁵ The authors of this study suggest that the vegetation in this study (mostly trees and grass) helped create “vital neighborhood spaces”.¹²⁶

Relationship Between Social Cohesion and Health

Social Cohesion is the ongoing process of developing a community of shared values, shared challenges and equal opportunities, and is based on a sense of trust, hope and reciprocity.¹²⁷ Dimensions of social cohesion include supportive social networks (which provide access to material and emotional support in times of need), social participation (meaning participation in relationships providing friendship, company, and participation in the workforce), community engagement (including participation in organizations that work for the benefit of members and others), and political engagement (involvement in the democratic process to advance needs or interests).

The opposite of social cohesion is social exclusion, which refers to a state where certain members or groups in a society are marginalized or disenfranchised relative to others. Groups can be excluded from resources or opportunities on the basis of ethnicity, religion, gender, or class. This impacts economic position and mobility, educational attainment, and living standards. Residential segregation is a key spatial indicator of social exclusion. Environmental Justice research has demonstrated that segregated neighborhoods with a disproportionate share of the poor or ethnic minorities are more likely to have unwanted land uses such as power generation, solid and hazardous waste sites, and bus yards, freeways and other busy roadways and are less likely to have quality parks and schools and supermarkets. Segregated neighborhoods are also often isolated from economic opportunities and marginalized in political decision-making, limiting their ability to effect change in their circumstances. Such place-based social exclusion has profound impacts on health. For example, research tells us that residents of high-poverty neighborhoods live about eight fewer years than non-poverty neighborhoods, in large part due to preventable events like infant mortality, pedestrian injuries, and homicide.¹²⁸

Empirical research over the last 20 years has linked diverse attributes of social cohesion to human health. Overall, social cohesion may affect health in three broad ways: (1) as a force to create and maintain shared norms for healthy behaviors; (2) by providing the ties to others that create security and give meaning to life; and (3) as a vehicle of collective problem solving and action to achieve material, political, and spiritual needs. By creating shared norms, social cohesion can discourage smoking and

¹²⁵ Sullivan WC., Kuo FE. DePooter SF. 2004. The Fruit Of Urban Nature:Vital Neighborhood Spaces. *Environment And Behavior*. 36(5):678-700

¹²⁶ This paragraph summarized from Oak to Ninth Avenue Health Impact Assessment (May 30, 2006).
¹²⁷ Community Services Council, Newfoundland and Labrador. "enVision.ca Virtual Resource Centre." December 11, 2007.

<<http://www.envision.ca/templates/profile.asp?ID=56>>.

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other drug use, delinquency, violent behavior, and poor eating habits. Shared norms can also encourage healthy prenatal care, immunization, and physical activity. Social ties to family, friends, neighbors, local business owners, and trust in random encounters can foster security and meaning, which has a profound effect on mental health. Finally, social cohesion can lead to collective efficacy, wherein neighbors solve local health dilemmas and take action together.

Regulations, Programs and Laws Affecting Pathway between Traffic and Pedestrian Collisions, Social Cohesion and Physical Fitness

West Oakland Truck Route

- Designated truck route (Figure 2) established by the Port of Oakland, West Oakland Truck Route Committee, Office of Council member Nancy Nadel, Oakland Police Department and West Oakland Community Partners. The truck route is also listed in City of Oakland Municipal Code Section 10.52.120, with reference to 10.52.070.
- Trucks are permitted to deviate from the official truck route, if they have business elsewhere, per Municipal Code Section 10.52.110.
- Most streets in West Oakland have truck prohibition signs. Commercial truck parking is prohibited on all residential streets.
- West Oakland Truck Route brochure states the following: "Truck routes are enforced 24 hours a day, 7 days a week. Penalty for taking commercial trucks into restricted areas could be \$351 or more."¹²⁹

Zoning Controls

- Title 17 of the City of Oakland Municipal Code describes the zoning districts within Oakland (Figure 3).

City of Oakland Municipal Code

- Section 10.52.030 - Heavy loads on streets in restricted districts where signs are posted.
- Section 10.52.050 - Vehicles exceeding four and one-half tons are prohibited of certain streets between 11 p.m. and 6 a.m. These streets do not include areas of West Oakland nearby to the Port.
- Section 10.52.060 - Vehicles exceeding four and one-half tons are prohibited on certain residential streets. These streets do not include all residential areas in West Oakland.
- Section 10.52.070 - Truck route "A" covering truck travel between intersection of California Highway Route 5 (U.S. Route 50) and the Oakland-San Leandro boundary and the distribution structure of the San Francisco-Oakland Bay Bridge.
- Section 10.52.110 - Deviations from truck route are permitted for pick-ups, drop-offs, and service trips only. Deviations should be kept to a minimum and stay as close to the approved route as possible.

¹²⁹ Port of Oakland. New West Oakland Truck Route.

- Section 10.52.120 - Local truck routes are listed in addition to the major roads stipulated in Section 10.52.070.

Bicycle Master Plan (Revised Draft, October 2007)

- Infrastructure — Develop the physical accommodations, including a network of bikeways and support facilities, to provide for safe and convenient access by bicycle (BMP Goal 1).

Pedestrian Master Plan

- Create a street environment that strives to ensure pedestrian safety (PMP Goal 1).
- Develop an environment throughout the City - prioritizing routes to school and transit - that enables pedestrians to travel safely and freely (PMP Goal 2).
- Provide pedestrian amenities and promote land uses that enhance public spaces and neighborhood commercial districts (PMP Goal 3).

Transportation

- Minimize nuisance impacts on nearby residential land uses through appropriate siting and efficient implementation and enforcement of environmental and development controls for new and existing industrial and commercial uses, including seaport activities (Policy I/C4.2).
- Concentrate truck services in areas near the freeways and the seaport, while ensuring the attractiveness of the environment for visitors, local businesses, and nearby neighborhoods (Policy T1.5).
- Designate a truck route which relies upon arterial streets away from residential neighborhoods (Policy T1.6).
- Re-route traffic away from neighborhoods, when possible, and enforce truck route controls (Policy T1.8).

Land Use

- Buffer and protect residential areas from seaport and other industrial uses (Policy W1.3).
- Develop appropriate buffering measures for heavy industrial uses and transportation use on adjacent residential neighborhoods (Policy W2.2).
- Develop the land adjacent to the seaport with a variety of uses that benefit from the seaport and enhance the unique characteristics of the seaport (W7.1).
- Locate large-scale commercial activities in areas visible or amenable to high volumes of traffic. Direct the traffic generated from large scale commercial development to arterial streets that do not adversely affect nearby residential streets (Policy N1.4).

Open Space, Conservation and Recreation (OSCAR)

- Current requirements for public art are supported and possible ways to expand the public art program are suggested (Open Space Chapter, Open Space for Community Character Section; Directive 5).
- A broad policy framework supporting street trees is presented. The OPR and OPB are directed to update the Street Tree Plan and pursue its adoption. The Street Tree Plan would prioritize planting projects and identify tree palettes that are appropriate and cost-effective. The Element also mandates public involvement in street tree selection, maintenance, and removal and establishes general criteria for tree removal (Open Space Chapter, Open Space for Community Character Section; Directive 6).

Comprehensive Truck Management Plan, Objectives

The Port of Oakland lists "mitigating impact of port related trucking on neighborhoods immediately adjacent to the port and the surrounding Local Impact Area (LIA)" as one of the objectives of its Comprehensive Truck Management Plan.¹³⁰

Healthy People 2010, U.S. Department of Health and Human Services

The U.S. Department of Health and Human Services (USDHHS) establishes National objectives for exercise goals and the rate of injuries.¹³¹ The Federal Department of Health and Human Services defines the injury rate as the number of injuries per unit time in a population of a standard size (e.g. injuries per year 100,000 people).

By 2010, the following objectives should be achieved:

- A rate of non-fatal vehicle injuries to pedestrians no greater than 19 injuries per year per 100,000 people.
- A rate of fatal vehicle injuries to pedestrians no greater than 1 injury per year per 100,000 people.
- Objective 22-2 - Increase the number of adults who engage in regular, preferably daily, in moderate physical activity for 30 minutes per day.
- Objective 22-14 - Increase the proportion of trips made by walking.
- Objective 22-15 - Increase the proportion of trips made by bicycling.

¹³⁰ Wong, Joseph. "Comprehensive Truck Management Plan" Letter to Port Commissioner Kenneth Katzoff, Commissioner Mark McClure, and Commissioner David Kramer. 7 June 2007. <http://www.portofoakland.com/pdf/ctmp_01.pdf>

¹³¹ U.S. Department of Health and Human Services. Healthy People 2010 Objectives.



Figure. Approved Truck Route, Bike Lanes, Schools and Landmarks

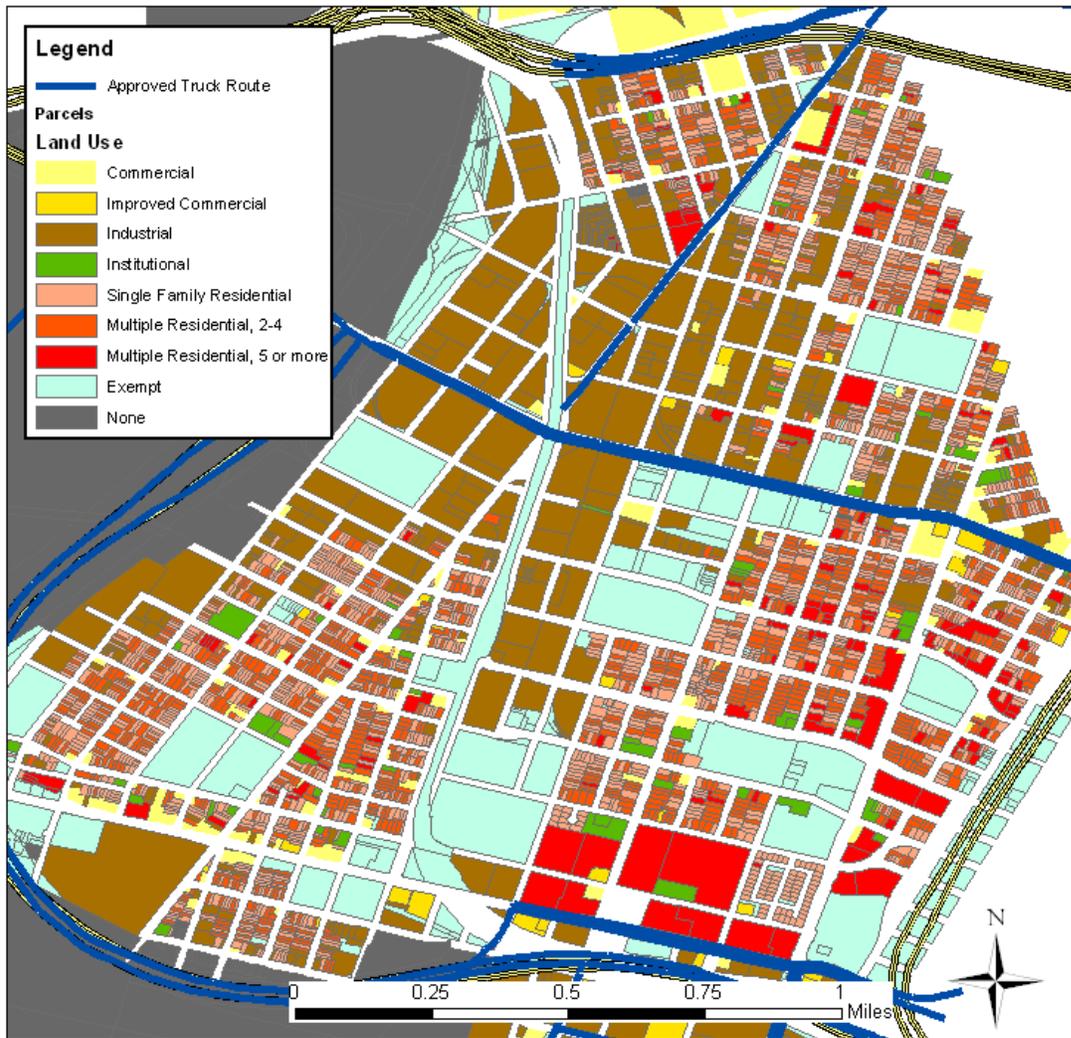


Figure. Land Use Map

Assessment of Transportation Impacts

We synthesized qualitative and quantitative data and information from several sources to assess how the Port of Oakland affects pedestrian collisions, resident physical activity, and social cohesion in West Oakland. Our analysis sought to answer the following questions:

1. How frequent are pedestrian-truck collisions in West Oakland? How severe is the rate of injuries resulting from them?
2. Do pedestrian-truck collisions occur at certain intersections ("hot spots") more than others?
3. Do trucks transporting containers to and from the Port of Oakland follow designated truck

routes?

4. How does traffic influence social cohesion and physical activity?
5. What are existing pedestrian assets and deficits that influence social cohesion and physical fitness?
6. How does the pedestrian environment on key routes (e.g. to a school or to a park) affect social cohesion and physical fitness?
7. How does the Port of Oakland potentially contribute to the pedestrian environment in West Oakland?
8. How much does the Port of Oakland's participation in truck regulation contribute to the trucking activities?

We utilized the following data sources and analytic methods to estimate the Port's contribution to traffic, and traffic's influence on health in West Oakland:

- Statewide Integrated Traffic Records System (SWITRS), 1996-2006
- U.S. Census Data, 2000
- Seaport Air Emissions Inventory, 2005

Field observations

- Port of Oakland's Forum on the Clean Truck Program on October 6th, 2007
- Two focus groups held with West Oakland residents on November 1st and 3rd, 2007
- Five site visits on weekday mornings
- Google Maps (including satellite and street view features)
- City of Oakland Bicycle Master Plan Existing Bikeways Map
- Walk Oakland Map and Guide
- West Oakland Truck Route Map

Analytic methods

- Pedestrian Environmental Quality Index (PEQI; qualitative analysis) (SFDPH, 2007)
- Neighborhood Environment Walkability Scale (NEWS; qualitative analysis) (Saelens, 2003)

West Oakland Truck Route and its Effectiveness

The truck route in West Oakland was implemented in response to community protest to the number of trucks passing through the neighborhood. The route has been in place for many years and has been amended several times.

UCBHIG made three weekday morning visits to West Oakland to count trucks. Approximately three hours were spent counting trucks in several randomly selected locations. As shown in figure 4, 104 trucks were observed either parked or driving off of the approved truck route. In this figure, the densities have been defined to show the relative differences between the locations. The 'Low' density

locations are areas that are within approximately a block of a truck sighting. The 'Very High' density locations contain anywhere from 5 to 9 truck sightings at the same intersection. Although not every intersection in the community was sampled, the main purpose of this analysis was to simply identify whether trucks were prominent in the neighborhood on or off of the approved truck route. Some were parked directly next to "No Parking" signs.

Many streets off of the truck route have signs directing trucks not to park on that particular street. However, according to one West Oakland Police Officer, these signs are not frequent enough to enforce parking violations.

During site visits made by UCBHIG, it was noticed that signage for the route is confusing, especially if one is unfamiliar with the area. For example, one sign directs truck traffic to follow Peralta, but after exiting onto Peralta, a driver will observe "No Through Traffic" signs.

At the Port-organized community meeting on October 6, 2007, community members expressed concern that there was no resource for them to contact when trucks were sighted in their neighborhoods. The "Truck Hotline" listed on the Community and Customer Relations section of the Port of Oakland website takes callers to a pre-recorded message about the Port's truck replacement program. Currently, the Port of Oakland, Councilmember Nancy Nadel's office, the Oakland Police Department, and Neighborhood Crime Prevention Councils each field complaint calls.

At the time of this report, the current West Oakland truck route is being revised.



Figure. Truck Sightings Density Map

Port of Oakland's Contribution to Enforcing the Truck Regulation in West Oakland and the Port area

The Port of Oakland has been financially supporting police officers from the Oakland Police Department (OPD) since 1993.¹³² At one point, three officers were responsible for port-related activity, but there is presently only funding for two. These officers are part of the Commercial Enforcement Unit (CEU) and work 6 am through 4 pm, with overtime as necessitated for special investigations. The OPD officers have a large amount and large variety of responsibilities. These officers are responsible for Port security, which includes patrolling the Middle Harbor Shoreline Park on foot, the waterfront area by police boat, and the West Oakland area by patrol car. They have been trained in truck-law enforcement and are relied upon for truck safety checks (bald tires, faulty breaks, etc) and truck height and weight enforcement. Truck weight is limited to 80,000 pounds, unless the truck has a special permit, which allows for 90,000 pounds. The port security officers review permit applications for weight, height, and length allowances¹³³; one of the OPD's CEU officers estimated that the duo see 300 permit applications every month. As trucks belong to both individual drivers and large-scale trucking companies, there is no guarantee that the owners follow any safety standard. Independent drivers do not generally have the capital of large companies to update their mechanics and hardware as often as is safe. This is also true of emissions violations. Because of the potential community safety impact of a truck's breaks, steering, mechanism, and other parts, the OPD officers spend a good percentage of their time with stopped trucks checking the safety of the vehicle.¹³⁴

Two final areas of responsibility are truck route and truck parking enforcement. According to Oakland City Municipal Code Section 10.52.070 and 10.52.120, the city has designated a truck route for all truck traffic in the West Oakland area. Trucks are required to stay on the designated route, unless they are making a delivery, a pick-up, or a service call. Similarly, Oakland's General Plan includes Policy T1.6 and T1.8, which discuss truck routes directing traffic away from residential areas and enforcing the truck routes. West Oakland, however, is home to 52 truck based businesses, besides the Port, which do not sit on the truck route.¹³⁵ It can be argued that several of these businesses, including the largest generator of truck traffic, Oakland Maritime Support Services, are located in the vicinity of West Oakland because of proximity to the Port. Because there are so many distribution centers in the neighborhood visited by trucks each day, officers have found enforcing the truck route regulations nearly impossible. UCBHIG observed that the truck route is poorly marked and signage can be misleading a sentiment that was echoed by one of the OPD CEU officers. In 2007, the OPD CEU officers issued 844 parking citations.

¹³² Gordon, Jim. Telephone Interview. 20 November 2007.

¹³³ DeLuca, Niccolo. Telephone Interview. 11 December 2007.

¹³⁴ Gordon, Jim. Telephone Interview. 20 November 2007.

¹³⁵ Martien, Phil. West Oakland Diesel PM Emission Inventory: Truck-Related Businesses and Construction Projects. Ed. STI CARE Task Force., 2007. 12/12/2007.

<www.baaqmd.gov/CARE/documents/care_tf_wo_dpm_emiss_07_24_07.pdf>

However, the OPD's CEU does not keep a database of the locations of any parking tickets that they write and could not confirm that these were all truck parking citations.¹³⁶

In both focus groups, residents advised that trucks are observed in their neighborhood after dark. Neither of the Commercial Enforcement Unit Officers is regularly scheduled to work after 4 pm, although they do work overtime as required. According to OPD, violent crime in the area is a large problem in this neighborhood, and any officers in the area after 4 pm are focusing on this problem.

Since at least August of this year, the Port has discussed increasing the level of enforcement, using Sheriffs as traffic monitors, using City of Oakland parking enforcement, and increasing oversight of the OPD officers.¹³⁷

The Port of Oakland began implementing a Radio Frequency Identification Device program on a volunteer basis in March 2007. The tags can be electronically read and linked back to a specific trucking company and specific trips. As of June 2007, the Port believed that approximately 1,000 trucks out of an estimated 2,500 had been issued their RFID tags. The Port plans to implement a requirement of GPS and RFID technology on all trucks sometime in 2008. There is currently no information on a plan for geofencing the West Oakland neighborhood or monitoring deviations from the route based on GPS and RFID technology.

Port of Oakland's Potential Contribution to the Pedestrian Environment in West Oakland

The most direct contribution the Port of Oakland makes to West Oakland's pedestrian environment is that of trucks driving through residential streets. An estimated 10,000 truck trips occur from the Port of Oakland each day; while they are directed to follow the designated truck route, site visits and focus groups have shown that trucks deviate from the route and enter the West Oakland neighborhood regularly. There are potential indirect contributions to pedestrian quality deficits in West Oakland as well, such as the possibility that public works resources may be preferentially allocated to the Port's truck routes over maintenance of other residential West Oakland streets, causing the latter to be overlooked. A second indirect contribution relates to the overall industrial nature of West Oakland. In addition to the Port, West Oakland is home to a Union Pacific intermodal freight facility, warehousing and distribution facilities, and other light and heavy manufacturing facilities. Many of these activities are associated with the Port, and others may have located in West Oakland due to the presence of the Port and other industrial sites lowering property values.

There are clearly other contributors to the pedestrian environment in West Oakland besides the Port. The West Oakland BART Station contributes traffic danger to pedestrians, because a large number of

¹³⁶ DeLuca, Niccolo Telephone Interview. 11 December 2007.

¹³⁷ Port of Oakland Steering Committee Meeting Minutes for 27 August 2007.12/12/07.

<http://www.portfoakland.com/pdf/ctmp_070827_06.pdf>

patrons commute by car from outside of the community to access BART. Eighty percent of West Oakland BART riders use a car to reach the station versus the BART system-wide average of 54%. Eight percent use buses to reach the station compared to 21% system-wide, and only 11% walk compared to 23% system-wide.¹³⁸ West Oakland residents, on the other hand, contribute minimal traffic danger to pedestrians during commuting hours. Forty percent of West Oakland households do not own an automobile, and 33% use transit, biking, or walking to get to work.¹³⁹

The City of Oakland is the responsible party for maintaining streets and sidewalks throughout the city.

Truck Collisions in West Oakland

SWITRS data for all injury collisions from 1996-2006 for Alameda County was geocoded to the nearest intersection to provide a base for the analysis of truck collisions. Figure 5 shows the distribution of truck collisions in West Oakland, with a total of 177 during the 11 year period. The collision densities have been defined to show the relative differences between the locations. The 'Low' density locations are those that fall approximately within a block of a truck collision. The 'Very High' density locations contain up to 20 collisions at the same intersection. However, all of the collisions may not have occurred at the exact same point, rather they would be spread out along the freeway near the intersection. Major freeways did show the highest concentration of collisions, but other streets such as Mandela Pkwy and 14th also experienced large concentrations. The relative amount of truck collisions in West Oakland can be seen in Table 1 that shows 7.3% of all motor vehicle collisions involved a truck. The rest of Oakland only experienced truck collisions in 4.2% of all accidents. However, truck collisions in Oakland and West Oakland both experienced truck collisions with a pedestrian during 6.2% of all truck collisions compared to only 3.5% for Alameda County.

Note: All tables exclude the contained municipality from the encompassing one. For example, Oakland values contain all of Oakland, except for West Oakland, and Alameda County contains data from the county, excluding West Oakland.

¹³⁸ Moore Iacofano Goltsman, Inc. West Oakland Community-Based Transportation Plan., 2006.

¹³⁹ Moore Iacofano Goltsman, Inc. West Oakland Community-Based Transportation Plan., 2006.

Table 1. Truck Collisions (1996-2006)

<u>Location</u>	<u>Truck Collisions</u>	<u>% of Trucks in All Motor Vehicle Collisions</u>	<u>% of Truck Collisions involving Pedestrian</u>
Alameda County	4504	5.0	3.5
Oakland	1029	4.2	6.2
West Oakland	177	7.3	6.2

Figure 6 shows the locations of the pedestrian-truck collisions, usually the most costly type of injury collisions and the focus of many health measures. There were 11 truck-pedestrian collisions during the study period, but several occurred on port roads not in the map view. Six of these collisions, including the only fatal collision, occurred on today's approved trucking route covering port roads or freeways. The other five collisions occurred on surface streets at residential locations and within a quarter mile of a school. The buffer ring on the surface street collisions shows the area that is encompassed within a quarter of a mile. Injury rates based on these truck-pedestrian collisions have been calculated and displayed in Table 2. Although USDHHS standards have been established for pedestrian injury rates involving all types of motor vehicles, there is nothing specific for truck collisions. However, the rate of truck related pedestrian injuries in West Oakland accounts for over a quarter of the non-fatal injury and nearly half of the fatal injury standards used for all motor vehicles. This is a very large proportion considering trucks are involved in less than ten percent of the total amount of collisions in the region. Since the USDHHS standards do not apply directly to these rates, the rates can also be compared between the locations. Non-fatal injury rates in West Oakland are over five times greater than Oakland and over ten times greater than Alameda County. Fatal injuries are nearly four times greater in West Oakland than Oakland with a larger discrepancy compared to Alameda County.

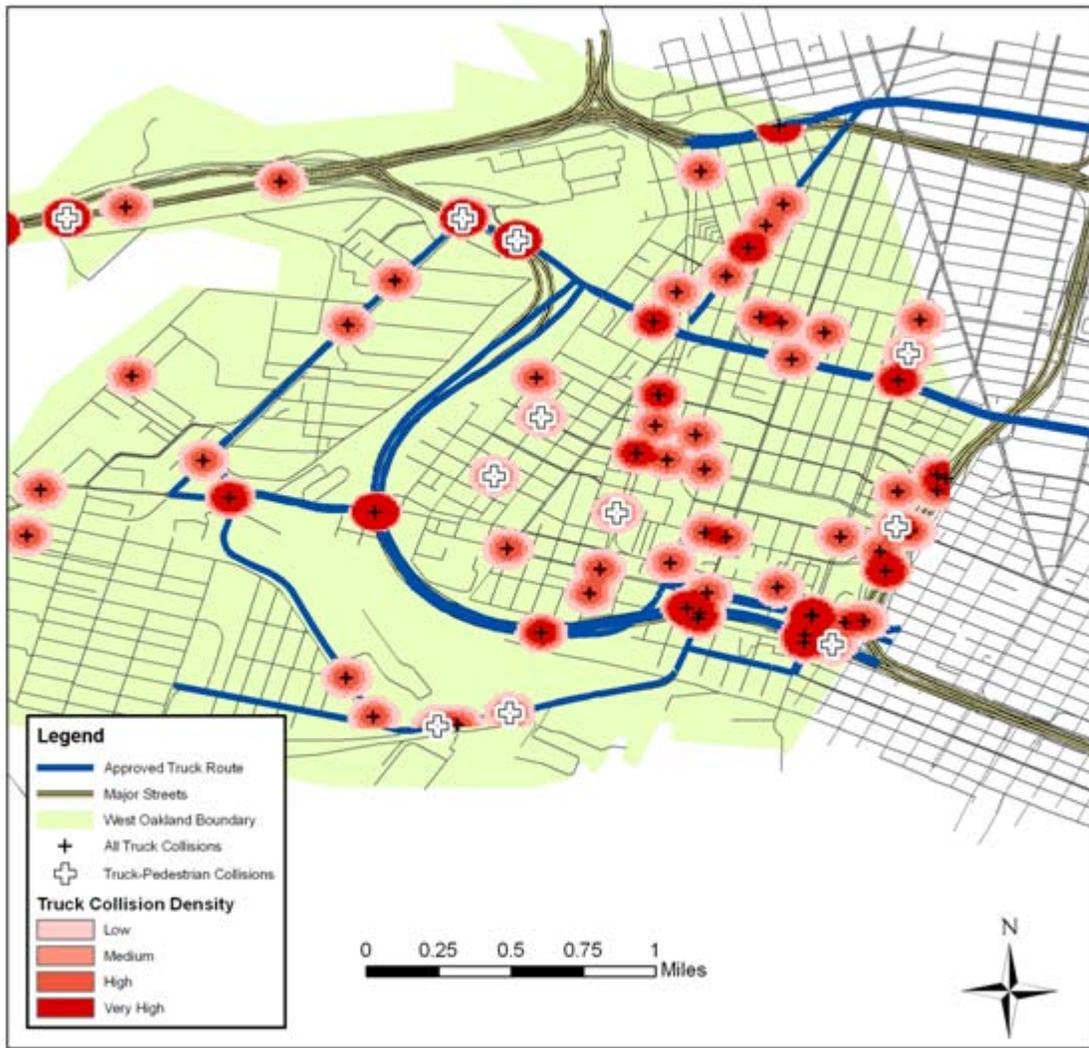


Figure 5. Truck Collision Density Map

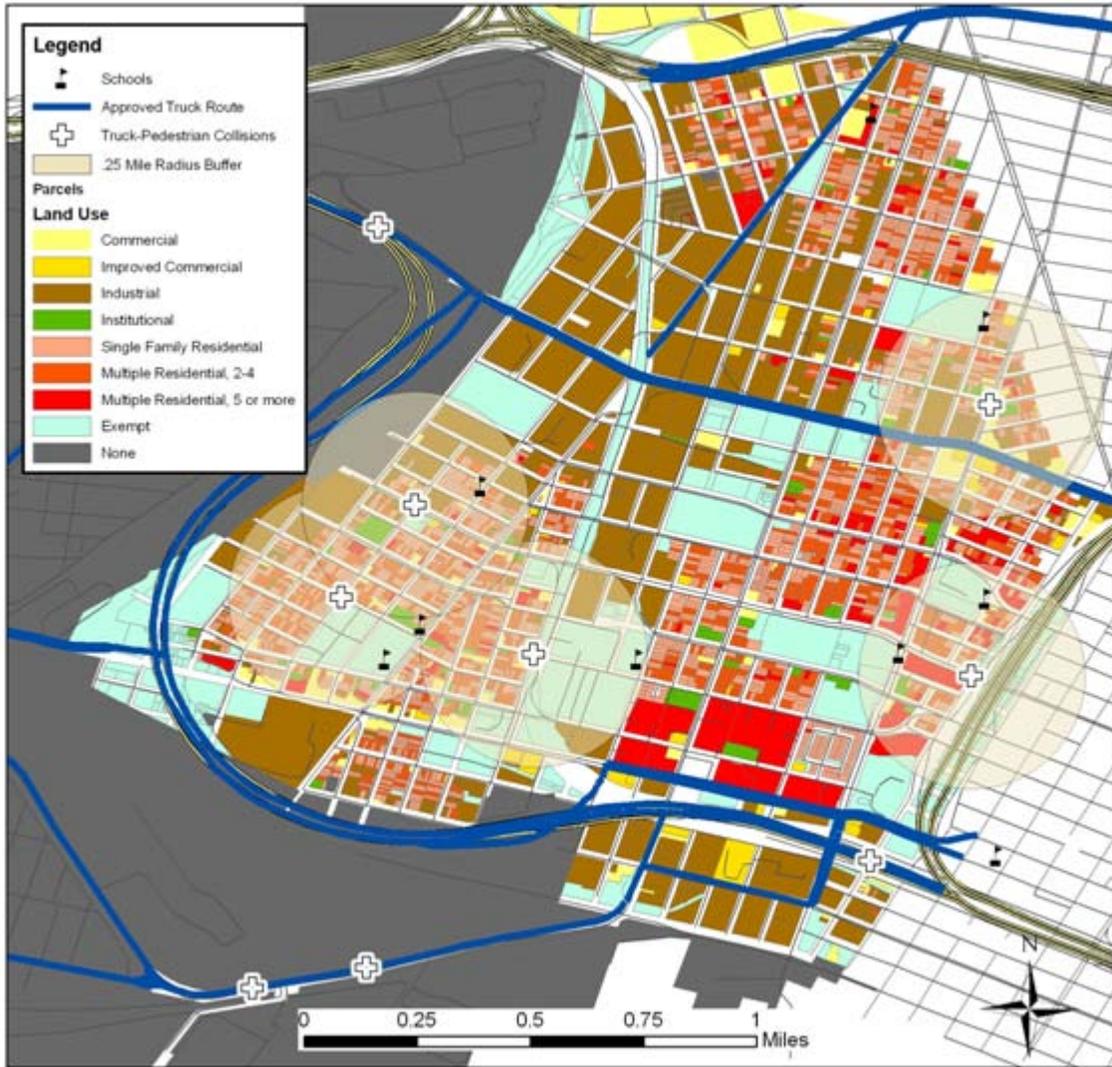


Figure 6. Truck-Pedestrian Collision Map with Schools and Collision Buffers

Table 2. Pedestrian/Truck Collisions (1996-2006)

<u>Location</u>	<u>Population (2000)</u> ¹⁴⁰	<u>Non-Fatal Injuries / year / 100,000 people</u>	<u>Fatal Injuries / year / 100,000 people</u>
Alameda County	1,044,257	0.43	0.07
Oakland	379,710	0.79	0.12
West Oakland	19,774	4.6	0.46

Traffic's Influence on Social Cohesion and Physical Activity in West Oakland

All four participants in the November 1, 2007 focus group agreed that the presence of moving and parked trucks in their neighborhood negatively affects their quality of life. They frequently observe trucks driving through West Oakland, and they do not suspect that the truck routes are enforced by authorities. Aside from emissions, most worrisome to them is the presence of children in close proximity to moving trucks. They added that trucks, truck cabs, and truck trailers frequently drive and park in their neighborhood during weekdays, weekends, and overnight.

Focus group participants also expressed concern about speeding automobiles on residential streets in West Oakland. Many young people race one another in speeding cars, perform "donuts" in the street, and participate in "sideshows," which are illegal street rallies in which young drivers informally compete with one another in various performances using their cars. One focus group member said that 10th Street is characterized by a particularly high amount of this behavior.

When questioned about walking and other outdoor activities in the neighborhood, one focus group member explained that she enjoys walking but intentionally avoids West Oakland due to air pollution and to a lesser degree, the presence of trucks. As observed by UCBHIG and confirmed by focus group members, many children walk to school in West Oakland. UCBHIG observed crossing guards escorting students across streets in the early morning hours at intersections adjacent to Cole Middle School, MLK Elementary School, Lafayette Elementary School, and Prescott Elementary School.

During five weekday visits to West Oakland, UCBHIG observed adults and children walking to school and work during morning commute hours. UCBHIG observed very few people walking and bicycling for recreation in the neighborhood.

Existing Pedestrian Assets and Deficits

UCBHIG used the following indicators adapted from PEQI and NEWS to qualitatively evaluate the

¹⁴⁰ Source: U. S. Census Bureau, 2000 Census of Population, SF1, Table P1.

pedestrian environment in West Oakland based on field observations. The following table lists indicators of a good quality pedestrian environment in the left column, with the columns to the right describing West Oakland's adherence (or lack thereof) to them.

Table 3. Pedestrian Environmental Quality Indicators

Pedestrian Quality Indicator	Presence? (yes/no)	Comments
Low Danger of Vehicle-Pedestrian Collisions	No	Several trucks observed throughout entire neighborhood. See Figure 4 for a map of truck sightings made by UCBHIG in three visits to the area.
Crosswalks	Yes	Most busy intersections in West Oakland have at least two crosswalks. However, many intersections do not. See Figure 7 for a visual representation of crosswalks on key pedestrian routes.
Signals	Yes	Many busy intersections (for example, those along Adeline Street) in West Oakland have signals. Intersections along most small and medium sized streets do not have signals.
No Turn on Red sign	No	These were not observed by UCBHIG.
Traffic Calming Features	Yes	Curb extensions observed at the 8th and Adeline intersection. Medians observed on 14th Street and Mandela Parkway. Speed bumps observed along Chester and Center Streets between Peralta Street and 7th Street and adjacent to some schools.
Additional Signs for Pedestrians	Yes	Bright yellow pedestrian sign reading "Pedestrian Crossing" observed in center of Campbell Street in front of Prescott Elementary School. No other pedestrian signs observed.
Presence of Sidewalk	Yes	Most West Oakland streets have sidewalks. However, many streets west of Peralta Street do not (for example, sections of Wood Street, 17th Street, and Campbell Street).
Sidewalk Free of Impediments	No	Many cracked sidewalks observed with vegetation growing through; trash (including glass, sharp metal, and furniture) litters sidewalks; these types of impediments are particularly severe west of Peralta Street.
Trees/Planters/Gardens	Yes	Trees within sidewalks observed along sections of 7th Street, 12th Street, 18th Street, Chestnut Street, Chester Street, Center Street, Market Street, Peralta Street, and other streets interspersed throughout neighborhood.
Public Seating	Yes	Mandela Parkway median has public seating; besides this, none observed.
Public Art	No	None observed by UCBHIG.
Restaurant and Retail Use	Yes	Very little restaurant and retail use compared to average urban areas. See Retail Chapter of this HIA for more information.

Cleanliness/lack of litter	No	Litter on sidewalks and streets is prevalent, particularly in areas west of Peralta Street. Illegal dumping observed on many vacant lots.
Lighting	Yes	Pedestrian-scale lighting observed on Mandela Parkway median and sidewalks near 7th Street only.
Low Levels of Construction	No	Active construction sites are interspersed throughout neighborhood; abandoned and rotting temporary wooden pedestrian walkway observed on Peralta at 14th Street.
Lack of Abandoned Buildings	No	Many abandoned houses, apartment buildings, retail spaces, and industrial sites observed throughout West Oakland.
Street Connectivity (NEWS criterion)	Yes	Most streets in West Oakland are interconnected to others.
Bike Lanes (NEWS criterion)	Yes	There are bike lanes on Mandela Parkway, 8th Street, 3rd Street, and a portion of Market Street. However, several streets without bike lanes contain large potholes on shoulders where bicyclists need to ride.

As shown in Table 3, pedestrian quality assets in West Oakland include crosswalks and/or signals at most busy intersections in the eastern portion of the neighborhood. Except for areas west of Peralta Street, most streets in the neighborhood have sidewalks, and many of the sidewalks have trees planted within them. Bike lanes follow some of the major streets traversing West Oakland. According to Jason Patton, Bicycle/Pedestrian Program Manager with the City of Oakland, new bike lanes were installed on Market Street between 3rd and 18th Streets in June 2007. Additional bike lanes on Market Street will be installed between 18th Street and West MacArthur Blvd in spring 2008, which will complete the Market Street Bikeway.¹⁴¹ The grid-like street pattern in West Oakland makes for good street connectivity.

UCBHIG also observed pedestrian quality deficits in West Oakland. Many deficits are concentrated in the western portion of West Oakland (i.e. west of Peralta Street). There is a lack of sidewalks on many streets in this area, and existing sidewalks are of poor quality in many cases. More abandoned buildings were observed west of Peralta than east of Peralta, as well as more litter on streets and sidewalks.

Also, major roads such as Mandela Pkwy or W Grand Ave are well maintained and the road conditions are excellent. This is in stark contrast to the local streets that are riddled with pot holes. Trucks cause more damage to roads than passenger vehicles, yet the streets designated for trucks are in much better condition. Funding is possibly being diverted from the local streets to maintain peak road conditions for the trucks.

One hundred and four trucks were observed driving or parked throughout West Oakland during three weekday visits made to the site by UCBHIG (Figure 4). Trucks appear to have a substantial presence

¹⁴¹ Patton, Jason. Personal Communication. October 31, 2007.

throughout West Oakland both on and off the designated truck route. They may present a perceived danger to pedestrians, as well as decrease the aesthetic quality of the pedestrian environment.

Throughout West Oakland, few signs were observed that alert drivers to pedestrians. While there are some traffic calming features in the neighborhood now, additional traffic calming measures would be advantageous in terms of protecting pedestrians. No public art was observed by UCBHIG, and public seating and pedestrian-scale lighting was limited to Mandela Parkway. Several active construction sites were seen throughout the neighborhood. Deep potholes were observed in many West Oakland Streets, which present a hazard to cyclists.

Pedestrian Environment on Routes to Key Destinations

UCBHIG estimated pedestrian routes to four key destinations in West Oakland and evaluated pedestrian quality along these routes. Destinations chosen include Ernie Raimondi Park (bordered by 18th, 20th, Wood, and Campbell Streets), West Oakland BART Station (on 7th Street between Chester Street and Mandela Parkway), MLK Elementary School (on 10th Street between Filbert and Market Streets), and West Oakland Senior Center (on Adeline between 16th and 18th Streets). Figure 7 depicts features of pedestrian quality along these routes.

In summary, routes to Ernie Raimondi Park are characterized by a very poor pedestrian environment. Many streets approaching the park do not have sidewalks or crosswalks, and many of the sidewalks are not well maintained and littered with trash. Industrial facilities and highways surround the park.

Major pedestrian routes to the West Oakland BART Station include 7th Street and streets approaching the station from the north. Seventh Street has well-maintained sidewalks, crosswalks, and signals. Chester and Center Streets north of the BART Station and south of Peralta have speed bumps on them. While devoid of certain pedestrian features such as public seating and vibrant storefronts, the pedestrian environment along 7th Street and along residential routes north of the station is adequate.

Most residential streets around MLK Elementary School include crosswalks, and during early morning hours, crossing guards are present at busy intersections to escort children across the street. Market and Adeline Streets are characterized by high traffic volumes and speeds, and may pose hazards to children walking to MLK Elementary. However, besides the busy streets, the overall pedestrian environment within neighborhoods surrounding this school to the north, west, and south, is adequate.

The West Oakland Senior Center is located on Adeline Street, which has high traffic speeds and volumes relative to most West Oakland Streets. Intersections along Adeline to the north and south of the Center include sidewalks and crosswalks, and in most cases, signals. However, 16th and 18th Streets, which border the Center, do not have crosswalks along them between Adeline and Market Streets. The

pedestrian environment along these routes is adequate, but more crosswalks and additional pedestrian assets such as public seating, pedestrian scale lighting, and signage, would vastly improve it.

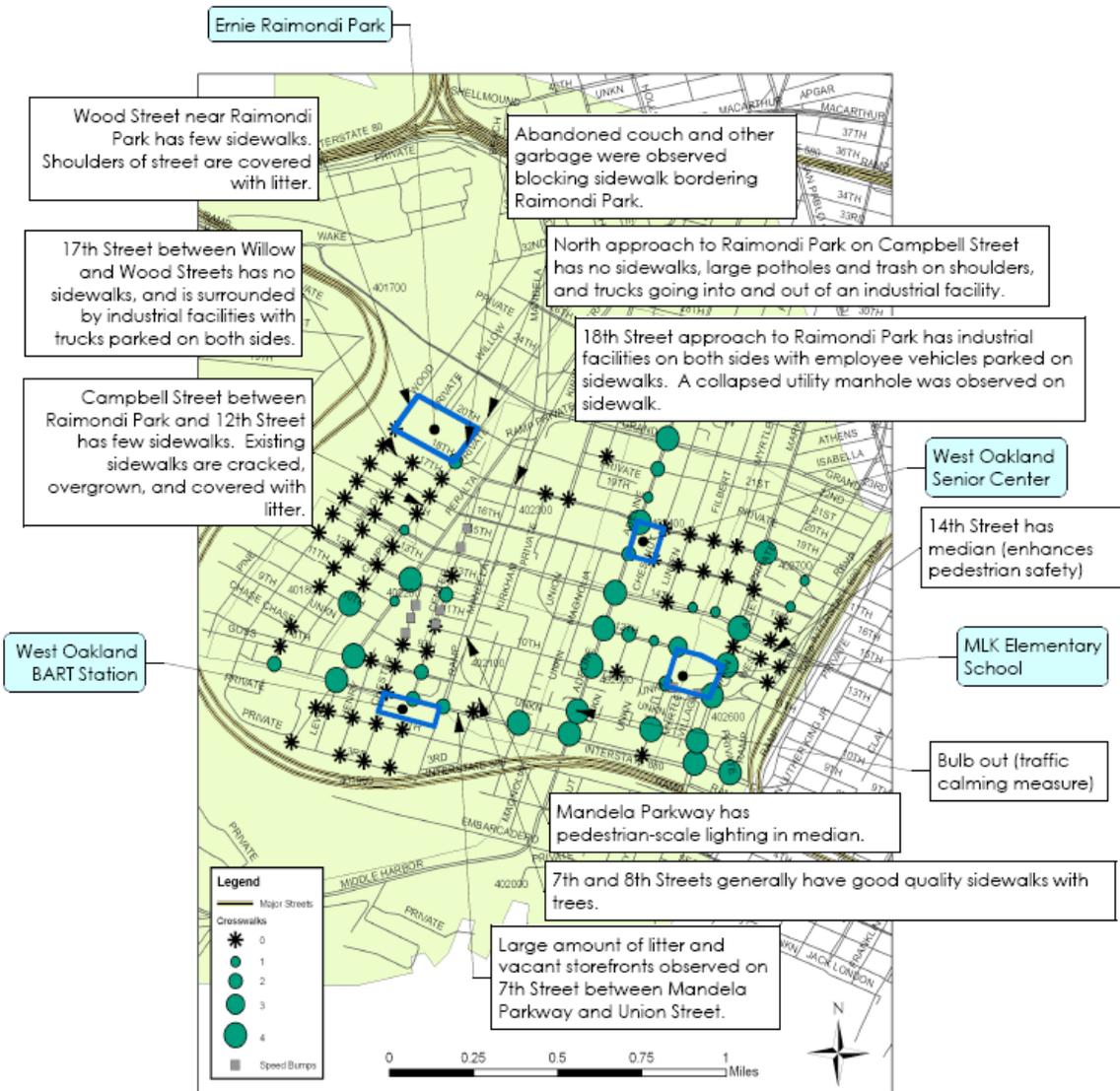


Figure 7. Crosswalks and other pedestrian quality indicators on common walking routes surrounding West Oakland BART Station, Ernie Raimondi Park, West Oakland Senior Center, and MLK Elementary School

Interpretations

Based on findings, UCBHIG makes the following interpretations:

- The Port of Oakland contributes roughly 10,078 truck trips per day to the residential streets of West Oakland. Therefore, the Port is partially responsible for the volume of truck traffic in West Oakland
- There is a disproportionate number of non-fatal and fatal pedestrian-truck collisions in West Oakland than in the rest of Oakland and Alameda County.
- West Oakland is not regularly monitored for truck route deviations and truck parking violations.
- Port-funded Oakland Police Department officers may be over utilized and unable to monitor truck route deviations.
- Based on the opinions of residents participating in two focus groups as well as field observation, truck traffic volume and automobile speed in West Oakland discourage residents from outdoor activities.
- Based on limited field observation, pedestrian environmental quality in West Oakland is adequate in some areas and poor in others. Pedestrian resources are particularly poor west of Peralta Street. Overall, pedestrian environmental quality in West Oakland does not encourage physical activity or community life.
- The Port of Oakland and other industrial sites in West Oakland contribute to deficits in pedestrian quality in the neighborhood.
- The Port of Oakland and associated industrial facilities in West Oakland may drive down property values in West Oakland, attracting more industry to the neighborhood.

Limitations

- The number of collisions is likely to be underestimated because only those collisions reported to the police are recorded in SWITRS database. Property damage only collisions were also not accounted for in this analysis.
- Two focus groups were held with a total of seven West Oakland resident participants. While focus groups contributed valuable information to this analysis, seven people is not a representative sample of the West Oakland community.
- UCBHIG field observations, including truck counts, evaluation of pedestrian environmental quality, evaluation of the quality of parks and open space, and estimation of social cohesion and physical activity levels, were limited to five trips to West Oakland. Each trip was made in the morning on a weekday, and observation locations were chosen arbitrarily. A more powerful study would include a longer observation period and cover the neighborhood more thoroughly.

Conclusions

- There is a heavy truck presence and relatively frequent interaction of trucks and pedestrians in West Oakland.
- Truck-pedestrian injury collisions occur at high rate, disproportionate to the rest of Oakland and Alameda County.
- The Truck Route is not clearly marked and it is difficult to enforce.

- Other issues besides route enforcement receive more time from Port-paid Oakland police officers (e.g. crime and truck safety and permits)
- The Truck Route is not monitored at all in the late afternoons or at night.
- Physical activities are limited by community members due to traffic on major roads and/or neglected pathways on smaller roads.
- Social cohesion is disrupted by truck traffic.
- Mixed industrial and residential land use contributes to the high concentration of trucks in West Oakland.
- Major discrepancies in road conditions of major truck roads compared to local streets.

Recommendations

The truck traffic derived from the Port of Oakland and associated businesses constitute a significant presence in the West Oakland. This truck traffic presence can have adverse health effects on the community. The rate of pedestrian injuries in West Oakland due to truck collisions is almost 6 times the rate compared to the rest of Oakland. The higher traffic volumes can also lead to decreased physical activity and impede residents from building relationships with their neighbors. Therefore, West Oakland could benefit from a comprehensive plan to reduce pedestrian injuries, improve co-existence with the trucks and promote healthy community measures. A countermeasure plan should be based on further analysis of pedestrian safety hazards and mitigations on specific streets and intersections with significant amounts of truck traffic volume. Particular attention should be given to high injury intersections and street segments and to routes traveled by vulnerable populations (i.e., children, elderly, disabled). Any mitigations to reduce pedestrian injuries should not come at the expense of limiting, or discouraging pedestrian access and activity since there are multiple health benefits to walking.

We recommend:

1. Provide truck services, including food and restrooms, at Oakland Army Base to reduce neighborhood truck traffic.
2. Improve enforcement system of designated truck routes to keep trucks off of neighborhood streets.
3. Decrease truck traffic by increasing use of rail transport.
4. Implement a traffic calming program in residential neighborhoods to include vehicle lane narrowing, raised crosswalks, raised intersections and traffic circles, to prevent truck traffic from entering the area.
5. Provide countdown pedestrian signal heads, bulb outs, and center median refuge islands at high volume multi-lane intersections where cumulative traffic volume increases exceed 5%.
6. Provide pedestrian warning signs or lights at all crossings or cross walks without traffic signal lights.
7. Institute speed limit reductions to less than 20mph in mixed-use residential areas.
8. Widen sidewalks or provide buffers between sidewalks and vehicle lanes on busy roadways with significant pedestrian traffic.
9. Improve 'attractiveness' of pedestrian pathways by repairing sidewalks, improving landscaping, displaying public art, increasing public seating and planting trees.

10. Expand City Municipal Code Section 10.52.050, which stipulates that truck traffic over four and a half tons is prohibited between the hours of 11 pm and 6 am, to include all residential areas of West Oakland.
11. Expand City Municipal Code Section 10.52.060, which stipulates that truck traffic over four and a half tons is prohibited on certain roads, to include all residential areas of West Oakland.
12. Increase the number of posted signs that prohibit truck parking and truck traffic on residential streets off of the truck route.
13. Improve road maintenance of West Oakland neighborhood, including off-truck route roads and streets which have old railroad tracks embedded in them.
14. Enforce parking laws by increasing the number of parking monitors in the neighborhood.
15. Increase the number of Oakland Police Department officers patrolling the neighborhood for truck violations and port security.
16. Implement and monitor a radio frequency identification device program for trucks, with a published time line, to include tracking personnel to monitor deviations from approved truck route.
17. Implement a geo-fence around the residential sections of West Oakland, which will alert port monitoring personnel if a truck enters.
18. Update City Municipal Code Section 10.52.120, which stipulates local roads included in the truck route, to match port-published literature and the most current truck route.
19. Create a central truck-sighting hot line, so residents can report truck route violations.
20. Promote education of children as to benefits of physical activity, pedestrian risks in the neighborhood, and safe routes to school.
21. As city land use changes, build a buffer area between the industrial and residential areas of West Oakland, identify opportunities for safe pedestrian-only corridors that offer an excellent health-promoting environment, and opportunities for reducing traffic from outside of the community (e.g., reducing BART parking).

Retail Environment

Chapter 5

Summary

A healthy retail environment is one which benefits the community by providing retail goods and services that promote improved **nutritional health** through better access to affordable, quality food, increased **physical activity** by integrating retail and residential uses in a pedestrian-friendly environment, and a **vibrant economy** that contributes to the economic well-being of individuals. A healthy retail environment may also facilitate **social cohesion** and **environmental quality**.

Based on an analysis of three reference points in the community, on average 53% of common retail services were available within a 0.5 mile walking distance, suggesting a lack of retail vitality in West Oakland. Moreover, there tends to be an increase in median and mean property values with distance from the Port.

Analysis shows that Port Operations contribute both positively and negatively on the markets for retail goods in West Oakland. Port Operations create a niche market for transportation-related retail services and are assumed to crowd out the market for common services.

Industrial land uses create an inhospitable atmosphere for retail viability. While this is not the main reason that business owners cite for failing to locate in Oakland, it is a partial contributor to the lack of a thriving retail environment in West Oakland, as it may contribute to a negative perception of public safety.

The Port may support an underground retail economy that serves port-related needs, but also indirectly affects retail viability through traffic, noise and attractiveness of the area.

Recommendations

1. Respond to community needs by providing usable commercial corridors that contain 75% of “common services” such as grocery stores, banks, and post offices.
2. Work to attract “small-footprint” merchants to fill shuttered businesses in commercial corridors. This mitigation avoids the “big boxing” of the neighborhood, maintaining character while increasing access. Chains such as Tesoco and Walmart are using small-footprint stores as an entry point into urban areas, and the growing momentum in the movement should be utilized.
3. Work with local food merchants to increase availability of fresh food through micro-loan programs or other financial incentives. Corner stores are prevalent in the West Oakland retail environment; establishments such as these need financial assistance to install the infrastructure necessary to provide what the community needs.
4. Increase enforcement of illegal truck routes that conflict with retail atmosphere (i.e. create adverse traffic and noise effects that deter foot traffic). Increase lighting in retail/industrial mixed neighborhoods to enhance public safety.

5. Examine the legal options for Port contributions directly to the neighborhood for these ventures. The Port has been known to contribute to OUSD, among other charitable causes. Increasing access to retail goods and services could be a part of the Port's commitment to giving back to the neighborhood.

Background

Land use development for community benefit requires analysis of effects, both positive and negative, on the retail environment, including an analysis of the distribution of those effects. Public health research identifies a number of relationships between retail goods and services and human health. Improved **nutritional health** is a direct consequence of access to affordable, quality food. Increased **physical activity** is a direct consequence of integrating retail and residential uses. Indirectly, retail can contribute to **vibrant economy** benefiting the economic well being of individuals. Income and related socioeconomic factors (such as education, occupation, and wealth) mediating health status are well-established determinants of health.^{142 143} Indirectly, retail also facilitates **social cohesion** and **environmental quality**. The evidence supporting these relationships is described below.

Retail diversity and proximity increases physical activity

Complete neighborhoods with integrated public and retail services as well as quality pedestrian environments can increase physical activity by making everyday retail destinations accessible by walking.¹⁴⁴ A San Francisco Bay Area study looking at non-work related trips (in four neighborhoods, controlled for SES) found that the proximity and mix of retail and having many, quality destinations and modes of transport choices are one of the most influential factors in people's decisions to walk.¹⁴⁵ Physical activity has been associated with various health benefits including reductions in premature mortality, the prevention of chronic diseases such as diabetes, obesity, and hypertension, and even improvements in psychological well-being.¹⁴⁶

Research also demonstrates that there are significant relationships between obesity and measures of the built environment. A recent study in Atlanta assessed resident obesity in relation to levels of density, mixed-use, and street connectivity.¹⁴⁷ A 12.2% reduction in the odds of being obese was

142 McDonough et al. 1997 Income dynamics and adult mortality in the United States, 1997 through 1989. *American Journal of Public Health*, 87 (9), 1476-1483.

143 Lantz et al. 1998. Socioeconomic factors, health behaviors, and mortality. *Journal of the American Medical Association*, 279-1703-1708.

144 Ewing, R and Kreutzer, R. Understanding the relationship between public health and the environment. A report prepared for the LEED-ND Core Committee; May 2006

145 Handy, S. 1996 Understanding the link between urban form and non-work traveling behavior. *Journal of Planning Education and Research*. 15:183-98.

146 Powell KE, Martin LM, Chowdhury PP. 2003. Places to Walk: Convenience and Regular Physical Activity. *American Journal of Public Health*. 93;9:1519-1521.

147 Frank, L, Andresen, M, Schmid, T. 2004. Obesity relationships with community design, physical activity and time spent in cars. *American Journal of Preventive Medicine* Volume 27 Issue 2.

detected with an inter-quartile increase in density, mixed-use, and street connectivity measured within a 1 km radius of a residential area, providing evidence that living in a mixed use area with a variety of shops and services is a robust predictor of obesity levels in urban areas.

Retail Food Access is linked to Nutritional Health

Diet-related disease is one of the top sources of preventable deaths among Americans,¹⁴⁸ with the burden of overweight and obesity falling disproportionately on the populations with the highest poverty rates.¹⁴⁹ The causes of such health disparities can be traced to economic development policies and, for low-income populations in urban areas, accessible and affordable nutritious food remains a significant unmet need.

Land use and transportation planning in the later part of the 20th century favored development and investment in suburbs rather than urban areas. Consequently, the migration of supermarkets to suburbs left corner stores with limited selection and higher prices as the main source of local groceries.^{150 151} This lack of competition maintained high prices in urban areas and forced a dependence on these small stores with significantly higher prices and less selection.¹⁵² In fact, smaller retail food stores typically charge about 10% more for products than supermarkets.¹⁵³ Such stores often have less or no fresh produce available yet offer more processed foods. Currently, 85% of Oakland's food retail stores have an area less than 3,000 square feet, underscoring a need to build larger capacity for food provision.³⁴

Low-income households have negotiated these higher grocery prices under economic constraints by purchasing less expensive yet higher energy-dense foods to maintain dietary energy.¹⁵⁴ In this way, obesity may be mediated in part by the inverse relationship between energy density and cost.¹⁵⁵

148 U.S. Department of Health and Human Services. The Surgeon General's call to action to prevent and decrease overweight and obesity. Available at: <http://w.surgeongeneral.gov/topics/obesity/>

149 Carlson SJ, Andrews MS, Bickel GW. Measuring food insecurity and hunger in the United States: development of a national benchmark measure and prevalence estimates. *J. Nutr* 1999;129:510S-6S.

150 House Select Committee on Hunger. Obtaining food: shopping constraints of the poor, Committee Report. Washington DC: US Government Printing Office, October 1990.

151 Morland K. et al. Neighborhood Characteristics Associated with the Location of Food Stores and Food Service Places. *Am J Prev Med* 2002;22:23-29.

152 Williams D, Collins C. Racial Residential Segregation: A fundamental Cause of Racial Disparities in Health. *ASPH Public Health Reports*. 2001;116:404-416.

153 United States Department of Agriculture, Economic Research Service, U.S. Food Marketing System, Agriculture Marketing Report No. 811, 2002.

154 Basiotis PP. Validity of the self-reported food sufficiency status item in the U.S. In Haldeman, Va, ed. Paper presented at: American council on Consumer interests 38th Annual Conference, U.S. Department of Agriculture, 1992. Columbia, MO.

155 Drewnoski, A. Darmon N, Briand A. Replacing fats and sweets with vegetables and fruit – a question of cost. *Am J. public Health* (in press).

On the other hand, full-service neighborhood supermarkets and farmers markets can support households to make nutritious food choices. Using proximity to a full service supermarket as a proxy of food access, public health research has demonstrated that the retail environment affects individual health. One study conducted in Los Angeles County concluded longer distances traveled to the grocery store are associated with an increased body mass index (BMI).¹⁵⁶ For a 5'5" tall person, traveling 1.75 miles or more to get to a grocery store meant a weight difference of about 5 pounds.

Additionally, other place-based factors influence nutritional health outcomes. Whereas fast food restaurants tend to lead to low quality nutrition; full-service restaurants are associated with better diets.⁷ The 2005 San Francisco *Collaborative Food Systems Assessment* represents a comprehensive evaluation of food access opportunities and barriers in one city.¹⁵⁷

A Vibrant Local Economy improves Individual and Community Health

Ethnically and economically integrated neighborhoods also support health by promoting employment and educational opportunities. Detrimental effects on health caused by unemployment and underemployment include higher rates of hypertension¹⁵⁸, higher rates of depression, a tendency towards alcohol and drug abuse¹⁵⁹, and reduced life expectancy.¹⁶⁰

Conversely, jobs providing self-sufficiency wages and benefits such as health insurance coverage can increase timely access to health care. According to the Institute of Medicine (IOM), individuals without health insurance frequently go without necessary health care and as a consequence suffer from poorer health and are more likely to die a premature death than their insured counterparts.¹⁶¹

Some forms of retail development may provide higher quality jobs than others. A study of retail impacts in Chicago's Andersonville district compared the economic impacts of the neighborhood's locally owned businesses with that of large chain-operated businesses. Results indicated locally owned businesses and national chains generate comparable revenue per square foot of retail space; however the benefit to the local economy is 70 percent greater for locally owned businesses than for chains.¹⁶²

156 Inagami, et al., You Are Where You Shop. American Journal of Preventive Medicine. Volume 31 Issue 1 July 2006.

157 Collaborative Food Systems Assessment San Francisco Food Alliance: San Francisco; 2005.

158 Ferrie 2004

159 Khat 2004

160 Wadsworth 1999

161 Institute of Medicine (IOM) 2004

162 Civic Economics, "The Anderson Study of Retail Economics, Chicago Illinois" October 2004. Available at: <http://www.andersonvillestudy.com/html/reports.html>

Integrating residential and retail uses can reduce community violence

Mixed-use development is a strategy for reducing community violence and increasing perceived safety.

¹⁶³ Retail development in the context of mixed-use design generates natural public surveillance.

Reduced crime, in turn, improves levels of *perceived* safety. Fear of crime is also strongly related to the feeling that one is part of the community. A sense of being a part of a community results in less fear,¹⁶⁴ and a vibrant neighborhood retail environment provides one type of setting for social interaction.

Retail accessible via walking Improves Environmental Quality and Promotes Physical Activity

Relying on automobiles to access day to day retail needs has adverse consequences on health via air pollution and noise levels. (Refer to the chapters on Transportation and Noise, and Air Quality) Such effects are particularly problematic in high auto-use regions. In fact, researchers have correlated sprawl with health problems such as breathing difficulties, high blood pressure, headaches and arthritis.¹⁶⁵ However, ensuring complete neighborhoods with adequate retail goods and services in close proximity to residents' homes can reduce reliance on automobiles for day to day needs.

Some Retail Uses Are Associated With Adverse Health Outcomes

Some types of retail also have greater potential to actually have adverse effects on one's health. Types of retail, such as liquor and food stores, are more prone to crime than others. These businesses spend more on security than their counterparts from more affluent areas and also experience greater revenue losses due to crime costs. The density of liquor stores in an area is strongly associated with assault rates.¹⁶⁶ In Oakland, convenience stores located in low-income neighborhoods experience both shoplifting and break-ins nearly nine times more when compared to stores in Rockridge, one of Oakland's more affluent areas. Crime and safety concerns commonly create anxiety among current business owners and create reluctance among potential retailers; thereby detracting commercial revenue for low-income neighborhood economies.

163 Crime Prevention Through Environmental Design Guidebook. October 2003.

Singapore National Crime Prevention Council. [http://www.ncpc.gov.sg/pdf/CPTED Guidebook.pdf](http://www.ncpc.gov.sg/pdf/CPTED%20Guidebook.pdf). Accessed November 2006.

164 Schweitzer JH, JW Kim, and JR Mackin, The Impact of the Built Environment on Crime and Fear of Crime in Urban Neighborhoods, *Journal of Urban Technology*, Volume 6, Number 3

165 Sturm, R. Cohen D. Suburban sprawl and physical and mental health. October 2004

166 Gruenewald et al., *Addiction*. 2006: 101:666-667.

Additionally, the presence of fast-food restaurants in one’s neighborhood is also related to diet-related disease rates.¹⁶⁷ The table below organizes the types of retail into three categories with a list of typical examples. Those placed next to a shaded box indicate the kinds of retail presenting pathways to negative health costs. Note that in some settings, high concentrations of particular services may be ill-perceived. For instance, areas with many Auto Repair services may be associated with community blight and poor environmental quality due to high levels of parked cars, noise and engine exhaust, and use of chemicals.

Table 1. Retail Categories and Examples Related to Health

<i>Food Retail</i>	<i>Other Retail Goods</i>	<i>Services</i>
<ul style="list-style-type: none"> <input type="checkbox"/> Full-service Supermarket <input type="checkbox"/> Small Grocery Stores <input type="checkbox"/> Convenience Stores <input type="checkbox"/> Farmers markets <input type="checkbox"/> Restaurants <input type="checkbox"/> Cafes <input checked="" type="checkbox"/> Fast Food Establishments <input checked="" type="checkbox"/> Liquor Stores <input checked="" type="checkbox"/> Bars 	<ul style="list-style-type: none"> <input type="checkbox"/> Pharmacies <input type="checkbox"/> Bookstores <input type="checkbox"/> Specialty Shops <input type="checkbox"/> Hardware Stores <input type="checkbox"/> Auto Supplies 	<ul style="list-style-type: none"> <input type="checkbox"/> Dry Cleaners <input type="checkbox"/> Laundromats <input type="checkbox"/> Banks & Credit Unions <input type="checkbox"/> Check Cashers <input type="checkbox"/> Beauty Salons <input type="checkbox"/> Hotels/Motels <input type="checkbox"/> Maintenance Services <input type="checkbox"/> Entertainment <input type="checkbox"/> Auto Repair

Existing Standards for Measuring Retail Environment

Promoting physical activity, reducing obesity, promoting mental health and well-being, and promoting healthy environments are all leading health objectives included in the US Department of Health and Human Services report Healthy People 2010.¹⁶⁸ The public health service recommends that adults get at least 30 minutes of moderate physical activity each day. While walking to nearby retail can increase physical activity, no public health standards exist for access to local retail services. Research has found that a reasonable amount of time for people to get to food stores by foot is about 1/4 mile, or within a 5

167 Morland K. et al. Neighborhood Characteristics Associated with the Location of Food Stores and Food Service Places. *Am J Prev Med* 2002;22:23-

168 16 U.S. Department of Health and Human Services. [2001]. The Surgeon General’s call to action to prevent and decrease overweight and obesity. [Rockville, MD]: U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General; Available from: U.S. GPO, Washington.

minute walking distance.¹⁶⁹ It is also reasonable to expect that most people would walk ¼ mile to access to other essential types of retail services, such as a laundromat, pharmacy, or a bank ATM.

The San Francisco Department of Public Health recently created the “Healthy Development Measurement Tool” as a method of assuring “accountable, evidence-based and health-oriented planning and policy” making around land-use development. While the Tool represents voluntary guidance, the following development targets may be applicable to retail development in other jurisdictions:¹⁷⁰

Residential development projects are sited in areas where retail services¹⁷¹ should be within 1/2 mile of residence for (*Objective PI.6*):

- Min: 6 out of 12 common services
- Benchmark: 9 out of 12 common services
- Max: 12 out of 12 services

New residential development has a full-service grocery store/supermarket within 1/2 mile (*Objective PI.6*)

Assessment of the Retail Environment

While much research has been done on the relationship between retail services and health, this HIA attempts to tackle a slightly different topic--the effects of the Port of Oakland on the West Oakland retail environment. This is an undeniably difficult task; isolating the effects of the Port on retail is a challenge because of the nature of causality. Normally, one can posit a counterfactual claim: “if not for the port, what would be here”? But, the answer is not clear. Current zoning on the waterfront, as well as the presence of other large industry, complicates the causal relationship. However, the following assessment will give insight into the current status of the West Oakland retail environment and how the Port might positively and negatively impact that environment.

The following research questions guided this analysis:

- 1) How do the Port Operations contribute to the markets for retail goods in West Oakland?
- 2) How do land uses supporting Port Operations affect the retail environment in West Oakland?

169 Dunkley, B. and A Helling, D. Sawicki. Accessibility Verses Scale: Examining the Tradeoff in Grocery Stores Journal of Planning and Educational Research (2004) 23(4): 387-401.

170 Farhang, L and Bhatia R. San Francisco DPH Healthy Development Measurement Tool. June 2006.

171 Key services include, but are limited to: bank, produce market, convenience store, supermarket, hardware store, cleaner, auto repair, restaurant, farmer’s market café, childcare.

3) Do Port Operations have indirect effects on service needs and infrastructure in West Oakland?

In attempting to answer all of these questions, attention was paid to determining the retail needs of the West Oakland residents, determining why certain retail establishments are or are not present in West Oakland and determining how the Port could be related to these findings.

The Current State of West Oakland Retail

Through small focus groups and personal interviews, trends emerged from West Oakland residents regarding the retail environment of their neighborhood. Overall, residents expressed disappointment and frustration over the lack of retail goods and services within convenient distance from their homes. Figures 1 – 3 illustrate the lack of common services using three different points of reference: 10th St and Willow, 10th St and Adeline, and 24th St and Market. All common services, as defined in the figures, within a 0.5 mile radius from that point were plotted and percentages calculated. The benchmark minimum standard, based on the HDMT, was 75% of common services represented. The following table breaks down the percentages by reference point.

Table 2. Percentages of Common Services Represented in West Oakland by Reference Point

Reference Point	Percentage of Common Services Represented
10 th Street and Willow	53%
10 th Street and Adeline	47%
24 th Street and Market	58%
AVERAGE	52.7%

The methods of assessing the availability of common services are imperfect; the 0.5 mile radius, and the common services within, are a function of the reference point. Different reference points may produce different assessments, perhaps understating the availability of certain goods and services. However, availability may also be overstated, due to the technological constraints of the analysis and the unique characteristics of the community. Working with this kind of technology enables the researcher to analyze large amounts of land in a fairly small time period. While this technology will flag a certain good or service, it is not able to convey the functionality of the good or service. For instance, many times in this analysis, a business that was identified by current business listings as a restaurant was not currently open. Furthermore, upon closer inspection some retailers were incorrectly classified in current business listings.

As for the characteristics of the neighborhood, the percentages may overstate accessibility due to the lack of personal transportation of many residents. According to the latest cycle of the American Community Survey, 40% of West Oakland residents have no access to personal transportation (i.e. a car). Within focus groups and personal interviews, a recurring theme was the difficulty in shopping for West Oakland's elderly residents, many of whom rely on friends and family to get around for their shopping needs. Since very few of the necessary goods and services are available in their own neighborhood, West Oakland residents must drive outside their neighborhood to shop, contributing further to noise, traffic and air quality problems mentioned in other chapters of this HIA.

This research team also conducted in-person qualitative analysis of the West Oakland "Commercial Corridors". These corridors are zoned by the city as commercial enterprise zones, and this team was interested in the actual quality of those commercial areas. What was gathered from the analysis was a dire lack of retail goods and services that could contribute to the health of West Oakland residents. For instance, Jack London Gateway, a shopping center with great potential and empty real estate is lacking a viable anchor store. The supermarket that did exist at one time inexplicably closed overnight and has yet to be replaced. Interviews with retailers in the shopping center illustrated that the majority of workers and business owners in the center were from outside West Oakland, and the customers were from both surrounding neighborhoods and the port. The need for a thriving retail environment exists, and customers are ready, but the goods and services offered by the shopping center are not positively related to health effects. Along much of the commercial corridors, empty lots and shuttered businesses made the retail environment stark and uninviting. The presence of industrial warehouses around these commercial corridors also contributed to the lack of retail viability. (Figure 5)

Theories as to why retailers are not locating in West Oakland are too numerous to include in this HIA. However, McKinsey and Company recently performed an economic analysis for the city, part of which centered on the reasons for Oakland's struggles in attracting retailers¹⁷². The top reasons that retailers offered for not locating in Oakland revolved around threats to public safety. Real or perceived, this atmosphere is not conducive to a viable retail sector. Respondents to the consulting firm's survey indicated that crime was the biggest barrier to locating in Oakland, a city that consistently finds itself in the top-ten most crime-ridden cities. More specifically, the perceived safety level of the West Oakland neighborhood may act as a large barrier to retail viability. During the course of retail interviews, team members were made aware of incidents in the neighborhood that caused concern for business owners. For example, the Subway Sandwich shop adjacent to the West Oakland BART station was rumored to be shutting down due to numerous robberies; however, the store remained open, and instead installed thick bulletproof glass between the workers and the customers. Respondents, when asked about this situation, expressed disgust at the glass and resentment towards the business owners. This is an illustration of the conflict between protecting worker safety and making the customer feel comfortable.

¹⁷² Oakland Metropolitan Chamber of Commerce. "Taking Stock of Oakland's Economy". April 2007.
Retail-9

Retail and the Port: Positive and Negative Impacts

Beyond crime, institutional forces have shaped the character of West Oakland over the last 60 years. What was once a thriving middle-class neighborhood is now home to some of the lowest median incomes in the city.¹⁷³ The presence of the Port casts an industrial shadow over much of West Oakland, especially in the neighborhoods closest to the Port. How the presence of the Port influences the lack of retail may be through various pathways, the most direct of which is the industrial atmosphere and proximity to trade routes. Manufacturing sites, as well as light industrial such as storage centers and printing shops, are more likely to be attracted to an industrial area with large spaces and easy access to shipping, rail and truck transport. Port-associated business, particularly that business that utilizes truck transport, can be assumed to have a negative impact on retail viability due to noise, traffic, and overall neighborhood attractiveness. City zoning guidelines may also contribute to mix and locations of retail versus industrial land use. We describe some of the conflicts in zoning below.

During this team's analysis of light industrial employers for the labor section of this HIA, some industrial employers expressed concern over the lack of foot traffic in the area and the negative effects that this has on their business. We can only imagine that the same holds for retail employers. To try and achieve a more quantitative measure of the effect of port proximity on retail viability, this research team used housing values as a proxy for retail viability. One can assume a positive relationship between property value and access to retail goods and services and by doing so expect to see a decline in home values associated with retail desolation in a neighborhood. To do this analysis, circles of 0.25, 0.5, 1, 2 and 3 miles were produced with the Port as an center point from which housing values were assessed. None of the areas of analysis were overlapping, such that the interpretation of housing values at 0.5 miles from the Port does not include property under 0.25 miles from the Port. Extreme outliers were dropped, and the results for price per square foot are listed in table 3.

¹⁷³ Ibid.

Table 3. Mean and Median Home Values by Distance from Port

Distance from Port	Mean price per square foot	Median price per square foot
0.25 Miles	128.77	82.79
0.5 Miles	190.88	164.76
1 Mile	140.35	84.95
2 Miles	159.27	100.65
3 Miles	172.88	115.29

According to this analysis, the results of the relationship between Port proximity and home value are slightly unclear. The 0.5 mile category is an anomaly when interpreted in light of the overall trend. While this research team is still working to uncover the underlying cause of this outlier, it is still worthwhile to look at the larger relationship between distance and home values. Removing the 0.5 mile category shows a positive relationship between distance from the Port and home values. Since the purpose of using this analysis was to draw conclusions about retail viability, we can conclude that proximity to the port is negatively associated with retail presence. For the residents of those neighborhoods closest to the Port in West Oakland, this means negative health effects as a result of the lack of convenient access to goods and services.

It is not fair to interpret the impacts of the Port on the retail environment as solely negative. While the Port may have a depressive effect on common retail viability (i.e. stores that were included in the above retail analysis), it has created a market for manufacturing and transportation-related retail such as auto parts stores, truck dealerships, and other such necessary retail outlets for those doing Port-related business. Furthermore, the presence of the Port supports an underground economy that was obvious in this research team’s experience. Food stands are rampant on truck routes, and anecdotal evidence suggests an underground economy within the Port for truck washers and freelance truck maintenance workers. Given the relatively low educational attainment of West Oakland residents, according to the latest cycle of the American Community Survey, the contribution of these workers is not trivial. In fact, it is a critical part of understanding the whole picture of retail in West Oakland, and lends support to the idea that more in-depth analysis of this underground economy is needed.

The economic impacts of this industrial atmosphere, analyzed more in depth in the Labor chapter of this HIA, are part of a trade-off that Oakland must make when deciding the best use of the land surrounding the Port area in West Oakland. As it stands now, there are areas of zoning conflict in West Oakland that are products of that trade-off (Figure 4). Such conflicts present themselves as islands of industry surrounded by residential land use that are scattered throughout the community. If these islands were instead zoned for retail, it would potentially reduce the health impacts of truck traffic traveling through

the community, while solving some of the retail shortages that are within walkable distances. It is unclear however, whether the trade-off from industrial labor opportunities to retail labor opportunities justifies such change.

The Waterfront section of the Oakland General Plan lays out policy plans for Oakland's waterfront property, an area that includes the Port of Oakland, and highlights sometimes conflicting goals of development: to enhance Oakland as a thriving center of maritime trade, and to develop the waterfront as a viable commercial attraction. Given the current situation of the retail atmosphere in West Oakland, it is hard to believe that Oakland could accomplish both goals without compromising the health of neighborhood residents. The recommendations that follow speak to that conflict and propose mitigations to deal with sub-par retail environment that currently exists in West Oakland.

Interpretations

- Based on an analysis of three reference points in the community, on average 53% of common retail services were available within a 0.5 mile walking distance, suggesting a lack of retail vitality in West Oakland. Moreover, there tends to be an increase in median and mean property values with distance from the Port.
- Analysis shows that Port Operations contribute both positively and negatively on the markets for retail goods in West Oakland. Port Operations create a niche market for transportation-related retail services and are assumed to crowd out the market for common services.
- Industrial land uses create an inhospitable atmosphere for retail viability. While this is not the main reason that business owners cite for failing to locate in Oakland, it is a partial contributor to the lack of a thriving retail environment in West Oakland, as it may contribute to a negative perception of public safety.
- The Port may support an underground retail economy that serves port-related needs, but also indirectly affects retail viability through traffic, noise and attractiveness of the area.

Limitations

- It is difficult to isolate the effects of the Port of Oakland on the West Oakland retail environment. Many of the impacts relate generally to the industrial atmosphere of the area, which relates to the Port, zoning, and social perceptions of area.

Conclusions

The West Oakland community suffers from a lack of common retail services, which is likely due to a number of factors. The Port and surrounding industrial land use may contribute to the lack of certain retail services in the area, however, the Port also creates opportunities for Port-serving businesses.

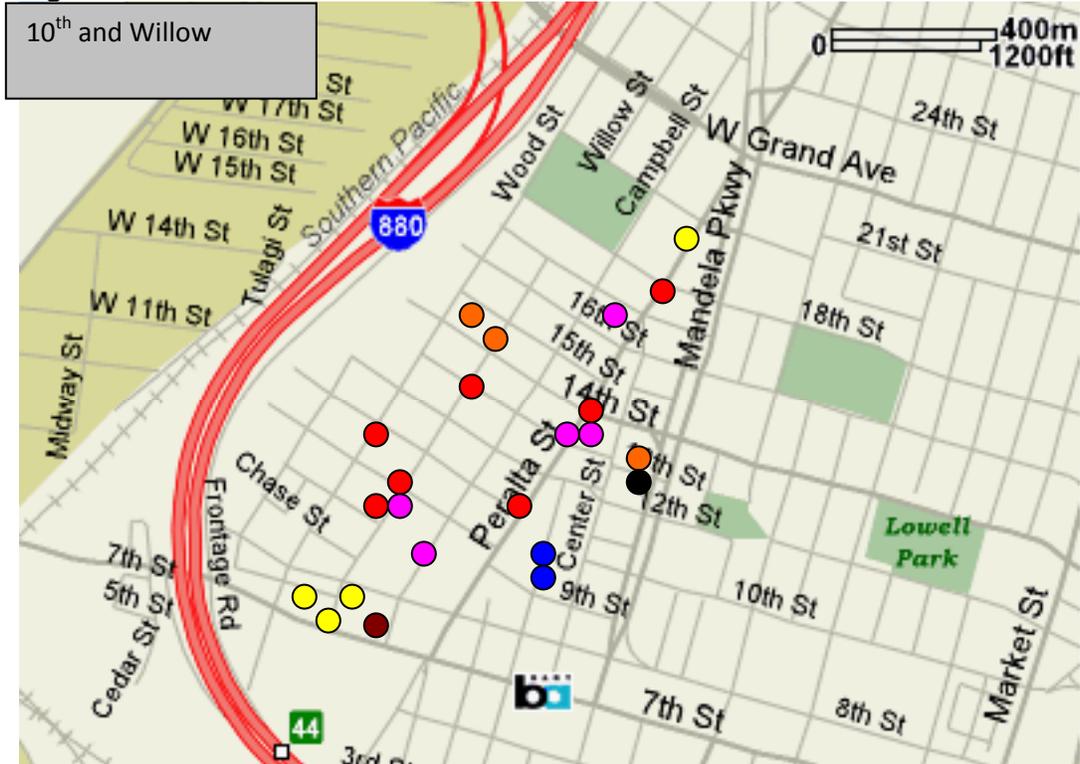
Recommendations

The following recommendations are offered as an initial brainstorm of this research team. More analysis needs to be performed to establish criteria by which to judge the feasibility of these alternatives. For

instance, financial incentives to existing businesses may be more or less politically feasible depending on city administration and economic conditions.

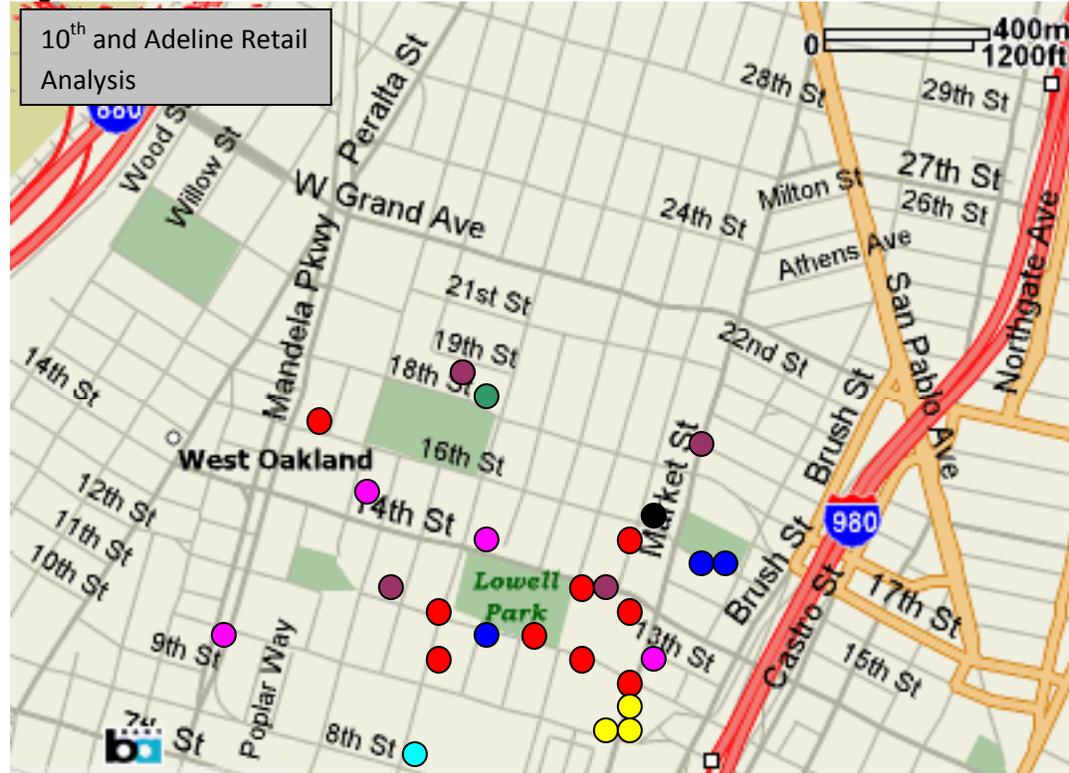
1. Respond to community needs by providing usable commercial corridors that contain 75% of “common services” such as grocery stores, banks, and post offices.
2. Conduct a community retail needs assessment to gather reliable data on the gaps in goods and services in the community.
3. Leverage new development to provide for common services through a mandatory developer contribution to economic development fund that will cultivate retail industry
4. Work to attract “small-footprint” merchants to fill shuttered businesses in commercial corridors. This mitigation avoids the “big boxing” of the neighborhood, maintaining character while increasing access. Chains such as Tesoco and Walmart are using small-footprint stores as an entry point into urban areas, and the growing momentum in the movement should be utilized.
5. Work with local food merchants to increase availability of fresh food through micro-loan programs or other financial incentives. Corner stores are prevalent in the West Oakland retail environment; establishments such as these need financial assistance to install the infrastructure necessary to provide what the community needs.
6. Increase enforcement of illegal truck routes that conflict with retail atmosphere (i.e. create adverse traffic and noise effects that deter foot traffic).
7. Examine the legal options for Port contributions directly to the neighborhood for these ventures. The Port has been known to contribute to OUSD, among other charitable causes. Increasing access to retail goods and services could be a part of the Port’s commitment to giving back to the neighborhood.

Figure 1. Common Services Assessment of 10th Street and Willow



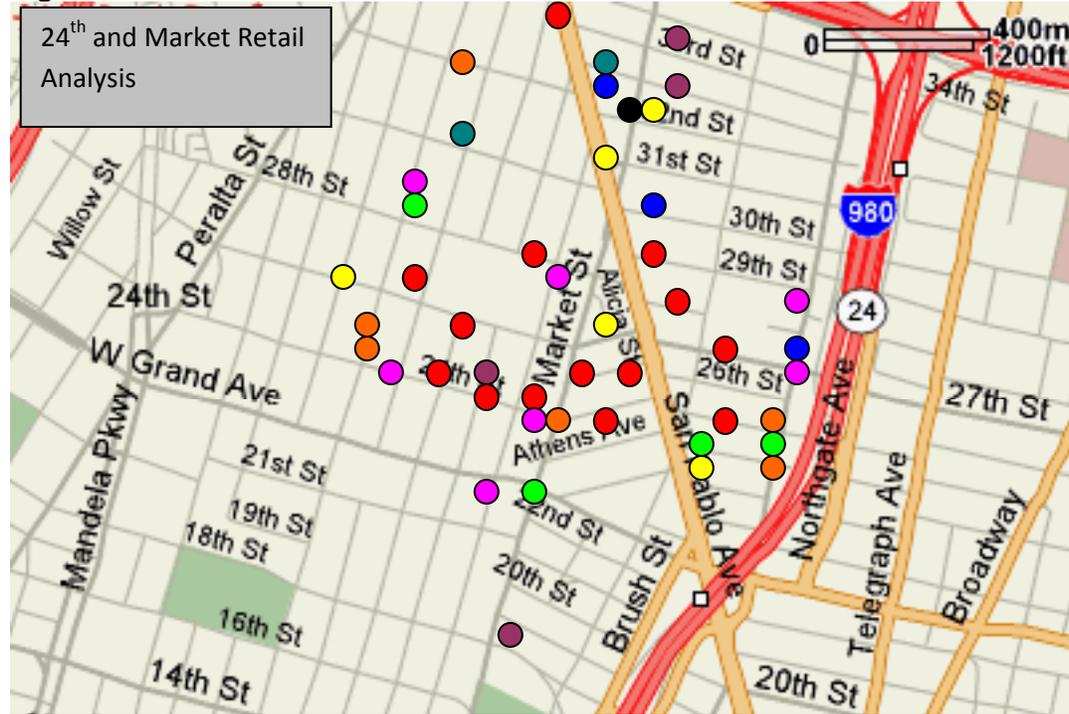
Community Service	Present?
Bank	No
Church	Yes
Convenience Store	Yes
Day Care	Yes
Dry Clean/Laundry	Yes
Fire Station	No
Hair Care	Yes
Hardware	No
Library	No
Medical/Dental Office	No
Nursing Home	Yes
Park (See Map)	Yes
Pharmacy	No
Post Office	Yes
Restaurant	Yes
School	No
Supermarket	No
Percentage	53%

Figure 2. Common Services Assessment of 10th Street and Adeline



<i>Community Service</i>	<i>Present?</i>
Bank	No
Church	Yes
 Convenience Store	Yes
 Day Care	Yes
 Dry Clean/Laundry	No
Fire Station	No
Hair Care	No
Hardware	No
 Library	Yes
 Medical/Dental Office	Yes
 Nursing Home	Yes
Park (See Map)	Yes
Pharmacy	No
Post Office	No
Restaurant	Yes*
 *All Fast Food	
 School	No
Supermarket	No
Percentage	47%

Figure 3. Common Services Assessment of 24th Street and Market



<i>Community Service</i>	<i>Present?</i>
Bank	No
Church	Yes
Convenience Store	Yes
Day Care	Yes
Dry Clean/Laundry	Yes
Fire Station	No
Hair Care	Yes
Hardware	No
Library	No
Medical/Dental Office	No
Nursing Home	Yes
Park (See Map)	Yes
Pharmacy	Yes
Post Office	No
Restaurant	Yes
School	Yes
Supermarket	No
Percentage	58%

Figure 4. Areas of Zoning Conflict in West Oakland

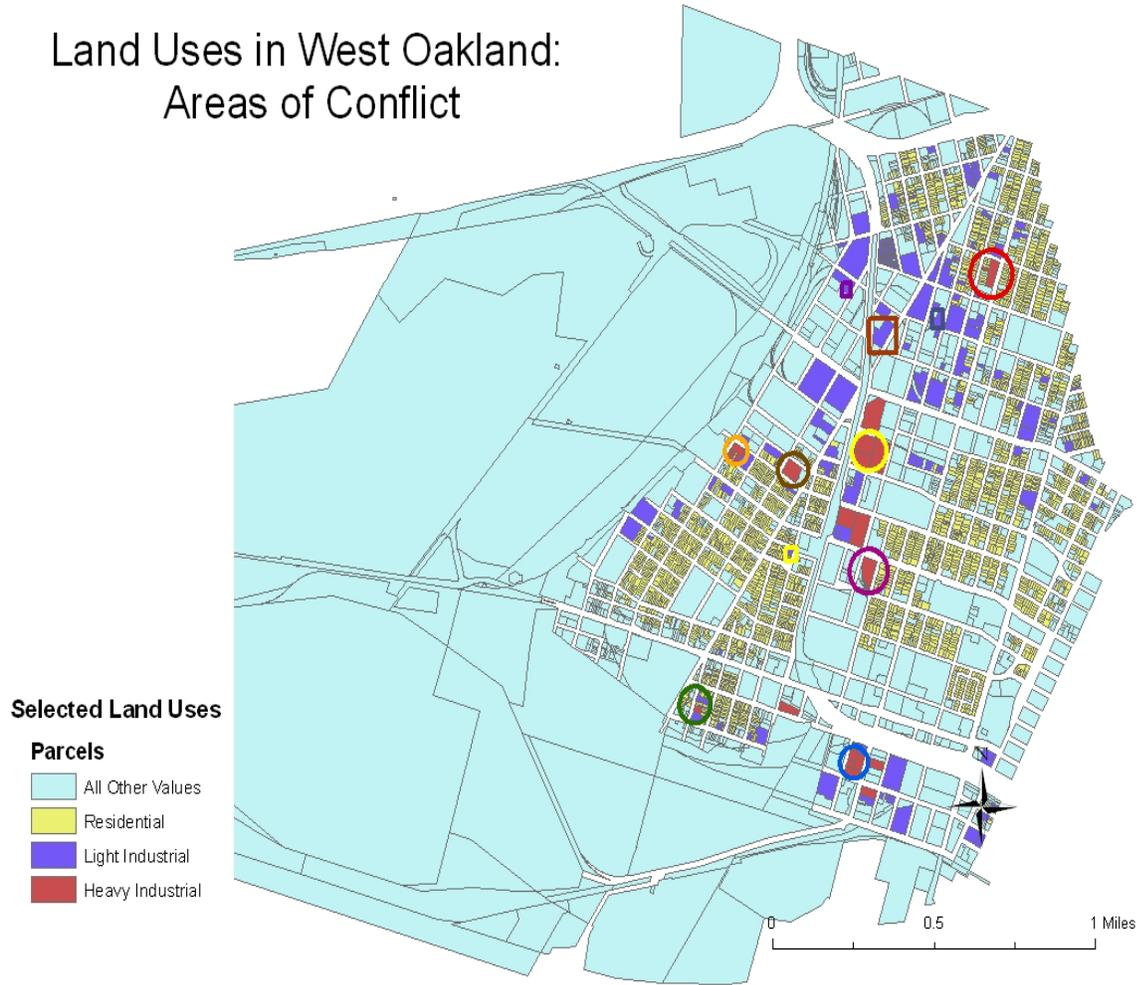


Figure 5. Pictures of West Oakland Retail Locations in Commercial Corridors

All Photos Courtesy of Jenesse Miller



A common theme amongst respondents was the need for larger grocery stores. Resentment was expressed towards the development of a 99 Cent discount store.



Sign at Jack London Gateway shopping center, an underutilized retail center with good potential.



Jack London Gateway. One of several fast food options available to local residents



An abandoned retail shopping center is West Oakland. Formerly Grand Foods Supermarket



A few more examples of unhealthy retail in West Oakland.

Labor Opportunities

Chapter 6

Summary

Healthy labor provides incomes that can sustain the basic living needs, is safe and secure, and offers access to health care. Businesses serve an important role in a community by providing a range of healthy jobs. Populations that are unemployed or have low income are unhealthy. Businesses may improve the health of their communities through corporate citizenship. A responsible business is one which is a good neighbor, which meets local labor needs, and helps to reduce local poverty.

Port of Oakland has employment positions with wages above the Basic Family Budget Wage, which also includes exceptional benefits, which include medical coverage, dental, and mental health services. What is not yet determined is of these positions, which are vacant and what are the minimum requirements to be eligible for these positions (education, skills). Another question not yet answered is the degree to which positions are filled by West Oakland residents. According to OSHA records provided by the Port progress report, the incidence rate and total number of injuries and illnesses are decreasing and according to national statistics, Port and Harbor Operations are 0.1% of total water transportation fatalities.

In regards to indirect employment with the Port of Oakland, MAPLA provides for good local hiring goals for contractors. However, contractors are still not able to reach local hire goals as determined by MAPLA. Many of the interviewed contractors do not use the Port to assist them in recruiting local, but rely heavily on unions providing local hire. Due to contractors inability to determine how many West Oakland residents were employed in their business, this proves one limitation of assessing how many West Oakland residents are employed with contractors who are providing services to the Port. MAPLA does not extend to Port positions or to independent truck drivers.

Other indirect employment resulting from Port operations are both independent and private employee truck drivers. Both types of drivers face elevated health risks from diesel pollution resulting in cancer risk higher than Oakland residents and other working in terminals in the Port of Oakland. These risks may be more detrimental to independent truck drivers where the majority of these drivers do not have health insurance, or other employment benefits that may protect them from occupational health and safety hazards.

Recommendations

1. As a good neighbor, the Port should take an active role in reducing West Oakland's high unemployment rates through better outreach to the local community when positions are available.
2. To better demonstrate their commitment to local hiring, the Port should monitor and make publically available West Oakland-specific employee and hiring statistics.

3. The Port should consider funding philanthropic activities that increasingly benefit the West Oakland community as Port growth occurs. These activities should focus on improving the social conditions of West Oakland, for example, by reducing crime, improving education at all age levels (training, internships, scholarships), and funding local research and industry into clean technologies.
4. The Port needs to continue the promising trends towards reducing injury and illness of its employees. Moreover, the Port needs to continue to optimize and make more efficient its operations, such that emissions are reduced. This includes reducing truck wait and idle times during container pick-ups.
5. The city may consider strategies to preferentially divert increasing tax revenue from increasing Port operations into West Oakland services.
6. With regards to improving truck driver health, various strategies have been proposed, including government mandating of emissions reductions, using public funds to subsidize clean trucks, and converting independent truck drivers into employees. Many of these are not mutually exclusive options, and in fact some are only practical if implemented together. Hence, we recommend:
 - a. The State needs to establish strong regulations on truck emissions with rapid phase in.
 - b. At the same time, a combination of sustained public-private funding and tax credits or incentives should be made available such that there is little barrier for truck owners to update their trucks.
 - c. The Port and State agencies should take a leadership position in improving the health of truck drivers. This may come through the mandating of Port-truck industry agreements as laid forth in the EBASE report, which clean trucks, minimize their impact on the community, emphasize local hiring, provide flexibility in allowing for small owner-operated trucking businesses, but yet mandating minimum health benefits.
 - d. Such incentives/regulations need to be considered in light of the situation at all west coast ports. It does not help to push Port of Oakland/West Oakland's problems onto other communities.

Background

Businesses contribute to the health of a community by providing jobs, training, insurance, and services to its residents. A business also provides tax revenue and promotes the existence of other related businesses. Businesses may also contribute to the health of a community and society through what is known as corporate social responsibility or corporate citizenship. Citizenship activities might include fair business practices, use of green technologies, donations to local community organizations, and employee volunteering within the community.

For the purposes of this study, we identified four pathways that seemed of primary importance in assessing the impact of port employment on the health of West Oakland residents. Employment can have a positive impact on health by increasing income and/or providing health insurance. Employment can have a negative impact on health if it is low-wage, offer a low level of job security, or if it is unsafe. These four pathways are discussed in detail below.

Employment, Income, and Health

One of main purposes of employment is to earn an income that will sustain the basic needs for food, housing, transportation, and hopefully provide a means of achieving a high quality of life. For most people, employment is their main source of income. The literature on income and health is rich, with a clear link identified by many researchers in different contexts between income and health. In one study, McDonough et al. found that people who earned \$15,000 or less per year were three times as likely to die as people who earned \$70,000.¹⁷⁴

There are many factors that mediate the relationship between income and health. These include education, social support, wealth, access to healthcare, exposure to environmental hazards, and community violence. Yet even when these factors are accounted for, people with lower incomes experience higher rates of mortality than their higher income counterparts.¹⁷⁵ Additionally, people with lower incomes are at higher risk for a wide range of poor health outcomes, ranging from chronic conditions to injuries to cancer.¹⁷⁶

Income also impacts health through a range of mediating factors. People with lower incomes experience higher levels of community violence and have lower levels of educational attainment. Thus, on top of the negative health impacts brought on by poverty, people with low incomes are subjected to additional decreases in their health status through these mechanisms.

¹⁷⁴ McDonough P, Duncan GJ, Williams DR, House J. Income dynamics and adult mortality in the United States, 1972 through 1989. *American Journal of Public Health*. 1997; 87:1476-83.

¹⁷⁵ Isaacs S, Schroeder S. Class—The Ignored Determinant of the Nation’s Health. *New England Journal of Medicine*. 2004, 351(11): 1137-1142

¹⁷⁶ Yen IH and Syme SL. The Social Environment and Health: A Discussion of the Epidemiologic Literature. *Annual Review of Public Health*. 1999;20:287-308.

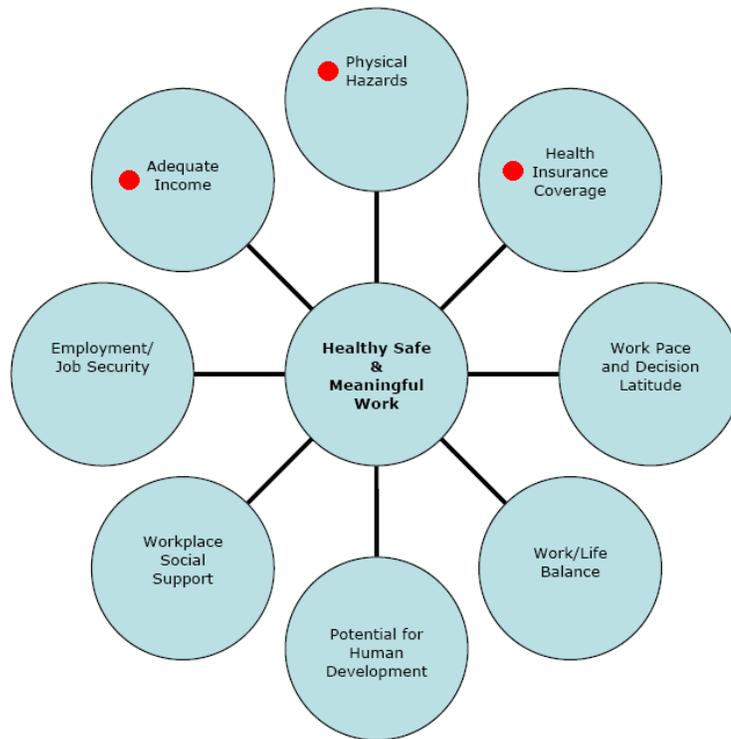


Figure 1. Multi-Dimensional Occupational Health Framework provided by Health Jobs SFDPH (June 2007), to demonstrate target areas of interest for this assessment (Red Dot).¹⁷⁷

Employment, Occupational Safety, and Health

Unlike the multiple pathways through which income impacts health, workplace hazards represent a direct impact on the health of workers. Occupational hazards are highly stratified by job type, with workers in some jobs bearing a much higher share of the injuries and deaths associated with workplace conditions. Occupational health and safety laws help to limit illness and injury, but are unable to eliminate all hazards from the workplace. Between 1995 and 1999 U.S. workers experienced an average of 17 fatal work injuries per day.¹⁷⁸

The most common causes of fatal on-the-job injuries are transportation-related incidents and violent assaults. In California, the highest rates of fatal injuries occur among specialty trade contractors, truck transportation drivers, building equipment contractors, and heavy civil engineering construction

¹⁷⁷ Tales of a City's Workers: A Profile of Jobs and Health in San Francisco

¹⁷⁸ Kappagoda M, Bhatia R, Farhang L, Sargent M. Tales of a City's Workers: A Profile of Jobs and Health in San Francisco. San Francisco Department of Public Health. Program on Health, Equity and Sustainability. June 2007.

workers. Nationally, laborers and material movers and heavy and tractor-trailer truck drivers experience the most injuries.¹⁷⁹

Employment, Job Security, and Health

Job security is an additional mediating factor between employment and health. Part-time, seasonal, or contract employment may provide some of the benefits associated with regular employment. However, insecure job tenure also leads to periods of unemployment, with the negative health impacts that follow. Unemployment causes not only a loss of income, but often carries social stigma and leads to stress and social isolation.¹⁸⁰ Unemployment is associated with a number of adverse health impacts, including shortened life-expectancy and increased risk of cardiovascular disease, hypertension, depression, and suicide.^{181 182 183} Furthermore, even when not in periods of unemployment, job insecurity leads to poor mental health status, depression, and increased risk of hypertension and chronic illness.^{184 185}

Employment, Health Insurance, and Health

In the U.S., the primary means of accessing health care is through employment. According to a recent Kaiser Commission report, 74% of insured non-elderly U.S. residents have employer-sponsored insurance.¹⁸⁶ Non-employer sponsored insurance is associated with higher out-of-pocket costs and lower levels of coverage.

Because people who have health insurance access medical care more often and have better health outcomes than do people with no insurance,¹⁸⁷ insurance provision becomes another mediating factor between employment and health. In a 2006 study by Bloom et al, uninsured children and adults were 3 times as likely as insured children and adults to have *not* seen a health care provider in the past year (children 26% vs. 8%, adults 14% vs. 42%). In addition to decreased access to care, people without

¹⁷⁹ Kappagoda M, et al. 2007.

¹⁸⁰ Ibid.

¹⁸¹ Jin RL, Shah CP, Svoboda TJ. The impact of unemployment on health: a review of the evidence. *The Journal of the Canadian Medical Association*. 1995;153:529–540.

¹⁸² McKee-Ryan F, Song Z, Wanberg CR, Kinicki AJ. Psychological and physical well-being during unemployment: a meta-analytic study. *J Appl Psychol*. 2005;90(1):53-76.

¹⁸³ Voss M, Nylén L, Floderus M, Diderichsen F, Terry P. Unemployment and Early Cause-Specific Mortality: A Study Based on the Swedish Twin. *American Journal of Public Health*. 2004;94(12):2155-2161.

¹⁸⁴ Kopp MS, Stauder A, Puerbl G, Janszky I, Skrabski A. Work stress and mental health in a changing society. *The European journal of public health*. 2007; 1-7.

¹⁸⁵ Ferrie JE, Shipley MJ, Newman K, Stansfeld SA, Marmot M. Self-reported job insecurity and health in the Whitehall II study: potential explanations of the relationship. *Social Science & Medicine*. 2005;60(7):1593-1602.

¹⁸⁶ Kaiser Commission on Medicaid and the Uninsured. *The uninsured: a primer*. 2007.

¹⁸⁷ Hoffman CB, Paradise J. Health Insurance and Access to Health Care in the United States. *Ann N Y Acad Sci*. 2007 Oct 22; [Epub ahead of print].

insurance have higher rates of asthma hospitalizations and low birth weight births, higher likelihood of being diagnosed with late-stage cancer, and higher rates of premature mortality (Hoffman and Paradise 2007).¹⁸⁸ The Institute of Medicine estimates that 18,000 unnecessary deaths are attributable to lack of health coverage every year.¹⁸⁹ According to a report by the San Francisco Department of Public Health:

Families with at least one full-time, full-year worker are more than twice as likely to have health insurance coverage, compared to families whose wage earners work as part-time employees (less than 35 hours per week), as contingent labor (e.g., on a seasonal or temporary basis, as employees of contractors, self-employed), or in which there is no wage earner.¹⁹⁰

Existing Standards for Labor and Health

- The federal poverty level for a family of four was \$16895 in 1999.¹⁹¹
- The state's Division of Labor Standards Enforcement is responsible for the state's minimum labor standards, including minimum wages, payment for overtime, and rest and meal period requirements.
- Healthy People 2010 sets a target of 100% of persons under the age 65 years with health care coverage by 2010.
- Healthy People 2010 sets a target to reduce deaths from work-related injuries to 3.2 deaths per 100,000 workers (in all industry) and to 8.3 deaths per 100,000 workers (transportation industry) by 2010.
- Cal/OSHA enforces workplace safety and health regulations.

Impact Analysis

The Port describes its own business as follows: "The Port of Oakland oversees the Oakland seaport, Oakland International Airport and 19 miles of waterfront. The Oakland seaport is the 4th busiest container port in the U.S.; Oakland International Airport offers more than 200 daily non-stop flights to 42 domestic and international destinations; and the Port's commercial real estate includes Jack London Square, Oakland's premier entertainment spot along the waterfront. The Port of Oakland was established in 1927 and is an independent department of the City of Oakland."¹⁹²

¹⁸⁸ Ibid.

¹⁸⁹ Institute of Medicine. Committee on the Consequences of Uninsurance. *Insuring America's Health: Principles and Recommendations*. January 2004. <http://www.iom.edu/Object.File/Master/17/736/0.pdf>

¹⁹⁰ Kappagoda et al. 2007

¹⁹¹ Alameda County Public Health Department, 2005, *Community Information Book Update: West Oakland Social and demographic characteristics*.

<http://www.acphd.org/AXBYCZ/Admin/DataReports/2005update-westoakland.pdf>

¹⁹² Port of Oakland . www.portofoakland.com

According to a 2007 report, the Port has a \$7 billion impact on the economy in Northern California and approximately \$33 billion worth of goods are shipped through the Port of Oakland each year.”¹⁹³

Port Operations may act upon the employment-health pathways described above through both direct employment at the Port and through employment at businesses that are port-dependent, such as truck mechanics and washers, quick-service restaurants, and other industrial uses. The port may also have an indirect impact on employment through its presence in the area. If port-serving businesses preclude other types of businesses from locating in the area, some types of jobs may be unavailable.

Alternatively, if the port leads to declines in local infrastructure through port trucks traveling on roads not strengthened to meet their capacity, declines in home values due to air and noise pollution attributable to port proximity, or lack of social cohesion attributed to port traffic, this may impact the desire of businesses to locate in the area and the stock of available local jobs.

If jobs at the port and port-serving businesses pay living wages, include benefits, and hire from within the local community, perhaps the health benefits provided by the jobs offered would offset some of the negative health impacts the port has on the local community. If these jobs do not fulfill these criteria, and the impacts of the port are more negative than positive, the equation remains out of balance.

We aimed to determine what jobs are created by the Port are available to West Oakland residents, and of those available jobs, what are the characteristics with regards to health (wages, safety, and benefits). Specifically:

What are available employment positions within the Port of Oakland, specific to working within terminals and working on the transport of containers (TEUs), i.e. property adjacent to West Oakland, excluding the airport?

Of those employment positions, which are available or currently filled by West Oakland residents?

What are the physical hazards, job security, income, and benefits associated with these jobs?

How does the Port of Oakland outreach to West Oakland residents with employment opportunities via local job centers, contractors, and unions?

The Port of Oakland website (www.portofoakland.com) provides information on job openings, salary table associated with employment, benefits, occupational health and safety and reports from their Social Responsibility Division and Employment Resources Development Program. Port of Oakland’s Social Responsibility Division contained information on outreach efforts providing lists of community and tenant partnerships. Port of Oakland Maritime and Aviation Project Labor Agreement (MAPLA) Progress Report contained local-hire goals, contractors who achieved those goals, and union partnerships. Port of Oakland officials were contacted to retrieve further information on outreach with West Oakland community, contractors, unions, occupational health and safety.

¹⁹³ Working for You to Make a Difference, Port of Oakland, 2007.

West Oakland Income Levels and Unemployment

Based on an Alameda County Health Department report on the social and demographic characteristics of West Oakland, 61% of households in community earned an income of less than \$30,000 in 1999, as compared to 26% in Alameda County as a whole.¹⁹⁴ The median income of West Oakland is approximately \$18,000 compared to \$40,000 for all of Oakland.¹⁹⁵ The median income in West Oakland's poorest census tract is \$11,944.

In 2004, approximately 9.1% of Oakland residents age 16 or older were unemployed compared to 6.0% in Alameda County as a whole. The unemployment rate for West Oakland is approximately 18%.

Port Jobs versus West Oakland Employment Characteristics

Figure 2 illustrates the types of jobs and their relative fraction available from the Port or Oakland. While we were unable to identify the Port of Oakland positions available and held by West Oakland Residents, a report from the Alameda County Health Department provides a non-Port-specific breakdown of employment within the community in 2000 (Figure 3). Note that 14% of residents held jobs in the production, transportation and material moving sector, which are likely to be at the Port, or in Port-related businesses. There are a large fraction of administration, labor, and professional jobs at the Port that may match with corresponding West Oakland occupational categories.

¹⁹⁴ Alameda County Public Health Department, 2005, Community Information Book Update: West Oakland Social and demographic characteristics. <http://www.acphd.org/AXBYCZ/Admin/DataReports/2005update-westoakland.pdf>

¹⁹⁵ <http://www.planning.org/cap/pdf/WestOaklandDemographicProfile.pdf>

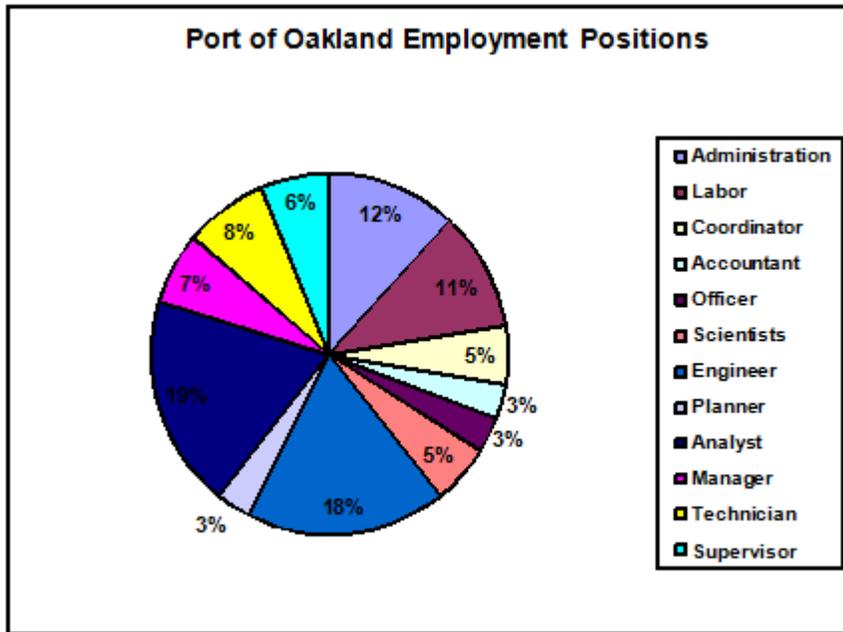


Figure 2. Port of Oakland employment positions obtained from “Port of Oakland-Salary Schedule”¹⁹⁶

West Oakland Occupations, 2000

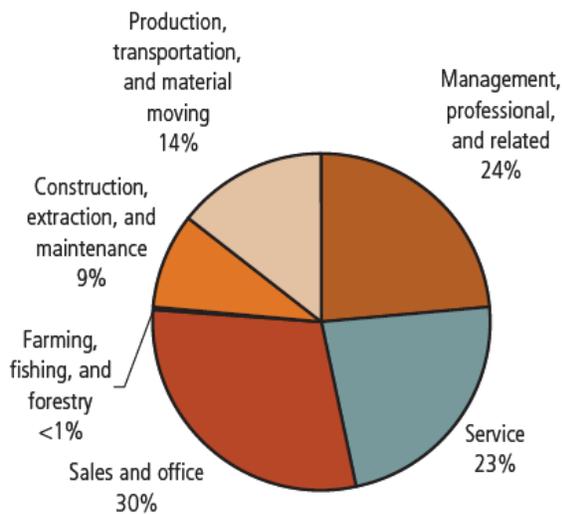


Figure 3. General employment characteristics for West Oakland residents (not Port-specific)¹⁹⁷

¹⁹⁶ <http://www.portoakland.com/jobcente/salaryta.asp>

¹⁹⁷ Alameda County Public Health Department, 2005, Community Information Book Update: West Oakland Social and demographic characteristics.

<http://www.acphd.org/AXBYCZ/Admin/DataReports/2005update-westoakland.pdf>

There is a large discrepancy in the wages earned for the positions available at the Port and general income characteristics of the community. Table 1 lists the pay for the positions available at the Port. The median annual salary is approximately \$96,000. Less than 9% of the community make this level of income at a household level.

Table 1. Port of Oakland employment positions including maximum (Step E) monthly and yearly wage according to “Salary Schedule”¹⁹⁸

Title	Positions	WAGE	
		Monthly	Yearly
Analyst	18	7,935	95,217
Engineer	17	9,059	108,704
Administration	11	6,934	83,213
Labor	10	6,379	76,543
Technician	7	6,269	75,225
Manager	6	11,254	135,052
Supervisor	6	9,515	114,174
Coordinator	5	8,409	100,913
Scientists	5	7,611	91,327
Accountant	3	7,263	87,152
Planner	3	7,208	86,496
Officer	3	10,747	128,958

¹⁹⁸ <http://www.portofoakland.com/jobcente/salaryta.asp>
Retail-10

West Oakland Household Income Distribution, 1999

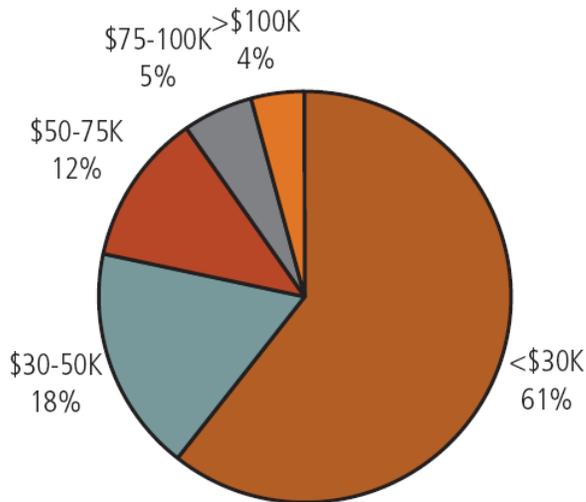


Figure 4. Income characteristics for West Oakland residents¹⁹⁹

Benefits

Benefits from Port of Oakland employment consist of medical insurance for active and retired employees with the choice of four medical plans. The Port contributes to 100% of premium cost monthly and for employees and their dependants health insurance coverage is provided for the lowest costing medical plan. Employees are provided with the choice of two dental plans and one vision plan and the Port provides 100% cost for active and retired employees for themselves and their dependants. In regards to mental health, the Port of Oakland is receiving services from the U.S. Behavioral Health Plan of California. Under this independent mental health care company, employees and their dependants are provided with mental health, chemical dependency and Employee Assistant Program services. Retirement consists of the Port paying 100% of a 7 percent that is removed from annual salary for the City of Oakland’s State of California Public Employees’ Retirement System (PERS). The Port pays this percent of salary otherwise removed from one’s cumulative earnings back. Another opportunity save one’s salary for retirement is the Deferred Compensation Plan. The Port contributes 100% of premium cost for Long Term Disability Insurance for certain employees (Unit C, D, E, F, H). Also 60% of salary is paid to an employee after 90 calendar days or completion of sick leave. The Port also provides regular full-time employees life insurance where in the case of death, disability or loss of vision, a

¹⁹⁹ Alameda County Public Health Department, 2005, Community Information Book Update: West Oakland Social and demographic characteristics.

<http://www.acphd.org/AXBYCZ/Admin/DataReports/2005update-westoakland.pdf>

benefit is allocated that is equal to an employees annual salary rounded up to the nearest thousand dollars. The full premium cost, maximum \$200,000 (adjusted for any salary increase), for coverage is covered by the Port.²⁰⁰

Occupational Health and Safety

According to occupational health and safety records from a Report on the Operations of the Social Responsibility Division at the Port of Oakland released March 2007, the annual incidence rate of recordable injuries and illnesses as documented by the Occupational Safety and Health Administration (OSHA) is currently 6.6 injury and illness per 100 employees. At the release of the report, the Port of Oakland had 560 to 590 full time equivalent (FTE) employees. There has been a reduction of injuries and illnesses since 2003 (Figures 5 – 6).

According to national statistics from the Bureau of Labor Statistics, 3 fatalities occurred in 2006 involving “Port and Harbor Operations,” which comprised of 0.1% of all fatalities within the water transportation industry. This industry is classified by the North American Industry Classification System of 2002. National non-fatal injuries, summarized in Figures 7 – 8, provide some indication of the types of injuries that might occur from this industry.

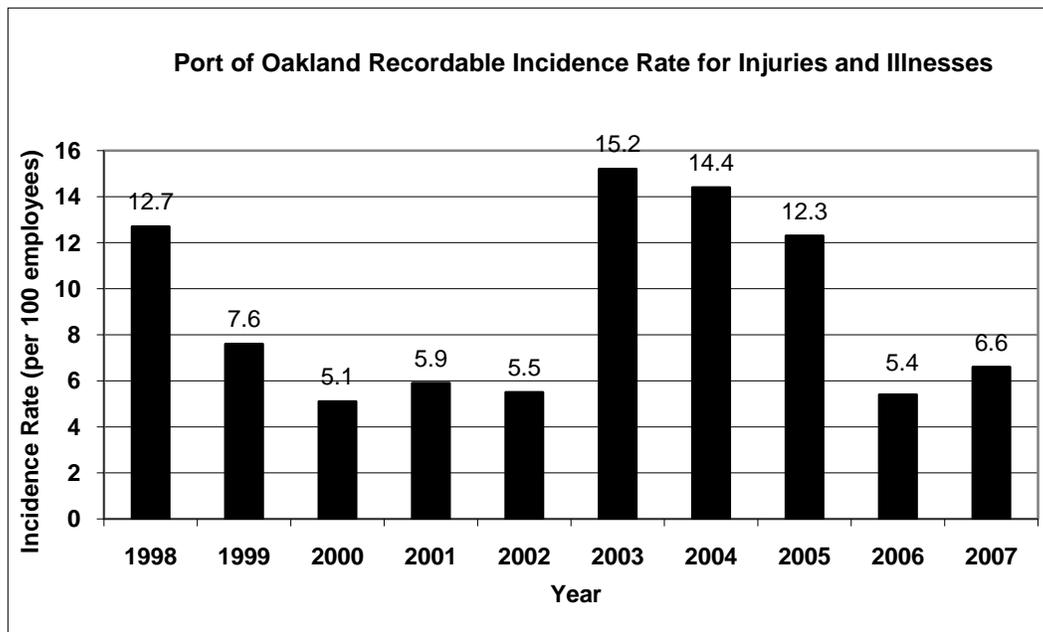


Figure 5. U.S. Occupational Health and Safety Administration (OSHA) recordable injury and illness incidence rate (injuries and illnesses per 100 employees with 560-590 FTE’s employed) for the Port of Oakland²⁰¹

²⁰⁰ <http://www.portofoakland.com/jobcente/benefits.asp>

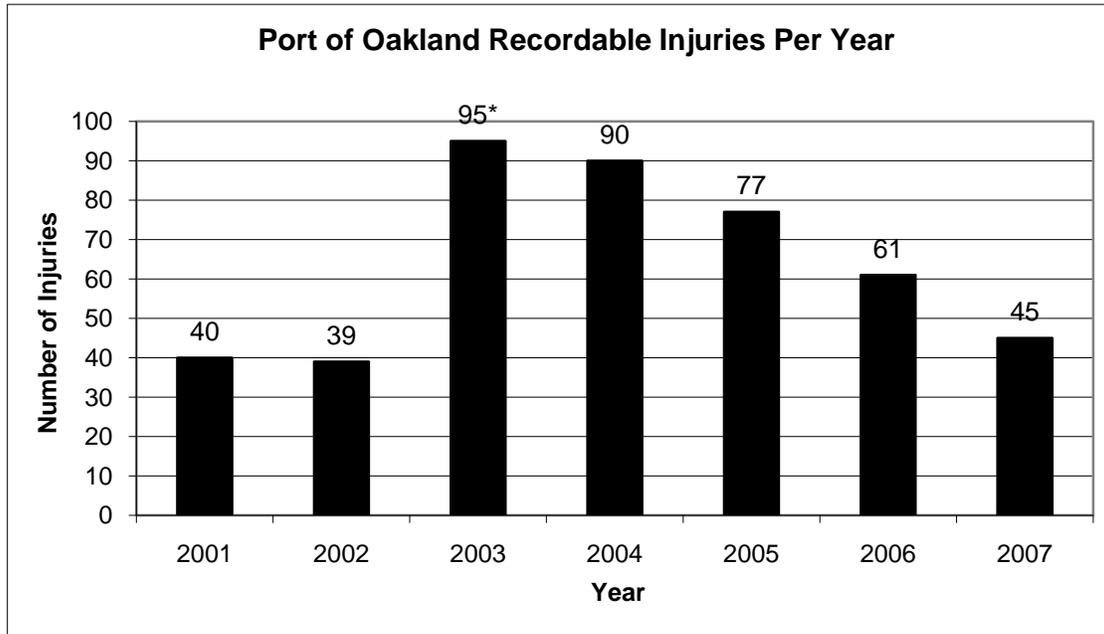


Figure 6. U.S. Occupational Health and Safety Administration recordable injuries per year from 2001 to 2007 from Port of Oakland Safety and Health Injury and Illness Summary Report (January 2007- March 2007) *Note: Number of injuries in 2003 based visual estimation in comparison to 2004 value.²⁰²

²⁰¹ Report on the Operations of the Social Responsibility Division, Port of Oakland July1, 2006 through March 31, 2007 by Bernida Reagan.

²⁰² Ibid.

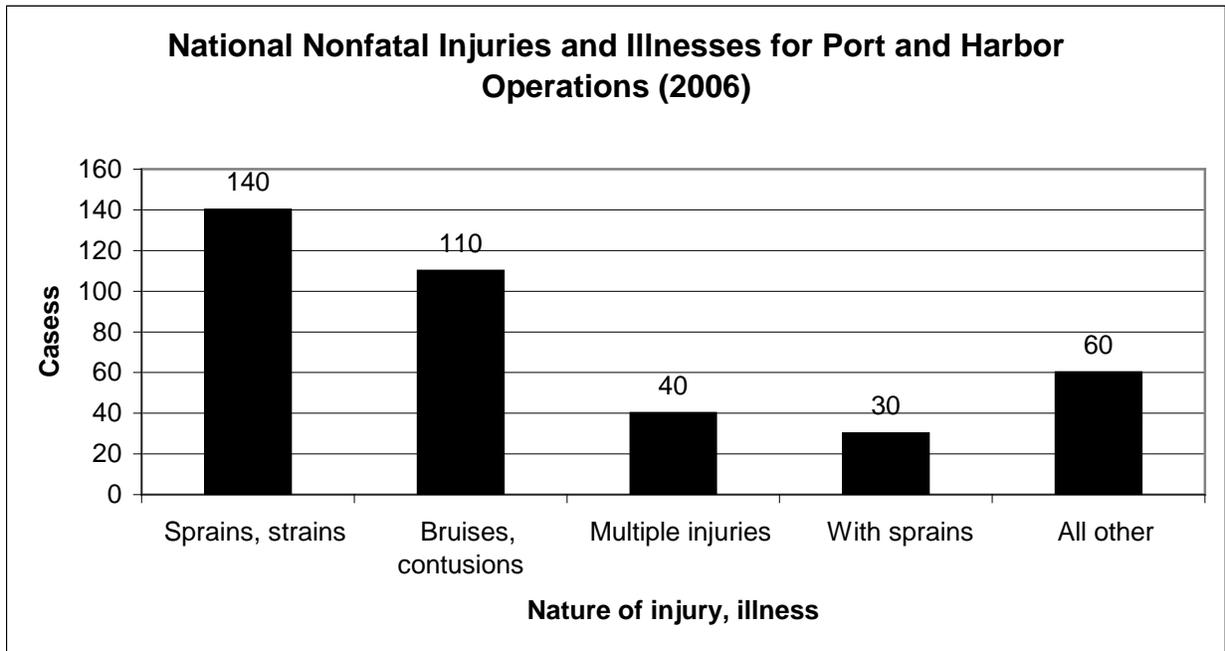


Figure 7. National nonfatal injuries and illnesses categorized by nature of the injury/illness for port and harbor operations totaling 390 injuries/illness, according to Bureau of Labor Statistics (2006).

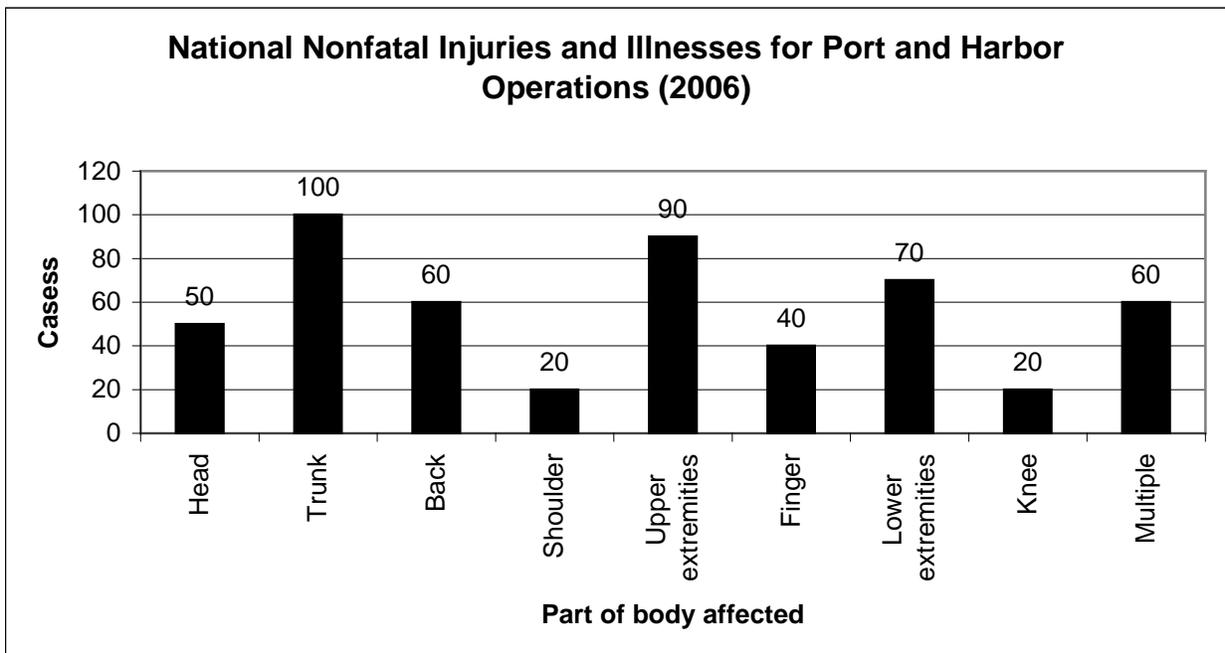


Figure 8. National nonfatal injuries and illnesses for port and harbor operations based on part of body affected by injury/illness in 2006, according to Bureau of Labor Statistics.

Port of Oakland: Social Responsibility Division

The Port of Oakland's Social Responsibility Division (SRD) is a division within the External Affairs branch that addresses economic, employment and environmental issues concerning the Port, its stakeholders and its neighbors. They release an annual report containing information of employment services they provide for tenants, the community, workforce development partnerships, internships, and constructions services through contractor collaborations. Some of their highlights from 2005-2006 consist of conducting six outreach events, increasing the use of small businesses, increasing hours worked by local hire, and achieving local business utilization of 90%.²⁰³

Employment Resources Development Program

The Employment Resources Development Program (ERDP) within the SRD provides job seekers opportunities to apply to employment openings from contractors or tenants who are seeking employees. The Port of Oakland website under the ERDP section lists employment openings. As obtained from their most recent report (2005-2006), 72 interviews by West Oakland residents occurred, with 19 job placements resulting from those interviews. In order to classify residents, two main categories exist as defined by the Maritime and Aviation Project Labor Agreement (MAPLA). The Local Impact Area (LIA) consists of those job seekers or current employees who reside in Oakland, Emeryville, San Leandro, and Alameda. The Local Business Area (LBA) consists of Alameda and Contra Costa Counties. These areas have been separated according to zip code.

While the percent of interviews leading to hires in West Oakland is just short of that for East Oakland and other areas in the LIA, it is higher than the percentage for the LBA (Figure 10).²⁰⁴ However, the actual number of hires and interviews (Figure 9) is lower in West Oakland than in other areas. This suggests that the Port needs for more and better outreach to West Oakland residents of employment opportunities.

²⁰³ Ibid.

²⁰⁴ JoAnn Yoshioka-George. Port of Oakland Employment Resources Development Program, Social Responsibility Division Summary (July 1, 2005- June 30, 2006). http://www.portofoakland.com/pdf/erdp_05-06Report.pdf.

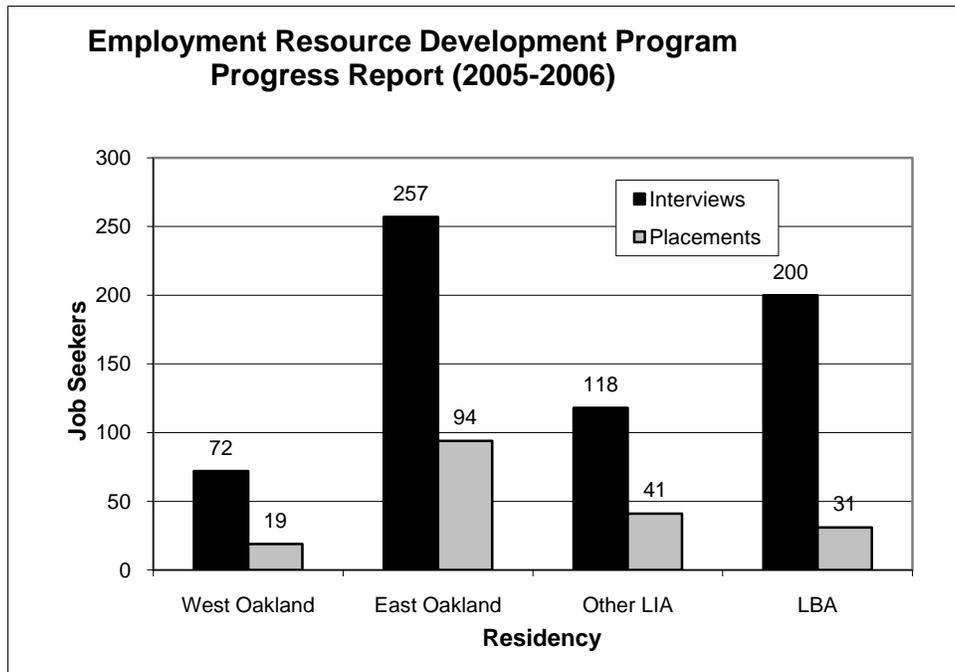


Figure 9. Progress Report from the Employment Resource Development Program (ERDP) displaying number of job seekers who interview and later placed with employer. Job seekers are classified by residence, LIA (Local Impact Area), LBA (Local Business Area).²⁰⁵

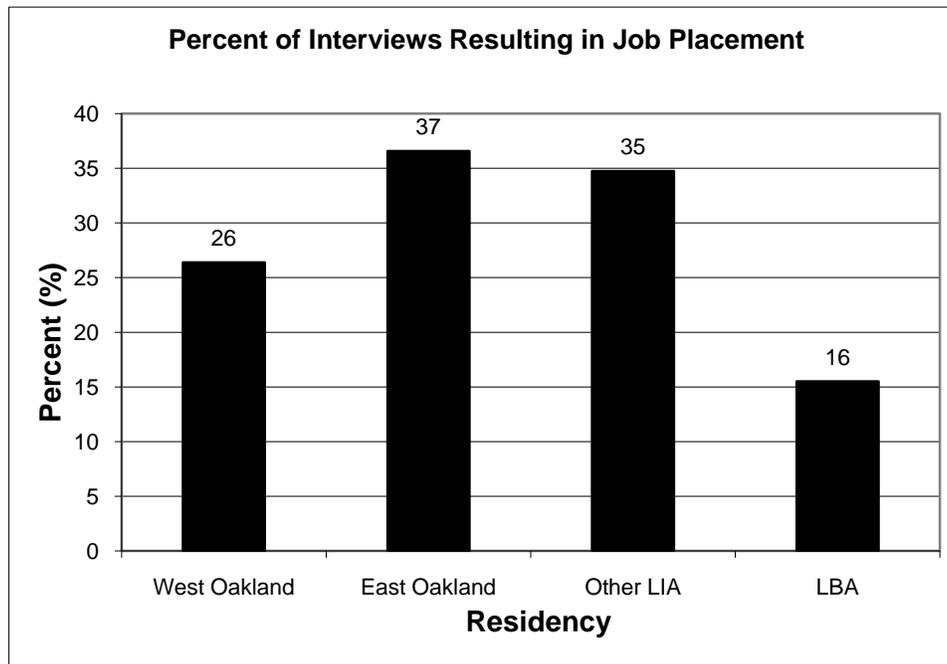


Figure 10. Percent of job seekers (categorized by residence: West Oakland, East Oakland, LIA (Local Impact Area), LBA (Local Business Area) whose interviews resulted in job placement.²⁰⁶

²⁰⁵ Ibid.

ERDP: Community and Tenant Employment Partnerships

The ERDP does provide outreach and partnership with organizations throughout the Bay Area. Partnerships specifically between organizations who serve West Oakland and the Port of Oakland consist of job fairs, presentations, workshops, and community events. Of 16 job fairs provided to the community by the Port, one job fair, at the George P. Scotland Youth and Family Center, was held in West Oakland. Of six presentation/workshops provided, zero were conducted in West Oakland. However, three of six community events provided were held in West Oakland. These community events were held at the Family Day at DeFermery Park, Mandela Marketplace Fundraiser, and Poplar Park Open House.

Of 16 partnerships with Bay Area organizations, two were held with organizations from West Oakland, which consisted of Scotland Youth and Family Center, and Cypress Mandela Training Center. Also, of the seven schools involved in the Ports internship programs, none specifically included McClymonds High School located in West Oakland.

ERDP provides a directory of the Port's partners for job seekers. Of 75 partners located throughout the Bay Area, approximately 9% (7) are located in West Oakland. Of these 7 West Oakland partners, three are not employment service specific, while the other four partners focus on jobs. These partners include:

- Academy of Trucking
- Alameda County Youth Development Inc.
- Cypress Mandela Training Center
- Goodwill Job Placement Center
- Next Step Learning Center
- Oakland Housing Authority
- West Side Economic Development Corp.²⁰⁷

Senior staff at these organizations had mixed reactions when asked to describe their relationships with the Port of Oakland, which were in part based on how qualified their clients may be for current Port employment opportunities. One respondent believed that the Port and other large employers “pay lip service” to job placements but in fact place strict eligibility requirements for the available positions, that it's impossible to place them in those jobs. Because the youth are placed primarily in entry-level positions, he felt most of the jobs at the Port are “out of reach” of their clients. His suggestion for the Port and other large employers is to create formal, high-quality internships for the youth with “reasonable” criteria, and give their clients “serious consideration” when filling the internships.

²⁰⁶ Ibid.

²⁰⁷ Port of Oakland Employment Resources Development Program Directory.
www.portofoakland.com/jobcente/erdp.asp

Leadership staff at other job training centers described more positive experiences. One respondent said that their organization had a “great collaboration” with the Port of Oakland. Many of the students completing the 16-week training programs (in crafts including but not limited to carpentry, surveying, iron-working, general construction) went directly into employment with the Port (he emphasized the Port’s airport operations). He added that students may also be eligible for loans provided by the Port (via community-based organizations) to pay their apprentice initiation or dues.

Social Justice Trust Fund

Other efforts as mentioned by the Port of Oakland’s SRD who contribute to Oakland employment development are through the Social Justice Trust Fund. This fund is available through direct contributions from contractors who contribute 15 cents per craft hour. Funds amounted to \$65,000 in 2006-2007 and past recipients included the Cypress Mandela/ Women in Skilled Trades Training Center location in West Oakland. Applicants submit a proposal and applications are viewed by the Social Justice Committee.²⁰⁸

Maritime and Aviation Project Labor Agreement (MAPLA)

A progress report issued by the MAPLA for July 2006 to December 2006 focused on labor relations with the Port, local hire goals, local hire enforcement, and Social Justice Trust Fund grants. How local hire goals are reached and enforced and how Social Justice Trust Fund grants are allocated is relevant to West Oakland. Local hire goals as set by the MAPLA require that 50% of total hours worked by contractors at the Port be completed by LIA residents, and 20% of total hours apprenticed by LIA residents. Apprentices are those LIA residents who are with a union.

During the reporting period from July 2006 to December 2006, 31.67% of the total hours were worked by LIA residents. The LIA residents include those residents from all of Oakland, Alameda, and San Leandro. The total hours completed by LIA apprentices were 6.87%, which was a deficit of approximately 13%.

As describe by the supervisor of ERDP, contractors who are working on Port of Oakland projects are required on a monthly basis to provide total hours worked by employees as categorized as residents from LIA or LBA. Contractors who fail to meet local hire goals are put before the Social Justice Committee to address local hire deficiencies. The ERDP supervisor mentioned that many contractors do compile these records to stay in compliance to continue working with the Port. Contractors’ local hiring performance are categorized “Tier,” where Tier I is the preferred goal (Table 2).²⁰⁹

²⁰⁸ Report on the Operations of the Social Responsibility Division, Port of Oakland July1, 2006 through March 31, 2007 by Bernida Reagan. http://www.portofoakland.com/pdf/busi_SRD_Operations.pdf.

²⁰⁹ Port of Oakland Maritime and Aviation Project Labor Agreement Progress Report (July 2006-December 2006). Released May 2007. http://www.portofoakland.com/pdf/busi_maplaReport.pdf

Table 2. Contractors categorized by “tier” as described by MAPLA with Tier I as preferred goal to reach.²¹⁰

Tier	Goals
I	Exceeded Multiple LIA Craft/Apprentice
II	Exceeded Multiple and at least 1 LIA
III	Exceeded LIA for 1 Craft
IV	Exceeded LIA/LBA in 1 or more craft

Contractors who are granted the opportunity to contribute to a job with the Port of Oakland have been classified in the MAPLA report and some have been contacted to determine how they reach their local hire goals and how the Port assists them to achieve those goals. Table 3 provides a brief summary of contractors contacted, how they reach their local hire goals, and the extent of Port of Oakland partnership. Of 45 contractors listed in the progress report, 2 contractors were located in West Oakland, but as of November 2007, only one contractor remained in West Oakland. Interestingly, all contractors used union workers for their contracted work. One contractor (3) mentioned that he was required to have 3 workers join a union to stay in compliance with Port requirements. All contractors, except two, specifically requested local employees from unions. Of these contractors, many stated that they are “very committed to hire local.” When asked if they needed the Port’s assistance to hire local, 4 mentioned they were able to accomplish goals without the Port’s assistance, two asked for local hire to remain in compliance with Port requirements, and other mentioned relying heavily on unions to provide local hire. Local hire for all contractors included Oakland residents, but many contractors could not specify of those Oakland employees, which were West Oakland residents. Contractor 8 mentioned that 40-50% of applicants and current workers were West Oakland residents, but contractor could not specify on a number of West Oakland residents. Two contractors were very proactive in recruiting local hire. Contractor 8 discussed recruiting through the assistance of Oakland Private Industry Council (PIC), local job fairs, and community outreach. Doug Blacksher, owner of A. Green & Shrubbery (Contractor 3), is located in East Oakland and is committed to have 95-100% of employees from East Oakland. Currently, they have 100% (9) employees residing in East Oakland who make up their workforce. This contractor has not only committed to hiring local, but continues to strive to remain conscious of the needs of the community. “We hire East Oakland residents because I grew up here and know it is important to invest into the community.” They recognize the need to invest in youth by providing them the opportunities to earn competitive wages. Blacksher continued to discuss the importance of hiring local as to prevent any transportation barriers, but also to stay connected to the community and ensure economic capital stay within the City of Oakland.

²¹⁰ Ibid.

Table 3. Contractors under the MAPLA who have exceeded local hire goals, location of contractor, craft, their use of unions to provide employees, assistance needed from Port to achieve goals, and local hire (ratio indicates Oakland resident out of total employed staff).

Contractor	Location	Craft	Tier	Use Union	Request Local	Assisted by Port	Local Hire	West Oakland
1	Richmond	Demolition	II	Yes	Yes	Not needed	Oakland	Unknown
2	Oakland	Electrical	III	Yes	By Default	N/A	2/8 Oakland	Unknown
3	East Oakland	Laborers, Teamsters	I	Yes	Yes	Not needed	9/9 East Oakland	No
4	Alameda	Operational Engineers	I	Yes	Yes	Yes, to achieve LIA goals	0/12 Oakland	Not Applicable
5	Oakland	Laborers	II	Yes	Yes	Yes, to stay in compliance	Oakland	Unknown
6	Berkeley	Laborers, Teamsters, Operational Engineers	II	Yes	By Default	Contractors and Unions	Oakland	Unknown
7	San Leandro	Drywall, Tapers	II	Yes	Yes	N/A	Oakland	Unknown
8	Oakland	Electrical	III	Yes	Yes	Oakland PIC, Job Fairs, Outreach	Oakland	40-50%

Unions

Contractors serving the Port of Oakland use unions to hire local Oakland residents. As outlined in the progress report of the MAPLA, unions who participate in ensuring compliance of local hire are:

- Iron Workers Local 378
- IBEW, Local 595
- Sheet Metal Workers, Local 104
- Operating Engineers, Local 3
- Carpet Layers, Local 12
- Laborers, Local 304
- Teamsters, Local 853
- Operating Engineers, Local 3
- Sheet Metal, Local 104

- Lathers, Local 9068
- Bricklayers and Allied Crafts, Local 3
- Building & Construction Trades Council of Alameda County, AFL-CIO²¹¹

A union that was not included in the list of participants involved in local hire that should be noted as contributing to Port of Oakland local hire is the International Longshore and Warehouse Union Local 10.

Union membership by West Oakland residents was not investigated in this report and may be an area for further exploration to determine their role in connecting residents with contractors and Port of Oakland employment.

Trucking Industry

All information above is related to Port of Oakland employment excluding the trucking industry. The trucking industry is made up of truck drivers who are both employees of a private trucking company or independent truck drivers whose services are contracted out to serve terminals needing containers (TEUs) moved and distributed. As independent truck drivers, who are the majority (61%) of the truck driving industry that serves the Port of Oakland, the majority of these workers do not have employment benefits, such as health insurance, unemployment insurance, or workers compensation. These drivers also pay for their own truck maintenance and parking fees. A study done by the East Bay Alliance for a Sustainable Economy (EBASE) in September 2007 surveyed 202 truck drivers, where 53 were excluded for being long distance drivers along with 23 who were employees of private trucking companies.²¹² Of those surveyed, 43% reside in the East Bay, which includes Oakland, but not specified are West Oakland residents.

²¹¹ Ibid.

²¹² East Bay Alliance for a Sustainable Economy. "Taking the Low Road." September 2007.

Table 4. Percent distribution of where independent truck drivers reside in California.²¹³

Bay Area	79%
East Bay	43%
Peninsula	10%
South Bay	19%
North Bay	8%
Central Valley	21%

Truck Driver Income, Benefits, and Shifts

Approximately 2,000 truck drivers serve the Port of Oakland, with 61% (1,200) of drivers being independent contractors. As previously mentioned, independent truck drivers must use their net annual earnings for other work related expenses resulting in a reduction of take-home income. The average independent truck driver will earn approximately \$30,001- \$40,000 of net annual income (Figure 11), but this does factor in a reduction of income by 54% as a result of additional expenses, which include:

- Insurance
- Annual registration and other permits
- Fuel
- Maintenance & repairs
- Communications (radios and/or cell phones)
- Payments for truck loan
- Parking
- Damages to chassis (which they don't own)
- Tolls, traffic tickets and other expenses²¹⁴

There are some drivers that do make more than \$50,000 net annual earnings, but half of the drivers make less than \$30,000 annual, not including income reductions due to external truck related expenses. The hourly wage of independent truck drivers is \$10.41, which is \$1.17 less than what the Port of Oakland has calculated as a living wage. About 56% of drivers earn below the Port's living wage of \$11.58. When comparing the average truck driver's wage (\$10.41) to the "Basic Family Budget Wage", which is the wage needed for a household comprised of two working adults (both earning an hourly wage of \$17.00) and two children to make ends meet, drivers earn approximately 61% of what is recommended for this family type living in the Bay Area. Based on the Basic Family Budget Wage needed to live in the Bay Area, only 12% of Port independent drivers earn this wage.

²¹³ Ibid.

²¹⁴ Ibid.

Figure 11. Net annual earnings of trucker drivers surveyed who serve the Port of Oakland²¹⁵

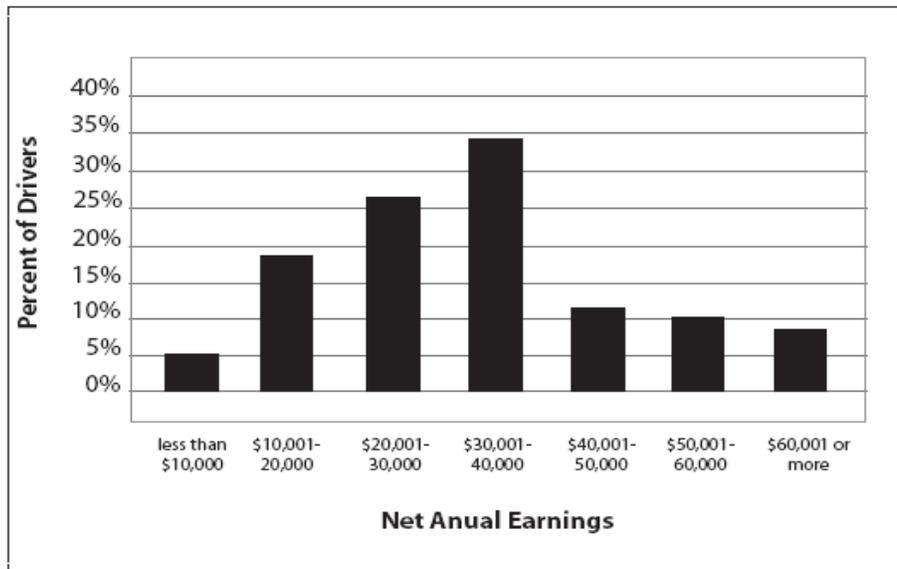


Table 5. Wages as compared to poverty wage, Port living wage and basic family budget wage.²¹⁶

Economic Hardship Threshold	Wage
Average Port Driver Wage	\$10.41
Port Living Wage	\$11.58
Poverty Wage, Family of Four	\$12.02
Basic Family Budget Wage	\$17.00

Independent truck drivers cannot receive health insurance benefits from their employees resulting in a majority (62%) of drivers not having any type of health insurance coverage. Some drivers are able to receive coverage from their spouse, by purchasing health insurance, or are eligible and receive government sponsored health coverage (Figure 12). During the surveying process, 30% of drivers interviewed mentioned using emergency medical services for themselves or their family members. This situation not only burdens the families, but also burdens public health care systems financially. Many drivers do not have the benefit of having retirement plans. A small portion of driver interviewed (12%) do have retirement plans, but this is below the average coverage of other “blue-collar worker” where approximately 52% have retirement plans.

²¹⁵ Ibid.

²¹⁶ Ibid.

The average shift of a driver serving the Port of Oakland is about 11 hours and this is above the average transportation/ warehouse worker who works an average shift of 7.4 hour per day (Figure 13). Approximately 22% of drivers surveyed, reported working 13 or more hours per day. Due to low wages, many drivers reported needing to work long hours to compensate for making up income that was used for truck needs.

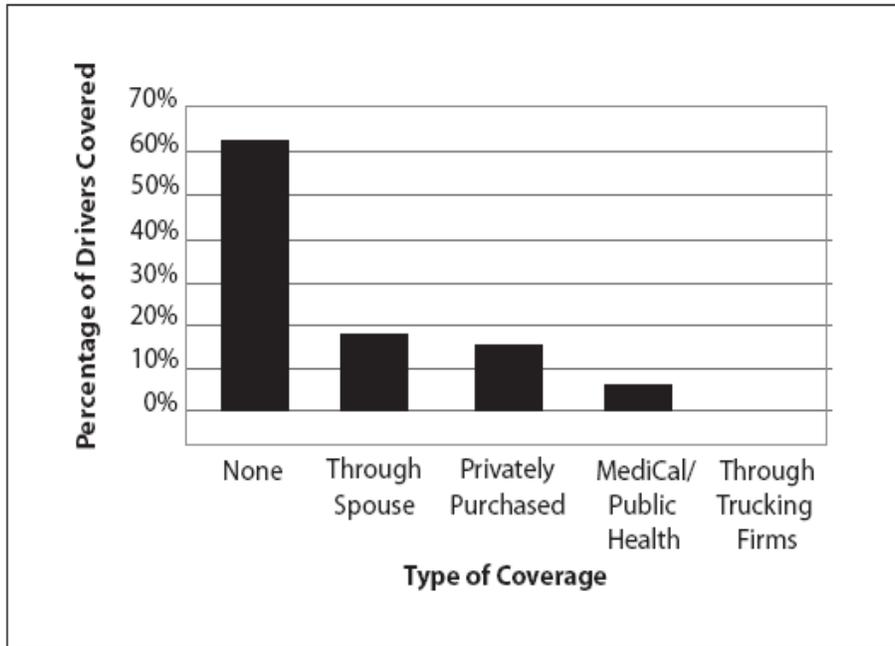


Figure 12. Percent of drivers covered with health insurance and type of coverage²¹⁷

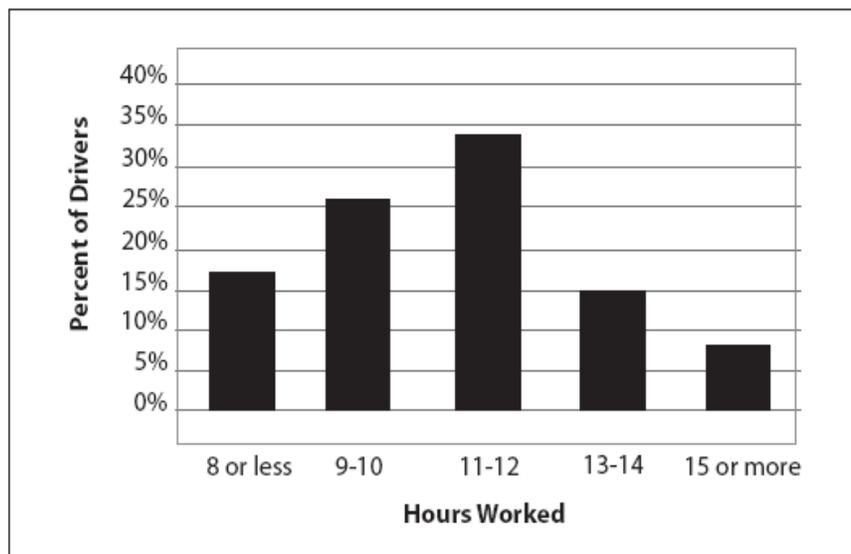


Figure 13. Hours worked in a typical day of driver surveyed who serve the Port of Oakland²¹⁸

²¹⁷ Ibid.

Truck Driver Occupational Health and Safety

Truck drivers face occupational health and safety hazards from the emissions of their own trucks, the trucks around them, and other Port sources. These hazards are experienced by both independent and private trucking company employees. As demonstrated by a recent study measuring black carbon concentrations within the truck cabins of seven truck drivers who serve the Port of Oakland, the age of truck may determine the amount of emissions inside a truck. Surrounding trucks and other sources also contribute to those concentrations.²¹⁹

Black carbon is a component of diesel particulate matter (DPM), which is a significant component of diesel exhaust, which has been classified as a human carcinogen, but also is related to cardiovascular disease, increased heart attacks, birth defects, low birth weights, premature deaths, and increased rates of death.

Of drivers who participated in the study, two reported having back pain, one had been diagnosed with asthma, another had breathing problems that only resumed when working, and lastly one had eye problems that a physician mentioned to him could be linked to the diesel exhaust. Two other drivers in the study reported having no health problems. The driver self-reported ailments do not suggest a direct link to their driving, but their symptom may be elevated due to their driving and/or exposure to diesel exhaust.

Concentrations measured inside truck cabins of truck drivers ranged from 9 to 23 microgram per cubic meter of DPM. Cancer risk levels associated with these DPM concentrations range from 1,000 to 2,600 per million (Table 6). These risks were calculated based on assumptions of life time employment exposure where a driver worked 40-hour weeks, for 50 weeks per year for 40 years. According to acceptable levels of cancer risk as considered by the Occupational Health and Safety Administration (OSHA), drivers are exposed to double the risk that is acceptable and approximately 2,000 times greater than the cancer risk as determined acceptable by the Office of Environmental Health Hazard Assessment (OEHHA).²²⁰ A truck driver's risk is 6.5 times higher than the background cancer risk of Oakland.

²¹⁸ Ibid.

²¹⁹ Diane Bailey, Zach Goldman, and Maria Minjares, "Driving on Fumes: Truck Drivers Face Elevated Health Risks from Diesel Pollution." Natural Resources Defense Council. December 2007.

²²⁰ A Guide to Health Risk Assessment. Office of Health Hazard Assessment.
<http://www.oehha.ca.gov/pdf/HRSguide2001.pdf>

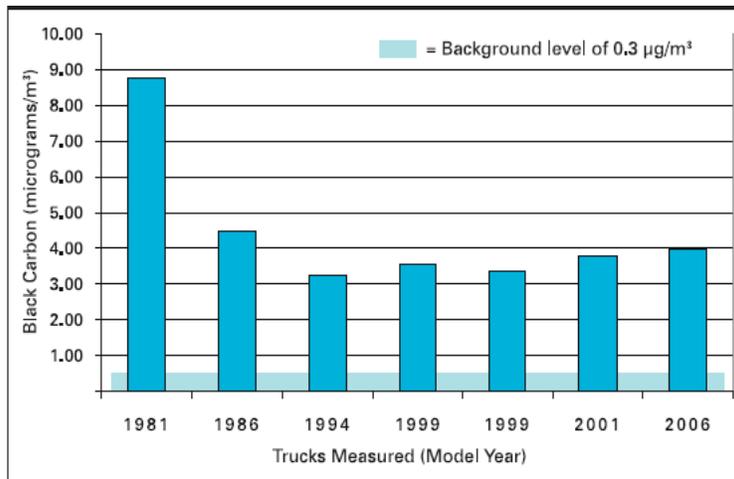


Figure 14. Average black carbon levels measured inside of truck cabins.²²¹

Table 6. Diesel particulate matter (micrograms per cubic meter) concentration comparison between those measured inside truck cabins, Port corridors and terminals, and Oakland.²²²

	Inside Truck Cabs	7th Street Oakland Truck Corridors ²⁹	Port of Oakland Terminal ³⁰	Inside School Buses ³¹	Oakland Background ³²
Diesel Particulate Matter (µg/m³)	9–23	6	13	8–19	1
Associated Cancer Risk Levels	1,000–2,600 per million (occupational)	2,300 per million	1,500 per million (occupational)	23–46 per million (limited duration)*	400 per million

*Duration based on 1 to 2 hours on a school bus per day for 180 days per year for 10 years.

Conclusion

Port of Oakland does have employment positions with wages above the Basic Family Budget Wage, which also includes exceptional benefits, which include medical coverage, dental, and mental health services. What is not yet determined is of these positions, which are vacant and what are the minimum requirements to be eligible for these positions (education, skills). Another question not yet answered is the degree to which positions are filled by West Oakland residents. According to OSHA records provided by the Port progress report, the incidence rate and total number of injuries and illnesses are decreasing

²²¹ Diane Bailey, Zach Goldman, and Maria Minjares, “Driving on Fumes: Truck Drivers Face Elevated Health Risks from Diesel Pollution.” Natural Resources Defense Council. December 2007.

²²² Ibid.

and according to national statistics, Port and Harbor Operations are 0.1% of total water transportation fatalities.

In regards to indirect employment with the Port of Oakland, MAPLA provides for good local hiring goals for contractors. However, contractors are still not able to reach local hire goals as determined by MAPLA. Many of the interviewed contractors do not use the Port to assist them in recruiting local, but rely heavily on unions providing local hire. Due to contractors inability to determine how many West Oakland residents were employed in their business, this proves one limitation of assessing how many West Oakland residents are employed with contractors who are providing services to the Port. MAPLA does not extend to Port positions or to independent truck drivers.

Other indirect employment resulting from Port operations are both independent and private employee truck drivers. Both types of drivers face elevated health risks from diesel pollution resulting in cancer risk higher than Oakland residents and other working in terminals in the Port of Oakland. These risks may be more detrimental to independent truck drivers where the majority of these drivers do not have health insurance, or other employment benefits that may protect them from occupational health and safety hazards.

Recommendations

1. As a good neighbor, the Port should take an active role in reducing West Oakland's high unemployment rates through better outreach to the local community when positions are available.
2. To better demonstrate their commitment to local hiring, the Port should monitor and make publically available West Oakland-specific employee and hiring statistics.
3. The Port should consider funding philanthropic activities that increasingly benefit the West Oakland community as Port growth occurs. These activities should focus on improving the social conditions of West Oakland, for example, by reducing crime, improving education at all age levels (training, internships, scholarships), and funding local research and industry into clean technologies.
4. The Port needs to continue the promising trends towards reducing injury and illness of its employees. Moreover, the Port needs to continue to optimize and make more efficient its operations, such that emissions are reduced. This includes reducing truck wait and idle times during container pick-ups.
5. The city may consider strategies to preferentially divert increasing tax revenue from increasing Port operations into West Oakland services.
6. With regards to improving truck driver health, various strategies have been proposed, including government mandating of emissions reductions, using public funds to subsidize clean trucks, and converting independent truck drivers into employees. Many of these are not mutually exclusive options, and in fact some are only practical if implemented together. Hence, we recommend:
 - a. The State needs to establish strong regulations on truck emissions with rapid phase in.

- b. At the same time, a combination of sustained public-private funding and tax credits or incentives should be made available such that there is little barrier for truck owners to update their trucks.
- c. The Port and State agencies should take a leadership position in improving the health of truck drivers. This may come through the mandating of Port-truck industry agreements as laid forth in the EBASE report, which clean trucks, minimize their impact on the community, emphasize local hiring, provide flexibility in allowing for small owner-operated trucking businesses, but yet mandating minimum health benefits.
- d. Such incentives/regulations need to be considered in light of the situation at all west coast ports. It does not help to push Port of Oakland/West Oakland's problems onto other communities.

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