

# At a Crossroads in Our Region's Health: Freight Transport and the Future of Community Health in the San Francisco Bay Area

December 2011



  
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A report by the Pacific Institute with the Ditching Dirty Diesel Collaborative

# At a Crossroads in Our Region's Health: Freight Transport and the Future of Community Health in the San Francisco Bay Area

**December 2011**

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## About the Ditching Dirty Diesel Collaborative

The Ditching Dirty Diesel Collaborative (DDDC) is a Bay Area collaborative of over a dozen environmental justice and health organizations that work to reduce diesel pollution and improve health in environmental justice communities throughout the San Francisco Bay Area. The Freight Transport Committee of DDDC works to advance community health and social equity in freight transport and land use decision-making.

## About the Pacific Institute

The Pacific Institute is one of the world's leading independent nonprofits conducting research and education to create a healthier planet and sustainable communities. Based in Oakland, California, we conduct interdisciplinary research and partner with stakeholders to produce solutions that advance environmental protection, economic development, and social equity— in California, nationally, and internationally. Our Community Strategies for Sustainability and Justice Program partners with community-based organizations and coalitions to conduct action research that supports organizing, leadership development, and policy advocacy for environmental health, justice, and sustainability in low-income and communities of color. Since our founding in 1987, the Pacific Institute has become a locus for independent, innovative thinking that cuts across traditional areas of study, helping us make connections and bring opposing groups together. The result is effective, actionable solutions addressing issues in the fields of freshwater resources, climate change, environmental justice, and globalization. More information about the Institute and our staff, directors, funders, and programs can be found at [www.pacinst.org](http://www.pacinst.org).

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Catalina Garzón is Program Co-Director of the Pacific Institute's Community Strategies for Sustainability and Justice Program. She has a Masters Degree in City and Regional Planning (MCP) with a concentration in Housing and Community Development from the University of California at Berkeley. Her work with the Community Strategies Program has included coordinating community-based transportation planning projects, collaborative research and mapping projects on freight transport and climate change adaptation issues with coalition partners, and participatory curriculum development efforts with community partner organizations. Ms. Garzón's prior training and technical assistance work has included serving as a brownfields redevelopment researcher with the Community Partnerships Office at the Institute of Urban and Regional Development and coordinating Urban Habitat's Leadership Institute for Sustainable Communities. She has co-authored numerous publications and articles based on her work with community and coalition partners in peer-reviewed academic journals as well as advocacy and popular media. Ms. Garzón is the 2010 recipient of the Thomas I. Yamashita Prize, which honors a scholar-activist whose work serves as a bridge between academia and the community.

### **The Ditching Dirty Diesel Collaborative (DDDC)**

The Ditching Dirty Diesel Collaborative (DDDC) is a regional environmental justice coalition led by a Steering Committee comprised of organizations based in communities most impacted by diesel pollution in the San Francisco Bay Area. Community-based organizations on the Steering Committee include Bayview-Hunters Point Community Advocates in southeast San Francisco, Communities for a Better Environment (CBE) in East Oakland and Richmond, Bay Area Healthy 880 Communities in San Leandro, and the West Oakland Environmental Indicators Project. Since its founding in October 2004, the Diesel Collaborative has launched successful campaigns to educate communities and truck drivers about anti-idling regulations as well as to advance health-protective policies in local, regional, and state-level transportation and land use planning. The Diesel Collaborative has co-authored several publications with the Pacific Institute, most recently the curriculum guide *Gearing Up for Action* (2010) based on capacity-building workshops about freight transport issues conducted with DDDC member organizations and the research report *Paying with Our Health* (2006) which quantified the public health costs of the freight transport system in California. More information about the Diesel Collaborative and its members can be found on our website, <http://www.ditchingdirtydiesel.org/>.

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## Table of Contents

Executive Summary .....	10
Introduction: At a Crossroads in Our Region's Health.....	13
Freight Transport Hazards and Environmental Justice in the San Francisco Bay Area .....	14
Health Implications of Regional Growth through Infill and Transit-Oriented Development....	20
Methods: Assessing Freight Transport Hazards in Priority Development Areas .....	23
Findings: Existing and Potential Land Use Conflicts in Freight-Impacted Communities .....	25
Recommendations: Encouraging Land Use Decisions that Protect Community Health.....	32
Conclusion: Planning for Healthy and Sustainable Communities.....	35
Endnotes.....	37
Appendices.....	39
Appendix A: San Francisco Bay Area .....	39
Priority Development Area in the Bay Area .....	39
Priority Development Area and CARE Zones in the Bay Area .....	40
Appendix B: Alameda County.....	41
Priority Development Area and CARE Communities.....	41
Airport Freight Impact Zones (2000 ft).....	42
Freeway Freight Impact Zones (500 ft).....	43
Freeway Freight Impact Zones (1000 ft).....	44
Sea Port Freight Impact Zones (1500 ft).....	45
Railyard Freight Impact Zones (1000 ft).....	46
Warehouse and Distribution Center Freight Impact Zones (500 ft).....	47
Freight Transport Impact Zones .....	48
Freight Transport Impact Zones, Excluding Distribution Centers and Warehouses.....	49
Appendix C: East Contra Costa County.....	50
Priority Development Area and CARE Communities.....	50
Freeway Freight Impact Zones (500 ft).....	51
Freeway Freight Impact Zones (1000 ft).....	52
Warehouse and Distribution Center Freight Impact Zones (500 ft).....	53

Freight Transport Impact Zones .....	54
Freight Transport Impact Zones, Excluding Distribution Centers and Warehouses .....	55
Appendix D: West Contra Costa County .....	56
Priority Development Area and CARE Communities .....	56
Freeway Freight Impact Zones (500 ft) .....	57
Freeway Freight Impact Zones (1000 ft) .....	58
Sea Port Freight Impact Zones (1500 ft) .....	59
Railyard Freight Impact Zones (1000 ft) .....	60
Warehouse and Distribution Center Freight Impact Zones (500 ft) .....	61
Freight Transport Impact Zones .....	62
Freight Transport Impact Zones, Excluding Distribution Centers and Warehouses .....	63
Appendix E: San Francisco County .....	64
Priority Development Area and CARE Communities .....	64
Freeway Freight Impact Zones (500 ft) .....	65
Freeway Freight Impact Zones (1000 ft) .....	66
Sea Port Freight Impact Zones (1500 ft) .....	67
Warehouse and Distribution Center Freight Impact Zones (500 ft) .....	68
Freight Transport Impact Zones .....	69
Freight Transport Impact Zones, Excluding Distribution Centers and Warehouses .....	70
Appendix F: San Mateo County .....	71
Priority Development Area and CARE Communities .....	71
Airport Freight Impact Zones (2000 ft) .....	72
Freeway Freight Impact Zones (500 ft) .....	73
Freeway Freight Impact Zones (1000 ft) .....	74
Sea Port Freight Impact Zones (1500 ft) .....	75
Railyard Freight Impact Zones (1000 ft) .....	76
Warehouse and Distribution Center Freight Impact Zones (500 ft) .....	77
Freight Transport Impact Zones .....	78
Freight Transport Impact Zones, Excluding Distribution Centers and Warehouses .....	79
Appendix G: Santa Clara County .....	80
Priority Development Area and CARE Communities .....	80

Airport Freight Impact Zones (2000 ft).....	81
Freeway Freight Impact Zones (500 ft).....	82
Freeway Freight Impact Zones (1000 ft).....	83
Warehouse and Distribution Center Freight Impact Zones (500 ft).....	84
Freight Transport Impact Zones .....	85
Freight Transport Impact Zones, Excluding Distribution Centers and Warehouses.....	86

## Figures

Figure 1. Freight-impacted communities face increased exposure to diesel pollution which contributes to an array of documented health problems. ....	14
Figure 2. Freight transport infrastructure and people of color by Census Block Group, San Francisco Bay Area, 2000.....	17
Figure 3. Freight transport infrastructure and poverty rates by census tract, San Francisco Bay Area, 2000.....	18
Figure 4. Freight transport infrastructure and asthma hospitalization rates by zip code, San Francisco Bay Area, 1998-2000 .....	19
Figure 5. Infill and transit-oriented development also pose health concerns associated with siting additional housing, schools, and other sensitive land uses. ....	20
Figure 6. Residents adjacent to freeways could be at a greater risk of respiratory disease and cancer due to freeway-related diesel emissions.....	21
Figure 7. Relative Contribution of different on-road mobile sources to overall emissions, San Francisco Bay Area. Source: Bay Area Air Quality Management District .....	22
Figure 8. Priority Development Areas and Community Air Risk Evaluation (CARE) designations in the San Francisco Bay Area. Source: Pacific Institute .....	28

## Tables

Table 1. Overview of Priority Development Areas that Intersect with CARE Communities, by County.....	29
Table 2. CARE-Impacted PDAs and Freight Transport by County (acres) .....	30
Table 3. Sensitive Land Uses in Freight Transport Buffer Zones within CARE-Impacted PDAs by County.....	31

## Glossary

**Association of Bay Area Governments (ABAG):** Metropolitan planning organization in the San Francisco Bay Area responsible for coordinating regional planning efforts across cities and counties in the region.

**Bay Area Air Quality Management District (BAAQMD):** Regional agency responsible for meeting federal and state air quality standards in the San Francisco Bay Area.

**Bay Conservation and Development Commission (BCDC):** Regional agency responsible for protecting the San Francisco Bay and overseeing development along its shoreline.

**Buffer Zone:** An area separating a polluting land use, such as a freeway or rail yard, from a sensitive land use like housing to mitigate the effects of one land use on the other.

**California Air Resources Board (CARB):** State agency responsible for regulating air quality in California.

**CARE Communities:** Communities that the Bay Area Air Quality Management District has designated as having the highest health risk from toxic air contaminants in the region through its Community Air Risk Evaluation (CARE) program as areas that would most benefit from mitigation strategies to reduce exposure. These include greater Richmond, parts of Concord, southeast San Francisco, San Jose, Redwood City and East Palo Alto, and the I-880 corridor in the East Bay (Berkeley, Oakland, San Leandro, and Hayward).

**CARE-impacted Priority Development Area (PDA):** An area targeted for regional development that is located in a CARE community with high health risk from toxic air contaminants in the Bay Area.

**Climate Action Planning:** A local, regional, or state-level effort to identify a set of policies and programs that can be put in place to reduce greenhouse gas emissions in a certain area.

**Climate Change:** A long-term change in measures of Earth's climate, such as temperature and precipitation, due to natural variability or human activity.

**Co-Pollutant:** Other gases that may be released along with the air pollutant of concern.

**Development:** Building new structures or changing the natural landscape for human use.

**Diesel Particulate Matter (DPM):** Solid particles resulting from the combustion of diesel fuel. Diesel particulate matter is considered a toxic air contaminant in California (see "Toxic Air Contaminant").



**Freight Transport:** The movement of products and raw materials via ship, truck, train, or plane.

**Greenhouse Gas Emissions:** Gases resulting from the combustion of fossil fuels like petroleum that contribute to climate change, such as carbon dioxide (CO<sub>2</sub>).

**Health Impact Assessment:** A process for assessing the potential health impacts of a proposed policy, program, or project.

**Infill Development:** Development on underutilized urban land, such as vacant lots and buildings.

**Land Use Planning:** A process for making decisions about the best way to use land in a certain area.

**Land Use Conflict:** A conflict that is created by placing land uses that are incompatible with each other, such as a residential development and an industrial facility, next to each other.

**Metropolitan Transportation Commission (MTC):** Regional agency responsible for transportation planning as well as dispensing state and federal transportation funds allocated to the San Francisco Bay Area.

**Magnet Source:** A land use that attracts mobile sources of pollution like trucks and trains, such as a port or rail yard.

**Mitigation:** An action taken to reduce the environmental or health impacts of a proposed development.

**Mobile Source:** A source of air pollution that can move on its own, such as a truck or train.

**Off-Road Source:** Sources of air pollution that do not operate on paved roads, such as ships and aircraft.

**On-Road Source:** Vehicles that operate on paved roads, such as passenger cars and heavy-duty trucks.

**Opportunity Site:** A property that is likely to redevelop because the land itself is worth more than what is already built on that land.

**Point Source:** A fixed source of air pollution, like an industrial facility.

**Priority Development Area (PDA):** An area being prioritized for infill and transit-oriented development by regional agencies as part of SB 375 implementation in the San Francisco Bay Area.

**Senate Bill (SB) 375:** State climate legislation in California that requires metropolitan planning organizations to set regional greenhouse gas reduction targets and develop a coordinated regional plan to meet those targets.

**Sensitive Land Uses:** Areas where individuals most sensitive to exposure to air pollution, like children, the elderly, and those with pre-existing health conditions, are most likely to spend time. These include schools, parks, playgrounds, daycare centers, nursing homes, hospitals, health clinics, and residences.

**Sustainable Communities Strategy (SCS):** A set of goals and policies to align transportation, housing and land use priorities in a California region in order to reduce greenhouse gas emissions in that region.

**Toxic Air Contaminant:** A chemical that has been determined to be harmful at any level of exposure. For example, diesel particulate matter is considered a toxic air contaminant in the state of California.

**Transit-Oriented Development (TOD):** Development within walking distance of public transit infrastructure, such as a light rail station or a major bus corridor.

**Zoning:** A set of rules for implementing land use policies by specifying what can get built where

## Executive Summary

A recipe for a truly sustainable community must include community health along with quality housing and jobs connected by public transit as key ingredients. Regional plans are afoot in the San Francisco Bay Area to reduce air pollution that contributes to climate change, known as greenhouse gas emissions, by encouraging more compact development in already urbanized areas along transportation corridors. However, this approach to regional development could also pose hazards to community health by putting more residents next to sources of toxic pollution like freeways, rail yards, ports, and distribution centers. To protect both our climate and the health of future generations, our strategy for creating more sustainable communities in our region must account for and address potential conflicts between existing polluting land uses and proposed developments like new housing. By planning for health, we can create sustainable communities in the San Francisco Bay Area that are as rich in opportunities for a long healthy life as they are for quality jobs, housing, and transit for all residents.

As this report shows, suitable places to put new housing, schools, parks, and other sensitive land uses can be found in Bay Area communities that will protect residents from being exposed to sources of harmful pollution. Freight transport, or the movement of products and raw materials via truck, train, ship or plane, is a major source of unhealthy pollution that disproportionately affects low-income and communities of color in our region. Partly due to their proximity to polluting land uses, many of these communities are also burdened with the highest health risk from toxic air contaminants in the Bay Area. For many residents of these communities, conflicts between residential and freight-transport related land uses materialize in their daily lives in the form of noise, traffic congestion, pedestrian safety hazards and, worse yet, serious health problems like asthma, cancer, and heart disease.

Our report focuses on portions of the region where areas that have been prioritized for future development, or Priority Development Areas, overlap with communities with the highest health risk from toxic air contaminants, referred to as CARE communities. Using mapping and spatial analysis, the report assesses the current and potential conflicts that exist between freight transport-related land uses and sensitive land uses such as housing, schools, parks, and health clinics in these areas. To determine which places are most impacted by freight-related land uses, we generated health-protective buffers around freight transport-related land uses including freeways, rail yards, seaports, airports, warehouses, and distribution centers. We then identified how many sensitive land uses, such as schools, parks, and health clinics, are already located within these health-protective distances from freight-related land uses. Lastly, we calculated the amount of residentially zoned land within these health-protective buffer zones to assess the potential for future land use conflicts.

This report shows that, without proper regional planning, the potential for exacerbating land use conflicts between residential and freight-transport related land uses is significant in the San Francisco Bay Area. Our analysis found that **nearly half (42%) of the land being prioritized for development in our region is located in communities with the highest health risk from toxic air contaminants.** One-fourth (25%) of the land in Priority Development Areas that intersect with CARE communities is within a distance from freight-related land uses where it is unadvisable to site sensitive land uses like new housing, according to regulatory agencies like the California Air Resources Board.

Fortunately, many healthier places where we can locate sensitive land uses like new housing exist in communities being targeted for regional development in the Bay Area as part of efforts to reduce greenhouse gas emissions. We found that **three-fourths (74%) of the land in Priority Development Areas that intersect with CARE communities is far enough away from freight transport hazards to be suitable for sensitive land uses like new housing.** One out of every three acres of this more suitable land for sensitive land uses is zoned as residential or mixed residential/commercial.

Our report also outlines steps that regional and local decision-makers can take to better plan for health when making land use and transportation decisions that will affect residents of these communities for generations to come. To minimize potential land use conflicts, **available suitable land located at a health-protective distance from freight-related land uses should be prioritized for new housing and other sensitive land uses.** The remaining land area located in close proximity to freight-related land uses can be prioritized for commercial and light industrial development that creates jobs for local residents while protecting worker health. By accounting for health in deciding where to place new housing, we can retain the industrial and commercial land we need to accommodate economic growth while proactively reducing anticipated land use conflicts in residential areas.

We recognize that, in order to meet their housing needs, some communities may need to consider development opportunities for building new housing and other sensitive land uses near freight-related land uses. **Our report also contains a detailed list of measures that can be incorporated into the design of proposed developments near freight transport-related land uses to reduce exposure to harmful pollution.** Such measures include installing air filtration systems, triple-paned sealed windows, and other design elements that can help protect indoor air quality from harmful air pollutants. Other measures that can be taken include notifying prospective residents of the health risks posed by freight transport-related land uses surrounding the development and informing existing residents of the potential impacts of proposed expansion projects at freight-related land uses.

Siting sensitive land uses like housing near freight transport-related land uses in any community can pose a health risk to existing and future residents. However, planning for health is particularly important for addressing the burden posed by past land use and development

decisions that have created unhealthy neighborhood conditions in communities already overburdened by toxic pollution. Our findings indicate that we can advance regional development priorities in ways that protect community health while creating jobs and housing to benefit existing and future residents in these communities.

To realize a vision for truly sustainable communities, our blueprint for regional growth must strike a balance that benefits existing and future residents by protecting community health while providing quality housing and job opportunities for all. In creating a blueprint that will shape the future of all communities in the Bay Area, decision-makers and planners are in a prime position to ensure that community health also lies at the heart of our region's strategy to protect our climate. A key step on the path to the healthy future that all Bay Area residents deserve is to ensure that new housing, schools, parks, and other sensitive land uses are healthy places to spend our everyday lives. When deciding what should get built where, it's important to ask: "Would I want to live, work, play, pray, or go to school here?" For a community to be truly sustainable, the answer to that question must be "Yes!"



# At a Crossroads in Our Region's Health: Freight Transport and the Future of Community Health in the San Francisco Bay Area

## Introduction: Realizing a Vision for Sustainable Communities in the Bay Area

The San Francisco Bay Area is at a crossroads in which the future of its vibrant communities and ecosystems is at stake. As both people and goods in our region travel farther to reach their destinations, rising greenhouse gas and air toxics emissions have made it increasingly difficult to sustain current development patterns. In deciding how to plan for future growth, our region is poised to realign transportation, housing, and land use priorities so as to advance environmental health and quality of life for all communities.

Past land use and development decisions have resulted in homes, schools, and parks sharing borders with polluting land uses like freeways, rail yards, ports, and distribution centers. These land use patterns have overburdened residents in low-income and communities of color with elevated asthma rates, increased cancer risk, and other health hazards posed by toxic diesel pollution from freight transport. As a result freight transport – that is, the distribution of products and raw materials via truck, train, ship, or plane -- disproportionately affects thousands of Bay Area residents who live, work, play, worship, or go to school in neighborhoods where development has taken place without adequately planning for health.

Our region is currently determining how we can develop more sustainably in the future than we have in the past. In implementing state climate legislation SB 375 in the Bay Area, regional decision-makers are crafting a Sustainable Communities Strategy that will guide how we invest public dollars to encourage more compact land use and development patterns. Infill development could reduce greenhouse gas emissions by locating more housing near job centers and public transportation, making it easier for people to avoid driving long distances to meet their everyday needs. However, infill development could also expose more people to toxic air pollution if more housing is sited near freeways and other freight-related land uses without accounting for the risks that this poses to human health.

In setting priorities for how our region should grow, decision-makers can take proactive steps to reduce exposure to toxic pollution when considering where to locate sensitive land uses like new housing, schools, and parks. In order to realize a regional vision that supports healthy and thriving communities, community health and quality of life must be central to the creation of a Sustainable Communities Strategy for the San Francisco Bay Area. This report documents where areas being prioritized for regional development overlap with communities impacted by freight

transport hazards that face the highest health risk from toxic air contaminants. The report then identifies steps that regional and local decision-makers can take to better plan for health when making land use and transportation decisions that will affect residents of these communities for generations to come. Though the report focuses on reducing harm to future residents through better land use planning, many of the recommendations highlighted are relevant for reducing harm to existing residents of communities already being impacted by freight transport hazards.

## Freight Transport and Environmental Justice in the San Francisco Bay Area

Imagine waking up in the middle of the night to rattling windows and blaring horns from passing freight trains. In the morning you have a hard time waking your child, who like you is tired from a sleepless night filled with noise and vibrations from the trains. You decide to drive your child to school because the freight trucks rumbling down your street make it unsafe to walk, ride a bike, or even wait for the bus without breathing in fumes that could trigger an asthma attack. When you exit your home you are reminded to pack your child's inhaler as you hold your breath to avoid taking in a gust of diesel exhaust spewed by a passing truck. You are delayed at the rail crossing by a long freight train, making you late in dropping your child off at school and getting to work. As you wait behind the wheel, you notice that the vacant lot next to the warehouse on the corner has a new sign announcing the location of a future housing development. While watching idling diesel trucks line up behind you in your rearview mirror, you can't help but wonder: "Isn't there a better place to build more housing in this neighborhood?"

As this report shows, the answer to this question is: "Yes!" The experiences described above are but a few of the far-ranging impacts that diesel trains and trucks transporting freight have on the everyday lives of residents in freight-impacted neighborhoods. Our region has much to learn from communities contending with the legacy of land use and development decisions that have placed people next to sources of toxic air pollution like freeways, rail yards, ports, and distribution centers. One important lesson to learn in creating more sustainable communities is to consider the health risks posed by existing pollution sources in deciding where to site future amenities like new housing, schools, and parks.

Not all communities are equally burdened by freight transport hazards and their health effects. In the San Francisco Bay Area, low-income and communities of color bear the brunt of adverse impacts from freight transport infrastructure and operations in their neighborhoods (Figures 2 and 3).<sup>1</sup> Throughout our region, diesel-fueled trucks move freight along networks of disconnected truck routes interspersed with homes, schools, parks, and churches where families and children live, learn, play, and pray. Many of these sensitive land uses are walking distance from rail lines, freeways, rail yards, distribution centers, and ports that act as "magnets" to attract freight train and truck traffic into residential neighborhoods.

A major health concern that freight-impacted communities face is increased exposure to diesel pollution. Ships, trains, and trucks in California are powered almost exclusively by diesel engines. As a result, the freight transport sector contributes 75 percent of statewide emissions of diesel particulate matter and is a major source of other harmful air toxics.<sup>ii</sup> Inhaling diesel exhaust contributes to an array of documented health problems, including lung cancer, asthma, heart disease, and premature birth.<sup>iii</sup> In the San Francisco Bay Area, communities where freight-related land uses are concentrated contend with some of the highest rates of asthma hospitalizations in the region (see Figure 4). Over 80 percent of all cancer risk from air pollution in the Bay Area comes from diesel particulate matter, with the most elevated levels of cancer risk and other unhealthy conditions occurring in areas near freight transport hubs and corridors.<sup>iv</sup>



**Figure 1. Freight-impacted communities face increased exposure to diesel pollution which contributes to an array of documented health problems.**

*Source: Ditching Dirty Diesel Collaborative*

Land use conflicts between residential areas and freight transport infrastructure also create environmental conditions that undermine community health and quality of life in other ways. Truck and train traffic in freight-impacted communities has been shown to increase the risk of heart disease, reduce lung function in children, discourage walking and playing outdoors, and affect the school performance and sleeping patterns of children.<sup>v</sup> The presence of trucks on residential streets reduces visibility and poses a safety hazard for drivers, bicyclists, and pedestrians.<sup>vi</sup> According to the California Air Resources Board, 2830 hospital admissions, 360,000 missed workdays, and 1,100,000 missed days of school are attributable to freight transport in California each year.<sup>vii</sup>

The concentration of freight transport and other polluting land uses in low-income communities of color has been well documented.<sup>viii</sup> In the San Francisco Bay Area, residents of communities like West and East Oakland, greater Richmond, and southeast San Francisco that host freight-related land uses servicing the entire region, like major area ports and rail yard facilities, are predominantly low-income and people of color (see Figures 2 and 3). This disproportionate impact is largely the result of past land use and development decisions that did not adequately account for and address the health risks posed by potential land use conflicts between residential, industrial, and freight transport-related land uses.

In the last few decades, residents of communities overburdened by environmental hazards have demanded and achieved greater participation in the processes of zoning, permitting industrial facilities, and designating local truck routes to address the community impacts of existing and proposed development.<sup>ix</sup> Residents of these communities have advocated for a greater share of the benefits from proposed developments, such job creation and training opportunities for local residents.<sup>x</sup> Residents and workers in freight-impacted communities have also collaborated to identify solutions to occupational and community health hazards posed by freight transport operations.<sup>xi</sup>

As local land use decisions become increasingly shaped by regional development priorities, it is critical to understand how planning policies that emphasize infill and transit-oriented development can align with community-based efforts to address the impacts of freight transport. Additional expansions of freight transport infrastructure, such as the Port of Oakland, are being proposed to accommodate anticipated growth in our region's economy. At the same time, local planners are considering proposals to convert industrial and commercial land into residentially zoned land along major freight transport corridors like the I-880 to meet the need for more housing.<sup>xii</sup> Our region stands at the crossroads of these potentially conflicting visions for how land next to freight transport hubs and corridors should be developed. To realize a vision for truly sustainable communities, our blueprints for regional growth must strike a balance that benefits existing and future residents by protecting community health while providing quality housing and job opportunities for all.

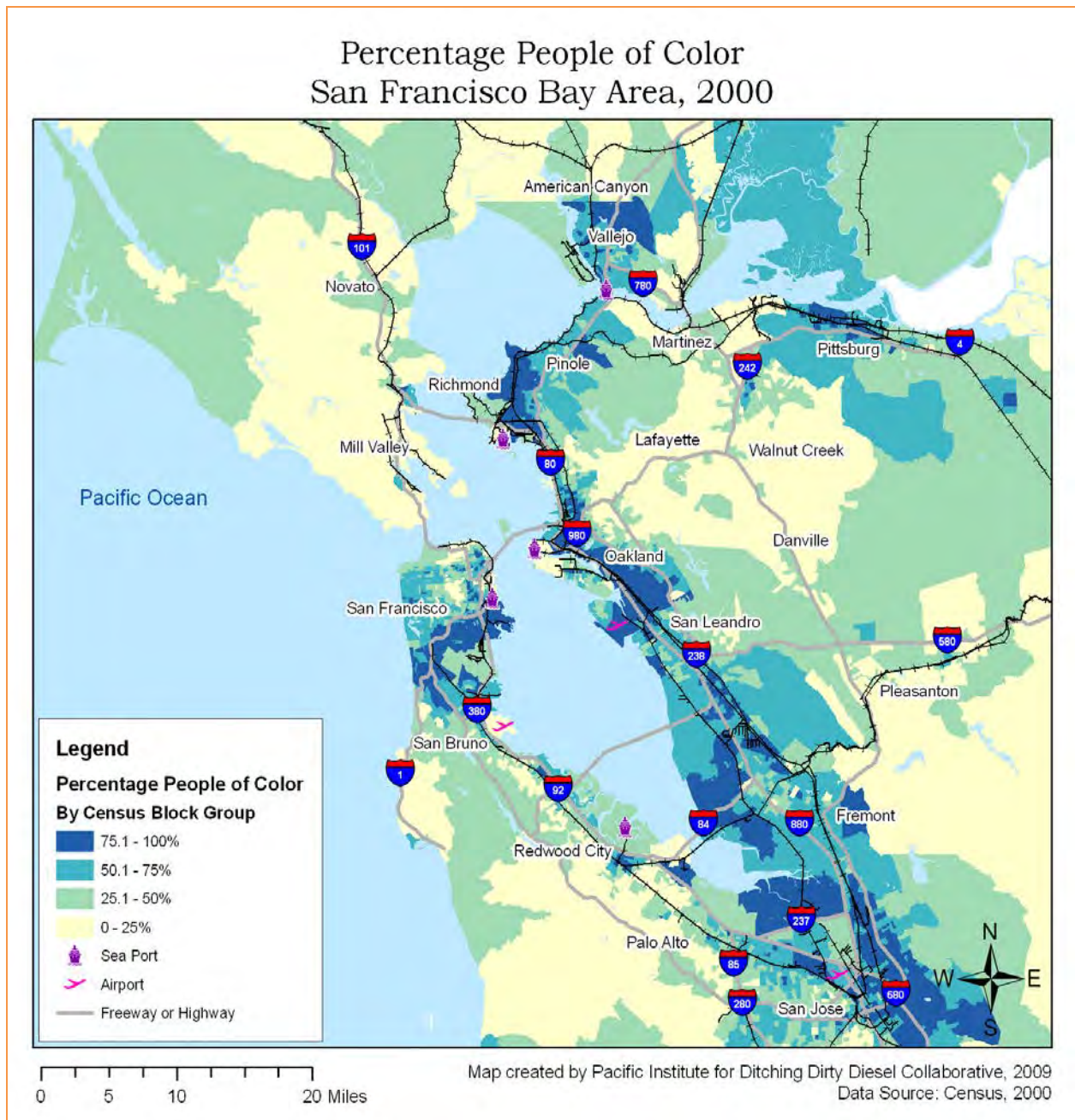


Figure 2. Freight transport infrastructure and people of color by Census Block Group, San Francisco Bay Area, 2000



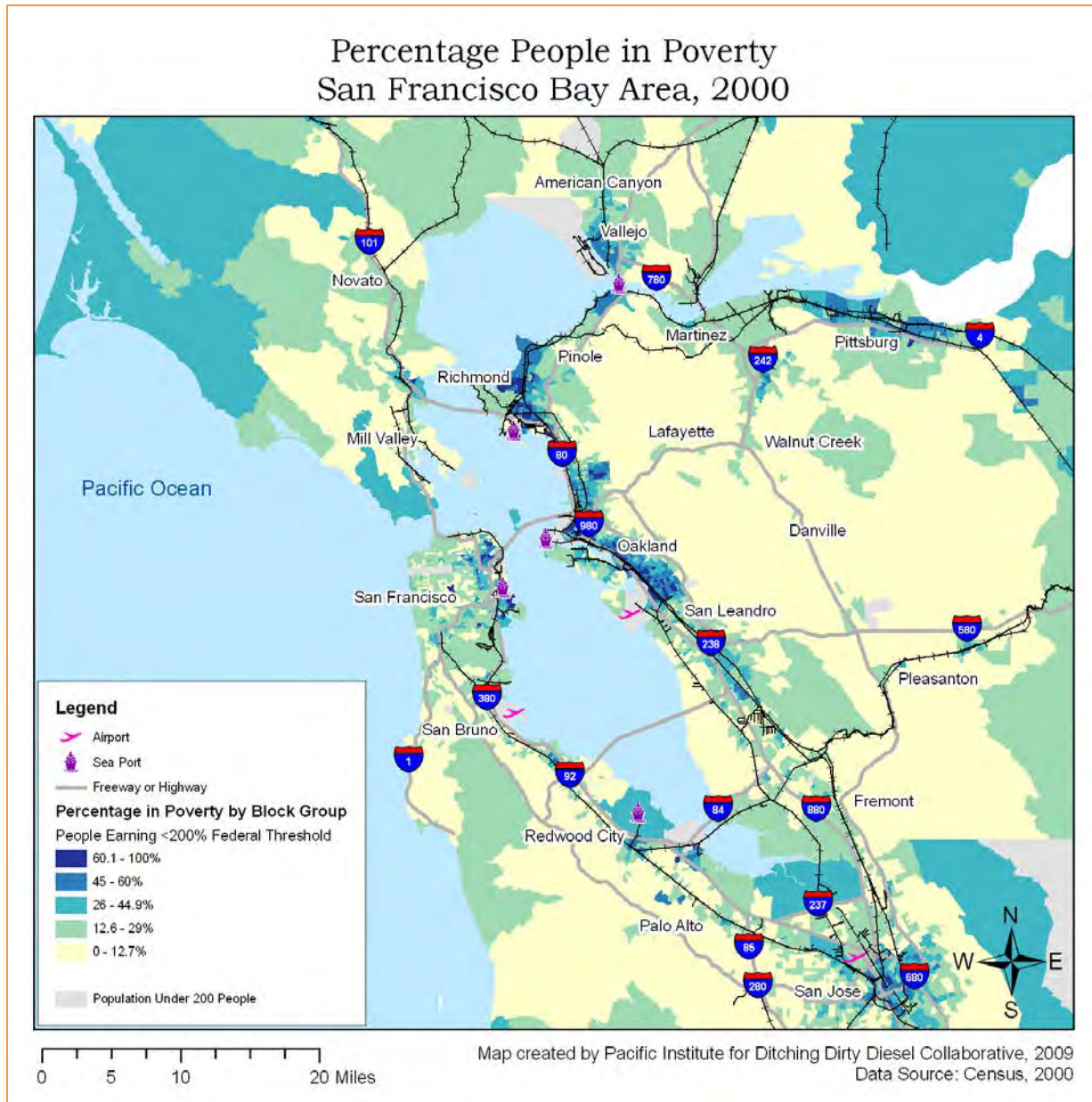


Figure 3. Freight transport infrastructure and poverty rates by census tract, San Francisco Bay Area, 2000

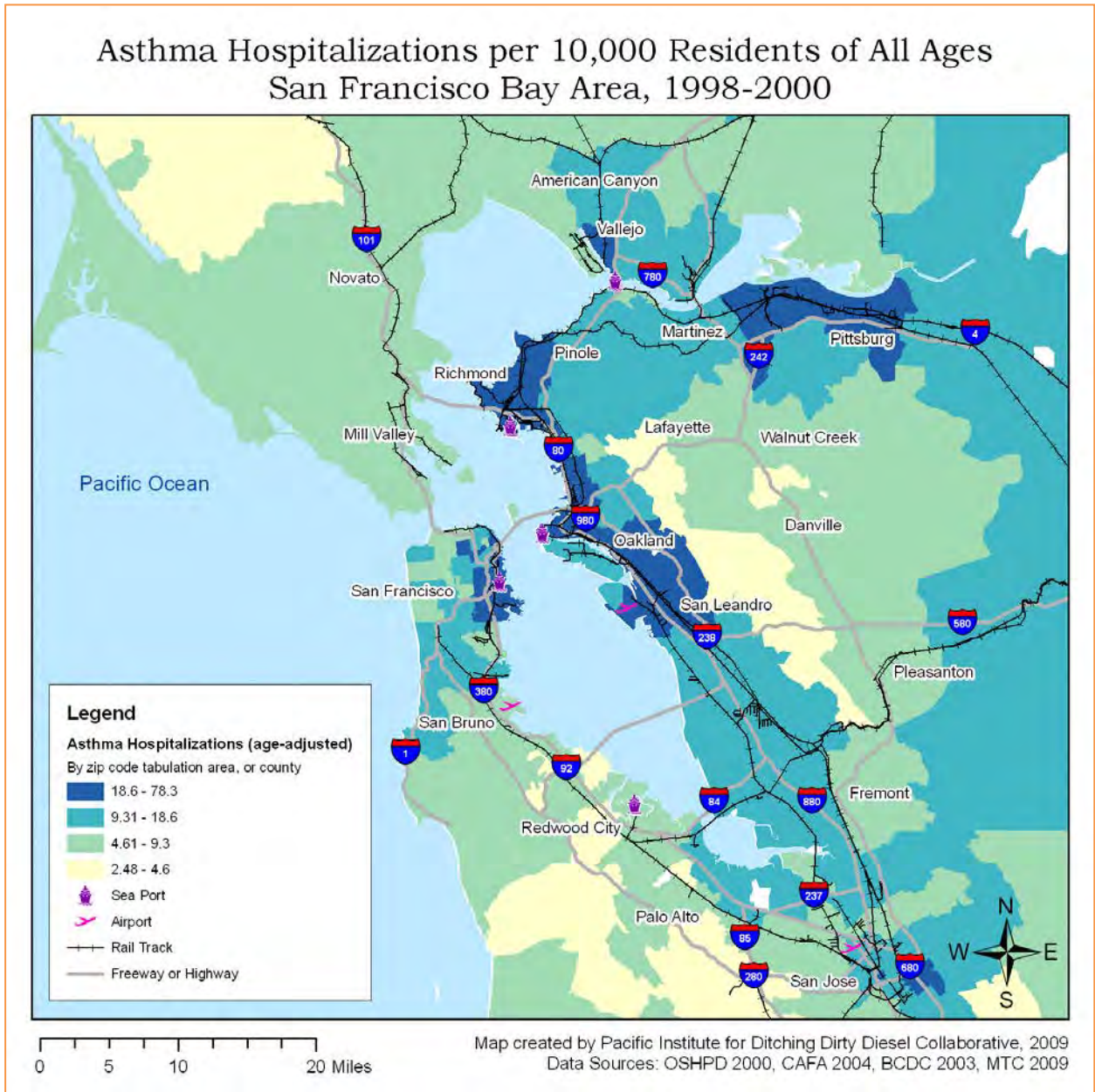


Figure 4. Freight transport infrastructure and asthma hospitalization rates by zip code, San Francisco Bay Area, 1998-2000

## Health Implications of Regional Growth through Infill and Transit-Oriented Development

Both infill and transit-oriented development are approaches to planning that seek to create compact, mixed-use, pedestrian-friendly communities in already urbanized areas. The state of California has enacted a climate action policy with the aim of encouraging infill and transit-oriented development as a means of reducing transportation-related greenhouse gas emissions. Passed in 2008, Senate Bill (SB) 375 requires regional metropolitan planning organizations to develop a Sustainable Communities Strategy that will align land use, housing, and transportation planning priorities so as to reduce vehicle miles traveled from passenger cars and light trucks.

Transit-oriented development refers to development within walking distance of public transit, while infill development refers to development on underutilized urban land. Both forms of development aim to reverse the trend of sprawling regional development by encouraging the use of available urban land and public transportation. Infill and transit-oriented development can help reduce the reliance on passenger cars for travel, thereby easing traffic congestion, improving regional air quality, and reducing greenhouse gas emissions. Health benefits associated with infill and transit-oriented development include enhanced public safety, improved neighborhood walkability, better access to employment, and other health-promoting activities.<sup>xiii</sup>

As approaches to regional planning, infill and transit-oriented development also pose health concerns associated with siting additional housing, schools, and other sensitive land uses along major roads, rail lines, and other major transportation hubs and corridors. For example, policies designed to reduce childhood obesity by increasing physical activity through more compact development could potentially place more children in close proximity to highways and other transportation-related sources of pollution.<sup>xiv</sup> According to the Southern California Association of Government's 2004 State of the Region report, infill and transit-oriented development could offset the gains to air quality made from reducing car trips by increasing exposure to vehicle exhaust.<sup>xv</sup>



**Figure 5. Infill and transit-oriented development also pose health concerns associated with siting additional housing, schools, and other sensitive land uses.**

Source: Bay Area Regional Transportation

In the San Francisco Bay Area, the implementation of state climate legislation SB 375 will direct additional transportation investments to projects in Priority Development Areas, or segments of urban and suburban land slated for infill and transit-oriented development. Priority Development Areas (PDAs) are locally-identified, infill development opportunity areas near transit that are submitted by local jurisdictions, such as city and county governments. Proposed PDAs are then reviewed and adopted by a consortium of four regional agencies: the Metropolitan Transportation Commission, the Association of Bay Area Governments, the Bay Area Air Quality Management District, and the Bay Conservation and Development Commission.



The existing land use patterns in many Priority Development Areas do not conform to health-protective guidelines issued by the California Air Resources Board, which recommends that residences and other sensitive land uses not be sited within 500 feet of freeways and high-volume roadways or within 1000 feet of rail yards.<sup>xvi</sup> The potential for increasing exposure to transportation emissions is especially important to consider in planning for future transit-oriented development in the Bay Area, given that regional transit corridors are often co-located with major roadways with heavy freight truck traffic volumes.<sup>xvii</sup> For example, due to a truck ban on the 580 freeway, heavy freight truck traffic in the East Bay is routed onto the Interstate 880 corridor which runs parallel to the BART regional light rail tracks and major Bus Rapid Transit lines like the 1R.

Health impact assessments for proposed infill and transit-oriented development projects in the Bay Area have underscored these concerns. For example, a health impact assessment for the proposed *Oak to 9<sup>th</sup> Avenue* project in Oakland CA found that future residents of the development could be at greater risk of respiratory disease and cancer due to freeway-related diesel emissions. The assessment also estimated that residents in proposed dwellings adjacent to the BART light rail line, which are predominantly low-income, could experience disturbances to sleep and concentration.<sup>xviii</sup> To address these impacts, the assessment recommended several mitigation measures including minimizing the number of new residences with 500 feet of the I-880 corridor, installing residential ventilation and filtration systems, and additional particulate matter monitoring.

Likewise, a health impact assessment for the *MacArthur BART Transit Village* project in Oakland CA attributed the additional pollution exposure that future residents of the development would face to freeway truck traffic. The assessment estimated that freeway emissions from diesel trucks could result in an additional 23 to 194 incidences of cancer per million people exposed. The assessment also estimated that residents living adjacent to the freeway could experience annoyance and sleep disturbance from noise.<sup>xix</sup>



**Figure 6. Residents adjacent to freeways could be at a greater risk of respiratory disease and cancer due to the freeway-related diesel emissions.**

These assessments of the health risks associated with proposed projects suggest that, unless health-protective measures are incorporated into infill and transit-oriented development policies, these forms of development may actually exacerbate the adverse impacts of freight transport on community health and quality of life. State climate legislation SB 375 mandates regional reductions in greenhouse gas emissions from passenger cars and light trucks, without establishing guidelines for reducing either these emissions or toxic co-pollutants from heavy-duty diesel trucks and other mobile freight sources. Without accounting for freight transport sources, SB 375 implementation could result in regional strategies that reduce greenhouse gas emissions while worsening air quality in freight-impacted communities.

No policy comparable to SB 375 mandates an integrated regional land use and transportation planning approach to reducing emissions from freight-related mobile sources of air pollution like

diesel trucks and trains. Yet poor land use and transportation planning has contributed significantly to greenhouse gas emissions and toxic air contaminants from the freight sector. In the Bay Area, freight trucks are responsible for 11% of greenhouse gas emissions and 41% of fine diesel particulate matter (PM 2.5) from on-road sources, the type of diesel emissions most harmful to human health (Figure 7). Many of the imports destined for our region are trucked from the Port of Oakland to distribution centers in the Central Valley before reaching their final destination. Other regional inefficiencies, such as the concentration of freight transport along the I-880 corridor due to a truck ban on portions of Interstate 580, unnecessarily increase truck travel distances, which overburdens low-income communities of color along the I-880 corridor with toxic diesel emissions.

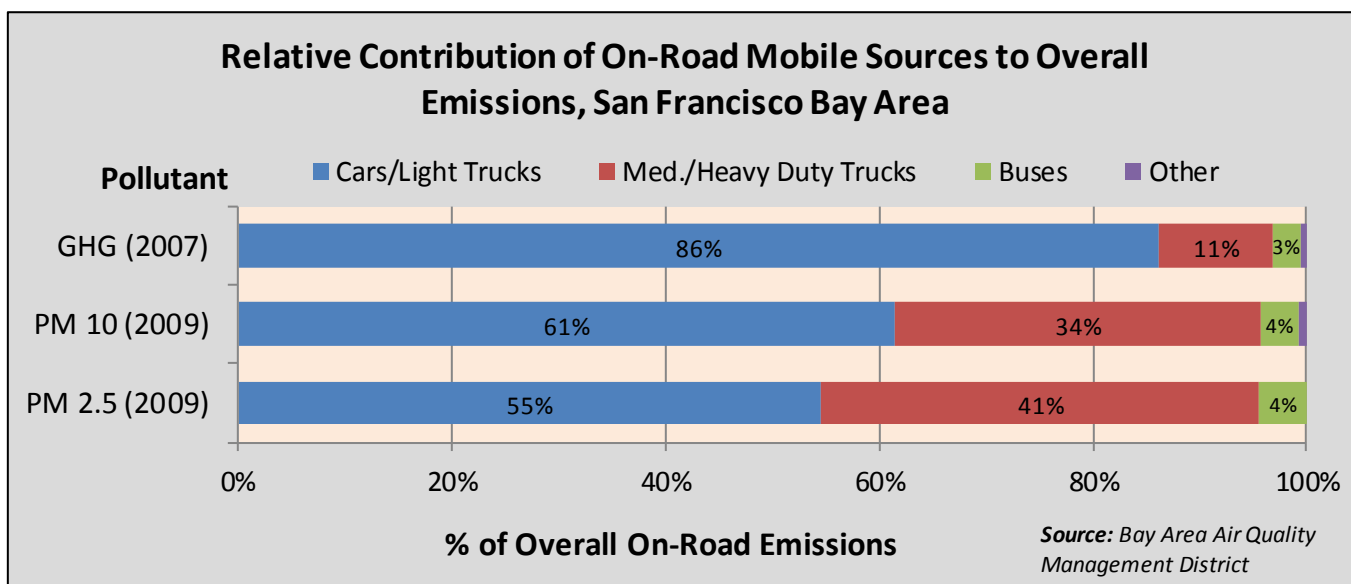


Figure 7. Relative Contribution of different on-road mobile sources to overall emissions, San Francisco Bay Area

While SB 375's mandate to reduce emissions from cars and light trucks does not include reductions in greenhouse gas emissions or particulate matter from freight transport, its implementation has major implications for communities that are already disproportionately impacted by freight transport. SB 375 implementation could incentivize housing development in areas where high health risk from toxic air contaminants is already making residents sick with asthma, cancer, and other serious health conditions associated with exposure to this pollution. Despite the best of intentions, an area with poor air quality due to freight-related pollution sources cannot be deemed a sustainable community regardless of the housing, transit, and other amenities that are provided there to retain and attract more residents. Responsible planning that creates truly sustainable communities requires that local and regional decision-makers take steps to account for and reduce exposure to toxic pollution in determining where to locate future housing and other sensitive land uses.



## Methods for Assessing Freight Transport Hazards in Priority Development Areas

This report examines freight transport hazards in areas with high health risk from toxic air contaminants that are currently targeted for infill and transit-oriented development as part of SB 375 implementation in the San Francisco Bay Area. Using mapping and spatial analysis, the report characterizes the current and potential conflicts that exist between freight transport-related land uses and sensitive land uses such as housing in these areas. The results of this analysis form the basis of the report's recommendations for health-protective measures that can be put in place to avoid or offset the potential adverse impacts of future land use conflicts in communities burdened by freight transport hazards.

Siting sensitive land uses like housing near freight transport-related land uses in any community can pose a health risk to existing and future residents. However, this analysis focuses on portions of the region where areas that have been prioritized for future development, or Priority Development Areas, intersect with communities with the highest health risk from toxic air contaminants, known as CARE communities. Priority Development Areas (PDAs) are areas that regional agencies intend to work with local jurisdictions to target for infill and transit-oriented development as part of SB 375 implementation in the Bay Area. PDAs are designated as either planned or potential, with planned PDAs having an adopted land use plan and a resolution of support from the city council or county board. Potential PDAs are eligible for planning and technical assistance grants, whereas planned PDAs are also eligible for capital infrastructure funds. Regional agencies have designated 125 Priority Development Areas throughout the 9-county Bay Area region.

Our analysis focuses on CARE communities that will be targeted for regional infill development efforts since these are places where the disproportionate impacts of poor air quality are already concentrated. CARE communities are communities that the Bay Area Air Quality Management District ("Air District") has designated as having the highest health risk from toxic air contaminants in the region. Through its Community Air Risk Evaluation (CARE) program, the Air District quantified overall health risk due to air pollution and identified six priority communities in the Bay Area with significant exposures that would most benefit from mitigation strategies. To identify these CARE communities, the Air District first conducted an inventory of sources of toxic air contaminants from individual point source facilities, area sources, on-road mobile sources, and off-road sources (e.g., construction equipment, ships, and aircraft). The Air District then combined this emissions data with demographic and health statistics data to integrate social and physical vulnerability in assessing the overall health risk posed by these emissions. The six priority CARE communities where high health risk from toxic air contaminants in the region is concentrated are greater Richmond, parts of Concord, southeast San Francisco, San Jose, Redwood City and East Palo Alto, and the I-880 corridor in the East Bay (Berkeley, Oakland, San Leandro, and Hayward).

To conduct this analysis, we identified Priority Development Areas (PDAs) that are either fully or partially within the boundaries of Community Air Risk Evaluation (CARE) communities. Within all PDAs that overlap with CARE communities, referred to as CARE-impacted PDAs, we used existing land use data obtained from the Association of Bay Area Governments to identify major freight-related land uses (e.g. freeways, rail yards, sea ports, airports, warehouses,

and distribution centers) in the San Francisco Bay Area. We initially applied distances recommended in the health-protective guidelines issued by the California Air Resources Board (CARB) in its *Air Quality and Land Use Handbook* to generate buffer zones around freight-related land uses including major freeways, rail yards, warehouses, and distribution centers. The CARB guidelines recommend that sensitive land uses not be sited within 500 feet of freeways, 1000 feet of rail yards, and 1000 feet of distribution centers.<sup>xx</sup>

We also calculated a buffer zone distance of 1000 feet around freeways based on agency guidance documents which suggested that the 500 feet distance recommended in the CARB guidelines would not adequately capture the zone of impact for freight transport-related land uses. Based on a detailed review of regulatory agency guidance documents, the South Coast Air Quality Management District recommends that a buffer distance of no less than 500 feet (150 m) and up to 1000 feet (300 m) between major roadways and school sites be considered to protect the health of schoolchildren and school employees.<sup>xxi</sup> The US Environmental Protection Agency's School Siting Guidelines are even more stringent, recommending that potential school sites within a half-mile (2640 feet) of high-volume roadways be identified and assessed for potential environmental, safety, and public health hazards.<sup>xxii</sup> We also reduced the buffer distance used around warehouses and distribution centers to 500 feet due to lower truck traffic volumes at those facilities than those on which the CARB guidelines were based.

We also included conservative 1500 feet buffer distances around seaports and 2000 feet buffer distances around airport facilities, which are not specified in the CARB guidelines. The seaport buffer distance of 1500 feet used in this analysis draws from a Health Risk Assessment for the Port of Oakland conducted by the California Air Resources Board, which found that the zone of impact for increased cancer risk resulting from diesel particulate emissions encompassed the entire West Oakland neighborhood.<sup>xxiii</sup> The airport buffer distance of 2000 feet used in this analysis is a conservative estimate based on the California Department of Transportation's School Site Evaluation Criteria, which recommends a 2500 feet setback for schools from airport runways.<sup>xxiv</sup> However, the actual health-protective buffer zone distance that is advisable for a particular sea port or airport facility should be calculated based on an inventory of emissions attributable to diesel trucks, cargo-handling equipment, and other sources at that facility.

We did not apply buffer distances around rail lines due to the large variation in train traffic volumes along rail lines. We were unable to obtain data sets needed to create traffic-weighted buffer distances along rail lines, so we excluded them from this analysis. However, it should be noted that the California Department of Transportation's School Site Evaluation Criteria recommends a 1500 feet setback for new school facilities from rail lines.<sup>xxv</sup> The potential health hazards posed to a site by a rail line should be evaluated on a case-by-case basis as part of the environmental review and health impact assessment processes for the proposed development on that site.

We then used existing land use data obtained from the Association of Bay Area Governments to map sensitive land uses that fall within the buffer zones around freight transport-related land uses. The California Air Resources Board defines sensitive land uses as areas where individuals sensitive to air pollution, such as children, the elderly, and those with pre-existing health conditions, are most likely to spend time. These land uses include schools and schoolyards, parks and playgrounds, daycare centers, nursing homes, hospitals and health clinics, and residential areas.

## Findings: Addressing Potential Land Use Conflicts in Freight-Impacted Communities

Our findings indicate that, without proper regional planning, the potential for exacerbating land use conflicts between residential and freight-transport related land uses is significant in the San Francisco Bay Area. Planning for health is particularly important given that nearly half (42%) of the land slated for infill development in our region is located in communities with the highest health risk from toxic air contaminants. However, we also found that three-fourths (74%) of the land in Priority Development Areas that intersect with CARE communities is far enough away from freight transport hazards to be suitable for sensitive land uses like new housing. One out of every three acres (36%) of this more suitable land is zoned as residential or mixed residential/commercial. These findings suggest that suitable places can be found for new housing, schools, parks, and other sensitive land uses that will protect residents from being exposed to sources of harmful pollution. Below is a more detailed summary of our findings:

**More than one-third of the areas slated for infill and transit-oriented development in the San Francisco Bay Area are in communities with the highest health risk from toxic air contaminants.** 46 of the 125 Priority Development Areas (PDAs) in the region intersect with a CARE community, as designated by the Bay Area Air Quality Management District. Five of the nine counties in the Bay Area have Priority Development Areas that intersect with CARE communities (Alameda, Contra Costa, San Francisco, San Mateo, and Santa Clara Counties). These CARE-impacted PDAs are located in the East Bay, southeast San Francisco, greater Richmond, parts of Concord, Redwood City and East Palo Alto, and San Jose (see Figure 5). A CARE-impacted PDA refers to a Priority Development Area of which some portion falls within a CARE community.

**Nearly half (42%)% of the land in Priority Development Areas in the region is located in CARE communities.** As summarized in Table 1 below, Bay Area counties with the greatest percentage overlap between Priority Development Areas and CARE zones are San Francisco County (87.9 %), Alameda County (60.3 %), and Santa Clara County (40.2 %). The largest acreage of Priority Development Area within CARE community boundaries is found in Alameda County (17,492 acres), followed by San Francisco County (10,982 acres) and Santa Clara County (10,860 acres).

**One-fourth (26%) of the land in Priority Development Areas that intersect with CARE communities overlaps with a freight transport buffer zone where it is inadvisable to site sensitive land uses.** The land area impacted by freight transport buffer zones was estimated based on the following health-protective distances from freight transport–related land uses: 500 feet for freeways, warehouses, and distribution centers, 1000 feet for rail yards, 1500 feet for sea ports, and 2000 feet for airports. As summarized in Table 2 below, the Bay Area counties with the greatest acreage of Priority Development Area impacted by freight transport hazards are Alameda County (8,866 acres), Santa Clara County (4,759 acres), and San Francisco County (3,182 acres).

The appendices to this report contain sets of maps, organized by county, that show the locations of these freight transport buffer zones within CARE-impacted Priority Development Areas. In Alameda County (Appendix B), freight transport-related land uses within CARE-impacted PDAs include the Port of Oakland, the Oakland Airport, the Interstate 880 freight truck corridor, and warehouse facilities along the 880 corridor. Freight-impacted communities in Alameda County include West Oakland, East Oakland, and parts of San Leandro and Hayward. In Santa Clara County (Appendix F), freight transport-related land uses within CARE-impacted PDAs include several major freeways, the San Jose Airport, and warehouse facilities that concentrate impacts in East San Jose and adjacent communities. In San Francisco County (Appendix D), communities in southeast San Francisco contend with several major freeways and numerous warehouse facilities attracting diesel truck traffic to and from these neighborhoods.

**Many sensitive land uses like schools, parks, hospitals, and churches already exist in Priority Development Areas within freight transport buffer zones.** Alameda, San Francisco, and Santa Clara Counties have the largest amounts of existing sensitive land uses like schools, parks, hospitals, and churches in close proximity to freight transport hazards within CARE-impacted Priority Development Areas. These land use patterns place vulnerable residents like children and those with pre-existing medical conditions at greater risk of being exposed to pollution that could compromise their health. In Alameda County alone, 30 parks, 45 schools, 5 hospitals and 87 churches within CARE-impacted PDAs are located within a distance from freight transport hazards that is inadvisable for sensitive land uses.

**Nearly one-fifth (17%) of the land in freight transport buffer zones within Priority Development Areas in CARE communities is designated for residential land uses.** Bay Area counties with the largest amount of residential land area within freight transport buffer zones in CARE-impacted PDAs are Alameda County (1885 acres), Santa Clara County (660 acres), and San Francisco County (387 acres). Alameda County (21.7% %), San Francisco County (12.5%), and Santa Clara County (10.1%) have the greatest percentage of land area zoned as residential or mixed residential/commercial within a distance of freight transport hazards that is inadvisable for sensitive land uses like new housing. These counties also already have many sensitive land uses in close proximity to freight transport hazards within their Priority Development Areas.

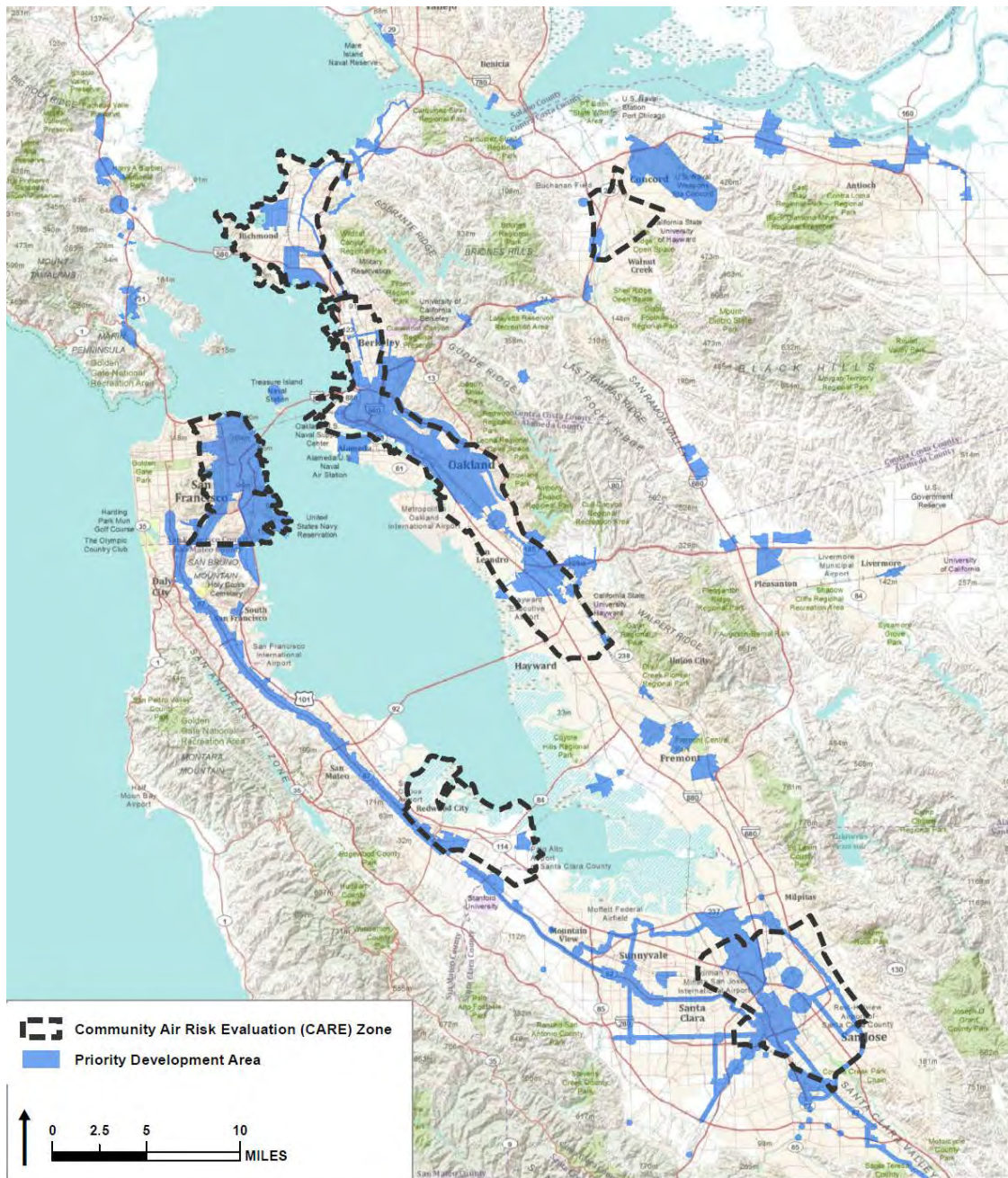
**Three-fourths (74%) of the land in Priority Development Areas that intersect with CARE communities is far enough away from freight transport hazards to be suitable for sensitive land uses like new housing.** Bay Area counties with the greatest amount of land outside of freight transport buffer zones are Santa Clara County (20409 acres), Alameda County (13324 acres), and San Mateo County (8462 acres). One-third (36%) of this land is zoned residential or mixed residential/commercial. As summarized in Table 3 below, Bay Area counties with the greatest percentages of residentially zoned land outside of freight transport buffer zones in PDAs that intersect with a CARE community are Alameda County (51%), San Mateo County (40%) and San Francisco County (32%).

In sum, our findings indicate that we can advance regional development priorities in ways that protect community health while creating jobs and housing to benefit existing and future residents. To minimize potential land use conflicts, available suitable land located outside of health-protective buffer zones around freight-related land uses can be prioritized for new housing and other sensitive land uses. The remaining land area located within the buffer zones around

freight-related land uses can be prioritized for commercial and light industrial development that creates jobs for local residents while protecting worker health. By accounting for health in deciding where to place new housing, we can retain the industrial and commercial land we need to accommodate economic growth while proactively reducing anticipated land use conflicts in residential areas.

Our findings complement those of other research studies on the potential for infill development in the San Francisco Bay Area. In their 2009 report *Grow Smart Bay Area*, the Greenbelt Alliance assessed the distribution of potential opportunity sites, or properties that are likely to redevelop, that could accommodate new housing and job growth in the region. Their report found that four-fifths of the region's anticipated housing and job growth can occur within "smart spots" for development ringing the San Francisco Bay including southeast San Francisco, the Inner East Bay, El Camino Real in the Peninsula, southern Alameda County, and northeastern Santa Clara County.<sup>xxvi</sup> Many of these places where opportunity sites are concentrated coincide with the areas analyzed in this report.





PRIORITY DEVELOPMENT AREA AND C.A.R.E. ZONES IN THE BAY AREA

Pacific Institute

**Figure 8. Priority Development Areas and Community Air Risk Evaluation (CARE) designations in the San Francisco Bay Area**

Source: Pacific Institute

**Table 1. Overview of Priority Development Areas that Intersect with CARE Communities, by County**

	Alameda	Contra Costa	San Francisco	San Mateo	Santa Clara	Marin	Solano	Sonoma	Total
<b>Acreage of Priority Development Areas (PDA)</b>	29,002	17,038	12,478	10,381	27,012	2,822	2,342	5,052	106,127
<b>Acreage of C.A.R.E.-Impacted PDA</b>	22,190	5,190	11,526	9,609	25,168	<i>No C.A.R.E. Community in county</i>	<i>No C.A.R.E. Community in county</i>	<i>No C.A.R.E. Community in county</i>	73,683
<b>Acreage of PDA within C.A.R.E. Community</b>	17,492	3,837	10,982	1,550	10,860	-	-	-	44,721
<b>Percentage of PDA within CARE Community</b>	60.3%	22.5%	87.9%	14.9%	40.2%	-	-	-	-

**Source:** Priority Development Area boundaries from FOCUS Initiative, including the Metropolitan Transportation Commission (MTC), the Association of Bay Area Governments (ABAG), the Bay Area Air Quality Management District (BAAQMD), and the Bay Conservation and Development Commission (BCDC). Community Air Risk Evaluation (C.A.R.E.) Community boundaries from the BAAQMD Community Air Risk Evaluation (C.A.R.E.) Program.

**Notes about Method:** We identified all Priority Development Areas that intersect with a C.A.R.E. community; that is, all PDAs of which some portion falls within the C.A.R.E. community. These PDAs are designated as “C.A.R.E.-Impacted PDAs,” referring to the whole (total acreage) of the PDA that intersects with a CARE community (row 2).

We also calculated the acreage of the PDA that falls within the C.A.R.E. community (row 3).

Lastly, we calculated the percentage of the total PDA acreage that falls within a C.A.R.E. (row 4 = row 3/row 1).



**Table 2. CARE-Impacted Priority Development Areas and Freight Transport Buffer Zones, by County (acres)**

	Alameda	Contra Costa	San Francisco	San Mateo	Santa Clara	Total
<b>Acreage of C.A.R.E.-Impacted PDA</b>	22,190	5,190	11,526	9,609	25,168	73,683
<b>Freeway Buffer (500 feet)</b>	2,403	527	1,800	188	2,710	7,628
<i>Percent of CARE-Impacted PDA</i>	15.3%	10.1%	15.6%	2.0%	10.8%	-
<b>Railyard Buffer (1000 feet)</b>	1,382	-	-	-	288	1,670
<i>Percent of CARE-Impacted PDA</i>	6.2%	-	-	-	1.1%	-
<b>Airport Buffer (2000 feet)</b>	146	-	-	73	523	742
<i>Percent of CARE-Impacted PDA</i>	0.7%	-	-	0.8%	2.0%	-
<b>Warehouse Buffer (500 feet)</b>	5,749	119	1,180	910	1,837	9,795
<i>Percent of CARE-Impacted PDA</i>	25.9%	2.3%	10.2%	9.5%	7.3%	-
<b>Port Buffer (1500 feet)</b>	301	180	589	-	-	1,070
<i>Percent of CARE-Impacted PDA</i>	1.4%	3.5%	5.1%	-	-	-
<b>Total Acreage of Freight Buffer Zones in C.A.R.E.-Impacted PDAs (Additive &amp; Merged to Account for Overlapping Areas)*</b>	8,866	821	3,182	1,147	4,759	18,775

Source: Warehouse and Railyard land use classifications from Association of Bay Area Governments (ABAG) Existing Land Uses Data, 2005. Railyards for Contra Costa County were hand-digitized because they were not available in the ABAG data. Freeway data from US National Transportation Atlas Interstate Highways. Port data in map form was gathered from the Port of Oakland, Port of Richmond, and Port of San Francisco and then hand-digitized.

Notes about Method: C.A.R.E.-Impacted PDAs serve as the basis for these calculations (row 1) (see Notes about Methods, Table 1 for definition). Freight Transport land uses were identified and selected from ABAG Existing Land Uses Data, and then buffered based on the following standards:

- Freeways: 500 feet
- Railyards: 1000 feet
- Warehouses: 500 feet
- Sea ports: 1500 feet
- Airports: 2000 feet

An explanation of the basis for these buffer distances can be found in the Methods section of this report. We calculated the acreage within each Freight Transport Impact Buffer (first merging to account for any overlapping buffers). The percentages reflect the proportion of Freight Impact Buffer acreage to total acreage of C.A.R.E.-Impacted PDA.

**Table 3. Sensitive Land Uses in Freight Transport Buffer Zones within CARE-Impacted PDAs by County**

County	Alameda	Contra Costa	San Francisco	San Mateo	Santa Clara	Total
<b>Acreeage of C.A.R.E.-Impacted PDA</b>	22,190	5,190	11,526	9,609	25,168	73,683
<b>Acreeage of Freight Buffer Zones in C.A.R.E.-Impacted PDAs (Additive &amp; Merged to Account for Overlapping Area)</b>	8,866	821	3,182	1,147	4,759	18,775
<i>Percent of C.A.R.E.-Impacted PDA Within Freight Buffer Zones</i>	40%	15.8%	27.6%	11.9%	18.9%	-
<b>Acreeage outside of Freight Buffer Zones in C.A.R.E.-Impacted PDAs (Additive &amp; Merged to Account for Overlapping Area)</b>	13,324	4,369	8,344	8,462	20,409	54,908
<i>Percent of C.A.R.E.-Impacted PDA Outside Freight Buffer Zones</i>	60%	84.2%	72.4%	88.1%	81.1%	-
<b>Acreeage of Residential &amp; Mixed Residential/ Commercial within Freight Buffer Zones</b>	1,885	66	397	241	660	3,249
<i>Percent of Freight Buffer Zones that is Residential &amp; Mixed R/C</i>	21.7%	8.1%	12.5%	6.7%	10.1%	-
<b>Acreeage of Residential &amp; Mixed Residential/ Commercial outside Freight Buffer Zones, within C.A.R.E.-Impacted PDA</b>	6,790	856	2,706	3,359	5,871	19,582
<i>Percent of C.A.R.E.-Impacted PDA, outside Freight Buffer Zones, that is Residential &amp; Mixed R/C</i>	51%	20%	32%	40%	29%	-
<b>Parks (count) within Freight Buffer Zones</b>	30	1	8	4	11	54
<b>Schools (count) within Freight Buffer Areas</b>	45	0	16	3	10	74
<b>Hospitals (count) within Freight Buffer Areas</b>	5	0	4	0	0	9
<b>Churches (count) within Freight Buffer Areas</b>	87	1	14	3	14	119

Source: Residential & Mixed Residential/Commercial land use classifications from Association of Bay Area Governments (ABAG) Existing Land Uses Data, 2005. Park, School, Hospital and Church locations from Cal-Atlas, California Geographic Names Data, 2009.

Notes about Method: The total acreage of Freight Transport Impact Buffer Zones within C.A.R.E.-Impacted PDAs serves as the basis for these calculations (row 1). We also calculated the acreage of the PDA that falls outside the Freight Transport Impact Buffer Zones (row 3).

Residential and Mixed Residential/Commercial land uses were identified by county from ABAG Existing Land Uses Data, and then we calculated the total acreage of these land use types that fall within C.A.R.E.-Impacted PDAs (row 5). We also calculated the acreage of residential land in the PDA outside of the Freight Transport Buffer Zones.

Parks, Schools, Hospitals, and Churches were selected from the California Geographic Names Data and overlaid with the Freight Transport Impact Buffer Zones for each county to determine the total number (count) of each that falls within these Buffer Zones (rows 7-10).

## Recommendations: Encouraging Land Use Decisions that Protect Community Health

There is much that local and regional decision-makers can do to avoid future land use conflicts by siting sensitive land uses like new housing away from freight-related sources of pollution. Available land in close proximity to freight-related land uses should be targeted for light industrial and commercial developments that are compatible with existing and anticipated land use patterns in those areas. If new housing is to be sited within areas impacted by freight transport hazards, a number of mitigation measures can be integrated into the design of the proposed development to reduce exposure of residents to harmful air pollution. The recommendations outlined below detail a number of health-protective measures that local and regional decision-makers can integrate into land use planning policies to account for and address the health risk posed by freight transport hazards.

- A. Conduct a detailed analysis of proposed Priority Development Areas (PDAs) that determines which portions of these PDAs are healthy for new residential development and which are not.** Portions of Priority Development Areas where new residential development is not advisable have higher health risk from toxic air contaminants like diesel particulate matter. Due to the fact that the health risks from fine particulate matter decrease rapidly the further it is measured from a source, that risk is not homogeneous throughout any given Priority Development Area containing a source such as a freeway or distribution center. These distinctions must be made to yield meaningful and useful results when evaluating the health impacts within PDAs for alternative scenarios currently being considered as part of the region's Sustainable Community Strategy. Portions of Priority Development Areas within 1000 feet of freeways, 1500 feet of seaport facilities, 2000 feet of airport facilities, 500 feet of warehouses and distribution centers, and 500 feet of designated truck routes should be considered as places with higher health risk from toxic air contaminants, and should be included in an analysis of where it is not advisable to build additional housing *without appropriate mitigations to minimize this risk*. See recommendation H below for a detailed list of potential mitigation measures that could be put in place to address health risks associated with siting housing in close proximity to freight transport hazards.

- B. Prioritize siting new housing, schools, parks, clinics, and other sensitive land uses in portions of Priority Development Areas that fall outside of health-protective buffer zones around freight-related land uses.** Opportunity sites exist that are suitable for new housing and other sensitive land use development at a health-protective distance from freight transport hazards. Three-fourths (74%) of the land in Priority Development Areas that intersect with communities at high health risk from toxic air contaminants is suitable for sensitive land use development. Of this land, one-third (36%) is zoned as residential or mixed residential/commercial.
- C. Prioritize siting more suitable land uses such as commercial and light industrial land uses within portions of Priority Development Areas in close proximity to freight transport hazards.** Converting industrially-zoned land adjacent to pollution sources to a land use designation that facilitates housing development on that land does not make sense from either a health or an economic perspective. Industrial land retention is integral to creating jobs, advancing community economic development, and accommodating future growth in the industrial and commercial sectors to sustain our region's economy. To protect the health of workers and residents, mitigation measures should be incorporated into the design of new light industrial and commercial developments to prevent pollution generated by operations as well as reduce exposure to toxic air pollution and other occupational hazards.
- D. Account for anticipated expansions of freight-related land uses like port facilities and rail yards in establishing development priorities for areas near major freight transport corridors and infrastructure.** Retaining industrial land near existing freight transport infrastructure is critical to encouraging compact growth in this sector<sup>xxvii</sup> that can also reduce greenhouse gas emissions from freight-related sources. The redevelopment of properties adjacent to existing regional freight transport infrastructure (such as the former Oakland Army Base) should account for anticipated expansions at this infrastructure (such as at the Port of Oakland). Proposed expansions of freight transport infrastructure should also account for recent and anticipated land use changes in neighboring communities like West Oakland that may necessitate the relocation of freight-related and industrial facilities to reduce land use conflicts with existing and proposed residential development.
- E. Require jurisdictions applying for One Bay Area Grant funds to determine if their housing needs can be met by locating housing outside of portions of their Priority Development Areas with high health risk from toxic air contaminants.** The One Bay Area Grant (OBAG) program, managed by regional agencies implementing SB 375 in the Bay Area, is intended to incentivize infill and transit-oriented development that contributes to greenhouse gas emissions reductions in Priority Development Areas. Before block grant money can be used, jurisdictions should be required to determine if their housing needs can be met by placing their housing allocation outside of high risk areas like the freight transport buffer zones defined in this report. Jurisdictions applying for these funds could conduct this analysis in the form of a Community Risk Reduction Plan, and this activity should be eligible for OBAG funding. OBAG grant funds could

also be made available to help developers building affordable housing to offset the cost of buying more expensive land further away from high health risk areas.

**F. Require jurisdictions applying for One Bay Area Grant funds to require developers to identify mitigation measures and secure adequate funding to implement them to offset the impacts of building more housing in high health risk areas.** If a jurisdiction can demonstrate that not enough affordable land is available outside of high risk areas to meet their housing allocation, they should be required to identify suitable mitigation measures that can reduce the health risk posed by these developments before the jurisdiction is eligible to receive block grant funding. OBAG funding could also be made available to help developers building affordable housing pay for these mitigation measures.

**G. Encourage local jurisdictions to require mitigation measures for proposed residential developments within portions of Priority Development Areas with the highest health risk from toxic air contaminants.** An example of a health-protective local policy measure is the City of Oakland's Air Quality Guidelines for Housing (SCA-94), which outlines Standard Conditions of Approval based on inclusion criteria at the time the project developer gets zoning approval. SCA-94 is attached to any project at any address within city boundaries which exceeds the screening criteria set by the Bay Area Air Quality Management District, and identifies seven mitigation measures that can be put in place by the developer to meet the required conditions for zoning approval. These measures range from indoor air filtration and monitoring to site re-design that locates sensitive receptors as far away as possible from sources of air pollution.

**H. Require mitigation measures in proposed developments within health-protective buffer zones around freight transport hazards in Priority Development Areas.** The appropriate mitigation measures required to reduce health risks posed by the proposed development should be identified based on detailed modeling and assessment of local conditions at and surrounding the site, including proximity to freight-related hazards and empirically counted amounts of diesel truck and train traffic moving through the area. Examples of these mitigations include:

1. Install HEPA indoor air filtration systems designed to filter out toxic air contaminants including fine particulate matter (PM 2.5)
2. Install triple-paned, sealed, and non-operational windows that reduce the impact of vibrations from freight traffic and minimize outdoor air contaminant flow into indoor spaces
3. Use green, healthy building materials that do not off-gas or release air toxins that compromise indoor air quality
4. Install noise barriers such as soundwalls based on soundscaping of the development site to reduce noise pollution related to freight operations
5. Incorporate adequate green space, vegetative planting, and permeable surface area that is well-maintained into development design and management plans
6. Minimize parking allocations in the development to reduce congestion and air pollution from additional automobile traffic and stalled freight traffic, and incentivize the use of transit, car-sharing, and zero-emission electric vehicles by integrating chargers into the design of parking garage areas



7. Design developments to capture polluted runoff from the sides of buildings and other outdoor surfaces that have accumulated diesel soot and other contaminants so that such contaminants do not flow into green spaces in the development
8. Design developments to equitably distribute the health risk from toxic air contaminants posed by the development across all units in the development. In other words, do not locate affordable housing units in the least desirable areas of the development closest to freight transport-related land uses like freeways.
9. Install on-site air monitoring equipment to measure toxic air contaminants and provide quarterly monitoring results to residents or users of the development
10. Conduct an annual survey of health conditions of existing residents and report survey results to existing and prospective residents or users of the development
11. Notify prospective residents within the deed or lease document for the property of the hours of operation of freight transport facilities within the buffer zone distance of the development, and of their related noise, air quality, light pollution, and health impacts
12. Provide prior notification to existing and prospective residents about proposed expansions and upgrades at freight transport-related land uses within the buffer zone distance of the development, and of their potential noise, air quality, light pollution, and health impacts

**I. Target mitigation-related funding and resources towards portions of Priority Development Areas (PDAs) with the highest health risk from toxic air contaminants, particularly in those PDAs that overlap with Community Air Risk Evaluation (CARE) communities.** CARE communities are areas designated by the Bay Area Air Quality Management District as being most vulnerable to health risks associated with diesel particulate matter and other air toxics. Regional and local funding streams available for air quality-related mitigations should be targeted towards proposed developments in portions of the region's Priority Development Areas with the highest health risk from toxic air contaminants.

## Conclusion: Planning for Healthy and Sustainable Communities

No one should have to choose between living in housing that is safe and affordable, working at a quality job, having accessible and reliable transit options close by, and being able to breathe clean air. Yet for far too long, this daily dilemma has faced thousands of San Francisco Bay Area residents in low-income and communities of color overburdened by environmental hazards like toxic air pollution and underserved by regional transportation and housing amenities. To resolve this dilemma, decision-makers have the power to put measures in place to protect the health of existing residents by reducing harmful air emissions from pollution sources and retrofitting homes to improve indoor air quality in already overburdened communities. Transportation and land use planners can also take proactive steps to expand opportunities for all communities by catalyzing equitable and sustainable development that benefits Bay Area residents now and in the future.

By planning for health, we can create truly sustainable communities that are as rich in opportunities for a long healthy life as they are for quality jobs, housing, and transit for all residents. In creating a blueprint that will shape the future of all communities in the Bay Area, decision-makers and planners are in a prime position to ensure that health lies at the heart of our region's Sustainable Communities Strategy. A key step on the path to the healthy future that all Bay Area residents deserve is to ensure that new housing, schools, parks, and other sensitive land uses are healthy places to spend our everyday lives. When deciding what should get built where, it's important to ask: "Would I want to live, work, play, pray, or go to school here?" For a community to be truly sustainable, the answer to that question must be "Yes!"

## Endnotes

- <sup>i</sup> Ditching Dirty Diesel Collaborative. 2006. *Paying with Our Health: The Real Cost of Freight Transport in California*. Oakland, CA: Pacific Institute.
- <sup>ii</sup> California Air Resources Board. 2006. "Quantification of the health impacts and economic valuation of air pollution from ports and goods movement in California." Appendix A in *Emission Reduction Plan for Ports and Goods Movement*. Sacramento, CA: Author. Retrieved from: <http://www.arb.ca.gov/planning/gmerp/gmerp.htm>
- <sup>iii</sup> Environmental Protection Agency. 2002. *Health assessment document for diesel engine exhaust*. Washington, DC: National Center for Environmental Assessment. Retrieved from: <http://www.epa.gov/ncea>
- <sup>iv</sup> Bay Area Air Quality Management District. 2006. *Community Air Risk Evaluation Program: Phase 1 findings and policy recommendations related to toxic air contaminants in the San Francisco Bay Area*. San Francisco, CA: Author. Retrieved from <http://www.baaqmd.gov/Divisions/Planning-and-Research/CARE-Program.aspx>;
- Ditching Dirty Diesel Collaborative. 2006. *Paying with Our Health: The Real Cost of Freight Transport in California*. Oakland, CA: Pacific Institute.
- <sup>v</sup> Willich, S. N., Wegscheider, K., Stallman, M., & Keil, T. 2006. "Noise burden and the risk of myocardial infarction." *European Heart Journal*, 27(3), 276-82;
- Ditching Dirty Diesel Collaborative. 2006. *Paying with Our Health: The Real Cost of Freight Transport in California*. Oakland, CA: Pacific Institute;
- Stansfeld, S. A., Berglund, B., Clark, C., Lopez-Barrio, I., Fischer, P., Ohrstrom, E., Haines, M. M., Head, J., Hygge, S., van Kamp, I., & Berry, B. F. 2005. "Aircraft and road traffic noise and children's cognition and health: a crossnational study." *Lancet*, 365, 1942-1949.
- <sup>vi</sup> East Bay Alliance for a Sustainable Economy and Pacific Institute. 2008. *Taking a Toll: The High Cost of Health, Environment, and Worker Impacts of the Oakland Port Trucking System*. Oakland CA: Pacific Institute.
- <sup>vii</sup> California Air Resources Board. 2006. "Quantification of the health impacts and economic valuation of air pollution from ports and goods movement in California." Appendix A in *Emission Reduction Plan for Ports and Goods Movement*. Sacramento, CA: Author. Retrieved from: <http://www.arb.ca.gov/planning/gmerp/gmerp.htm>
- <sup>viii</sup> Arnold, C. A. (1998). "Planning *milagros*: environmental justice and land use regulation." *Denver University Law Review*, 76(1), 1-155.
- <sup>ix</sup> Salkin, P. 2006. "The intersection between environmental justice and land use planning." *Planning & Environmental Law*, 58(3), 3-10;
- Gonzales, P., Minkler, M., Garcia, A., Gordon, M., Garzón, C., Palaniappan, M., Prakash, S., & Beveridge, B. 2011. "Community-based participatory research and policy advocacy to reduce diesel exposure in West Oakland, California." *American Journal of Public Health* 101, S1.
- <sup>x</sup> Moore, E., & Nettles, M. 2010. *Advancing Community Health through Community Benefits Agreements: Four Case Studies and Lessons for the Oakland Army Base Redevelopment*. Oakland CA: Pacific Institute.
- <sup>xi</sup> East Bay Alliance for a Sustainable Economy and Pacific Institute. 2008. *Taking a Toll: The High Cost of Health, Environment, and Worker Impacts of the Oakland Port Trucking System*. Oakland CA: Pacific Institute.
- <sup>xii</sup> See: Hausrath Economics Group and Cambridge Systematics, Inc. 2004. *MTC Goods Movement Study Phase 2: Task 11 Working Paper - A Land Use Strategy to Support Regional Goods Movement in the San Francisco Bay Area*. Oakland CA: Authors. Retrieved from: <http://www.mtc.ca.gov/planning/rgm/Task11.pdf>
- <sup>xiii</sup> PolicyLink. 2007. *Equitable Development Toolkit: Transit Oriented Development*. Oakland, CA: Author. Retrieved from: <http://www.policylink.org>

- <sup>xiv</sup> Malina, C., & Balbus, J. M. 2007. "Environmental interventions to help address the obesity and asthma epidemics in children." *Duke Environmental Law & Policy Forum*, 103, 193-207.
- <sup>xv</sup> Winer, A. 2004. "Air quality in Southern California: Time for a paradigm shift." *The State of the Region*. Los Angeles, CA: Southern California Association of Governments.
- <sup>xvi</sup> California Air Resources Board and California Environmental Resources Agency. 2005. *Air Quality and Land Use Handbook: A Community Health Perspective*. CARB: Sacramento CA. Retrieved from: <http://www.arb.ca.gov/ch/handbook.pdf>.
- <sup>xvii</sup> Seto, E., Rivard, T., & Bhatia, R. 2007. *MacArthur BART Transit Village: Health Impact Assessment*. Berkeley, CA: UC Berkeley Health Impact Group.
- <sup>xviii</sup> Bhatia, R., Seto, E., & Rivard, T., & (UCBHIG). 2006. *Oak to Ninth Ave: Health Impact Assessment*. Berkeley, CA: UC Berkeley Health Impact Group.
- <sup>xix</sup> Seto, E., Rivard, T., & Bhatia, R. 2007. *MacArthur BART Transit Village: Health Impact Assessment*. Berkeley, CA: UC Berkeley Health Impact Group.
- <sup>xx</sup> California Air Resources Board and California Environmental Resources Agency. 2005. *Air Quality and Land Use Handbook: A Community Health Perspective*. CARB: Sacramento CA. Retrieved from: <http://www.arb.ca.gov/ch/handbook.pdf>.
- <sup>xxi</sup> South Coast Air Quality Management District (SCAQMD). 2005 (revised 2007). *Air Quality Issues in School Site Selection Guidance Document*. Retrieved from: [http://www.aqmd.gov/prdas/aqguide/doc/School\\_Guidance.pdf](http://www.aqmd.gov/prdas/aqguide/doc/School_Guidance.pdf)
- <sup>xxii</sup> US Environmental Protection Agency. *School Siting Guidelines: Exhibit 6*. Retrieved from: [http://www.epa.gov/schools/siting/downloads/Exhibit\\_6\\_Screening\\_Potential\\_Environmental\\_Public\\_Health\\_and\\_Safety\\_Hazards.pdf](http://www.epa.gov/schools/siting/downloads/Exhibit_6_Screening_Potential_Environmental_Public_Health_and_Safety_Hazards.pdf)
- <sup>xxiii</sup> California Air Resources Board. 2008. *Diesel Particulate Matter Health Risk for the West Oakland Community*. Retrieved from: <http://www.arb.ca.gov/ch/communities/ra/westoakland/documents/westoaklandreport.pdf>
- <sup>xxiv</sup> California Department of Transportation Division of Aeronautics. 2003. *California Code of Regulations, Title 21, Division 2.5, Chapter 2.1: School Site Evaluation Criteria*. Retrieved from: [http://www.dot.ca.gov/hq/planning/aeronaut/documents/Regs\\_School\\_Site\\_Eval\\_Criteria.pdf](http://www.dot.ca.gov/hq/planning/aeronaut/documents/Regs_School_Site_Eval_Criteria.pdf)
- <sup>xxv</sup> California Department of Transportation Division of Aeronautics. 2003. *California Code of Regulations, Title 21, Division 2.5, Chapter 2.1: School Site Evaluation Criteria*. Retrieved from: [http://www.dot.ca.gov/hq/planning/aeronaut/documents/Regs\\_School\\_Site\\_Eval\\_Criteria.pdf](http://www.dot.ca.gov/hq/planning/aeronaut/documents/Regs_School_Site_Eval_Criteria.pdf)
- <sup>xxvi</sup> Greenbelt Alliance. 2009. *Grow Smart Bay Area*. Oakland CA: Author. Retrieved from: <http://www.growsmartbayarea.org/downloads/GSBA%20brochure.pdf>
- <sup>xxvii</sup> Hausrath Economics Group and Cambridge Systematics, Inc. 2004. *MTC Goods Movement Study Phase 2: Task 11 Working Paper - A Land Use Strategy to Support Regional Goods Movement in the San Francisco Bay Area*. Oakland CA: Authors. Retrieved from: <http://www.mtc.ca.gov/planning/rgm/Task11.pdf>