MAC ARTHUR BART TRANSIT VILLAGE

HEALTH IMPACT ASSESSMENT

Public Review Draft

UC Berkeley Health Impact Group

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The process of plan making should be viewed as a continuous cycle. There are interrelationships among the phases of the planning process. Information gained at a later phase can inform the outcome of an earlier phase. It is important to recognize the iterative nature of planning and to allow for continuous cycling to occur.

THE PLANNING PROCESS

Dedicated to an informed, accountable and just democracy

Contributors

The UC Berkeley Health Impact Group (UCBHIG) consists of faculty and students of the course on Health Impact Assessment at UC Berkeley School of Public Health. The course faculty includes Rajiv Bhatia, MD, MPH Tom Rivard, MS, and Edmund Seto, PhD. The faculty collectively provided direction and oversight for the Mac Arthur BART Transit Village HIA and reviewed and edited the analysis and each chapter of this report. The following students conducted original research and drafted chapters for each of the following specific subject areas: Jme Mclean, housing; Mary Lee, Retail Services; Colleen Reid, Schools and Childcare; Max Richardson, Parks; Suzanne Tsang, Pedestrian Safety; Amod Pokrel, Air Quality; Eunice Lee, Environmental Noise; Suzanne Tsang, Community Violence; Kim Gilhuly, Social Cohesion and Social Exclusion. In addition, Matt Beyers, of the Alameda County Public Health Department provided analysis of census data, retail service maps. Cyndy Comerford provided pedestrian injury data and maps; Tom Rivard provided forecasts of traffic and particulate matter exposure and Rajiv Bhatia estimated the health effects of particulate matter exposure for the Chapter on Air Quality. Tom Rivard and Rajiv Bhatia wrote the chapter on Transportation. The Mac Arthur BART HIA borrows from the research on land use—health pathways, existing conditions in Oakland, regulatory standards, and forecasting methods documented in the Oak to Ninth HIA published in the June 2006.

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Mac Arthur BART Transit Village Health Impact Assessment

Executive Summary

Introduction

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.[1] [2] 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. [3] In the United States, HIA can be contrasted to the traditional EIA in being voluntary, evaluating environmental, social, and economic effects using the lens of human health, estimating benefits as well as adverse consequences, and considering the distribution or equity of effects.

Since, 1993, the City of Oakland, BART and the MacArthur Citizens Planning Committee (CPC) have been working to develop the MacArthur BART station area. They envision a safe, vibrant, pedestrian-scale mixed-use transit village that helps to connect the east and west sides of State Route 24. The most recent development proposal for the MacArthur Transit Village project includes the following key components:

- 518-625 units of high-density multi-family housing in structures 5-6 stories tall, of which approximately 20% will be below market rate rental and 80% will be for-sale condominiums.
- Approximately 30,000 square feet of ground-floor neighborhood serving retail and community space.
- 625-750 residential parking spaces and 15-60 retail and community parking spaces and replacement of 300 of the 600 existing BART spaces along with the implementation of a Residential Parking Permit Program that covers ¼ mile radius around project.
- Public infrastructure upgrades, including a new public street through the site off of Telegraph Avenue, the renovation of the existing BART entry plaza, a new public plaza adjacent to the retail space, and streetscape improvements on 40th Street adjacent to the station."

In the context of our course on HIA at the School of Public Health at the University of California at Berkeley, students and faculty engage firsthand with the practice of HIA by conducting an analysis on one project of regional significance and communicating their findings to local or regional officials. The fall 2006 class chose Mac Arthur BART as a subject for a HIA after considering the socially vulnerable areas surrounding the transit village, the spatial patterns health disparities in Oakland, and the potential for the project to affect, both positively and negatively, multiple environmental and social determinants of health. This report provides the findings of a health impact assessment on the Mac Arthur BART Transit Village.

The process for conducting an HIA on the Mac Arthur BART builds on lessons learned from the Oak to Ninth Avenue HIA undertaken during the spring of 2006. First, the HIA is being conducted concomitant with the environmental analysis and should be complete and ready to share with key stakeholders,

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[1] Quigley R. Health Impact Assessment. International Best Practice Principles. International Association of Impact Assessment 2006

[2] 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.

[3] National Association of City and County Health Officials (USA)

agency, and developers in advance of the draft environmental impact report. Second, the HIA will attempt to qualitatively and quantitatively evaluate project benefits, in order to provide a more comprehensive assessment with regards to health. Third, the HIA works to further develop the analytic techniques used in the prior study. Forth, the HIA attempt to bring in more original qualitative and quantitative data.

To scope this assessment, UCBHIG developed a set of assessment questions related to the project and its potential effects on several categories of health determinants. (See Scope in Chapter 1) UCBHIG students then used the following methods and strategies to conduct this analysis:

- Describing of potential pathways between the project and health based on of the empirical and scientific literature on the relationships between the built environment and health
- Reviewing planning and assessment documents related to the transit village and area transportation projects
- Conducting Field visits and observations of the site area
- Interviewing key stakeholders and content experts
- Interviewing area residents and business people
- Interpretation, analysis, and mapping of available secondary data
- Collecting environmental data on air quality, noise, and pedestrian environments
- Applying quantitative health effects forecasting tools, where available

This report that follows includes one chapter for each category of health determinant in the scope. Relevant figures and maps follow each chapter. Each chapter begins with a short summary of identified impacts and recommendations to improve those impacts. Each chapter is then organized into the following six sections:

A. Summary;
B. Evidence on the relationships between the project and human health;
C. Relevant established standards and health objectives;
D. A description of the setting, context, or existing conditions
E. Key health assessment questions and synthesis of the findings from research;
F. Recommendations for design and mitigation.

Relevant figures and maps follow each chapter. We include each chapter summary below as part of this executive summary.

We ask readers to keep in mind that health impact assessment is a developing practice in the United States. While substantial evidence supports the pathways between the project and health discussed in this analysis 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. In some cases, the analysis suggests mixed effects. (e.g. pedestrian improvements and more pedestrian-vehicle conflicts).

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 Health Impact Assessment to provide useful and constructive information to those designing and evaluating the Mac Arthur BART transit village. UCBHIG also hopes this effort contributes to the field of health impact assessment in California and the United States.

Oak to Ninth Avenue Health Impact Assessment
Executive Summary

Chapter Overview	Health Impacts	Recommendations for Design and Mitigation
HOUSING In this chapter, we summarize the relationships between housing and human health and review the evidence that supports them. We then consider these linkages in an assessment of the MacArthur BART Transit Village (MBTV) Project's housing plans. In our assessment, we highlight key health assets of the MBTV Project, suggest strategies and mitigations to improve housing plans where possible, and discuss any health-related housing dilemmas related to the MBTV design.	1. The project will result in a significant net increase the regional housing supply; 2. The project will not provide homeownership opportunities to Oakland households of average economic means; 3. The project will increase the regional supply of rental housing affordable to those making less than the median income; 4. The project will result in an in-migration of wealthier residents, positively contributing to area economic integration and markets for retail services; 5. The project may result indirectly increased property values and rent costs in the greater Mac Arthur BART Area potentially leading to some existing residents and businesses getting priced out;	1. Promote healthy air quality and noise levels within the housing units through proper ventilation and noise control design measures that reduce exposures from highway traffic 2. Select building materials and ventilation systems for housing units to reduce allergies and toxic exposures; LEED-certified green building options may be appropriate 3. Conduct lead screenings and removal in the Greater Mac Arthur BART Area to reduce possible community exposure to lead 4. Use best practices for air quality monitoring and dust regulation during the destruction of existing buildings to reduce exposure to toxins 5. Ensure that enough money is set aside in the budget for proper maintenance and repair of future housing units over time 6. Incorporate Green Building design to create more energy efficient homes 7. Use higher quality building materials to offset maintenance and repair costs down the road 8. Provide outreach to area residents with regards to public resources available for home maintenance and repair; 9. Un-bundle the sale of parking from the sale of housing units and reduce the number of parking spaces per household or overall parking spaces per development area 10. Provide bicycle parking to residents, possibly in the form of monitored bike parking similar to the Bike Station in Berkeley 11. Increase the availability of affordable housing by requiring the developer to provide or fund BMR housing as a condition of development; or by providing a density bonus to the developer conditional on the provision of BMR housing 12. Increase the number of family-size housing units to accommodate local families 13. Explore ways to provide some BMR units for sale 14. Integrate BMR with Market rate housing minimizing differences between the nature and the quality of units offered to low-income and market-rate units 15. Work together with local residents and property owners to improve housing stock using public housing improvement resources.

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TRANSPORTATION This chapter provides an assessment of the proposed Mac Arthur BART transportation village (MBTV) on transportation and identifies feasible mitigations to reduce project generated vehicle trips.	1. As an example of TOD, the MBTV will reduce the growth of vehicle miles traveled expected at a regional level, limiting deterioration in regional air quality and preventing associated circulatory and respiratory disease. (Beneficial Effect) 2. The project will facilitate routine physical activity for project residents. This will help prevent obesity, improve cardiovascular function, and increase community interaction. (Beneficial Effects) 3. Local vehicle trips will increase resulting in increases in pedestrian accidents and bicycle accidents on streets in the immediate vicinity. (Potential Adverse Effect)	1. Increase the density of the project by increasing the number of new units. 2. Increase the proportion of below market rate housing and housing units affordable to those with moderate incomes. 3. Unbundle the cost of parking from residential rents to encourage residents to reduce their car ownership rates. 4. Reduce the number of structured parking spaces for residential uses below a ratio of 3 spaces for 4 units. 5. Price structured residential parking and area residential parking permits at the market rate. 6. Increase parking costs for use of the BART station to reduce vehicle use and encourage local shuttle use. 7. Do not provide structured employee parking for BART or project commercial uses. 8. Provide free structured parking for car share. 9. Require transit shuttles to operate at least every 30 minutes in off peak and every 15 minutes during peak travel times with hours to match BART schedules. 10. Ensure the project is connected to the local bike network via class I or II bike lanes. 11. Ensure sidewalk bicycle racks are co-located with retail uses 12. Provide secure bicycle storage protected from the weather at BART. 13. Improve pedestrian and bicycle street crossing, especially at Telegraph & 40th and Telegraph& Mac Arthur intersections. If the pathway to transit is conducive to walking the area of TOD influence can expand beyond the normal ¼ mile to as fare as ½ mile thereby resulting in further reduction in VMT. 14. Enhance streetscape of the 40th Street underpass to provide connectivity for Westside residents and enhance the desirability of the transit village. 15. Incorporate retail diversity study in selecting new retail outlets for Mac Arthur BART. Retail should serve the needs of the local community thereby reducing trips originating both within and beyond the local neighborhood.

Chapter Overview	Health Impacts	Recommendations for Design and Mitigation
Retail Services This chapter provides an overview of the relationships between retail and health both with regards to service access and resident livelihood. We then provide a brief community health assessment of the Macarthur BART transit village (MBTV) proposed 30,000 square feet of ground-floor neighborhood-serving retail and community space based on reviews of planning and assessment documents, secondary data sources, and interviews with stakeholders.	1. A retail plan that includes a neighborhood grocery store is likely to improve access to quality food and nutritional health for both residents and BART commuters. This benefit will depend on the size, diversity, and affordability of the establishment and may be greatest for a full service grocery store. (Potential Beneficial Effect) 2. Development of a vibrant mixed-use commercial corridor through residential and retail development has potential to deter crime, reducing injuries and stress for residents. (Potential Beneficial Effect) 3. The transit village may contribute to the diversity of retail goods and services to the neighborhood. Via effects on pedestrian activity the project may increase resident physical activity and reduce some vehicle trips. Ensuring that new retail fills existing gaps and responds to resident needs will maximize this benefit. (Potential Beneficial Impact) 4. New retail associated with the project may provide new employment opportunities some of which may be suitable for unemployed or underemployed area residents. Job training and local recruitment may support this benefit. (Potential Beneficial Impact) 5. The project will increase retail property value and as a result, may eventually displace some of the current retail businesses, disrupting local livelihoods. (Potential Adverse Effect)	1. Ensure retail development is reflective of community's wants and needs a. Conduct a comprehensive retail market analysis to include a retailer and consumer survey b. Establish a neighborhood retail planning council to assist in retail planning phases 2. Create a local fund via a development agreement or assess a development impact fees to: a. maintain property affordability for current vulnerable businesses 3. Encourage a wide variety of healthy food establishments a. Recruit a full-service grocery store to occupy retail space on the site; b. Alternatively, work to locate a full service grocery store on the western side of SR 24 c. Hold a farmers market near western side of the BART station d. Require retail food stores to accept food stamps and EBT. 4. Ensure that community members have adequate and equitable access to a range of necessary, yet diverse array of goods and services. a. Recruit a pharmacy, bank, and hardware store to locate at or near the site b. Require retail food stores to accept food stamps and EBT. 5. Provide tax incentives, or interest-free loans to stimulate local entrepreneurship a. Provide incentives for full-service grocery store – (e.g., help pay for parking spaces) 6. Use a development agreement or a community benefits agreement to ensure: a. employment of local residents in new retail b. provision of jobs with living wage and health insurance c. fund workforce development programs 7. Analyze the current labor market in terms of employment opportunities, placement, and retention and implement appropriate retail development according to workforce needs. 8. Prohibit or limit retail establishments associated with adverse health outcomes such a liquor stores 9. Work with the community to create strategies promoting

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		safety, reducing crime, and elevating perceived safety among retailers and consumers.
Schools and Childcare This chapter provides an assessment of (1) neighborhood public school capacity relative to project generated demand (2) neighborhood childcare capacity relative to project generated demand and (3) the adequacy and safety of current walking and biking routes to neighborhood public schools from MBTV.	1. Using varying methods, estimates of student generation based on the proposed MBTV project's 80/20% mix of 625 market and below-market rate housing range from 132 to 420 new students. Although the local high school may have sufficient capacity for additional students from the transit village, local elementary and middle schools are near capacity and may not be able to support all new students from the transit village. 2. A quantitative forecast of child care demand based on demographic data, suggests between 638 and 722 children will need the services of either family child care or a child care center, while only 172 and 373 spots are currently available in existing family child care and child care centers, respectively. 3. Local schools are within 1.5 miles from MBTV, which allows for children to walk or bike to school. However, pedestrian hazards surrounding Mac Arthur BART (e.g. multi-lane roads, high vehicle volume) and limited safety countermeasures (e.g., advanced crosswalk design, bike paths) create a barrier to active transportation to schools.	1. Re-assess the adequacy of school capacity in the neighborhood under the assumption that the project may ultimately attract families to the same degree as other transit villages; 2. Work with the Oakland Unified School District to ensure that local schools can meet project generated student demand; 3. Conduct further analysis of child care supply by age of child. 4. Ensure that there is a child care center at the Mac Arthur BART Transit Village with safe indoor or outdoor play space; 5. Investigate financial strategies for enabling or subsidizing child care on the site with Local Investment in Child Care (LINCC); 6. Include at least two housing units in the village designed to function as family child care facilities; 7. Implement the City of Oakland Recommended Bikeway Network from 1999, especially the on-street striped bike lanes on 40th Street and Telegraph Ave; 8. Make pedestrian improvements on Telegraph Avenue to provide a safe crossing for children walking to local schools.
Parks and Open Space This chapter reviews the existing standards for parks and public health in Oakland, assesses the existing park and natural resources in Oakland and the MacArthur BART Neighborhood, and offer mitigations to improve park resources for current and future residents of the MacArthur BART	1. The MacArthur BART neighborhood currently has greater access to high quality park space than many Oakland neighborhoods. Less than half of Oakland residents live within 10 minutes walking distance of a city park. MacArthur BART residents, however, are within walking distance of Mosswood Park. Grove Shafter Parks I, II, and III are also nearby, but currently lack high quality amenities and users are subject to freeway related noise and air pollution. Regardless, the existing amount of park space available to MacArthur BART residents still falls short of goals set out by Oakland's General Plan. An increased population will decrease the per capita park acreage even further. 2. Improving and maintaining pedestrian and bicycle access to park	1. Create safe, continuous, and functional routes to Mosswood Park for MacArthur BART residents West and East of I-980. This can be done through a "green corridor," signage, bike lanes, improved pedestrian facilities, etc. 2. Actively promote and advertise public transit services to local and regional parks. A joint collaboration between the City of Oakland, AC Transit, BART, and MacArthur BART development agencies should advertisement campaigns, bike tours, increased signage, etc. to promote public transit as a means to reach parks and natural spaces.

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neighborhood.	resources will result in net positive health benefits for current and new residents of the neighborhood. 3. With proper development and landscaping, the project area can function to increase the amount of green and open space in the MacArthur BART neighborhood. 4. Improved transit options associated with transit oriented development (TOD) may encourage the use of other city and regional parks (e.g. Lake Merritt; Bay Trail) accessible by BART and AC Transit. 5. In the project area, access to quality parks is greater for residents west of State Route 24 than for that west of SR 24. As planned the project does not provide improvements in quality or access necessary to diminish these existing health resource disparities.	3. Ensure the socio-economic integration of local parks. Current and future amenities and programs at Mosswood Park and Grove Shafter Parks I, II, and II should appeal to and be accessible by all residents of the MacArthur BART Neighborhood. 4. Consider existing and proposed designs that improve visibility of green and open space. 5. Engage the local community in any park and recreational redevelopment that may result from project mitigations: a. Mobilize local residents to rejuvenate Grove Shafter Parks I, II, and III with possibly a city-funded project to improve the parks with added landscaping, improved playground facilities, and improved recreational amenities and public spaces. b. Engage the local community in addressing local programming needs in the neighborhood's parks. c. Explore the potential social and recreational opportunities on the project's public space, such as farmer's markets, public concerts, dances, or community fairs.
Pedestrian Safety This chapter examines conditions related to pedestrian safety in the MacArthur BART Transit Village (MBTV) project area, estimates project-related pedestrian injury impacts, and provides recommendations for reducing pedestrian hazards.	1. Quantitative forecasting of changes to Oakland's pedestrian injury rate based on project related changes in traffic flows and a baseline rate of 16.2 pedestrian injuries or deaths per year along arterial roads estimates an additional pedestrian injury or death every 3.25 years on Telegraph, West Mac Arthur, and 40th Streets. (Adverse Health Impact)	1. Provide pedestrian safety engineering improvements including countdown pedestrian signal heads, bulb outs, and center median refuge islands at high-volume multi-lane intersections along Telegraph Avenue, 40th Street, West MacArthur Boulevard where cumulative traffic volume increases exceed 5%; 2. Provide pedestrian warning signs or lights at all crossings or cross walks with high traffic volumes (>5000) and without traffic signal lights; 3. Institute speed limit reductions to less than 20mph in mixed-use residential areas adjacent to the project; 4. Widen sidewalks or provide buffers between sidewalks and vehicle lanes on busy roadways with significant pedestrian traffic such as 40th Street, West MacArthur, Blvd, and Telegraph. Consider vehicle lane reductions on some corridors (e.g., West MacArthur , 40th Street) to

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		simultaneously reduce and slow traffic 5. Create a pedestrian-friendly environment in the retail area by a. Maximizing pedestrian and transit access to the site from adjacent land uses. b. Providing comfortable transit stops and shelters with pedestrian connections to the main buildings; transit stops and pedestrian drop-offs should be located within reasonable proximity to building entrances - preferably no more than 225 meters (750 feet), and ideally much closer than that. c. Providing attractive pedestrian walkways between the stores and the adjacent sites. d. Ensuring that fencing and landscaping does not create barriers to pedestrian mobility.
Air Quality This chapter of the Mac Arthur BART HIA evaluates the air quality for future residents of the Mac Arthur BART Transit Village and estimates the potential pollution related health effects.	1. Modeled annual levels of PM2.5 at the project site decline with distance on the east side of Highway 24; modeled annual average PM2.5 declines from 0.30 microgram per cubic meter at the western edge of the project site to 0.1 micrograms per cubic meter at the eastern edge. 2. Freeway diesel emissions from trucks result in an excess cancer risk for project residents ranging from 23 to 194 per million. 3. Project related traffic will result in a modest increase in pollution related health effects exposure to residents of neighborhoods adjacent to the project.	1. Notifying all potential buyers that the property they are occupying has air quality risks and educate them in the proper use of any installed air filtration. 2. Install a central HVAC (heating, ventilation and air conditioning) system with high efficiency filters for particulates. According to a recent study by Bill Fisk at Lawrence Berkeley Laboratory, the following design standards would remove 80% of fine particulate matter mitigating all expected additional roadway effects of particulates and having added health benefits in terms of reducing allergen loads: ASHRAE 85% supply air filters; >= 1 air exchanges per hour of fresh outside filtered air ; >= 4 air exchanges / hour recirculation; <= 0.25 air exchanges per hour in unfiltered infiltration. 3. In addition, air intake systems for HVAC should be located as far away from I-580 and SR-24. The project developer should be required to implement an ongoing maintenance plan for filtration system associated with HVAC. 4. Providing 110 and 220 outlets at project loading docks so that trucks can connect with these outlets to power their auxiliary equipment. Utilizing only electric forklifts and landscaping equipment in the

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		project operations and the operations of tenants. 5. Unbundling the cost of parking from the purchase or rent of residential units to potentially reduce car ownership and usage by residents. 6. Increasing the frequency of AC Transit services to the project site. 7. Requiring secured bicycle parking for both employees and residents; 8. Restricting employee parking for commercial tenants; 9. Provide on-site child-care (assuming installation of proper HVAC and/or filtration), and/or other services that might reduce typical vehicle trips associated with commuter behavior, which would otherwise rely purely on public transportation. 10. Increasing parking fees for BART parking with no fee for carpool vehicles.
Noise This chapter evaluates environmental noise exposure and associated health effects for residents of the proposed Mac Arthur BART Transit Village project.	1. Regardless of the feasibility and effectiveness of indoor noise mitigations, some project residents are likely to be exposed to environmental noise to an extent that can create annoyance and adversely effect school and work performance. We estimate the annoyance levels to range from 43% of the exposed population living near BART and the freeway to 5% of the exposed population who live in the relatively quieter inner courtyards. 2. Without mitigations, we estimate 17% of residents in dwellings adjacent to the railway line and highway will experience sleep disturbance; in the quieter inner courtyards we estimate sleep disturbances will affect 6-13% of residents. 3. Existing project area outdoor noise levels proximate to BART and the freeway of greater than 70 dB will prevent normal voice level communication at unprotected exterior locations.	1. Construction standards required to meet Title 24 noise insulation requirements requiring the use of noise-insulating windows, acoustical exterior doors and walls would also be appropriate mitigations. 2. Design units as far away from BART and the freeway as possible, and implement a design that has interior courtyards and patios that open into acoustically protected and shielded areas. 3. Reduce the speeds of the traffic on the highway-24 and project's residential streets through traffic calming measures. 4. Notify all potential buyers that the property they are occupying has significant noise risks. 5. Integrate below market and market rate units in the same buildings to prevent environmental justice impacts. 6. While BART accounts for only small increases in noise exposures, undertaking necessary maintenance of BART tracks would further minimize train-associated noise. 7. Explore possible BART scheduling changes to minimize train passes during typical nighttime sleep hours.

Chapter Overview	Health Impacts	Recommendations for Design and Mitigation
Community Violence This chapter examines the potential for the Mac Arthur BART to affect and prevent community violence and provides recommendations to incorporate violence prevention into development planning.	1. With the inclusion of physical design strategies that discourage crime, as well as strategies to support a sense of place and community, the project is likely reduce in crime rates and the fear of crime in the area. (Potential Beneficial Effect)	1. Providing adequate and pedestrian scaled lighting for all public areas, residential streets, and adjacent public streets. 2. Creating clear sight lines to maximize visibility, especially for high risk areas such as parking garages, stairwells and underpasses. 3. Creating public or common spaces that generate/reinforce a lot of pedestrian level activity and/or encourage a sense of community. For example, community urban gardens provide a setting for social activity and users of the gardens contribute to surveillance. 4. Using durable, vandal resistant materials so maintenance is minimal.
SOCIAL COHESION AND SOCIAL EXCLUSION This chapter of the Mac Arthur BART Transit Village Health Impact Assessment provides background information on the relationships among development, social cohesion, and social exclusion and considers mechanisms though which the Mac Arthur Bart Transit Village (MBTV) might positively and negatively affect and social cohesion and social exclusion.	1. Given the expected cost of the project's market rate housing and the current project area demographics, the project is likely to result in greater residential integration with regard to income at the level of the census tract. (Beneficial Effect) 2. Indirectly, expected demographic changes can improve health of area residents via effects on retail environment and public infrastructure. Current area residents should share in many of those benefits. (Beneficial Effect) 3. Market rate and below market rate housing will be segregated on the project site; project could further advance social integration by integrating BMR units. (Potential Beneficial Effect) 4. The incorporation of streets and sidewalks, retail and public areas within the project may facilitate interaction among project and neighborhood residents. (Beneficial Effect) 5. The social integration of the East and West sides of the project area, historically socially segregated by the construction of the Macarthur BART and State Road (SR) 24 is a key goal both to community residents and BART, which, if achieved, would benefit health. Streetscape improvements to 40th Street between MLK and Telegraph will support reconnection but may not be adequate to achieve this outcome. A Westside entrance to BART would help achieve this goal if a feasible and safe method for such an entrance is available is found. Alternatively, developing Mac Arthur Blvd as a retail and pedestrian corridor might serve to help achieve this goal. (Potential Beneficial Effect) 6. The project itself will not directly displace area residents but, via desired economic and environmental effects, may ultimately result in higher property values and rents in the area. Potentially, project-stimulated economic effects may result indirectly in displacement of residents	1. Implement additional strategies to include more west side residents in the design and planning for MBTV. 2. Integrate Below Market Rate and Market Rate housing on the project site. 3. Create common walking routes and meeting points that encourage interaction. 4. Facilitate economic development of MLK between 40th and MacArthur Blvd. 5. Encourage locally-owned business development at the MBTV and on MLK. 6. Solicit funding to hire a community program coordinator. 7. Study Macarthur Boulevard as another Connector Project. 8. Continue to study the feasibility of a Westside BART station entrance/tunnel with regard to safety, structural feasibility, and cost. . 9. Develop programs to retain low-income residential tenants vulnerable to displacement. 10. Step up routine City maintenance of current infrastructure.

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	neighboring the MBTV, affecting social cohesion of the neighborhood. (Potential Adverse Effect) 7. The project includes both new retail and new markets for retail. Local retail that addresses the needs of residents will encourage walking and social interaction from casual contact. Increasing local retail opportunities could also potential increase employment opportunities, thus economic integration. (Beneficial Effect) 8. Public infrastructure and retail environment benefits will be disproportionately realized by east-side residents. Integrating plans for neighborhood serving retail on the West side could serve West-side economic revitalization and area-wide social cohesion. (Potential Beneficial Effect) 9. If the community's safety concerns regarding the MBTV (and ongoing concerns in the neighborhood) are properly addressed, increased perceived safety within the area could encourage people to interact outside of their homes. (Potential Beneficial Effect) 10. The 5,000 feet of community space currently included in the project can foster social interaction if programming providing it is designed in response to community needs. (Potential Beneficial Effect)	

Mac Arthur BART Transit Village

Health Impact Assessment

Chapter 1

Introduction and Scope

A. The Rationale for Health Assessment in Land Use Planning

The health of people depends on quality of their environments. In broad terms, a healthful environment requires adequate housing; access to public transit, schools, parks and public spaces; safe routes for pedestrians and bicyclists; meaningful and productive employment; unpolluted air, soil, and water; and, cooperation, trust, and civic participation.

Land use and transportation planning decisions can have significant and wide-ranging impacts on the environment as well as on health. Today it is well recognized that urban design that maintains long distances between where people live, work, shop, and play is responsible for air and water pollution, stressful commutes, physical inactivity, and global warming.[1] Effects on land use decisions on health are due to physical as well as social factors and the interactions among them. Unaffordable housing forces people to live in crowded or substandard conditions; to compromise access to quality jobs, services and education; and to work multiple jobs to make ends meet. The concentration of low-income populations in segregated neighborhoods creates multiple forms of disadvantage, including deteriorated schools and public infrastructure, high rates of crime, and limited employment opportunities. Societies achieve optimal health for their populations by providing healthful environments and working conditions for all members.

Key to the design of a healthful environment are mechanisms to consider health in policy making, however, few such mechanisms exist. With regards to land use and transportation planning and policy, no specific mandates exist to consider health comprehensively. While land use plans and development projects must comply with specific environmental and building health and public safety regulations and, in some state, requirements for environmental review, the regulations do not take into account all health issues.

Residents and community organizations frequently request planning agencies to conduct health and social analyses of land use plans and development projects; however, within local and regional Planning Departments, resources, expertise, and experience do not typically exist to assess health impacts. Similarly, most public health professionals have little experience working in the realm of planning. In general, Planning, Transportation, Housing and Economic Development agencies make decisions that affect health-related factors in built environment important to health, typically without consideration of health and without consultation with public health professionals.

In the United States, local public health agencies are increasingly recognizing the need to play a role in improving environmental conditions. For example, in its 2004 Oakland Health Profile, the Alameda County Public Health Department documented the burden of disease and mortality varies considerably from neighborhood to neighborhood, illustrating the importance of place to health. For neighborhoods with high poverty rates and poorer health outcomes in Oakland, the Department prioritized: ",,, a focus on supporting and working with community as partners to address social and environmental factors associated with good health. Specific issues include access to healthy foods, parks and playgrounds, housing, transportation, education, employment, universal access to quality health care, and clean air."

Cities in California, such as Oakland and San Francisco, are reviewing an unprecedented amount of residential development. Some of this development represents location-efficient infill and transit oriented development, which has well recognized environmental and health benefits. Indirectly, location efficient development can benefit health by increasing walking and bicycling, reducing emissions of pollutants into air and water, improving traffic safety, and building social capital. Collectively, these factors are associated with heart disease, hypertension, asthma, bronchitis, stroke, diabetes, obesity, osteoporosis, depression, and some cancers. A health analysis that illustrates these benefits might support resource-efficient land use strategies and can also help focus attention on the design and infrastructure needs for healthy and active living.

[1] Ewing R, Frank L, Kreutzer R. Understanding the Relationship Between Public Health and the Built Environment: A Report to the LEED-ND Core Committee. 2006.

However, if not appropriately planned, location-efficient development also has the potential to cause or exacerbate avoidable health disparities. For example, many opportunity sites for infill and smart growth development are near freeways and other busy roadways. New residential development in core urban neighborhoods can thus increase noise and air pollution exposure and pedestrian--vehicle conflicts and injuries. New residential development that is not affordable risks involuntary displacement, a significant concern for existing urban communities. A health analysis of projects and plans can help analyze and mitigate such harmful effects. For example, health analyses could illustrate the need for requiring ventilation systems to reduce indoor particulate pollution and by requiring engineering countermeasures to reduce pedestrian injuries. Preventing their adverse health outcomes supports the adoption and success of location-efficient growth strategies.

Overall, some of relationships between design and health that merit analysis might include:

- Attention to safety and indoor air quality in the design and construction of buildings can both reduce environmental asthma triggers and prevent unintentional injuries.
- Neighborhood schools and child care centers reduce vehicle pollution while supporting childhood learning and parental involvement.
- Complete neighborhoods with integrated public and retail services and quality pedestrian environments increase physical activity potentially decreasing several chronic health conditions.
- Neighborhood groceries and farmer's markets support households to make nutritious food choices.
- Accessible and frequent transit services provide improved access to goods, services and health care.
- Ethnically and economically integrated neighborhoods support equality of economic and educational opportunities, resulting in better mental health and less violence.

B. The Practice of Health Impact Assessment

One strategy being used by local public health agencies to evaluate and improve land use and transportation planning is Health Impact Assessment (HIA).[2] 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.

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.[3] [4] 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. The International Association of Impact Assessment summarizes the rationale for HIA below:

> Development planning without adequate consideration of human health may pass hidden "costs" on to affected communities, in the form of an increased burden of disease and reduced well-being. From an equity point of view, it is often marginalized and disadvantaged groups who experience most of these adverse health effects. From an institutional point of view, it is the health sector that must cope with development-induced health problems and to which the costs are incurred of dealing with an increased disease burden. HIA provides a systematic process through which health hazards, risks and opportunities can be identified and addressed upstream in the development planning process, to avoid the transfer of these hidden costs and to promote multi-sectoral responsibility for health and well-being.

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[2] National Association of City and County Health Officials (USA)
[3] Quigley R. Health Impact Assessment. International Best Practice Principles. International Association of Impact Assessment 2006
[4] 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.

Typical steps in the HIA process are not dissimilar from the more common Environmental Impact Assessment (EIA). Typical steps include screening, scoping, analysis, reporting, and monitoring. Like Environmental Impact Assessment (EIA), this HIA includes an impacts analysis and proposes a set of mitigations to those impacts. However HIA, in the United States, is a new practice, with practitioners exploring alternative approaches to its practice and learning practical knowledge and information needs. HIA is also distinct from EIA as it is a voluntary assessment not bound in scope or approach by the procedural requirements and past practice of EIA. In general, HIA differs from the traditional EIA in several significant ways:

- HIA is voluntary but complements analysis required under law;
- HIA evaluates environmental, social, and economic effects using the lens of human health;
- HIA estimates benefits as well as adverse consequences;
- HIA evaluates the distribution of impacts on different populations; and,
- HIA uses quantitative and qualitative methods.

Health Impact Assessment can also be understood as a policy tool intended to support a democratic, transparent, and fully informed policy-making process that considers the health of all people and fairness in the distribution of health resources. In adhering to these principles, practitioners of HIA should strive to involve affected stakeholders, use the best available knowledge, analyze both costs and benefits to health, evaluate the distribution of effects on vulnerable populations, and consider short term and long term effects. In fact, according to the IAIA, the core values of HIA are:

- Democracy – emphasizing the right of people to participate in the formulation and decisions of proposals that affect their life, both directly and through elected decision makers.
- Equity – emphasizing the desire to reduce inequity that results from avoidable differences in the health determinants and/or health status within and between different population groups.
- Sustainable development – emphasizing that development meets the needs of the present generation without compromising the ability of future generations to meet their own needs.
- Ethical use of evidence – emphasizing that transparent and rigorous processes are used to synthesize and interpret the evidence, that the best available evidence from different disciplines and methodologies is utilized, that all evidence is valued, and that recommendations are developed impartially.
- Comprehensive approach to health – emphasizing that physical, mental and social well-being is determined by a broad range of factors from all sectors of society.

C. The Mac Arthur BART Transit Village Planning Process

According to the Bay Area Rapid Transit Agency, “The City of Oakland, BART and the MacArthur Citizens Planning Committee (CPC) have been working in partnership since 1993 to develop the MacArthur BART station area into a safe, vibrant, pedestrian-scale mixed-use transit village. A major goal of the partnership is to mend the community split in two by the freeway’s infrastructure through a comprehensive development effort. This effort includes complete redevelopment of the east parking lot, enhancements to 40th Street adjacent to the station and crossing under Interstate 980, and infill development and streetscape improvements along Martin Luther King, Jr. Way.”

According to the City of Oakland, “The MacArthur BART Station serves as a major transportation hub within Alameda County, served by three out of the five BART system lines, eight AC Transit bus routes, and several shuttle services including Emeryville’s Emery-Go-Round service and hospital shuttles operated by Kaiser Hospital and Summit Hospital. In April 2004, the City of Oakland Redevelopment Agency and BART selected a new development team for the MacArthur Transit Village, MacArthur Transit Community Partners, LLC, a partnership made up of three development firms: Bridge Housing, Shea Properties, and Aegis Equity Partners.

The ‘MacArthur Transit Community Partners’ proposal for the MacArthur Transit Village project as presented at the October 5, 2006 MacArthur BART Citizen’s Planning Committee Meeting contains the following key components:

- 518-625 units of high-density multi-family housing, of which approximately 20% will be below market rate rental and the remainder will be for-sale condominiums.
- The residential buildings along Telegraph and 40th Street will be 5 stories (about 50 feet tall), including ground floor retail and 4 stories of housing above. Adjacent to Highway 24, there will be one building with BART parking and 4-6 stories of housing above.
- Approximately 30,000 square feet of ground-floor neighborhood serving retail and community space. The exact use of the community space is still under consideration and may include childcare.
- BART Parking: replacement of 300 of the 600 existing BART spaces.
- 625-750 residential parking spaces and 15-60 retail and community spaces.
- Institution of a Residential Parking Permit Program that covers ¼ mile radius around project.
- Public infrastructure upgrades, including a new public street through the site off of Telegraph Avenue, the renovation of the existing BART entry plaza, a new public plaza adjacent to the retail space, and streetscape improvements on 40th Street adjacent to the station."

D. The Mac Arthur BART Health Impact Assessment

The University of California at Berkeley Health Impact Group (UCBHIG) is an independent group of faculty and students. In the context of course sponsored by the School of Public Health that teaches the core concepts, approaches, and tools of HIA, students engage firsthand with the practice of HIA by conducting an analysis on one project of regional significance and communicating their findings to local or regional officials. In June 2006, UCBHIG published a draft HIA of the Oak to Ninth Avenue development project in Oakland focusing on several determinants of human health including, housing, social segregation, open space, air quality, environmental noise, and traffic hazards

Students taking the course in the fall of 2006 screened several alternative candidate class projects and ultimately chose the Mac Arthur BART transit village as a subject for a HIA. Three factors appeared most significant in this screening decision:

1. Socially vulnerable areas surrounding the transit village, indicating that the population in the area may experience health disparities that could be affected, positively and negatively, by the project.
2. The size and scope of the project was likely to affect multiple environmental and social determinants of health, allowing for a comprehensive analysis;
3. Transit villages have potential environmental health benefits suitable for health analysis.

The process for conducting an HIA on the Mac Arthur BART builds on some of the lessons learned from the Oak to Ninth Avenue HIA. First, the HIA is being conducted concomitant with the environmental analysis; the analysis should be complete and ready to share with stakeholders, agency, and developers in advance of the draft environmental impact report. Second, the HIA will attempt to qualitatively and quantitatively evaluate project benefits, in order to provide a more comprehensive assessment with regards to health. Third, the HIA works to further develop the analytic techniques used in the prior study. Forth, the HIA attempt to bring in more original qualitative and quantitative data.

In approaching the scope of the assessment, UCBHIG developed a set of preliminary assessment questions related to the project and its potential effects on several categories of health determinants. The group then began to gather existing facts about the project and identify information sources and research methods that could help answer the questions. As the group explored the information available, they added additional questions in the scope and additional knowledge sources. The scope also included candidate mitigation measures warranting an assessment of feasibility. The final scoping document for this HIA is attached as Appendix I to this chapter. The planning timeline for the HIA is described in the table below.

This report that follows includes one chapter for each category of health determinant in the scope. Relevant figures and maps follow each chapter. Each chapter begins with a short summary of identified

impacts and recommendations to improve those impacts. Each chapter is then organized into the following six sections:

A. Summary;
B. Evidence on the relationships between the project and human health;
C. Relevant established standards and health objectives;
D. A description of the setting, context, or existing conditions
E. Key health assessment questions and synthesis of the findings from research;
F. Recommendations for design and mitigation.

UCBHIG students used the following methods and strategies to conduct this analysis:

1. Describing of potential pathways between the project and health based on of the empirical and scientific literature on the relationships between the built environment and health
2. Reviewing planning and assessment documents related to the transit village and area transportation projects
3. Conducting Field visits and observations of the site area
4. Interviewing key stakeholders and content experts
5. Interviewing area residents and business people
6. Interpretation, analysis, and mapping of available secondary data
7. Collecting environmental data on air quality, noise, and pedestrian environments
8. Applying quantitative health effects forecasting tools, where available

Planning Timeline for the UCBHIG Mac Arthur BART Health Impact Assessment

September 2006	Screening of Mac Arthur Bart Transit Village for HIA; Preliminary information gathering; Community Meeting Participation
October 2006	HIA Scoping Exercise Working scope produced
October-November 2006	Document Review Field research Key Stakeholder Interviews
December 2006	Drafts of Chapters to Course Instructors Instructor comments / edits & additions Students review and approve changes
January 2007	Draft Chapters shared with public agency representatives, developer team, and the CPC for comments
February 2007	Final Drafts incorporating responses to comments submitted to public agencies and the CPC

We ask readers to keep in mind that HIA is a developing practice in the United States. While substantial evidence supports the pathways between the project and health discussed in this analysis 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. In some cases, the analysis suggests mixed effects.

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 Health Impact Assessment to provide useful and constructive information to those designing and evaluating the Mac Arthur BART transit village. UCBHIG also hopes this effort contributes to the field of health impact assessment in California and the United States

Appendix I

Scope for the MBTV HIA

Revised December 7, 2006

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
Housing Housing size Housing affordability Housing quality Location quality Stable Housing tenure	Crowded conditions increase risks for infections, respiratory disease, mental health, and fire risk. Unaffordable rents or mortgages result in trade-offs between housing, food, and medical care.	518 – 625 Units located on existing parking lot east of BART station. Twenty percent of units will be affordable. Affordable housing will be architecturally homogenous, but spatially segregated from market rate housing Subsidy from the City drives quantity of affordable housing All BMR housing will be rental, while market rate will be for sale Most units will be less than 900 sq ft	*Does the design of the MBTV housing promote and protect health by via materials choices, ventilation systems, and site location and orientation?* *Does the project anticipate the needs of long term maintenance and upkeep of the housing?* *Is the location of the housing accessible to resident needs, such as retail, parks, and schools?* *Is the location of the housing safe for residents, neighbors and visitors, including seniors, children, and health sensitive populations?* *Will the transit village help to meet the housing needs of area residents with regards to size, quality, and affordability? Will it meet these needs for Oakland residents? Regional area residents?*	*Unbundling parking from housing ownership* *Reducing housing production costs to increase BMR proportion or affordability* *Integrating BMR and market rate housing within buildings* *Have options for renting and owning both BMR and market rate housing*	*Assess of demographic makeup of neighborhood and demographic trends (income, education, ethnicity, household size, etc) using Census of Geolytics software* *Obtain market research on demographics of home purchasers to assess the expected demand for family units at the project site* *Evaluate the housing produced by the project relative to needs based on area and city demographics* *Identify housing developments, particularly near transit villages that have integrated BMR and market rate housing and assess how they were made feasible* *Assess best practices in reducing housing production costs.*

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
			Will MBTV lead to displacement of people, either directly or indirectly? *Will housing design and capacity impact social cohesion in the area?*		
Transportation Access to jobs, goods, services, and educational resources Vehicle trips Trips made via walking and biking	Public transit provides access to employment, education, parks, and health care services. Sidewalks, bicycle lanes, parks and open space facilitate physical activity, reducing heart disease, diabetes, obesity, blood pressure, and osteoporosis, symptoms of depression, anxiety, and falls in the elderly. Vehicle speeds are directly proportional to injury severity	Project will be built on existing parking lot. New parking will be partially underground with 300 BART commuter parking spaces (reduction of 300), residential parking provided at >1:1 ratio; and neighborhood parking permits program Currently, 90% of people using MacArthur BART do not drive their cars to the station BART access priorities are: 1. pedestrian 2. bike, 3. transit (shuttle/bus) 4. auto/carpool 5. auto/single occupancy . Traffic study is planned as part of the EIR	*What are the potential effects of the project on vehicle trips, vehicle miles traveled, and mode split.* *How will the transit village affect utilitarian or leisure active transport, including biking and walking for project and area residents?* *Will reductions in BART parking reductions positively or negatively affect transit use and active travel behaviors?*	*Unbundle parking from home ownership or rental* *Extend pedestrian and bicycle network around project and BART* *Parking Demand Reduction Strategies (e.g., unbundled parking, car share)* *Ensure adequate BART –AC Transit linkages and maps!* *Run new local area shuttle (e.g. Piedmont Ave to BART)* *More bike parking! Perhaps a bike station like the one in Berkeley*	*Survey Pedestrian Environmental Quality in area* *Describe status and needs of bike lane network for area. (Source: EBBC, CEDA/ Patton)* *Estimate vehicle use reductions and increases in transit and walking trips using URBEMIS* *Assess parking demand for the project* *Explore identify all feasible transportation demand management approaches that might be feasibly applied to the project.* *Survey residents on what modes of travel they use and why including student transportation modes* *Review BART access study in progress.*

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
Livelihood Security of Employment Adequacy of wages, income, benefits, and leave Job Hazards Job Autonomy Economic diversity Locally owned businesses	Unemployment is a source of chronic stress and low self esteem and is associated with health adverse behaviors and premature death. Income is strongly associated with life expectancy Vacation leave provides time for rest and recreation Sick leave supports timely use of health care. Rates of unemployment and poverty are proportional to crime rates Job autonomy predicts reduced mortality from cardiovascular disease	Project will include 36,000 – 38,000 sq feet of new retail space Some construction involves demolition of exiting retail businesses	*Will project-related jobs provide jobs with living wages and core benefits (e.g. paid sick leave)?* *Will the project contribute to area employment by hiring local residents for hiring for construction or operations jobs?* *Will the project strengthen or diversity the neighborhood economy?* *-Will the project support locally owned businesses and entrepreneurship?*	*-Formula Retail Disincentives?* *-Subsidies for high need retail services?* *-Subsidies for local ownership?* *-Rental subsidies contingent on rent escalation.*	*Note Demographic Analysis above* *Compare education / skills to skills needed for employment opportunities provided by village (Source: CA EDD, Redevelopment Agency, SFDPH Labor Market Profile)* *Assess retail mix and needs in area.* *Contact Fruitvale development, TALC, and other TOD interests to find out what seems to work with TOD retail planning.*
Retail Goods and	Adequate	Shay Retail & Homes	*Will area residents have*	*Prohibit or limit*	*Interpret county health dept*

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
Public Services, including food resources Quality and proximity of financial institutions Quality and proximity of childcare services Quality and proximity of health services	nutrition prevents infectious diseases Low birth-weight predicts chronic disease in later life Consumption of fruits and vegetables linked to reduced cancer risk Local financial institutions help families create and maintain wealth Timely access to primary health services prevents serious hospitalizations Quality childcare increases childhood educational and job outcomes	in discussions about an "anchor" grocery store (originally 50,000 sq. ft, now 15,000 sq ft)	*adequate access to quality food resources?* *Will the transit village provide or contribute to the area's diversity of retail goods and services?* *Will an adequate mix of goods and services be accessible within walking distance?* *Will the transit village provide or contribute to adequate access to public services? Will these public services be within walking distance?*	*unhealthy food establishments (fast food joints)* *Encourage diverse delicious food establishments (not sure how you legitimately say this!)* *Have a farmers market in plaza close to BART station* *Requirement to contract to a grocery store with healthy food choices* *Add mixed-use features and services, like a post office or other government service like WIC?* *Micro-financing programs for local(existing or new?) entrepreneurs; group-lending may also fortify social networks*	*data profiles the relative prevalence of nutrition related illness in the project area.* *Map area retail food resources?* *Map existing retail establishments* *Assess area retail needs via maps and area interviews* *Research feasible interventions to improve area retail environment* *Review LSA retail study when complete* *Survey local residents on what kind of community center they would want/need and use*
Education Quality, Proximity, and Capacity of Schools Quality, Proximity, and Capacity of	Children commuting to school have less sleep, less exercise, and greater exposure to vehicle	Developer considering plan for onsite childcare center	*What is the new demand for area k-12 public schools created by the project? Will existing schools be sufficient to meet demand?*	*Provide low cost commercial shell / or space for onsite childcare provider* *Provide rooftop garden amenities to serve*	*Map out schools locations and Map out walking paths to schools; using PEQI data, Google Maps, and field observations evaluate quality of walking routes to schools*

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
Family and Center-based childcare	pollution. Local community schools can promote parent participation and good educational outcomes		*Will the village provide any educational resources for k-12 public schools?* *Will the project contribute to social integration in area k-12 public schools?* *Will families living at the site be able to safely walk or bike between schools and the transit village?* *Will the project create new demand for childcare? Will existing or proposed facilities be sufficient to meet demand?*	*childcare needs* *Ensure that paths for peds and bikes extend to local schools to encourage public transit usage for school students and parents.* *Provide space that teens would use to spend time after school in some of the retail space – hire local teens to work in stores, allow safe skateboarding or have a park*	*Estimate public school capacity using local area school enrollment data including recent trends?* *Research current supply of child care* *Estimate student generation Use demographics to predict the number of families with children who would be living in the transit village* *of the project* *Estimate childcare demand of the project*
Parks and Natural Space Quality, proximity, and capacity of parks	Regular physical activity reduces the risk of developing heart disease, diabetes, osteoporosis, and obesity, reduces blood pressure, relieves symptoms of depression and anxiety, and prevents falls in the elderly. Access to places for physical		*Are existing and area park resources sufficient to enable minimal physical activity requirements of residents?* *Are there safe walking and biking paths to local parks?* *Will trees, rooftop gardens or other natural elements be integrated into the development?*	*Include provisions for rooftop green space* *Add a plaza with public art and spaces for a variety of public uses* *Create safe paths for walking and biking to local parks* *Plant more trees in development and along sidewalks*	*Interpret county health dept data profiles on physical activity in the project area.* *Assess inequities in park access for the area relative to the city* *Enumerate and evaluate park size, amenities, and programs* *Assess quality of area parks based on field visits and Friends of Oakland Parks assessments.* *Map out walking paths to parks; using PEQI data and*

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
	activity increases the frequency of physical activity in children and adults. People who live in greener environments have better physical and mental health Trees and greens space remove air pollution from the air and mitigate the heat island effects.				*observations evaluate quality of walking routes to schools* *Qualitatively or quantitatively estimate physical activity for residents based on area park resources and empirical evidence)* *Interview area residents about park use and needs – and other overall needs and assets in the area. Do they want more parks? Are the current parks in the area dangerous?*
Pedestrian Safety	Direct Effect	Planned pedestrian realm improvements to 40th Street	*Will the transit village contribute to or prevent pedestrian injuries* *--What safety precautions is BART employing for vulnerable populations (disabled, seniors)?*	*Implement pedestrian safety engineering improvements* *Implement traffic calming in project and on adjacent streets* *Consider lane reductions on 40th*	*Map baseline injury rates in area* *Evaluate pedestrian quality using Google maps* *Survey Pedestrian Environmental Quality in area via field observations*
Air Quality The level of contaminants / pollutants in outdoor air	Vehicle emissions exacerbate respiratory		*Will vehicle emissions associated with the I-580 /SR 24 Interchange create hazard for respiratory diseases in project*	*Ventilation system design and engineering strategies* *Integrate rooftop solar systems into project*	*Measure site air quality* *Model air quality based on traffic counts using CALINE* *Forecast respiratory*

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
The level of contaminants / pollutants in indoor air Exposure to environmental tobacco smoke	disease and increase cardio-pulmonary mortality. Indoor aero-allergens cause or exacerbate asthma		*residents?* *Will the transit village cumulatively improve or compromise air quality?*	*design* *See also transportation demand reduction strategies (e.g. unbundling parking)*	*disease rate change based on measured values and empirical studies*
Water Quality The level of contaminants or infectious agents in the drinking water supply The safety of the recreational water supply.	Contaminated water can spread serious infectious disease Some chemical contaminants in water increase risk of cancer Recreational physical activity reduces cardiovascular diseases risk		*Will the project negatively impact urban runoff into the bay?*		-
Noise The level of environmental noise	Chronic noise exposure harms sleep, temperament, hearing, and blood pressure	Noise will be evaluated within the EIR Developer planning unspecified acoustic mitigations.	*Will area noise sources (e.g. freeway and Bart) create health hazards for new project residents?* *Are regulatory requirements for acoustic mitigations sufficient to protect health and sleep?*	*Noise barrier between highway and housing* *Noise reduction on the BART tracks?*	*Measure ambient noise in area* *Measure SELs associated with BART trains* *Apply health outcomes forecasting equations (annoyance, sleep disturbance)* *Identify best practices in residential noise mitigations*

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
Community Violence Violent Crime Property Crime	Direct Effects Indirect effects of crime include fear, stress, and poor mental health. Fear of violence inhibits walking behaviors	Developer considering the following safety mitigations: additional front doors on Mac Arthur, better network of streets, better access to BART garage, retail on Village Dr, 40th, and Telegraph will increase safety; designing residences with stoops on 38th.	*-What safety precautions is BART employing for vulnerable populations (disabled, seniors)?* *-Will the project increase or decrease crime rates in the neighborhood surrounding MacArthur BART?*	*Implement strategies of environmental design for crime prevention in public areas* *Ensure public walkways are well-lit* *Make common spaces that encourage lots of people to use, instead of desolate areas where people might be alone (and vulnerable)… perhaps add benches in common areas*	*Map baseline crime rates in area* *Identify physical design strategies for crime prevention.*
Social Cohesion Supportive relationships with friends, families, and neighbors Participation in social organizations The degree and quality of participation in public decision-making The responsiveness of public agencies to peoples needs	Physical and emotional support buffers stressful situations, supports illness recovery, prevents isolation, contributes to self-esteem, and reduces the risk of early death. Social contact across ethnic and class groups ensures equitable	Several community groups are involved in the public process with approximately 50-75 people attending the 10/7/06 planning meeting The proposal has space for a 5000 sq ft community center planned. One use of this center may be a child care facility.	*Will the village contribute to physical or social assets that contribute to social interaction? What are existing physical and social assets for social cohesion?* *Does the project add new parks? Do these have physical or programming elements that promote social interaction?* *Does the project create new public plaza? Do these have physical or programming elements that promote social interaction?* *Does the project provide*	*Creation of public plaza with community desired /designed amenities*	*Evaluate the current assets (physical and social) supporting social interaction and cohesion in the community* *Survey residents adjacent to BART to assess their perspectives, concerns, needs with regards to the project* *Evaluate available knowledge on displacement impacts of transit villages and new infill development.* *Evaluate whether the project achieves the neighborhood connectivity goals of 2002 Westside*

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
	access to public health and educational services Supporting the effective participation of marginalized group in governance helps ensure achievement of basic human needs (e.g. food, shelter, health services) Locus of control is a major factor in quality of health		*new or enhanced community serving facilities (e.g. meeting spaces, etc)* *Will the village contribute to displacement of existing area residents, either directly or indirectly?* *Will the development provide a means to support cohesion between the west and east sides of SR 24? 1.* *Did the project planning engage the community in a way that increased area social cohesion or social capital?* *How do plans respond to community concerns (design changes, feasibility studies, etc)*		*Pedestrian planning process.*
Social Exclusion The proportion of the population living in relative poverty Attitudes towards or stereotypes of minority racial,	Economic exclusion in segregated neighborhoods limits wealth which is a buffer against illness and stress. Residents of low-	The BMR and market rate housing will be in separate structures The project does not provide any significant improvement on the west side of the BART tracks, which has a higher rate of poverty.	*Did the MBTV planning and implementation process for the transit village meaningfully responding to the needs of all area residents?* *Are community residents engaged in the TOD planning process? Why or*	*Add structures (safe walking paths – park under freeway) that connects neighborhood west of BART station to the new development, stores, etc.*	*Assess the degree of integration / segregation currently in the project area* *Survey residents adjacent to BART to assess their perspectives, concerns, needs with regards to the project*

Social and Environmental Health Determinants	Relationships between Health determinants and health outcomes	Facts About the Decision at Hand	Candidate Questions for Health Impact Assessment	Candidate Mitigations and Design Strategies	HIA Research Methods and Tasks
social, and ethnic groups The segregation of residences by race, ethnicity, religion, or class The degree of inequalities in income or wealth	income and ethnically segregated neighborhoods experience, high rates of teenage childbearing, tuberculosis, cardiovascular disease, and homicide.		*why not?* *Who is participating in the public process and who is not?* *What efforts been made to assess the needs of non-participants?* *What do we know about the needs, concerns, and perspectives of non participants? As designed, will the project meet those needs? Is the planning and implementation process for the transit village meaningfully responding to the needs of all area residents?* *Will the transit village affect the degree of residential segregation in the area? In Oakland?* *Will the village contribute to excessive rent burdens displacement of existing area residents?* *Will the development help connect residents on the west side of 24 with the resources and amenities on the east side?*		*Evaluate whether the project achieves the neighborhood connectivity goals of 2002 Westside Pedestrian planning process.* *Assess economic costs and benefits associated with development: change in property value due to entitlements; developer costs including the economic value of developer provided community benefits; public subsidies* *Survey community groups on the costs and benefits of the project on the community*

Mac Arthur BART Transit Village

Health Impact Assessment

Chapter 2
Housing

Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services

—Universal Declaration of Human Rights. The United Nations General Assembly December 10, 1948 [1]

1 United Nations. (1948). "Universal Declaration of Human Rights." Available at: http://www.un.org/Overview/rights.html. Accessed: December 11, 2006.

A. Introduction and Summary

Housing contributes to health not only by providing shelter; affordability, environmental quality, access to jobs, schools, transportation and services, as well as the placement of a home within a community are all factors tied to housing that influence the physical, mental, and social well-being of people.

In this chapter, we summarize the relationships between housing and human health and review the evidence that supports them. We then consider these linkages in an assessment of the MacArthur BART Transit Village (MBTV) Project's housing plans. Some major questions we address in this section include:

- How does MBTV housing improve or impede health?
- What project aspects should be upheld for their existing health benefits?
- What project aspects could be improved for the well-being of current and future MBTV-area residents?
- Are there conflicts or contradictions in how MBTV housing affects health? If so, what are they, and how might they be resolved?

In our assessment, we highlight key health assets of the MBTV Project, suggest strategies and mitigations to improve housing plans where possible, and discuss any health-related housing dilemmas related to the MBTV design.

Health Impacts

1. The project will result in a significant net increase the regional housing supply;
2. The project will not provide homeownership opportunities to Oakland households of average economic means;
3. The project will increase the regional supply of rental housing affordable to those making less than the median income;
4. The project will result in an in-migration of wealthier residents, positively contributing to area economic integration and markets for retail services;
5. The project may result indirectly increased property values and rent costs in the greater Mac Arthur BART Area potentially leading to some existing residents and businesses getting priced out;

Recommendations for Design and Mitigation

1. Promote healthy air quality and noise levels within the housing units through proper ventilation and noise control design measures that reduce exposures from highway traffic
2. Select building materials and ventilation systems for housing units to reduce allergies and toxic exposures; LEED-certified green building options may be appropriate
3. Conduct lead screenings and removal in the Greater MacArthur BART Area to reduce possible community exposure to lead
4. Use best practices for air quality monitoring and dust regulation during the destruction of existing buildings to reduce exposure to toxins
5. Ensure that enough money is set aside in the budget for proper maintenance and repair of future housing units over time
6. Incorporate Green Building design to create more energy efficient homes
7. Use higher quality building materials to offset maintenance and repair costs down the road
8. Provide outreach to area residents with regards to public resources available for home maintenance and repair;

9. Un-bundle the sale of parking from the sale of housing units and reduce the number of parking spaces per household or overall parking spaces per development area
10. Provide bicycle parking to residents, possibly in the form of monitored bike parking similar to the Bike Station in Berkeley
11. Increase the availability of affordable housing by requiring the developer to provide or fund BMR housing as a condition of development; or by providing a density bonus to the developer conditional on the provision of BMR housing
12. Increase the number of family-size housing units to accommodate local families
13. Explore ways to provide BMR units for sale
14. Integrate BMR with market-rate housing to minimize differences between the nature and the quality of units offered to low-income and market-rate units
15. Work together with local residents and property owners to improve housing stock using public housing improvement resources.

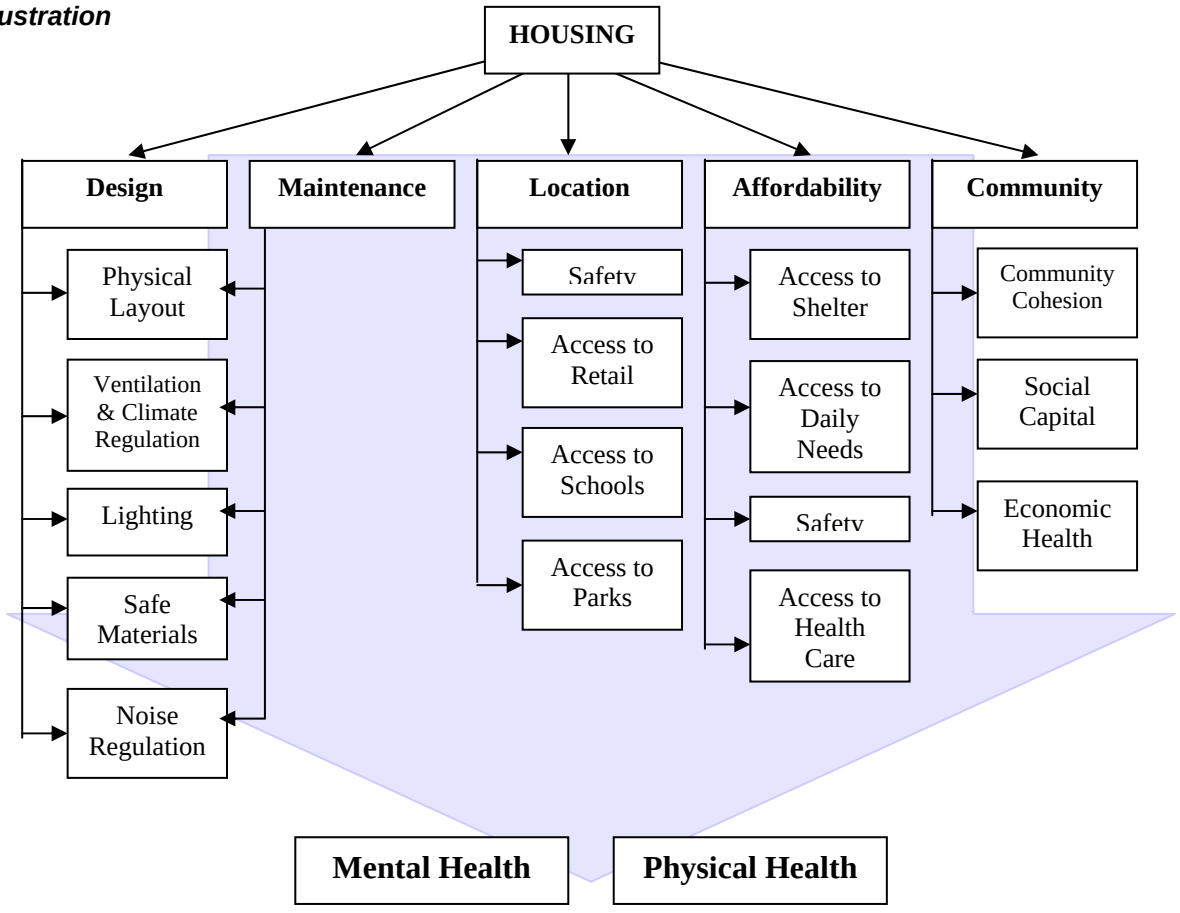
B. Pathways Between Housing and Health

> Living and housing conditions are the basis for many aspects that affect residential health: indoor air quality, home safety, noise, humidity and mold growth, indoor temperatures, asbestos, lead, radon, Volatile Organic Compounds (VOC), lack of hygiene and sanitation equipment and crowding are some of the most relevant possible health threats to be found in dwellings…
>
> The immediate housing environment and the neighborhood [also] represent an everyday-landscape which can either support or limit the physical, mental and social well-being of the residents.
>
> *– The World Health Organization*[2]

The pathways between housing and health – both the documented and the hypothesized – span a wide range. Although further research is needed to substantiate the many pathways between housing and health, there is a growing body of literature detailing how housing impacts health. This review considers five major categories in the proven and potential pathways between housing and health – the design of a home, its maintenance over time, its location, its affordability, and the community in which it is situated – and the evidence supporting these linkages.

For the reader's convenience, an illustration of the pathways between housing and human health is included. More details are included in the pages that follow.

Illustration



2 The World Health Organization Regional Office for Europe. Housing and Health. Available at: http://www.euro.who.int/Housing. Accessed: December 11, 2006.

Housing Design

The design of a home can significantly impact the health of its residents. Physical layout, together with ventilation, temperature regulation, plumbing, and sewage systems, can influence safety, sanitation, and air quality in the home environment, directly affecting resident well-being. Materials used in home construction – from paint to insulation – also impact health.

Physical Layout

The physical design of a home influences movement within a home and to outdoor surroundings. Hazardous physical conditions in the home create a significant burden of injury; in the United States, approximately 13.5 million non-fatal injuries occur in or around the home each year, attributable to physical conditions including functionality of windows, quality of building materials, and the presence or lack of adequate safety precautions near heating devices.[3] Properly functioning windows, doorways and stairs, well-designed plumbing and sanitation systems, and appropriate safety features for known hazards such as stoves and heaters can reduce physical injuries.

Healthy housing layout and physical design promote safety and accessibility and reduce opportunities for injury and barriers to access. Accessibility in a home is a particular concern for children, elderly, and physically disabled populations. Stairways, entranceways, bathrooms, kitchens, and corridor size can be designed to promote safety for sensitive populations, or pose hazards and create barriers for these individuals. Design features such as wide hallways for walker or wheelchair access, ramps and elevators in the place of stairs, and child safety precautions, such as lower stairway handrails and rounded corners, are design features that can improve physical safety and prevent injury for all residents.[4]

Housing design can also reduce the threat of extreme climates and weather. Strong insulation and windows can protect residents by ensuring adequate warmth in areas of extreme winter cold. Situating homes in naturally shaded areas can help to provide adequate cooling in areas of extreme summer heat. Durable, sloping roofs can provide safety from severe precipitation, such as sleet, hail, and heavy snowfall, while other simple design features can prevent bodily harm in the event of natural disaster, including tornadoes, floods and earthquakes. With the appropriate consideration, housing design can protect residents from risks such as hypothermia, heat stroke, heart attacks, accidents, physical injuries and even death due to extreme weather.[5] [6]

"Green" housing design is a relatively new concept that utilizes sustainable building materials and energy efficient design. Advocates and planners in the fields of green building and Leadership in Energy and Environmental Design (LEED) Standards have suggested that green homes reduce occupational exposures of toxic building materials for construction employees and mitigate long-term exposures to toxic materials for residents.[7] Features such as solar panels and designs that maximize the benefits of lighting and harness natural light opportunities can result in cost savings to improve the quality of life of

3 Krieger J, Diggins D. (2002). Housing and Health: Time Again for Public Health Action. American Journal of Public Health. 92(5):758-768.

4 Breysse PN, Galke W, Lanphear B, Farr N. The National Center for Healthy Housing. (2003). "The Relationship Between Housing and Health: Children at Risk Workshop. Report on the Workshop (November 7-8, 2002)." Chapter 4. Unintentional Injury of Children in the Home.

5 Kovats RS, Kristie LE. Heatwaves and Public Health in Europe. European Journal of Public Health. 2006; 16(6): 592-599.

6 Rudge J, Gilchrist R. Excess Winter Morbidity Among Older People at Risk of Cold Homes: A Population-Based Study in a London Borough. Journal of Public Health (Oxford). 2005; 27(4):353-358.

7 Green Guide for Health Care Steering Committee. "The Green Guide for Health Care: Best Practices for Creating High Performance Healing Environments. Pilot Version 2.1." Available at: http://www.gghc.org/download/mgdocs.cfm. Accessed: December 11, 2006.

residents.[8] Furthermore, reduced environmental impact has health benefits for the community and society at large in terms of resource conservation and reduced pollution.

Ventilation and Climate Regulation

Ventilation is important for airflow control, moisture reduction and temperature control to reduce the onset of respiratory disease. Ventilation helps to control levels of irritants such as allergens, mold, and dust, which contribute to respiratory disease, as well as fumes chemicals used indoors, which can cause a host of illnesses, ranging from lightheadedness from short-term exposure to cancer from long-term exposure.

Damp housing conditions have been linked with insomnia, respiratory ailments, including cough, wheezing, nasal, ocular and throat symptoms, headache, and allergies.[9] [10] [11] Chronic respiratory ailments – such as asthma – have also been attributed to damp, cold, and moldy housing, "even after potentially confounding factors such as income, social class, smoking, crowding, and unemployment are controlled for."[12] Furthermore, pests – including mites, roaches and rodents – as well as disease-causing agents such as viruses and bacteria not only aide in the spread of disease, they also thrive in warm, damp environments.[13]

Windows, doorways and HEPA systems can deter pests and rodents and ensure that indoor air quality remains healthy for human inhabitance. In addition to physical design features that mediate natural climate, heating elements, air conditioners, filtration systems, humidifiers/dehumidifiers and other climate-controlling devices can be designed into a home to improve opportunities for physical and mental health. Targeting root causes of moisture and allergens that trigger episodic or chronic respiratory ailments has been shown to reduce symptoms of asthma morbidity.[14] [15] Proper ventilation devices, such as vent pipes, can also help to reduce resident exposure to radon, a toxic gas known to cause lung cancer.[16]

Proper ventilation and filtration systems can also prevent poor outdoor air quality from traffic and factory emissions from impacting indoor air quality. Further information on outdoor air quality in residential areas, as well as a detailed review of the health effects of good air quality is available in Chapter 8.

8 Ballentine C, Ratliff N, and Smith DH. (2002). Investing in your future: is a solar panel a worthwhile investment? College of Business Administration Working Paper Series, Northern Arizona University, Ref. 02-36. Available at: http://www.cba.nau.edu/faculty/workingpapers/pdf/Smith_SolarCase.pdf. Accessed: December 11, 2006.

9 RHINE Study Group: Janson C, Norback D, Omenaas E, Gislason T, Nystrom L, Jogi R, Lindberg E, Gunnsbjorndottir M, Norrman E, Wentzel-Larsen T, Svanes C, Jensen EJ, Toren K. Insomnia is more common among subjects living in damp buildings. Occupational Environmental Medicine. 2005; 62(2):113-118.

10 Engvall K, Norrby C, Norback D. Sick Building Syndrome in Relation to Building Dampness in Multi-Family Residential Buildings in Stockholm. International Archives of Occupational and Environmental Health. 2001; 74(4):270-278.

11 Brunekeef B. Damp Housing and Adult Respiratory Symptoms. Allergy. 1992; 47(5):498-502.

12 Krieger J, Diggins D. (2002). Housing and Health: Time Again for Public Health Action. American Journal of Public Health. 92(5):758-768.

13 Krieger J, Diggins D. (2002). Housing and Health: Time Again for Public Health Action. American Journal of Public Health. 92(5):758-768.

14 Eggleston PA, Butz A, Rand C, Crutin-Brosnan J, Kanchanaraska S, Swartz L, Breysse P, Buckley T, Diette G, Merriman B, Krishnan JA. Home environmental intervention in inner-city asthma: a randomized controlled clinical trial. Annals of Allergy, Asthma and Immunology. 2005; 95(6):496-497.

15 Kercsmar CM, Dearborn DG, Schluchter M, Xue L, Kirchner HL, Sobolewski J, Greenberg SJ, Vesper SJ, Allan T. Reduction in asthma morbidity in children as a result of home remediation aimed at moisture sources. Environmental Health Perspectives. 2006; 114(10):1574-1580.

16 The US Environmental Protection Agency (EPA). Radon-Resistant New Construction. Available at: http://www.epa.gov/radon/construc.html. Accessed: December 11, 2006.

Noise

Levels of environmental noise in a home are unlikely to be sufficient to cause hearing damage. However, more modest levels of environmental noise are also associated with health effects. Annoyance resulting from environmental noise levels can impact sleep quality, ability to concentrate and learn, increased anxiety, and increased stress.[17] [18] [19] Sleep quality is known to affect physical health as well as job performance.[20] There is evidence that noise exposure impairs cognitive performance, motivation and negatively impacts mental health.[21] Hypertension and ischemic heart disease have also been linked with chronic noise exposure.[22] [23]

Recovery from chronic noise and noise annoyance, such as that experienced in the workplace, must take place in a quiet environment for at prolonged period of time in order to prevent potential hearing loss.[24] Noise control can be designed into a home with soundproofing elements such as thick window panes, doors, and walls, and in extreme cases, specialty soundproofing materials. Careful consideration of the geographic placement of a home within a community can also impact home noise levels – zoning laws and noise ordinances can help to control the amount of noise exposure in residential areas. Chapter 9 provides a detailed review of noise conditions in the MBTV project area and associated health effects.

Lighting

Lighting can impact both physical and mental health. Adequacy of light is necessary for safety within the home; lack of ample lighting can lead to accidents resulting in physical injuries.[25] While lighting is known to increase productivity and treat sleep disorders,[26] poor lighting has been linked with depression and mood disorders, such as seasonal affective disorder.[27] [28] Recent studies have suggested that exposure to light at night might be linked with cancer, through the suppression of melatonin secretion.[29] [30]

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17 Van Kempen EEMM, Kruize H, Boshuizen H, Ameling CB, Staatsen BAM, de Hollander AM. The Association between Noise Exposure and Blood Pressure and Ischemic Heart Disease: A Meta-Analysis. Environmental Health Perspectives. 2002; 110(3): 307-317.

18 Evans GW. Child Development and the Physical Environment. Annual Review of Psychology. 2006; 57:423-451.

19 Evans GW and Marcynyszyn LA. Environmental Justice, Cumulative Environmental Risk, and Health among Low- and Middle-Income Children in Upstate New York. American Journal of Public Health. 2004; 94:1942-1944.

20 Mohr, D., Vedantham, K., Neylan, T., Metzler, T., Best, S., and Marmar, C. The mediating effects of sleep in the relationship between traumatic stress and health symptoms in urban police officers. Psychosomatic Medicine 2003; 65(3):485-9

21 Stansfield SA and Matheson MP. Noise Pollution: Non-Auditory Effects on Health. British Medical Bulletin. 2003; 68:243-257.

22 Willich SN, Wegschneider K, Stallmann M, Keil T. Noise Burden and the Risk of Myocardial Infarction. European Heart Journal. 2006; 27(3):276-282.

23 Babisch W, Beule B, Schust M, Kersten N, Ising H. Traffic noise and risk of myocardial infarction. Epidemiology. 2005; 16(1): 33-40.

24 Personal communication, Edmund Seto, PhD, Lecturer and Assistant Researcher, Environmental Health Sciences, UC Berkeley School of Public Health. November 29, 2006.

25 Zima BT, Wells KB, Freeman HE. Emotional and behavioral problems and severe academic delays among sheltered homeless children in Los Angeles County. American Journal of Public Health. February 1994; 84:260-264.

26 Van Bommel WJM. Non-visual biological effect of lighting and the practical meaning for lighting for work. Applied Ergonomics. 2006; 37(4):461-466.

27 Wehr TA. Seasonal vulnerability to depression. Implications for etiology and treatment. L'Enchephale. 1992; 18(4):479-483.

28 Lurie SJ, Gawinski B, Pierce D, Rousseau SJ. Seasonal Affective Disorder. American Family Physician. 2006; 74(9): 1521-1524.

29 Pauley SM. Lighting for the human circadian clock: recent research indicates that lighting has become a public health issue. Medical Hypotheses. 2004; 63(4):588-596.

30 Stevens RG. Artificial lighting in the industrialized world: circadian disruption and breast cancer. Cancer Causes & Control. 2006; 17(4):501-507.

Large windows, skylights and strategically situated homes can maximize natural daytime lighting to ensure adequate lighting for household activity and boost work productivity while possibly mitigating potential cancer risk. Built-in lighting fixtures, including track lighting, can help to ensure appropriate lighting in risky areas of the home, such as the stairwell, kitchen, or areas with little natural light. Conversely, proper window coverings and functioning electrical systems can also assure darkness at appropriate times for sleep.

Building Materials

The materials used to build a home should be safe for all of its residents, and the processes involved in manufacturing such materials should be safe for all laborers involved in material manufacture. Numerous housing products contain chemicals or other hazards that may impair health and well-being.

Lead and asbestos are two well known chemical hazards. Lead is a highly toxic metal used in paint that can cause a "range of health effects, from behavioral problems and learning disabilities to seizures and death."[31] Until 1978, was known to contain lead.[32] Children under the age of 6 are among the most vulnerable to lead exposure; even small doses of lead from crumbling paint chips, paint dust or lead-contaminated residential soil can have dire consequences on their small, but quickly-growing bodies.[33] Asbestos was widely used for thermal insulation has been linked to severe negative health effects, including lung cancer, asbestosis, and mesothelioma.[34] Although lead-based paint has not been used in homes since the late 70s and most asbestos-containing products were banned from use by the EPA in 1989, these hazards may continue to threaten the health of residents of older homes and buildings.

Other potential sources of hazardous exposures in the home include pesticide residues known to cause neurological disorders; pressure-treated wood commonly used to build decks and playground equipment which can contain arsenic, a known carcinogen; and carbon monoxide from improper heating devices in the home have caused respiratory ailments and even death.[35] [36] [37] However, careful selection of housing materials can help to prevent unnecessary health risks.

Finally, the quality of materials used in a home contributes to the rate at which those materials will deteriorate or need repair. High-quality building materials and home fixtures can increase the longevity of the home and provide ongoing health benefits over time at less expense to the resident or landlord. Green building materials are less toxic both to manufacture and to use.

Housing Maintenance

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31 The Environmental Protection Agency (EPA) Prevention, Pesticides and Toxic Substances. Lead in Paint Dust and Soil. Available at: http://www.epa.gov/lead/. Accessed: December 11, 2006.

32 The Environmental Protection Agency (EPA) Prevention, Pesticides and Toxic Substances. Lead: Basic Information. Where Lead is Found. Available at: http://www.epa.gov/lead/pubs/leadinfo.htm#facts. Accessed: December 11, 2006.

33 Ibid.

34 The Environmental Protection Agency (EPA) Prevention, Pesticides and Toxic Substances. Asbestos and Vermiculite: Basic Information. Available at: http://www.epa.gov/asbestos/pubs/help.html#Info. Accessed: December 11, 2006.

35 Landrigan PJ, Claudio L, Markowitz S, Berkowitz G, Brenner B, Romero H, Wetmur J, Matte T, Gore AC, Goldbod JH and Wolff MS. Pesticides and Inner-City Children: Exposures, Risks, and Prevention. Environmental Health Perspectives. 1999; 107(Supplement 3):431-437.

36 Healthy Building Network. Issues: Pressure Treated Wood. Available at: http://www.healthybuilding.net/arsenic/index.html. Accessed: December 12, 2006.

37 United States Consumer Product Safety Coalition (CPSC). Carbon Monoxide Questions and Answers, CPSC Document #466. Available at: http://www.cpsc.gov/cpscpub/pubs/466.html. Accessed: December 12, 2006.

Although housing is bound to deteriorate as it ages, the rate at which it deteriorates can be slowed by periodic preventative and ongoing responsive home maintenance, repair and upgrades.

Proper care of a home will result in increased longevity of the home and improved health for residents. Deterioration of a home typically results in compromised air quality and climate control, the growth of mold and mildew, and pest or rodent infestations, which tend to increase pesticide use.[38] Ongoing maintenance ensures safe air, water, and soil, as well as safe surfaces for walking and maneuvering around a home. Responsive repairs and pro-active upgrades can help to keep an aging building good as new, promoting health opportunities for residents and neighbors.

Housing maintenance also impacts health at a community level. In some locales, as housing stock ages and deteriorates, a process of housing filtering occurs, where residents cycling through a particular dwelling tend to be of progressively lower incomes over time.[39] This results in a disparity in the quality of home inhabited by rich and poor populations, and subsequently, the health that these populations might experience.[40] On the contrary, upgrading and repair of a home as it ages can contribute to positive neighborhood effects, where "positive changes in the exterior appearance of a home cause spillover benefits for surrounding homes," including increases in market value.[41]

Upgrading and repairing aging housing stock provides people of varying incomes equal opportunity to healthy housing, and might contribute to overall well-being through cost savings. Proper budgeting and allocation of resources can assure that proper maintenance occurs over time.

38 Bradman A, Chevrier J, Tager I, Lipsett M, Sedgwick J, Macher J, Vargas AB, Cabrera EB, Camacho JM, Weldon R, Kogut K, Jewell NP and Eskenazi B. Association of Housing Disrepair Indicators with Cockroach and Rodent Infestations in a Cohort of Pregnant Latina Women and Their Children. Environmental Health Perspectives. 2005; 113(12):1795-1801.

39 O'Sullivan A. (1993). Chapter 14: "Why Is Housing Different?" Urban Economics. Homewood, IL: Irwin.

40 Kiefer D. Housing Deterioration, Housing Codes and Rent Control. Urban Studies. 1980; 17: 53-62.

41 O'Sullivan A. (1993). Chapter 14: "Why Is Housing Different?" Urban Economics. Homewood, IL: Irwin. Page 388.

Housing Location

The location of a home within a neighborhood, town or city is associated with its residents' ability to access certain vital resources, including schools, retail, parks, recreational areas and transportation.

Families with children rely heavily upon good-quality local schools for the education of their children. Well-educated children are better able to make life decisions that will positively influence their health. Meanwhile, older youth are better prepared to enter the workforce and obtain higher-paying jobs based on the quality and level of their education. The linkages between schools, education and health are wide-ranging; a summary can be found in Chapter 5.

A diverse array of retail establishments selling food, clothing, and other life necessities may also be important to residential health. Although empirical studies of the impacts of local retail on health are few, the benefits of a nearby grocery store or hardware retailer to quality of life are readily apparent. Some studies have shown that lack of access to grocery stores selling healthful foods has been connected to higher body mass indices of nearby residents.[42] For more information about the impacts of retail on neighborhood health, please consult Chapter 4.

Parks and recreation provide people – particularly those inhabiting urban areas – with the opportunity to exercise and recreate in the outdoors. Chapter 6 outlines the numerous health benefits to local recreation opportunities.

Transit opportunities in a neighborhood can also impact the health of local residents. Energy-efficient buses and trains reduce reliance on automobiles, which produce particulate matter dangerous to human health.[43] Driving has been linked with increased levels of stress and anxiety, as well as injury from vehicular crashes and pedestrian accidents.[44] People-powered forms of transit, such as walking, running, bicycling, skateboarding and scootering, are inherently healthy forms of exercise, with benefits ranging from increased longevity and reduced risk of diabetes to obesity prevention and improved psychological well-being.[45] [46] [47]

Probably the greatest health benefit of local schools, retail, parks and transit to a residence is increased accessibility to utilitarian exercise. Safe neighborhoods with ample destinations promote walking as the primary form of transportation. Further information on neighborhood safety is available in Chapter 10.

Home Affordability

Affordable housing assures that families and individuals all have access to a place to live, and that they are not paying beyond their means at the expense of other vital necessities, such as healthy food, weather-appropriate clothing, health maintenance and medical care.

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42 Inagami S, Cohen DA, Finch BK, and Asch SM. You Are Where You Shop: Grocery Store Locations, Weight and Neighborhoods. American Journal of Preventive Medicine. 2006; 31(1):10-17.

43 Frumkin H, Frank L, Jackson R. (2004). Urban Sprawl and Public Health: Designing Planning and Building for Healthy Communities. Washington DC: Island Press.

44 Frumkin H, Frank L, Jackson R. (2004). Urban Sprawl and Public Health: Designing Planning and Building for Healthy Communities. Washington DC: Island Press.

45 Serfass RC, Gerberich SG. Exercise for optimal health: strategies and motivational considerations. Preventative Medicine. 1984; 13(1):79-99.

46 Poirier P, Despres JP. Exercise in weight management of obesity. Cardiology Clinics. 2001; 19(3):459-470.

47 Sallis J and Glanz K. The role of built environments in physical activity, eating and obesity in childhood. The Future of Children. 2006; 16(1):89-108.

However, housing is a unique commodity sold and rented in a widely fluctuating – and at times, volatile – market.[48] The cost of renting or purchasing a home varies with the size, quality and durability of the physical dwelling as well as the home's proximity to jobs and living resources (such as schools, retail and parks), and the overall neighborhood environment (safety, maintenance of nearby homes, etc.).[49] As such, it is not surprising to find that, in unregulated areas, housing quality inversely proportional to home affordability – older, more deteriorated homes filter down to populations of lower socio-economic status.[50]

In cases of extreme demand, however, the market system will favor those with increased buying power, leaving the poor with fewer options for affordable housing. "When the demand for affordable housing is greater than its supply, households have a limited number of choices. Individuals must either pay more than they can afford for housing, resort to lower quality housing, accept overcrowding, or move away to where costs are lower in order to stay within their economic means."[51]

The health repercussions of unaffordable housing include homelessness, overcrowding, displacement, segregation, and material poverty, which are described in more detail below.

Homelessness

The most extreme health consequence of unaffordable housing is the lack of secure shelter, or homelessness. There is a marked rate of increased morbidity and mortality among individuals lacking homes; "a 1994 study of children living in homeless shelters in Los Angeles found that the vast majority (78%) of homeless children interviewed suffered from depression, a behavioral problem, or severe academic delay."[52] "Among sheltered homeless men and women, age adjusted death rates are several times higher than in the general population."[53]

Homeless individuals seek refuge in temporary shelters or unoccupied, substandard buildings, which can pose numerous threats to health. Substandard housing "often lacks safe drinking water and hot water for washing, and often have ineffective waste disposal, intrusion by disease vectors (e.g. insects and rats)."[54]

Overcrowding

A common means for tenants or homeowners to reduce the cost of an unaffordable home is to increase the number of residents in the home in order to lower the economic burden per person. "Doubling up" also occurs when affordable housing does not meet demand. This leads to overcrowding, which can result in numerous adverse health effects.

Overcrowding can increase the risk for respiratory infections such as tuberculosis in adults and ear infection in children.[55] Poor sanitation, increased environmental noise, and risk of residential fires may

48 O'Sullivan A. (1993). Chapter 14: "Why Is Housing Different?" Urban Economics. Homewood, IL: Irwin.

49 O'Sullivan A. (1993). Chapter 14: "Why Is Housing Different?" Urban Economics. Homewood, IL: Irwin.

50 O'Sullivan A. (1993). Chapter 14: "Why Is Housing Different?" Urban Economics. Homewood, IL: Irwin.

51 Bhatia R, Minjares R, Ortega A. Oak to Ninth Health Impact Assessment. Chapter 5. Healthy Housing, page HH-7. Available at: http://ehs.sph.berkeley.edu/hia/O2N.HIA.C5.pdf. Accessed: December 11, 2006.

52 Zima BT, Wells KB, Freeman HE. Emotional and behavioral problems and severe academic delays among sheltered homeless children in Los Angeles County. American Journal of Public Health. February 1994; 84:260-264.

53 Barrow SM, Herman DB, Cordova P, Stuening EL. Mortality among Homeless Shelter Residents in New York City. American Journal of Public Health. 1999; 89:529-534.

54 Bhatia R, Minjares R, Ortega A. Oak to Ninth Health Impact Assessment. Chapter 5. Healthy Housing, page HH-7. Available at: http://ehs.sph.berkeley.edu/hia/O2N.HIA.C5.pdf. Accessed: December 11, 2006.

increase when the relative population of a household increases, placing particular burden on children. For instance, overcrowding can limit the space and quiet necessary for children to do homework.[56] A recent study showed that crowding and noise significantly increase chronic stress hormones in children from low-income families.[57]

Displacement

Involuntary displacement or relocation results when residents are no longer able to afford homes in areas or communities in which they already live. Residents who cannot afford their homes are forced to relocate away from jobs, schools, and relationships which bound them to their original residence.

Public health research has shown positive correlates between residential stability and health outcomes. One study linked residential stability in childhood with positive effects on self-rated health at midlife.[58]

Conversely, several studies have linked displacement with negative health outcomes. One longitudinal analysis showed that increased mobility during childhood is associated with adverse childhood events, including abuse, neglect, and household dysfunction.[59] The same study also linked increased relocation during childhood with the likelihood of smoking and suicide. "Another longitudinal study demonstrated that residential instability in childhood predicted the lifetime risk of depression and the timing and onset of depression."[60] Additional research from the fields of education and social science fields has demonstrated that frequent family relocation may lead to academic delay in children, school suspensions, and emotional and behavioral problems.[61]

Segregation

A common consequence of displacement that has been typical throughout United States history is residential segregation. Lack of affordable housing disproportionately affects poor and minority communities, who tend to be displaced to areas of concentrated racial inhabitation.[62] For a variety of reasons, the inability of the poor and specific minorities in the United States – particularly African-American populations – to access and purchase affordable homes has lead to ghettoization in numerous urban areas across America.[63]

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55 Krieger J, Diggins D. (2002). Housing and Health: Time Again for Public Health Action. American Journal of Public Health. 92(5):758-768.

56 Cooper M. (2001). Canadian Policy Research Networks Inc. Discussion Paper No. F-11. "Housing Affordability: A Children's Issue." Available at: http://www.cprn.com/en/doc.cfm?doc=176. Accessed: December 11, 2006.

57 Evans G, Marcynyszyn LA. Environmental Justice, Cumulative Environmental Risk, and Health Among Low- and Middle-Income Children in Upstate New York. American Journal of Public Health. 2004; 94:1942-1944.

58 Bures RM. Childhood residential stability and health at midlife. American Journal of Public Health 2003; 93:1144-1148.

59 Dong M. Childhood residential mobility and multiple health risks during adolescence and adulthood. Archives of Pediatrics and Adolescent Medicine. 2005; 159:1104-1110.

60 Gilman SE, Kawachi I, Fizmaurice GM, Buka L. Socio-economic status, family disruption and residential stability in childhood: relation to onset, recurrence and remission of major depression. Psychological Medicine. 2003; 33:141-1355.

61 Cooper M. (2001). Canadian Policy Research Networks Inc. Discussion Paper No. F-11. "Housing Affordability: A Children's Issue." Available at: http://www.cprn.com/en/doc.cfm?doc=176. Accessed: December 11, 2006.

62 Sampson RJ. (1999.) What "Community" Supplies. In: Urban Problems and Community Development. RR Donnelly and Sons, Harrisonburg, VA.

63 Massey D & Denton N. (1993). Chapters 2 and 4, pp. 17-59 and 83-114. "The construction of the ghetto" and "The continuing causes of segregation." In: American Apartheid: Segregation and the Making of the Underclass. Harvard University Press, Cambridge, MA.

The health impacts of residential segregation occur through complex social, environmental and economic interactions at both the individual and community-level. Racially segregated neighborhoods tend to have fewer institutional assets, such as schools, libraries and public transit than neighborhoods that are not racially segregated.[64] Environmentally-burdensome infrastructure, such as highways, power plants, polluting factories, waste sites, etc., tend to be located in close proximity to low-income, racially segregated residential areas, disproportionately compromising air quality, noise quality, soil and water quality for local residents.[65] Higher rates of violent crime, early mortality, and morbidity due to both infectious and chronic disease occur all around in racially or socioeconomically segregated communities.[66] [67] [68]

Material Poverty

Unaffordable housing is both a consequence and cause of poverty. For many residents for whom displacement and overcrowding is not a problem, financial distress may be "responsible for a large reduction in monetary allocation for other basic living needs such as food, medication and clothing."[69] It is commonly believed that housing should account for no more than 30% of a household's budget.[70] Nevertheless, a study by the Joint Center for Housing Studies of Harvard University showed that even households with incomes far larger than full-time minimum wage utilize over half of their income for housing.[71] Low paying jobs and high housing costs are the most frequently-cited reasons for hunger in American cities.[72]

High housing costs can create strains on economic and human resources within a household. Parents of children must negotiate multiple jobs, childcare, and the costs associated with raising a family (healthy, nutritious foods, ample outdoor play and exercise, etc.) in addition to high housing costs. When a disproportionate amount of family expenses goes toward housing, ability to provide essential needs is compromised. This results in multiple negative health outcomes in children. Time-pressured parents may choose either more punitive or low-effort strategies to resolve conflict with children.[73] Furthermore, studies have shown that children from low-income families without subsidies for housing were eight times more likely to experience retarded growth than children whose families had subsidies for housing, an effect due to poor nutrition.[74]

Financial strain is a common source for stress, which, as previously mentioned, can be responsible for a host of negative health outcomes.

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66 Acevedo-Garcia D, Lochner KA, Osypuk TL, Subramanian SV. Future Directions in Residential Segregation and Health Research: A Multilevel Approach. American Journal of Public Health. 2003; 93:215-221.

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68 Williams DR & Collins C. Racial residential segregation: a fundamental cause of racial disparities in health. Public Health Reports. 2001; 116:404-416.

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Community Cohesion

> "While typically seen in geographic terms communities may be based instead on shared interests or characteristics, such as ethnicity, sexual orientation or occupation (Fellin 2001). Communities have been defined as (1) functional spatial units that meet basic needs for sustenance, (2) units of patterned social interaction, and (3) symbolic units of collective identity (Hunter 1975). Eng and Parker (1994) add a fourth political definition of community: people coming together to act politically to make changes."[75]

The value of social interaction within a community is invaluable, and the constitution of neighborhoods is fundamental to community cohesion. When communities consist of supportive social networks and residents hold a sense of collective efficacy, communities are better able to address community-wide health issues, including promoting factors that improve health and fighting health threats.[76] Community cohesion and social capital, variably described as "a resource that helps us and our constituents act to solve problems, from the everyday to the crisis level," or "a collective good or resource possessed by a social system that helps the system as a whole to solve problems," have been linked with numerous positive health outcomes.[77] [78] A variety of studies have shown that "an equitable sharing of societal resources – social, economic, political – translates into a lower burden of mortality for all members of the community."[79] It has also been demonstrated that "social involvement and participation can themselves be significant psychosocial factors in improving perceived control, individual coping capacity, health behaviors and health status."[80]

Along with transportation, education, and access to health insurance, housing is one of a number of factors that together contribute to community health. Housing is linked with neighborhood safety, access to goods and services, and community interaction, all factors that contribute to community cohesion. A report by the Greenlining Institute has outlined the many ways that decent, affordable housing contributes to health and community.[81]

Chapter 11 provides an extensive assessment of how community factors such as social cohesion, collective efficacy and social capital can influence health.

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75 Minkler M & Wallerstein N. (2005). "Improving Health through Community Organization and Community Building: A Health Education Perspective." In: Community Organizing and Community Building for Public Health. New Brunswick, NJ: RutgersUniversity Press.

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79 Ibid.

80 Minkler M and Wallerstein N. "Improving Health Through Community Organization and Community Building: A Health Education Perspective." In: Minkler M (Ed.). (2005). Community Organizing and Community Building for Health. New Brunswick, NJ: Rutgers University Press.

81 The Greenlining Institute. Housing: The Foundation for Individual and Community Health. Bridges to Health Program. Available at: http://www.calendow.org/reference/publications/pdf/disparities/TCE1209-2002_Housing_The_Fo.pdf. Accessed: December 12, 2006.

C. Established Standards and Health Objectives

Numerous housing standards and laws help to regulate the safety and health of homes for residents, neighbors and construction workers. There are also a number of agencies and organizations wishing to improve housing in the United States, with goals and objectives aimed to improve American housing quality and accessibility. Standards and objectives relevant to the MacArthur BART Transit Village are named below.

National

Healthy People 2010 National Health Objectives:[82]

- Goal 8-11: Eliminate elevated blood lead levels in children
- Goal 8-16: Reduce indoor allergen levels
- Goal 8-19: Increase the number of new homes constructed to be radon resistant
- Goal 8-23: Reduce the proportion of occupied housing units that are substandard

US Department of Housing and Urban Development[83]

- A: Increase homeownership opportunities
  - A1: Expand national homeownership opportunities
  - A2: Increase minority homeownership
  - A5: Help HUD-assisted renters become homeowners
  - A6: Keep existing homeowners from losing their homes
- B. Promote decent affordable housing
  - B1: Expand access to and availability of decent, affordable rental housing
  - B3: Improve housing opportunities for the elderly and persons with disabilities
- C. Strengthen communities
  - C2: Enhance sustainability of communities by expanding economic opportunities
  - C3: Foster a suitable living environment in communities by improving physical conditions and quality of life
  - C4: End chronic homelessness and move homeless families and individuals to permanent housing
  - C5: Address housing conditions that threaten health
- F. Promote participation of faith-based and community organizations
  - F3: Encourage partnerships between faith-based/community organizations and HUD grantees and subgrantees

State

State of California Department of Housing and Community Development[84]

- Goal 1: Ensure local governments "take care of their own" by providing an adequate housing supply in an efficient land use pattern while minimizing impacts on valuable habitat and productive farmland.
- Goal 2: Remove barriers to increasing overall housing supply.
- Goal 4: Ensure the safety and health of residents in manufactured housing.
- Goal 5: Strengthen communities by attracting, expanding and retaining business and jobs in California.

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82 United States Department of Health and Human Services Healthy People 2010. Objectives for Improving Health (Part A: Focus Areas 1-14). Available at: http://www.healthypeople.gov/document/tableofcontents.htm#parta. Accessed: December 11, 2006.

83 United States Department of Housing and Urban Development. HUD Strategic Plan. FY 2006-2011. Available at: http://www.hud.gov/offices/cfo/reports/hud_strat_plan_2006-2011.pdf. Accessed November 29, 2006.

84 State of California Department of Housing and Community Development. Mission: Strategic Plan and Performance Management System. Available at: http://www.hcd.ca.gov/mission.html. Accessed: December 11, 2006.

(State, Continued)
California Housing Code, Division 13, Part 1.5 offers regulation for Buildings Used for Human Habitation[85]

Municipal

City of Oakland Community and Economic Development Agency (CEDA) Fair Housing Planning: Analysis of Impediments to Fair Housing in Oakland Conclusions & Recommendations, June 2005 [86]

- Recommendation A: Increase affordable housing
- Recommendation B: Increase pre-development community-outreach and improve public engagement processes in housing development projects
- Recommendation C: Eliminate discrimination in the sale and rental of housing
- Recommendation D: Eliminate discrimination in mortgage lending
- Recommendation E: Increase minority homeownership
- Recommendation F: Eliminate discrimination in land use and zoning practices
- Recommendation G: Improve Oakland Housing Authority practices
- Recommendation H: Distribute housing assistance resources more equitably across Oakland

City of Oakland Community and Economic Development Agency (CEDA) Consolidated Plan for Housing and Community Development, July 1, 2005 – June 30, 2010 Strategic Plan.[87]

- Expand the Supply of Affordable Rental Housing
- Preserve the Supply of Affordable Rental Housing
- Expand the Supply of Affordable Ownership Housing
- Expand Ownership Opportunities for First Time Homebuyers
- Improve the Existing Housing Stock
- Provide Rental Assistance for Extremely Low and Low Income Families
- Provide Supportive Housing for Seniors and Persons with Special Needs
- Remove Impediments to Fair Housing

Their priorities were laid out in Table 14 of the Consolidated Plan and are included here:

Table 14
Priorities for Housing Assistance 2005-2010

	Renters				Owners			Homeless Persons		Non-Homeless Persons with Special Needs
	Elderly 1&2 Member Households	Small, Related Households (2 to 4)	Large Related Households (5 or more)	All Other Households	Existing Homeowners	First-Time Homebuyers: With Children	First-Time Homebuyers: All Others	Individuals	Families	
A. Household Income										
1. Extremely Low 0 to 30% MFI	M	M	M	M	M	L	L	H	H	M
2. Low 31 to 50 % MFI	H	H	H	M	H	M	M			
3. Moderate 51 to 80% MFI	M	H	H	L	M	H	H			
B. Activity										
1. Acquisition	S	S	S	S				S	S	S
2. Rehabilitation	S	S	S	P	P	S	S	S	S	S
3. New Construction	P	P	P	S		P	P	S	P	P
4. Rental Assistance	P	P	P	S				P	P	P
5. Homebuyer Assistance						P	P			
6. Support Facilities & Services	S			S		S	S	P	P	P

Priorities
H = High--City will provide funding
M=Medium--City may provide funding if other funds can be leveraged
L=Low--City not likely to fund but will support applications for other funds
Activities:
P=Primary
S=Secondary

85 State of California Legislative Counsel. Official California Legislative Information. Available at: http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=17001-18000&file=17920-17927. Accessed: December 11, 2006.

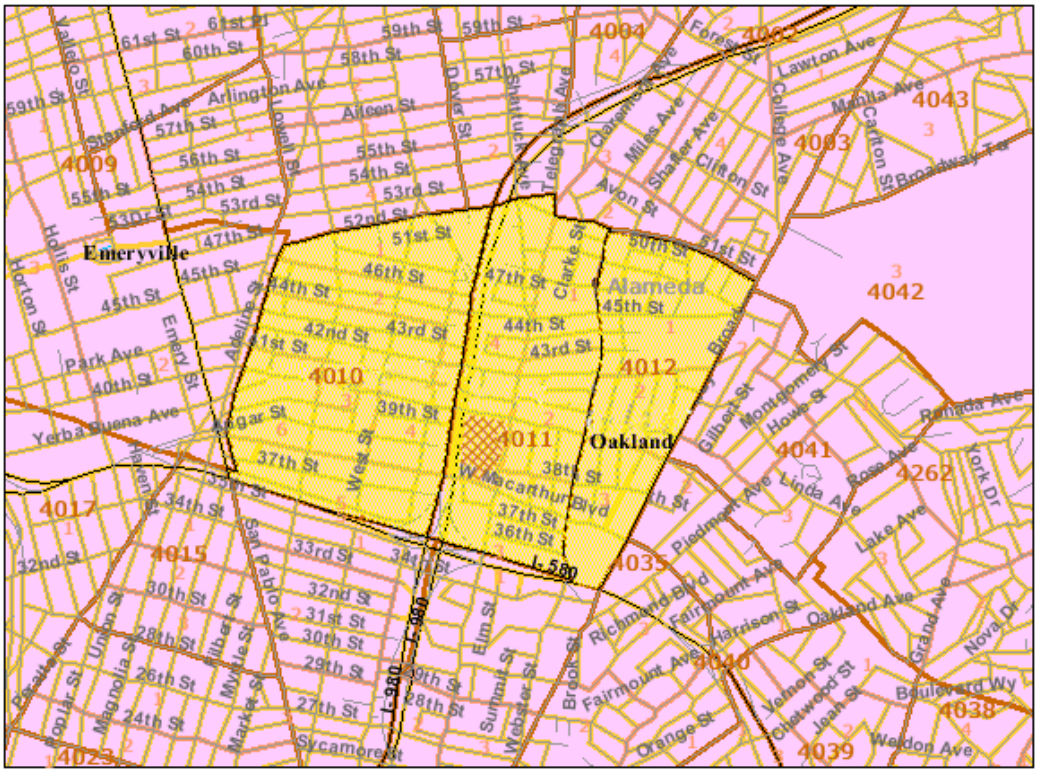
86 City of Oakland Community and Economic Development Agency (CEDA). Fair Housing Planning: Analysis of Impediments to Fair Housing. June 2005. Available at: http://www.oaklandnet.com/government/hcd/policy/docs/AI_2005.pdf. Accessed: December 11, 2006.

87 City of Oakland Community and Economic Development Agency (CEDA). (May 13, 2005). Consolidated Plan for Housing and Community Development. July 1, 2005 – June 30, 2010. Available at: www.oaklandnet.com/government/hcd/policy/docs/conplan2005-10.pdf. Accessed: December 11, 2006.

D. Existing Conditions

Geography

The MacArthur BART Station is located in central Oakland, between 40th Street and MacArthur Avenue and bounded by the 880/24 Highway to the west and Telegraph Avenue to the east. The area designated for the proposed development project is currently occupied by a large parking lot for BART passengers, as well as several residential and commercial buildings lining MacArthur Boulevard, Telegraph Avenue and 40th Street. Surrounding neighborhoods include the 4010, 4011 and 4012 Census Tracts, as illustrated below.



The Greater Mac Arthur BART Area

Age of Area Housing Stock

Current housing in the greater MacArthur BART Area (census tracts 4010, 4011, and 4012, illustrated above) dates back to the 1950s; over 54% of the housing stock in the area was built before 1939. The average dwelling unit in the Greater MacArthur BART Area was built in 1941 and has four rooms.

GREATER MacARTHUR BART AREA HOUSING STOCK

2000 US Census SF3 Data

Block Group	Area Land (Sq. Meters)	*DATE UNITS BUILT*									Median Year Structure Built
		Pre-1939	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990-1994	1995-1998	1999-March 2000	
4010.001	216,999	167	88	101	10	0	0	0	0	0	1942
4010.002	138,730	218	40	43	45	0	18	0	0	0	1939
4010.003	240,223	188	154	119	31	52	23	0	0	0	1946
4010.004	138,801	180	50	62	0	17	0	0	0	0	1939
4010.005	217,873	150	34	143	60	33	7	0	0	0	1952
4010.006	214,035	298	19	72	20	26	0	0	8	0	1939
4011.001	163,147	230	24	41	20	10	0	7	0	0	1939
4011.002	182,947	495	143	62	34	13	0	0	0	0	1939
4011.003	204,576	215	115	58	44	7	0	5	7	0	1941
4011.004	329,778	217	148	66	40	5	17	0	16	0	1943
4012.001	331,806	316	69	40	26	32	5	0	0	0	1939
4012.002	145,048	235	49	59	7	20	21	0	0	0	1939
4012.003	183,805	208	53	36	15	19	0	0	0	0	1939
Total*	2,707,768	3117	986	902	352	234	91	12	31	0	N/A
Average*	208,290	240	76	69	27	18	7	1	2	0	1941
% Total	N/A	54%	17%	16%	6%	4%	2%	0%	1%	0%	N/A
Minimum	138,730	150	19	36	0	0	0	0	0	0	1939
Median*	204,576	217	53	62	26	17	0	0	0	0	1939
Maximum	331,806	495	154	143	60	52	23	7	16	0	1952

Housing Occupancy

Year 2000 census data indicate that approximately 30% of all housing units in the Greater MacArthur BART Area are occupied by their owners. Rents in the area range from approximately $500 to $900, averaging at $690 per unit. There was a vacancy rate of 5% at the 2000 census, while approximately 6% of households in the area reported more than one occupant per room.

GREATER MacARTHUR BART AREA HOUSING OCCUPANCY DATA

2000 US Census SF1 Data

Block Group	Housing Units	Units Occupied	Units Vacant	Median Rooms per Unit**	Owner Occupied	% Owner Occupied *	Renter Occupied	% Renter Occupied *	Median Gross Rent
4010.001	350	328	22	4.2	113	34%	215	66%	$ 589
4010.002	379	365	14	4.6	138	38%	227	62%	$ 763
4010.003	558	531	27	4.8	221	42%	310	58%	$ 703
4010.004	311	291	20	3.7	57	20%	234	80%	$ 495
4010.005	427	375	52	3.2	82	22%	293	78%	$ 513
4010.006	450	409	41	4.7	129	32%	280	68%	$ 589
4011.001	341	329	12	4.7	103	31%	226	69%	$ 879
4011.002	735	701	34	3.5	110	16%	591	84%	$ 724
4011.003	455	424	31	3.1	76	18%	348	82%	$ 663
4011.004	508	487	21	3.3	66	14%	421	86%	$ 678
4012.001	503	491	12	4.6	224	46%	267	54%	$ 896
4012.002	404	392	12	4.2	117	30%	275	70%	$ 784
4012.003	330	317	13	3.4	56	18%	261	82%	$ 694
Total*	5751	5440	311	52	1492	N/A	3948	N/A	N/A
Average*	442.38	418.46	23.92	4.0	114.8	28%	30369%	72%	$ 690
Minimum	311	291	12	3.1	56	14%	215	54%	$ 495
Median*	427	392	21	4.2	110	30%	275	70%	$ 694
Maximum	735	701	52	4.8	224	46%	591	86%	$ 896

* = calculated from US Census data

** = SF3 data

Mac Arthur BART Area Demographics

Overall, residents of the Greater Mac Arthur BART Area comprise a racially diverse mix. Over the three census tracts, nearly 50% of residents are African-American, followed by 30% White, 10% Hispanic or Latino and 10% Asian. However, in some areas, concentrations of racial and ethnic groups exist on a neighborhood-by-neighborhood basis – while the highest concentration of Asians can be found in block group 3 of tract 4011, a great portion of tract 4010 – the area west of the proposed BART project – is nearly 75% African-American, and tract 4012 – the area closest to the hills – is predominately comprised of White residents (at approximately 60%). Geographic distribution of Hispanic/Latino ethnicity populations was not investigated. Most residents of the Greater MacArthur BART Area are families, while 39% of the local population is single. The average family consists of 3 people. Nearly 70% of the population is age 25 or older. Residents of the Greater MacArthur BART Area are of relatively low socio-economic status. The area shows an overall 30% poverty rate, distributed fairly evenly over the three tracts. Annual salaries in the area range from $16,641 to $60,583, averaging at $30,825.

GREATER MacARTHUR BART AREA DEMOGRAPHIC INFORMATION

2000 US Census SF1 Data

Block Group	Total Pop	% Pop Adult (Over Age 25) **	% Pop White Alone *	% Pop Black Alone *	% Pop AmInd Alone *	% Pop API *	% Pop Other *	% Pop Mixed*	House-holds (HH)	Fam-ilies	Ave. Fam Size	Pop in Fam-ilies *	Pop Single *	% Fam-ilies *	% Single-tons *	*INCOME* 1999 Median HH Income	% Poverty *
4010.001	788	61%	14.0	74.6	0.3	4.6	3.0	3.3	328	191	3.05	583	205	73.93	26.07	$ 25,881.00	15%
4010.002	902	59%	13.2	74.7	0.3	4.1	2.8	4.9	365	202	3.14	634	268	70.32	29.68	$ 31,863.00	26%
4010.003	1328	68%	16.3	67.9	0.5	5.6	3.0	6.6	531	305	3.16	964	364	72.58	27.42	$ 33,409.00	27%
4010.004	685	66%	13.9	69.3	1.6	7.0	2.9	5.3	291	129	3.41	440	245	64.22	35.78	$ 16,641.00	53%
4010.005	1055	63%	8.2	73.9	0.2	7.1	5.5	5.1	375	245	3.33	816	239	77.33	22.67	$ 22,148.00	45%
4010.006	951	72%	13.7	68.1	0.2	10.4	4.0	3.6	409	201	3.15	633	318	66.58	33.42	$ 26,183.00	20%
4011.001	707	66%	54.2	24.3	1.0	8.5	4.1	7.9	329	125	2.95	369	338	52.16	47.84	$ 41,630.00	11%
4011.002	1244	80%	54.3	27.2	1.4	6.3	3.5	7.2	701	185	2.64	488	756	39.26	60.74	$ 33,073.00	16%
4011.003	963	77%	25.1	35.0	0.8	25.6	8.1	5.3	424	175	3.47	607	356	63.06	36.94	$ 34,120.00	19%
4011.004	1093	61%	29.0	43.2	0.8	12.3	8.1	6.6	487	209	2.99	625	468	57.17	42.83	$ 25,450.00	31%
4012.001	1050	71%	60.3	22.0	0.3	8.7	2.7	6.1	491	231	2.65	612	438	58.30	41.70	$ 60,583.00	13%
4012.002	772	78%	62.8	15.4	0.0	11.8	3.1	6.9	392	131	2.76	362	410	46.83	53.17	$ 44,219.00	11%
4012.003	610	74%	42.0	31.0	0.5	15.9	5.4	5.2	317	87	3.02	263	347	43.07	56.93	$ 36,375.00	70%
Total*	12148	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5440	2416	N/A	7395	4753	N/A	N/A	N/A	N/A
Average*	934	69%	31.29	48.21	0.61	9.84	4.33	5.69	418	186	3.06	569	366	N/A	N/A	$ 30,827.64	30%
Minimum	610	59%	8	15	0	4	3	3	291	87	2.64	263	205	39.26	22.67	$ 16,641.00	11%
Median*	951	68%	25	43	0	8	4	5	392	191	3.05	607	347	63.06	36.94	$ 33,073.00	20%
Maximum	1328	80%	63	75	2	26	8	8	701	305	3.47	964	756	77.33	60.74	$ 60,583.00	70%

* = calculated from US Census data

** = SF3 data

% of Total in a Family * = 61%

% of Total Single * = 39%

GREATER MACARTHUR BART AREA - Additional Census Info

Tract	Hispanic or Latino	% of HH with >1 Occupant per Room
4010	547	9.80%
4011	472	7.30%
4012	185	1.30%
Total	1204	N/A
Average	401	6%
Oakland Total	12104	N/A
% of Oakland	10%	N/A

Housing Affordability in Oakland

A range of data sources suggest City of Oakland currently has significant unmet housing affordability needs.

According to the Department of Housing and Urban Development, housing costs are considered high relative to income when they exceed 30% of household income. Spending over 50% of income on housing reflects a severe cost burden. According to the National Low Income Housing Coalition, a household making the median income in the Oakland-Fremont Metropolitan Area needs to spend 60% of its income to afford a fair market rent of $1250 for a 2 bedroom apartment. [88] This fair market rent reflects 142 hours of work per week at the minimum wage or 58 hours of work per week at the typical renter's wage.

The situation in the City of Oakland is consistent with the metropolitan area. Using 2000 Census data the City of Oakland recently concluded that in Oakland 40,000 renters earn less than $30,000/year and 20,000 pay more than 50% of income for rent.[89] The City's analysis also showed that 21% of households were overcrowded and 14% severely overcrowded. Furthermore, a large numbers of renter families are in substandard housing.

Area housing affordability needs are dependent on the proportion of area households with low income. A low-income household is defined by U.S. Department of Housing and Urban Development (HUD), based on median income for Oakland–Fremont metropolitan area. The table below illustrates 2006 thresholds for different categories of low income. On average, household income in Oakland is lower than that for the metro area as a whole. According to the US Census, the 2000 median household income for Oakland was $40,055 relative to the current area median income of about $83,000. Over half of all Oakland households qualified as very low or low income and 37% qualified as very low income. The map below illustrates the spatial distribution of low-income household in Oakland, illustrating a significant economic gradient moving from flatlands to hills.

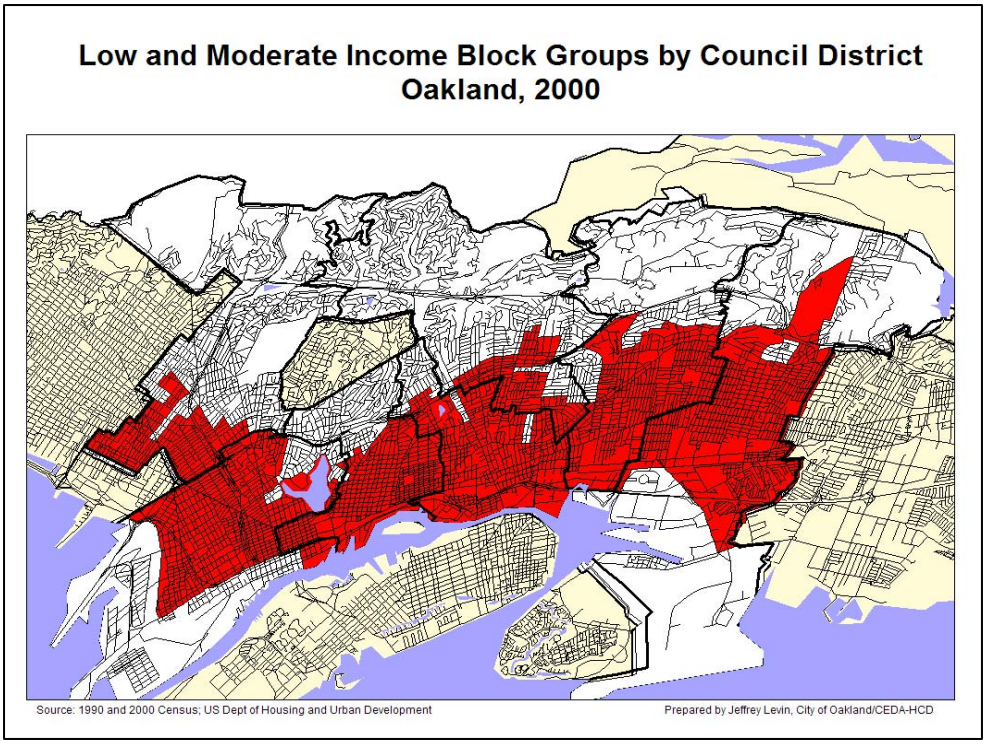
	Household Size (number of persons)					
Income Level	**1**	**2**	**3**	**4**	**5**	**6**
Extremely Low	$17,600	$20,100	$22,650	$25,150	$27,150	$29,150
Very Low	$29,350	$33,500	$37,700	$41,900	$45,250	$48,600
Low	$46,350	$53,000	$59,600	$66,250	$71,550	$76,850
Median	$58,700	$67,000	$75,400	$83,800	$90,500	$97,200

[88] Out of Reach 2006. National Low Income Housing Coalition.
89 Jeff Levin. City of Oakland Community Economic Development Agency. 2006

The lower household incomes of Oakland residents mean that available housing creates is unaffordable or results in housing cost burdens for many. For example, according to the City of Oakland, the Fair Market Rent for a two-bedroom apartment is $1,238, which requires an income of at least $49,000. Similarly, purchasing a $400,000 house requires an income of over $90,000 in addition to a down payment.

Renters have particular vulnerability to market trends in housing costs. Based on an analysis done by the Oakland Tenant's Union in 2004,[90] City of Oakland currently has significant unmet needs for renters.

- 63% of Oakland renters are currently unable to afford a 2-bedroom apartment in Oakland at the fair market rate of $1,420/month.[91]



- 42% of renters and 33% of owners pay more than 30% of their income for housing. And among renters with incomes of less than $35,000, about 70% of them pay more than 30% of their income towards rent. (2003 DHE)
- Waiting lists for assisted housing for seniors, disabled, and families range from 6 months to 2 years
- Waiting lists for Section 8 vouchers currently range between 3 and 5 years, with an anticipated increase based upon new federal policies.[92]

Regional Housing Needs and Oakland Housing Production

90 Margaretta Lin and Carol Chacon. The Coalition To Protect Rental Housing Report And Analysis Of Proposed Changes To Oakland's Condominium Conversion Ordinance: Impacts On Affordable Housing And Low-Income Tenants. East Bay Community Law Center 2004. Available at: http://www.oaklandtenantsunion.org/condos/EBCLC_Report_20040525.doc

91 National Low Income Housing Coalition, "Out of Reach 2003: America's Housing Wage Climbs".

92 New HUD policies will severely reduce the amount of Section 8 vouchers funded. National Low Income Housing Coalition, April 30, 2004 Advisory.

In the context of regional and State population growth, the production of new housing is necessary to meet the needs for adequate housing. In California, under Government Code Section 65584, local jurisdictions are required to provide fair share of their regions expected need for housing at all levels of affordability. [93] According to the State Department of Housing and Community Development, there was a regional need for 230,743 new housing units in the nine Bay Area counties from 1999—2006. Of that amount, at least 58 percent, or 133,164 units, were needed for moderate, low and very low-income households. In order to achieve RHND targets Cites are obligated by the state to develop a Housing Element (a mandatory element of the General Plan) to identify policies and implementation actions. Housing production in Oakland in the most recent RHND period (1999-2006) is enumerated in the table below. As of June 2005, Oakland had already exceeded market-rate housing obligations for 1999-2006 by seventy-seven percent based on building permits issued.[94] In contrast, Oakland has only met 18%, 57%, and 8% of its current RHND obligation for very-low, low and moderate income households, respectively.

93 The Regional Housing Needs Determination (RHND) process is a State mandate devised to address the need for and planning of housing across a range of affordability in all communities throughout the State. HCD provides regional housing numbers or "goal numbers" that specify the regions' share of the state's housing need. It is the responsibility of the Association of Bay Area Governments (ABAG) to determine the fair share of regional housing need for each city and county within the San Francisco Bay Area region. The law further states that "[T]he share of a city or county of the regional housing needs includes the share of the housing need of persons at all income levels within the area significantly affected by a general plan of the city or county."

94 Levin, J. Workforce Housing Annual Progress Report on Implementation of the Housing Element. City of Oakland. CEDA December 2005.

Oakland's Housing Production Compared to Regional Housing Needs Determination (RHND) for 1999-2006[95]

State Identified Affordability Categories	1999-2006 RHNA	City of Oakland Housing Permits Issued			
			Jul 1, 2004 – Jun 30, 2005		
		Jan 1, 1999 – Jun 30, 2004	Unrestricted	Deed Restricted	Total
Very Low (up to 50% AMI)	2,238	289	0	104	393
Low (51- 80% AMI)	969	419	0	136	555
Moderate (81-120% AMI)	1,959	152	0	3	155
Above Moderate (> 120% AMI)	2,567	3,650	903	0	4,553
Total	**7,733**	**3,727**	**746**	**37**	**5,656**

95 Ibid.

E. Impact Analysis

Considering the various pathways between housing and health this analysis aimed to answer the following questions with regards to the current plans for the MBTV development. Complete analysis of several health-relevant questions is not possible based on the available project information. The HIA of addressed some of questions below in other chapters.

Design
1. At minimum, does the design of the MBTV housing meet State Housing Law (California Housing Code, Division 13, Part 1.5)[96] and Regulation of Buildings Used for Human Habitation, including rules related to minimal sanitation, ventilation, usage of toxic building materials and noise levels?
2. Does the design of the MBTV go beyond these codes to further improve human health? If so, how? If not, how can it do so?
Maintenance
3. How will maintenance and upkeep of the housing units be handled over time? Are financing strategies for maintenance activities available? If so, how can these be safeguarded? If not, what can be done to obtain them?
4. What safeguards are assured to ensure that at minimum, housing codes are met in the long term? If they are not available, how can they be added?
Location
5. How does the transit village nature of the housing impact health?
6. Is the location of the housing accessible to resident needs, such as retail, parks, and schools?
7. Is the location of the housing safe for residents, neighbors and visitors, including seniors, children, health sensitive populations (e.g. asthmatics), and physically disabled individuals (i.e. traffic safety, crime, air quality)?
8. Are safety measures in place for community-level incidents such as violent crime, natural disaster or terrorism?
Housing Supply and Affordability
9. Will the transit village help to meet the housing needs of area residents with regards to size, quality, and affordability? Will it meet these needs for Oakland residents? Regional area residents?
10. Will the project provide low income home ownership opportunities?
11. Will MBTV lead to displacement of people, either directly or indirectly?

96 State of California Legislative Counsel. Official California Legislative Information. Available at: http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=17001-18000&file=17920-17927. Accessed: December 11, 2006.

Social Cohesion
12. How will the proposed housing design and capacity impact social capital of both existing and possible new residents in the area?
13. Will the proposed housing contribute to stability of community in the area – will most residents be transient or long-term?
14. Will the proposed housing contribute to sustainable local economic development to maintain or improve quality of life, safety, and capital within the area; i.e., will local residents be able to meet job needs in the local area, will residents patronize local businesses, etc.?

Description of the Proposed Development

The proposed MBTV development would be the largest housing development in the greater MacArthur BART Area in nearly a decade. The current proposal calls for "518-625 units of high density multi-family housing, of which approximately 20% (103-125 units) will be below market rate rental and the remainder will be for-sale condominiums."[97] Units will be approximately 900 square feet in size and house between 1 and 2 bedrooms.[98] The residential buildings will range from 4-6 stories in height with retail on the ground floor; one building – the one closest to Highway 24 – will substitute retail for BART parking. A multi-story residential tower proposed in a previous iteration of the plan was removed in October 2006.

To accommodate the new development, several existing buildings in the area will be demolished. Development proposal maps show that a few buildings on the corner of MacArthur and Telegraph, as well as one building on the corner of Telegraph and 40th, will remain.[99] All of the proposed MBTV development will occur in the MacArthur BART Area described above, and will not extend into surrounding neighborhoods.

Design

California State Housing Law includes several health-based building regulations for new construction. At the time of this Health Impact Assessment, information pertaining to the design of MacArthur BART Transit Village was not sufficient to assess compliance of with existing State or Local Housing Law.

Nevertheless, there are a number of emerging issues in environmental health that are not addressed through existing regulations. For example, the close proximity between the residences and the highway increases the hazards for respiratory disease among residents, and ventilation and filtration systems may be required to offset poor air quality and in noise control to reduce errant noise from traffic. Detailed information regarding noise levels and air quality are available in Chapters 8 and 9.

Allergens and multiple chemical toxicities can be prevented through careful selection of building materials (e.g., smooth floor surfaces reduce the accumulation of dust mites which are known allergens and

97 City of Oakland Community and Economic Development Agency (CEDA). (October 2006). MacArthur Village Transit Project Information Sheet. Available at: http://www.oaklandnet.com/government/ceda/revised/planningzoning/majorprojectssection/MacArthurTransitVillageProjectInformation.pdf. Accessed: December 12, 2006.

98 Personal communication, Kim Gilhuly and MacArthur Transit Associates.

99 City of Oakland Community and Economic Development Agency (CEDA). (October 2006). MacArthur Village Transit Project Information Sheet. Available at: http://www.oaklandnet.com/government/ceda/revised/planningzoning/majorprojectssection/MacArthurTransitVillageProjectInformation.pdf. Accessed: December 11, 2006.

triggers fro asthma) and installation of proper ventilation and temperature regulation systems. Choosing LEED-certified green building options can prove to be both economically- and environmentally-efficient.

Lead is currently banned in construction materials; however, lead may be released into the environment through demolition of exiting structures. Lead dispersed in the course of redevelopment might affect neighborhood soil or water, impacting the overall quality of community health. Dust mitigation best practices and, where appropriate, air quality monitoring should be carried out during the demolition of existing buildings in the MBTV area, as lead, asbestos and other hazardous particulates may be released during the demolition process.[100]

The City estimates up to two-thirds of the existing housing units in Oakland could contain lead based paint.[101] Providing lead hazards testing and removal in the region surrounding the MBTV Project would be an additional action to help to improve health in the greater area, improve neighborhood quality, and subsequently, quality of life at the MBTV.

As the Transit Village project plans change and develop, it is recommended that stakeholders use the time before finalization of the design as an opportunity to carefully consider the important factors involved in the pathway between housing design and health. Careful consideration of physical layout, ventilation and climate regulation, lighting, noise regulation, and building material choices can help to build health into future revisions and creations of MBTV design.

Maintenance

Planning documents at this stage do not include plans for maintenance and repair of MBTV after its construction and were not available for this Health Impact Assessment. It is recommended that budgetary information be reviewed to ensure that maintenance and repair financing is available and sufficient to maintain healthy residences at MBTV in order to safeguard the health of MBTV residents and neighbors over time.

Also, it is noteworthy that housing stock in the area surrounding MBTV is relatively old. Encouraging proper maintenance and repair of the homes in the surrounding neighborhood can not only increase health outcomes for neighbors, it can help to raise and maintain property values of the homes in the overall area.

Location

Located in the northern-central part of Oakland, which itself is situated in the geographic center of the San Francisco Bay Area, the MacArthur BART Transit Village area has great potential for offering residents access to a wealth of resources in the greater region, including increased access to jobs, while reducing reliance on automobiles, and facilitating physical exercise.

Due to the convenience of the BART, residents will have excellent commuting access to jobs extending from Fremont to Daly City to Pleasanton to Pittsburgh. Proximity to AC Transit lines will also provide residents good access to jobs and resources within Oakland on the bus line. Retail establishments located at the MBTV may also serve as a source for employment of local residents, although job variety at the site may be limited and salaries relatively low. This can be mitigated through careful selection of

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100 London Councils, the Greater London Authority, the Building Research Establishment and the PRECIS Working Group. (November 2006). The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance. London: The Greater London Authority.

101 City of Oakland Community and Economic Development Agency (CEDA). Fair Housing Planning: Analysis of Impediments to Fair Housing. June 2005. Available at: http://www.oaklandnet.com/government/hcd/policy/docs/AI_2005.pdf. Accessed: December 11, 2006.

retail and other business establishments chosen to occupy the MBTV site. Access to good jobs is important for health because good jobs translates to increased earnings and subsequently greater opportunities for health, from increased quality of food and childcare to greater access to healthful activities, such as gyms and recreational equipment.

Proximity to a major transit source also may reduce local residents' reliance on automobiles. Reduced reliance on automobiles may reduce driving in the area, which might help to improve local air quality and offset vehicular and pedestrian accidents that can cause injuries and take lives. Less driving might also result in less driving-related stress and anxiety. However, though proximity to excellent mass transit resources discourages driving, ample parking for residents may encourage driving. Reducing the number of parking spots available to MBTV residents may discourage residents from owning cars, which will help not only to reduce driving in the area, but may also result in cost savings for BART, the developer and MBTV residents. See Chapter 3 on Transportation for a discussion of effects on transportation mode choices.

Cutting back on driving and encouraging public transit in a high-density, multiple-use area also encourages people-powered strategies of transportation, including walking and biking, that have numerous health benefits. To further encourage such means of transit, the MBTV developers could ensure that ample bicycle parking be provided both to local residents and to visitors in the area, including BART patrons, shoppers, and local employees. A Bike Station similar to the one in Downtown Berkeley could be an appropriate *transit-first* substitute for reduced parking spaces for local residents.

The MBTV's proximity to local highways is double-edged – while providing convenient access to residents who might need to drive to work or in transporting children, highway convenience might result in increased driving, and subsequently increased injuries, stress, and reduced exercise. Furthermore, poor air quality and high noise levels from highway traffic might jeopardize the health of MBTV residents, particularly those in the building above the garage, closest to the highway. Mitigations to improve air quality and reduce noise for these residents are addressed in the design section of this chapter and in Chapters 8 and 9.

Healthy communities thrive when local resources are available in addition to regional resources to sustain the daily needs of residents. Retail local to a residential area should include diverse and healthy food options, clothing, and a variety of living necessities for families and individuals. An analysis of retail impacts of the MBTV is available in Chapter 4. Chapter 5 details how area schools are key to the health of not only youth in the area, but also families and the community as a whole.

Meanwhile, nearby parks provide residents opportunities for physical exercise, recreation and relaxation, and community cohesion, each of which has numerous health benefits. A review of the health considerations that parks bring to the MBTV Project is available in Chapter 6.

The location of a home also contributes to the overall safety of its residents; safety services such as policing and fire preparation are essential for both natural and manmade disaster preparedness, furthermore, location can influence whether an atmosphere is conducive to safe behavior and reduced criminal activity. A pedestrian safety analysis of the MBTV Project is available in Chapter 7 and an analysis of community violence is in Chapter 10.

Effects on Housing Supply and Affordability

Although information for final and estimated costs of proposed sites was not available in time for this analysis, several conclusions using existing information can be drawn regarding how well the proposed housing at the MBTV site will meet area and regional needs.

Supply and Affordability

Given that very little housing currently exists on the MBTV site, the addition of any housing at this site will add to both the City and Regional housing supply. *With regards to the affordability of the units, the majority* of the units at the project will be sold for ownership at market rate and will not be affordable to most Oakland households. As documented in the current conditions section, above, a household earning the median income in Oakland cannot afford to purchase a typical market rate condominium.

The project site sits within an Oakland Redevelopment Zone, which requires that 15 percent of housing units developed in the associated redevelopment area be affordable to low income households, with 40 percent affordable to "very low income" households. The City of Oakland currently facilitates these BMR housing through incentives for developers, including density bonuses, tax exemptions and public subsidies. The City of Oakland Community and Economic Development Agency (CEDA) has worked with the MacArthur BART Transit Community Partners (the developer) to assure 20% BMR rental housing in the proposed MBTV development. This will result in between 103 and 125 affordable units available for rent at the MBTV site.

Notably, the price of market rate housing at the MBTV site should also be somewhat lower that comparable market rate dwellings as the developer will not need to purchase the land. BART intends to retain the land rights to the parcel and provide a long-term lease to developers. This strategy not only provides a long term investment for BART but it also eliminates the need for developers to raise capital and purchase the property. Typically, in multi-family construction, land costs comprise 10-20% of the total cost of producing housing. The production costs of housing should thus be significantly lower for MBTV than for a similarly situated project where the developers must purchase. The financial structure of the development can be viewed similar to a land trust where a public or non-profit entity retains land rights while allowing users of the property the rights to the improvements. While future residents will not own a share of the land rights, they will benefit by having to pay moderately lower housing prices.

Mac Arthur BART project contribution to Oakland's Share Regional Housing Needs Determination (RHND)

	Very-low	Low	Moderate	Market	Total
Oakland Share of RHND 1999-2006	2238	969	1969	2567	7743
Oakland Housing Permits Issued (June-05)	393	555	155	4,553	5656
Oakland Unmet Needs (2005)	1845	414	1814	-1986	2087
Percent Achievement of RHND	18%	57%	8%	177%	
Proposed Units		125		500	625
Contribution to RHND	0%	13%	0%	19%	

The table above disaggregates the project's housing production by affordability. As discussed above, table illustrates that Oakland has only met 18%, 57%, and 8% of its current RHND obligation for very-low, low and moderate income households, while exceeding RHND requirements for market rate housing by 77%. The **Mac Arthur BART** project would result in an additional 19% of the 1999-2006 production targets for market-rate housing, while producing only 0%, 13%, and 0% of very-low, low and moderate production goals. Given the area's demographics, few current area residents would be able to afford to live in the housing at the site.

Raising the percentage of BMR homes can greater accommodate the existing low-income community already in the area. Many of the current residents are also living in poverty – 30% of local residents are

below the poverty line – and 7% of the existing households are overcrowded. Increased affordability of homes in the local area may help to offset high living costs and reduce crowding.

As the percentage of affordable housing is typically a product of the public subsidy provided in Oakland,[102] increasing the funding available to subsidize affordable housing is an alternate means of increasing the percentage of BMR homes at the MBTV site. Increasing the residential density of the development might also make feasible a greater fraction of BMR housing and should also be investigated and pursued

Another way to increase BMR availability at the MBTV site is to require the developer to provide additional BMR units directly as a condition of development. This is similar to an inclusionary zoning requirement. In many other California jurisdictions, inclusionary zoning laws mandate that developers include a certain percentage of affordable housing units in the construction of new housing developments. Numerous cities in Northern California have affordable housing legislation in place – Pleasanton, San Mateo, South San Francisco and Berkeley have mandated 20% affordable housing in all new development and redevelopment initiatives, while Walnut Creek has set the bar to 25%.[103] [104] Oakland does not yet have an inclusionary zoning law; however, proposals for such laws are currently under study by the City Council.[105] By requiring the developer to provide 10-15% BMR units within the market rate structures, the City could supplement the 20% of units being provided using public subsidies.

Low Income Home Ownership Opportunities

According to current plans BMR units will only be available for rent, and not for sale.[106] While increasing the supply of affordable rental housing is an established City goal, offering BMR units for sale would also meet an established goal to expand the supply of affordable ownership housing. Furthermore, it may help to create wealth for already low-income individuals and families. Further investigation needs to be made into why BMR units are not offered for sale in order for worthwhile mitigations to be suggested. It is highly recommended that involved stakeholders consider ways to integrate BMR units for ownership into the MBTV housing.

Indirect Effects on Affordability and Displacement Risks

To help evaluate indirect effects on affordability and displacement risks, we reviewed housing characteristics and demographic and socioeconomic data in the Greater MacArthur BART Area (Census Tracts 4010, 4011, and 4012) and compared this information with demographic and socioeconomic indicators from the Metropolitan Transportation Commission Planning Section on residential areas within ½ mile of existing Bay Area Transit Villages. We also compared this information with data for the City of Oakland overall.

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102 Personal Communication. Professor Fred Collignon, UC Berkeley College of Environmental Design, Department of City and Regional Planning. Monday, October 30, 2006.

103 City of Oakland Community and Economic Development Agency (CEDA). (May 15, 2001). Council Agenda Report: Informational Report on Inclusionary Zoning for Affordable Housing. Available at: http://oaklandnet.com/government/hcd/policy/docs/inclusionary_zoning_info_5-15-01.pdf. Accessed: December 11, 2006.

104 Dickey L. (July 20, 2006). "Land Use Committee Settles on Inclusionary Housing Amendments." Available at: http://www.beyondchron.org/articles/Land_Use_Committee_Settles_on _Inclusionary_Housing_Amendments_3496.html. Accessed: December 11, 2006.

105 Calavita N, Grimes K, Mallach A. "Inclusionary Housing in California and New Jersey: A Comparative Analysis." Housing Policy Debate, 1997. 8(1):pp.109-142).

106 City of Oakland Community and Economic Development Agency (CEDA). MacArthur Transit Village Project Information Sheet, October 2006. Available at: http://www.oaklandnet.com/government/CEDA/revised/planningzoning/MajorProjectsSection/MacArthurTransitVillageProjectInformation.pdf. Accessed: December 11, 2006.

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Greater MacArthur BART Area as Compared with Regional Indicators		Greater MacArthur BART Area *2000 Census SF1*	San Francisco Bay Area Transit Areas *2000 MTC Study*	Overall Oakland *2000 Census SF1*
Race	Black	48%	8%	35%
	White	31%	46%	24%
	Asian	10%	23%	15%
	Hispanic	10%	17%	22%
Family Status	Families	61%	29%	57%
	Single	39%	71%	43%
Occupancy	Rent	72%	67%	57%
	Own	28%	33%	43%
SES	Poverty	30%	20%	20%

Comparisons of average demographic and socioeconomic characteristics of Bay Area Transit Areas with those of current MacArthur BART neighborhood residents show clear differences in racial composition, socioeconomic status and family composition. Current residents of the Greater MacArthur BART Area are predominately African-American, while residents in SF Bay Area Transit Areas are predominately White. The Greater MacArthur BART Area is comprised mostly of families, while Bay Area Transit Areas are predominately occupied by single people. Finally, the proportion of households living in poverty at San Francisco Bay Area Transit Areas is approximately 20%, the proportion in the Greater MacArthur BART Area is elevated at 30%.

If the development alters the area's demographics to look more like other existing transit villages in the greater region, the area is likely to have relatively fewer African-American residents, more White residents, more Asian residents, more Hispanic residents, and fewer families. The area may also see decreased poverty rates. Shifts could occur due to influx of residents to the MBTV development, efflux of residents in the greater area, or a combination thereof.

Alternatively, if new housing development results socioeconomic and demographic shift to reflect the City of Oakland characteristics overall, the MacArthur BART Area would see more Asian and Hispanic residents, fewer Black and White residents, a few more single residents, and an overall decrease in poverty.

In either scenario, it is clear that the creation of over 500 new housing units will result a demographic and socioeconomic shift of some sort in the MacArthur BART Area. As discussed, the MBTV would not be likely to provide long term home ownership opportunities for most existing area residents.

Table V. Demographic Characteristics by Proximity to Rail Stations and Ferry Terminals (Modified)							
Planning Section, Metropolitan Transportation Commission. *Characteristics of Rail and Ferry Station Area Residents in the San Francisco Bay Area: Evidence from the 2000 Bay Area Travel Survey: Volume I.* Page 13.							
				Proximity of Household to Rail Stations and Ferry Terminals			
	Demographic Characteristic			< 1/2 mile	1/2 mile to 1 mile	> 1 mile (urban)	Total
Household Income	Low (<200% Poverty Level)			20%	19%	16%	14%
	Medium (201%-500% Poverty Level)			33%	38%	44%	38%
	High (>500% Poverty Level)			47%	43%	40%	48%
Household Type by Tenure	Single-Family, Rent			12%	16%	17%	16%
	Single-Family, Own			29%	40%	38%	54%
	Multiple-Family, Rent			55%	41%	42%	28%
	Multiple-Family, Own			4%	3%	2%	2%
Household Life Cycle	Not Retired	No Children	One Adult	36%	24%	23%	20%
			Two or More Adults	26%	25%	21%	23%
	Not Retired	Children	One Adult	6%	7%	9%	6%
			Two or More Adults	23%	33%	36%	36%
	Retired	No Children	One Adult	5%	6%	4%	5%
			Two or More Adults	5%	6%	7%	10%
	Retired	Children	One Adult	Not Available	Not Available	Not Available	Not Available
			Two or More Adults	Not Available	Not Available	Not Available	Not Available
Race/ Ethnicity	White			46%	45%	33%	53%
	Hispanic/Latino			17%	20%	22%	16%
	Black/African American			8%	10%	12%	7%
	Asian/Pacific Islander			23%	19%	26%	17%
	Other			6%	6%	7%	7%

In-migration, growth, and resident economic diversity are not, by themselves, undesirable outcomes. An influx of wealthier residents and local population growth would create a more economically diverse resident composition and create some advantages to the health of all residents (see prior discussion on segregation and health). Furthermore, the MBTV development might catalyze home and property improvements in areas outside the project boundaries. A new market for diverse retail may both increase the quality and diversity of available goods and help catalyze neighborhood investment and beautification.

While such neighborhood change has some health and welfare benefits, it may also result in increased property values and rent inflation costs in the greater MacArthur BART Area, leading to existing residents getting priced out. The proposed development of the MBTV has already resulted in the purchase and planned development of several vacant lots in the Greater MacArthur BART Area by private developers. As the prices of homes and rental units in the Bay Area rise, homeownership becomes "increasingly difficult for moderate-income households and all but impossible for lower-income households."[107]

Solutions to such trade-offs associated with gentrification involve protecting social and economic diversity via mixed income housing and specific regulatory protections against displacement (e.g. replacement requirements for redevelopment of lower-income housing.) Several mitigations might cumulatively help to address concerns about possible displacement. In the case of MBTV, these mitigations might include:

- Offering more BMR units overall
- Offering BMR units for purchase
- Increasing unit size to accommodate larger families
- Replacement requirements for redevelopment of affordable rental properties

Second, the development team, together with CEDA, can work together with residents of the greater area to ensure that local residents are aware of the advantages of homeownership and ways to improve housing stock. Mitigations of the MBTV project design to open up the BART station to the West side of

107 City of Oakland Community and Economic Development Agency (CEDA). Fair Housing Planning: Analysis of Impediments to Fair Housing. June 2005. Available at: http://www.oaklandnet.com/government/hcd/policy/docs/AI_2005.pdf. Accessed: December 11, 2006.

the Greater MacArthur BART Area will provide residents all with the benefits and opportunities of developing the MBTV site.

Social Cohesion

The effects of the project on social cohesion and social exclusion are analyzed in Chapter 11.

F. Recommendations for Design and Mitigations

The MacArthur BART Transit Village development project offers numerous opportunities for health through housing to residents of the greater area, the City of Oakland, as well as the Bay Area. Most immediately, MBTV planning should take into consideration the needs of the local community with respect to basic safety in design and affordability. An overview of potential mitigations suggested in the analysis is available below.

1. Promote healthy air quality and noise levels within the housing units through proper ventilation and noise control design measures that reduce exposures from highway traffic
2. Select building materials and ventilation systems for housing units to reduce allergies and toxic exposures; LEED-certified green building options may be appropriate
3. Conduct lead screenings and removal in the Greater MacArthur BART Area to reduce possible community exposure to lead
4. Use best practices for air quality monitoring and dust regulation during the destruction of existing buildings to reduce exposure to toxins [108]
5. Ensure that enough money is set aside in the budget for proper maintenance and repair of future housing units over time
6. Incorporate Green Building design to create more energy efficient homes[109]
7. Use higher quality building materials to offset maintenance and repair costs down the road
8. Provide outreach to area residents with regards to public resources available for home maintenance and repair;
9. Un-bundle the sale of parking from the sale of housing units and reduce the number of parking spaces per household or overall parking spaces per development area[110]
10. Provide bicycle parking to residents, possibly in the form of monitored bike parking similar to the BikeStation in Berkeley
11. Increase the availability of affordable housing by requiring the developer to provide or fund BMR housing as a condition of development; or by providing a density bonus to the developer conditional on the provision of BMR housing
12. Increase the number of family-size housing units to accommodate local families
13. Explore ways to provide BMR units for sale

108 London Councils, the Greater London Authority, the Building Research Establishment and the PRECIS Working Group. (November 2006). The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance. London: The Greater London Authority.

109 Furman Center for Real Estate and Housing Policy. "Reducing the Cost of Housing Construction in New York City: 2005 Update." Available at: http://furmancenter.nyu.edu/CREUP_Papers/cost_study_2005/CostStudy_Chapters.html. Accessed 10/22/06.

110 San Francisco Planning & Urban Research Association. "Reducing Housing Costs by Rethinking Parking Requirements." Available at: http://www.spur.org/documents/981101_report_01.shtm. Accessed 10/22/06.

14. Integrate BMR with Market rate housing minimizing differences between the nature and the quality of units offered to low-income and market-rate units [111] [112]
15. Work together with local residents and property owners to improve housing stock using public housing improvement resources.

111 Personal Communication. Professor Fred Collignon, UC Berkeley College of Environmental Design, Department of City and Regional Planning. Monday, October 30, 2006.

112 Brophy PC and Smith RN. "Mixed Income Housing: Factors for Success." A Journal of Policy Development and Research. 1997; 3(2):3-31.

Mac Arthur BART Transit Village

Health Impact Assessment

CHAPTER 3
TRANSPORTATION

A. Summary:

Transit oriented development (TOD) increases participation in mass transportation systems while reducing vehicle miles traveled (VMT) and the demand for new road construction,[1] consequentially, diminishing health costs associated with personal vehicle trips. This chapter provides an assessment of the proposed Mac Arthur BART transportation village (MBTV) on transportation. The additional 625 new residential units will contribute additional vehicle traffic; however, relative to a non-TOD of similar scale, MBTV should reduce regional vehicle trips by at least 5%. Furthermore, the inclusion of below market housing will also mean fewer vehicle trips relative to a market rate only project. The proposed 30,000 sq ft of retail space at the MBTV should also reduce trips from the surrounding neighborhood by 5% providing the retail serves neighborhood needs.[2] From a regional perspective, net reductions of vehicle trips will improve air quality and decreased contributions of green house gases, (See Chapters on air quality and noise for environmental quality effects of traffic at a local scale). Indirectly the project should have a positive health impacts via increased physical activity while creating some new hazards for pedestrians and bicyclists. Additional mitigations to further decrease vehicle trips suggested in this HIA would enhance community heath benefits associated with this project.

Project Health Impacts:

1. As an example of TOD, the MBTV will reduce the growth of vehicle trips and vehicle miles traveled expected at a regional level, limiting deterioration in regional air quality and preventing associated circulatory and respiratory disease.[3] (Beneficial Effect)
2. The project will facilitate routine physical activity for project residents. This will help prevent obesity, improve cardiovascular function, and increase community interaction. (Beneficial Effects)
3. Local vehicle trips will increase resulting in increases in pedestrian accidents and bicycle accidents on streets in the immediate vicinity. (Potential Adverse Effect)

Recommendations for design and mitigation

1. Increase the density of the project by increasing the number of new units.[4]
2. Increase the proportion of below market rate housing and housing units affordable to those with moderate incomes. [5]
3. Unbundle the cost of parking from residential rents to encourage residents to reduce their car ownership rates.
4. Reduce the number of structured parking spaces for residential uses below a ratio of 3 spaces for 4 units.
5. Price structured residential parking and area residential parking permits at the market rate.
6. Increase parking costs for use of the BART station to reduce vehicle use and encourage local shuttle use.[6]
7. Do not provide structured employee parking for BART or project commercial uses. [7]
8. Provide free structured parking for car share.

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1 Cervero, R, Rail-Oriented Office Development in California: How Successful?, Transportation Quarterly, Vol. 48, 1994

2 URBEMIS2002, Version 8.7, Emissions Estimation for Land Use Development Projects, Jones and Stokes, Assoc. , 2005

3 Transportation-related Land Use Strategies to Minimize Motor Vehicle Emissions – An Indirect Source Research Study. JHK and Associates. California Air Resources Board, 1995. 92-348.

4 Holzclaw, John, How Compact Neighborhoods Affect Modal Choice- Two Examples. Available at; www.sierraclub.org/sprawl/articles/modal.asp, 2002

5 URBEMIS2002, Version 8.7, Emissions Estimation for Land Use Development Projects, Jones and Stokes, Assoc. , 2005

6 Shoup, Donald, 1999

7 Air Resources Board, California Environmental Protection Agency, Parking Cash-Out Incentive: Eight Case Studies, June 1998

9. Require transit shuttles to operate at least every 30 minutes in off peak and every 15 minutes during peak travel times with hours to match BART schedules.[8]

10. Ensure the project is connected to the local bike network via class I or II bike lanes.

11. Ensure sidewalk bicycle racks are co-located with retail uses

12. Provide secure bicycle storage protected from the weather at BART.[9]

13. Improve pedestrian and bicycle street crossing, especially at Telegraph & 40th and Telegraph& Mac Arthur intersections. If the pathway to transit is conducive to walking the area of TOD influence can expand beyond the normal ¼ mile to as fare as ½ mile thereby resulting in further reduction in VMT.[10]

14. Enhance streetscape of the 40th Street underpass to provide connectivity for Westside residents and enhance the desirability of the transit village.[11]

15. Incorporate retail diversity study in selecting new retail outlets for Mac Arthur BART. Retail should serve the needs of the local community thereby reducing trips originating both within and beyond the local neighborhood.

8 Lund, Hollie: Cervero, Robert; and Willson, Richard, Travel Characteristics of Transit-Oriented Development in California. Final Report, January, 2004

9 Ibid.

10 Opcit., Lund

11 Opcit., Lund

B. Health Effects Associated with Transportation:

The diversity, density, and design of land use all impact needs for transportation creating profound indirect impacts on public health.[12] [13] [14] [15] For example, separate zoning for manufacturing, office, retail, and residential has increased work related commute travel times and distances. Demand for larger and faster highways, in theory, to reduce travel times has enabled living further and further from jobs and daily needs. Greater vehicle use has meant more air pollution and noise and more vehicle crashes and injuries as well as less walking and biking. Fundamentally, healthier and more sustainable transportation system increases access by bringing closer together the origins and destinations of travel, providing convenient alternatives to driving, and facilitating more active forms of transport. The benefits of such sustainable transportation systems benefit are improvements in air and water quality, reductions in noise and injuries, and access to goods and services, and increased physical activity. Evidence related to these health effects is discussed in greater detail below.

	Harmful Impacts				**Beneficial Impacts**				
Mode of Travel		Injuries	Air Quality	Noise		Access	Physical Activity	Equity	Social Integration	
Walking						++	+++	+	+++	
Bicycling						++	+++	+	+	
Bus, Van, or Rail		+	+	+		++	+	+++	+	
Personal Vehicle		+++	++++	+++		++		+ /-	---	
Air		+	+++	+++		+				

Traffic injuries: the greatest cause of disability and death for young people

In 2001, over 42,000 people died in traffic related incidents nationally, including 5000 pedestrian deaths and 100,000 pedestrian injuries.[16] Oakland pedestrians experience over 353 injuries per year which is over 4 times the National Healthy People objective. Pedestrian injuries disproportionately occur in downtown, Chinatown and along arterial streets.[17] Several environmental factors predict the number of pedestrian injuries, including as vehicle volume, vehicle speed, pedestrian volume, roadway width, vehicle speed, pedestrian facilities, intersection design, lighting, and weather.[18] [19] [20] [21] [22] [23] [24] [25] [26] In a

12 Dora C, Phillips M (editors). Transport, environment and health. Copenhagen: World Health Organization Regional Office for Europe; 2000.

13 Frank LD, Engelke P. How land use and transportation systems impact public health: A literature review of the relationship between physical activity and built form. Atlanta, GA: Centers for Disease Control; 2000.

14 Our Built and Natural Environments: A technical review of the interactions between land use, transportation, and environmental quality. USEPA Washington DC 2001

15 The Land Use—Air Quality Linkage: How land use and transportation affect air quality. California Environmental Protection Agency. 1997

16 Earnst M. Mean Streets 2004. Washington DC: Surface Transportation Policy Project; 2004.

17 Pedestrian Master Plan, City of Oakland, 2002

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

19 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.

20 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.

21 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.

22 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.

study of nine intersections in Boston's Chinatown, researchers calculated an increase in 3-5 injuries per year for each increase in 1000 vehicles.[27] Vehicle speeds also predict 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.[28] Furthermore, pedestrian collisions are more common in low income areas, potentially reflecting a greater residential density, greater traffic volume, and lower automobile ownership among residents of these neighborhoods.[29] Design related physical factors, traffic volume, traffic speed and the separation between pedestrians and traffic, also influence perceived safety and comfort for pedestrians indirectly affecting walking behavior and physical activity.[30]

Driving is a Significant Source of Air Pollution

Most people are familiar with the environmental consequences of driving. Motor vehicles produce fine particulate matter, nitrogen oxides, carbon monoxide, and volatile organic compounds directly and tropospheric ozone indirectly through a chemical transformation of nitrogen oxides (NO_x) and volatile organic compounds (VOC). Particulate matter exacerbates cardiovascular disease and asthma leading to hospital visits and premature death. Ozone is a respiratory irritant that exacerbates asthma and impairs lung development. Vehicles also emit air toxics, such as those in diesel exhaust, which cause cancer. The EPA estimates that, nationally, motor vehicle air quality impacts result in 50 to 70 million days with restricted levels of activity, 20,000 to 46,000 cases of chronic respiratory illness, and 40,000 premature deaths. Vehicle emissions also disproportionately burden people living high traffic roadways, with studies

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23 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.

24 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.

25 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.

26 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.

27 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.

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

29 La Scala EA, Johnson FW, GAruenewald PJ. Neighborhood Characteristics of Alcohol-related Pedestrian Injuries. Prevention Science. 2001: 2:123-134.

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

30 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.

30 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.

30 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.

30 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.

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

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30 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-

30 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.

30 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.

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

30 Landis BW, Vatttikuti VR, Ottenberg RM, McLeod DS, Guttenplan M. Modeling the Roadside Walking Environment: A Pedestrian Level of Service. TRB Paper -1-0511 Tallahassee. 2000.

consistently finding associations between the proximity to roadways, respiratory disease symptoms, lung function measures. [31] [32] [33]

Vehicles are also a primary source of greenhouse gases, and the growth in greenhouse gas emissions in driven almost entirely on growth in transportation. Transportation accounts for 58% of California's greenhouse gases emissions, of which 37% is due to gasoline.[Cal EPA, 2002] Climate change threatens catastrophic effects on health through more frequent extreme weather events, worse air pollution, create flooding, limitation s food production, and increases in waterborne and food-borne illnesses, and increases in the vectors of infectious diseases.

Traffic Is a Significant Source Of Environmental Noise

Vehicles and roadway conditions are also primary sources of environmental noise in urban areas like Oakland. Chronic exposure to moderate levels of environmental noise results in poor quality, interrupted sleep that may cause both physical and psychological problems. [34] Noise-induced stress can cause chronic elevated blood pressure, coronary disease, ulcers, and migraine headaches. Noisy environments give individuals and their community the feeling of powerlessness, because they cannot even control the environment within their own home. Noise potentially coupled with sleep deprivation can result in annoyance, anger, rage and associated violent outcomes. Noise can also interfere with speech communication outdoors, in the workplace and in the schoolrooms, interfering with the ability of people to perform their work.

Active Transportation Can Contribute To The Physical Activity Required For Good Health

It is now common wisdom that physical activity can prevent obesity, diabetes, and heart disease, reduce stress, improve mental health, and promote longevity. [35] The distance of a travel trip exerts a strong influence on the decision to walk, or drive; nevertheless, environmental factors also influence walking. Such factors include the design and spatial arrangement of neighborhoods, including street connectivity, public spaces, and the quality of the pedestrian realm; traffic characteristics such as vehicle volume, roadway width, traffic speed; and socioeconomic characteristics, including residential and commercial density, the intermixing of retail and commercial uses with residential uses, public spaces, auto-ownership, and safety.[36] [37] Physical activity research shows that people walk on average 70 minutes longer in pedestrian-oriented neighborhoods.[38] A recent study by Besser and Dannenberg (2005)[39] documents that walking to and from public transportation can significantly contribute to the thirty minutes of regular exercise necessary to meet the physical activity objective of the Healthy People, 2010.

31 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.

32 Mikkelsen J. Effect of vehicular particulate matter on the lung function of asthmatic children in Fresno CA. Unupublished Manuscript.

33 Air Quality and Land Use Handbook: A Community Health Perspective. California Air Resources Board; 2005.

34 Guidelines for Community Noise. Geneva: World Health Organization; 1999.

35 Regional Development and Physical Activity: Issues and Strategies for Promoting Health Equity. Policy Link 2002.

36 Frank L, Engelke P, Schmid T. Health and Community Design: The Impact of the Built Environment on Physical Activity. Washington DC: Island Press; 2003.

37 Frank, Lawrence, Andresen, M., Schmid T., 2004. "Obesity Relationships With Community Design, Physical Activity, and Time Spent in Cars." American Journal of Preventive Medicine, Vol 27. No 2.

38 Saelens BE, Sallis JF, Black JB, Chen D. Neighborhood-Based Differences in Physical Activity: An Environment Scale Evaluation. American Journal of Public Health. 2003;93:1552 - 1558.

39 Besser, Lilah, Dannenberg, Andrew, Walking to Public Transit, Steps to Help Meet Physical Activity Recommendations, American Journal of Preventive Medicine, 2005;29(4)

Features of Land Use and transportation Systems and their effects on Health

Dimension / Feature	Pathways	Health Related Variables
Street interconnectivity	decreases trip distance provides alternative routes mitigates commute stress increased bike /ped mode	Physical activity (+) Ambient pollution (-)
Traffic calming	slows driving increased bike /ped mode supports interactions	Ambient pollution (-) Physical activity (+) MVA Injuries (-) Social network (+) Violent Injuries(-)
Pedestrian and Bicycle facilities including bike lanes and sidewalks	perceived safety increased bike /ped mode mitigates commute stress supports interactions decreased pedestrian injuries	Physical activity (+) Stress(-) Ambient pollution (-) MVA Injuries (-) Social network (+)
Enhancement of Streetscape with Lighting, Trees, Furniture, etc	perceived safety increased bike /ped mode	Physical activity (+) MVA Injuries (-) Violent Injuries(-) Stress(-)
Reduced Parking Supply	perceived safety increased bike /ped mode decreased auto use	Physical activity (+) Ambient pollution (-) MVA Injuries (-) Stress (+/-) Leisure time (+/-)
Increased Residential Density	Decreases trip time/ distance mitigates commute stress influences economic opportunity Increases crowding	Physical activity (+) Ambient pollution (-) Leisure time (+) Income (+/-) Stress (+/-)
Transit Oriented and Mixed Use Development	Decrease trip time/distance enhances b/p use mitigates commute stress influences economic opportunity	Physical activity (+) Ambient pollution (-) Leisure time (+) Stress (-) Income (+/-)
Open Space	enhances b/p use supports interactions mitigates heat island effect provides pleasing ambient environment	Physical activity (+) Social network (+) Violent Injuries(-) Ambient pollution (-) Heat (+) Stress(-)

C. Established Standards and Significance Criteria

Land Use and Transportation Element of the Oakland General Plan (LUTE) Policies

Transportation and Transit-Oriented Development

- "The Policy Framework proposes that congestion be lessened by promoting alternative means of transportation, such as transit, biking, and walking, providing facilities that support alternative modes, and implementing street improvements. The city will continue to work closely with local and regional transit providers to increase accessibility to transit and improve inter-modal transportation connections and facilities. Additionally, policies support the introduction of light rail and trolley buses along appropriate arterials in heavily traveled corridors , and expanded use of ferries in the bay and estuary" (*Policy Framework Encouraging Alternate Means of Transportation*)
- The City should include bikeways and pedestrian walks in the planning of new reconstructed, or realized streets, wherever possible. (*Policy T3.5, Including Bikeways and Pedestrian Walks*)
- The City will require new development, rebuilding, or retrofit to incorporate design features that encourage use of alternative modes of transportation such as, transit, bicycling, and walking. (*Policy T4.1, Incorporating Design Features for Alternative Travel*)

Bicycle Master Plan

- Reduce the number of bicyclists killed or injured by 10% in 5 years. (Objective 3, BMP)

Pedestrian Master Plan

- Improve pedestrian crossings in areas of high pedestrian activity where safety is an issue (PMP policy 1.1, Crossing Safety)
- Implement pedestrian improvements along major AC Transit lines and at BART station to strengthen connections to transit (PMP 2.3, Safe Routes to Transit)

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

- Objective 22-2- Increase the number of adults who engage in regular, preferably daily, in moderate physical activity for 30 minutes per day.

D. Existing Transportation Conditions

The Macarthur BART Project Area

The Mac Arthur BART project is bounded by the Highway 24 and the BART station on the West, Telegraph Avenue on the East, 40th. Street on the North and, Mac Arthur Boulevard and Interstate 580 on the South. According to the California Department of Transportation the 2005 average annual daily traffic (AADT) for **Highway 24** was 144,000 vehicles/ day. The truck AADT was 3571 trucks or 2.48% of the traffic. [40] **Highway 580** has an average annual daily traffic of 224,000. The truck AADT is 2486 or 1.11%. [41] The Average Daily Traffic Count on **Telegraph Avenue**, south of 40th Street, is also relatively high at 23,562.[42]

According to the DEIR for the Proposed Restriping of Telegraph Avenue to Accommodate Bike Lanes, the intersection near Mac Arthur BART (Telegraph and 40th / 41st Streets) also carries

40 2005 Average Annual Daily Truck Traffic on California State Highway System, State of California Department of Transportation, November, 2006

41 Ibid., Caltrans.

42 Draft Environmental Impact Report "Existing Traffic Analysis. Environmental Review of the Proposed Restriping of Telegraph Avenue to Accommodate Bike Lanes." December 4, 2003. Page 4.

relatively high pedestrian volumes during the peak hours, particularly in the morning commute period. [43] (See table below)

Traffic Characteristics for Telegraph Avenue at 4Oth September 16-18, 2003, 7am-9 am, 11am-1pm, 4pm-6pm

Direction	Traffic (ADT)	LOS	Pedestrian Count (AM, midday, PM peak)	Bicycle Count (AM, midday, PM peak)
Northbound	12,385	B	50, 6, 3	16, 16, 32
Southbound	11,177	B	57, 20, 30	34, 24, 21
Eastbound			51, 6, 14	22, 6, 4
Westbound			42, 15, 19	26, 6, 10

Regional Travel Characteristics

Transportation summaries for Oakland from MTC travel forecasts illustrate that Alameda County and the Bay Area region will experience a significant growth in personal vehicle trips between 2007 and 2030. MTC expects a growth of about 12 million vehicle miles originating in Alameda County.

Average Weekday Daily Vehicle Miles of Travel (VMT) by San Francisco Bay Area county-of-occurrence1990-2030[44]

County	1990	1998	2000	2007	2015	2025	2030
Alameda	24,540,300	29,239,100	31,808,900	36,402,500	39,810,100	45,452,500	48,131,300
Contra Costa	13,376,900	16,516,200	18,071,500	20,498,800	22,848,600	24,985,500	26,017,200
Marin	5,333,100	5,510,500	6,248,500	6,701,100	7,064,600	7,259,200	7,405,400
Napa	1,474,700	2,079,600	2,298,600	2,805,900	3,131,200	3,453,500	3,665,500
San Francisco	7,165,900	7,839,300	8,052,100	8,293,100	8,846,000	9,485,000	9,807,600
San Mateo	14,883,600	16,410,200	16,605,600	17,220,200	18,817,200	20,409,300	21,187,500
Santa Clara	26,411,500	33,608,400	37,212,100	40,037,600	45,459,100	51,193,000	53,652,900
Solano	8,648,100	8,963,700	10,307,100	11,633,700	15,088,300	17,281,500	19,916,300
Sonoma	5,873,500	8,206,500	9,511,700	10,579,100	11,566,000	12,521,400	12,972,800
Bay Area	107,707,600	128,373,400	140,116,000	154,172,000	172,631,100	192.040.900	202,756,400

43 Collected by Kimley-Horn and Associates. September 16-18, 2003, 7am-9 am, 11am-1pm, 4pm-6pm

44 Source: MTC travel forecasts, based on Projections '98 (1990), Projections 2000 (1998) and Projections 2003 (2000, 2007, 2015, 2025 and 2030

E. Impact Analysis

This analysis sought to address the following four questions**:**

1. What are the project's effects on vehicle trips with origin / destination in the project area?
2. What are the project's effects on regional vehicle trips?
3. What are the impacts of below market rate housing on vehicle trip generation?
4. What are the indirect effects of the project on physical activity?

Note that this analysis considers vehicle trips an indirect measure of community health as vehicle trips are directly proportional to vehicle emissions, environmental noise, and vehicle related accidents. A detailed analysis of health effects associated with transport-related air quality, noise and traffic safety are provided in chapters 6, 7, and 8.

Project Vehicle Trip Generation

The California Air Resources Board (CARB) developed the "Urban Emissions Model" (URBEMIS) to assist local public agencies with estimating air quality impacts from land use projects when preparing a CEQA environmental analysis. Vehicle trips are an intermediate output from URBEMIS. Using the URBEMIS model, the proposed Mac Arthur transit village will generate approximately 4000 new additional daily trips.[45]

Effects of Transit Oriented Location on Vehicle Trip Generation

Transit oriented development reduces the number of vehicle trips and the distance of those trips thereby reducing the number of vehicle miles traveled. Using the URBEMIS model it was calculated that the Mac Arthur BART development will decrease vehicle trips by 22% when compared to an alternative project without similar mitigations and not within a half mile of the BART station. Mass transit services, local serving retail, pedestrian improvements, and affordable housing all serve to reduce daily vehicle trips from 5160 to 4043 and vehicle miles traveled from 25777 to 19760.

Additional Effects of Below Market Rate Units on Vehicle Trip Generation

Additional reductions in the number of vehicle trips may be expected from the inclusion of 20% below market rate units. Based on regional travel survey data, the beneficial effect of affordability on trip generation can be potentially significant. The Bay Area Metropolitan Transportation Commission has quantified the relationship between household income, travel behavior, and vehicle trips from the results of their Bay Area Travel Survey. Based on the survey, Households in the highest income quartile generate almost 4 more vehicle trips per day (160 percent increase) than those in the lowest quartile. These travel behavior data do not account for the effect of TOD.

45 URBEMIS a user-friendly computer application that estimates construction, area source, and operational air pollution emissions from a wide variety of land use development projects in California. The model accounts emission reductions associated with specific mitigation measures including transportation demand reduction measures and affordable housing.

Quartile of Household Income	Q1	Q2	Q3	Q4
Range of Household Income	<$30,000	$30,000-59,999	$60,000-99,999	$100,000 +
Weekday Vehicle Driver Trips	2.402	4.102	5.302	6.327

URBEMIS estimates of vehicle trip generation account for BMR housing; however, the URBEMIS model assumes only a 4% reduction in vehicle trips for each deed-restricted below market rate housing unit, [46] which significantly less difference in vehicle trip generation between households in the lower and higher income quartiles in the Bay Area Region based on regional travel survey data.

Based on the MTC survey, and conservatively assigning households in the second quartile of income to BMR rental units, we estimate that relative to a market rate only project, the proposed the 20% inclusion of affordability requirements would result about 300 fewer weekday vehicle trips (see table below). The difference between URBEMIS parameter and MTC survey data may reflect differences in the income—vehicle trips relationship between the Bay Area and the rest of the State of California.

	Income Quartile				***Weekday Trips***
	Q1	*Q2*	*Q3*	*Q4*	
Weekday Trips	2.402	4.102	5.302	6.327	
Market Rate Only				625	3954
20% Below Market		125		500	3676

Distribution of project generated trips to area roads

There are presently 4 entrance/exits planned for the transit village. Two of these are on Telegraph Avenue and one each are on Mac Arthur Blvd. and 40th. Street, respectively. For the purpose of this analysis and in the absence of a published transportation impacts analysis for this project, we distributed the cars evenly to each exit path and determined that the Telegraph Avenue would receive approximately 2000 vehicle trips, and Mac Arthur Blvd. and 40th Street would each receive approximately 1000 vehicle trips. The trips were assigned evenly between traffic directions. Under these conditions Telegraph Avenue average daily traffic counts will increase by 8% northbound and 9% southbound. An increase of more than 5% is "considerable" according to the City of Oakland. A more detailed traffic study is expected in the DEIR for this project.

Effects on Physical Activity

The new Mac Arthur BART transit village will locate 625 new households in a location where access to BART and AC Transit is both close and convenient. In addition the new transit village will provide 30,000 square feet of new local retail which will encourage residents and neighbors to walk or bicycle to their shopping destinations. As discussed above, TOD can result in increased levels of routine physical activity both for project residents as well as residents of a surrounding neighborhood. According to the study by Besser and Dannenberg, Americans who use transit spend a median of 19 minutes daily walking to and from transit and 29% achieve > or =30 minutes of physical activity a day solely by walking to and from transit. A study of travel behavior conducted in Alameda County resident living near BART stations showed that 37% use BART for commuting every day.[47] This evidence suggests that future residents of the proposed transit village will experience greater levels of physical activity greater than those of a similarly scaled project located away from regional transit.

46 Software User's Guide: URBMEIS2002 for Windows with Enhanced Construction Module, Version 8.7, South Coast Air Quality Management District, April 2005.

47 Op cit., Lund

It is beyond the scope of this analysis to quantify the benefit on physical activity for project residents. Such estimation is possible with data on the number of trips, their distribution by mode, and their destination. The DEIR for this project may provide sufficient data to allow for this quantification in the future.

The neighborhood retail diversity and quality, pedestrian amenities and pedestrian safety countermeasures, and walkable or bikable routes to area parks and schools will also impact the degree of routine physical activity experience by resident due to active transit. These issues are considered in the chapters on parks, schools, and pedestrian safety in this HIA.

F. Recommendations for Design Mitigations:

Planning and design strategies that achieve sustainable transportation goals include: increasing the densities of neighborhoods, operating more convenient public transit services, creating safer and more enjoyable routes for bicycling and walking, calming traffic, providing retail and pubic goods and services near where people live, and ensuring that those who drive pay the actual social costs of driving.

1. Increase the density of the project by increasing the number of new units.[48]
2. Increase the proportion of below market rate housing and housing units affordable to those with moderate incomes. [49]
3. Unbundle the cost of parking from residential rents to encourage residents to reduce their car ownership rates.
4. Reduce the number of structured parking spaces for residential uses below a ratio of 3 spaces for 4 units.
5. Price structured residential parking and area residential parking permits at the market rate
6. Increase parking costs for use of the BART station to reduce vehicle use and encourage local shuttle use.[50]
7. Do not provide structured employee parking for BART or project commercial uses. [51]
8. Provide free structured parking for car share.
9. Require transit shuttles to operate at least every 30 minutes in off peak and every 15 minutes during peak travel times with hours to match BART schedules.[52]
10. Ensure the project is connected to the local bike network via class I or II bike lanes.
11. Ensure sidewalk bicycle racks are co-located with retail uses
12. Provide secure bicycle storage protected from the weather at BART.[53]
13. Improve pedestrian and bicycle street crossing, especially at Telegraph & 40th and Telegraph& Mac Arthur intersections. If the pathway to transit is conducive to walking the area of TOD influence can expand beyond the normal ¼ mile to as fare as ½ mile thereby resulting in further reduction in VMT.[54]

48 Holzclaw, John, How Compact Neighborhoods Affect Modal Choice- Two Examples. Available at; www.sierraclub.org/sprawl/articles/modal.asp, 2002

49 URBEMIS2002, Version 8.7, Emissions Estimation for Land Use Development Projects, Jones and Stokes, Assoc. , 2005

50 Shoup, Donald, 1999

51 Air Resources Board, California Environmental Protection Agency, Parking Cash-Out Incentive: Eight Case Studies, June 1998

52 Lund, Hollie: Cervero, Robert; and Willson, Richard, Travel Characteristics of Transit-Oriented Development in California. Final Report, January, 2004

53 Ibid.

54 Opcit., Lund

14. Enhance streetscape of the 40th Street underpass to provide connectivity for Westside residents and enhance the desirability of the transit village.[55]

15. Incorporate retail diversity study in selecting new retail outlets for Mac Arthur BART. Retail should serve the needs of the local community thereby reducing trips originating both within and beyond the local neighborhood.

55 Opcit., Lund

Macarthur BART Transit Village

Health Impact Assessment

Chapter 4
Retail Services

A. Summary

Residents of low-income neighborhoods in Oakland bear significant health consequences from economic segregation, particularly due to the lack of access to affordable, quality retail services. Land use development can potentially benefit community health by increasing the quality and diversity of retail services, increasing employment, and improving overall economic vitality. The following chapter provides an overview of the relationships between retail and health both with regards to service access and resident livelihood. We then provide a brief community health assessment of the Macarthur BART transit village (MBTV) proposed 30,000 square feet of ground-floor neighborhood-serving retail and community space based on reviews of planning and assessment documents, secondary data sources, and interviews with stakeholders.

Overall, we conclude that the development of mixed-use commercial corridors such as the MBTV can offer multiple health benefits to area residents improving access to essential goods and services, as well as employment and community economic investment. Outstanding challenges for the planning of the MBTV are (1) to ensure new retail meets area resident needs and (2) to protect the livelihoods and enhance the success of existing merchants and residents. Implementing a comprehensive analysis of the project's effects on retail services and the livelihood of business owners, in conjunction with the indirect impacts of these effects on human health, would be a valuable component of MBTV planning.

Health Impacts

Based on current planning and design proposals, the Macarthur BART Transit Village is likely to have the following effects on individual and community health:

1. A retail plan that includes a neighborhood grocery store is likely to improve access to quality food and nutritional health for both residents and BART commuters. This benefit will depend on the size, diversity, and affordability of the establishment and may be greatest for a full service grocery store. (Potential Beneficial Effect)
2. Development of a vibrant mixed-use commercial corridor through residential and retail development has potential to deter crime, reducing injuries and stress for residents. (Potential Beneficial Effect)
3. The transit village may contribute to the diversity of retail goods and services to the neighborhood. Via effects on pedestrian activity the project may increase resident physical activity and reduce some vehicle trips. Ensuring that new retail fills existing gaps and responds to resident needs will maximize this benefit. (Potential Beneficial Impact)
4. New retail associated with the project may provide new employment opportunities some of which may be suitable for unemployed or underemployed area residents. Job training and local recruitment may support this benefit. (Potential Beneficial Impact)
5. The project will increase retail property value and as a result, may eventually displace some of the current retail businesses, disrupting local livelihoods. (Potential Adverse Effect)

Recommendations for Design and Mitigation

1. Ensure retail development is reflective of community's wants and needs
    a. Conduct a comprehensive retail market analysis to include a retailer and consumer survey
    b. Establish a neighborhood retail planning council to assist in retail planning phases

2. Create a local fund via a development agreement or assess a development impact fees to:
    a. maintain property affordability for current vulnerable businesses

3. Encourage a wide variety of healthy food establishments
    a. Recruit a full-service grocery store to occupy retail space on the site;

b. Alternatively, work to locate a full service grocery store on the western side of SR 24
c. Hold a farmers market near western side of the BART station
d. Require retail food stores to accept food stamps and EBT.

4. Ensure that community members have adequate and equitable access to a range of necessary, yet diverse array of goods and services.
   a. Recruit a pharmacy, bank, and hardware store to locate at or near the site
   b. Require retail food stores to accept food stamps and EBT.

5. Provide tax incentives, or interest-free loans to stimulate local entrepreneurship
   a. Provide incentives for full-service grocery store – (e.g., help pay for parking spaces)

6. Use a development agreement or a community benefits agreement to ensure:
   a. employment of local residents in new retail
   b. provision of jobs with living wage and health insurance
   c. fund workforce development programs

7. Analyze the current labor market in terms of employment opportunities, placement, and retention and implement appropriate retail development according to workforce needs.

8. Prohibit or limit retail establishments associated with adverse health outcomes such a liquor stores

9. Work with the community to create strategies promoting safety, reducing crime, and elevating perceived safety among retailers and consumers.

B. Background: Health Effects of Retail Goods and Services

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. Figure R1 illustrates four evidence-based pathways between access to retail and 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. [1] [2] 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.[3] 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.[4] 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. [5]

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. [6] A 12.2% reduction in the odds of being obese was 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.

1 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.

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

3 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

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

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

6 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.

Retail Food Access is linked to Nutritional Health

Diet-related disease is one of the top sources of preventable deaths among Americans,[7] with the burden of overweight and obesity falling disproportionately on the populations with the highest poverty rates. [8] 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. [9] [10] 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. [11] In fact, smaller retail food stores typically charge about 10% more for products than supermarkets.[12] 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.[13] In this way, obesity may be mediated in part by the inverse relationship between energy density and cost. [14]

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). [15] 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.[16]

A Vibrant Local Economy improves Individual and Community Health

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7 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/

8 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.

9 House Select Committee on Hunger. Obtaining food: shopping constraints of the poor, Committee Report. Wahington DC: US Governemtn Printing Office, October 1990.

10 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.

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

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

13 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.

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

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

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

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 hypertension[17], higher rates of depression, a tendency towards alcohol and drug abuse[18], and reduced life expectancy.[19]

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.[20]

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.[21]

Integrating residential and retail uses can reduce community violence

Mixed-use development is a strategy for reducing community violence and increasing perceived safety. [22] 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,[23] 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.[24] 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 issues than others. These

17 Ferrie 2004

18 Khlat 2004

19 Wadsworth 1999

20 Institute of Medicine (IOM) 2004

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

22 Crime Prevention Through Environmental Design Guidebook. October 2003.
Singapore National Crime Prevention Council. http://www.ncpc.gov.sg/pdf/CPTED Guidebook.pdf. Accessed November 2006.

23 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

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

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.[25] 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.

Additionally, the presence of fast-food restaurants in one's neighborhood is also related to diet-related disease rates.[26] 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.

Table RS.1 Retail Categories and Examples Related to Health

Food Retail	*Other Retail Goods*	*Services*
❑ Full-service Supermarket ❑ Small Grocery Stores ❑ Convenience Stores ❑ Farmers markets ❑ Restaurants ❑ Cafes ■ Fast Food Establishments ■ Liquor Stores ■ Bars	❑ Pharmacies ❑ Bookstores ❑ Specialty Shops ❑ Hardware Stores ❑ Auto Supplies	❑ Dry Cleaners ❑ Laundromats ❑ Banks & Credit Unions ❑ Check Cashers ❑ Beauty Salons ❑ Hotels/Motels ❑ Maintenance Services ❑ Entertainment ❑ Auto Repair

C. Relevant Established Standards and Health Objectives

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.[27] 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 minute walking distance.[28] 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.

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

26 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.

27 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.

28 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.

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:[29]

- Residential development projects are sited in areas where retail services[30] 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)*
- Proportion of jobs paying entry-level wages is greater than or equal to the self-sufficiency standard is (Objective HE.1):
    - Min: 60% of new jobs
    - Benchmark: 75% of new jobs
    - Max 100% of new jobs
- Proportion of jobs providing health insurance, sick days, and retirement benefits (Objective HE.1):
    - Min: 70% of new jobs
    - Benchmark: 80% of new jobs
    - Max 100% of new jobs
- New development supports the retention and development of locally owned businesses by:
    - Min: giving priority to locally owned
    - Benchmark: providing favorable rent or lease terms to locally owned businesses as a community benefits associated with a development incentive
    - Max: creating permanent favorable lease terms

D. Existing Conditions and the Current Retail Context

Labor Market Conditions in Oakland

According to the 2000 Census, 10% of Oakland's labor force was unemployed and 36% of those over 16 years of age are not in the labor force. In terms of education, 30% of those who are 25 years old and older have a bachelor's degree or higher.[31] Notably, in four out of the last seven years, Forbes magazine ranked Oakland within the top 15 cities for business, with 49% services; 10% retail 9% manufacturing.[32]

Project Area Retail Environment

UCBHIG mapped existing neighborhood retail services available within a quarter mile radius of the MBTV site (refer to Figure R3). We found a significant 44% of services indicating neighborhood completeness are not currently met within the quarter mile area. Area retail gaps and public service gaps include: bank/credit union, hardware store, pharmacy, post office, and supermarket.

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

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

31 US Census 2000

32 City of Oakland, Community Economic Development Agency (CEDA) "Doing http://www.business2oakland.com

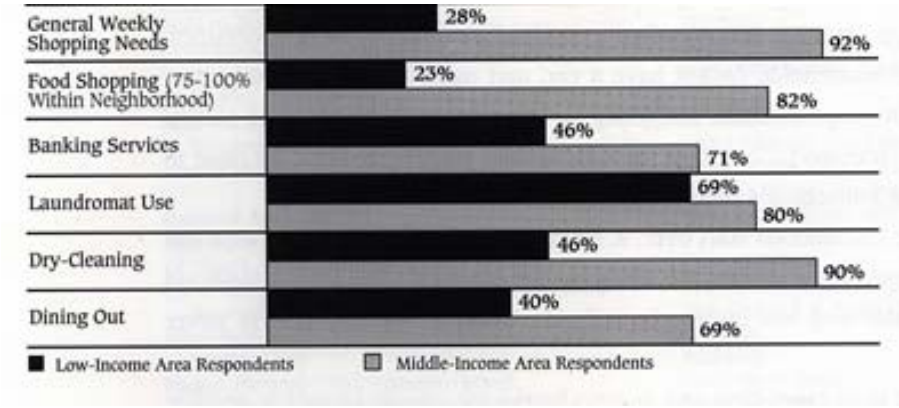
Retail maps of the three nearest census tracts identified similar gaps (See Figure R4). UCBHIG was not able to create maps for neighborhood completeness for a half mile radius which might reveal a greater diversity of services.

Inequalities in Retail Access by Neighborhood

In 1993 the Consumers Union (CU) published *The Thin Red Line: How the Poor Still Pay More*, detailing the disparities between low-income and middle-income neighborhoods in obtaining basic goods and services.[33] In a detailed analysis of the retail environment in Oakland, CU compared three low-income neighborhoods in Oakland (West Oakland, Fruitvale, and Oakhurst) with Rockridge, a middle-income neighborhood, by conducting both retailer and consumer surveys. The results indicated low-income residents were not getting basic needs for goods services met close to their homes. Furthermore, despite the significant amount spent by low-income consumers, their preferences for commercial amenities were not being prioritized.

Consumers Union found low-income consumers did not patron local neighborhood business due to high prices, low quality and selection, as well as lack of availabilities. Instead, they often traveled outside their own neighborhoods to meet these needs, unlike mid-income neighborhood residents. Thus, the loss of potential retail dollars for these low-income neighborhoods is significant, while the middle-income retail economy receives a larger portion of revenue from poor consumers. These are all indicators of lost opportunities for economic development and the continued unavailability of essential goods and services in already impoverished areas. In fact, Rockridge has between three to five times the level of retail access and choices as do the three other poor areas of Oakland.

Table RS.2 How often are basic needs met in the neighborhoods?



33 Troutt, David D. The Thin Red Line: How the Poor Still Pay More. San Francisco, CA: West Coast Regional Office, Consumers Union; 1993.

Table RS.3 Number of stores by neighborhood

Type of Store	Rockridge	W. Oakland	Fruitvale	Elmhurst
Supermarkets	4	1	2	2
Pharmacies	3	0	3	0
Restaurants	26	3	22	10
Fast Food	0	2	7	3
Banks	4	0	2	1
Check Cashers	0	2	6	2
Liquor	2	7	8	10
Grocery	4	1	11	9
Speciality Foods	13	0	1	0
Laundromats	1	2	4	1
Dry-Cleaners	6	1	4	4
Hair & Nails	10	2	10	10
TOTALS	73	21	80	52

Additional findings from CU's study highlight both the constraints and resources to business in Oakland's low-income and middle-income neighborhoods, as summarized in Table R4 below.

Table RS.4 Constraints and Opportunities for Expanding to Retail Services

Oakland's	Resources to business	Constraints to business
Low-income Neighborhoods	▪ Loyal customer base ▪ Virtual neighborhood monopoly	▪ High local unemployment ▪ Credit squeeze by lenders ▪ Inadequate police patrols ▪ High sales and liquor taxes ▪ Deterioration of local malls bank ▪ Locations
Middle-income Neighborhoods	▪ Access to business loans ▪ Insurance availability ▪ Local police ▪ Local marketing agents	▪ Parking ▪ Competition with other stores

Source: Consumers Union 1993

Federal Food Assistance Oakland has a considerably high percentage of eligible residents not enrolled in the Food Stamp program, with 78%, or $54 million in unclaimed benefits in 2003.[34] Though many food retailers accept food stamps in the Electronic Benefits Transfer form, most of these retailers operate convenience stores, which often do not carry an adequate selection of healthy foods to their patrons.

Oakland Farmers Markets Oakland currently operates nine farmers markets throughout the city primarily during the weekend. Importantly, all current farmers markets accept WIC and Senior Farmer's Market checks and three accept food stamps/EBT. The following table shows the location and date of each farmers market.

Table RS.5 Farmers Markets in Oakland

Name	*Location*	*Day, Time, Seasonality*
East Oakland Faith and Deliverance Center	73rd Ave. and International Blvd.	Fridays, 10-1 (April-Nov)
East Oakland Senior Center	9255 Edes Ave. at Jones Ave.	Wednesday, 10:30-2:30 (Year Round)
Fruitvale Transit Village	34th Ave and International Blvd.	Sundays, 10-3 (Year Round) *Accepts EBT/Food Stamps
Grand Lake	Grand Ave. and MacArthur Blvd.	Saturdays, 9-2 (Year Round)
Jack London Square	End of Broadway at Embarcadero	Sundays, 10 - 2 (Year Round) Wednesdays, 10-2 (May-Oct)
Millsmont	MacArthur Blvd., between Seminary & 61st Ave.	Saturdays, 10 - 2 (May - Oct) *Accepts EBT/Food Stamps
Montclair Village	Moraga Ave. and La Salle Ave.	Sundays, 9 – 1, (May –Oct)
Old Oakland	Ninth St. at Broadway	Fridays 8 - 2 (Year Round)
West Oakland / Mandela Farmers Market	Mandela Pkway at 7 th St., near BART	Saturdays, 10 – 4 (Year Round) *Accepts EBT/Food Stamps

All farmers' markets accept WIC and Senior Farmers' Market Checks

Source: Oakland Food System Assessment Report, 2006

Health Outcomes Related to Retail

Oakland has a significantly higher rate of hospitalizations caused by diabetes than the rest of Alameda County, with a disproportionate mortality burden falling on African American and Latino residents.[35] Further, 14% of the children in Alameda County are obese.[36]

34 ibid.

35 Oakland Health Profile 2004, Alameda County Public Health Department Community Assessment, Planning, and Education Unit. Available at: http://www.acphd.org/USER/data/

36 Unger, Serena and Wooten, Heather. 2006 "Oakland Food Systems Assessment Report" Mayor's Office of Sustainability, Oakland. Accessed at http://oaklandfoodsystem.pbwiki.com/

E. Health Impact Analysis

As part of the retail health impact analysis UCBHIG aimed to answer the following questions through a review of existing planning documents for the project, interviews with local stakeholders and key informants, and use of secondary data to construct maps:

1. Will the transit village provide or contribute to the area's unmet needs for retail goods and services?
2. Will an adequate mix of goods and services be accessible within walking distance?
3. Will new area residents have adequate access to quality food resources?
4. Will current retail owners be able to thrive given planned environmental changes?

In general, while existing data allows for an assessment of retail needs (see existing conditions section above), project plans are currently not specific or certain enough to support definitive answers to the above questions.

1. Will the transit village provide or contribute to the area's unmet needs for retail goods and services?
2. Will an adequate mix of goods and services be accessible within walking distance?

A preliminary answer to these two questions can only be based on the project vision and planning activities. The City of Oakland's Community and Economic Development Agency's (CEDA) vision for the MBTV retail is one that will serve as a community benefit, more than as a source of profit. As such, CEDA envisions that retail will include basic neighborhood services as well as services for BART riders. These goals stand in contrast to the recently constructed Fruitvale Transit Village project, which aimed to create a "destination" retail center.[37] Oakland's Redevelopment Agency has also initiated streetscape improvements on Telegraph Avenue in order to make it more pedestrian friendly and encourage retail use. [38]

CEDA staff have also identified several challenges to the above objectives. These include[36]:

- Linking retail corridor - distance from BART station to Temescal District, a strong retail area;
- Creating a distinct retail district in the project area along Telegraph Avenue;
- Achieving a balance between chain and non-chain retail;
- Obtaining a commitment from a grocery-supermarket.

As the early phases of project planning unfold, retail brokers and recruiters will be determined. Based on data described in the existing conditions section above, retail planning decisions could prioritize unavailable and essential retail needs which, up til now remain unavailable, including a bank/credit union, fire station, hardware store, pharmacy, post office, and supermarket.

37 Kathy Kleinbaum of CEDA, personal communication November 14, 2006.

38City of Oakland, Community Economic Development Agency (CEDA)"Doing Business in Oakland". http://www.business2oakland.com

Table RS.6 Mac Arthur BART Neighborhood Trade Area Demographics

Average Annual Household Income	$50,000
Average Household Size (persons/unit)	2.2
Median Age	34
Race/Ethnicity	
African American	46%
White	38%
Hispanic	10%
Asian	10%
Other	6%

Source: MapInfo-Thompson 2004

In terms of available public measures to building a vibrant retail environment, Oakland offers the following forms of financial assistance for local business owners:[39]

- *Downtown Tenant Improvement Grants* cover 50% of tenant improvement costs (caps at $10/ square foot) available to eligible entertainment and retail businesses in targeted areas of downtown. Also covers $5,000 of interior design/architecture fees.
- *Façade Improvement Grants* offer free architectural assistance and 50% matching grants up to $20,000 (downtown and parts of central Oakland) or $10,000 (specified neighborhood commercial districts) to property and business owners for eligible projects. Grant funds can be used to rehabilitate and repair exterior commercial building facades and exterior improvements. The city sends out info to property owners and retail tenants annually or every two years to remind them of their eligibility.[40]
- *Neighborhood Commercial Revitalization Program* (NCR) partners with small businesses, property owners and community organizations to improve the physical and economic conditions of neighborhoods.
- *Business Loans* - Oakland Business Development Corporation concentrates on new small business owners. Small loans for small businesses are available through Oakland Merchants Leadership Forum (OMLF), a non-profit. The City no longer offers small loans directly, but does provide money to OMLF and now refers businesses needing financial assistance to OMLF.[41]

3. Will new area residents have adequate access to quality food resources?

In 2004, a supermarket analysis conducted for the MBTV site rated the site characteristics as "average overall for supermarket use": [42] More specifically, the report suggested that:

> … a great diversity of grocery operators could be attracted to the site, given the synergy this complex will generate both as a housing and BART transit center. While some twenty grocery operators are widely dispersed throughout the area and accounted for in this analysis, MacArthur BART Transit village serves to fill a void for a food operator on Telegraph Avenue… Subsequently, any major supermarket chain or independent operator wishing to deploy either a conventional or concept store at the site will benefit from the lack of nearby competition in this portion of the trade area.

39 City of Oakland, Community Economic Development Agency (CEDA)"Doing Business in Oakland". http://www.business2oakland.com

40 Kathy Kleinbaum of CEDA, personal communication November 14, 2006.

41 Ibid.

42 Source MapInfo-Thompson June 2004 (TA#1455-001) Proposed Supermarket MacArthur BART Transit Village

The report confirmed the need for grocery retail in the project area yet identified challenges for locating larger (30,000-50,000 square feet) supermarkets involved the trade impacts from "healthy" grocers in Oakland, Berkeley Bowl, Whole Foods, and Market Hall. One major supermarket chain, Safeway, already has a store located nearby at Broadway and Pleasant Valley. Most supermarkets prefer a distinct space and call for a parking ratio requirement of 4/100 square feet (240 spaces in this case), which makes it a costly site. Additional space for parking would likely involve trade-off with housing or other components of the development. Thus, the analysis determined a smaller (20,000square feet), full service market would be ideal for the MBTV site. Largely due to the BART riders and new employees resulting from the project, the analysis forecasts peaks in business during breakfast and lunch hours; and therefore suggests a 'to go' prepared foods section, juice bar and coffee station, sushi and deli stations.

According to CEDA staff, members of the community advisory committee have expressed preference for a smaller food retailer such as a Trader Joes, rather than a supermarket since they are "more pedestrian-oriented and have less of a traffic impact". However, as there are plans to open a Trader Joe's in the Grand Lake neighborhood, a Trader Joe's at Mac Arthur BART appears less likely.[43]

Voices from behind the Counter

As far as how the project will affect the business – well, during the construction phase, my customers are going to be disturbed by the noise.

The project scares me. This business is our bread and butter, it's the only thing my family has.

Sometimes new stores bring more crime. As long as there is no crime and there's security, it's ok.

4. Will current retail owners be able to thrive given planned environmental changes?

The MBTV development objectives—to stimulate a vibrant, diverse retail corridor that serves community and commuter needs--present some potential conflicts with the needs of existing businesses. Increasing retail diversity may increase perceived safety and help provide the mix of retail needed for a complete, walkable neighborhood. However, a potential negative consequence of retail success might include increased rents. CEDA staff describe the process and the trade-offs involved[36]:

In general, with the success of the Temescal area, rents are already increasing. Changes in retail rents will depend largely on a property-by-property basis but businesses under existing leases will not be affected by increasing property value. However, when rents increase, you also get an increase in retail diversity and retail quality… The project hopes to acquire a few privately owned sites from a few existing businesses. We hope to internally relocate these businesses, but this may be challenging due to constraints posed by construction timing.

The above statement acknowledges a potential adverse consequence of the project and, notably, one that is directly a result of the project successfully meeting its objectives.

Another method to assess effects on existing retail businesses is to survey them directly. UCBHIG is not aware of any surveys conducted to assess the views of existing retailers about the MBTV project. In order to assess retailers' views qualitatively, UCBHIG conducted semi-structured interviews with five local business operators. We attempted to capture a range of business types: bookstore, motel, florist, liquor/convenience store, and hair braiding salon. We approached 5 different types of retail establishments in the MacArthur Bart Transit Village

43 Kathy Kleinbaum of CEDA, personal communication November 14, 2006.

(MBVT) area and engaged workers or owners in open-ended interviews regarding their perceptions of the development plans. Specifically, we asked about:

1. Retailers awareness of the development plans
2. How their businesses might be affected
3. How they think the neighborhood will be affected
4. How many years their business has been in operation in its current location.

From our initial interviews, we discovered the typical retail profile reflecting well-established businesses ranging from 25 - 75 years of existence in their current location. Most stores are minority-owned and family-operated establishments. Notably, the one retailer who was unaware of the MBTV plans was also the only recent immigrant business owner. The majority of the retailers also expressed a desire to be kept informed of the project developments.

Local business owners expressed these views regarding the project

Perceived positive impacts of development	**Perceived adverse impacts**
• Improved access to area for more people • Potential increase of business as a result of improved access	• Development will increase crime • Displacement and lack of contingency options • Lack in prioritizing low-income people and families • Increase in pollution and traffic • Noise from construction phase may avert customers • Disdain for large, corporate chains overtaking local retail

Several of the interviewed retailers expressed a lack of faith in a fair distribution of the city's economic development resources. Some felt the MacArthur area's needs are a low priority. One of the retailers we interviewed pointed out the streetscape improvements on San Pablo and on Broadway, with planters and more lighting. "Why doesn't that happen on MacArthur? This isn't the safest area. Peoples' cars are always getting broken into... Sometimes our customers at the motel feel nervous in the area, so I tell them they shouldn't stay here if they're not comfortable. It's important to always feel comfortable where you're staying."

These interviews represent a small, convenience sample and not the comprehensive and broadly representative survey we would have preferred to conduct. Due to time and resource constraints, UCBHIG is unable to carry out such a full-scale assessment. Nonetheless, such a surveying process would serve as a vital way to accurately understand retailers' current situations and be a better predictor of how the project would affect them as well as navigate planning towards the best ways to manage such critical actors and forces in the MTBV retail development.

Despite constraints, the MBTV planning process should anticipate and thoroughly consider the repercussions of the project. While this often requires time and financial investment, it is a worthwhile initial expense; otherwise, over time irreversible health trends due to declining livelihoods and commerce may be imminent.

F. Recommendations for Design and Mitigation

Promoting a vibrant economy through mixed-use development has potential to improve overall health in the MacArthur BART project neighborhood. Creating a mixed-use retail corridor can serve as a vehicle towards improving access to goods and services, economic opportunities, and

livelihoods. The retail development plans in its current state presents prospects for improving health and economic stability in the MBTV area. While the project proposes some essential retail services, there are ways to more thoroughly ensure opportunities for enhanced human health achievable via retail development. The following recommendations would bring the project measures closer towards one which would provide such improvements:

1. Ensure retail development is reflective of community's wants and needs
    a. Conduct a comprehensive retail market analysis to include a retailer and consumer survey. We recommend utilizing mail out surveys as the best way to reach a representative portion of the local population. If surveying is not possible, we recommend using findings from Consumers Union's extensive surveying of Oakland retailers as a guide to planning the retail services for MBTV.
    b. Establish a neighborhood council to include local retailers and residents to assist in retail planning phases.
    c. Conduct a comprehensive retail market analysis focusing on
        - determining consumer profiles:
            -Who currently shops in the area and why?
            -Who is not shopping here and why?
            -What stores do consumers want?
        - trade area projections
            -Demographics
            -Consumer spending
            -Underserved populations

2. Create a local fund via a development agreement or assess a development impact fees [44] [45] to:
    a. maintain property affordability for current vulnerable businesses at risk for displacement due to rent inflation.

3. Encourage a wide variety of healthy food establishments
    a. Recruit a full-service grocery store to occupy retail space on the site;
    b. Alternatively, work to locate a full service grocery store on the western side of SR 24
    c. Hold a farmers market near western side of the BART station
    d. Require retail food stores to accept food stamps and EBT.

4. Ensure that community members have adequate and equitable access to a range of necessary, yet diverse array of goods and services.
    a. Recruit a pharmacy, bank, and hardware store to local at or near the site
    b. Require retail food stores to accept food stamps and EBT.

5. Provide tax incentives, or interest-free loans to stimulate local entrepreneurship [46]
    a. Provide incentives for full-service grocery store – (e.g., help pay for parking spaces)

6. Use a development agreement or a community benefits agreement to ensure:
    a. employment of local residents in new retail
    b. provision of jobs with living wage and health insurance
    c. fund workforce development programs

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44 Policy Link "Exactions" Accessed at http://www.policylink.org/EDTK/Exactions/

45 Impact fees serve as a means to reinforce government responsibility to economic and social equity in regulating land use by requiring new development to bear a fair burden of the public costs generated by their project. Community benefit impact fees in the form of development agreements are a possible mitigation, which have potential to offset some of the negative consequences from the project. However, opponents of impact fees assert that such fees hinder local economic development and deter job growth, though various studies observed evidence of the fees supporting job growth and facilitating economic development.

46 San Francisco Food Alliance has called for "Food Retail Enterprise Zones" in which retailers providing nutritious foods would be exempt from city taxes. http://www.sffoodsystems.org/pdf/FSA-online.pdf

7. Analyze the current labor market in terms of employment opportunities, placement, and retention and implement appropriate retail development according to workforce needs. As in the Fruitvale development project, collaborate with Urban Strategies Council or another NGO to outline and inventory workforce development resources and services. [47]

8. Regulate retail establishments associated with adverse health outcomes; prohibit liquor stores and limit unhealthy food establishments.[48]

9. Work with the community to create strategies promoting safety, reducing crime, and elevating perceived safety among retailers and consumers.

47 For details on the Fruitvale workforce analysis, refer to A Preliminary Scan of Workforce Development Programs Serving the Lower San Antonio Neighborhood by Urban Strategies and also Abt Associates' February 2005 report, Picking Workforce Development Targets: A Tool to Identify Opportunities for Better Employment Outcomes.

48 Numerous cities in California, such as San Francisco, Los Angeles, Berkeley, Calistoga, and Davis, have placed restrictions on unhealthy food establishments to promote healthy food retail environments in their communities.

Figure R1. Mixed-use commercial corridors improve a variety of health outcomes through multiple pathways.

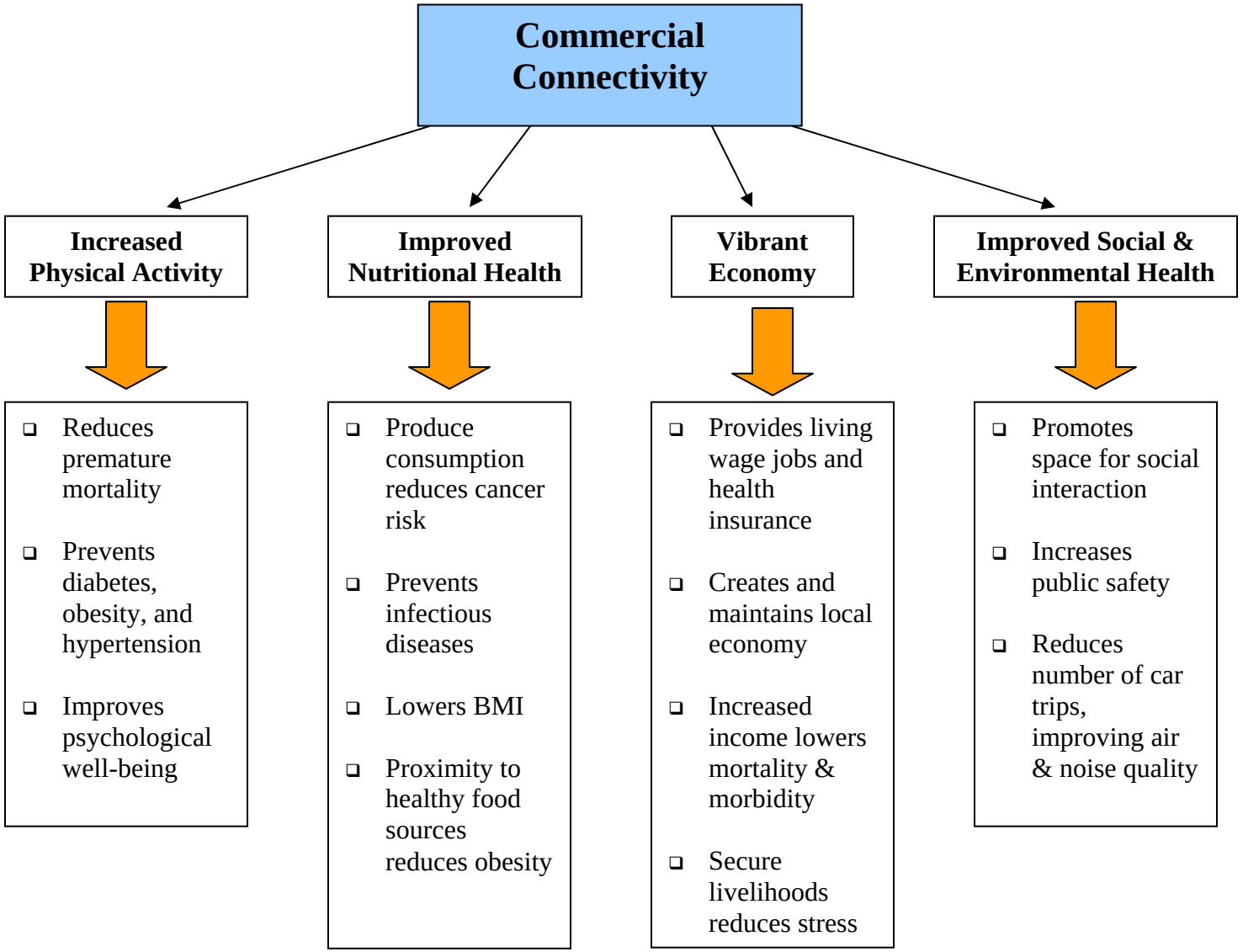
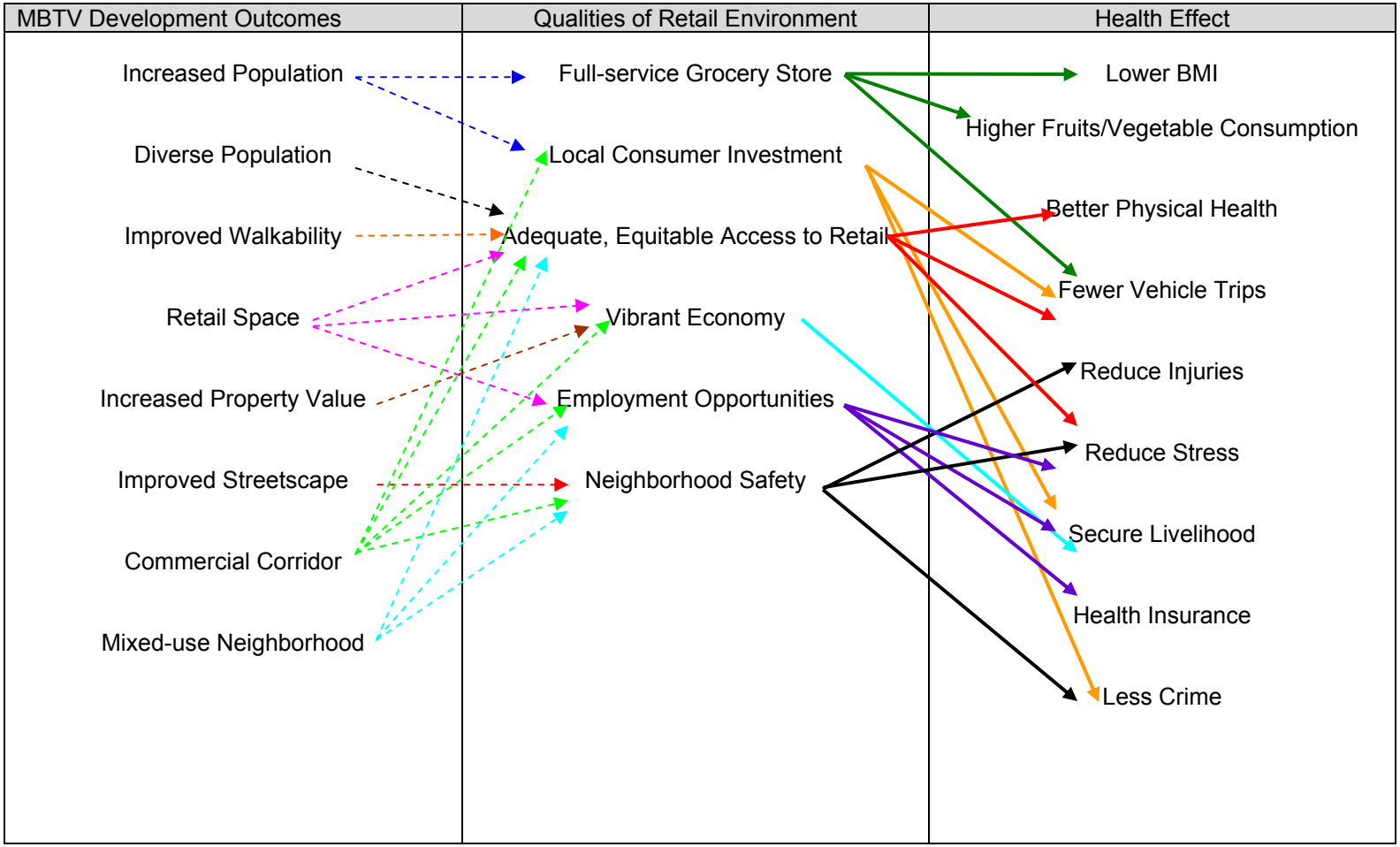
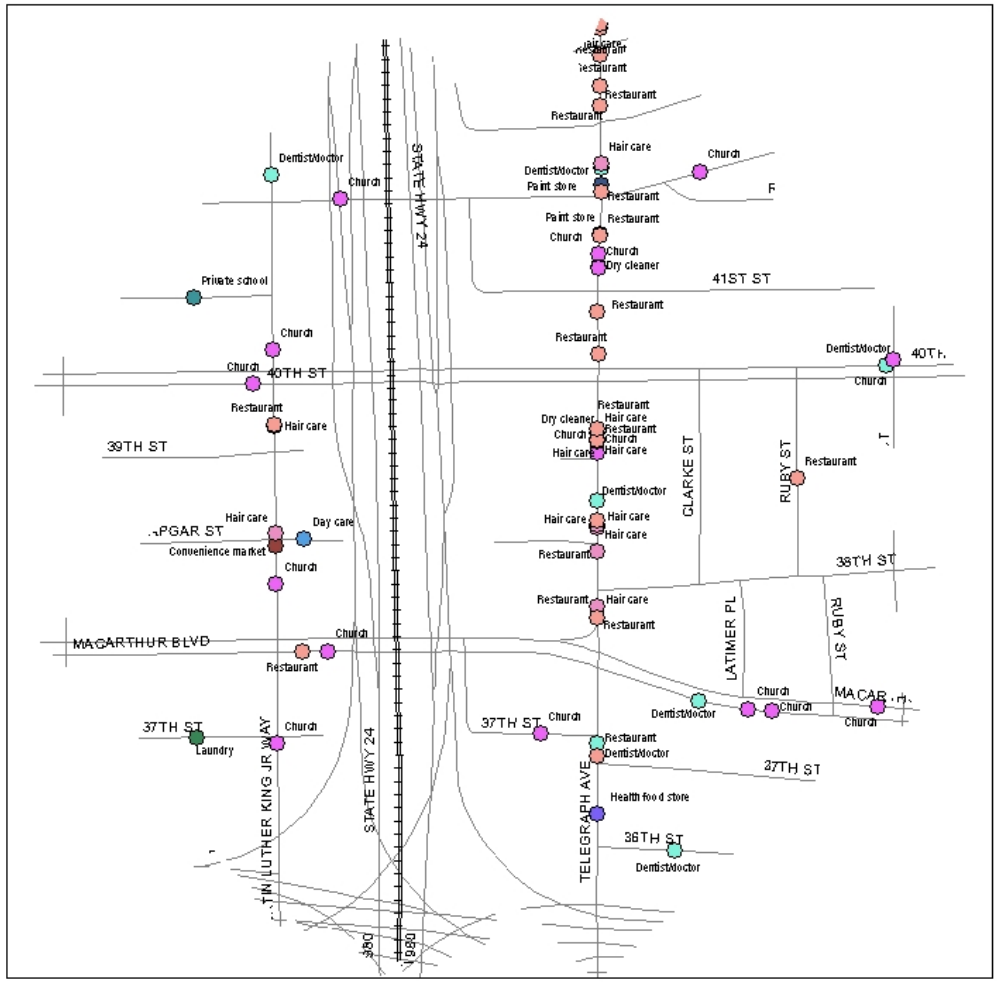


Figure R2. The pathways from retail development to health - MacArthur BART Transit Village .



MacArthur BART - 1/4 Mile Neighborhood Completeness

Neighborhood Service	MacBART
Bank	no
Church	yes
Convenience grocery	yes
Day care	yes
Dry clean	yes
Fire station	no
Hair care	yes
Hardware	no
Laundry	yes
Library	yes
Medical/dental office	yes
Nursing home	no
Park	no
Pharmacy	no
Post office	no
Restaurant	yes
School	yes
Supermarket	no
Percentage	44%



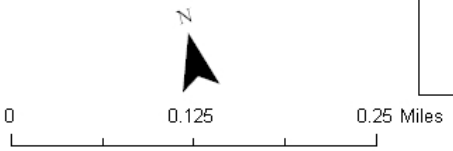
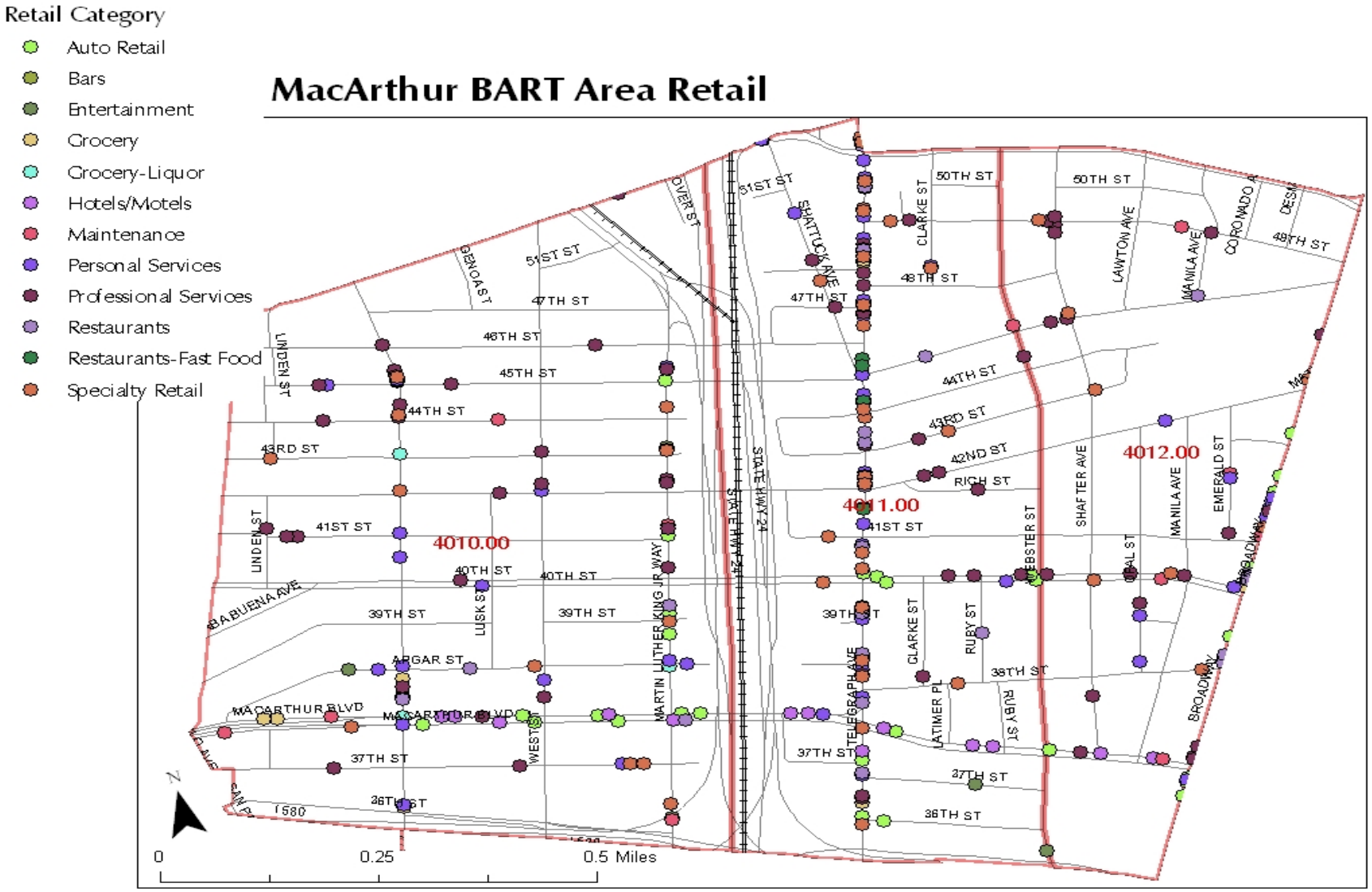


Figure R4


Retail Category
Auto Retail
Bars
Entertainment
Grocery
Grocery-Liquor
Hotels/Motels
Maintenance
Personal Services
Professional Services
Restaurants
Restaurants-Fast Food
Specialty Retail
MacArthur BART Area Retail
4010.00
4011.00
4012.00
MACARTHUR BLVD
MACARTHUR BLVD
ARGAR ST
ABABUENA AVE
41ST ST
40TH ST
39TH ST
38TH ST
37TH ST
36TH ST
51ST ST
50TH ST
48TH ST
47TH ST
46TH ST
45TH ST
44TH ST
43RD ST
42ND ST
RICH ST
LINDEN ST
LUSK ST
WEST ST
MARTIN LUTHER KING JR WAY
STATE HWY 24
TELEGRAPH AVE
CLARKE ST
RUBY ST
LATIMER PL
WEBSTER ST
SHAFTER AVE
MANILA AVE
EMERALD ST
BROADWAY
LAWTON AVE
SHATTUCK AVE
OVER ST
GENOA ST
CORONADO AVE
I 580
N
0
0.25
0.5 Miles

Mac Arthur BART Transit Village

Health Impact Assessment

Chapter 5
Schools and Child Care

A. Summary

Schools and child care are essential parts of a healthy community. Not only do neighborhood schools contribute to educational success and foster neighborhood social cohesion, they increase the likelihood that children will walk or bike to school increasing daily physical activity levels and decreasing air pollution. To be successful, local schools need sufficient physical capacity as smaller class sizes have been shown to increase student learning. Similarly, locally accessible child care potentially improves children's educational outcomes and decreases vehicle miles traveled. This chapter provides an assessment of (1) neighborhood public school capacity relative to project generated demand (2) neighborhood childcare capacity relative to project generated demand and (3) the adequacy and safety of current walking and biking routes to neighborhood public schools from MBTV. Based on current school enrollment and projected student generation from the MBTV, the Oakland Unified School District may not be able to satisfy project-generated public school student demand in local area schools, potentially leading to longer school commutes for families, increased private school enrollment, or decreased attractiveness of the transit village for families with children. The increase in young children predicted for the transit village will also increase demand for child care beyond the current local supply. In addition, based on a screening analysis of the shortest routes between the project and schools, walking to school currently present a number of known hazards; improvements to these roads could lead to decreased pedestrian injuries and increased proportion of children walking and biking to school.

Project Health Impacts

1. Using varying methods, estimates of student generation based on the proposed MBTV project's 80/20% mix of 625 market and below-market rate housing range from 132 to 420 new students. Although the local high school may have sufficient capacity for additional students from the transit village, local elementary and middle schools are near capacity and may not be able to support all new students from the transit village.
2. A quantitative forecast of child care demand based on demographic data, suggests between 638 and 722 children will need the services of either family child care or a child care center, while only 172 and 373 spots are currently available in existing family child care and child care centers, respectively.
3. Local schools are within 1.5 miles from MBTV, which allows for children to walk or bike to school. However, pedestrian hazards surrounding Mac Arthur BART (e.g. multi-lane roads, high vehicle volume) and limited safety countermeasures (e.g., advanced crosswalk design, bike paths) create a barrier to active transportation to schools.

Recommendations for Design and Mitigations

1. Re-assess the adequacy of school capacity in the neighborhood under the assumption that the project may ultimately attract families to the same degree as other transit villages;
2. Work with the Oakland Unified School District to ensure that local schools can meet project generated student demand;
3. Conduct further analysis of child care supply by age of child.
4. Ensure that there is a child care center at the Mac Arthur BART Transit Village with safe indoor or outdoor play space;
5. Investigate financial strategies for enabling or subsidizing child care on the site with Local Investment in Child Care (LINCC);
6. Include at least two housing units in the village designed to function as family child care facilities;
7. Implement the City of Oakland Recommended Bikeway Network from 1999, especially the on-street striped bike lanes on 40th Street and Telegraph Ave;
8. Make pedestrian improvements on Telegraph Avenue to provide a safe crossing for children walking to local schools.

B. Background

Pathways between Neighborhood Schools and Health

Neighborhood schools, whose students come from the surrounding community, are key elements of healthy and sustainable neighborhoods, and housing choice for families is strongly dependent on neighborhood school access and quality.[1] Neighborhood schools provide a sense of safety, build connections between the school and neighborhood, instill a sense of community among students, engage students in learning, encourage parental involvement, facilitate physical activity, and promote environmental quality.[2] Research on educational practices has demonstrated that well designed and operated community based schools support the goal of high quality education.[3] Some of the key pathways between local schools, child care and health are illustrated in figure 1 below.

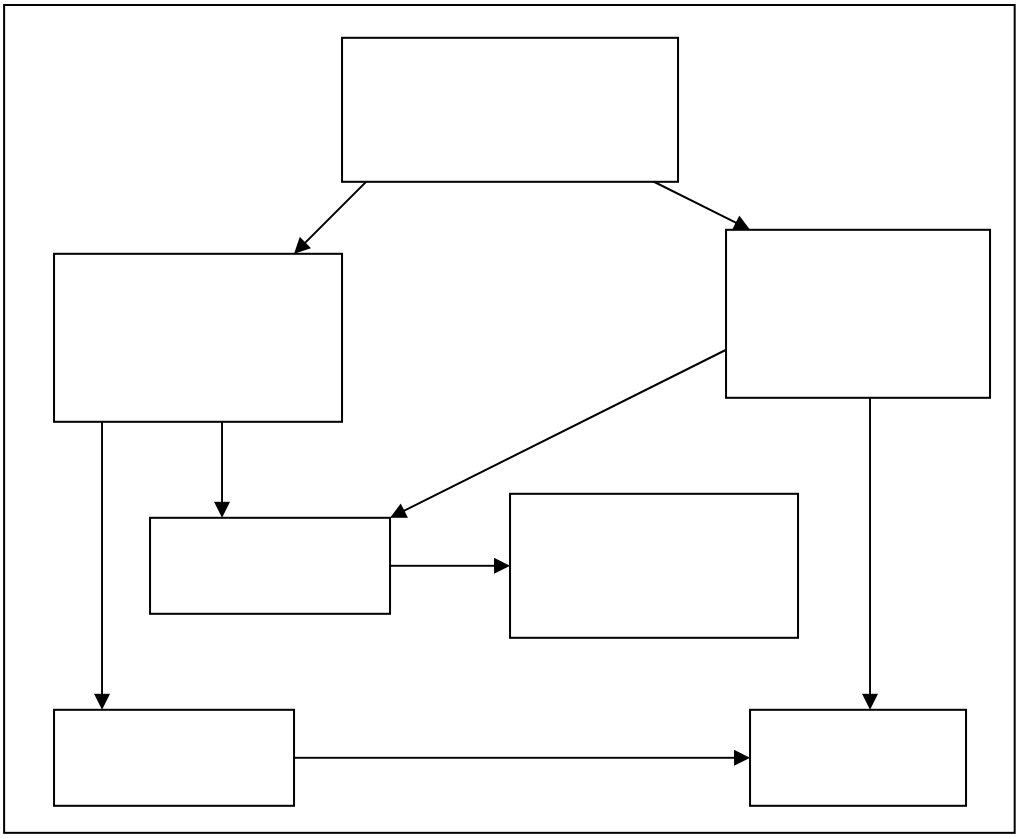


Figure 1. School and child care pathways to health.

1 Blash, Lisel; Shafer, Holley; Nakagawa, Monique; Jarret, September; Getting Behind The Headlines: Families Leaving San Francisco; San Francisco State University; Public Research Institute; September 2005

2 Schools for Successful Communities: An Element of Smart Growth; The School Building Association including Council of Educational Facility Planners International and United States Environmental Protection Agency; September 2004

3 Steven; Quinn, Linda, and Sullivan, Kevin; "Schools as Centers of Community: A Citizen's Guide For Planning and Design"; National Clearinghouse for Educational Facilities, Coalition for Community Schools, Building Educational Success Together; Knowledge Works Foundation, Council of Educational Facility Planners; Washington D.C., 2003

Walking or Biking to School promotes physical activity and reduces air pollution

The United States has witnessed a dramatic increase in the prevalence of obesity among children in recent decades; rates have doubled for children ages 6-11 from 1980 to 2004 and tripled for teens, ages 12-19 years.[4] A 2002 CDC survey found that 22.6% of children ages 9-13 did not participate in any physical activity in their free time in the week prior to the survey and 61.5% don't participate in any organized physical activity outside of school.[5] Physical activity from walking to school has also declined. According to the 2001 National Household Travel Survey, less than 15% of children aged 5 to 15 walk to school. In contrast, in 1969, almost half of students walked or biked to school.

According to the CDC, long distances to school are a primary barrier to walking and danger from traffic was the second most important barrier.[6] Local community schools are important for health because when children live closer to school they are more likely to walk.[7] A CDC report found that 31% of children that live within one mile of school walk, compared to only 2% of children living within two miles of school.[8] Research on travel mode choice also shows that when schools are located closer to home, more children walk and/or bicycle to school and vehicle pollution emissions fall. A simulation done for Gainesville, Florida demonstrated that neighborhood schools and sidewalk completeness resulted in a doubling of the number of children walking and a 15% reduction in vehicle emissions.[9] Hence, in addition to potentially improving the health of children by increasing physical activity through promoting walking and biking, neighborhood schools may also improve health by improving air quality.

Traffic hazards are a second key barrier to children walking and biking to school.[10] On a per-mile basis, walkers and bicyclists going to school have the highest injury and fatality rates.[11] Changes in the physical environment, such as sidewalks, traffic calming measures, and well designed crosswalks, can make walking and biking to school more desirable and safer.[12] Bike lanes also improve safety, as a study comparing streets with and without bike lanes in Davis, CA found that bike accidents were much lower on streets with bike lanes.[13]

4 CDC. Healthy Youth!: Childhood Overweight. Online. Internet. http://www.cdc.gov/HealthyYouth/overweight/index.htm. Last updated August 3, 2006.

5 CDC. Physical Activity Levels Among Children Aged 9-13 Years – United States, 2002. Online. Internet. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5233a1.htm. Last updated August 23, 2003.

6 Dellinger A Staybtib C, Barriers to Children Walking and Bicycling to School. Morbidity and Mortality Weekly Report. 2002; 51: 701-704.

7 Ewing R, Schroeer W, and Greene W. School Location and Student Travel: Analysis of Factors Affecting Mode Choice. Transportation Research Record: Journal of the Transportation Research Board. 2004; 1895: 55-63.

8 CDC. Physical Activity Levels Among Children Aged 9-13 Years – United States, 2002. Online. Internet. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5233a1.htm. Last updated August 23, 2003.

9 Ewing R, Forinash CV, Schroeer W. Neighborhood Schools and Sidewalk Connections. What are the impacts on travel mode choice and vehicle emissions. Transportation Research News. March-April 2005 pp 4-10

10 Dellinger A Staybtib C, Barriers to Children Walking and Bicycling to School. Morbidity and Mortality Weekly Report. 2002; 51: 701-704.

11 McMillan T. The relative influence of urban form on a child's travel mode to school. Transportation Research. 2007; Part A 41: 69-79.

12 Ewing R, Schroeer W, and Greene W. School Location and Student Travel: Analysis of Factors Affecting Mode Choice. Transportation Research Record: Journal of the Transportation Research Board. 2004; 1895: 55-63.

13 Lott DF and Lott DY. Effect of Bike Lanes on Ten Classes of Bicycly-Automobile Accidents in Davis, California. Journal of Safety Research. 1976; 8(4): 171-179.

Smaller Class Size Advances Health By Supporting Educational Success

Although there is some controversy, many studies show a link between smaller class sizes and increases in children learning, especially in the primary grades. An experimental study of 76 elementary schools in Tennessee found that students who were placed in classrooms with fewer children had higher scores in math, reading, and study skills compared to students in regular sized classes and that these increases in achievement were maintained over time.[14] While class size has not been studied directly in epidemiologic studies of health, improved school outcomes translates into educational success and improved adult economic outcomes, both of which are well documented predictors of health and longevity. The US Centers for Disease Control's Healthy People 2010 summarizes the importance of a educational success to health below:[15]

> Dropping out of school is associated with delayed employment opportunities, poverty, and poor health. During adolescence, dropping out of school is associated with multiple social and health problems, including substance abuse, delinquency, intentional and unintentional injury, and unintended pregnancy. Some researchers suggest that the antecedents of drug and alcohol problems, school dropout, delinquency, and a host of other problems can be identified in the early elementary grades, long before the actual problems manifest themselves. These antecedents include low academic achievement and low attachment to school, adverse peer influence, inadequate family management and parental supervision, parental substance abuse, sensation-seeking behavior, and diminished personal capabilities. Children who perform poorly in school, are more than a year behind their modal grade, and are chronically truant are more likely to exhibit risk behaviors and experience serious problems in adolescence. Finally, risk of these outcomes is increased if children fail to form meaningful social bonds to positive adult and peer role models with whom they interact at school or in the community. If high school dropout rates are addressed as part of the Nation's health promotion and disease prevention agenda, unwarranted risks of problem behavior may be reduced and the health of young people improved.

High Quality Child Care Effects Health by Promoting Educational Success

Numerous studies have found that quality early childhood education and group child care settings can have long-term educational benefits, especially for low-income children. For example, one study of young adults compared those who had been in child care from infancy until starting elementary school to a control group finding that at age 21 young adults who had had consistent child care scored higher on tests of academic skills, were more likely to attend a four-year college and were more likely to still be in school at 21.[16] Because of the extensive evidence relating early childhood education to educational and developmental success, in 2002, the Centers for Disease Control Task Force on Community Preventive Services (Task Force) conducted a systematic review of early childhood development interventions. As the basis for their recommendation, the Task Force cited evidence of effectiveness in preventing developmental delay, assessed by improvements in grade retention and placement in special education.[17] Based on this review, the Task Force strongly recommends publicly funded, center-based, comprehensive early childhood development programs for low-income children aged 3--5 years.

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14 Finn JD and Achilles CM. Answer & Questions about Class Size: A Statewide Experiment. American Educational Research Journal, 1990; 27(3): 557-577.

15 U.S. Department of Health and Human Services. Healthy People 2010: Understanding and Improving Health. 2nd ed. Washington, DC: U.S. Government Printing Office, November 2000.

16 Campbell FA and Pungello E. High Quality Child Care Has Long-Term Benefits for Poor Children. Paper presented at the 5th Head Start National Research Conference, Washington, DC. June 28 – July 1, 2000.

17 Laurie M. Anderson, Ph.D., M.P.H., Carolynne Shinn, M.S., Joseph St. Charles, M.P.A. Community Interventions to Promote Healthy Social Environments: Early Childhood Development and Family Housing A Report on Recommendations of the Task Force on Community Preventive Services. MMWR. 2002; 51:1-8

C. Established Standards and Health Objectives

The US Department of Health and Human Services (USDHHS) establishes National objectives improving health for the year 2010.[18] One Healthy People 2010 target related to education is to increase high school completion from a baseline of 85% of persons aged 18-24 years in 1998 to 90%. This target is consistent with the National Education Goal. A related goal is to eliminate racial and ethnic gaps in high school graduation rates. With respect to physical activity, a Healthy People 2010 target calls for an increase the proportion of adolescents who engage in moderate physical activity for at least 30 minutes on 5 or more of the previous 7 days from a baseline of 27% of students in grades 9-12 to 35%. Physical activity targets related to schools include an increase the trips to school of 1 mi or less among children and adolescents aged 5-15 years from a baseline of 31% in 1995 to 50% and an increase children and adolescents bicycling to schools 2 miles or less away from 2.4% to 5%

D. Existing conditions

Existing Oakland Public Schools Capacity and Demand

According to the Oakland Unified School District's (OUSD) school-finder website,[19] the Mac Arthur BART transit village falls within the boundary for the Santa Fe Elementary School and is also on the border of the Emerson Elementary School attendance area. Westlake Middle School and Oakland Technical High School also serve the MBTV project area.

In Oakland, families are allowed to choose among all district schools subject to available capacity. The process of school selection involves families making a list of their top choices and the district making the assignment. Where demand for a particular school exceeds capacity, area residents have first priority for their neighborhood schools. In general, parents have been able to secure assignment to neighborhood schools with the District placing portable classrooms at a school site to meet excess demand.

Additionally, if a school in OUSD is subject to a required improvement plan due to lower test scores in previous years, families with children attending that school may ask for a transfer to another school. Westlake Middle School and Oakland Technical High School are currently on the improvement plan but the local elementary schools are not.

Figure 2 shows enrollment in the four local public schools for the past three years. Santa Fe Elementary School currently has 317 students relative to its capacity of 320 students.[20] In the past over 900 students have attended Westlake Middle School however, under a recent reorganization, their enrollment is near capacity at 700 students.[21] Despite increasing enrollment in recent years, enrollment at Oakland Technical High School is not at capacity of about 2000 to 2500 students.[22] Capacity for Emerson Elementary School was not obtained, but student enrollment data suggests that the student population is relatively stable.

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

19 http://mapstacker.ousd.k12.ca.us

20 Personal communication with secretary of Santa Fe Elementary School on December 1, 2006.

21 Personal communication with secretary of Westlake Middle School on December 1, 2006.

22 Personal communication with a counselor at Oakland Technical High School on December 1, 2006

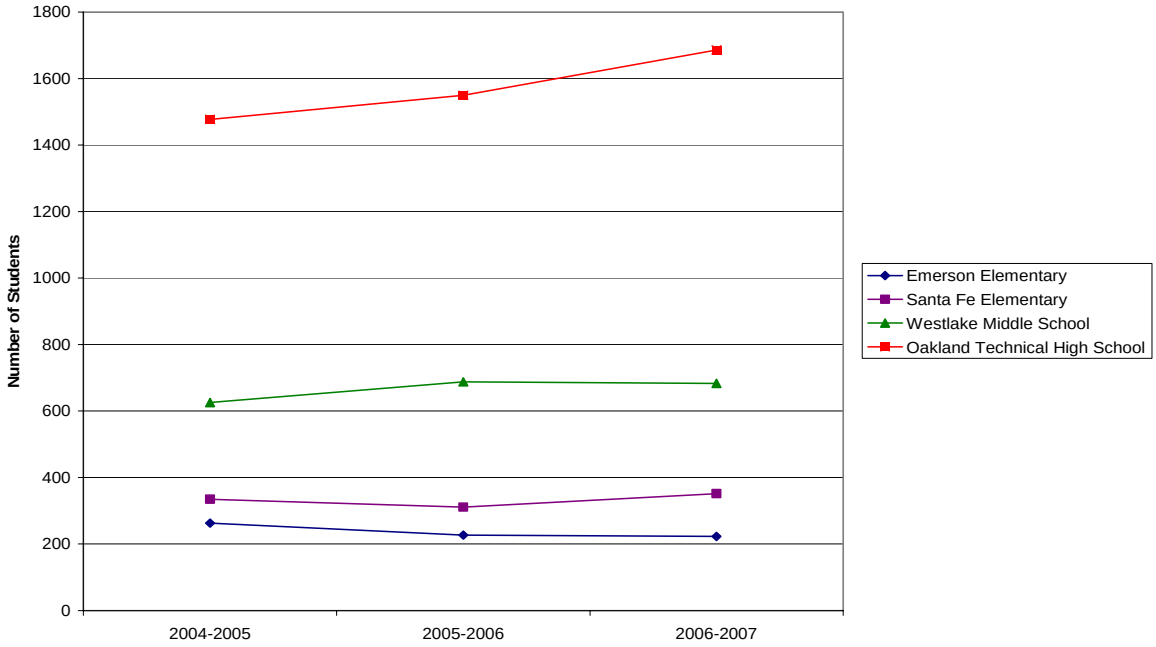

Figure 2. Enrollment at Public Schools Close to Mac Arthur BART Transit Village

Existing Child care Demand and Capacity

Alameda County performs a child care needs assessment for every city in the County as well as each zip code within the City of Oakland. The needs assessment for the zip code 94609, which includes Mac Arthur BART, provides demographic information for the area from the 2000 census, but does not explicitly estimate the number of children who would need child care services. [23] With regards to supply, the 94609 zip code area has 423 child care spots in either part-time or full-time child care providers (including family child care and center-based care) designated for different age groups.

BANANAS Inc.[24], a non-profit child care referral and support agency located in Oakland also tracks childcare providers. According to BANANAS, Inc., there are 17 family child care facilities and 5 child care centers in currently operating near Mac Arthur BART. Family child care facilities are licensed child care facilities that are run out of a person's home and child care centers are larger facilities that are not run from someone's home. Each child care facility has limits on ages of children, but summing the capacity of each facility yields 172 spots in family child care and 373 spots in child care centers.

Safe Routes to Schools Programs

The Safe Routes of Schools Program is a nationally funded program started in August 2005 to provide funds to states and local communities to improve safe walking and biking conditions to schools. The goals of the program include increasing the number of children walking and biking to school, improving traffic safety around schools, decreasing traffic congestion around schools, decreasing obesity in children, improving air quality, community safety and community involvement, and creating partnerships between schools and the local community. Local areas can apply for funds to implement a program that

23 Alameda County early Care and Education for All, Needs Assessment Report, June 2006.

http://www.acgov.org/childcare/documents.shtml.

24 http://www.bananasinc.org/.

combines education, encouragement, engineering, enforcement and evaluation in order to make walking and biking to school safer.[25]

The Transportation and Land Use Coalition (TALC) is initiating a *Safe Routes to Schools* program in Oakland starting with two schools in 2007 based on the successful program in Marin County. The program combines teaching basic safety to kids, contests and events to encourage children to walk to school, coordinating with local police to enforce traffic and safety laws near schools, and identifying safety hazards and working with the city to make improvements to streets for pedestrian safety.[26] The two initial schools in the TALC program are Peralta Elementary and Berkeley Maynard Academy located 1.5 miles and 1.9 miles from MBTV.

E. Impact Analysis

The schools and childcare analysis in the Mac Arthur BART transit village HIA focuses on the following three questions:

1. Do area public schools have sufficient capacity to meet demand created by student generation from the Mac Arthur BART transit village?
2. Do area child care resources have sufficient capacity to meet demand created by residents of the Mac Arthur BART transit village?
3. Will routes between schools and Mac Arthur BART enable residents to walk or bike to school?

1. Do area public schools have sufficient capacity to meet demand created by student generation from the Mac Arthur BART transit village?

The Oakland Unified School District (OUSD) does not have a local formula for assessing the student generation from new land use development. [27] Under State law, the California State Department of Education provides a student generation rate from new residential units in order to estimate the need for new schools. This statewide formula estimates that one unit of housing would generate on average 0.5 elementary or middle school students and 0.2 high school students.[28] Applying these rates to MBTV's estimated 600 units would yield about 300 elementary or middle school students and about 120 high school students for a total of 420 students. An estimate is based on statewide student generation assumptions may not provide an accurate estimate of the student population generated by the MBTV.

An alternate estimate can be based on an OUSD assessment of student generation resulting from new multi-family housing developments in the downtown area.[29] Consultants for OUSD analyzed how many students from completed developments enrolled in their schools and used this to project the number of students they would expect to enroll from the new downtown developments. Out of 1698 market rate units in previous developments, only 3 students were enrolled in OUSD schools in 2005, whereas in affordable or below market-rate (BMR) developments 16 students enrolled from 42 new units. Based on empirical data, a generation rate of 0.002 students per unit in market-rate housing and 0.38 students per unit in BMR housing was calculated in the OUSD report. The report recommended using a range of 0.4

25 CalTrans. Safe Routes to School (SRTS) Program. Online. Internet. http://www.dot.ca.gov/hq/LocalPrograms/saferoute2.htm. Last updated October 2, 2006.

26 Transportation and Land Use Coalition. Safe Routes to Schools. Online. Internet. http://www.transcoalition.org/c/sr2s/index.html. Last updated November 8, 2006.

27 Personal Communication with David Kakashiba, Member, OUSD Board.

28 Oak to Ninth Draft EIR, September 1, 2005. http://www.oaklandnet.com/government/ceda/revised/planningzoning/MajorProjectsSection/oaktoninth.html.

29 Lapkoff & Gobalet Demographic Research Inc. 2006. Impact of New Housing Developments on OUSD Enrollments and Facilities. Found at: http://webportal.ousd.k12.ca.us/news/demographic%20report%209%206%2006%20v2.pdf

to 0.7 students per unit for below market rate units and a range of 0.01 to 0.1 students for market rate units as a conservative student generation rate for downtown area development, although the actual rates they calculated were lower than these.

MBTV is not in the downtown area and was not considered in aforementioned OUSD analysis; however, based on 600 units with 20% below market rate rental units and 80% market rate units for ownership and the rate ranges recommended in the OUSD downtown area analysis, the MBTV would have between 47 and 132 students.(See Table 1) OUSD-based estimates reflect current development trends for the Oakland downtown area, and may also not be appropriate to the proposed project. These estimates are also significantly lower than those based on the California State Department of Education student generation rate.

Table 1. Student Generation from MBTV based on OUSD analysis of downtown Oakland Condominium developments.

		Student Generation Rate for BMR Units (Students Per Unit)	
		0.4	*0.7*
Student Generation Rate for Market Rate Units	*0.01*	53	89
	0.1	96	132

Estimates in each cell are rounded to the nearest whole person

A third way to estimate public school demand is based on the expected number of school-age children might at the MBTV, which might provide more context estimates but still requires making assumptions about the demographic characteristics of the future population (e. g, household size and age distribution) based on local demographic data and assumptions about family enrollment in public schools. Specifically, the required demographic parameters include the number of people per household and their age distribution of the people. To create a range for our estimates, we used three alternative sources for household size:

- For the three census tracts surrounding Mac Arthur BART, the average owner-occupied household has 2.45 people and the average renter-occupied household has 2.07 people[30].
- For the city of Oakland as a whole, the average number of people living in each household is 2.76 for owner-occupied housing and 2.49 for renter-occupied properties.[31]
- Considering households within 0.5 miles of a rail or ferry station within the San Francisco Bay Area, the average household size is 2.29.[32]

Using the above three household size assumptions, the number of people projected to live in MBTV ranges between 1,374 and 1,624. (See Table 2)

Furthermore, according to the 2000 census, 21% of the people in Alameda County tract numbers 4010, 4011, and 4012 are children under age 18 (See Table 3). Applying these assumptions about population demographics, we can project a range of between 193 and 229 school age children (ages 6-17) living at the Mac Arthur BART Transit Village (See Table 4)

30From the 2000 Census SF1. www.census.gov

31 InfoPlease.com, Demographic Statistics for Oakland, CA. Online. Internet.

http://www.infoplease.com/us/census/data/california/oakland/demographic.html. Visited on November 18, 2006.

32 Metropolitan Transportation Commission, Planning Section. Characteristics of Rail & Ferry Station Area Residents in the San Francisco Bay Area: Evidence from the 2000 Bay Area Travel Survey, Volume 1. September, 2006.

Table 2. Estimated number of people living in the MacArthur BART Transit Village

	Owner-occupied housing Market Rate 80% of MBTV	Renter-occupied housing Below-Market Rate 20% of MBTV	Total Projected Population for MBTV
MTC estimate (2.29 / household within 0.5 mile of rail or ferry station)	1,099	275	1,374
Rates from neighborhood surrounding MBTV (2.45 / household in owner-occupied 2.07 / household in renter-occupied)	1,176	248	1,424
Rates from Oakland (2.76 / household in owner-occupied 2.49 / household in renter-occupied)	1,325	299	1,624

Estimates rounded to nearest whole person.

Table 3. Population Age Distribution in Area Surrounding Mac Arthur BART in 2000.

Age Category	Number of People (%)
0 to 2 years	398 (3.28%)
3 to 5 years	420 (3.46%)
6 to 9 years	592 (4.87%)
10 to 13 years	559 (4.60%)
14 to 17 years	560 (4.61%)
18 years and older	9,619 (79.2%)

Census 2000 data from www.census.gov for Census Tracts 4010, 4011, 4012.

Table 4. Projected Number of School-Age Children in MBTV Based on 2000 Census Rates

	Population estimate from MTC rates: 1374 people	Population estimate from surrounding neighborhood rates: 1424 people	Population estimate from Oakland rates: 1624 people
Ages 6-9	67	69	79
Ages 10-13	63	66	75
Ages 14-17	63	66	75
Total School-Age Children	193	201	229

Estimates rounded to nearest whole person.

Because the housing proposed for Mac Arthur BART is exclusively multi-family, estimates based on either neighborhood, Oakland, or transit area demographics which represent a mix of single family and multi-family dwellings, may overestimate the child population. Of course, it is not possible to conclusively predict the population characteristics of a proposed residential project in advance; however, in the absence of specific demographic data on future project residents the assumptions provide a reasonable range of estimates of the child population.

This range of expected school-age population can be translated into a number of children who will attend the local public schools assuming a rate of private school attendance. In the 2002-2003 academic years,

13% of students in Alameda County attended private schools.[33] This countywide private school attendance rate, which may or may not represent the preferences of the future MBTV population, yields a project generation of 168 to 199 public school students. A summary of the results of these three projection methods to estimate the number of children who would attend the OUSD schools from MBTV is shown in Table 5.

Table 5. Summary of Projections of Children Living in MBTV Who Will Attend OUSD Schools

Method	Estimate
California State Department of Education Rates	420
OUSD's Rates for New Developments in Downtown	47 – 132
Rates Based on Area Population in 2000 Census	168 - 199

Overall, it appears that the MBTV will create a modest increase in the student demand for OUSD schools with estimates varying from a low of 47 to as high as 420. Given current OUSD school capacity in the area and policy, some students from MBTV may have to attend schools farther from home, requiring the use of public transit or additional vehicle trips. Alternatively, families without neighborhood school capacity may be more likely to opt for private school alternatives, reducing both financial contributions to public schools which are dependent on student attendance and social benefit of family participation in public education.

2. Do area child care resources have sufficient capacity to meet demand created by residents of the Mac Arthur BART transit village?

This HIA used a methodology created by the Enterprise Foundation to assess area child care demand created by the new development.[34] Key parameters in this methodology include the number of children, the number of parents in family households and their employment status. In our calculations, percent of children in married households was derived from the number of married family households with one or more people under the age of 18 divided by the total number of households with members under the age of 18. Percent of children living with a single parent was calculated from the number of family households with any members under the age of 18 with either a male householder with no wife present or a female householder with no husband present divided by the total number of family households with any member under the age of 18. The census contains information on number of people employed in a household but not whether those households have children. For this analysis, it was assumed that rates of employment are the same for households with and without children and that there is no effect on employment of the parents based on the age of children in the family. Table 6 shows the results of these calculations based on the three census tracts around MBTV.

33 Oak to Ninth Draft EIR, September 1, 2005.
http://www.oaklandnet.com/government/ceda/revised/planningzoning/MajorProjectsSection/oaktoninth.html.

34 Understanding Child Care Supply and Demand Practice. Enterprise Foundation. Spreadsheet Provided by Ellen Dektar, Alameda County Coordinator of Local Investment in Child Care (LINCC) Project. The Enterprise Institute makes a number of assumptions in this method. For example, the spreadsheet was originally designed for low-income families. Not all families living in MBTV will be low-income. In order to combine the census categories with the categories required for the spreadsheet, married-couple families were counted as two parent families, male householder with no wife present and female householder with no husband present were counted as single parent families, and non-family households were not used in this analysis because there was no way to know if there were two adults or one adult responsible for the children.

Table 6. Percent of household types in the census tracts 4010, 4011, 4012 based on the 2000 US Census.

Number of married couple family households with one or more people under 18 years	38%
Number of single parent family households with one or more people under 18 years	62%
Married households with both spouses working	53%
Married households with one spouse working	29%
Married households with neither spouse working	18%
Single parent households with one parent working	74%
Single parent households with no parent working	26%

Using three alternative assumptions for household size (See Table 2) and the age structure of surrounding census tracts (See Table 3), we projected number of children living in Mac Arthur BART to range between 286 to 338 (See Table 7). As discussed above, the three alternative assumptions are that the MBTV population structure will resemble the surrounding neighborhood, the city of Oakland, or the areas surrounding regional transit. As acknowledged above, it is not possible to conclusively predict the population characteristics of a proposed residential project in advance.

Table 7. Projected Number of Children living in MacArthur BART Transit Village

Age Groups	2000 population (tracts 4010, 4011, 4012)	MBTV Population mirrors area transit villages: 1,374 persons	MBTV Population mirrors local area: 1,424 persons	MBTV Population mirrors Oakland: 1,624 persons
0-2 years	398	45	47	53
3-5 years	420	48	49	56
6-9 years	592	67	69	79
10-13 years	559	63	66	75
14-17 years	560	63	66	75
18+ years	9,619	1,088	1,128	1,286

Estimates rounded to nearest whole person.

Table 8. Estimates of number of children needing child care by type of child care for different population estimates.

	Family Child Care	Child Care Center	Other kind of care	Family Child Care + Child Care Center
2000 Population	260	377	1332	638
2000 population + MTC rates	290	419	1483	709
2000 population + local area rates estimate	291	421	1488	712
2000 population + Oakland rates	295	427	1510	722

Using these parameters and the Enterprise Institute methodology yields the needs for child care described in Table 8. These estimates may overestimate demand because they also include children through age 13 that may need after school care. We did not assess child care needs for special needs children in this assessment.

Based on the BANANAS Inc.[35] estimated capacities of 172 spots in family child care and 373 spots in child care centers in the area, it appears that there is insufficient current capacity in family child care in the local area to meet the needs of the current local population and child care centers are at capacity. Childcare demand from future MBTV residents will result in additional excess demand relative to supply suggesting a need not just for a child care center at the MBTV but also a need for additional family child care facilities.

In addition to the added child care needs from children at MBTV, and in the surrounding community, people commuting on Mac Arthur BART and those that work in the area may find it more convenient to use child care in MBTV rather than places closer to their home, thus increasing the demand for child care services at MBTV. Nelson and Nygaard[36] estimated in 1991 that about 4% of all morning riders entering and exiting Mac Arthur BART would need child care services. In addition, employees in the surrounding area, whether they use BART to commute to work or not might be interested in using child care services close to their jobs. One local employer, Kaiser Hospital, is expected to hire an additional 950 employees in the next 15 years.[37] Collectively, these developments will likely lead to increased demand for center based child care near Mac Arthur BART.

3. Will routes between schools and Mac Arthur BART facilitating walking or bicycling to school?

As discussed above in Section B of this chapter, two primary obstacles to children walking to school are distance and safety. The two elementary schools that are closest to MBTV and the high school that students living in MBTV would attend are all within 1 mile, making them within walking distance. Westlake Middle School is slightly farther away, at 1.4 miles, which is possible for walking, but may be conducive to biking (Table 9). Although the MBTV development will not affect the location of schools, it can affect, both through physical changes onsite and offsite, the adequacy of walking routes to school.

Table 9 Distances from Mac Arthur BART Transit Village to Local Public Schools

School	Approximate Walking Distance
Santa Fe Elementary School	1 mile
Emerson Elementary School	0.7 miles
Westlake Middle School	1.4 miles
Oakland Technical High School	0.7 miles

With regards to the safety of routes to schools, some information on pedestrian hazards is provided from maps of pedestrian injuries in the area near Mac Arthur BART (See Figure 3). (Note: A full analysis of impact of the project on pedestrian injuries is presented in a separate chapter of the MBTV Health Impact Assessment report.) Most of the injuries are located along the busiest roads, with many injuries along Telegraph Avenue. Students walking or biking from MBTV to Oakland Technical High School, Westlake Middle School or Emerson Elementary School will have to walk along or cross intersections with a significant history of pedestrian injuries.

35 http://www.bananasinc.org/.

36 Bruce Riordan, Elmwood Consulting

37 East Bay Business Times , May 5, 2006.

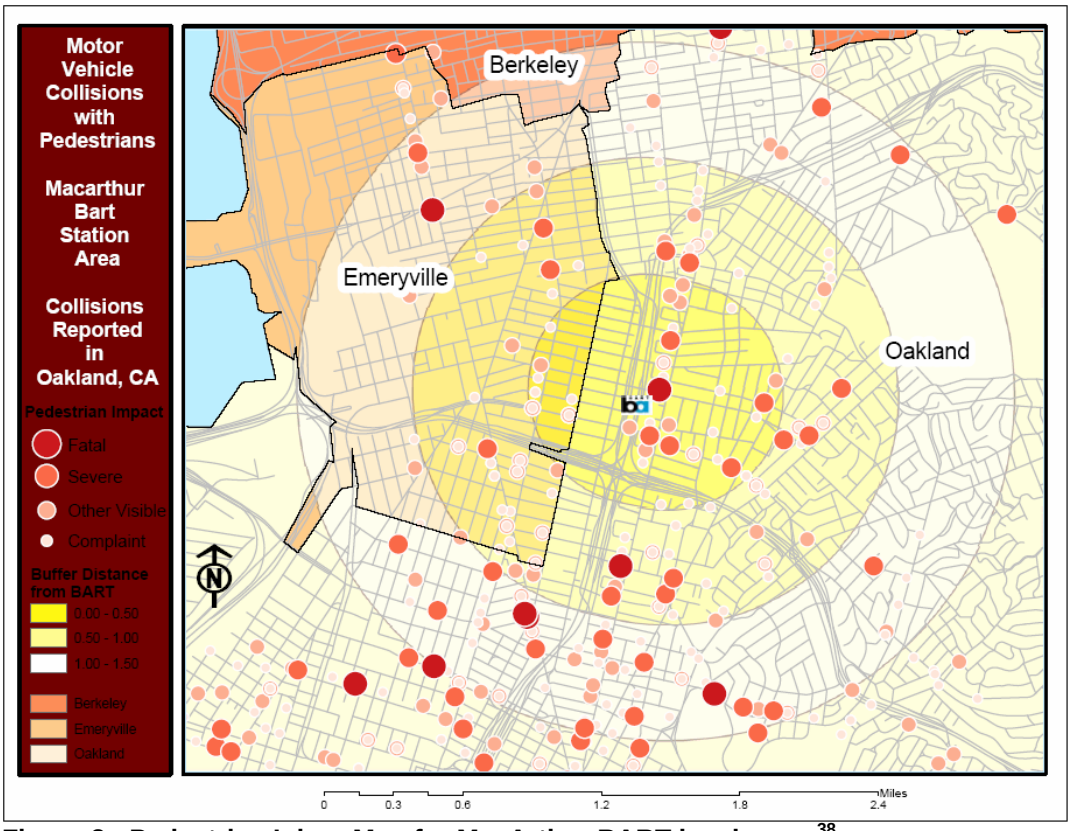

Figure 3: Pedestrian Injury Map for MacArthur BART local area. [38]

Historical, injury data provides only a limited assessment of safety and may not identify all hazards on all routes. In order to try to ascertain whether the pedestrian environment will be safe for future students living at MBTV, the streets along key routes between MBTV and the schools were analyzed by looking at satellite imagery of these routes using Google Maps online and assessing several factors, including presence of sidewalks, how many intersections children would have to cross to get to school, the number of crosswalks per intersection, presence of speed bumps on any of the roads traveled, and number of lanes of largest road on walk.[39] While not a complete assessment of pedestrian safety of these streets, this approach serves as a rapid screening tool for potential areas of improvement when considering children walking and biking to school from MBTV.

Table 10 lists safety characteristics of the shortest walking route (as calculated by Google Maps) from MBTV to each school. All the streets that children would walk from MBTV to the four schools being investigated in this report have sidewalks, so this was not added to the table. Figures 4, 5, 6 and 7 illustrate the shortest routes between MBTV and each school.

38 GIS map provide by C. Commerford 2006

39 http://maps.google.com, accessed May, 2006.

Table 10: Safety Characteristics of the Shortest Walk from MBTV to Schools Within Walking Distance of MBTV

School	# of intersections in walk	# of intersections with given number of crosswalks	Evidence of Speed bumps	Number of lanes of largest road
Santa Fe Elementary	14	4 crosswalks: 3 3 crosswalks: 1 2 crosswalks: 2 1 crosswalk: 2 0 crosswalks: 6	Not on main roads	4 lanes on 40th St.
Emerson Elementary	9	4 crosswalks: 3 3 crosswalks: 1 2 crosswalks: 2 1 crosswalk: 2 0 crosswalks: 0	45th Street	4 lanes on Telegraph Avenue
Oakland Technical High School	6	4 crosswalks: 3 3 crosswalks: 1 2 crosswalks: 0 1 crosswalk: 1 0 crosswalks: 1	42nd Street	4 lanes of traffic on Telegraph Avenue, but is only a couple of blocks

Santa Fe Elementary The walk to Santa Fe Elementary School from MBTV requires crossing under the highway overpass along 40th Street. 40th St. is a wide road with four lanes and high volumes of traffic; However, there are currently planned pedestrian improvements for 40th Street under the highway.[40] If children were to take the shortest path to Santa Fe Elementary School, they would have to cross 14 intersections, many of them without crosswalks in all directions. The shortest route would continue on 40th St and then turn right on Market St. and continuing until arriving at the school at Market St. and 54th St. There are alternative paths that students could take such as turning onto West St. which only has two lanes of traffic and has large painted warnings reminding motorists to STOP for pedestrians, however not all of the intersections on West St. have crosswalks. 42nd, 45th, 46th, and 47th streets have speed bumps, however these streets could only be accessed by turning off of 40th Street before getting to Market St.

40 Personal communication with Zac Wald, staff for Oakland City Councilor Jane Brunner.

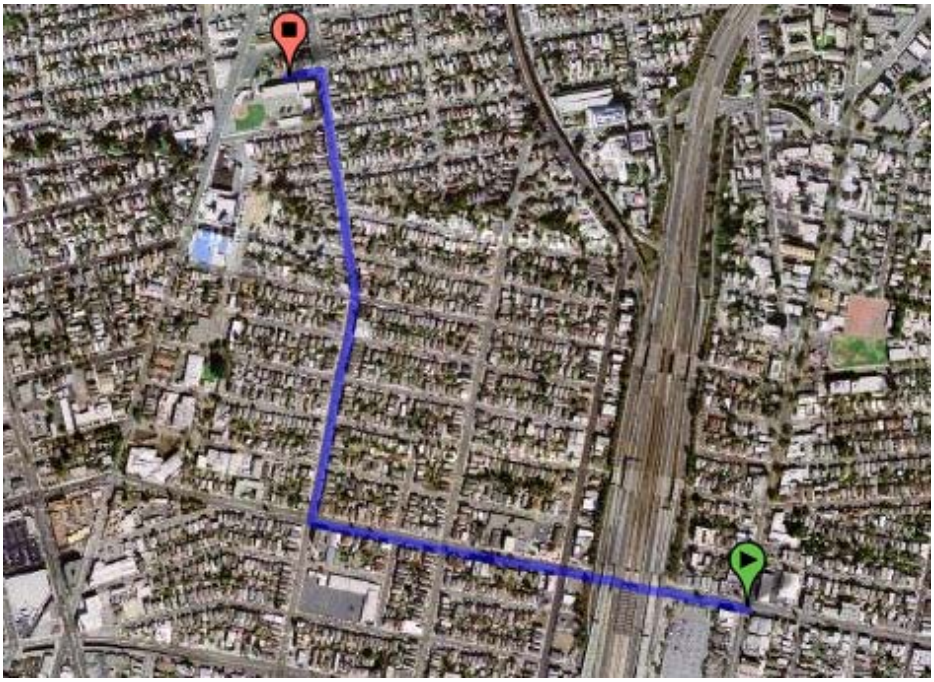

Figure 4: Shortest Route from MacArthur BART to Santa Fe Elementary School
Image taken from maps.google.com

Emerson Elementary School The walk to Emerson Elementary School is mainly along Telegraph Avenue, with students turning east onto 45th St and then north onto Lawton Avenue to arrive at school. This walk contains nine intersections, not all of which have crosswalks. Telegraph Avenue is a four lane roadway with a very high volume of traffic (>20,000 trips / day) and has been the location of a large number of pedestrian injuries in the past (Figure 3). As an alternative route, students could take 41st St., which has speed bumps, to Shafter St, both streets with only 2 lanes of traffic and fewer pedestrian injuries. Given the location of MBTV, children walking to Emerson Elementary will have to cross Telegraph Avenue at least once.

Figure 5. Route from MBTV to Emerson Elementary

Oakland Technical High School The shortest route to Oakland Technical High School from MBTV is mainly along 42nd Street, and crosses only six intersections. The street has speed bumps and only two lanes of traffic. No matter how students walk to Oakland Tech, they will have to cross Telegraph Avenue, which has four lanes of traffic and many pedestrian injuries. Overall, this appears to be the safest route to school from MBTV of all of the schools.

Figure 6: Route to Oakland Technical High School from MBTV

Westlake Middle School The walk from MBTV to Westlake Middle School is a difficult one not just because of the distance of about 1.4 miles, but also that it requires crossing under Interstate 580 and all the roads that would be taken have four lanes of traffic. All possible routes include many intersections not all of which have crosswalks. In this circumstance, it would be advisable for students to find an alternate mode of transit to school.

Figure 7: Route to Westlake Middle School from MBTV

Further analysis by walking the actual streets children would take on their way to school during normal commute hours to/from schools would significantly improve this analysis by providing observations of other indicators of pedestrian safety including sufficient lighting on the streets, a well-defined curb, trees and other greenery, maintenance and width of sidewalks, and presence of other people walking.

Biking to Schools

An alternative active way for students to get to school is by biking. However, there are no bike paths in the streets from MBTV to the various schools as shown in Figure 7. The only on-street bike paths in this part of Oakland are on the downtown side of I-580. Shafter Street is considered a bike route, but there are no delimited bike paths.

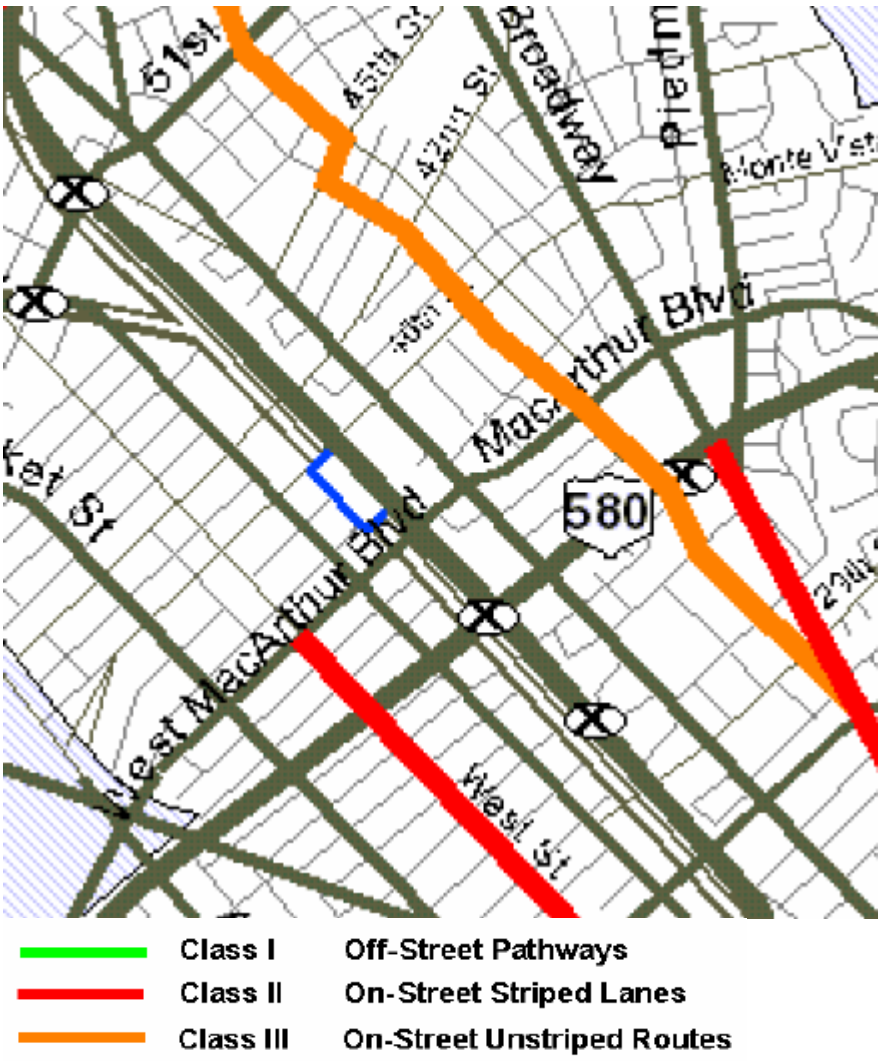

Figure 8: Zoomed in City of Oakland Existing Bikeways 1999

The City of Oakland has a proposed bike plan that, if implemented, would put more bike lanes in the MacArthur BART area as shown in Figure 9. This proposed plan was made in 1999, but as of now, these plans have not been implemented in the Mac Arthur BART area, as can be seen in the satellite maps of the area. The proposed plan puts on-street bike paths on both Telegraph Ave. and 40th St., both of which would improve bikability for kids living in MBTV to area schools. Plans are being made to put bicycle lanes on 40th Street as part of planned improvements.[41]

41 Personal communication with Zac Wald, staff for Oakland City Councilor Jane Brunner.

Figure 9: Zoomed-In Oakland Proposed Bicycle Map 1999

F. Recommendations for Design and Mitigations

Given the many benefits of accessible neighborhood schools and adequate childcare on children, families, neighborhoods, and the environment, our analysis suggests the following recommendations for project design and impact mitigations:

1. Re-assess the adequacy of school capacity in the neighborhood under the assumption that the project may ultimately attract families to the same degree as other transit villages;
2. Work with the Oakland Unified School District to ensure that local schools can meet project generated student demand;
3. Conduct further analysis of child care supply by age of child.
4. Ensure that there is a child care center at the Mac Arthur BART Transit Village with safe indoor or outdoor play space;
5. Investigate financial strategies for enabling or subsidizing child care on the site with Local Investment in Child Care (LINCC);
6. Include at least two housing units in the village designed to function as family child care facilities; Design specifications for family child care facility include that the unit be on the ground floor with a full bath on the first floor and a washer and dryer in the unit and a safe enclosed placed for toddlers to play. [42]
7. Implement the City of Oakland Recommended Bikeway Network from 1999, especially the on-street striped bike lanes on 40th Street and Telegraph Ave;
8. Make pedestrian improvements on Telegraph Avenue to provide a safe crossing for children walking to local schools.

[42] Requirements for family child care units can be found by contacting the Local Investment in Child Care, http://www.lincc-childcare.com/.

Mac Arthur BART Transit Village
Health Impact Assessment

Chapter 6
Parks and Natural Spaces

A. Summary

Access to parks and natural spaces confers numerous health benefits. Passive and active recreation, as well as contact with nature, is associated with increased physical activity, improved mental health and an improved sense of well-being, social cohesion, and environmental quality. Specific health outcomes improved by access to quality parks include depression, obesity, heart disease, cognitive function, and problem solving ability. On the other hand, significant economic and social costs may result from limited and unequal access to parks and natural spaces.

Oakland, compared to the rest of the Alameda County, bears a disproportionate burden of unfavorable socioeconomic conditions and poor health conditions. This is largely attributable to decreased educational opportunities, lower household income, and greater income inequality and unemployment.[1] Households with lower socio-economic status commonly have less access to quality public parks and natural spaces which contributes to their experience of health disparities. This chapter reviews the existing standards for parks and public health in Oakland, assesses the existing park and natural resources in Oakland and the MacArthur BART Neighborhood, and offers mitigations to improve park resources for current and future residents of the MacArthur BART neighborhood. Any development in the MacArthur BART neighborhood should consider the amount of existing green space and parks, the parks' current carrying capacity, and its ability to absorb new residents without diminishing park quality or access to park amenities. With such considerations, parks can be a significant benefit to the health of all Oakland residents.

Project Health Impacts

1. The MacArthur BART neighborhood currently has greater access to high quality park space than many Oakland neighborhoods. Less than half of Oakland residents live within 10 minutes walking distance of a city park. MacArthur BART residents, however, are within walking distance of Mosswood Park. Grove Shafter Parks I, II, and III are also nearby, but currently lack high quality ammenties and users are subject to freeway-related noise and air pollution. Regardless, the existing amount of park space available to MacArthur BART residents still falls short of goals set out by Oakland's General Plan. An increased population will decrease the per capita park acreage even further.
2. Improving and maintaining pedestrian and bicycle access to park resources will result in net positive health benefits for current and new residents of the neighborhood.
3. With proper development and landscaping, the project area can function to increase the amount of green and open space in the MacArthur BART neighborhood.
4. Improved transit options associated with transit oriented development (TOD) may encourage the use of other city and regional parks (e.g. Lake Merritt; Bay Trail) accessible by BART and AC Transit.
5. In the project area, access to quality parks is greater for residents west of State Route 24 than for that west of SR 24. The plans for the project should consider improvements in quality or access necessary to diminish these existing health resource disparities.

Recommendations for Design and Mitigations

1. Create safe, continuous, and functional routes to Mosswood Park for MacArthur BART residents West and East of I-980. This can be done through a "green corridor," signage, bike lanes, improved pedestrian facilities, etc.
2. Actively promote and advertise public transit services to local and regional parks. A joint

[1] Alameda County Department of Public Health. Oakland Health Profile 2006.

collaboration between the City of Oakland, AC Transit, BART, and MacArthur BART development agencies should advertisement campaigns, bike tours, increased signage, etc. to promote public transit as a means to reach parks and natural spaces.

3. Ensure the socio-economic integration of local parks. Current and future amenities and programs at Mosswood Park and Grove Shafter Parks I, II, and II should appeal to and be accessible by all residents of the MacArthur BART Neighborhood.
4. Consider existing and proposed designs that improve visibility of green and open space.
5. Engage the local community in any park and recreational redevelopment that may result from project mitigations:
    a. Mobilize local residents to rejuvenate Grove Shafter Parks I, II, and III with possibly a city-funded project to improve the parks with added landscaping, improved playground facilities, and improved recreational amenities and public spaces.
    b. Engage the local community in addressing local programming needs in the neighborhood's parks.
    c. Explore the potential social and recreational opportunities on the project's public space, such as farmer's markets, public concerts, dances, or community fairs.

B. Background[2]

Open Spaces (natural spaces) constitute lands set aside for the purpose of either preserving or creating a natural environment. Parks, which may or may not include natural spaces, are public places dedicated for outdoor recreational and leisure activities. Early proponents of urban parks, such as Fredrick Law Olmstead, promoted the inclusion and design of public open space as a critical component of making cities healthier. Much of the recent attention and research on the health benefits of open space have focused on cities where the high densities of people, buildings, roads, and other infrastructure can limit access to natural environments.

Parks and natural spaces fill some of human beings' most basic needs– the need for interaction with other people and nature. They also can be among a City's most egalitarian places, bringing together ethnically and socio-economically diverse people seeking an escape from everyday stressors or an opportunity for leisure or physical activity with family and/or friends. They provide environmental services that benefit the entire community. These functions result in a variety of health benefits, but require safe and inviting environments for their full realization.

Today, considerable evidence exists confirming the significant role of parks and naturals spaces in determining the health status of individuals and communities. The diverse evidence-based relationships between open space and health are illustrated in framework in Table P1. This framework identifies typical types of public and natural spaces in the urban environment. These types of public space improve health through:

- The direct use of public and natural spaces by people and
- The role of these spaces in improving the physical environment.

Health outcomes are associated with both human uses and positive environmental effects resulting park space. The pathways to health facilitated by quality park space are shown in Figure P1. Features of open space that have been positively linked to a variety of health outcomes include:

- Providing opportunities to engage in physical activity,
- Encouraging community interaction,
- Increasing access to contact with natural environments, and
- Improving environmental quality.

[2] Rotkin-Ellman, M., UCBHIG, Oak to Ninth Avenue – Parks and Natural Spaces, http://ehs.sph.berkeley.edu/hia/

Table P1. Urban design element and their relation to improved health outcomes via human and environmental mechanisms.

Public Space Urban Design Elements	Human and Environmental Functions of Natural Spaces	Health Outcomes Related to Natural Spaces
❑ Plazas ❑ Squares ❑ Courtyards ❑ Parks ❑ Community Gardens ❑ Greenways ❑ Bike and Walking Trails	*Via Human Activity:* ❑ Physical Activity ❑ Recreation ❑ Leisure Activity ❑ "Escape facilities" and Relaxation ❑ Social Interaction *Via Environmental Quality:* ❑ Air quality ❑ Water quality ❑ Noise reduction ❑ Views of green space	*Disease Reductions:* ❑ Premature mortality ❑ Obesity ❑ Coronary heart disease ❑ Hypertension ❑ Diabetes ❑ Depression ❑ ADHD ❑ Respiratory illnesses *Health Promotion:* ❑ Happiness and well-being ❑ Focus and attention ❑ Improved problem solving and mental capacity ❑ Recovery from illness ❑ Stress reduction ❑ Improved social connectivity ❑ Community cohesion *Reduction in Exposure to Environmental Contaminants:* ❑ Drinking water ❑ Storm runoff ❑ Air pollutants

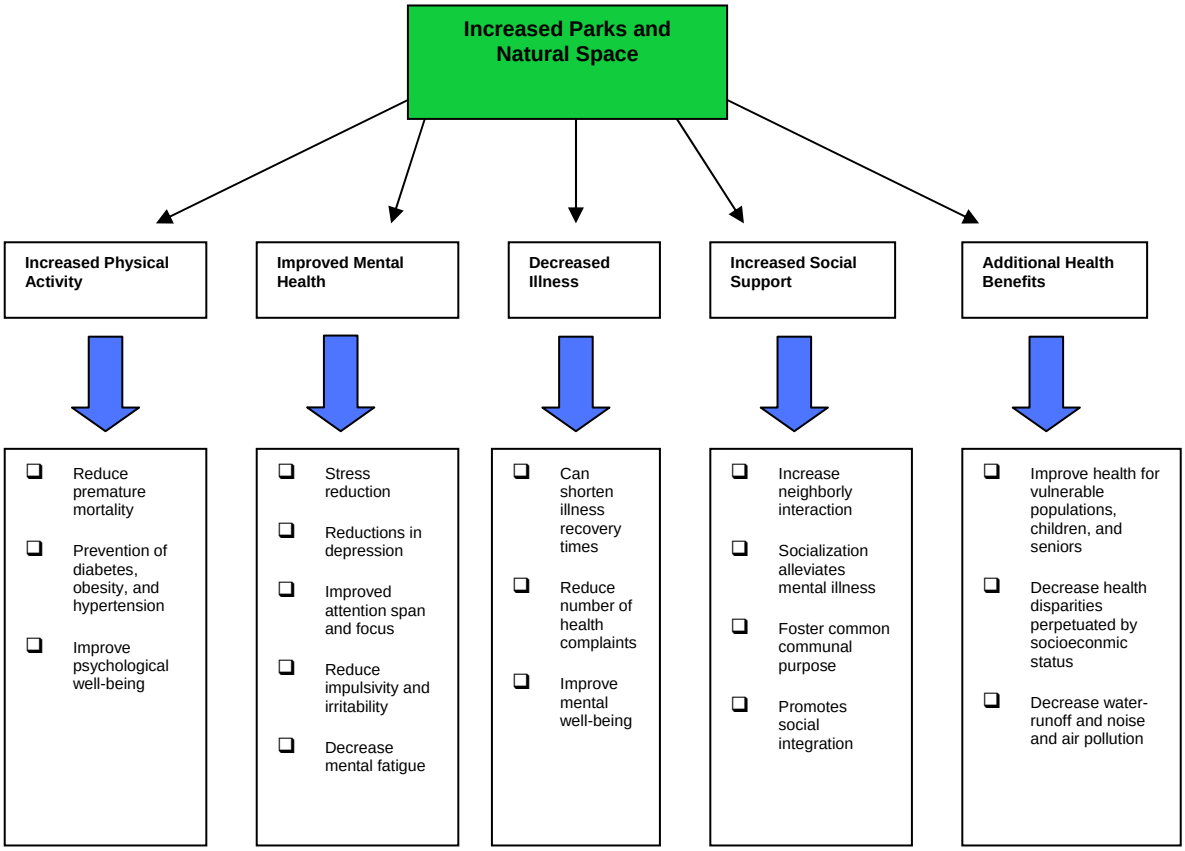

Figure P1. Parks and natural spaces improve a variety of health outcomes through multiple pathways.

The following section outlines some key evidence linking these aspects of open space with health benefits experienced by individuals and communities. The evidence below focuses on the health effects of individuals and communities uses of natural spaces and urban parks. Indirect health benefits resulting from improvements in environment quality are beyond the scope of this analysis. A more comprehensive review of research on parks, natural spaces and health may be found in *Healthy Parks Healthy People: The Health Benefits of Contact with Nature in a Park Context*, published in 2002 by Deakin University in Australia. A 2006 report by Paul M. Sherer, *The Benefit of Parks: Why America Needs More City Parks and Open Space*, further describes the economic, environmental, and social benefits associated with parks.

Physical activity

Physical inactivity leads to obesity and chronic diseases. Parks facilitate physically active lifestyles by providing relatively low cost choices for recreation. In a 2004 report the Institute of Medicine (IOM) found compelling evidence that the availability of parks and natural spaces "facilitate or constrain physical activity".[3] Multiple studies, including many of those summarized in

[3] 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.

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.[4][5][6] A summary of results is included in Table P2.

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.[7] A recent study has found that a 1% increase in park space can increase physical activity in youth 1.4%.[8] Another recent study found that for each additional park space within a half mile of a young girl's home, physical activity increased 2.8%.[9] These modest increases can have a substantial impact on a community's health over time. A report released by the Center for Disease Control (CDC) found that enhanced access to spaces for physical activity resulted in 25% more people exercising 3+ days per week.[10] Other quality park features, such as lighting and other amenities (track, basketball courts, playgrounds, etc.) were also associated with increased physical activity. Such increases in physical activity have been linked to numerous health benefits including, reductions in premature mortality, the prevention of chronic diseases such as diabetes, obesity, and hypertension, and improvements in psychological well-being.[3]

[4] Powell KE, Martin LM. Chowdhury PP. 2003. Places to Walk: Convenience and Regular Physical Activity. American Journal of Public Health. 93;9:1519-1521.
[5] 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.
[6] 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.
[7] Kahn EB. 2002. The effectiveness of interventions to increase physical activity. American Journal of Preventative Medicine. 22:87-88.
[8] Roemmich JN, et al. 2006. Association of access to parks and recreational facilities with the physical activity of young children. Preventive Medicine. Article in press.
[9] Cohen DA, et al. 2006. Public Parks and Physical Activity Among Adolescent Girls. Pediatrics. 118:1381-1389.
[10] CDC. 2001. Increasing Physical Activity: A Report on Recommendations of the Task Force on Community Preventive Services. Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5018a1.htm> last accessed 1 December 2006.

Table P2. Research associating park access with physical activities and health outcomes.

Study Population	Environmental Measure	Health Outcome Measure	Authors	Year
Adults from Georgia 18 and over	Park access within 10 minutes walking distance	52% of adults within 10 minutes of park met physical activity standards (moderate activity, 30 mins/day 5 days/wk or vigorous activity 20 mins/day 3days/wk) versus 37% who lived farther away from parks.	Powell, et al.	2003
Senior citizens in Tokyo	Access to green space and tree lined streets	Increased longevity	Takano, et al.	2002
Review of research done on various study populations	Created or increased access to activity spaces (gyms, paths, etc.)	48% of people reported more frequent physical activity	Kahn, et al.	2002
Boys and girls and 4-7 years old in Erie County, NY	Park and recreation areas within 1/2 mile of home	For every 1% increase in park space, there was a 1.2% increase in physical activity	Roemmich, et al.	2006
6th grade girls from DC, MD, SC, MN, LA, AZ, CA	Parks within 1/2 mile of home; type, number, and specific parks amenities	For each additional park, physical activity increased 2.8%; increase physical activity found for parks with walking paths, running tracks, playgrounds, and basketball courts; park lighting also associated with increased physical activity	Cohen, et al.	2006

Stress, Depression, and Mental Functioning

In modern cities, parks and open spaces provide needed reprieve from the everyday stressors that lead to mental fatigue. Parks and other natural spaces act, in effect, as "escape facilities." The ability to escape fast-paced urban environments has been shown to improve the health of adults and children by reducing stress and depression and improving the ability to focus, pay attention, be productive, and recover from illness.[11] Evidence shows that spending time in parks can reduce irritability and impulsivity, while promoting intellectual and physical development in children and teenagers, by providing a safe and engaging environment to interact and develop social skills, language and reasoning abilities, and muscle strength and coordination. In other words, visiting a park can leave one with increased abilities to cope.

Researchers in Chicago have found associations between contact with the natural environment and improvements in the functioning children with Attention Deficit and Hyperactivity Disorder (ADHD).[12] Individuals that are dissatisfied with their available green spaces have 2.4 times higher risk for mental health issues.[13] Contact with natural environments, such as trees, has also been associated with improvement in the psychological resources of individuals living in public housing. This 'mental empowerment' enables individuals to make changes that will improve their lives and decrease "mental fatigue," aiding in their ability to overcome problems they once considered insurmountable.[14]

Recovery from Illness

In addition to promoting health and preventing disease, Parks and natural spaces have also been associated with more direct healing effects. A classic study demonstrated that views of trees enhances the recovery of surgical patients and shortens the duration of hospitalizations.[15] More recently, research from the Netherlands found that people who live in greener environments have a reduced number of health complaints.[16]

Neighborhood Social Support and Cohesion

Green parks increase neighborly interaction by enticing residents into public spaces with trees, lush lawns, and playgrounds. Conversely, dirty and barren communal spaces instill a sense of fear and indifference among residents, discouraging interaction between neighbors, an otherwise crucial act for building a sense of community. Sociability may alleviate some forms of mental illness and contribute to a sense of belonging and community. Neighborhood workdays for park and/or garden maintenance and improvement foster common purpose and a sense of ownership among residents. Perhaps most importantly, parks become a source of community pride and inspiration for further community improvements and revitalization.

There is significant evidence that open spaces, particularly those that consist of a substantial amount of vegetation, 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, vegetated areas were found to be used by significantly more people. Those individuals were more likely to

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[11] Maller C, Townsend M, Pryor A, Brown P, St Leger L. 2005. Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations. Health Promotion International. 21;1:45-53.
[12] Kuo FE. 2001. Coping With Poverty Impacts of Environment and Attention in the Inner City. Environment And Behavior 33;1:5-34
[13] Guite HF, Clark C, Ackrill G. 2006. The impact of physical and urban environment on mental well-being. Public Health. Article in press.
[14] Taylor AF, Kuo FE, Sullivan WC. 2001. Coping With ADD: The Surprising Connection to Green Play Settings. Environment And Behavior. 33;1:54-77
[15] Ulrich RS. 1984. View through a Window may influence recovery from surgery. Science. 224: 421-421.
[16] Vries S de, Verheij RA, Groenewegen PP, Spreeuwenberg P. 2003. Natural environments - healthy environments? An exploratory analysis of the relationship between green space and health. Environment and Planning. 35:1717-1731.

be engaged in social activities.[17] The authors of this study suggest that the vegetation in this study (mostly trees and grass) helped create "vital neighborhood spaces." Social interaction and neighborhood spaces have been identified as key components of healthy communities that support the social networks, social support systems, and social integration that have been linked to improvements in both physical and mental health.[18]

Effects on Vulnerable Populations

Significant attention in the literature of the relationships between open space and health is focused on the particular needs of youth and seniors as populations that could benefit greatly from access to open space. Unfortunately, the distribution of parks and open spaces within cities is often inequitable, with the majority situated in affluent areas. Low-income residents are left with few affordable, high quality, and accessible recreational options. Concern about rapidly increasing rates of childhood obesity has resulted in increased attention on the access of youth to opportunities for recreation and physical activity.[19]

Effects on Environmental Quality

Parks and open spaces provide savings on city infrastructure costs by filtering dirty air and water. Vegetation alleviates pressures on storm water management and flood control efforts by slowing and filtering water flow and also decreasing the area of impervious surfaces. Trees and greens space also improve the physical environment by removing air pollution from the air, mitigating the heat island effects produced by concrete and glass, and lowering energy demands and associated emissions during warm periods.[20] Increased vegetation can also dampen sound and mitigate noise pollution.[21] As green spaces become more numerous and well-connected, human powered transit options (such as walking and bicycling) increase, potentially reducing traffic and vehicle emissions (in parallel with the benefits of increased physical activity).

C. Established Standards and Health Objectives

Standards and health objectives exist for some of the features included in the framework established connecting open space with health benefits. In general, standards include quantitative targets for reducing disease outcomes, recommendations for activities supported by parks and natural spaces, and standards for the amount and distribution of parks and natural spaces in urban environments.

Promoting physical activity, reducing obesity, promoting mental health well-being, and promoting healthy environments are all leading health objectives included in the US Department of Health

[17] Sullivan WC., Kuo FE. DePooter SF. 2004. The Fruit Of Urban Nature: Vital Neighborhood Spaces. Environment And Behavior. 36;5:678-700.
[18] Berkmana LF, Glass T, Brissette IC, Seeman TE. 2000. From social integration to health: Durkheim in the new millennium. Social Science and Medicine. 51:843-857.
[19] U.S. Department of Health and Human Services. 2000. Healthy People 2010 (2nd Ed.). With Understanding and Improving Health and Objectives for Improving Health. 2 vols. Washington, DC: U.S. Government Printing Office.
[20] Sherer PM. 2003. Parks for People: Why America Needs more City Parks and Open Space. San Francisco: The Trust for Public Land.
[21] Bolund P, Hunhammar S. 1999. Ecosystem services in urban areas. Ecological Economics. 29:293-301.

and Human Services (HHS) report Healthy People 2010.[22]

- Recommended levels of physical activity include 30 minutes of moderate-intensity activity five or more days per week or vigorous-intensity activity 20 minutes three or more days per week.[23]

Recommendations included in both the Surgeon General's report on Preventing Obesity and the IOM report on the connection between the built environment and physical activity emphasize the need to increase access to locations where individuals can engage in physical activity. In general, access measures take two common forms: 1) aggregate acreage per capita and 2) distances between residences and parks.

- The Oakland General Plan, Open Space Conservation and Recreation Element (OSCAR) provides the most general standard for open space, and sets forth a goal of 4 acres of parkland for every 1,000 Oakland residents.
- The International City & County Management Association, in the document "Creating a regulatory Blueprint for Healthy Community Design", suggests that parks be located within a quarter of a mile of every residence, roughly equivalent to a 10 minute walk.[3]

This distance is supported by research conducted in Georgia that found those individuals who reported they lived within a 10 minute walking distance of a public park were more likely to achieve recommended levels of physical activity.[4]

D. Existing conditions

City of Oakland Parks

According to data from the Trust for Public Lands, 10.7% of the City of Oakland is devoted to parkland. This is slightly below the national average of 12.9% for high-density cities. However, including city and regional parklands, Oakland has 9.6 acres of parkland for every 1000 residents (slightly higher than the national average of 7.9 acres per 1000 residents). City Parks provide 5.2 acres per every 1000 Oakland residents.[24] This parkland, however, is not equitably distributed throughout the City. This is illustrated in Figure P2.

City of Oakland Parks in the MacArthur BART Neighborhood

The MacArthur BART Neighborhood is currently served by two City of Oakland Parks greater than 5 acres: Mosswood Park and Grove Shafter Parks I, II, and III. Thus, the MacArthur BART Neighborhood has improved access to large parks as compared to other Oakland neighborhoods. This is highlighted in Figure P3. Mosswood Park is an 11-acre park with numerous recreational amenities and the Mosswood Recreation Center. Mosswood Park serves both the MacArthur BART Neighborhood and the Mosswood Park Neighborhood. A total of 29,954 residents live in these 2 neighborhoods.[25] Thus, Mosswood Park provides 0.37 acres of parkland per 1000 local

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

[23] Centers for Disease Control and Prevention. 2006. Physical Activity for Everyone: Recommendations. Available at <http://www.cdc.gov/nccdphp/dnpa/physical/recommendations/index.htm>, last accessed 18 November, 2006.

[24] The Trust for Public Land. "Acres of Parkland per 1,000 Residents by City and Agency." Available at <www.tpl.org/content_documents/ ccpe_AcresbyCityandAgency.pdf>, last accessed 18 January 2007.

[25] Bay Area Census. "Population and race data by county by census tract." Available at <http://www.bayareacensus.ca.gov/small/small.htm>, last accessed 18 January 2007.

residents, well below the goal set forth by OSCAR.

Grove Shafter Parks I, II, and III consist of a series of disconnected green spaces below the I-980 and I-580 interchange. The Park totals 5.55 acres. It primarily serves the MacArthur BART Neighborhood and the area just south I-580, home to 17,291 residents. Thus, Grove Shafter Parks I, II, and III provide 0.32 acres of parkland per 1000 local residents, well below the goal set forth by OSCAR.

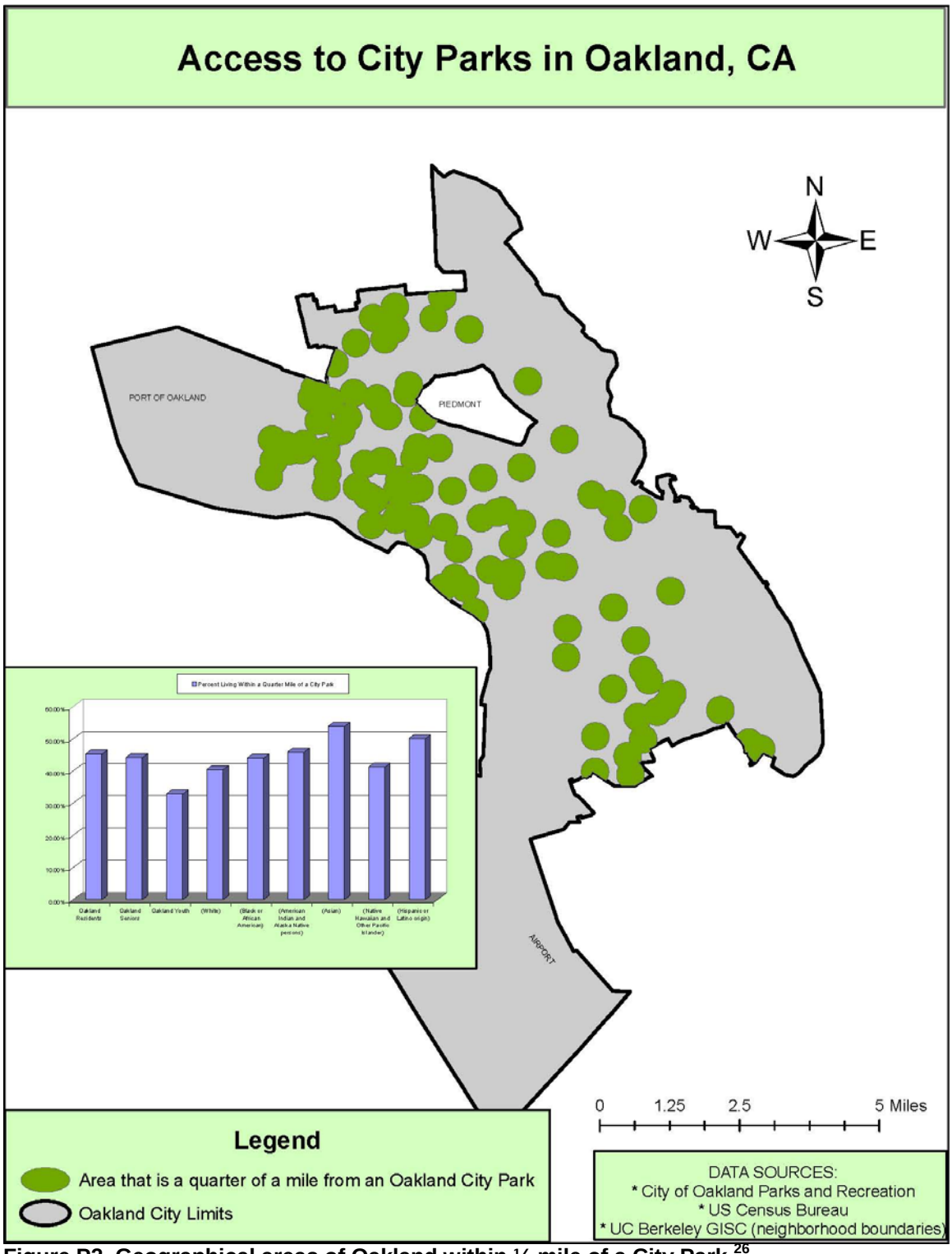

Figure P2. Geographical areas of Oakland within ¼ mile of a City Park.[26]

[26] Rotkin-Ellman, M., UCBHIG, Oak to Ninth Avenue – Parks and Natural Spaces, http://ehs.sph.berkeley.edu/hia/

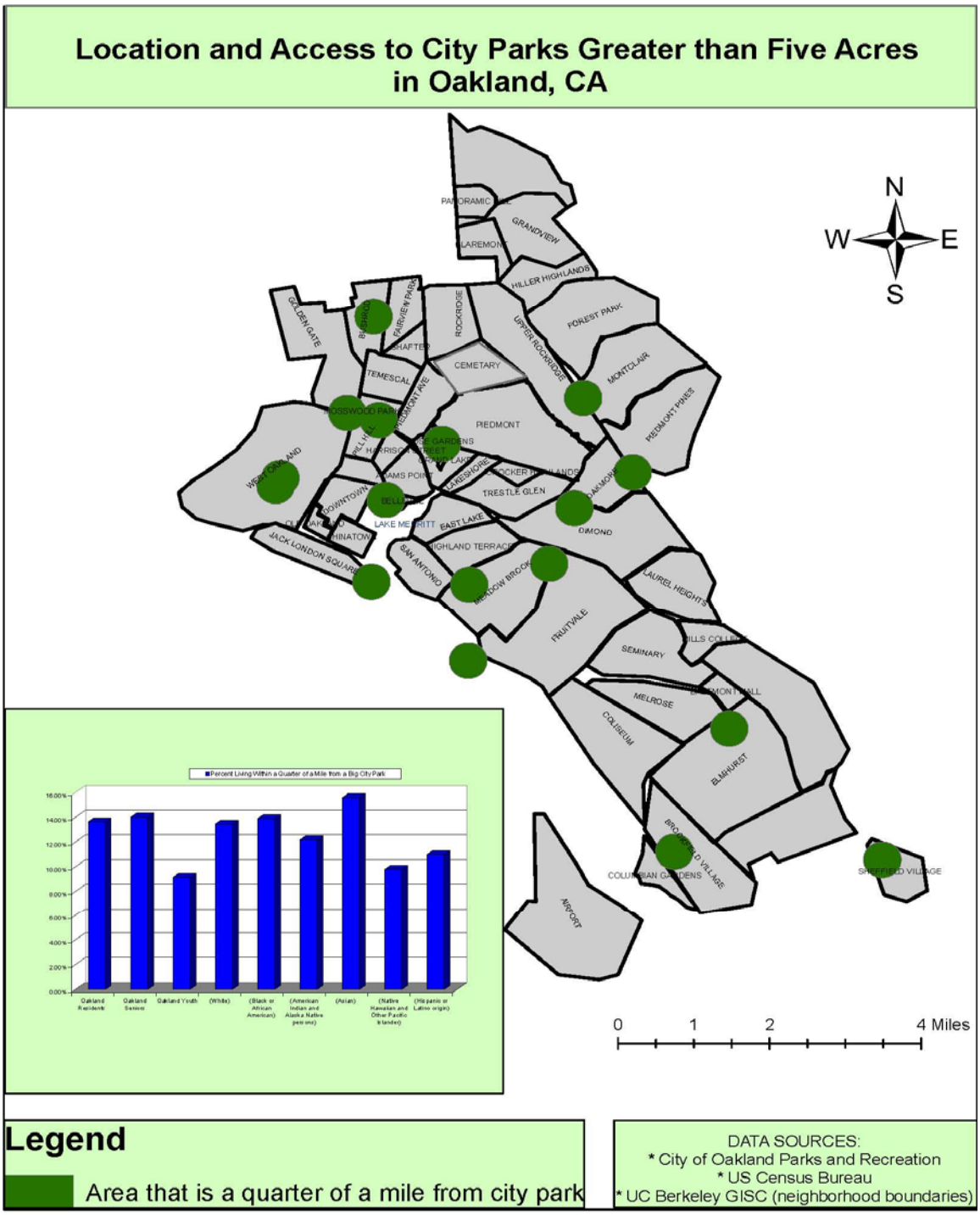

Figure P3. Geographical areas of Oakland within ¼ mile of a City Park greater than 5 acres.[27]

[27] Rotkin-Ellman, M., UCBHIG, Oak to Ninth Avenue – Parks and Natural Spaces, http://ehs.sph.berkeley.edu/hia/

E. Impact Analysis

This section of the HIA focuses on the following questions:

1. ***Are park resources and open space in the MacArthur BART Neighborhood of sufficient quality to provide a full range of health benefits?***

Mosswood Park and Grove Shafter Parks I, II, and III each serve the MacArthur BART neighborhood, but they vary greatly in quality. Mosswood Park meets many of the requirements set forth by the Neighborhood Parks Council necessary to provide high quality green space with diverse amenities.[28] Mosswood Park has a wide variety of amenities. Grove Shafter Parks I, II, and III are of diminished quality. The Park also has fewer amenities. The amenities of each park are outlined in Table P3.

As mentioned earlier, a wide variety of park amenities increases physical activity. Mosswood Park has considerable more high-quality amenities than Grove Shafter Parks I, II, and III. It also has better landscaping, a series of longer and more connected paths, and more congregating areas such as recreational sites (horseshoe pits, tennis courts, etc.) and picnic sites. The Recreation Center, large courtyard, and amphitheater provide additional sites for community interaction.

Table P3. Park amenities and needs in Mosswood Park and Grove Shafter Parks I, II, and III

Park Amenities in the MacArthur BART Neighborhood

Mosswood Park	Grove Shafter Parks I, II, and III
Assets	Assets
Recreation center	2 lesser quality basketball courts
2 high quality basketball courts	1 additional smaller basketball court
3 tennis courts	Gazebo
An amphitheater	Several benches
Medium sized playground	
Baseball field	
Extensive larger fields	Needs
Horsheshoe pits	More play space for small children
Various picnic sites	Strategies to reduce litter volume
Connected walking paths	Better path connectivity
Courtyard near Kaiser Permanente	More landscaping
Benches throughout	
Low litter volume	
Extensive landscaping	

[28] Park Maintenance Standards. Neighborhood Parks Council. Available at < http://www.parkscansf.org/training.aspx#>, last accessed 18 November 2006.

Grove Shafter Parks I, II, and II do have several promising features, such as the 2+ basketball courts and green space where there would normally be concrete. Although Grove Shafter Parks constitute a total of 5.55 acres, these acres are split into 3 sections divided by two major highways (Figure P4). This disconnectivity greatly diminishes the quality of the park. The park spaces are also set back from the road and views are obstructed by highway pillars, diminishing the sense of safety in the park by excluding the communal police force of "eyes in the street."

In addition, its location under the interchange of two highly traveled freeways limits its attractiveness and usability, likely contributing to its deterioration in comparison to Mosswood Park. There may be an additional problem as well—a study done in the East Bay found that areas closer to major roadways had a greater concentration of air pollutants, and residents in those areas had a greater prevalence of respiratory illness.[29] Despite these concerns, availability of high quality park space likely outweighs the possible harm caused by localized noise and air pollution.

An analysis was performed by the San Francisco Department of Public Health for an analogous situation—a proposed park site adjacent to I-80 in the Rincon Hill Special Use District.[30] The SFDPH analysis determined that noise levels below this freeway would be significantly elevated in comparison to areas alternate locations. Elevated noise may disrupt more tranquil activities such as meditation or conversation, but it is likely compatible with to other common park activities, such as basketball. The analysis also determined that exposure to air pollution for Rincon Hill park users would likely be no worse than the exposure experienced by a commuter. Overall, the SFDPH judged that the opportunity to promote physical activity and social interaction among community members would outweigh the short-term exposure to noise and air pollution.

[29] Kim JJ, et al. Traffic-related Air Pollution Near Busy Roads. 2004. Am J Respir Crit Care Med. 170:520–526.
[30] City and County of San Francisco Department of Public Health. 2004. Public Health Analysis of the Proposed Rincon Hill Park Site. Unpublished data available upon request.

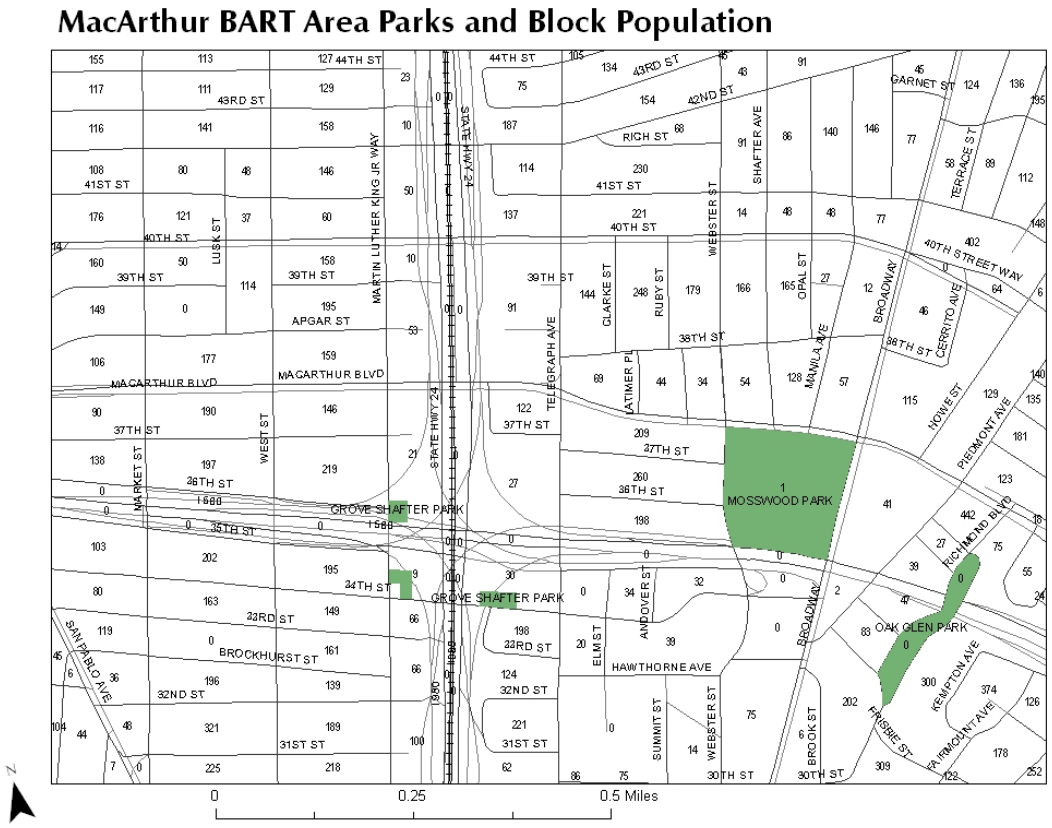

Figure P4. Location of Grove Shafter Parks I, II, and III and Mosswood Park. Numbers indicate block population data.

2. What is the current access to City of Oakland parks in the MacArthur BART Neighborhood that are suitable as sites for physical activity and recreation?

Quality access to park space results from the physical proximity of safe and high-quality park space, pedestrian safety in accessing the park space, and locally appropriate programming and park amenities. New residents moving into the MacArthur Development will have access to a high quality City of Oakland park, resulting in a positive health outcome. All current MacArthur BART Neighborhood residents are within ¼ to ½ mile of a park, but there are access inequities based on geographical isolation and park quality. Residents West of I-980 have diminished access to high quality park space. In order to get to Mosswood Park, residents must cross under the Freeway (a major geographical barrier, as well as a safety concern due to the unwelcoming pedestrian environment) and over Martin Luther King Jr Way and Telegraph Avenue. They may also have to cross MacArthur Boulevard. All three are major arterial roadways (Figure P4).

Residents West of I-980 do have greater access to Grove Shafter Parks I, II, and II, but as mentioned earlier, this recreational space is of diminished quality. However, this park space has the potential to provide a net health benefit to the community. Mitigations should be considered to improve the quality of Grove Shafter Parks I, II, and III.

Residents East of I-980 have improved access to Mosswood Park because they do not have to cross under a major freeway. There is, however, still concern over the safety of the pedestrian environment along Telegraph Avenue and MacArthur Boulevard, two major arterial roadways. Park access for all residents may diminish relative to existing access because of increased traffic in the area. Refer to the chapter on pedestrian safety for a more thorough analysis.

3. How will the residents living in transit-oriented development benefit in access to regional park resources?

Transit oriented developments (TOD) provide residents with good access to public transportation. The MacArthur BART redevelopment has the potential to connect residents to other park resources and natural spaces within the City of Oakland and Alameda County, including Lake Merritt, Ohlone Park, the Bay Trail and others. Figure P5 shows all parks in Alameda County within ¼ mile (about a 10 minute walk) of existing BART stations. Much of the larger regional parks in Alameda County do not have easy access from BART.

AC Transit, however, could also be used to gain access to larger regional parks in the area. AC Transit offers a comprehensive listing of transit routes and destinations on its website (www.actransit.gov). Parks and naturals spaces served include Tilden Regional Park, Crab Cove, and Ardenwood Farm to name a few. There is a diverse range of activities offered, including walking, hiking, biking, boating, swimming, and learning about natural history and agricultural practices.

Information concerning safe bike paths, lanes, and routes is available from the East Bay Bicycle Coalition (http://www.ebbc.org/maps/map.html). Maps available from EBBC show potentially hazardous areas, hill gradients, and public transit facilities.

Extensive information concerning transit and bicycle access to city and regional parks is not currently accessible at the MacArthur BART station.

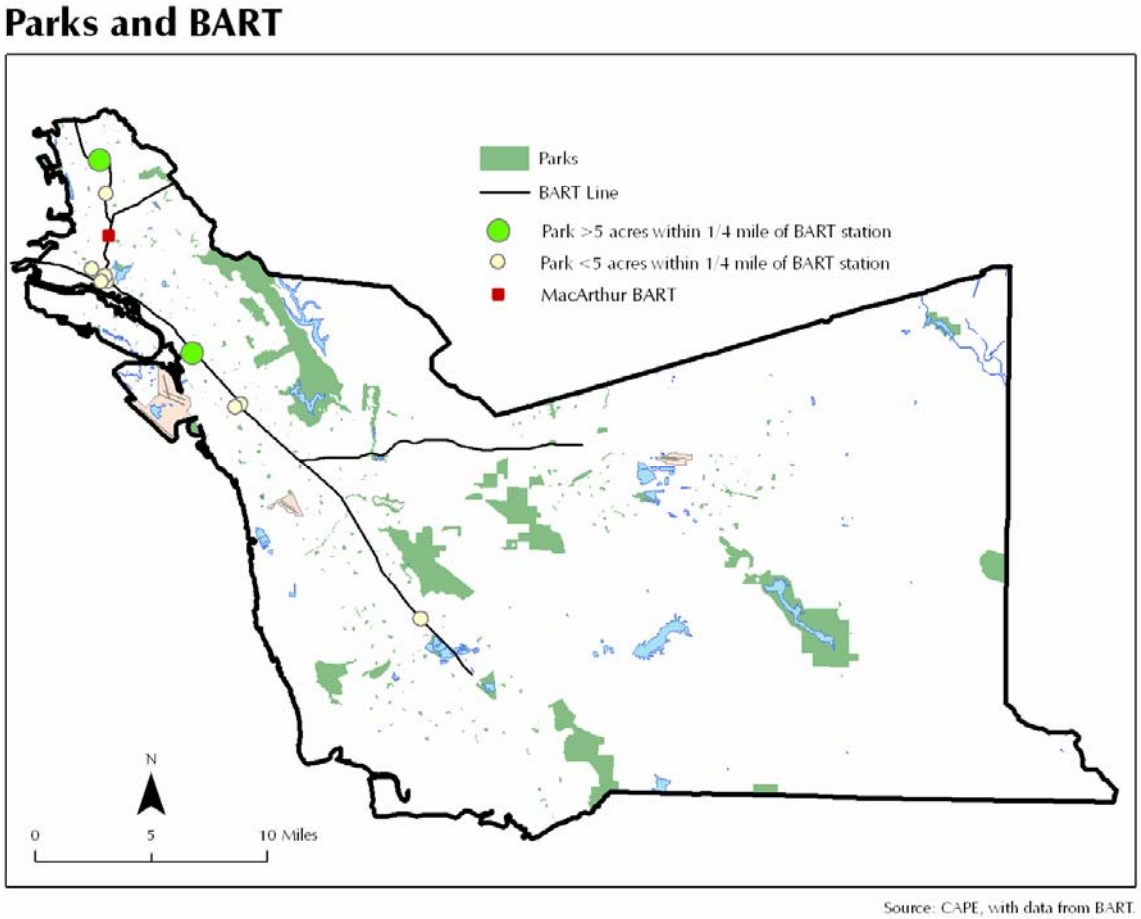

Figure P5. Parks in Alameda County within ¼ mile of a BART station. Mosswood and Grove Shafter Park are excluded in order to show MacArthur BART station.

F. Recommendations for Design and Mitigations

In general, urban infill can have many positive local and regional health effects, but it must be done thoughtfully and equitably to realize the full range of health benefits. Paramount in healthy urban development is the creation and maintenance of quality parks and natural spaces. Mosswood Park is a cornerstone park and recreation area for the MacArthur BART Neighborhood. However, it already serves more people than desired as established by goals set in the Oakland General Plan. Any development in the area must take this valuable limited resource into account.

Recommendations and mitigations to ensure adequate park access and health opportunities for all current and future MacArthur BART residents could include the following:

1. Making improvements in the Neighborhood pedestrian environment can increase the ability of current and future residents to access local park resources, improving physical activity, mental health, and social cohesion.
2. Existing corridor-connection planning in Oakland is underway for MacArthur Boulevard. Planning goals should be augmented to include the connection of parks and open space via pedestrian and bicycle-friendly connections for both Westside residents and future project

area resident. A "green pedestrian corridor" running along MacArthur Boulevard could decrease inequitable park access, connect two historically divided populations, and increase interaction and integration between current and future residents.

3. Make infrastructure improvements to Mosswood Park to ensure a continued standard of high-quality park amenities. This may include expansion of recreational programs or other park amenities, such as playgrounds or other recreational spaces. Neighborhood residents and the City of Oakland Office of Parks and Recreation should be involved in the process to ensure that local needs are met.

4. Incorporate significant green landscaping elements into the MacArthur BART development. This will increase the health residents for incoming and current residents, provide the "escape facilities" important for improved mental health, and has the potential to reduce noise and air pollution.

5. Design the public areas of the project to support social integration and viable recreational uses. Spaces could be used for farmer's markets, concerts, playgrounds, or other community events.

6. Work with the City of Oakland in scoping the conversion of brownfields West of I-980 into green spaces. Increased quality green space in the MacArthur BART neighborhood would benefit the health of current and future residents.

7. Further investigate design alternatives to rejuvenate Grove Shafter Parks I, II, and III. The parks fragmented nature limits its ability to provide large open spaces, but it could be used to develop a diverse park landscape. For example, the basketball courts could continue to serve their current function. Another area of the park could undergo a community-led, publicly funded rejuvenation project to improve landscaping, playground facilities, and social gathering spaces. This would provide multiple benefits, including:

    - increasing social interaction and integration,
    - instilling a sense of ownership and pride in the park amongst neighborhood residents, and
    - facilitate the physical rejuvenation of the park.

    A third section of the park could be used for additional recreation space, picnic sites, or a neighborhood dog park—all of which would promote social interaction and cohesion. Local needs should be met. FROG Park in the Temescal-Rockridge Neighborhood can serve as a local example of successful community park rehabilitation.

8. Actively promote the use of BART and AC Transit to access other city and regional parks in the East Bay. Nearby resources include Lake Merritt, the East Bay Ridge parks, and the Regional Bay Trail and other previously mentioned natural spaces. Promotion could occur through increase signage and maps illustrating park access via BART and AC Transit. Development or city sponsored programming (such as public sponsored bike day-trips, community outings utilizing public transit or hired buses, or other tours) would also increase the health benefits from city and regional parks and improve equitable access to these valuable natural resources. In addition, increased use of public transit has the added benefit of reducing local and regional air pollution.

Mac Arthur BART Transit Village

Health Impact Assessment

Chapter 7
Pedestrian Safety

A. Summary

Data available from the Statewide Integrated Traffic Records System (SWITRS) demonstrates that in Oakland between 2000 and 2005, there have been 2045 pedestrian collisions with motor vehicles between the years of 2000-2005. 1951 of the collisions have resulted in pedestrian injuries with 198 of the injuries being severe and 63 fatal. The annual rate of pedestrian injuries is about 4 times United States Department of Health and Human Services targets for population health. This chapter examines conditions related to pedestrian safety in the MacArthur BART Transit Village (MBTV) project area, estimates project-related pedestrian injury impacts, and provides recommendations for reducing pedestrian hazards. A review of historical data demonstrates a significant number of pedestrian injuries along Telegraph Avenue and West Macarthur Boulevard. Health impact forecasting shows that the project will contribute to a modest increase in pedestrian injury rates due to an increase in project related vehicle trips. Increases in pedestrian volume may also increase the cumulative hazard. Both existing pedestrian safety hazards as well as the project's contribution to these impacts warrant investments in feasible pedestrian safety mitigations at intersections and in pedestrian routes between the project and typical destinations.

Project Health Impacts

1. Quantitative forecasting of changes to Oakland's pedestrian injury rate based on project related changes in traffic flows and a baseline rate of 16.2 pedestrian injuries or deaths per year along arterial roads estimates an additional pedestrian injury or death every 3.25 years on Telegraph, West Mac Arthur, and 40th Streets. (Adverse Health Impact)

Recommendations for Design and Mitigations

1. Provide pedestrian safety engineering improvements including countdown pedestrian signal heads, bulb outs, and center median refuge islands at high-volume multi-lane intersections along Telegraph Avenue, 40th Street, West MacArthur Boulevard where cumulative traffic volume increases exceed 5%;
2. Provide pedestrian warning signs or lights at all crossings or cross walks with high traffic volumes (>5000) and without traffic signal lights;
3. Institute speed limit reductions to less than 20mph in mixed-use residential areas adjacent to the project;
4. Widen sidewalks or provide buffers between sidewalks and vehicle lanes on busy roadways with significant pedestrian traffic such as 40th Street, West MacArthur, Blvd, and Telegraph. Consider vehicle lane reductions on some corridors (e.g., West MacArthur , 40th Street) to simultaneously reduce and slow traffic
5. Create a pedestrian-friendly environment in the retail area by[1]:
    a. Maximizing pedestrian and transit access to the site from adjacent land uses.
    b. Providing comfortable transit stops and shelters with pedestrian connections to the main buildings; transit stops and pedestrian drop-offs should be located within reasonable proximity to building entrances - preferably no more than 225 meters (750 feet), and ideally much closer than that.
    c. Providing attractive pedestrian walkways between the stores and the adjacent sites.
    d. Ensuring that fencing and landscaping does not create barriers to pedestrian mobility.

1 FHWA Course on Bicycle and Pedestrian Transportation, Lesson 5: Adapting Suburban Communities for Bicycle and Pedestrian Travel http://safety.fhwa.dot.gov/ped_bike/univcourse/swless05.htm. Accessed December 9, 2006.

B. Background

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 to13th place, and is still sinking.[2] 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 US 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.

The risk of pedestrian injuries may discourage pedestrian activity and negatively impact physical activity levels. Increased walking provides exercise and has the potential to reduce rates of childhood obesity and overweight, as well as increase mobility and access among older adults. Walking also provides a transportation alternative to the automobile, reducing traffic congestion and related environmental hazards such as noise and air pollution.

Environmental Causes of Pedestrian Injuries

Important environmental variables associated with pedestrian collisions include pedestrian volume,[3] vehicle volume,[4 5 6] vehicle type,[7] vehicle speed,[8 9] intersection design, pedestrian facilities, lighting, and weather.[10]

Public health and transportation safety research consistently demonstrates that vehicle volumes are an independent environmental predictor of pedestrian injuries.[11 12 13 14] In other words, all things being equal, when the number of vehicle trips increases, the number of vehicle injuries to pedestrians will also increase. 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-

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

3 Agran PF, Winn DG, Anderson CL, Tran C, Del Valle CP. The role of physical and traffic environment in child pedestrian injuries. Pediatrics 1996;98(6 pt 1):1096-103.

4 Roberts I, Norton R, Jackson R, Dunn R, Hassall I. Effect of environmental factors on risk of injury of child pedestrians by motor vehicles: a case-control study. BMJ 1995;310(6972):91-4.

5 Lee C, Abdel-Aty M. Comprehensive analysis of vehicle-pedestrian crashes at intersections in Florida. 2005;37:775-786.

6 Brugge D, Lai Z, Hill C, Rand W. Traffic injury data, policy, and public health: lessons from Boston Chinatown. J Urban Health 2002;79(1):87-103.

7 Paulozzi LJ. United States pedestrian fatality rates by vehicle type. Inj Prev 2005;11(4):232-6.

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

9 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.

10 Eisenberg D, Warner KE. Effects of snowfalls on motor vehicle collisions, injuries, and fatalities. Am J Public Health 2005;95(1):120-4.

11 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.

12 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.

13 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

14 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.

variate analysis.[15] The City of Oakland Pedestrian Master Plan also highlights the negative effect of high volumes on safety.[16] The magnitude of effect of vehicle volume on injuries is significant. For example, a study of nine intersections in Boston's Chinatown, researchers calculated an increase in 3-5 injuries per year for each increase in 1000 vehicles.[17]

Vehicle speeds predict both the frequency as well as 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.[18]

The relationship of vehicle volume and pedestrian volume and pedestrian injury are not entirely linear. For instance, an analysis of pedestrian and bicycle volume found that with increasing numbers of walkers and bicyclists, injury rates decreased.[19] Similarly, an analysis of pedestrian injuries in Oakland illustrated that the risk for pedestrian-vehicle collisions was smaller in areas with greater pedestrian flows and greater in areas with higher vehicle flows.[20]

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.

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

Environmental Controls can Reduce Pedestrian Hazards

Effective design strategies to improve pedestrian safety exist for residential and commercial areas. In some cases, planning efforts have included the development of comprehensive countermeasure plans to prevent injuries. For example, in Oakland, the Revive Chinatown Plan lays out an approach to pedestrian safety for the Chinatown District. The UC Berkeley Traffic Safety Center has also conducted site specific pedestrian safety analysis in Emeryville and San Francisco.[21]

15 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.

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

17 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.

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

19 Jacobsen PL. Safety in numbers: more walkers and bicyclists, safer walking and bicycling. Inj Prev 2003;9:205-9.

20 Geyer J, Raford N, Ragland D, Pham T. The Continuing Debate about Safety in Numbers—Data from Oakland, CA. UC Berkeley Traffic Safety Center 2005; UCB-TSC-RR-TRB3. Available at: http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1029&context=its/tsc

21 Johnson ES, Ragland DR, Cooper JF, and O'Connor T, "Pedestrian and Bicycle Safety Evaluation for the City of Emeryville at Four Intersections" U.C. Berkeley Traffic Safety Center. Paper UCB-TSC-RR-2005-23. August 1, 2005; Ragland, DR. Markowitz, F. MacLeod, KE "An Intensive

Data on the effectiveness of particular interventions for reducing pedestrian injuries is available but limited. Efficacy in reducing pedestrian injuries has been demonstrated a number of interventions that lower traffic speeds (traffic calming). International studies demonstrate that on average traffic calming interventions in residential area reduce accident rates by 15%.[22]

The National Cooperative Highway Research Program's recently published a State of the Knowledge Report on crash reduction factors for traffic engineering. [23] The report summarizes the best evidence on the effectiveness of diverse interventions. For example, according to the Report and based on studies of 8 intersections, roundabouts reduced injuries by 70% on single lane urban roadways that had had stop signs. While the report reviews the effectiveness of interventions on motor vehicle accidents overall, it includes a number of studies specifically focused on effects on pedestrian injuries.

	Level of Predictive Certainty	Accident Modification Factor
Intersection Treatments		
Install a roundabout	High	0.12-0.95
Add exclusive left-turn lane	High	0.42-0.81
Add exclusive right-turn lane	High	0.83-0.96
Install a traffic signal	High	0.33-1.5
Remove a traffic signal	High	0.69-0.82
Modify signal change interval	Medium-High	0.63-1.12
Convert to all-way stop control	Medium-High	0.28-0.87
Convert stop-control to yield-control	Medium-High	2.37
Install red-light cameras	Medium-High	0.84-1.24
Roadway Segment Treatments		
Narrow lane widths to add lanes	Medium-High	1.03-1.11
Add passing lanes (two-lane roads)	Medium-High	0.65-0.75
Add two-way left-turn lane (TWLTL)	Medium-High	
Increase lane width	Medium-High	
Change shoulder width and/or type	Medium-High	See formula
Flatten horizontal curve	Medium-High	See formula
Improve curve super elevation	Medium-High	See formula
Add shoulder rumble strips	Medium-High	0.82-0.87
Add centerline rumble strips	Medium-High	0.75-0.86
Install/upgrade guardrail	Medium-High	0.53-0.56
Install raised medians at crosswalks	Medium-High	Marked Crosswalks= 0.54 Unmarked crosswalks = 0.61

Pedestrian Safety Engineering Study Using Computerized Crash Analysis" (May 1, 2003). U.C. Berkeley Traffic Safety Center. Paper UCB-TSC-RR-2003-12

22 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.

23 Source: CRASH REDUCTION FACTORS FOR TRAFFIC ENGINEERINGAND INTELLIGENT TRANSPORTATION SYSTEM (ITS) IMPROVEMENTS: STATE-OF-KNOWLEDGE REPORT Research Results Digest 299 National Cooperative Highway Research Program; 2005. (Available at: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_299.pdf)

C. Established Standards and Health Objectives

The US Department of Health and Human Services (USDHHS) establishes National objectives for the **rate of injuries**.[24] 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 per 100,000 people)

.

By 2010, the following objectives should be achieved:

Unintentional injury prevention

- 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.

D. Existing conditions

According to Oakland's Pedestrian Master Plan, Oakland residents suffer approximately 85.5 vehicle injuries to pedestrians per 100,000 every year including 3 pedestrian fatalities per 100,000 per year.[25] Pedestrian/vehicle collisions represent 4% of total collisions in Oakland, but pedestrian fatalities comprise 39% of the total number of traffic fatalities in the City of Oakland.[26]

More recent data available from the Statewide Integrated Traffic Records System (SWITRS) demonstrates that in Oakland between 2000 and 2005, there have been 2045 pedestrian collisions with motor vehicles between the years of 2000-2005.[27] 1951 of the collisions have resulted in pedestrian injuries with 198 of the injuries being severe and 63 fatal.

A map of Oakland pedestrian injury data around MacArthur BART reveals that, between 2000 and 2005, there have been approximately 51.5 pedestrian injuries per year and 1 pedestrian fatality per year within a 1.5 mile buffer of the project site. Pedestrian injuries appear concentrated along Telegraph Avenue and West MacArthur Boulevard. (See Pedestrian Injury Map below) The annual rate of pedestrian injuries or deaths along Telegraph, West MacArthur, and 40th Streets in this period is 16.2 pedestrian injuries or deaths per year.

According to the DEIR for the Proposed Restriping of Telegraph Avenue to Accommodate Bike Lanes, the intersection near MacArthur BART (Telegraph and 40th / 41st Streets) carries relatively high pedestrian volumes during the peak hours, particularly in the morning commute period. The Average Daily Traffic Count on Telegraph Avenue, south of 40th Street, is also relatively high at 23,562.[28]

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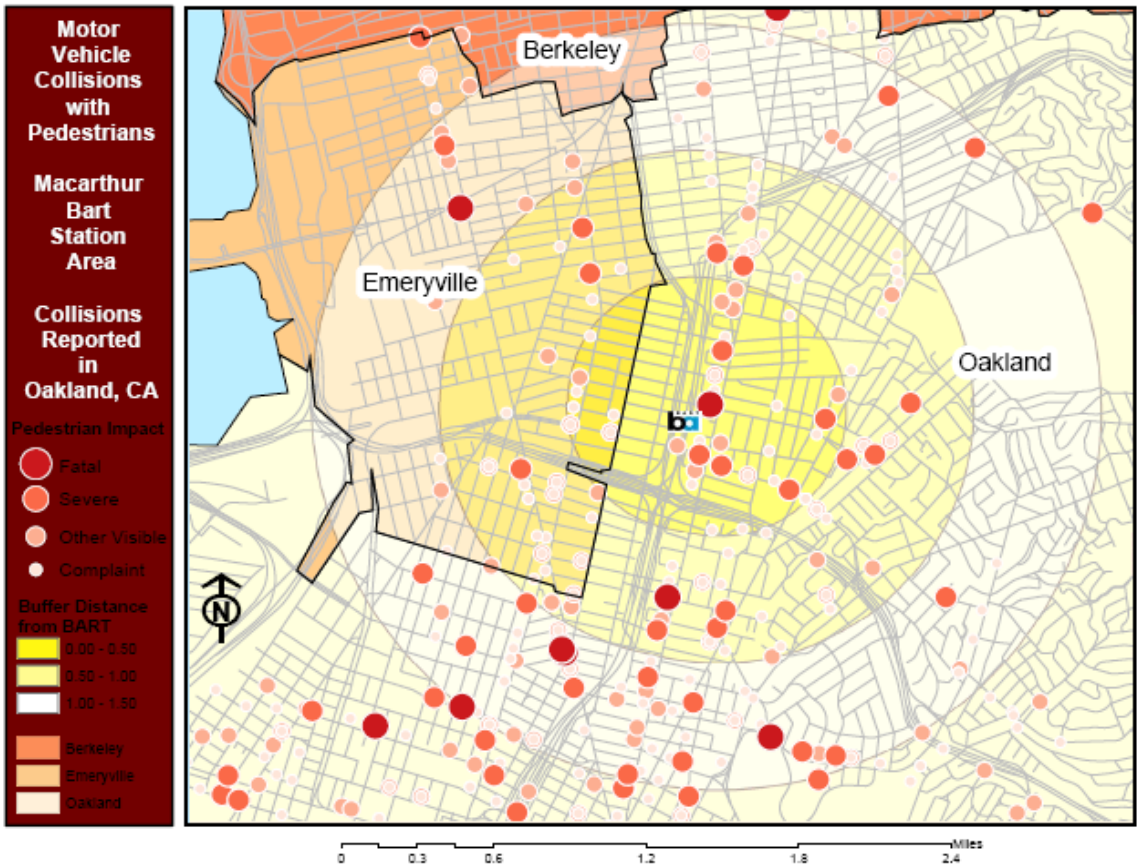
24 U.S. Department of Health and Human Services. Healthy People 2010 Objectives.

25 Oakland Pedestrian Master Plan. Page 30.

26 Oakland Pedestrian Master Plan. Page 20.

27 Pedestrian collision data for Oakland was obtained from the Statewide Integrated Traffic Records System (SWITRS). 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 a five 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. All vehicle collisions with pedestrians were selected and 2045 (90%) of these cases were geocoded successfully to an intersection. The vehicle collisions with pedestrians were then categorized by pedestrian impact and displayed on a map. Each circle represents a location where a vehicle collided and injured one or more pedestrian. This number is underestimated because only 90% of pedestrian collisions were geocoded. The actual number of pedestrian collisions can be anywhere from 0 – 10% higher. It is difficult to estimate because there could be significant pattern differences resulting from spatially non-random differences in geocoding.

28 Draft Environmental Impact Report "Existing Traffic Analysis. Environmental Review of the Proposed Restriping of Telegraph Avenue to Accommodate Bike Lanes." December 4, 2003. Page 4.



In 2003 a review of pedestrian and bicycle safety along Telegraph Avenue was prepared for the City of Oakland by Kimley-Horn and Associates as part of the "Environmental Review of the Proposed Re-striping of Telegraph Avenue to Accommodate Bike Lanes". The review evaluated traffic counts, level of service (LOS), pedestrian counts, bicycle counts, and AC transit boarding and exits as well as pedestrian safety, and bicycle safety issues for Telegraph Avenue. According to the study, pedestrian safety along Telegraph Avenue near Mac Arthur BART is presently inadequate as indicated by their safety index. The Telegraph Avenue street segment from 42nd to 38th Street scored 22% on such safety performance measures as bike lanes, traffic speed and volume, on-street parking etc. The intersection at Telegraph Avenue and 40th Street scored 62% on such safety performance issues as sight distance, right turn speeds, and right turn conflicts. Existing bicycle and pedestrian safety are presently inadequate and pose safety hazards to exiting users. The Oakland Bicycle Master Plan identifies the Telegraph Avenue corridor as the 3rd worse corridor for bicycle accidents with 29.4 accidents per mile in a 10 year period.

E. Impact Analysis

This section of the HIA focuses on the following question:

1. ***Will the project increase or decrease pedestrian injuries?***

Injuries related to changes in vehicle volume

Both the increase of pedestrian activity and vehicle volume associated with the project is likely to result in greater pedestrian—vehicular conflicts. Existing software tools to evaluate area-level

pedestrian injuries potentially applicable to EIA include the Pedestrian and Bicycle Crash Analysis Tool and Crossroads. These tools help identify crash patterns and their causes linking causes to potential strategies. Zonal analysis is another method that helps planners identify and target areas with high densities of pedestrian injuries one analysis.[29] However, none of these methods are routinely used in planning and environmental review for pedestrian safety impact analysis.

Few precedents exist for forecasting pedestrian injuries in the context of planning and environmental review; nevertheless, existing research suggests that such forecasting models could be readily developed and applied with existing data. As discussed above, studies in both the transportation and public health literature consistently show that a number of environmental factors affected by development, including vehicle volume and vehicle speed have direct, statistically independent significant and independent effects on injuries. Roadway vehicle volume is also an environment variables routinely assessed in land use planning. In EIA, transportation analysis already involves assigning project related vehicle trips to existing roadway to determine subsequent effects on Level of Service and delay at intersections.

In the public health discipline, risk assessment principles are used commonly in combination with exposure data and effect estimates from empirical research to apply novel applied methods to specific contexts. Human health risk assessment methods are sufficiently robust and flexible to predict human health hazards based on generalizable empirical environmental health evidence. Appropriate use of risk assessment methods requires empirically derived effect estimates along with data on exposure, the population at risk, and baseline incidence of the condition of interest. Typically, a practitioner using risk assessment must also make and document certain simplifying assumptions. Overall, in order to be useful in the context of EIA, a pedestrian injury forecasting tool should to be simple to use, based on available or routinely produced inputs, provide meaningful, interpretable, and robust estimates, and be applicable for use in diverse areas.

Our analysis forecasts pedestrian injury based on a single predictor (dependent) variable— vehicle volume— and a common form of the road safety function—a description given by transportation engineers to the relationship between vehicle volume and injury rates or counts. Intuitively and empirically, increases in vehicle volume on a given road facilities will also increase the probability of pedestrian-vehicle conflicts. This logical inference should hold unless vehicle volume increases or related changes results in a change in pedestrian volume or behavior or new design elements are introduced to reduce pedestrian-vehicle conflicts or hazards (e.g. traffic calming).

As referenced above, studies supporting a volume-pedestrian injury nexus are typically cross-sectional in design but have used multi-variate analysis techniques. Multivariate modeling techniques have allowed traffic safety researchers to estimate the influence of predictor variables on response variables taking into account variation in other environmental characteristics. Multiple studies, cited above, used multi-variate modeling techniques to estimate the effect of vehicle volume on injuries independent of the other factors listed above. These studies consistently show that vehicle volume has a direct, statistically significant and independent effect on injuries;

A power function is a common empirically supported parametric form of the road safety function:

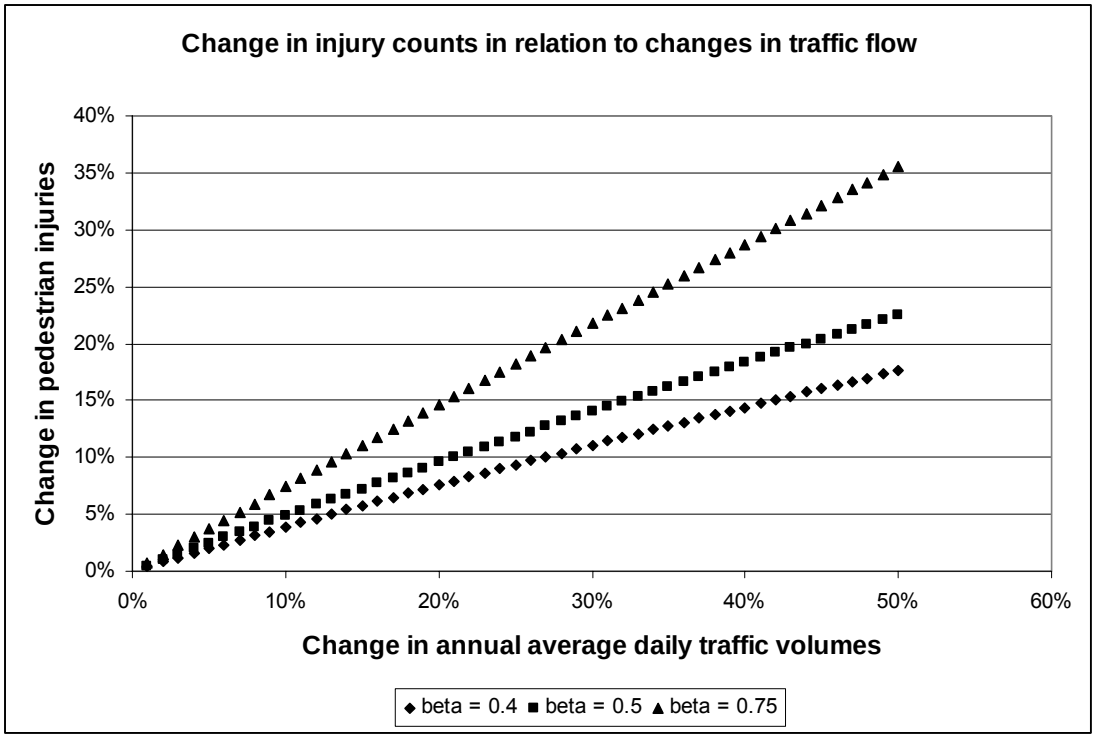
$$\textbf{Injuries} = \alpha \, \textbf{X (Average Annual Daily Trips)}^{\beta} \textbf{ ; typically where } \beta < 1 \quad [30]$$

Empirical evidence suggests that 0.5 is a reasonable parameter for β in the equation above; in other words, pedestrian injuries rate on a roadway are.[31] Based on this relationship, the rate of

29 Zone Guide for Pedestrian Safety. NHTSA, 1998.

30 Lord D, Manar A, Vizioli A. Modeling crash-flow density and crash-flow-V/C ratio relationships for rural and urban freeway segments. Accident Analysis and Prevention 2005; 37: 185-199.

pedestrian injuries will increase proportional to the square root of vehicle volume and the increase in the rate will be attenuated at higher vehicle volumes. The figure below graphically illustrates the relationship between change in vehicle volume and the change in the number of injuries varying the parameter Beta. Based on this function and Beta =0.5, a 50% increase in traffic volume would translate into an approximately 22% increase in the number of pedestrian injuries. Research in San Francisco has recently demonstrated that this parametric relationship between volume and injuries based on a power function is equivalent to results from multivariate analysis using a negative binomial model.[32]



To forecast pedestrian injuries prospectively using this model requires two data inputs: the baseline rate of pedestrian injuries in the area and the expected change in vehicle volume on roadways in the area.

Using the California Air Resources Board modeling tool, URBEMIS, projections of traffic volume around the MacArthur BART Transit Village development were made. The new development, which includes 518-625 residential units, 625-750 residential parking spaces, and 300 BART parking spaces, is expected to produce about 3000 additional vehicle trips a day. (Note: This number would have been greater if it were not part of a transit village.) These additional vehicle trips will likely be distributed along the arterial roads – Telegraph, West MacArthur, and 40th Streets.

Assuming the projected increases in vehicle trips as a result of the development will be equally distributed along Telegraph, West MacArthur, and 40th Streets, a 1.68% increase in pedestrian injuries or deaths will be expected along Telegraph – a conservative estimate using the lower

31 Lee C, Abdel-Aty M. Comprehensive analysis of vehicle-pedestrian crashed at intersections in Florida. Accident Analysis and Prevention 2005; 37: 775-786.

32 Megan Weir. San Francisco Department of Public Health. Personal Communication.

bound of beta = 0.4.‡ With a baseline annual rate of pedestrian injuries or deaths along Telegraph, West MacArthur, and 40th Streets of 16.2 pedestrian injuries or deaths per year, the model described above estimates an increase of one additional pedestrian injury or death every 3.25 years along these arterial roads. (See chart below)

	Telegraph Ave.	40th St.	West MacArthur Blvd.	Total among 3 arterial streets
Baseline Injuries or Deaths/Yr	8.67	2.5	5	16.17
Additional injuries or Deaths/Yr (1.68% increase)	0.18	0.04	0.08	0.31
Projected Injuries or Deaths/Yr	8.85	2.54	5.08	16.47

The following are the main assumptions required for this forecast of project-induced pedestrian injuries:

1. The relationship between volume and injuries for road facility in areas affected by project-related traffic can be robustly represented by a power function with a Beta of 0.4.
2. Pedestrian flow does not change in the affected area. (The development is likely to increase pedestrian traffic; however, increased roadway traffic may inhibit pedestrian activity.
3. No new pedestrian safety countermeasures are implemented
4. Vehicle volume changes at intersections evaluated for the LOS analysis are reasonable surrogates for volume changes at adjacent and area roadways bounded by those intersections.

While simple to understand and use, the approach used in this analysis of pedestrian injuries could be improved by developing and validating an analytic model in the local context. A more specific analysis using the above approach might estimate changes in pedestrian injuries based on vehicle flow on all segments on all roadways; in our case, the lack of data on volume changes for all intersections and roadway precluded this approach. As discussed, above Zonal analysis or software tools such as Pedestrian and Bicycle Crash Analysis Tool and Crossroads would also provide a complimentary method for pedestrian impact analysis for this project.

Injuries related to changes in pedestrian volume

For any given environmental context, the risk of pedestrian-vehicle conflicts is dependent on the volume of pedestrians as well as the volume of vehicles. Because the development, by design, is also expected to produce an increase in the number of walking trips, there may be greater cumulative probability of pedestrian-vehicle conflict; however, as discussed above, higher volumes of pedestrians may result in more attention and caution by drivers leading to a reduction in the individual risks faced by each pedestrian. Even if the individual risk for any single pedestrian declines; the total number of injuries may rise because of the increase in the absolute number of pedestrian trips. UCBHIG does not have an available method to estimate the net effect of changes in pedestrian volume on pedestrian injuries.

Planned Area Wide Pedestrian Safety Mitigations

Existing efforts are underway to plan or implement traffic safety interventions in the project area. For example, the proposed re-striping of Telegraph Avenue to accommodate bike lanes which

‡ β = 0.4 – lower bound; Additional traffic volume on Telegraph = 1000;
Change in injuries = (((1000+23562)/23562) 0.4 - 1) x 100 = 1.68%

would slow down traffic and decrease the likelihood of pedestrian injury. Planned improvements along 40th street include crosswalk improvements at MLK and Telegraph, lighting in and outside the pedestrian underpass, and lighting improvements on 40th Street. Some projects have not been approved due to funding issues, however (e.g., lighting improvements on Telegraph Avenue). The MacArthur Bart Transit Village Development could provide funding for the implementation of the plan proportional to it's project related share of traffic volume in the area.

F. Recommendations for Design and Mitigations

Because the rate of pedestrian injuries in Oakland is already 4 times the USDHHS standards and the project is located adjacent to streets that experience pedestrian injuries, planning for the MBTV could benefit from a comprehensive pedestrian safety countermeasure plan. A countermeasure plan should be based on further analysis of pedestrian safety hazards and mitigations on specific streets and intersections with significant increases in 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. Recommendations and mitigations to enhance safety in the project area could include the following:

1. Provide pedestrian safety engineering improvements including countdown pedestrian signal heads, bulb outs, and center median refuge islands at high-volume multi-lane intersections along Telegraph Avenue, 40th Street, West MacArthur Boulevard where cumulative traffic volume increases exceed 5%;
2. Provide pedestrian warning signs or lights at all crossings or cross walks with high traffic volumes (>5000) and without traffic signal lights; alternatively, remove non-signalized crosswalks on high volume roads;
3. Institute speed limit reductions to less than 20mph in mixed-use residential areas adjacent to the project;
4. Widen sidewalks or provide buffers between sidewalks and vehicle lanes on busy roadways with significant pedestrian traffic such as 40th Street, West MacArthur, Blvd, and Telegraph. Consider vehicle lane reductions on some corridors (e.g., West MacArthur , 40th Street) to simultaneously reduce and slow traffic
5. Create a pedestrian-friendly environment in the retail area by[33]:
    a. Maximizing pedestrian and transit access to the site from adjacent land uses.
    b. Providing comfortable transit stops and shelters with pedestrian connections to the main buildings; transit stops and pedestrian drop-offs should be located within reasonable proximity to building entrances - preferably no more than 225 meters (750 feet), and ideally much closer than that.
    c. Providing attractive pedestrian walkways between the stores and the adjacent sites.
    d. Ensuring that fencing and landscaping does not create barriers to pedestrian mobility.

33 FHWA Course on Bicycle and Pedestrian Transportation, Lesson 5: Adapting Suburban Communities for Bicycle and Pedestrian Travel http://safety.fhwa.dot.gov/ped_bike/univcourse/swless05.htm. Accessed December 9, 2006.

Mac Arthur BART Transit Village

Health Impact Assessment

Chapter 8
Air Quality

A. Summary

Given that regional transit lines in the Bay Area have been co-located with major roadways, implementing Transit Oriented Design (TOD) will need to address potential population exposures to air pollution for residents of TOD projects. This chapter of the Mac Arthur BART HIA evaluates the air quality for future residents of the Mac Arthur BART Transit Village and estimates the potential pollution related health effects. Vehicle emissions associated with Highway 24 result in ambient levels of particulate matter and diesel particulate matter higher on the project site than locations further from the freeway. Without mitigations, future residents of the Macarthur Bart Transit Village living within 50 meters of the highway are likely to experience higher rates of morbidity from respiratory illnesses, including asthma. The chapter suggests mitigations to reduce air pollution exposure at the site.

Health Impacts

1. Modeled annual levels of PM2.5 at the project site decline with distance on the east side of Highway 24; modeled annual average PM2.5 declines from 0.30 microgram per cubic meter at the western edge of the project site to 0.1 micrograms per cubic meter at the eastern edge.
2. Freeway diesel emissions from trucks result in an excess cancer risk for project residents ranging from 23 to 194 per million.
3. Project related traffic will result in a modest increase in pollution related health effects exposure to residents of neighborhoods adjacent to the project.

Recommendations for Design Mitigations

1. Notifying all potential buyers that the property they are occupying has air quality risks and educate them in the proper use of any installed air filtration.
2. Install a central HVAC (heating, ventilation and air conditioning) system with high efficiency filters for particulates. According to a recent study by Bill Fisk at Lawrence Berkeley Laboratory, the following design standards would remove 80% of fine particulate matter mitigating all expected additional roadway effects of particulates and having added health benefits in terms of reducing allergen loads:
   - ASHRAE 85% supply air filters;
   - >= 1 air exchanges per hour of fresh outside filtered air ;
   - >= 4 air exchanges / hour recirculation;
   - <= 0.25 air exchanges per hour in unfiltered infiltration.

   In addition, air intake systems for HVAC should be located as far away from I-580 and SR-24. The project developer should be required to implement an ongoing maintenance plan for filtration system associated with HVAC.
3. Providing 110 and 220 outlets at project loading docks so that trucks can connect with these outlets to power their auxiliary equipment. Utilizing only electric forklifts and landscaping equipment in the project operations and the operations of tenants.
4. Unbundling the cost of parking from the purchase or rent of residential units to potentially reduce car ownership and usage by residents.
5. Increasing the frequency of AC Transit services to the project site.
6. Requiring secured bicycle parking for both employees and residents;
7. Restricting employee parking for commercial tenants;
8. Provide on-site child-care (assuming installation of proper HVAC and/or filtration), and/or other services that might reduce typical vehicle trips associated with commuter behavior, which would otherwise rely purely on public transportation.

9. Increasing parking fees for BART parking with no fee for carpool vehicles.

B. Health Effects Associated with Air Quality

Criteria Air Pollutants The USEPA identifies 6 criteria air pollutants that have important human health impacts; these include Ozone (O_3), carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. The Clean Air Act requires the EPA to develop specific public health and welfare-based exposure standards for the six criteria air pollutants and directing States to develop plans to achieve theses standards. Nationally, a network of air quality monitors provides information on ambient concentrations of criteria air pollutants.

Despite promulgation of National Ambient Air Quality Standards for criteria pollutants and implementation of air quality control plans, air pollutants continue to have significant impacts on human health. In part, these ongoing effects are due to non-attainment of air quality standards; however, exposure to air pollutants also results in health impacts even when levels are below existing standards.[1]

Particulate matter is unique among criteria air pollutants as it represents a heterogeneous group of physical entities.[2] Epidemiological studies in diverse populations on five continents have documented relationships between ambient concentrations particulate matter and health outcomes. Adverse health outcomes associated with particulate matter include premature mortality, respiratory hospital admissions, emergency room visits, upper respiratory illness, lower respiratory illness, restricted activity days, asthma attacks and chronic disease.

Based on toxicological and epidemiological research, smaller particles and those associated with traffic appear more closed related to health effects.[3] Other particulate matter characteristics that may be important to human health effects include: mass concentration; number concentration; acidity; particle surface chemistry; metals; carbon composition; and origin.

Health Effects Below Ambient Air Quality Thresholds Air quality epidemiology has not established clear “no effects” thresholds for particulate matter, and recent epidemiologic studies in California have also found that significant fine particulate matter is causing health effects at levels below national standards.[4] According to a cost-benefit analysis recently done by the USEPA, reducing the NAAQS for fine particulate matter by 1 ug per cubic meter from 15 to 14 would result in 1900 fewer premature deaths, 3700 fewer non-fatal heart attacks, and 2000 fewer emergency room visits for asthma each year.[5] The 2002 State of California Air Resources Board Air Quality Standards Staff Report for Particulate Matter estimated that significant health effects benefits would accrue from reducing ambient PM 2.5 from current levels to natural background concentrations for every county in California.[6]

Toxic Air Contaminants and Diesel Particulate Matter Toxic air contaminants (TACs) are another category of air pollutants not regulated under Federal Criteria air pollution rules but known to have

1 Johnson PRS and Graham JJ. Fine Particulate Matter National Ambiet Air Quality Standards: Public Health Impact on Populations in the Northeastern United States. Environmental Health Perspectives 2005; 113; 1140-1147.

2 Health Aspects of Air Pollution with Particulate Matter, Ozone and Nitrogen Dioxide Report on a WHO Working Group Bonn, Germany 13–15 January 2003. Copenhagen: World Health Organization, 2003

3 Schlesinger RB, Kunzli N, Hidy GM, Gotschi T, Jerrett M. The Health Relevance of Ambient Particulate Matter Characteristics: Coherence of Toxicological and Epidemiological Inferences. Inhalational Toxicology. 2006; 18:95-125.

4 Ostro B, Broadwin R, Green S, Fang WY, Lipsett M. Fine Particulate Air Pollution in Nine California Counties: Results from CALFINE. Environmental Health Perspectives. 2006: 114: 29-33.

5 Regulatory Impact Assessment. 2006 National Ambient Air Quality Standards for Particle Pollution. US EPA. 2006

6 California Air Resources Board. Particulate Matter Staff Report. 2002

adverse human health effects. There are hundreds of different types of TACs and health effects range from birth defects to cancer. Diesel exhaust particulate matter (DPM) is a toxic air contaminant and known lung carcinogen resulting from combustion of diesel fuel in heavy duty trucks and heavy equipment.

Table 1. Selected hazardous criteria and non-criteria air pollutants, sources, and effects on human health.

Air Pollutant	Source	Health Effects
Ozone	Troposphere ozone is formed in the atmosphere from chemical transformation of certain air pollutants in the presence of sunlight. Ozone precursors include vehicles, other combustion processes and the evaporation of solvents, paints, and fuels	Ozone causes eye irritation, airway constriction, and shortness of breath and can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema.
Carbon Monoxide (CO)	Produced due to the incomplete combustion of fuels, particularly by motor vehicles	Exposure to high concentrations of CO reduces the oxygen-carrying capacity of the blood resulting in fatigue, impaired central nervous system function, and induced angina.
Particulate Matter (PM_{10} and $PM_{2.5}$)	Diverse sources including motor vehicles (tailpipe emissions as well as brake pad and tire wear, fireplaces and stoves, industrial facilities, and ground-disturbing activities	Impaired lung function, exacerbation of acute and chronic respiratory ailments, including bronchitis and asthma, excess emergency room visits and hospital admissions, pre-mature arteriosclerosis, and premature death.
Nitrogen Dioxide (NO_2)	Combustion processes in vehicles and industrial operations	Increase the risk of acute and chronic respiratory disease and reduce visibility
Sulfur Dioxide (SO_2)	Combustion of sulfur-containing fuels such as oil, coal, and diesel	Increased risk of acute and chronic respiratory
Lead	Leaded gasoline (historically), lead paint (on older houses, cars), smelters (metal refineries), and lead storage batteries	Neurotoxic health effects in children
Diesel Particulate Matter	Emissions from diesel engines	Cause of lung cancer

Sensitive Populations Air quality does not affect every individual in the population in the same way, and some groups are more sensitive to adverse health effects. Population subgroups sensitive to the health effects of air pollutants include the elderly and the young, population subgroups with higher rates of

respiratory disease such as asthma and COPD, populations with other environmental or occupational health exposures (e.g. indoor air quality) that impact cardiovascular or respiratory diseases.

Health Effects Due to Within Area Variations in Exposure Sources The assessment of air pollution using community wide monitoring data does not provide estimates of actual population exposure within a city. Within an area or place, exposure typically varies spatially with higher levels of exposure in proximity to sources of pollution. Two particular sources of within-area variation in air pollution hazards are industrial sources and roadways.

Factors responsible for variation in exposure may also be associated with populations more sensitive to air pollution. For example, poorer residents may be more likely to live in crowded substandard housing and be more likely to live near industrial or roadway sources of air pollution. This misclassification, inherent in much of air pollution research, may be resulting in a significant underestimation of health effects. A recent study of mortality and air pollution in Los Angeles found that concentration response functions based on within city estimate was 2-3 times that based on studies comparing communities.[7]

Health Effects Due to Proximity to Industrial Sources of Air Pollution A number of industrial processes create potential exposure sources of TACs. The California Air Resource Board, Air Quality and Land Use Handbook: A Community Health Perspective (2005) recommends not locating sensitive land uses, including residential developments, within specific distances of certain known sources of toxic air contaminants.[8] Specific CARB recommendations for the location of residential uses relative to air pollution sources are listed in the section on regulatory thresholds and guidance below.

Roadway Related Health Effects Motor vehicles are responsible for a large share of air pollution especially in California. This is consistent with the theory that proximity to air pollution sources is likely to increase both relative exposure and hazards. Epidemiologic studies have consistently demonstrated that children and adults living in proximity to freeways or busy roadways have poorer health outcomes.

- A study of children in the Netherlands found that lung function declined with increasing truck traffic density especially for children living within 300 meters of motorways.[9]
- Children in Erie County, New York hospitalized for asthma were more likely to live within 200 meters of heavily trafficked roads. [10]
- Among children living within 150 m of a main road in Nottingham, United Kingdom, the risk of wheeze increased with increasing proximity to the road. [11]
- In Oakland California, in children with higher exposure to traffic related pollutants had more asthma and bronchitis symptoms.[12]

7 Jerrett M et al. Spatial Analysis of Air Pollution and Mortality in Los Angeles. Epidemiology. 2005; 16: 727-736

8 California Environmental Protection Agency Air Resources Board Air Quality and Land Use Handbook: A Community Health Perspective (Draft approved for publication) February 17th, 2005. Available at: http://www.arb.ca.gov/ch/landuse.htm

9 Brunekreef, B. et al. “Air pollution from truck traffic and lung function in children living near motorways.” Epidemiology. 1997; 8:298-303.

10 Lin, S. et al. “Childhood asthma hospitalization and residential exposure to state route traffic.” Environ Res. 2002;88:73-81.

11 Venn. et al. “Living near a main road and the risk of wheezing illness in children.” American Journal of Respiratory and Critical Care Medicine. 2001; Vol.164, pp. 2177-2180.

- In a low income population of children in San Diego, children with asthma living with 550 feet of high traffic flows were more likely than those residing near lower traffic flows to have more medical care visits for asthma.[13]
- In a study of Southern California School Children, living within 75 m of a major road was associated with an increased risk of lifetime asthma, prevalent asthma, and wheeze [14]
- In a study conducted in 12 southern California communities, children who lived with 500 meters of a freeway had reduced growth in lung capacity relate to those living greater than 1500 feet from the freeway [15]

Air pollution monitoring done in conjunction with epidemiological studies has confirmed that roadway related health effects vary with modeled exposure to particulate matter and nitrogen dioxide. However, at this time, it is not possible to attribute roadway related health effects to a single type of roadway, vehicle, or type of fuel. Vehicle tailpipe emissions contain diverse particulate matter as well as well as ozone precursor compounds such as nitrogen oxides (NO_x) and volatile organic compounds (VOC). Vehicles also contribute to particulates by generating road dust and through tire and brake wear.

Because of the robust evidence relating proximity to roadways and a range of non-cancer health effects, the California Air Resource Board includes guidance on locating sensitive land use in proximity their *Air Quality and Land Use Handbook: A Community Health Perspective* (2005). CARB recommends not locating sensitive land uses, including residential developments, within 500 feet of a highway with more than 100,000 vehicles per day.[16] Given that many infill opportunity sites in urban areas are in proximity to busy roadways and other industrial sources, implementing location-efficient development (Smart Growth) will need to address air quality related heath effects in the course of site selection, design, and development.

Exposure Assessment Techniques While a national network of air quality monitors provides information on ambient concentrations of criteria air pollutants at the level of cities and regions, significant variation in air quality occur within cities, and established NAAQS monitoring stations do not permit assessment of exposure at specific development sites. In the absence of site specific assessment, via modeling or measurement, it not possible to evaluate the significance of the health hazard posed by roadways for specific proposed uses.

12 Kim, J. et al. "Traffic-related air pollution and respiratory health: East Bay Children's Respiratory Health Study." American Journal of Respiratory and Critical Care Medicine 2004; Vol. 170. pp. 520-526.

13 English P., Neutra R., Scalf R. Sullivan M. Waller L. Zhu L. "Examining Associations Between Childhood Asthma and Traffic Flow Using a Geographic Information System." (1999) Environmental Health Perspectives 107(9): 761-767.

14 McConnell, R. B., K. Yao, L. Jerrett, M. Lurmann, F. Gilliland, F. Kunzli, N. Gauderman, J. Avol, E. Thomas, D. Peter, J. (2006). "Traffic, susceptibility, and Childhood Asthma." Environmental Health Perspectives 114(5): 766-772.

15 Gauderman WJ, Avol E, Gilliland F, Vora H, Thomas D, Berhane K, McConnell R, Kuenzli N, Lurmann F, Rappaport E, Margolis H, Bates D, Peters J. The effect of air pollution on lung development from 10 to 18 years of age. N Engl J Med. 2004 Sep 9;351(11):1057-67. Erratum in: N Engl J Med. 2005 Mar 24;352(12):1276.

16 California Environmental Protection Agency Air Resources Board Air Quality and Land Use Handbook: A Community Health Perspective (Draft approved for publication) February 17th, 2005. Available at: http://www.arb.ca.gov/ch/landuse.htm

Several techniques may be employed to help estimate exposure at a particular point with a cities or regions. The application of these techniques with regards to roadway related health effects has been recently reviewed by Michael Jerrett and colleagues.[17]

- Most simply, distance or proximity to a pollution source can be used as a proxy for exposure. As discussed above CARB provides distance based buffers for selected stationary and mobile sources that can serve as a proxy for harmful exposure. Furthermore, with regards to roadway related health effects, California Department of Health Services maintains a GIS based web tool that provides total daily vehicle volume within any specified distance at any point in California. This web tool utilizes the California Environmental Health Tracking Program's (CEHTP) spatial linkage web service, computing traffic-related metrics on CalTrans Highway Performance Monitoring System (HPMS) 2004 data in California. (The URL for this tool is: http://www.ehib.org/traffic_tool.jsp.) The use of proximity as a surrogate for exposure does not address the cumulative impacts or the moderating effects of geography, topography, or weather on exposure.
- Second, exposure can be interpolated from measurements collected at existing monitoring stations. However, the limited distribution of monitoring stations in most regions does not permit fine grained interpolation.
- Third, regression techniques can be used to create a model of exposure based on land use and transportation characteristics. Researchers have created land use regression models for Alameda, San Diego, and Los Angeles based on simultaneous measurements of nitrogen dioxide. The application of this technique to a particular area requires the development and validation of a land use regression model.
- Fourth, exposure can be estimated using Gaussian dispersion models based on physical characteristics of emissions, meteorology, and topography. A particular advantage of this technique is that line source regression models have been frequently used in health effects research relating roadways to adverse health outcomes. The CAL3QHC Line Source Dispersion Model Version 2.0, an enhanced version of CALINE3, is an example of a dispersion model that can be used to calculate exposure to an air pollutant at a development site due to roadway vehicle traffic.[18]

Health Effects Assessment In general, exposure assessment is sufficient to make informed and health protective development and design decisions. In some cases a health effects assessment is not necessary to evaluate trade-offs. It is possible to quantify the human health effects due to either roadway or industrial sources using well established health risk assessment methodologies. In general, the approach to effects estimation requires (1) a concentration-response function, (2) estimates of exposure to air pollutants, (3) estimates of the number of people exposed and their age distribution, and (4) baseline incidences of health effects. Concentration-response functions are equations that relate a change in the incidence of an adverse health outcome to the change in an ambient concentration of a pollutant. Typically, air quality health impact analysis uses C-R functions based on regression analyses

17 Jerrett M, et al. A review and evaluation of intraurban air pollution exposure models Journal of Exposure Analysis and Environmental Epidemiology. 2005; 15:185-204.

18 Op. cit., SCMAQMD, p11.

from epidemiological studies. [19] Using this method, Ostro has estimated the benefits of federal standards for Particulate Matter and Kunzli has estimated the total health burden of particulate matter in three European Countries.[20] Quantitative assessments using similar methods have been conducted in other countries and contexts. [21] Using this methodology, in 2002, the State of California Air Resources Board Air Quality Standards Staff Report for Particulate Matter estimated that a reduction in ambient PM 2.5 from current levels to 12 ug/ cubic meter in California would result in approximately 6500 fewer deaths and 3100 fewer hospitalizations. [22]

A similar approach can be used to estimate excess Cancer Risk Estimation Due to Diesel Particulate Matter. This approach applies an estimates of diesel PM 10 exposure to an inhalation cancer risk unit risk factor (URF) in order to estimate additional lifetime cancer probability. The EPA risk factor (URF) for diesel exhaust in cancer deaths per person exposed in a lifetime to 1ug/m^3 is 1.7 X 10^{-5}. [23]

Mitigation of Roadway Related Health Effects In general, the design of mitigations to protect sensitive uses from higher levels of pollution should follow exposure assessment. Pre-development assessment in areas potentially near hazardous air pollutions sources, such as busy roadways, should include at a minimum air quality modeling or direct measurement and, where necessary, a health effects assessment. [24] [25] Development at a site where exposure levels are substantially higher than background should either be avoided, or, where alternative locations are not feasible, design and development should include sufficient verifiable mitigations to protect future residents from higher rates of morbidity and mortality. Such a program would be similar to site assessment and mitigation programs currently in place for other hazardous physical exposures (e.g. environmental noise and contaminated soil) that occur through development.

The table below outlines the key elements of a programmatic approach of site assessment to prevent roadway related effects. First, hazard identification involves assessing the cumulative traffic volumes and vehicle mix on roadways within a specified distance of the planned use. Available air pollution exposure modeling tools would provide a mechanism for site specific evaluation. Reductions in exposure associated with future emissions controls will be reflected through modeling methodologies. Engineering solutions including providing mechanical ventilation, keeping building interiors under positive pressure, installing particulate filtration and carbon filtration as needed, and locating air intakes away from pollution sources all could provide a potential pathway for mitigation of this impact to a less-than significant level. Critical in this approach will be to match the design of ventilation solutions to the findings of exposure assessment. Ventilation design needs to be informed by a standard exposure assessment method and

19 Quantification of the Health Effects of Exposure to Air Pollution Report of a WHO Working Group
Bilthoven, Netherlands 20-22 November 2000 EUROPEAN CENTRE FOR ENVIRONMENT AND HEALTH, 2001

20 Kunzli et al. Public health impact of outdoor and traffic related air pollution: a European Assessment, The Lancet 356 (2000) p 795.

21 Levy J, Spengler JD"Estimated Public Health Impacts of Criteria Pollutant Air Emissions from the Salem Harbor and Brayton Point Power Plants," Harvard School of Public Health. 2000.

22 California Air Resources Board. Particulate Matter Staff Report. 2002

23 Biwer, B. B., JP. (1999). "Vehicle emission unit risk factors for transportation risk assessments." Risk Analysis 19(6): 1157-1171

24 BAAQMD CEQA Guidelines, Assessing the Air Qualtiy Impacts of Projects and Plans, December, 1999

25 SMAQMD, Recommended Protocol for Evaluating the Location of Sensitive Land Uses Adjacent to Major Roadways, Draft, October, 2006.

either represent best available technology or certified by an air quality professional. In some cases, site assessment data may reveal that that design and engineering solutions are not adequate to address the exposure hazard. This approach is consistent with California Air Resources Board call for context-specific evaluation of land use-air quality conflicts.

Table 2. Programmatic Approach to Mitigating Roadway Related Air Quality Health Impacts

Programmatic Element	Description
Hazard Identification	Use the California Environmental Health Tracking Program's (CEHTP) spatial linkage web service to assess the cumulative vehicle volume on roadways within a 500 feet buffer of the sensitive use site. (http://www.ehib.org/traffic_tool.jsp)
Exposure Assessment	Estimate exposure can be estimated using physics based models using data on vehicle volumes, vehicle types, emissions characteristics, meteorology, and topography. The CAL3QHC and CALINE4 Line Source Dispersion Models are examples of available tools.
Mitigation	Design ventilation systems to mitigate excess exposure. An air quality professional to certify ventilation system effectiveness. Based on recent study by Bill Fisk at Lawrence Berkeley Laboratory the following ventilations system design standards would remove 80% of fine particulate matter: ➢ ASHRAE 85% supply air filters; ➢ >= 1 air exchanges per hour of fresh outside filtered air ; ➢ >= 4 air exchanges / hour recirculation; ➢ <= 0.25 air exchanges per hour in unfiltered infiltration. Air intake systems for HVAC should be located as far away from I-580 and SR-24. The project developer should be required to implement an ongoing maintenance plan for filtration system associated with HVAC.
Health Effects Assessment	Quantify health effects of exposures not mitigated through ventilation or other design and engineering strategies.

C. Established Standards and Health Objectives

State and Federal Air Quality Standards Under the Federal Clean Air Act, the US EPA is responsible for setting health protective standards for six criteria air pollutants. These standards are achieved through the development and enforcement of State-level implementation plans.

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		Federal Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m³)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m³)		0.08 ppm (157 µg/m³)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m³	Gravimetric or Beta Attenuation	150 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m³		—		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		35 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m³	Gravimetric or Beta Attenuation	15 µg/m³		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10mg/m³)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m³)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m³)		35 ppm (40 mg/m³)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m³)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	—	Gas Phase Chemiluminescence	0.053 ppm (100 µg/m³)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.25 ppm (470 µg/m³)		—		
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	—	Ultraviolet Fluorescence	0.030 ppm (80 µg/m³)	—	Spectrophotometry (Pararosaniline Method)
	24 Hour	0.04 ppm (105 µg/m³)		0.14 ppm (365 µg/m³)	—	
	3 Hour	—		—	0.5 ppm (1300 µg/m³)	
	1 Hour	0.25 ppm (655 µg/m³)		—	—	—
Lead [8]	30 Day Average	1.5 µg/m³	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 µg/m³	Same as Primary Standard	High Volume Sampler and Atomic Absorption
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates	24 Hour	25 µg/m³	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m³)	Ultraviolet Fluorescence			
Vinyl Chloride [8]	24 Hour	0.01 ppm (26 µg/m³)	Gas Chromatography			

See footnotes on next page ...

For more information please call ARB-PIO at (916) 322-2990 California Air Resources Board (11/10/06)

California Air Quality and Land Use Guidance

The California Air Resource Board, *Air Quality and Land Use Handbook: A Community Health Perspective* (2005) recommends not locating sensitive land uses, including residential developments, within 500 feet of a highway with more than 100,000 vehicles per day.[26] Specific CARB recommendations for the location of residential uses relative to air pollution sources are listed in the table below.

Table 3. CARB 2005 Guidance on Preventing Air Quality—Land Use Conflicts

Source of Air Pollution	**Air Resource's Board Recommendations**
Freeways and High-Traffic Roads	Avoid siting sensitive land uses within 500 feet of a freeway, urban roads with 100,000 vehicles/day, or rural roads with 50,000 vehicles/day.
Distribution Centers	Avoid siting sensitive land uses within 1,000 feet of a distribution center (that accommodates more than 100 trucks per day, more than 40 trucks with operating TRUs per day, or where TRU unit operations exceed 300 hours per week). Take into account the configuration of existing distribution centers and avoid locating residences and other sensitive land uses near entry and exit points.
Rail Yards	Avoid siting sensitive land uses within 1,000 feet of a major service and maintenance rail yard. Within one mile of a rail yard, consider possible siting limitations and mitigation approaches.
Ports	Consider limitations on the siting of sensitive land uses immediately downwind of ports in the most heavily impacted zones. Consult with local air districts for the latest available data on health risks associated with port emissions.
Refineries	Avoid siting sensitive land uses immediately downwind of petroleum refineries. Work with local air districts to determine an appropriate separation.
Chrome Platers	Avoid siting sensitive land uses within 1,000 feet of a chrome plater.
Dry Cleaners Using Perchloro-ethylene	Avoid siting sensitive land uses within 300 feet of any dry cleaning operation. For large operations with two or more machines, provide 500 feet. Do not site sensitive land uses in the same building with perc dry cleaning operations.
Gasoline Dispensing Facilities	Avoid siting sensitive land uses within 300 feet of a large gas station (defined as a facility with a throughput of 3.6 million gallons per year or greater). A 50 foot separation is recommended for typical gas stations.

26 California Environmental Protection Agency Air Resources Board Air Quality and Land Use Handbook: A Community Health Perspective (Draft approved for publication) February 17th, 2005. Available at: http://www.arb.ca.gov/ch/landuse.htm

D. Existing Conditions: Air Pollution Sources and Area Meteorology

Stationary Sources of Air Pollution

Gasoline dispensing facilities are sited on Telegraph and on West Mac Arthur Blvd. This assessment did not identify any other significant stationary sources of air pollution adjacent to the proposed project.

Mobile Sources of Air Pollution Emissions

The proposed project is situated in immediate proximity to several major roadways and may be subject to air pollution from vehicle sources. These roadways include SR 24 to the west, Telegraph Avenue to the East, and I-580 / Mac Arthur Freeway to the South. Highway 580 runs East/West of the project and perpendicular to Highway 24. According to the California Department of Transportation the 2005 average annual daily traffic (AADT) for Highway 24 was 144,000 vehicles/ day. The truck AADT was 3571 trucks or 2.48% of the traffic. [27] Traffic volume for Highway 580 is 224,000 (AADT) with a truck ADDT of 2486 or 1.11%. The Average Daily Traffic Count on Telegraph Avenue, south of 40th Street is also relatively high at 23,562.[28]

Air Quality in the Project Area

Regional monitoring stations operated by the Bay Area Air Quality Management District provide data on levels of criteria air pollutants. As discussed above, this NAAQS monitoring data is limited because it does not provide information on variation of air pollution within an area or the effects of stationary and mobile sources in proximity to the project.

Air pollution modeling research conducted by the State Department of Health Services within Alameda County suggests that land uses and roadways are significant influences on air pollution levels. Researchers at the state department of health environmental health investigations branch used regression techniques and simultaneous measurements of nitrogen dioxide to create a model of vehicle emissions exposure based on land use and transportation characteristics using. A regression model of NO2 that included total traffic with 40 and 500 meter buffers, proximity of Port land uses, and distance to the nearest road explained 73% of the variation in air pollution levels.[29] Measures of NO2 showed exposure declining with distance both west and east from freeways, suggesting that prevailing winds do not entirely mitigate roadway related exposure hazards west of freeways.

Area Meteorology

Meteorological parameters that influence air pollution include wind direction and speed, temperature, atmospheric stability, mixing height, precipitation, humidity, solar radiation and visibility. Among other parameters, the direction and speed of surface winds govern the drift and diffusion of air pollutants discharged near the ground. The higher wind speed at or near the source helps to carry away the pollutants from the source, however, when the wind speed is lower in the area, the pollutants tend to be concentrated near the area of discharge. The

27 2005 Average Annual Daily Truck Traffic on California State Highway System, State of California Department of Transportation, November, 2006

28 Draft Environmental Impact Report "Existing Traffic Analysis. Environmental Review of the Proposed Restriping of Telegraph Avenue to Accommodate Bike Lanes." December 4, 2003. Page 4.

[29] Ross Z. EHIB land use regression to predict nitrogen dioxide concentrations in Alameda County, California. ZevRoss Spatial Analysis. June 2005.

meteorological data of Oakland shows that in both winter and summer, winds blow from the west about 25% of the time[30]. In addition, winds are calm over 17% of the time of the year. Wind rose below indicates prevailing wind direction for area of project. Given that the transit village is located in the east side within 50 meters from the edge of the freeway, it is very likely that transit village residents will be exposed to higher concentrations of freeway related vehicle emissions such as particulate matter, carbon monoxide and nitrogen dioxide.

Figure AQ.1--Wind rose for Alameda Naval Air Station

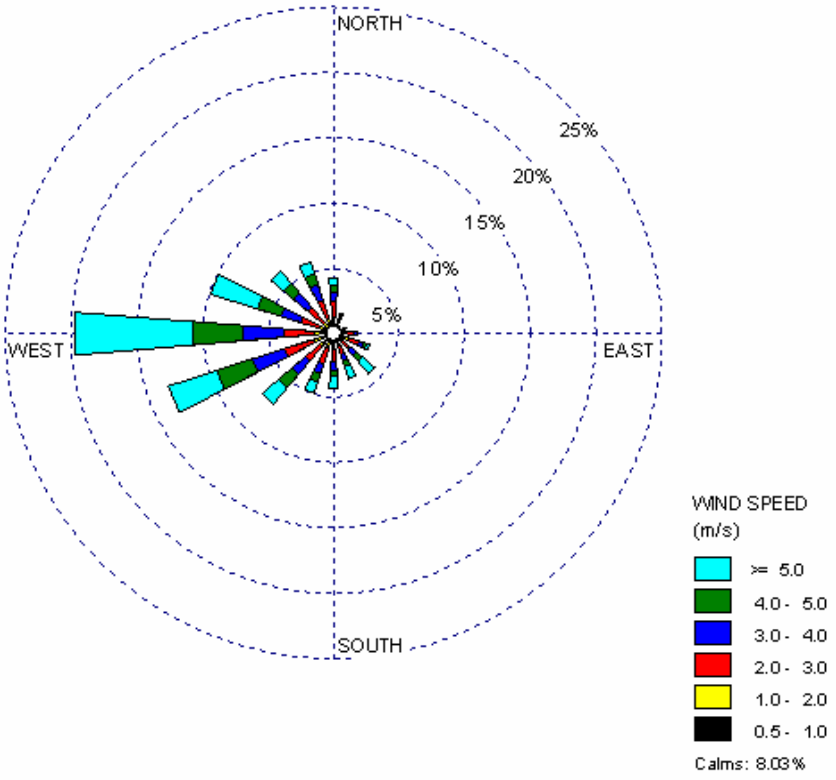


Figure 5: Wind directions at the Alameda NAS meteorological station for 1994 through 1996

30 Wind roses: Summer and Winter (1998-2001): http://www.met.utah.edu/jimsteen/jstewart/windroses.html (viewed 12806)

E. Health Impact Analysis

Urban land use development can affect population health effects of air quality in two related ways. First, growth and development may result in new local area sources of air pollution through new industrial uses, new transportation facilities, greater personal vehicle use, or increased demand for energy. Second, growth and development can bring a population in proximity to a pre-existing source of air pollution, like busy roadways, increasing exposure and hazard. The Mac Arthur BART transit village will contribute to reductions in regional air quality emissions by creating new residential uses in proximity to existing regional transit system. Based on this general framework, the focus of the air quality analysis in this HIA is reflected in the following question below:

1. Will vehicle emissions from the I-580 /SR 24 Interchange be a hazard for project residents?

Roadway Related Health Effects in Project Residents due to exposure to PM 2.5

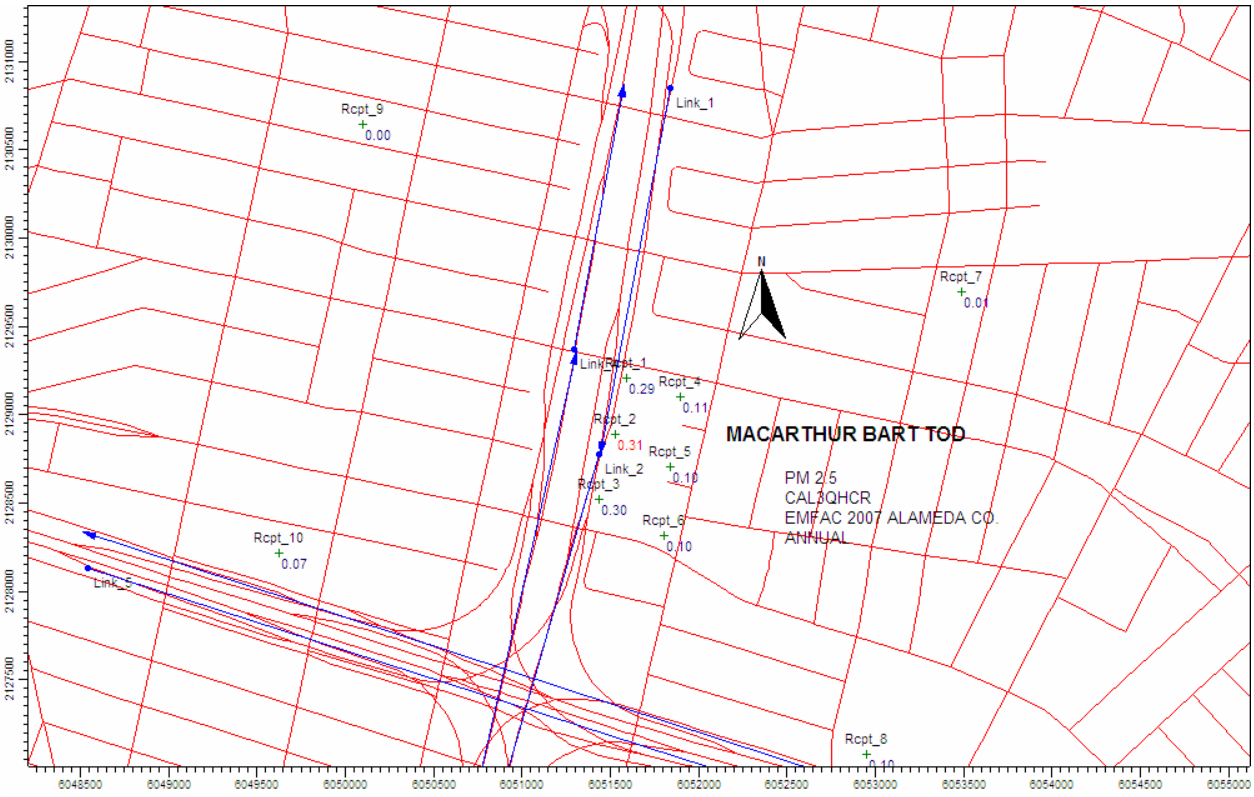
As discussed above, the California Air Resources Board recommends not to place sensitive land uses within 500 feet of a freeway, urban roads with 100,000 vehicles/day, or rural roads with 50,000 vehicles/day, based on *both* the long term lung cancer risks as well as short term effects on children's' lungs, including reduced lung function, bronchitis, asthma, and cardiovascular mortality. Non-cancer health effects on children's' lungs are associated with particulate matter and other exhaust emissions from the operation of fossil fueled vehicles and not associated exclusively to diesel exhaust particulates. Proximity to SR 24 in combination with wind rose data suggests the potential for significant exposure hazard during most times during the year.

We estimated peak hour concentrations for six receptors on the project site (see figure of modeled receiver locations and results). UCBHIG modeled Project Area PM 2.5 exposure attributable to freeway vehicle traffic on Interstate 880 using the CAL3QHCR Line Source Dispersion Model Version 2.0. CAL3QHCR is an enhanced version of CALINE3 (California Line Source Dispersion Model). The model allows for the use of annual meteorological data collected on an hourly basis. For the purpose of our analysis we used truck percentages and peak hourly traffic count data from California Department of Transportation (CalTrans). EMFAC 2007 for Alameda County was used to calculate emissions. Annual exposure was modeled using annual emissions at 55mph, 50% relative humidity, and 50 degrees F. Surface meteorology in the SAMSOM format was obtained from San Francisco International Airport[31] and Upper Air Data in the SCRAM format was obtained for the Oakland Metropolitan Airport[32]. Annual meteorological data from 1990 was used for all inputs to the CAL3QHCR model. Analysis was completed with the CALRoads View Interface Program produced by Lake Environmental.[33]

Based on the CAL3QHC model, the annual average contribution to PM 2.5 concentrations of vehicles on SR-24 and I-580 is ~0.30 micrograms per cubic meter. Consistent with prevalent winds, modeled concentrations are negligible to the west of SR 24 and decline across the project site moving east towards Telegraph Avenue to ~0.10 micrograms per cubic meter.

[31] Webmet.com, The Meteorological Resource Center, http://www.webmet.com/State_pages/met_ca.htm
[32] ibid.
[33] CALRoads View, Air Dispersion Models for Roadways, Lake Environmental, 2006

Figure AQ.2—Annual Contribution of Freeway Traffic to PM2.5 based on Dispersion Model.



There is no established health based no effect level for PM 2.5 exposure. A recent study by Michael Jerrett and colleagues in Los Angeles showed that a 1 ug / m3 increase in Pm 2.5 results in a 1.4% increase in annual mortality from non-injury causes. A 0.3 ug /m3 increase would thus result in a 0.42 % increase in non-injury mortality or an increase of about four excess deaths per 100,000 population per year.

Health effects can also be estimated based on the concentration-response functions for PM2.5 contained in the 2002 State of California Air Resources Board used C-R function approach to quantify the adverse health effects of new regulatory standards for particulate matter.[34] A health effects assessment contained in the 2002 CARB Report estimated that a reduction in ambient PM 2.5 from current levels to 12 ug/ cubic meter in California would result in approximately 6500 fewer deaths and 3100 fewer hospitalizations.

We used the same quantitative health effects assessment methodology used and documented by CARB in their 2002 Particulate Matter Standards Staff Report to evaluate the health impacts of particulate matter exposure on the project site attributable to freeway vehicle traffic. Along with our estimates of PM2.5 from the line source dispersion model described above, the following data sources were used to provide the inputs for this analysis:

- **Concentration Response Functions** for particulate matter exposure and health effects were replicated from those used and documented in the 2002 CARB Air Quality Standards Staff Report for Particulate Matter; The form of the concentration response functions for mortality, chronic bronchitis, hospital admissions, emergency room visits for asthma, work loss days, and minor restricted activity days is as follows:

  $$\Delta y = -y_0 (e^{-\beta * \Delta PM} - 1) * P$$

  y = health endpoint (e.g., mortality)

  y0 = baseline incidence rate per person

  β = coefficient from regression model per unit change in exposure

  P = population at risk

  The form of the concentration response functions for acute bronchitis, upper respiratory symptoms, lower respiratory symptoms, and asthma attacks is as follows:

  $$\Delta y = -(y_0 / ((1 - y_0) * e^{\beta * \Delta PM} + y_0) - y_0) * P$$

  y = health endpoint (e.g., acute bronchitis)

  y0 = baseline incidence rate per person

  β = coefficient from regression model per unit change in exposure

  P = population at risk

- **Baseline incidence rates** for disease endpoints were replicated from those used in the 2002 CARB Staff Report analysis of health effects, except for those specified below;
- The Alameda County Public Health Dept provided **crude mortality rates** for Oakland using California Vital Statistics Data
- For the sake of comparability, we present results in terms of population risk for an **exposed population** of 100,000 and the **age distribution** of residents of Oakland based on American Community Survey 2005 data for Oakland California.

34 California Air Resources Board. Particulate Matter Staff Report. 2002

Based on these established concentration response function, excess exposure to freeway vehicle PM2.5 emissions of 0.30 ug/m3 would contribute about three additional premature deaths due to long term exposure in a population of 100,000. The same excess exposure would contribute significantly to excess events with regards to other health outcomes including days with respiratory symptoms, days with activity limitations, and work-loss days. Detailed results are described in the table below.

Table 4. Forecasted Health Effects of PM2.5 on an exposed population of 100,000 based on CARB Concentration Response Functions

Outcome	Age Group Affected	Study / Author	Baseline Incidence Rate	Roadway Contribution to Pm 2.5 Exposure	Concentration Response Coefficient (β) for Pm2.5	Excess Events Per 100,000 exposed
Annual Mortality	*Age >30*	*Krewski, 2000*	1.10E-02	0.31	1.33E-02	2.7
Annual Chronic Bronchitis	*Age > 27*	*Abbey, 1993*	3.78E-03	0.31	1.32E-02	1.0
Daily Hospital Admissions for Asthma	*Age <65*	*Sheppard, 1999*	2.63E-06	0.31	2.51E-03	0.1
Annual Acute Bronchitis	*Age 8-12*	*Dockery, 1996*	4.40E-02	0.31	2.72E-02	34.2
Daily Lower Respiratory Symptoms	*Age 7-14*	*Schwartz, 1994*	1.20E-03	0.31	1.82E-02	26.9
Daily Work Loss Days	*Age 18-65*	*Ostro, 1987*	6.48E-03	0.31	4.60E-03	214.0
Daily Minor Restricted Activity Days	*Age 18-65*	*Ostro, 1989*	2.14E-02	0.31	7.41E-03	1136.5

This health effects assessment is subject to a few caveats.

- First, we estimate particulate matter health effects due only to the exposure contributed by freeway vehicles and only on future project area residents. Freeway associate emissions have additional impacts on existing residents. Area wide sources of particulate matter, including freeways, also contribute to a baseline area level of particulate matter and would contribute to additional adverse health effects.
- Second, we estimate the effects on health based on studies of exposure to PM2.5. Additional estimates are available based on the epidemiological studies of PM10.

- Third, our approach estimates health effects attributable to modeled exposure differences. While we use well established exposure modeling software, most studies that form the basis typically assess the relationship between health effects and area measures of particulate matter from monitoring stations. However, studies that have used modeled exposure differences as predictor variables in epidemiologic research on particulate matter have also found significant exposure—effect relationships.[35]
- Fourth, health effects estimation has typically been applied at a county, state, or national scale (e.g., to assess the benefit of national air pollution regulations.) On one hand, the small area exposure assessment allows for a more accurate assessment of the actual exposure to a discrete population. On the other hand, the use of concentration response functions based national and multi-city studies to a smaller area requires us to assume that characteristics and demographics of the area under study are similar to the study areas upon which the concentration response function is based. This is likely to be a safe assumption where concentration response functions are based on pooled analysis of multiple studies in multiple areas, as is the case with the C-R functions for mortality. Furthermore, available epidemiological studies that assess exposure at large area scales may be actually underestimating the actual magnitude of the effect of particulate matter because of their inability to estimate individual level exposures. Indeed, in a recent analysis of air pollution in Los Angeles researchers found that the effect of particulate matter on mortality was three times greater using within-city exposure gradients than for intra-city gradients.[36]
- Finally, the presence of a more sensitive or vulnerable population (e.g. people with asthma, elderly) may modify the effect of particulate matter on health. In general, the particular effects on vulnerable populations are not reflected in a population based C-R function. A more sensitive exposed population may thus lead to an underestimation of health effects.

35 Gaudermand, Op Cit; McConnell, Op. Cit.

36 Jerrett M, Burnett RT, Ma R, Pope CA 3rd, Krewski D, Newbold KB, Thurston G, Shi Y, Finkelstein N, Calle EE, Thun MJ. Spatial analysis of air pollution and mortality in Los Angeles. Epidemiology. 2005 Nov;16(6):727-36.

Cancer Risk Estimation Due to Diesel Particulate Matter

Our analysis of health effects also analyzed the impact of exposure to freeway related Diesel PM 10 on the lifetime risk of cancer to the future residents of Macarthur Transit Village (MTV). This approach requires an inhalation cancer risk unit risk factor (URF) and estimates of diesel PM 10 exposure to estimate additional lifetime cancer probability. We used the following parameters in our health effects estimation:

- The EPA risk factor (URF) for diesel exhaust in cancer deaths per person exposed in a lifetime to 1ug/m^3 is 1.7 X 10^{-5}. [37]
- PM10 concentrations from various types of diesel trucks on the parcel of air near transit village were estimated using a simple (mass balance) box model.

  A stable wind speed at the spot was assumed to calculate the ambient concentration of PM10. The concentration was calculated using formula 1.

  $Cp = M_p/V_b$ (formula 1).

  Where, Mp is the mass of pollutants (in grams) emitted and V_b is the volume of the box (cubic meters) into which they are emitted. We assumed the box would be a 300 meter length of Freeway 24 adjacent to the project. For particles, the units of C_p (PM10 concentration) were expressed as micrograms/m^3.

  The mass of pollutants (Mp) emitted by different types of diesel trucks (in mg) were calculated using formula 2, where Ev is emission rate in mg/km, N is number of trucks with in a box and Lb is the length of box.

  The Emission rate (Ev) for different types of diesel trucks were obtained from the risk assessment literature (Biwer 1999).

  $M_p = E_v \times N \times L_b$ (formula 2)

  The volume of the box was calculated using expression 3

  $V_b = h_b \times w_b \times L_b$ (formula 3)

  Where, L_b is the length of the box (300 meter), w_b is the width of the mixed zone (20 meter), and h_b is the height of the mixed zone (1000 meter similar to that used in the Caline4 model to estimate the Carbon monoxide concentration from freeway).

Based on this model, the contributions to PM10 exposure from various diesel trucks near the transit village were found to be in the range of 1.33 and 11.43 ug/m^3. **Thus lifetime excess probability from exposure to PM 10 diesel particulates at this site was calculated to be 198 in a million based on the unit risk factor above.**

Project Area Carbon Monoxide Exposure Using CALINE4

We estimated the worst-case carbon-monoxide exposure to the resident of Macarthur Transit Village from freeway using the CALINE4 dispersion model developed by the California Department of Transportation (Caltrans). [38] The CALINE4 dispersion model predicts air pollutant concentration near roadways based on vehicular traffic emissions, site geometry, and

37 Biwer, B. B., JP. (1999). "Vehicle emission unit risk factors for transportation risk assessments." Risk Analysis 19(6): 1157-1171

38 CALINE4 http://www.dot.ca.gov/hq/env/air/index.htm

meteorology data. It uses a line source model to predict pollutant concentration for receptors located near transportation corridors.

To run CALINE4 model some input parameters (emission factor) were generated from EMFAC model.[39] The estimated one-hour carbon monoxide concentration to the receptor located at 53 meter from the edge of the Highway 24 in the morning rush hours of winter was estimated 9 PPM. This concentration is within acceptable limit of CO concentration in the ambient air for one hour.

39 EMFAC http://www.aqmd.gov/CEQA/handbook/onroad/onroad.html

F. Recommendations for Design Mitigations

Given that regional transit lines in the Bay Area have been co-located with major roadways, implementing Transit Oriented Design will need to address the challenge of population exposures to vehicle related air pollution. Ideally, TOD would utilize sites in the Bay Area that do not pose an elevated risk to human health for future residents; however, where TOD sites are proposed adjacent to major roadways, every feasible effort should be made to mitigate air pollution. Based on a this analysis of air quality health effects on current and future area residents the MBTV project should plan, engineer, design, and build the new development in such a manner that mitigates air quality exposures. Air quality mitigation measures appropriate for this project include:

1. Notifying all potential buyers that the property they are occupying has air quality risks and educate them in the proper use of any installed air filtration.
2. Install a central HVAC (heating, ventilation and air conditioning) system with high efficiency filters for particulates. According to a recent study by Bill Fisk at Lawrence Berkeley Laboratory, design standards for residential building ventilation should be mechanical ventilation with the following parameters:
   - ASHRAE 85% supply air filters;
   - >= 1 air exchanges per hour of fresh outside filtered air ;
   - >= 4 air exchanges / hour recirculation;
   - <= 0.25 air exchanges per hour in unfiltered infiltration.

   Such a system would remove 80% of fine particulate matter mitigating all expected additional roadway effects of particulates and having added health benefits in terms of reducing allergen loads. Air intake systems for HVAC should be located as far away from I-580 and SR-24. The project developer should be required to implement an ongoing maintenance plan for filtration system associated with HVAC.
3. Providing 110 and 220 outlets at project loading docks so that trucks can connect with these outlets to power their auxiliary equipment.
4. Utilizing only electric forklifts and landscaping equipment in the project operations and the operations of tenants.
5. Unbundling the cost of parking from the purchase or rent of residential units to potentially reduce car ownership and usage by residents. .
6. Increasing the frequency of AC Transit services to the project site.
7. Requiring secured bicycle parking for both employees and residents;
8. Restricting employee parking for commercial tenants;
9. Providing on-site child-care (assuming installation of proper HVAC and/or filtration), and/or other services that might reduce typical vehicle trips associated with commuter behavior, which would otherwise rely purely on public transportation.
10. Increasing parking fees for BART parking with no fee for carpool vehicles.

MacArthur Bart Transit Village
Health Impact Assessment

Chapter 9
Environmental Noise

A. Summary

The development of the MacArthur BART Transit Village project will result in exposure to future residents of high levels of community noise. The project site is located next to the BART station and highways 24 and 980, has background noise levels estimated to be over Ldn 70 dBA. Residential uses at these levels are considered normally unacceptable based upon the Oakland General Plan, and require further noise analyses and highly effective noise mitigation. The USEPA estimates that these unmitigated noise levels will result in community reactions ranging from threats of legal action to vigorous protest and may result in elevated blood pressure, circulatory disease, ulcer, colitis, and sleep deprivation. Implementation and evaluation of a comprehensive set of indoor and outdoor noise mitigations should be required as a condition of development.

Health Impacts

1. Regardless of the feasibility and effectiveness of indoor noise mitigations, some project residents are likely to be exposed to environmental noise to an extent that can create annoyance and adversely effect school and work performance. We estimate the annoyance levels to range from 43% of the exposed population living near BART and the freeway to 5% of the exposed population who live in the relatively quieter inner courtyards.
2. Without mitigations, we estimate 17% of residents in dwellings adjacent to the railway line and highway will experience sleep disturbance; in the quieter inner courtyards we estimate sleep disturbances will affect 6-13% of residents.
3. Existing project area outdoor noise levels proximate to BART and the freeway of greater than 70 dB will prevent normal voice level communication at unprotected exterior locations.

Recommendations for Design and Mitigation

1. Construction standards required to meet Title 24 noise insulation requirements requiring the use of noise-insulating windows, acoustical exterior doors and walls would also be appropriate mitigations.
2. Design units as far away from BART and the freeway as possible, and implement a design that has interior courtyards and patios that open into acoustically protected and shielded areas.
3. Reduce the speeds of the traffic on the highway-24 and project's residential streets through traffic calming measures.
4. Notify all potential buyers that the property they are occupying has significant noise risks.
5. Integrate below market and market rate units in the same buildings to prevent environmental justice impacts.
6. While BART accounts for only small increases in noise exposures, undertaking necessary maintenance of BART tracks would further minimize train-associated noise.
7. Explore possible BART scheduling changes to minimize train passes during typical nighttime sleep hours.

B. Background: Noise and Health Impacts

Factors contributing to urban noise, noise-related health effects and a list of potential effect modifiers and mitigations are shown in Table 1. Long term exposure to moderate levels of environmental noise can aversely affect sleep, school and work performance, and cardiovascular disease.[1] The health impacts of environmental noise depend on the intensity of noise, on the duration of exposure, and the context of exposure. For example, the World Health Organization noise exposure thresholds are much lower for levels inside (30 dB) and outside (45 dB) homes than for commercial (70 dB) and other public areas. Noise affects sleep both by waking people up and reducing the quality of sleep. A 10 dB change is generally perceived by the human ear as a doubling of noise. According to the WHO, reductions of noise by 6-14 dBA result in subjective and objective improvements in sleep. Environmental noise is a risk factor for cardiovascular disease. Chronic road noise can affect cognitive performance of children including difficulty keeping attention, concentrating and remembering, poorer reading ability, and poorer discrimination between sounds.[2] The combination of noise and poor quality housing can have additive effects. In one study, a combination of these factors was associated with higher stress and stress hormone levels.[3] A comprehensive synthesis of the noise heath effects and control is contained in the World Health Organization's Guidelines for Community Noise.[4]

Table 1. Factors contributing to urban noise, noise-related health effects, and noise mitigation strategies

Determinants of Urban Noise	Health Effects	Effect Modifying Factors	Mitigations
Vehicle volume Vehicle type Vehicle speed Roadway Conditions Mechanical Equipment	Sleep Stress Cognitive Function Hypertension Annoyance Speech Intelligibility	Noise Intensity Noise Duration Perceived risk associated with noise	Building Orientation Insulated windows, doors, and walls Ventilation System Placement Buffers Traffic Calming

C. Established Standards and Health Objectives

The Healthy People 2010 Objectives[5] states:

> *Among the five senses, people depend on vision and hearing to provide the primary cues for conducting the basic activities of daily life. At the most basic level, vision and hearing permit people to navigate and to stay oriented within their environment. These senses provide the portals for language, whether spoken, signed, or read. They are critical to most work and recreation and allow people to interact more fully. For these reasons, vision and hearing are*

[1] Dora C and Phillips M. Transport, Environment, and Health reviews of evidence for relationships between transport and health World Health Organization 1999.
[2] Noise and Health: Making the Link London Health Commission 2003 http://www.phel.gov.uk/hiadocs/noiseandhealth.pdf
[3] Evans G, Marcynyszyn LA. Environmental Justice, Cumulative Environmental Risk, and Health among Low- and Middle-Income Children in Upstate New York. American Journal of Public Health 2004;94: 1942-1944.
[4] Available at: http://www.who.int/docstore/peh/noise/guidelines2.html.
[5] U.S. Department of Health and Human Services. Healthy People 2010: Understanding and Improving Health. 2nd ed. Washington, DC: U.S. Government Printing Office, November 2000.

defining elements of the quality of life… From the public health perspective, the prevention of either the initial impairment or additional impairment from these environmentally orienting and socially connecting senses requires significant resources.

The Objectives further state that approximately 10 million people in the United States have permanent, irreversible hearing loss from noise or trauma, and that approximately 30 million people are exposed to injurious levels of noise each day. Noise-induced hearing loss (NIHL) is the not only related to occupational environments, but also can be the result of continuing exposure to high levels of sound in recreational settings, and as the consequence of years of exposure causing gradual damage. Moreover, the NIHL can be exacerbated by individual vulnerability to noise. Noise levels, proximity to harmful sound sources, and time of exposure are also factors in NIHL. The Objectives note that many of the causes of NIHL can be controlled by prevention. Moreover, prevention of noise-induced hearing loss is necessary for people, not only at work, but off work also.

One of the Objectives' goals is: Improve the visual and hearing health of the Nation through prevention, early detection, treatment, and rehabilitation. Included in this goal are: 28-17, Reduce noise-induced hearing loss in children and adolescents aged 17 years and under, and 28-18, Reduce adult hearing loss in the noise-exposed public.

The WHO standards for community noise are outlined in Table 2. Of particular relevance to residential environments are the standards for outdoor and indoor dwellings of 50-55 and 30-35 dB, respectively. The US federal standards are listed in Table 3.

The Oakland General Plan Noise Element, adopted in 2005, provides guidelines for assessing compatibility between various land uses and ambient levels of noise (Table 4). With regards to residential uses, Oakland General Plan Noise Element's Land Use Compatibility Chart considers residential uses "normally acceptable" if the Ldn is less than 60 dB. Residential uses are conditionally acceptable if the Ldn is between 60 and 70 dB but development requires noise analysis and mitigation. Residential uses are normally unacceptable at levels over 70dB and the General Plan proscribes residential uses as "clearly unacceptable" where noise levels are greater than 75 dB Ldn, stating that such "development should not be undertaken".

Title 24 of the California Code of Regulations provides for noise insulation standards for residential buildings. The code requires an acoustical study whenever a residential building is proposed near an exiting or planned freeway, major roadway, rail line, or industrial noise source and where those noise sources cumulatively produce an outdoor Ldn of 60 dB or higher. Residences must be designed to limit interior noise to no more than a Ldn of 45 dB.

Table 2. WHO community noise standards and main health effects of concern

Environment	Critical health effect	Sound level dB (A)*	Time hours
Outdoor dwellings	Annoyance	50-55	16
Indoor dwellings	Speech intelligibility	35	16
Bedrooms	Sleep disturbance	30	8
School classrooms	Disturbance of communication	35	During class
Industrial, commercial and traffic areas	Hearing impairment	70	24
Music through earphones	Hearing impairment	85	1
Ceremonies and entertainment	Hearing impairment	100	4

Table 3. Federal regulation

Noise Source	Federal Regulation
Aircraft and Airports	Standard range from 65 dbA for residential areas to over 85 dbA for agricultural and transportation uses**. The Airport Improvement Act of 1982** (P.L. 97-248) established the Airport Improvement Program to provide federal assistance for airport construction and to award grant for noise mitigation.
Interstate Motor Carriers	**The Noise Control Act** required EPA to develop noise standards and it authorized the **Federal Highway Administration** to enforce them. The standards for all commercial vehicles over 10,000 pounds for highway travel, range from 81 to 93 dbA.
Interstate railroads	**The Noise Control Act** required EPA to develop noise standards and it authorized the **Federal Railroad Administration** to enforce them. At speeds of 45 miles per hours, the noise level from railway cars must not exceed 88 dbA and at speeds greater than 45 mph must not suppress noise level of 93 dbA.
Workplace Activities	**The Occupational Safety and Health Act of 1970** (P.L.91-596) required the **Occupational Safety and Health Administration** to develop and enforce the standards. Exposure of constant noise level of 90 dbA must not exceed 8 hours. The highest level of workers can constantly be exposed is 115 dbA and must not be exposed longer than 15 minutes within an 8-hour period.
Other Regulated Sources (transportation, construction, and electrical equipment and motors or engines, etc)	**The Noise Control Act** required EPA to develop and enforce the noise standards. Noise levels for motorcycles after 1982 range from 80-86 dbA. Mopeds are limited to 70 dbA and trucks over 10,000 pounds range from 80-83 dbA. **The Federal-Aid Highway Act of 1970** (P.L. 91-605) required the **Federal Highway Administration** to establish standards for highway noise levels. The law prohibits the approval of funding for highway projects if it dos not meet the standard of 52-75 dbA noise levels depending on land use. **The Housing and Urban Development Act of 1968** (P.L. 90-448), developed the noise standards for federal housing projects located in noise exposed areas.

Table 4. Oakland General Plan Compatibility Chart for Residential Uses and Community Noise

Exposure (Ldn, dB)	Guidance	Interpretation
< 60	Normally Acceptable.	Development may occur without an analysis of potential noise impacts to the proposed development.
60 - 70	Conditionally Acceptable.	Development should be undertaken only after an analysis of noise-reduction requirements is conducted, and if necessary noise-mitigating features are included in the design
70-75	Normally Unacceptable	Development should be discouraged; it may be undertaken only if a detailed analysis of the noise reduction requirements is conducted, and if highly effective noise insulation, mitigation, or abatement features are included in the design.
> 75	Clearly Unacceptable	Development should not be undertaken.

D. Existing Noise Conditions at the Project

As a transit village, the primary concern for noise exposure is proximity of new residents to noise from the BART train line and station. Associated noise from living next to the BART station potentially include, noise associated with train braking, acceleration, and wheel-track noise, as well as noise associated with train announcements and horns, and associated vehicular traffic for commuter drop-offs, parking and public transport stops (buses, shuttles, etc.). The site is also adjacent to highways 24 and 980, which have main lanes that straddle the BART station, and have numerous nearby on-off ramps.

For the noise assessment of the proposed project we measured existing noise levels at the site, and modeled potential future levels. Noise level was measured at various sites near project area including in the middle of the parking lot, at the front (closer to the BART and highway 24) and back (further away from the highway 24 and BART) edge of the parking lot. Near BART, we measured a 66.6 dBA LEQ over 20 minutes (2:20 pm), with minimum and maximum levels of 59.6 and 74.6 dBA, respectively. In the middle of the BART parking lot we measured a 62.1 dBA LEQ over 15 minutes (2:40 pm), with minimum and maximum levels of 59.1 and 71.4 dBA, respectively. As these measurements were taken mid-day it is unclear how representative they are of 24-hour Ldn levels, upon which there exists Oakland General Plan standards. If these noise levels are representative, then according to the Oakland General Plan, these noise levels are “conditionally acceptable”, requiring more thorough noise analysis, and potentially noise-reduction and mitigation in the design if development were to occur.

Although 24-hour data were not collected at the site due to logistical constraints, instead, we estimated 24-hour noise levels at the site based on BART, freeway, and surrounding local traffic using a model (Soundplan 6.4). Well-established standards were used in the modeling of the noise, including the Federal Highway Administration’s standard for vehicular traffic noise, and the Schall 03 standard for

railway noise. We first calibrated the rail model to typical noise levels measured in the field for a BART train entering and leaving a station. This calibration was done at the West Oakland BART station, which was free of the confounding effects of the nearby freeways 24 and 980. Two measurements were taken 50m away from the West Oakland station, and perpendicular to the line of travel, for the noise of approaching and leaving cars. These measurements were used to calibrate the noise levels for a single train, and then extrapolated to the situation for the MacArthur BART station based on its scheduled 156 (5:42a.m. – 9:53p.m.), 10 (10:23 p.m. – 12:11a.m.) daytime and nighttime trains, respectively. For the traffic model we used Caltrans traffic data for highway 24 (Table 5).

The current site, with existing buildings and major noise sources are shown in Figure 1. The noise model results for these existing conditions are shown in Figure 2. Estimated noise levels of the current project site are between 70 and 75+ dBA Ldn, with increasing noise close to BART and the highway; the averaged noise level of the parking lot is approximately 70 dBA. Based on these modeled noise levels and standards set forth by the Oakland General Plan, these noise estimates are rated as "normally unacceptable", and require further noise analyses and highly effective noise mitigation if development were to occur.

Table 5. Caltrans Average Annual Daily Traffic (AADT) data for highway 24.

Route	Vehicle AADT Total	Light Truck AADT Total	Heavy Truck AADT Total
24	144000	2196	1374

SPEED (km/hr)	Daytime cars	Nighttime cars	Daytime Light Trucks	Nighttime Light Trucks	Daytime Heavy Trucks	Nighttime Heavy Trucks
80	1997	444	30	7	13	17

E. Impact Analyis

The proposed building design of the project is comprised of outdoor/lower ground parking structure, courtyard, trees, and residential /commercial buildings with 5-storey heights. A proposed building layout is shown in Figure 3. The noise levels for this proposed situation are shown in Figure 4. Estimated future noise levels of the project area vary between approximately 53-77 dBA. Building locations proximate to highway 24 and BART resulted in estimated noise levels of 77 dBA or above. Interestingly, the model results clearly show the efficacy of the building heights in shielding the inner courtyards from BART and highway noise. With this design, noise levels are reduced by 5-17 dBA within the courtyards. Perimeter areas, particularly those close to BART and the freeway, may need noise mitigation to bring indoor levels to healthy standards.

Finally, we considered the incremental noise contribution to the proposed site from being near the BART station. Figure 5 shows the estimated noise levels with the BART line removed from the model. Compared to Figure 4, which has BART included, it is clear that due to the building design that includes inner courtyards, the incremental gain in noise living at the transit village (ie., near BART) is small (<4 dBA).

Due to the addition of new residents and retail space, increased local traffic can be expected at the new site. Based on the California Air Resources Board's URBEMIS model of vehicular emissions associated with land development projects[6], it is estimated that there will be approximately 3000 additional trips associated with the project, which will increase noise to some extent, though probably not as much as noise levels coming from the highway. The number of trips would be substantially higher if the same type of development was not located at a major transit hub. Nevertheless, since these additional trips were not included in the noise models, the resulting noise estimates may be viewed as a low projection of future noise levels.

A proposal for a childcare center at the site raises a concern whether noise levels may adversely affect children's learning. The observed noise shielding within the courtyards suggests that if a childcare center is to located within the project area, it should be open up to, and only have play facilities in these mitigated central areas.

Effects on annoyance

The USEPA estimates that unmitigated noise levels will result in community reactions ranging from threats of legal action to vigorous protest.[7] The level of annoyance is directly related to several health effects associated with noise induced stress response, including: elevated blood pressure, circulatory disease, ulcer, and colitis. Regardless of the ultimate feasibility and effectiveness of indoor noise mitigations, some project residents are likely to be exposed to environmental noise to an extent that can aversely affect subjective well-being and school and work performance. Based on a multi-country study of annoyance levels associated with measured outdoor road traffic noise levels[8], the following relationship can be used to estimate the percentage of highly annoyed (%HA):

$$\%HA = 9.994\times10^{-4}\left(L_{dn}-42\right)^3 - 1.523\times10^{-2}\left(L_{dn}-42\right)^2 + 0.538\left(L_{dn}-42\right)$$

Without noise mitigations, in residential locations near to BART and the freeway (77 dBA), we estimate that 43% of the exposed population will be highly annoyed by noise. However, in the relatively quieter inner courtyards (55 dBA), we estimate that only 5% of the exposed population

[6] http://www.arb.ca.gov/planning/urbemis/urbemis2002/urbemis2002.htm

[7] EPA, Noise Effects Handbook, 1979, p. 8-1, http://www.nonoise.org/library/handbook/handbook.htm

[8] Miedema H, Oudshoorn CGM. Annoyance from transportation noise: Relationships with exposure metrics DNL and DENL and their confidence intervals. Environ Health Perspect. 2001;109(4):409-416.

will be annoyed. Further mitigations including acoustical insulation and use of HVAC instead of open windows may further reduce awakenings.

Effects on sleep disturbance

Based on measurements at West Oakland BART, the average train coming and leaving the station results in noise SEL of approximately 77 dBA. With windows open, the exterior to interior building attenuation may be about 10 dBA, resulting in an interior SEL noise level of approximately 67 dBA. The U.S. Federal Interagency Committee on Noise has found that the relationship between sleep disturbance and noise is as follows[9]:

$$\% \text{ Awakening} = (7.079 \times 10^{-6}) \times \text{SEL}^{3.496}$$

Without noise mitigations, we estimated that approximately 17% of the exposed population would be awakened. However, if windows open to quieter interior courtyards (5-17 dB reduction), we estimate fewer awakenings (6-13% of the exposed population). Further mitigations including acoustical insulation and use of HVAC instead of open windows may further reduce awakenings.

Effects on speech

Existing project area outdoor noise levels of greater than 70 dB will prevent normal voice level communication at unprotected exterior locations.[10]

Environmental justice impacts

Members of low income households may be more sensitive to the health and developmental impacts of high environmental noise levels. Should the project include affordable housing, careful consideration of locating this housing within the project site to ensure against potential environmental injustices. If such residences are separate from market rate housing and located closer to BART and the freeway, for instance, there could be adverse environmental justice impacts.

[9] http://www.fican.org/pdf/nai-8-92.pdf
[10] ibid., p. 4-4, http://www.nonoise.org/library/handbook/handbook.htm

Figure 1. Current project site, with major buildings and noise features shown in colored symbols.

Noise Assessment of MacArthur Bart

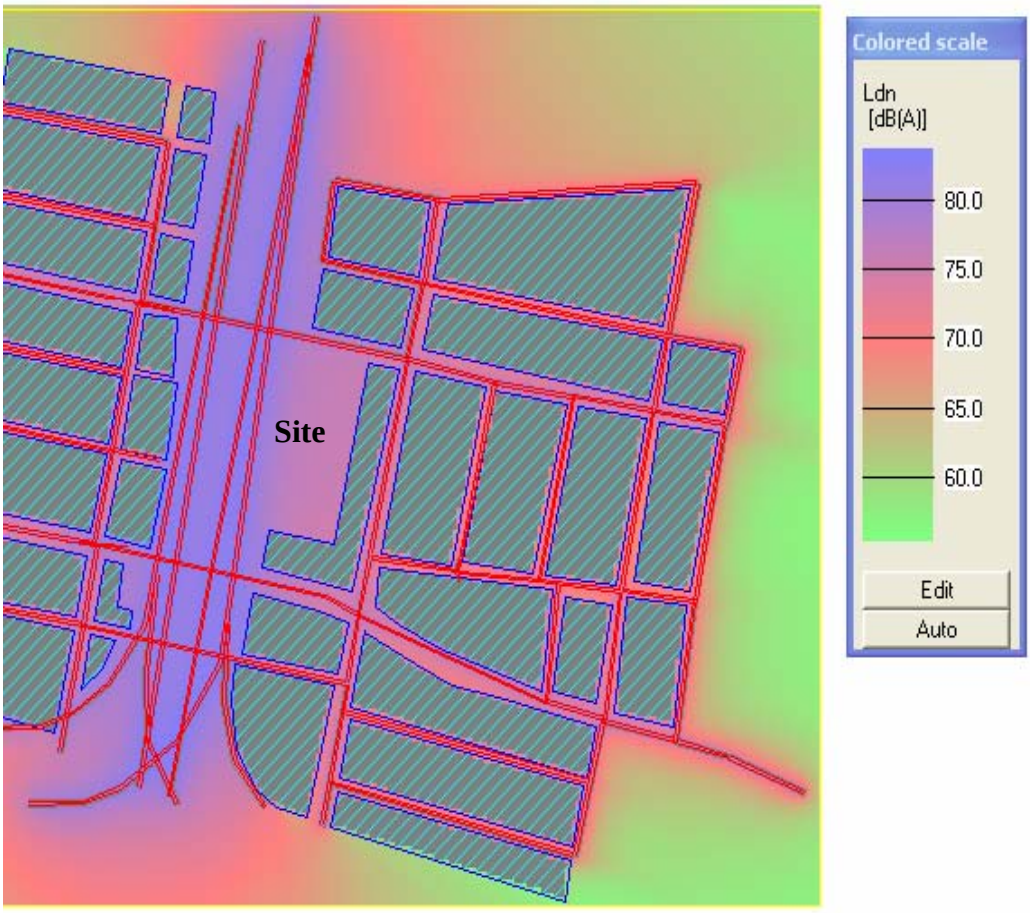


Figure 3. Building layout for proposed project, showing design of 5-storey building heights with inner courtyards

Figure 4. Modeled noise levels for proposed future development

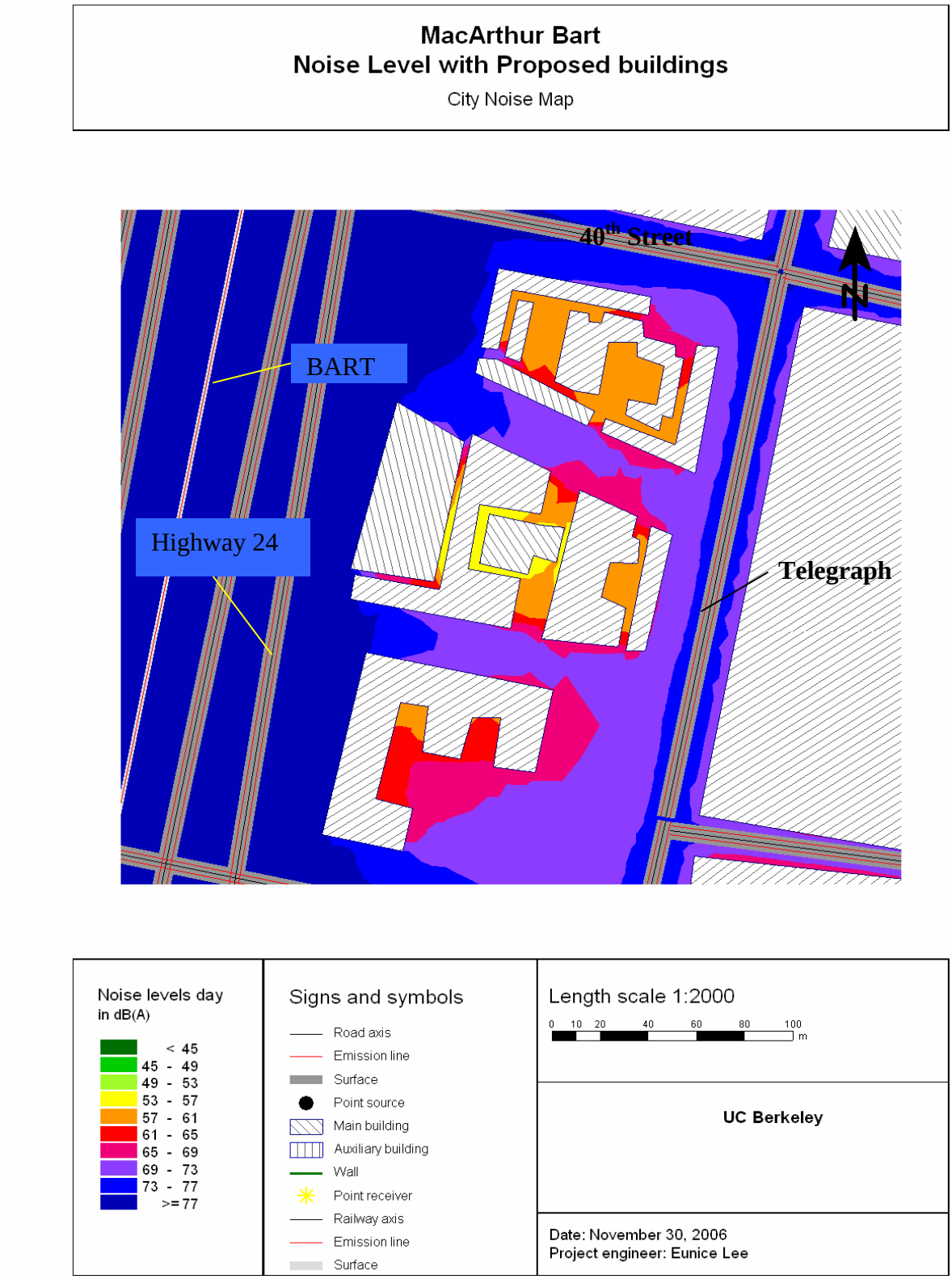
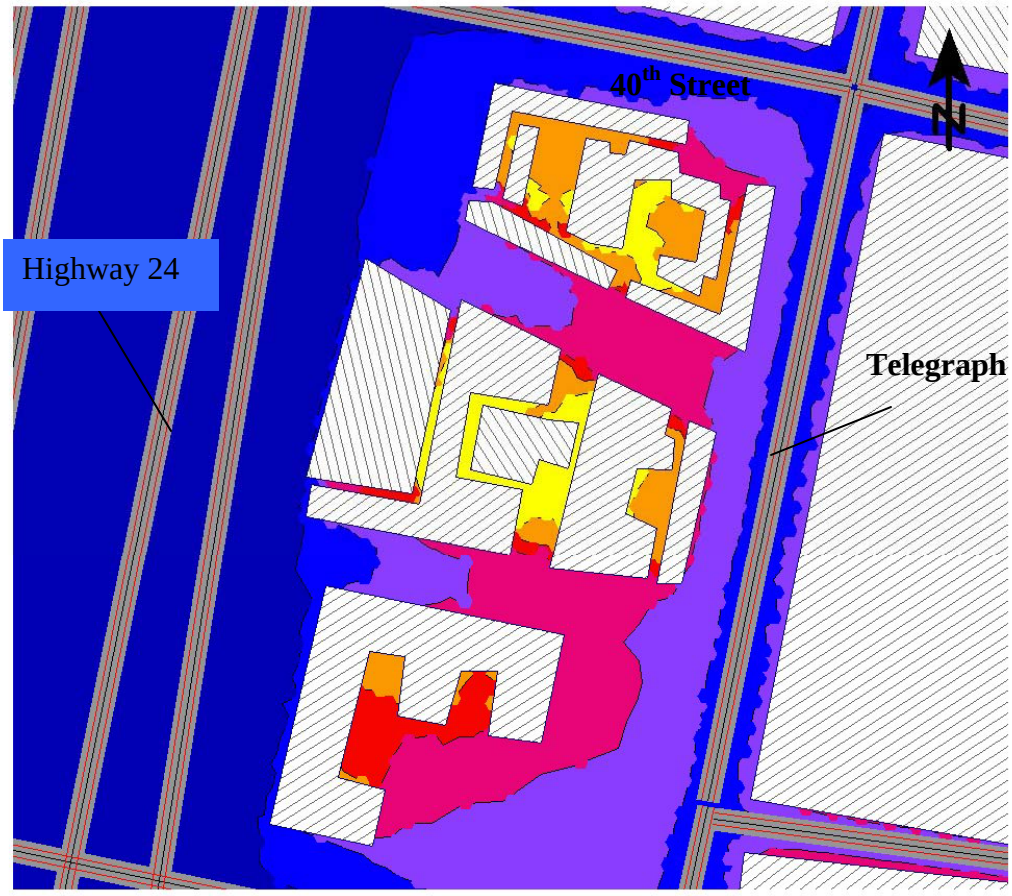


Figure 4. Modeled noise levels for proposed future development (without BART)

MacArthur Bart
Situation without BART

City Noise Map



Noise levels day in dB(A)

< 45
45 - 49
49 - 53
53 - 57
57 - 61
61 - 65
65 - 69
69 - 73
73 - 77
>= 77

Signs and symbols

- Road axis
- Emission line
- Surface
- Point source
- Main building
- Auxiliary building
- Wall
- Point receiver
- Noise calculation area

Length scale 1:2000

0 10 20 40 60 80 100 m

UC Berkeley

Graphics box for company logo: Double click to select

Date: December 1, 2006
Project engineer: Eunice Lee

F. Recommendations for Design and Mitigation

California law requires the construction of dwellings include noise mitigation; however, these standards only affect indoor noise exposure. Other measures that might affect ambient noise include (1) Re-engineering, reducing or altering timing of automobile and truck traffic on routes; (2) Requiring noise controls on indoor and outdoor commercial equipment; (3) Re-orienting buildings in ways that create sound buffers for outdoor spaces; (4) Reductions in vehicle speeds. Because the noise at the site largely comes from the BART and freeway, a sound barrier wall may be considered, although they may not be aesthetically pleasing. In our assessment we found large reductions in outdoor noise levels through the orientation of buildings to create inner courtyards. The following are recommended actions to reduce project resident exposure to noise.

1. Construction standards required to meet Title 24 noise insulation requirements requiring the use of noise-insulating windows, acoustical exterior doors and walls would also be appropriate mitigations.
2. Design units as far away from BART and the freeway as possible, and implement a design that has interior courtyards and patios that open into acoustically protected and shielded areas.
3. Reduce the speeds of the traffic on the highway-24 and project's residential streets through traffic calming measures.
4. Notify all potential buyers that the property they are occupying has significant noise risks.
5. Integrate below market and market rate units in the same buildings to prevent environmental justice impacts.
6. While BART accounts for only small increases in noise exposures, undertaking necessary maintenance of BART tracks would further minimize train-associated noise.
7. Explore possible BART scheduling changes to minimize train passes during typical nighttime sleep hours.

Mac Arthur BART Transit Village
Health Impact Assessment

Chapter 10
Community Violence

A. Summary

According to the US Department of Justice, in 2004, the property crime rate in Oakland was about 5,500 per 100,000 residents and the violent crime rate was 1277 per 100,000 residents. Oakland thus ranks 3rd in violent crime rate among California cities with populations of 100,000 and above. This chapter examines the potential for the Mac Arthur BART to effect community violence and provides recommendations to incorporate violence prevention into development planning. As a mixed-use development, activity and natural surveillance generated through retail and residential activity can potentially reduce both community violence and fear of crime in the area. Assuming the development further incorporates design strategies into the built environment that discourage crime, and that it is accompanied by traditional approaches to crime prevention as well as strategies for creating a sense of community, the project should lead both to a reduction in crime rates and a reduction in the fear of crime in the area.

Project Health Impacts

1. With the inclusion of physical design strategies that discourage crime, as well as strategies to support a sense of place and community, the project is likely reduce in crime rates and the fear of crime in the area. (Potential Beneficial Effect)

Recommendations for Design and Mitigations

1. Providing adequate and pedestrian scaled lighting for all public areas, residential streets, and adjacent public streets.
2. Creating clear sight lines to maximize visibility, especially for high risk areas such as parking garages, stairwells and underpasses.
3. Creating public or common spaces that generate/reinforce a lot of pedestrian level activity and/or encourage a sense of community. For example, community urban gardens provide a setting for social activity and users of the gardens contribute to surveillance.[1]
4. Using durable, vandal resistant materials so maintenance is minimal.

1 Taylor R.B. and A.V. Harrell “Physical Environment and Crime” NCJ 157311, May 1996.

http://www.ncjrs.gov/pdffiles/physenv.pdf. Accessed December 12, 2006.

B. Background: Crime, Community Violence, and Health

The World Health Organization defines violence as: *the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community that either results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development or deprivation*.[2] Violence is rarely caused by a single risk factor but rather by the presence of multiple risk factors and absence of protective (or resiliency) factors.

Risk and Resiliency Factors for Community Violence

Risk factors are traits or characteristics that increase the relative risk of an individual or community being affected by or perpetrating violence. Risk factors for community violence include: poverty and economic disparity, illiteracy and school failure, alcohol and other drugs, firearms, negative family dynamics, mental illness, incarceration/reentry, community deterioration, discrimination and oppression, power and control, media violence, experiencing and witnessing violence, and, gender socialization.

Resiliency factors are traits or characteristics that protect an individual or community from violence. Resiliency factors from violence include: economic capital, meaningful opportunities for participation, positive attachments and relationships, good physical and mental health, social capital, built environment, services and institutions, emotional and cognitive competence, artistic and creative opportunities, ethnic, racial, and inter-group relations, and media/marketing.[3]

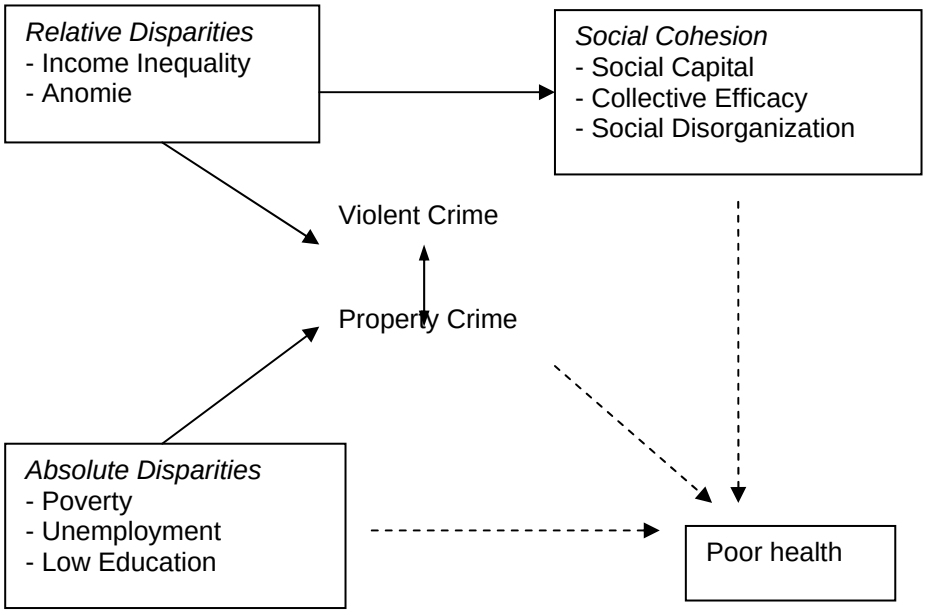


Figure 1
Source: Kawachia I., B.P. Kennedy, R.G. Wilkinson "Crime: social disorganization and relative deprivation" Social Science & Medicine 48 (1999) 719-731.

2 WHO Global Consultation on Violence and Health. Violence: a public health priority. Geneva, World Health Organization, 1996 (document WHO/EHA/SPI.POA.2).

3 A Lifetime Commitment to Violence Prevention: The Alameda County Blueprint. Prevention Institute. July, 2005. Accessed on: July 6, 2006: http://www.preventioninstitute.org/alameda.html

Economic disparities are a root cause of crime and violence

Criminological research suggests that crime is most prevalent in societies that permit large disparities in the material standards of living of its citizens.[4] It has also been found that crime is associated with low social capital.[5] (See Figure 1) One reason why greater income equality is related to lower crime rates (and better health outcomes in general) seems to be that it reduces social divisions, thereby improving social cohesion; visibly high inequalities in material assets tend to produce resentment that, in turn, disrupts the social fabric.[6]

Health Impacts of Community Violence

Violent crime results in direct and indirect adverse health outcomes for a community. Witnessing and experiencing community violence causes longer term behavioral and emotional problems in youth.[7] [8] Whether or not crime results in injury, it may indirectly impact health by causing fear, felling unsafe, stress, and poor mental health.[9] The fear of crime can limit mobility or physical activity in a community, leading to poor health outcomes and quality of life. Community violence also impacts the perceived safety of a neighborhood, inhibiting social interactions and adversely impacting on social cohesion.[10] In addition to these physical and psychological impacts, theft and burglary can affect victims financially as well.

Violent crime (i.e., homicide, aggravated assault, robbery involving a weapon, and forcible rape) disproportionately affects vulnerable groups in society, including young people and those who are economically deprived.[11] Nationally, males, blacks, and persons age 24 or younger continued to be victimized at higher rates than females, whites, and persons age 25 or older in 2005.[12] Among 10 to 24 year olds, homicide is the leading cause of death for African Americans, the second leading cause of death for Hispanics, and the third leading cause of death for American Indians, Alaska Natives, and Asian/Pacific Islanders (CDC 2006).[13] When violent death occurs in the younger population, many years of potential human life are lost. Additionally, in terms of medical costs, a 1993 report estimated the average cost of treating a fatal gunshot wound to be about $15,000 and the medical cost of a non-fatal firearm injury is nearly $38,000.[14] (Costs today are likely greater due to inflation.)

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4 Kawachia I., B.P. Kennedy, R.G. Wilkinson “Crime: social disorganization and relative deprivation” Social Science & Medicine 48 (1999) 719-731.

5 Kawachia I., B.P. Kennedy, R.G. Wilkinson “Crime: social disorganization and relative deprivation” Social Science & Medicine 48 (1999) 719-731.

6 Ibid

7 Perez-Smith AM, Albus KE, Weist MD. Exposure to violence and neighborhood affiliation among inner-city youth. J Clin Child Psychol. 2001;30(4):464-72.

8 Ozer EJ, McDonald KL. Exposure to violence and mental health among Chinese American urban adolescents. J Adolesc Health. 2006;39(1):73-9.

9 Guite H, et al. The impact of the physical and urban environment on mental well-being. Public Health (2006), doi:10.1016/j.puhe.2006.10.005

10 Fullilove MT, Heon V, Jimenez W, Parsons C, Green LL, Fullilove RE. Injury and anomie: effects of violence on an inner-city community. Am J Public Health. 1998;88(6):924-7.

11 Oakland Health Profile 2004, Alameda County Public Health Department. Page 18.

12 US Dept of Justice Bureau of Justice Statistics. http://www.ojp.usdoj.gov/bjs/abstract/cv05.htm. Accessed November 2006.

13 National Center for Injury Control and Prevention, Center for Disease Control. 2006. http://www.cdc.gov/ncipc/factsheets/yvfacts.htm Accessed November 2006.

14 Miller T.R., M.A. Cohen, and S.B. Rossman, “Victim costs of violent crime and resulting injuries,” Health Affairs (Millwood). Winter;12(4):186-97.

Environmental Factors Can Prevent Crime

Violence prevention is distinct from violence containment or suppression. As stated in the *Alameda County Blueprint for Violence Prevention*, violence prevention is "a comprehensive and multifaceted effort to address the complex and multiple risk factors associated with violence including, but not limited to, poverty, unemployment, discrimination, substance abuse, educational failure, fragmented families, domestic abuse, internalized shame, and felt powerlessness. Violence prevention efforts contribute to empowerment, educational and economic progress, and improved life management skills while fostering healthy communities in which people can grow in dignity and safety. Finally, efforts realign institutions to be more inclusive and receptive in responding to community needs. Violence prevention efforts targeted toward young children work to prevent experiencing or witnessing violence when young as well as to reduce the risk of future perpetration or victimization of violence."

While crime may stem largely from economic inequities in society, the rates of crime and fear of crime are also associated with features of the physical environment within neighborhoods.[15] Features range from housing configurations that facilitate "eyes on the street" to abandoned buildings that suggest vulnerability to crime.

The *Alameda County Blueprint for Violence Prevention* also identifies land use and zoning as potential factors that can have a positive impact on violence prevention. For example, "Land-use patterns that encourage neighborhood interaction and a sense of community have been shown not only to reduce crime, but also create a sense of community safety and security.'[16] Further, good community design can contribute to a general increase in community networks and trust by creating a "neighborhood feel" through which people are encouraged to interact with each other in a safe environment. Residents of buildings with green space had a stronger sense of community and reported less violence in dealing with domestic disputes.[17]"

Built environment elements that promote violence prevention include, "housing, transportation, product availability, and aesthetic/ambiance. Poor and inadequate housing is associated with increased risk for violence[18] and psychological stress.[19] Alternatively, the availability of safe and affordable housing can reduce stresses associated with living in unsafe, noisy, or overcrowded conditions or not being able to secure housing. Decisions about housing and its design can promote social interaction, community stability, and build a solid tax base to fund needed services, including violence prevention. Reliable and affordable transportation can ensure that people have access to jobs and services. Zoning can also influence the availability of beneficial products such as books and school supplies, sports equipment, arts and crafts supplies, and other recreational items as well as limit availability or lack, of potentially harmful products such as tobacco, firearms, alcohol, and other drugs can also have an impact on violence within a community. Low-income communities and communities of color have greater access to alcohol and tobacco products due to the high prevalence of local liquor stores."

Crime Prevention Through Environmental Design (CPTED): An Available Tool Box for Violence Prevention

Crime Prevention Through Environmental Design (CPTED) is a multi-disciplinary approach developed in the 1970's to deter criminal behavior and improve public safety. CPTED strategies rely upon the ability to

15 Dannenberg, Andrew L., RJ Jackson, H. Frumkin, R.A. Schieber, M. Pratt, C. Kochtitzky, H.H. Tilson, "The Impact of Community Design and Land-Use Choices on Public Health: A Scientific Research Agenda," Am J Public Health 2003 93: 1500-1508.

16 Calhoun J. National Crime Prevention Council. New Partners for Smart Growth: Building Safe, healthy, and Livable Communities. 2nd annual conference flyer. 2002.

17 Jackson RJ, Kochtitzky C. Creating a Healthy Environment: The Impact of the Build Environment on Public Health. Sprawl Watch Clearinghouse Monograph Series. Washington D.C.. p. 1-19.

18 PolicyLink. Reducing health disparities through a focus on communities. A PolicyLink Report. Oakland, CA: 2002.

19 Geronimus A. Understanding and eliminating racial inequalities in women's health in the United States: the role of the weathering conceptual framework. JAMWA. 2001;56(4):133-136

influence offender decisions that precede criminal acts.[20] The criminology literature suggests the following principles with respect to modifying the environment to prevent and control violence[21]:

- Physical design and immediate situational factors of a place may encourage or inhibit violence.
- Physical design and immediate situational factors can create a sense of territoriality in the legitimate users of a space and induce them to act on that attachment in order to protect against violence and other illegitimate use.
- Modifications can be made to the environment to reduce opportunities for violence by making the commission of the violent event appear more risky, more difficult, less rewarding, and less excusable to the potential offender.
- The effectiveness of specific environmental modifications to reduce violence depends on the type of violence and the particular setting (place, context) in which it occurs.
- Though environmental modifications alone will not prevent all violence in all settings, they offer a promising prevention and control strategy.

In essence, CPTED is based on the idea that the proper design and effective use of the built environment can lead to a reduction in the incidence and fear of crime and an improvement in the quality of life. Implementation of CPTED recommendations may have consequences on the health of a community beyond crime prevention, such as improvements in physical activity, mental health, and social capital.[22] Reductions in crime have been documented in communities that have followed CPTED recommendations.[23] The development and redevelopment of sites provides an opportunity to incorporate community safety principles into both the design of development and operational aspects. [24]

CPTED strategies include natural surveillance, natural access control, and territorial reinforcement, maintenance, and activity support.[25] [26] Natural surveillance limits the opportunity for crime by placing physical features, activities, and people in such a way to maximize visibility of a property or building. Natural access control creates a perception of risk in selecting crime targets by placing entrances and exits, fencing, lighting, and landscape to limit access or control flow. Territorial reinforcement employs such design elements as sidewalks, landscaping, and porches to help distinguish between public and private areas and helps users exhibit signs of "ownership" that send "hands off" messages to would-be offenders. The care and maintenance of property allows for the continued use of a space for its intended purpose; deterioration and blight indicates less control by the intended users of a site and indicate a greater tolerance of disorder. Activity support increases the use of a built environment for safe activities with the intent of increasing the risk of detection of criminal and undesirable activities.

20 http://en.wikipedia.org/wiki/Crime_prevention_through_environmental_design. Accessed November 2006.

21 Mair, Julie Samia and Michael Mair, "Violence Prevention and Control Through Environmental Modifications," Annual Review of Public Health 2003 24, 209-225.

22 Dannenberg, Andrew L., RJ Jackson, H. Frumkin, R.A. Schieber, M. Pratt, C. Kochtitzky, H.H. Tilson, "The Impact of Community Design and Land-Use Choices on Public Health: A Scientific Research Agenda," Am J Public Health 2003 93: 1500-1508.

23 Ibid

24 Community Safety Design Guide. Department of Infrastructure, Planning, and Environment, Northern Territory Government. http://www.ipe.nt.gov.au/whatwedo/planning/planningact/pdf/communitydesign20060214.pdf Accessed November 2006.

25 http://en.wikipedia.org/wiki/Crime_prevention_through_environmental_design Accessed November 2006.

26 Crime Prevention Through Environmental Design. General Guidelines for Designing Safer Communities. City of Virgina Beach. January 20, 2000. http://humanics-es.com/cpted.pdf. Accessed November 2006.

Published evaluations of CPTED indicate that it is successful in reducing robberies.[27] [28] In a systematic review of studies on the effectiveness of CPTED in reducing workplace robberies and related injuries, compared with control groups, robberies decreased 30% to 84% in places with multiple-component CPTED programs. Assault injuries to employees generally decreased, but findings on decreases in homicides were inconclusive. While study authors found weaknesses in methodology and design of some studies, they concluded that CPTED still appears to be an effective strategy in reducing robbery.

C. Established Standards and Health Objectives

The US Department of Health and Human Services (USDHHS) establishes National objectives for the **rate of injuries**.[29] 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 per 100,000 people).

With regards to violent injuries, by 2010, the following objectives should be achieved:

Violence and Abuse Prevention

- A rate of homicides no greater than 3.0 per year per 100,000 people
- A rate of rapes or attempted rapes no greater than 0.7 per year per 1,000 people.
- A rate of physical assaults no greater than 13.6 per year per 1,000 people aged 12 years older.

D. Existing Conditions: Community Violence in Oakland

In 2004, Oakland had a violent crime rate of 1277 per 100,000 residents and ranked 3rd in violent crime rate among California cities with populations of 100,000 and above.[30] Assault and robbery are the largest determinants of the overall violent crime rate.

Oakland Violent Crime Rates per 100,000 residents (2004) [31]

Aggravated assault	648.4
Robbery	542.8
Forcible rape	64.9
Murder	20.6

27 Casteel C, Peek-Asa C. Effectiveness of crime prevention through environmental design (CPTED) in reducing robberies. Am J Prev Med 2000;18:99–115.

28 Peek-Asa, C. and Craig Zwerling, "Role of Environmental Interventions in Injury Control and Prevention" Epidemiol Rev 2003;25:77–89.

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

30 FBI Uniform Crime Reports as prepared by the US Depatment of Justice Programs, Bureau of Justice Statistics. Available at: http://www.ojp.usdoj.gov/bjs. Accessed November 2006.

31 FBI Uniform Crime Reports as prepared by the US Depatment of Justice Programs, Bureau of Justice Statistics. Available at: http://www.ojp.usdoj.gov/bjs. Accessed November 2006.

Between 1998 and 2000, rates for assault hospitalizations were higher in Oakland than at the county level for each race/ethnic group. [32] Homicide rates in Oakland were also consistently been higher than the county between 1990 and 2001,[33]

Rates of property crimes, which include burglary, larceny-theft, and motor vehicle theft, have declined significantly between 1985 and 2001 in Oakland. Property crime rates rose to just over 11,000 per 100,000 residents in 1989 and fell steadily to about 5,500 in 2001. [34] [35]

Oakland Property Crime Rates per 100,000 residents (2004) [36]

Larceny-theft	2722.6
Motor vehicle theft	1704.6
Burglary	1071.8

An examination of a three month map of crime within a ½ mile of the MacArthur BART station shows that crime is dispersed throughout the surrounding area. There is a slight concentration of crime along Telegraph Avenue. (See attached crime map). Numerous thefts and car thefts have occurred along this street.

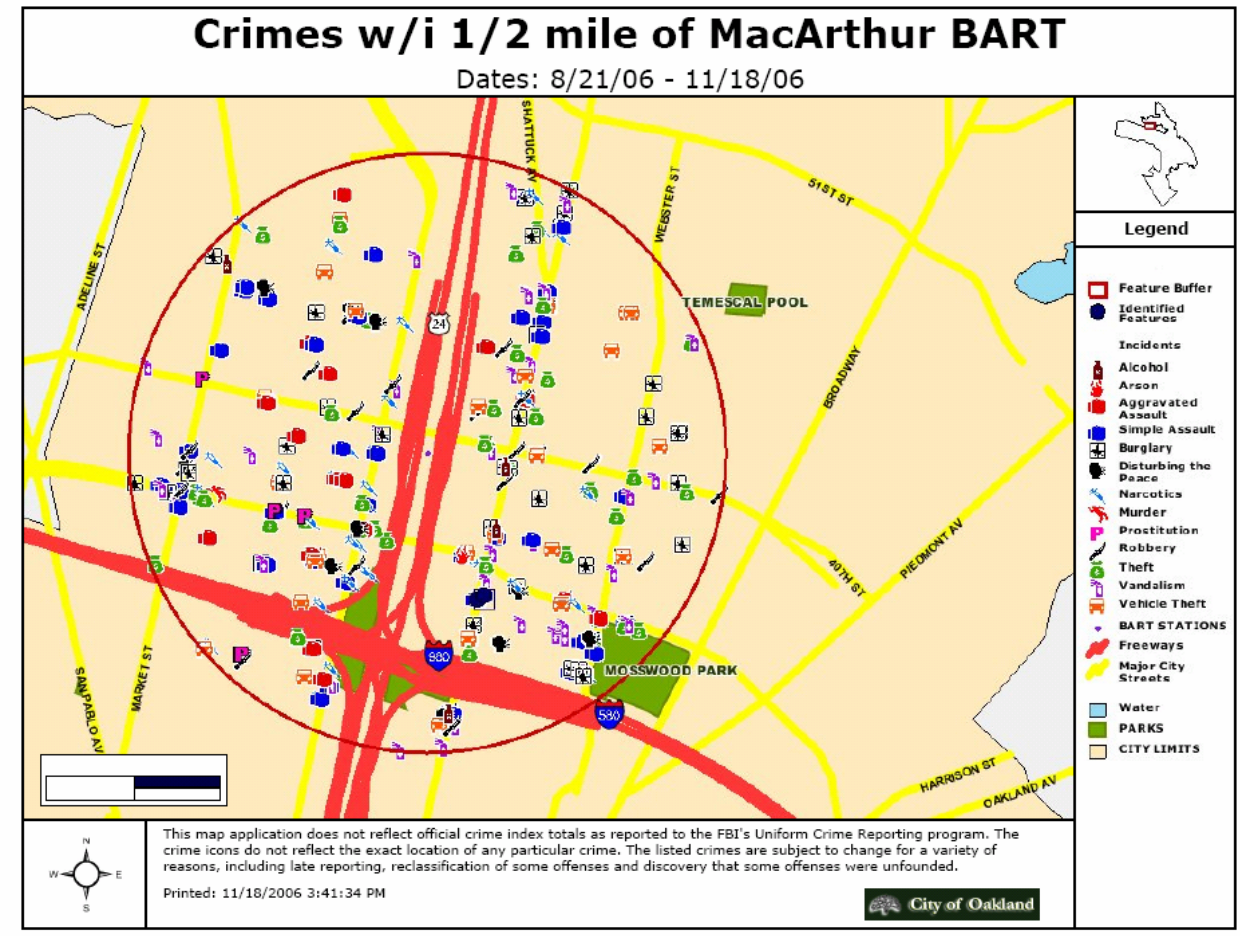
32 Oakland Health Profile 2004, Alameda County Public Health Department. Page 74-75.

33 Ibid

34 FBI Uniform Crime Reports as prepared by the US Depatment of Justice Programs, Bureau of Justice Statistics. Available at: http://www.ojp.usdoj.gov/bjs. Accessed November 2006.

35 Oakland Health Profile 2004, Alameda County Public Health Department. Page 18.

36 FBI Uniform Crime Reports as prepared by the US Depatment of Justice Programs, Bureau of Justice Statistics. Available at: http://www.ojp.usdoj.gov/bjs. Accessed November 2006.



E. Impact Analysis

This section of the HIA focuses on the following question:

1. **How will the project affect crime rates and the fear of crime in the surrounding area?**

The four CPTED principles – natural surveillance, access control, territoriality, and maintenance -- can be translated into various planning and design strategies that would enhance security. According to one CPTED guidebook[37], these strategies can be categorized as shown in the table below. Based on available plans of the project are not yet available, we can assess whether or not the MBTV incorporates each specific strategy.

37 Crime Prevention Through Environmental Design Guidebook. October 2003. Singapore National Crime Prevention Council. http://www.ncpc.gov.sg/pdf/CPTED Guidebook.pdf. Accessed November 2006.

For example, the planned retail on Village Drive, 40th Street, and Telegraph Avenue are activity generators and promotes natural surveillance of the area. There had also been discussion of designing residences with stoops on 38th Street, which would also encourage natural surveillance.

The status of additional strategies may become ascertainable as the design phase for the project proceeds. Should the developers incorporate other basic design strategies listed, such as adequate lighting, clear sight lines, and minimizing concealed routes, *and* the CPTED strategies are accompanied by traditional, complimentary approaches to deterring crime (e.g., locks, emergency telephones, security cameras, alarms)*, the project will most likely lead to a reduction of crime in the area.

Strategy	Status in MBTV Development
1. Allow for clear sight lines,	Unknown
2. Provide adequate lighting,	Unknown
3. Minimize concealed and isolated routes,	Unknown
4. Avoid entrapment,	Unknown
5. Reduce isolation,	Unknown
6. Promote land use mix,	Planned
7. Use of activity generators,	Planned
8. Create a sense of ownership through maintenance and management,	Unknown
9. Provide signs and information	Unknown
10. Improve overall design of the built environment.	Planned

With a reduction in crime, the fear of crime will also likely be reduced. However, fear of crime is strongly related to one's sense of community.[38] Should the developer incorporate strategies that encourage social inclusion and social networks in the community, including creating public areas or commons spaces, this would further encourage a reduction in the fear of crime.

Overall, the MBTV development provides a rare opportunity to reduce community violence a built environment intervention. Assuming the developer incorporates design strategies into the built environment that discourage crime, and that it is accompanied by traditional approaches to crime prevention as well as strategies for creating a sense of community, the project should lead both to a reduction in crime rates and a reduction in the fear of crime in the area.

F. Recommendations for Design and Mitigations

Developers are encouraged to incorporate as many CPTED elements into the design of the project wherever there is an opportunity to do so. CPTED strategies should not be limited to areas used by the general public, but should also be used to encourage a stronger sense of community among residents. Specific recommendations to reduce and prevent community violence include the following:

* CPTED is not meant to replace more traditional crime prevention strategies

38 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, pages 59–73.

1. Providing adequate and pedestrian scaled lighting for all public areas, residential streets, and adjacent public streets.
2. Creating clear sight lines to maximize visibility, especially for high risk areas such as parking garages, stairwells and underpasses
3. Creating public or common spaces that generate/reinforce a lot of pedestrian level activity and/or encourage a sense of community. For example, community urban gardens provide a setting for social activity and users of the gardens contribute to surveillance.[39]
4. Using durable, vandal resistant materials so maintenance is minimal.

39 Taylor R.B. and A.V. Harrell "Physical Environment and Crime" NCJ 157311, May 1996.
http://www.ncjrs.gov/pdffiles/physenv.pdf. Accessed December 12, 2006.

Mac Arthur BART Transit Village
Health Impact Assessment

Chapter 11
Social Cohesion and Social Exclusion

People cannot achieve their fullest health potential unless they are able to take control of those things which determine their health.[1]

-- **World Health Organization Ottawa Charter on Health Promotion**

1 World Health Organizations. (1986) Ottawa Charter for Health Promotion. Drafted at the First International Conference on Health Promotion. Ottawa, Canada. Document Number: WHO/HPR/HEP/95.1.

A. Summary

Social cohesion and social exclusion are two attributes of society closely related to human health and potentially affected, both positively and negatively, by land use development.[2] There are no precise, quantifiable ways to predict the effects of a particular development project on social cohesion and social exclusion and assessment requires careful interpretation of data, acknowledgment of assumptions and limitations, as well as the use of qualitative methods. This chapter of the Mac Arthur BART Transit Village Health Impact Assessment provides background information on the relationships among development, social cohesion, and social exclusion and considers mechanisms though which the Mac Arthur Bart Transit Village (MBTV) might positively and negatively affect and social cohesion and social exclusion. We pay particular attention to realized and unrealized opportunities to promote social cohesion via development based on a review of the planning process history and interviews with local residents and businesspeople. Because public participation helps to mediate these effects, this chapter also offers a brief critique of the community involvement in the planning process, considering the degree to which the MBTV project incorporates the needs of the community. Overall, we find that this project includes elements that will benefit social cohesion and prevent social exclusion. We also identify several opportunities for improving social cohesion via the land use development process.

Health Impacts on Social Cohesion and Social Exclusion

1. Given the expected cost of the project's market rate housing and the current project area demographics, the project is likely to result in greater residential integration with regard to income at the level of the census tract. (Beneficial Effect)
2. Indirectly, expected demographic changes can improve health of area residents via effects on retail environment and public infrastructure. Current area residents should share in many of those benefits. (Beneficial Effect)
3. Market rate and below market rate housing will be segregated on the project site; project could further advance social integration by integrating BMR units. (Potential Beneficial Effect)
4. The incorporation of streets and sidewalks, retail and public areas within the project may facilitate interaction among project and neighborhood residents. (Beneficial Effect)
5. The social integration of the East and West sides of the project area, historically socially segregated by the construction of the Macarthur BART and State Road (SR) 24 is a key goal both to community residents and BART, which, if achieved, would benefit health. Streetscape improvements to 40th Street between MLK and Telegraph will support reconnection but may not be adequate to achieve this outcome. A Westside entrance to BART would help achieve this goal if a feasible and safe method for such an entrance is available is found. Alternatively, developing Mac Arthur Blvd as a retail and pedestrian corridor might serve to help achieve this goal. (Potential Beneficial Effect)
6. The project itself will not directly displace area residents but, via desired economic and environmental effects, may ultimately result in higher property values and rents in the area. Potentially, project-stimulated economic effects may result indirectly in displacement of residents neighboring the MBTV, affecting social cohesion of the neighborhood. (Potential Adverse Effect)
7. The project includes both new retail and new markets for retail. Local retail that addresses the needs of residents will encourage walking and social interaction from casual contact. Increasing local retail opportunities could also potential increase employment opportunities, thus economic integration. (Beneficial Effect)

2 The Solid Facts: The Social Determinants of Health. WHO Europe: Brussels; 2004.

8. Public infrastructure and retail environment benefits will be disproportionately realized by east-side residents. Integrating plans for neighborhood serving retail on the West side could serve West-side economic revitalization and area-wide social cohesion. (Potential Beneficial Effect)
9. If the community's safety concerns regarding the MBTV (and ongoing concerns in the neighborhood) are properly addressed, increased perceived safety within the area could encourage people to interact outside of their homes. (Potential Beneficial Effect)
10. The 5,000 feet of community space currently included in the project can foster social interaction if programming providing it is designed in response to community needs. (Potential Beneficial Effect)

Recommendations for planning, design and implementation

The following recommendations for MBTV planning, design, and implementation may further promote social cohesion and prevent social exclusion via project planning and implementation:

1. Implement additional strategies to include more west side residents in the design and planning for MBTV.
2. Integrate Below Market Rate and Market Rate housing on the project site.
3. Create common walking routes and meeting points that encourage interaction.
4. Facilitate economic development of MLK between 40th and MacArthur Blvd.
5. Encourage locally-owned business development at the MBTV and on MLK.
6. Solicit funding to hire a community program coordinator.
7. Study Macarthur Boulevard as another Connector Project.
8. Continue to study the feasibility of a Westside BART station entrance/tunnel with regard to safety, structural feasibility, and cost. .
9. Develop programs to retain low-income residential tenants vulnerable to displacement.
10. Step up routine City maintenance of current infrastructure.

B. Background: Relationship between social cohesion, social exclusion, community participation and health

Empirical research over the last 20 years has linked diverse attributes of social cohesion to human health. Several terms and related concepts are used to identify and measure these attributes. The following section discusses these terms and concepts, reviews key evidence linking social cohesion, social exclusion, and human health, and discusses implications for land use planning.

Key Terms and Concepts

Social Cohesion means *a state in society in which the vast majority of citizens respect the law, one another's human rights and values, and share a commitment to retain social order*. (http://en.wikipedia.org/wiki/Social_cohesion) **Social cohesion** is a broad concept that operates at the level of the family, neighborhood, identity group, locality, society. Related constructs include social exclusion, social networks, social support, social integration, collective efficacy, and social capital.

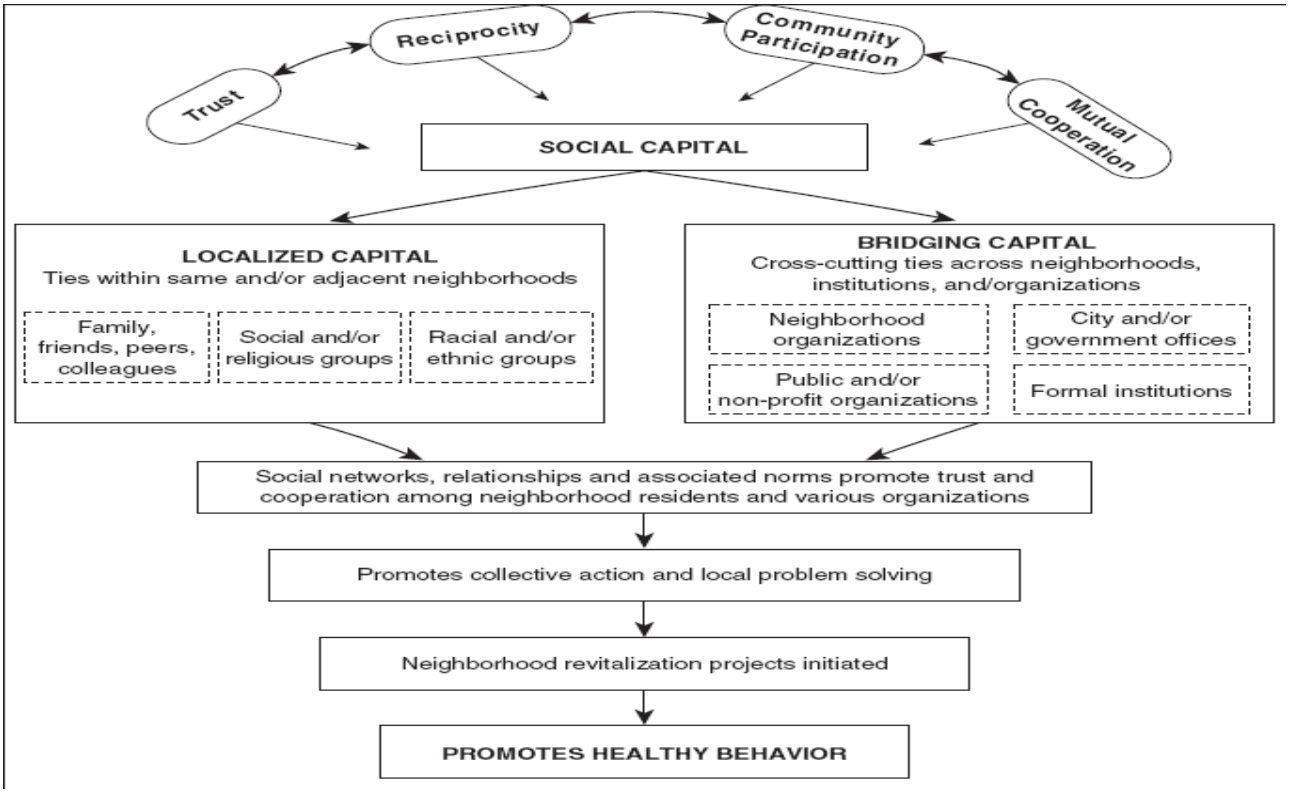
Dimensions of **social cohesion** include *supportive social networks* (which provide access to material and emotional support in times of need), *social participation* (meaning participation in relationships providing friendship, company, and participation in the workforce), *community engagement* (including 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).

Social exclusion referes 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.

Another construct closely related to social cohesion is social capital which is defined as the advantage created through relationships, formal, informal, and familial, with others. Social cohesion at each of the levels described above is associated with social capital. For Robert Putnam, author of Bowling Alone, social capital "refers to the collective value of all 'social networks' and the inclinations that arise from these networks to do things for each other." Alternatively, Francis Fukuyama associates social capital with shared values or norms that permit cooperation among members of a group. One may consider social capital a by product of social cohesion.

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 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. Example of issues local residents have engaged in are the lack of parks and exercise facilities, need for substance abuse treatment services, absence of availability of healthy food, poor police response to crime, and the like.

In the figure below, Semenza and Krishnasamy provide one model for how the diverse attributes of social cohesion advance the ability of a community to gain the resources necessary for health:[3]



Social networks are a source of material and emotional support for health

Strong social relationships protect of health in multiple ways. Neighbors, friends, and family provide material as well as emotional support. Support, perceived or provided, can buffer stressful situations, prevents damaging feelings of isolation, and contributes to a sense of self-esteem and value.[4]

Emile Durkheim was one of the first to demonstrate the impact of social ties on human health in his famous study of suicide. He concluded that "the lowest rates of suicide occurred in societies with the highest degrees of social integration. An excess of suicides occurred in societies undergoing dislocation and loosening of social bonds."[5]

3 Semenza JC, Krishnasamy PV. (2006). Design of a health-promoting neighborhood intervention. Health Promotion Practice. Epub 2006 Jun 30.

4 Cohen, S, Underwood, LG, Gottlieb, BH. Social Support Measurement and Intervention. Oxford University Press. New York. 2000.

5 Berkman & Kawachi, ibid.

In one of the first U.S. studies about social ties, researchers found that men and women in Alameda County who lacked ties to others were 1.9 to 3.1 times more likely to die than those who had many contacts.[6] More recently, people with self-reported "severe lack" of social support were over twice as likely (2.19 times) to report fair or poor health.[7] Research has subsequently demonstrated the significance of social ties to diverse health outcomes. Cardiac patients with higher social support recover more quickly after hospitalization from heart disease,[8] and social support has been found to moderate the anxiety and depression of witnessing community violence.[9] Social support was a consistent predictor of abstinence from opiate use over time,[10] and can bolster the maintenance of abstinence in substance abuse control.[11]

The value of social networks may also explain why living in first generation immigrant communities appears to be protective of health. In a recent study, living in high-density Mexican-American Neighborhoods reduced the risk of stroke, cancer, and hip fracture by two-thirds for older Mexican immigrants.[12]

Social Networks can help create and promote healthy social behaviors

Social networks can shape the flow of resources and information which determine access to opportunities and constraints on behavior.[13] The Alcoholics Anonymous model, which relies heavily on structured social support, has long been a success story in altering health behavior with regard to alcohol. Women who are overweight (BMI 25-29) are twice as likely to report low social participation.[14]

In a report entitled "Trust and collaboration in the prevention of sexually transmitted disease", an STD prevention program relied on social networks to disseminate information through their own social networks. The success of using social networks to educate about health behavior was clear: 23% of those involved reported using a condom consistently and 60% reported seeking care for an STD within 3 days of symptoms.[15] There are many public health programs that rely exclusively on social networks to disseminate information.[16],[17]

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6 Berkman LF, Syme SL. (1979) Social networks, host resistance and mortality: a nine-year follow up study of Alameda County residents. American Journal of Epidemiology 109:186-204.

7 Poortinga W. (2006) Social relations or social capital? Individual and community health effects of bonding social capital. Social Science and Medicine 63:255-70.

8 Fontana AF, Kerns RD, Rosenberg RL, Colonese KL. (1989) Support, stress, and recovery from coronary heart disease: a longitudinal causal model. Healthy Psychology 8(2):175-93.

9 Hammack PL, Richards MH, Luo Z, Edlynn ES, Roy K. Social support factors as moderators of community violence exposure among inner-city African American young adolescents. Journal of Clinical Child and Adolescent Psychology 33(3):450-62.

10 Gossop M, Green L, Phillips G, Bradley B. (1990) Factors predicting outcome among opiate addicts after treatment. Br J Clin Psychol 29(2):209-16.

11 Bandura A. (1997). Self-efficacy: The exercise of control. New York: W.H. Freeman and Company, 1997:1-7, 279-313.

12 Eschbach K, Ostir GV, Patel KV, Markides S, Goodwin JS. Neighborhood context and mortality among older Mexican Americans: Is there a Barrio Advantage. American Journal of Public Health. 2004; 94: 1807-1812.

13 Berkman LF, Glass T. (2000) Social Integration, Social Networks, Social Support, and Health. L.F. In Social Epidemiology. Berkman and I. Kawachi (Eds). New York: Oxford University Press:137-173.

14Ali SM, Lindstrom M. (2006) Socioeconomic, psychosocial, behavioral, and psychological determinants of BMI among young women: differing patterns for underweight and overweight/obesity. European Journal of Public Health 16(3):325-31.

15 Thomas JC, Eng E, Earp JA, Ellis H. (2001) Trust and collaboration in the prevention of sexually transmitted diseases. Public Health Report 116(6):540-7.

16 Kelly, J.A. (2004) Popular opinion leaders and HIV prevention peer education: Resolving discrepant findings, and implications for the development of effective community programs. AIDS Care 16(2):139-50.

Collective action and political engagement by social groups helps to secure material resources for health

One of the key measures of a healthy community which relates to social cohesion is a high degree of public participation in and control over the decisions affecting one's life, health, and well-being.[18] Being involved in community organizations that work for the benefit of others and being involved in the political process to advance needs or interests are ways that individuals exercise control over decisions that affect their lives.

There are many examples where involvement in the political process directly impacted health, such as political organizing to change smoking policies (thus exposure to second-hand smoke, known to cause lung cancer), community-based participatory research to impose limits on the hog industry (that caused water pollution from runoff, threatened small farmers' water supply, and caused noxious odors, and increasing access to abortion services.[19],[20] Community-led environmental justice efforts have opposed and altered unhealthy land use projects such as garbage incinerators, polluting industrial use, and construction of freeways. Conversely, engaging community members in advance of land use projects can help planners identify public infrastructure concerns and needs.

Group membership and political participation are significantly associated with human health outcomes. For one standard deviation increase in group membership in a community, mortality decreased by 83.2 individuals per 100,000.[21] People who were involved in electoral participation were 22% less likely to report poor/fair health.[22] In a study about neighborhood environment, if political engagement was low, people had 52% higher odds of reporting poor health.[23]

Community and political engagement also have intermediate outcomes such as leadership development, skills acquisition, social participation, establishment and growth of social and organizational networks, and community empowerment. Persons acquiring leadership skills increase their self-efficacy, or perceived ability to affect change in their lives. Autonomy and control are essential human aspirations. At the individual level, research demonstrates he unfavorable health consequences attached to low levels of control. For example, workers in jobs with high demands and a low level of discretion for dealing with them show more heart disease and other conditions.[24] [25] People with a low sense of self-efficacy also may forego preventative practices. If a person feels they are incapable of managing pain, for example, they avoid corrective treatment. Increasing self-efficacy is a key to encouraging behavior change of all

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17 Santana-Cruz D. Presentation about Club Moms Program of Peer Health Leaders. Alameda County Public Health Department. Improving Pregnancy Outcomes Program (IPOP). December 1, 2006.

18 Kawachi I, Kennedy BP, Lochner K, Prothrow-Stith D. (1997) Social capital, income inequality, and mortality. Am J Public Health 87:1491-8.

19 Farquhar SA, Wing S. (2003) Methodological and ethical considerations in community-driven environmental justice research: Two case studies from rural North Carolina. In Community-Based Participatory Research for Health, Minkler M & Wallerstein N (Eds.). Jossey-Bass: San Francisco, CA.

20 Joffe C, Yanow S. (2005). Advanced practice clinicians as abortion providers: Current developments in the United States. Reproductive Health Matters 12(24 Suppl):198-206.)

21 Kreuter MW, Lezin N. (2002) Social Capital Theory: Implications for Community-Based Health Promotion. In Emerging Theories in Health Promotion Practice and Research. Eds. DiClemente RJ, Crosby RA, Kegler MC. Jossey-Bass: San Francisco, CA.

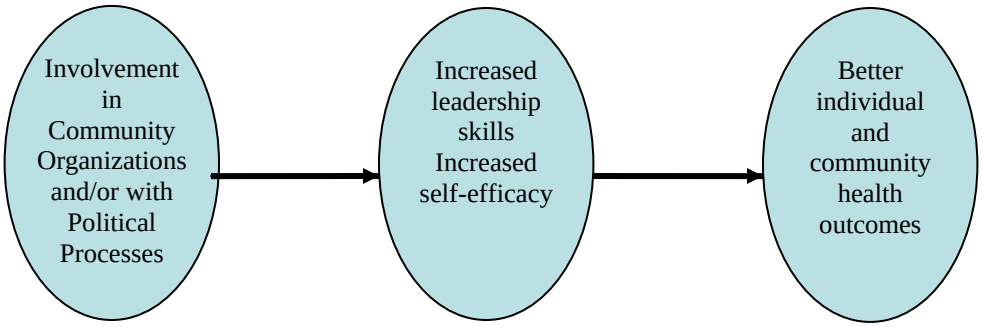
22 Kim D, Kawachi I. (2006) A multilevel analysis of key forms of community- and individual-level social capital as predictors of self-rated health in the United States. Journal of Urban Health 83(5):813-26.

23 Cummins S, Stafford M, Macintyre S, Marmot M, Ellaway A. (2005) Neighbourhood environment and its association with self rated health: evidence from Scotland and England. Journal of Epidemiology and Community Health 59:207-213.

24 Syme SL. (1998) Social and Economic Disparities in Health: Thoughts about Intervention. The Milbank Quarterly 76.

25 North FM, Syme SL, Feeney A, Shipley M, Marmot M. (1996) Psychosocial work environment and sickness absence among British civil servants: the Whitehall II study. Am J Public Health 86(3):332-340.

kinds, and being involved in community and political organizations that are able to win on issues teaches self-efficacy.[26] These outcomes also create more sustainable capacity on the part of society's members to protect and promote their health.



Social participation at the psycho-social, organizational and the community-political levels are interconnected. As a person becomes more engaged in a particular activity (such as engaging in a land-use planning process that has specific impacts on one's life), they are more likely to feel a sense of social cohesion and feel strong social ties through their participation in a group with a particular goal guiding the group's activity. Increased social engagement may have the benefits of improved mental and physical health because the person is out of the house more often and intellectually and socially stimulated. At the same time, as the person becomes more involved, this strengthens the capacity of the organization to achieve change, which has the potential to influence community and political outcomes. The table below provides examples of the conceptual direct and indirect health consequences of participation.

Non-Participation Health Risks	**Participation Health Benefits**	**Participation for Health Needs Social Benefits**
Alienation Apathy Passivity Stress Depression	Optimism/hope/positive outlook Self-esteem Sense of control Sense of belonging Social Support Inclusion Self-efficacy	Collective efficacy Social capital Safety/security Housing adequacy Secure livelihoods Access to health care Environmental quality

Social exclusion means unequal access to health resources

In the United States, the health consequences of social exclusion are vividly demonstrated by residential segregation. Socioeconomic status of a community affects health by impacting the social, service, and

26 Bandura, ibid.

physical environments, i.e., differential access to resources and differential exposure to environmental hazards.[27] Segregated neighborhoods have fewer resources and opportunities with regards to transportation, education, and employment, limiting the social mobility of their residents. As socioeconomic status is one of the most powerful predictors of health, this type of differential access can directly affect health outcomes.

In addition to being isolated from economic opportunities, occupants of socially excluded neighborhoods are often marginalized in political decision-making, limiting their ability to effect change. Hyper-segregation of neighborhoods by race and the related under-representation of blacks in elected offices at the municipal levels have important implications for the kinds of life-enhancing resources to which black communities will be able to gain access. The significance of segregation to health is underscored by research demonstrating that differences in life expectancy in U.S. cities vary from neighborhood to neighborhood by as much as twenty years.[28],[29]

Economic integration can lead to less crime and fear of crime, better city services, better jobs, more opportunities for educational advancement, exposure to different cultures and more role models for children, reduction in obesity and improved mental health.[30] A study on the effect of social integration on fear showed that while perception of increased pedestrian traffic in residential neighborhoods led to increased fear, there was a strong interaction with social integration. For those who were socially integrated, the volume of pedestrian traffic had no effect on fear, but for those who were not integrated, a very strong relationship was found. The conclusion is that fear of crime in residential areas is, basically, the fear of strangers, suggesting that social integration has a protective effect in this situation.[31] Consistent with this hypothesis, reducing residential segregation by income by encouraging mixed-income housing developments has improved household safety, measured by reduced exposure to crime and decreased neighborhood social disorder.[32]

The concentration of poverty is also a fundamental cause of the problems that plague segregated schools. Segregated schools have lower average test scores, fewer students in advanced placement courses, more limited curricula, less qualified teachers, less access to serious academic counseling, fewer connections with colleges and employers, more deteriorated buildings, higher levels of teen pregnancy, and higher dropout rates.[33]

Overall, residential integration is important to health because it facilitates a more equitable sharing of societal resources – social, economic, and political. This ultimately translates into a lower burden of

27 Robert, S. (1999) Socioeconomic Position and Health: The Independent Contribution of Community Socioeconomic Context. Annual Review of Sociology 25:489-516.

28 Murray CJ, Kulkarni SC, Michaud C, Tomijima N, Bulzacchelli MT, Iandiorio TJ, Ezzati M. (2006) Eight Americas: investigating mortality disparities across races, counties, and race-counties in the United States. PLoS Med Sept 3(9):e260.

29 Geronimus AT, Colen CG, Shochet T, Ingber LB, James SA. Urban-rural differences in excess mortality among high-poverty populations: evidence from the Harlem Household Survey and the Pitt County, North Carolina Study of African American Health. (2006) J Health Care Poor Underserved. Aug 17(3):532-58.

30 Abt Associates & National Bureau of Economic Research. Moving to Opportunity for Fair Housing Demonstration Program: Interim Impacts Evaluation. (September 2003) US Department of Housing and Urban Development. Office of Policy Development and Research.

31 Hunter A, Baumer TL. (1982). Street traffic, social interaction, and fear of crime. Sociological Inquiry 52(2):122-31.) Also in Halpern D. (1995) Mental Health and the Built Environment. Taylor & Francis: London.

32 Anderson LM, St. Charles J, Fullilove MT, Scrimshaw SC, Fielding JE, Normand J. (2003) Providing affordable family housing and reducing residential segregation by income: A systematic review. American Journal of Preventive Medicine 24(3S):47-67.

33 Williams DR, Collins C. (2001) Racial residential segregation: A fundamental cause of racial disparities in health. Public Health Report 116:404-16.

mortality for all members of the community. See below for a framework of the health effects of a socially excluded neighborhood:[34]

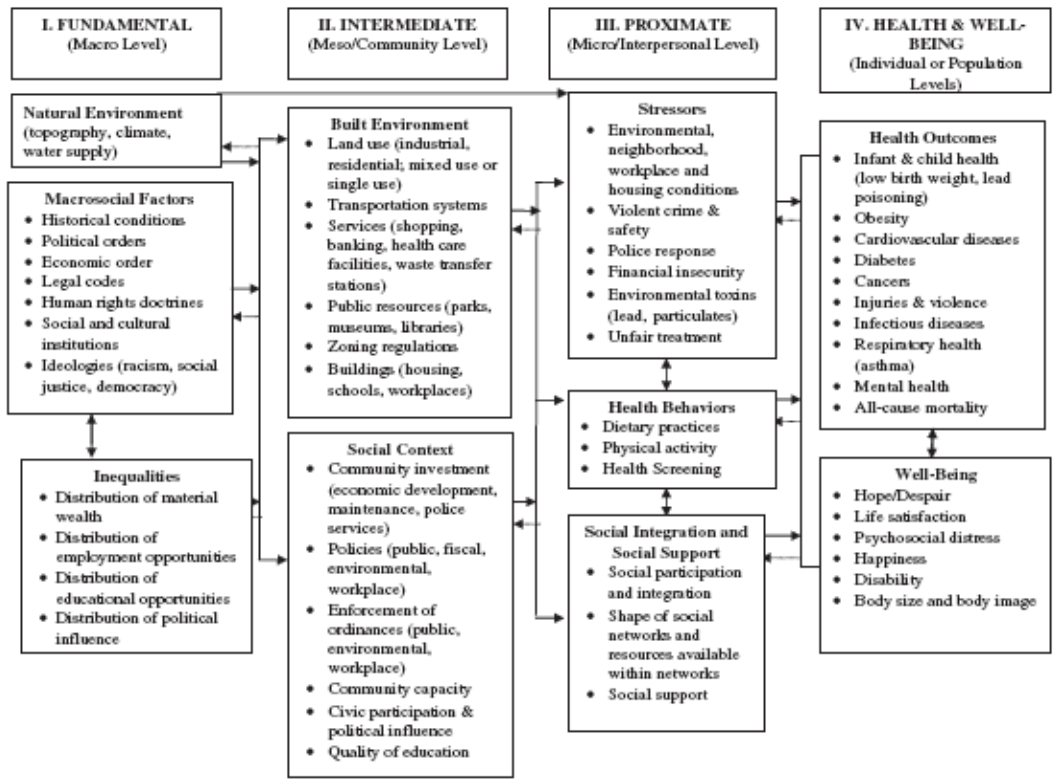


Figure 1. Social determinants of health and environmental health promotion.

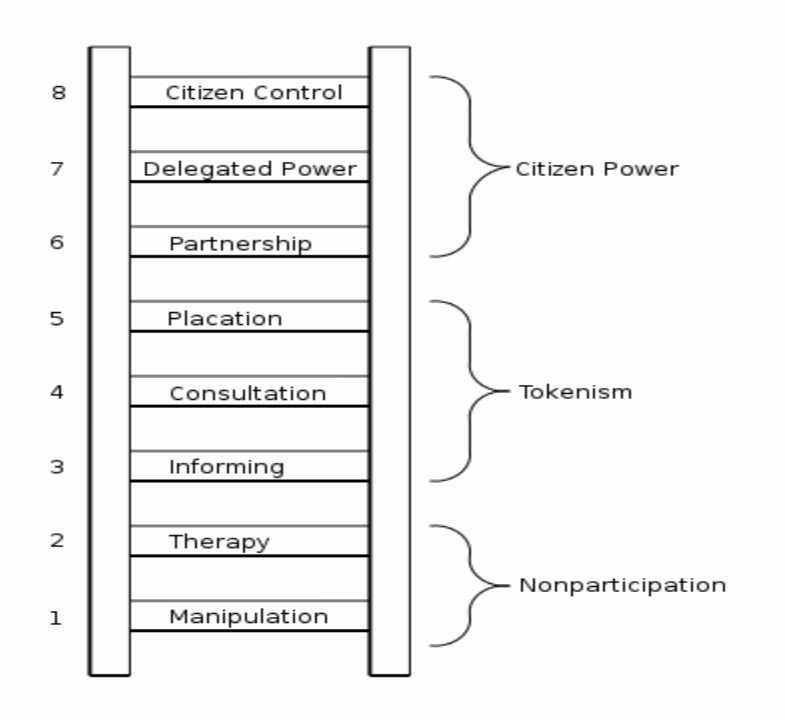
Land use development can affect both social cohesion as well as social inclusion

Land use development potentially benefits social cohesion by providing settings such as plazas and cultural facilities that enable social interaction. Conversely, land use policy has historically harmed social cohesion via involuntary displacement or actions that indirectly lead to neighborhood disinvestment. Development can prevent social exclusion by ensuring mixed-income neighborhoods. A socially integrated place diverse with regard to income, ethnicity, gender, and age, helps to ensure that all members of a community have equitable access to as employment opportunities, retail and finance services, schools, libraries, and public transportation. However, a gated or otherwise exclusive development prevents social interaction among diverse groups. Meaningful and inclusive public participation in a land use planning process can also build consensus on shared development objectives (e.g. affordable housing, parks) making contributions to health, well being, equity, and social cohesion. Land-use planning projects that do not meaningfully and successfully engage the effected community can polarize interests and open themselves up to criticism, minimally, and opposition.

34 Schulz A, Northridge ME. Social determinants of health: Implications for environmental health promotion. Health Education and Behavior 31(4):455-71.

Public Participation in planning can promote social cohesion as well as healthier planning decisions

In the context of public participation in public agency decisions, participation can mean attendance at a meeting, involvement in identifying problems to be solved, or a partnership to take action. Partnership can mean different things to different people. Sherry Arnstein (1969) used the "Ladder of Participation" to illustrate the different types of engagement individuals may experience in planning.[35] At the bottom rungs of the ladder, services or information are provided "to" the individual as opposed to their expertise and experience being sought. Higher up, at the consultation and placation level, opinions are sought out but rarely incorporated. At the level of partnership participants advise decision makers but do not hold the power themselves. It is only at the top rungs where participants have meaningful ability to influence the course of decisions.



There are a great many examples from literature on environmental justice where community engagement in the land use process has influence decisions. These efforts have typically opposed projects hazardous to health, usually of minority or low-income communities. For example, community members in diverse areas have organized to oppose the construction of a maximum security prison in a community in Los Angeles in the midst of 33 schools, to hold a corporation responsible for illegal toxic waste disposal at a nuclear weapons plant, and block construction of a plastics plant that would discharge carcinogenic emissions all point to direct health benefits of community engagement.[36] Some organizing efforts are not about opposition but instead about educating decision-makers. In almost all of them, the community researchers are empowered and gain self-effectiveness through their participation.[37]

35 Arnstein SR. (1969) A Ladder of Citizen Participation. Journal of American Planning Association 35(4):216-24.

36 Freudenberg N. (2004) Community capacity for environmental health promotion: Determinants and implications for practice. Health Education and Behavior 31(4):472-90.

37 Minkler M, Breckwich Vasquez V, Tajik M, Petersen D. (2006) Promoting environmental justice through community-based participatory research: The role of community and partnership capacity. Health Education Behavior Jul 21 [Epub ahead of print].

Organizing can also lead to support of a project. Active community members in West Oakland were able to achieve a Community Benefits Agreement (CBA) for hiring local and minority populations during the reconstruction of the Cypress Freeway (880). The CBA deserves mention as a model of *economic* inclusion of a low-income population (please also see Section D for more on the *community involvement* process of the Cypress Freeway reconstruction).[38],[39] A key part of the Agreement was a provision intended to ensure that local residents and businesses would receive a proportionate share of the jobs and contracts generated by the project. The agreement established the following goals:

- 35% Disadvantaged Business Enterprise (DBE) participation
- 20% Local Business Enterprise (LBE) participation
- 45% employment of local residents, minorities, and women on a craft-by-craft basis by hours of employment.
- DBEs are businesses owned by women and minorities. LBEs are businesses located within the City of Oakland.

Unfortunately, the development of a CBA does not ensure its successful implementation. For the case above, an Independent Monitoring Team was established 8 months after the CBA was put into place to ensure that contractors were upholding the Agreement. The Independent Monitoring Team was funded by CalTrans and issued periodic reports throughout the five years of construction. They found that contractors were not in compliance with many of the minority, female, and local hiring goals.

In another more recent example in Oakland, community organizations supported the Oak to Ninth Mixed-use Development project after reaching an agreement on community benefits with the City and the project's developer.[40]

Community involvement can help ensure the success of Transit Oriented Design (TOD)

Community involvement has particular importance in the planning of transit village because of the trade-offs involved in such practice. On one hand, increasing residential or commercial density near transit offers a great many positive environmental and health benefits – from decreasing the air pollution impact of single occupant vehicle trips to increasing exercise via walking, and promoting economic vitality. While transit villages offer local and regional benefits, they also have the potential to negatively impact the health of the existing nearby residents via increased population, traffic congestion, potential gentrification and displacement.[41]

Current residents deserve to have negative impacts mitigated and have an input into potential benefits for their passive contribution to this regional benefit. Community involvement can help planners and project proponents answer some key questions with regards to these tradeoffs: Will the new residents substantially differ from those currently living in the area, and if so, what impacts will that have? Will the services chosen to occupy retail and community space speak to the needs of the current residents? The answers to these questions impact the ability for residents to strengthen and build social capital.

It is also in the interest of those developing the projects to solicit community involvement to mitigate unforeseen conflicts involving current residents. The Federal Transit Administration recognizes the importance of community involvement in Transit Oriented Design (TOD) planning. They document TODs

38 California Department of Transportation. Environmental Justice Case Study: Cypress Freeway Replacement Project. Available at http://www.fhwa.dot.gov/ENVIRonment/ejustice/case/case5.htm. Accessed on November 15, 2006.

39 ICF Consulting. Desk Guide: Environmental Justice in Transportation Planning and Investments. (2003) California Department of Transportation, Office of Policy Analysis & Research. San Francisco, CA.

40 University of California, Berkeley Health Impact Group. Oak to Ninth Development Health Impact Assessment. Available at http://ehs.sph.berkeley.edu/hia/. Accessed on September 2, 2006.

41 New Places, New Choices: Transit-Oriented Development in the San Francisco Bay Area. November 2006. Metropolitan Transportation Commission/Association of Bay Area Governments.

that have been "stopped in their tracks" by community opposition, and cite the need for involving neighbors to move a project along and get buy-in, and also noted that community support can help to push local governments with land-use control to embrace transit supportive development.

Every TOD project has a unique context, opportunities, and needs. It is the goal of the Metropolitan Transportation Commission (MTC) to encourage community involvement in planning TOD projects, and for that reason they implemented a Community Design Planning Program to fund "bottom up" community design and planning processes.[42] TOD projects have acknowledged BART's flexibility to community interests, while also noting that BART's bureaucracy can slow projects.[43],[44],[45],[46] BART maintains its primary interest in immediate ridership as well as its long term vision of increasing reliance on public transit.

TOD projects have used various methods of community involvement, and most have used multiple types of ways to include current residents:[47]

- Community development agency as lead agency (not the developer or City)
- Ongoing community process
- Workshop series/charette/design studios
- Limited series of community forums
- Surveying local residents
- Focus groups
- Public information tables
- Storefront studio for ongoing access to City/designers/developers

As of July 2004, the MTC had awarded 55 Transportation for Livable Communities (TLC) community planning grants have been funded to facilitate community input. These projects totaled $2.2 million. In the eight years since the TLC program began, they have learned the following lessons with regard to community involvement in TOD Planning Processes:

- o Local champions are necessary to foster enthusiasm at the local level about community livability and to guide a project to its completion.
- o Partnerships between local government, community stakeholders and transportation providers are critical through all stages of planning, design, and delivery of a TOD.
- o Time and commitment are vital to ensure a meaningful community process.[48]

Community involvement leads in community responsive TOD

42 Transportation for Livable Communities (TLC): Works in Progress…Building a Better Bay Area. (2004) Metropolitan Transportation Commission.

43 Jeff Pace, Vice President of Finance and Business Opportunity, The Unity Council. Interview about the Fruitvale Transit Village, November 10, 2006.

44 Zac Wald, Assistant to Oakland City Councilmember Jane Brunner, Interview, November 2, 2006.

45 Walter Miles, chair of the Citizen Planning Committee for the MacArthur BART Transit Village, interview, October 30, 2006.

46 Federal Highway Administration (FHA). Environmental Justice Case Studies: Fruitvale Transit Village Project. Available at http://www.fhwa.dot.gov/environment/ejustice/case/case6.htm. Accessed on November 19, 2006.

47 TLC, ibid.

48 TLC, ibid.

One of the models of community involvement in TOD is the Fruitvale Transit Village (FTV). The project was grassroots, with the community responding to BART's plan to construct a parking garage which would have effectively been a barrier between the neighborhood and BART. The community engaged in an extensive planning process (12 years from the beginning to the opening of the FTV) lead by the Unity Council, a community economic development agency that has a long and trusted history with residents. The process involved a wide variety of community stakeholders and was funded through grants from city and transportation agencies. The FTV has more community amenities on site than most transit villages: a child-care center (Head Start); a senior center; a public library; and a health care clinic; all very well used. A key element to the continued success of the FTV as it rolls out to Phase II is having a community organization as the lead agency as opposed to a developer or the City. The Unity Council has been a part of Fruitvale, representing the community for 43 years and is committed to making the transit village a success for the people who live in the neighborhood.[49, 50]

Another bottom-up process in Los Angeles was the Neighborhood Initiatives program, where the city encouraged a bottom-up perspective with community involvement in everything from local planning to owning and operating smart shuttle services.[51] The Federal Transit Administration has noted the need and wisdom of involving the community, but has not set any standards in place; they simply give several examples of community involvement in TOD.

Good Jobs First looked at the way that TOD could serve the needs of working families by providing affordable housing and better access to jobs.[52] They chose 25 projects to profile that linked TOD with economic opportunity for low- and moderate-income families and/or affordable housing. Certain types of TOD projects were more likely to address the needs of working families, and thus allow for economic integration of low- to moderate- income families. Projects and policies included:

- Projects where a community coalition negotiated for a Community Benefits Agreement (CBA) with a private developer for guaranteed concessions such as local hiring, living wages, and affordable housing set-asides.
- Projects where a community development corporation (CDC) initiated the project and made it integral to the organization's neighborhood-improvement mission. The Fruitvale Transit Village was mentioned as an excellent example.
- Projects where an exceptional private developer intentionally designed a project for the benefit of low-income families and/or commuters.
- Implementation of policies whereby no business could receive municipal, state, or federal subsidies unless the business is transit-accessible. This can increase job accessibility for those lower-income potential employees who do not own a car. TOD has the potential to connect low- and moderate-income people to job opportunities to which they may otherwise have no access.

C. Standards and Guidelines to promote social cohesion and prevent social exclusion

There are no public agency "standards" for the achievement of social cohesion in the context of land use planning. However, there are principals and guidance for public participation in the context of land use development. Adherence to this guidance should indirectly advance the needs of social cohesion and help prevent social exclusion.

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49 Pace, ibid.

50 FHA, ibid.

51 Cervero R, Ferrell C, Murphy S. (2002) Transit-Oriented Development and Joint Development in the United States: A Literature Review. Research Results Digest 52. Transit Cooperative Research Program. Federal Transit Administration.

52 Grady S, LeRoy G. (2006) Making the Connection: Transit-Oriented Development and Jobs. Good Jobs First. Available at http://www.goodjobsfirst.org/pdf/makingtheconnection.pdf. Accessed on December 4, 2006.

Federal Guidance.

Federal guidelines about environmental justice in land use projects under the National Environmental Policy Act (NEPA) can address the extent to which minority and low income communities are socially excluded.[53] The guidelines state that in preparing an Environmental Impact Statement or Assessment (EIS or EA), agencies must consider both impacts on the natural or physical environment and related social, cultural, and economic impacts. While there is no standard formula for how environmental justice issues should be identified or addressed, NEPA sets out six principles for guidance:

- Consider the composition of the area of the project to determine if minority or low-income populations will be affected by any adverse health or environmental impacts.
- Consider public health or industry data regarding multiple or cumulative exposure to health or environmental hazards, historical patterns of exposure to environmental hazards.
- Consider cultural, social, occupational, historical, and economic impacts of changes in the physical environment. These can include disruption of the community structure, the physical structure, and the social structure of a community.
- Develop effective public participation strategies to overcome linguistic, cultural, institutional, geographic or other barriers to meaningful participation and incorporate active outreach to affected groups.
- Be aware of diverse constituencies when seeking community representations and endeavor to have complete representation of the community as a whole.
- Seek tribal representation that is consistent with established government-to-government policies when Native American groups are involved.

California State Guidance

The 2003 State of California Guidelines for General Plans[54] states that community engagement in the land use planning process can:

- Provide valuable information leading to more informed policy and project development by decision-makers.
- Insure the plan's successful implementation by building a base of long term support with the public.
- Reduce the likelihood of conflict and drawn-out battles by addressing public concern during the general plan process rather than on a case-by-case basis in the future.
- Educate the public about community issues.
- Increase the public's ability and desire to participate in the community.
- Enhance trust in government by strengthening the relationship between elected officials, government staff, and the public.
- Work toward community consensus and create a vision for the future.
- Lay the groundwork for community revitalization and increase investment in the community.
- Obtain public input regarding plan policies and community issues and objectives.

53 Council on Environmental Quality. Environmental Justice: Guidance Under the National Environmental Policy Act.(1997) Council on Environmental Quality. Executive office of the President. Washington, D.C.

54 Grattidge, B. and A. Lawler, State of California General Plan Guidelines, Office of Planning and Research, 2003.

- Provide the public with opportunities to evaluate alternative plans and participate in developing and choosing a plan that works for their community.
- Make sure the project is embraced by the community and is useful to the community.

Local Guidance for Participation

In Oakland, the General Plan, "strives to assure the fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of laws, regulations, and policies. This includes affirmative efforts to inform and involve civic, environmental, and community groups in the early stages of planning. The Plan encourages development that respects and supports the distinctive neighborhood orientation of Oakland and everyone's need for access to jobs, housing, services, and recreational areas."[55] Oakland's Citizen Participation Plan clearly articulates how the City of Oakland should engage its citizens in public decision-making processes.[56]

With regard to standards in economic integration of low-income residents, the City of Oakland has several strategies that are triggered by certain government decisions related to development and community design.[57]

- ***Prevailing Wage*** Under State and Local prevailing wages laws, all Oakland contractors and subcontractors on public works contracts must pay prevailing wages as set by the State of California.
- ***Living Wage*** Under city law companies or non-profits that enter into service contracts with the city of Oakland worth at least $25,000 or benefit from at least $100,000 in city subsidies in a year to pay workers a minimum of $9.25 an hour ($8.00 if the firm provides health benefits).
- ***Local & Small Local For Profit and Not For Profit Business Enterprise Program*** This program requires a 20% minimum local business participation requirement for all city construction contracts over $100,000 and all professional services contracts over $50,000. The 20% local business participation requirement must be met with a minimum participation of 10% for Local Business Enterprises (LBE)/Local Not For Profit Business Enterprise (L/NFPBE) and 10% for Small Local Business Enterprises (SLBE)/Small Local Not For Profit Business Enterprise (S/LNFPBE). The City of Oakland also certifies the above categories of enterprises.
- ***Local Employment Program*** The objective of the Local Employment Program is to cause the hiring of Oakland residents for public works and subsidized construction projects on as many prevailing wage jobs as possible, and to encourage businesses to hire local residents for non-City-funded work. Specifically, for work performed at the construction site, this policy establishes a goal of 50% of the work hours, which must be performed by Oakland residents on a craft-by-craft basis. In addition, a minimum of 50% of all new hires on the project (on a craft-by-craft basis) must be Oakland residents, and the first new hire must be an Oakland resident.
- ***Oakland Apprenticeship Workforce Development Partnership System*** OAWDPS requires developers and contractors on city projects or on projects using city funds to meet a 15%

55 Envision Oakland. City of Oakland General Plan. Land Use and Transportation Element. Community and Economic Development Agency, March 1998. Available at http://www.oaklandnet.com/government/ceda/revised/planningzoning/StrategicPlanningSection/Land%20Use%20and%20Transportation%20Element031298.pdf. Accessed on November 20, 2006.

56 City of Oakland Housing Plans, Policies & Laws. Citizen Participation Plan. Available at http://www.oaklandnet.com/government/hcd/policy/docs/citizen_participation_plan.pdf. Accessed on November 20, 2006.

57 Office of the City Administrator. Contract Compliance and Employment Services Division. Programs, Policies, and Ordinances. City of Oakland. Available at http://www.oaklandnet.com/government/cmo/donspage/WebPages/NewWebPages/programsnew.html. Accessed on December 8, 2006

participation resident apprenticeship hire goal that is based on total hours worked and on a craft-by-craft basic. The hours worked may be performed on City of Oakland projects, or 7.5% of the 15% hours worked may be performed by residents apprentices on a non-City of Oakland or Oakland Redevelopment Agency projects.

Complimentary programs for social inclusion in the City of Oakland include those for disadvantaged business enterprises and equal benefits for domestic partners.

D. Current situation of social cohesion, social integration, and community participation.

Social Cohesion

When the MacArthur BART station and the SR 24 were constructed in the 1960's, they divided a previously cohesive neighborhood in half, separating those living on the East side of BART and the highway from those living on the West side. While the neighborhood to the east of the BART station has seen an influx of new residential and commercial development, the neighborhood to the west continues to suffer from physical blight and disinvestment.[58]

With regard to community political engagement, there are 49 named community organizations in the Temescal, West Oakland, North Oakland, and Piedmont areas.[59],[60] Clearly, Oakland is a city where a great many people are concerned and involved in their communities. Oakland is also a city of neighborhoods, and people exhibit pride and ownership in their communities. This is reflected in the General Plan, which solicited input from over 1,000 citizens and makes it clear that the vitality of the neighborhoods is as important as the vitality of the city as a whole.[61]

There are many community organizations on both sides of SR 24 and the MacArthur BART, however, they do not currently appear to interact or collaborate with each other to a significant degree.

Social Inclusion / Integration

West Oakland has the highest poverty rate in Oakland (< 40%) and also has the highest rates of all cause mortality, teen births, tuberculosis, diabetes-related hospitalizations, asthma, and homicides. African Americans have higher rates of almost all chronic disease indicators except breast cancer, higher rates of low birth weight, and higher rates of homicide.[62,63] The area to the west of the proposed MBTV straddles the border between West Oakland and North Oakland, and its demographics more accurately mirror those of West Oakland. The area to the east of the MBTV mirror that of North Oakland.

58 MacArthur BART Station West Side Pedestrian Enhancement Project. (2004) City of Oakland/CalTrans/BART.

59 City Councilmember Jane Brunner District 1 Neighborhood Groups. Available at http://www.oaklandnet.com/government/council/coun_mem/brunner/ngroups.html. Accessed on November 20, 2006.

60 Websearch, knowledge of the author.

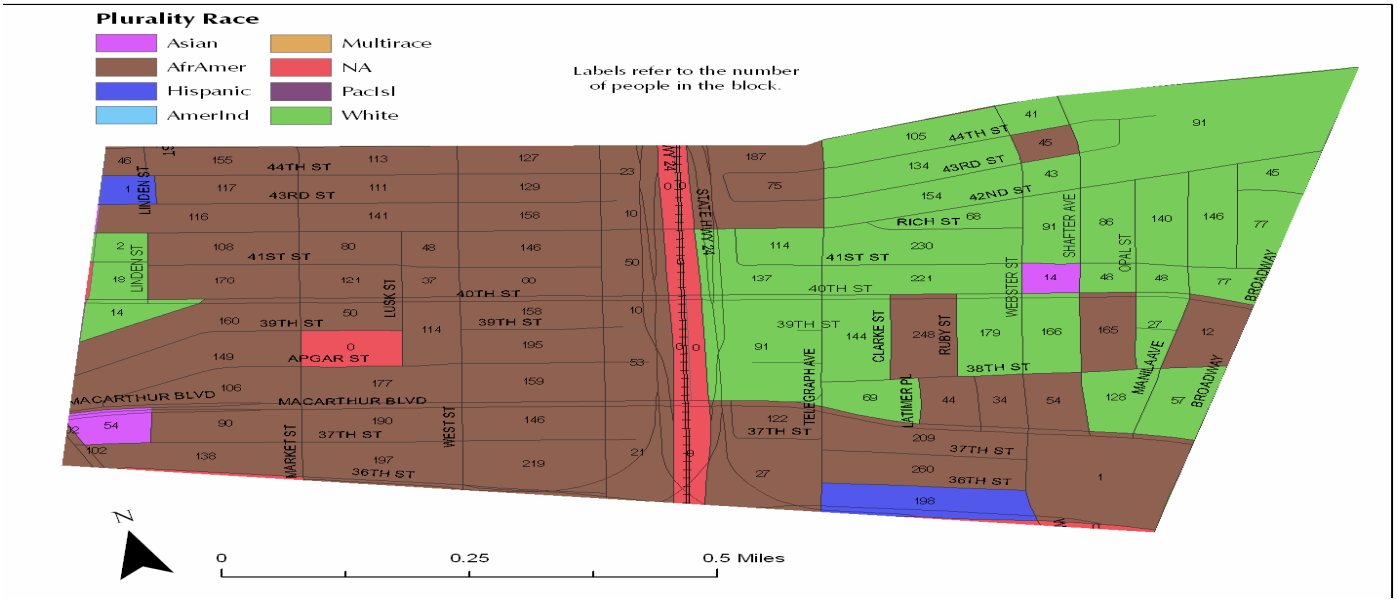
61 Envision Oakland. City of Oakland General Plan. Land Use and Transportation Element. Community and Economic Development Agency, March 1998. Available at http://www.oaklandnet.com/government/ceda/revised/planningzoning/StrategicPlanningSection/Land%20Use%20and%20Transportation%20Element031298.pdf. Accessed on November 8, 2006.

62 Murgai, N. Oakland Health Profile 2004. Alameda County Public Health Department. Community Assessment, Planning, and Evaluation Unit.

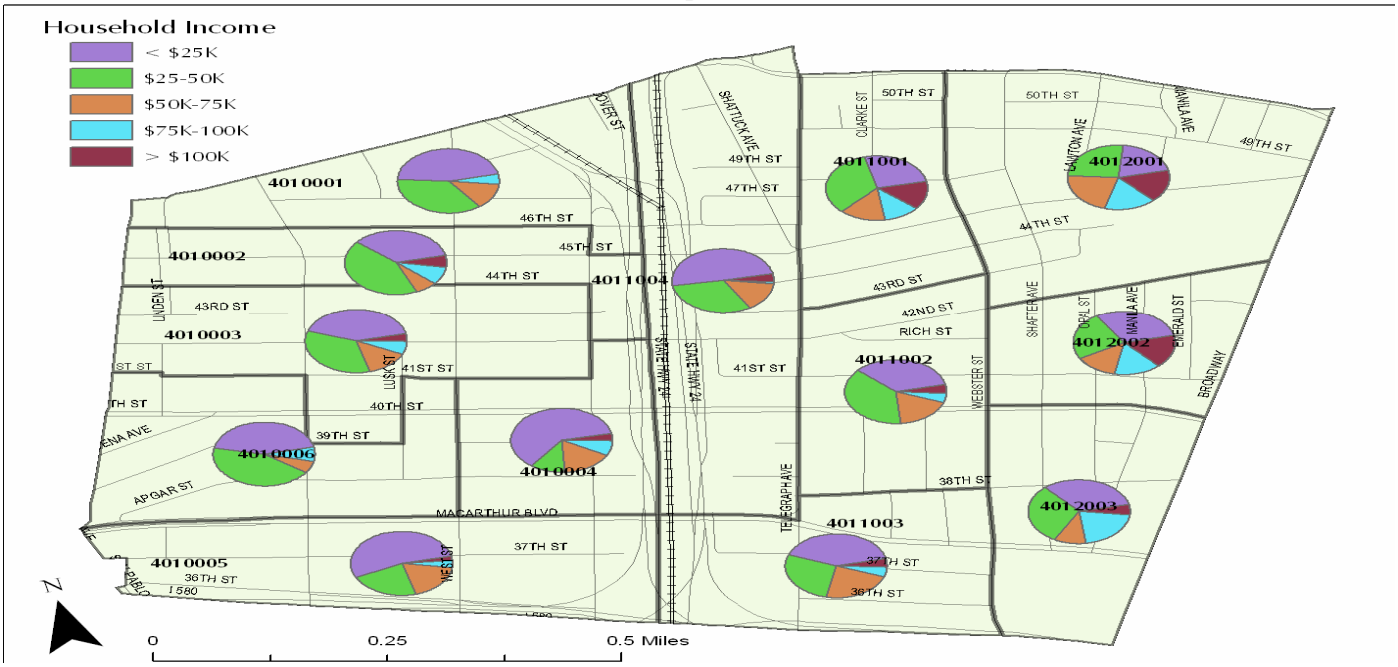
63 Beyers, M. (2006) Violence in Oakland: A Public Health Crisis. Alameda County Violent Death Reporting System 2002-2004. Alameda County Public Health Department.

Census data is instructive.[64] As evidenced by the census maps of the MBTV area below, racial and economic make-up of the East and West sides of SR 24 and the MacArthur BART are significantly different.

MacArthur BART Area Plurality Race



MacArthur BART Area Block Group Household Income



64 US Census Bureau Block Group Data for MacArthur BART Transit Village Area. Alameda County Public Health Department. Community Assessment, Planning, and Evaluation Unit. November 2006.

A community member from West Oakland offered an interesting observation about integration of community activism. She noted that the West Oakland Neighborhood Association (WONA) had not been very active, then "white people moved into the neighborhood and joined the WONA. The Association became more active, but it seemed as though it was just representing the views of the new white residents".[65] Would potential racial integration due to the MBTV have a similar outcome – more community engagement and political involvement representing the newcomers?

One area resident stated that for years, people "from San Francisco" have been moving into the area, and that this has driven up the price of homes to the point of being unaffordable for long-time members of the neighborhood.[66] This change cannot be attributed to the prospective plans for the MBTV, but points to potential displacement due to higher income Bay Area residents seeking a transit-convenient location at an affordable price.

Census data above supports community information that the construction of the MacArthur BART transit stop and SR 24 had splintered a formerly cohesive and vibrant community. One resident likened MacArthur Blvd before the construction to a street akin to Piedmont Ave, "vibrant and full of life and activity". He noted that MacArthur Blvd is currently a haven for drug dealers and other crime.[67]

Public Involvement in Area Planning

The MacArthur BART neighborhood has a history with transportation/land use decisions that have gravely affected the cohesiveness of the community. In the 1950's, with the decline of the railroad industry and the rise of the freeway system, the Cypress freeway was constructed above West Oakland's streets, driving a wedge into the community of West Oakland. This land-use project split the predominantly African-American community of West Oakland in half and uprooted 600 families and dozens of businesses. The community was cut off from downtown and more affluent sections of West Oakland to the east, sandwiched against metalworking shops, railyards, and the Port of Oakland. When the Cypress Expressway collapsed in 1989 during the Loma Prieta earthquake, Caltrans responded to pressure by the West Oakland community to move the roadway west to a location less disruptive to the community and to have minority set-asides in the awarding of contracts for highway construction. Caltrans has said that residents were more involved with this replacement road than any other project undertaken by the agency. Nine years after the earthquake, the reconstruction of 880 was complete. It took nearly a decade for a project that was considered a vital regional link and a high priority project.[68]

A Community Advisory Council, set up by Caltrans in response to the Citizen's Emergency Relief Team (CERT)'s opposition to reconstructing the freeway in its original location, was instrumental in the choice to divert the reconstruction. Of six alternatives, Caltrans chose the one supported by the community. The choice cost over $500 million simply to purchase the new right-of-way alone. The $1.2 billion price tag for the 5.2-mile stretch of asphalt and concrete easily made it the most expensive strip of highway in California history.[69]

Community Involvement in MBTV Planning

Since 1993, the City of Oakland and BART have been working with the community surrounding the MacArthur BART Station in a planning process for the MBTV. A Community Planning Commission (CPC)

65 Gilhuly K. Key informant interviews, MacArthur BART Transit Village Health Impact Assessment. Oct/Nov 2006.

66 Gilhuly, ibid.

67 Gilhuly, ibid.

68 California Department of Transportation. Environmental Justice Case Study: Cypress Freeway Replacement Project. Available at http://www.fhwa.dot.gov/ENVIRonment/ejustice/case/case5.htm. Accessed on November 15, 2006.

69 California Department of Transportation, ibid.

was formed at that time at the impetus of former City Councilor Sheila Jordan. Current City Councilor Jane Brunner eventually inherited the project and has been its champion along with the Community Economic Development Agency (CEDA) of the City of Oakland. The CPC met monthly for many years, and for the majority of the time, community member Walter Miles has headed the CPC. Miles lives just outside the half-mile radius of the MBTV. He has tremendous pride in Oakland and passionate interest in sustainable transportation and economic development. Currently, the CPC meets on an ad hoc basis, only when there is an update on the project.

The CPC list totals approximately 300 people and includes residents of the area around the MacArthur BART, business owners, faith-based organizations, neighborhood groups, other community organizations, and other area developers. The list is primarily North Oakland residents but there also includes staff from different public agencies (BART, AC Transit, Alameda County). The CPC and CEDA decided against making separate presentations to different neighborhood and community groups, and instead to encourage everyone to come to the CPC meetings to enable easier merging of potentially divergent purposes.

The CPC planning process overall has been successful at involving the East side of the MBTV community. Meetings had, according to the chair of the Citizen Planning Committee, between 30 – 100 people in attendance. The membership has changed over the years, as Miles said, "it's hard to sustain interest over that many years." Meeting agendas generally included updates from the developers, the City, or BART and a public comment period. In addition to attending, voicing opinions, taking notes, chairing, and leading the meeting, community members were also involved in the RFP process for choosing a new development team.[70],[71],[72] (See Appendix A for an example of CPC meeting minutes.)

A separate yet related community planning process took place in 2003-04 for Westside Pedestrian Enhancement projects. The West Side process was run by a consultant and funded through a Transportation for Livable Communities (TLC) community planning grant. The process took place through five community workshops involving approximately 25 people at each workshop. Through this process, the community decided on priorities for land-use projects to connect the area west and east of the BART station.

E. Key health assessment questions and results

UCBHIG synthesized qualitative data and information from several sources to how the Mac Arthur BART Transit Village project might affect social cohesion and social exclusion. Our analysis sought to answer several questions listed below:

1. Has participation in the planning process for MBTV been meaningful and inclusive?
2. Does the MBTV planning and implementation process respond to area needs?
3. Does the project planning engage the community in a way that increased social cohesion or social capital
4. What are the area's existing physical and social assets for social cohesion?
5. Will the village contribute to new physical or social assets that contribute to social cohesion, including parks, public plazas, meeting spaces, and other community serving facilities?
6. Will the development provide a means to support cohesion between the west and east sides of SR 24?

70 Miles W, chair of the Citizen Planning Committee for the MacArthur BART Transit Village. Interview, October 30, 2006.

71 Wald Z, Assistant to Oakland City Councilmember Jane Brunner. Interview, November 2, 2006.

72 Kleinbaum K, City of Oakland, Community Economic Development Agency. Interview, November 17, 2006.

7. Will the transit village affect the degree of residential segregation in the area? In Oakland?
8. What are the likely secondary economic effects of the project?
9. Will the village contribute to displacement of existing area residents, either directly or indirectly?

Has participation in the Transit Village planning process been meaningful and inclusive?

Community engagement for MBTV planning included an 1) an ongoing community process and 2) the TLC funded workshop series to flesh out the West Side connector projects. Like Fruitvale Transit Village, the planning process for the MBTV has taken a very long time—to date, 14 years. MTC notes the need for time and commitment in order to have a meaningful community process.[73] For much of that time, monthly meetings were held. The CPC meetings have been advertised via the mailing list, notices in community newsletters, and announcements sent to community groups. Several times over the years, area-wide letters were sent out in an effort to reach beyond those who were active in community groups. Attendees differed throughout the years and the project changed in response to community needs as well as market realities, developer, and City constraints.

Based on the categories in Arnstein's *Ladder of Participation* (See section B), the community involvement in planning for the MBTV falls somewhere between placation and partnership. Placation is defined as when power-holders select community members to participate on the planning committee, which is how CPC chair Walter Miles was originally involved in the project. However, community members have served on committees to select the new developer, to decide on the West Side Pedestrian Enhancement projects, and the community's opinion has been sought and served as the basis for decisions ranging from what the community center should be, what type of retail should be sought, and whether there should be large towers or not as part of the design. Notably, most people interviewed by UCBHIG who had been involved with the CPC felt that the community involvement had been exemplary. One person even stated that sometimes there was too much community involvement, because, in her opinion, "that can delay the construction of a good project."[74]

While the CPC demonstrates sustained participation in the process by an interested group of residents, it does not necessarily represent broad and diverse participation by the entire area affected by the MBTV. Most of participation on the CPC TV appears to come from residents on the East side. In contrast, the 2003 the West Side Pedestrian Enhancements Study represented a specific effort to involve West side residents more actively.[75],[76], [77] Relying on the CPC is likely insufficient to represent the needs and aspirations of the entire community affected by the MBTV project; however, the practical challenges of creating and maintaining long term and inclusive participation must also be acknowledged.

In qualitative key informant interviews conducted by UCBHIG in November 2006 (n=16, 7 retail, 10 resident [2 are both retail and residents]), 8 or 50% knew of the proposed project. What this sample shows is that while the quality of participation at the meetings and ongoing commitment to community involvement by the lead agencies (CEDA and developer) is quite good, based on our small convenience sample, the breadth of participation may be limited. People who knew about the project tended to be business owners who had been in the community for a longer period of time and residents of the East side.

73 Transportation for Livable Communities: Works in Progress…Building a Better Bay Area, ibid.

74 Gilhuly, ibid.

75 Wald, ibid.

76 Miles, ibid.

77 Kleinbaum, ibid.

Does the project planning engage the community in a way that increases social cohesion?

The CPC's decision to bring all individuals and groups to one meeting space for the CPC meetings (as opposed to making presentations at all community-based organizations and neighborhood groups) is useful for social cohesion of the CPC as well as moving the process forward. Kathy Kleinbaum of CEDA noted that every group has their own concerns, and if they are all in one room they can work together. This is true, though, only if all groups are in the room. However, the direct value to building social cohesion does not extend beyond the participants of the CPC.

In terms of growth and strengthening of existing organizations and their networks, one member of the Mosswood Park Neighborhood Association (formerly the 38th Street Neighborhood Association that has expanded) stated that she felt her group had grown and become more active in response to concerns and participation in the MBTV as well as another nearby project, the Kaiser Permanente expansion.[30] It is unclear if the CPC would continue to exist as an organization once the project is completed, however some members have become more involved in their community and could migrate to other neighborhood groups.

The pending implementation of the MBTV offers an excellent opportunity to re-energize outreach efforts to include more neighbors and organizations that represent the West side. The public review process for the Environmental Impact Assessment process could provide an effective vehicle to listen to and incorporate the needs of a broader community.

Does the MBTV planning and implementation process respond to area's environmental and social needs?

The table below describes community needs and actions/design elements included in MBTV planning that meets these needs. As illustrated in the table, the project as currently designed is responsive to a number of existing and established community needs. This Health Impact Assessment identifies additional potential ways the project could enhance social and health objectives, including pedestrian-oriented improvements on MacArthur Blvd and area-wide retail destinations uses on the West side.

The table below outlines community needs that have been identified through various processes, the ways that the MBTV project as currently planned will address those needs, and actions that could be taken to address community needs that have not been explored.

Identified community needs	*How needs were compiled*	*Needs addressed by MBTV Planning*	*Needs not addressed by MBTV Planning*
Reconnect East and West	CPC*, constituent communication - Brunner's office, West Side Ped Enhancement Process[78], UCBHIG**	MTC Transportation for Livable Communities (TLC) community involvement grant to design connector projects, TLC capital grant to implement 40th Street connector	--Tunnel connection currently deferred for safety and expense reasons. --Nothing studied or planned for MacArthur Blvd.
Jobs for community	CPC, UCBHIG	Project goals include: --Retaining local consumer dollars within neighborhood --Offer basic services near the MBTV so residents can meet their needs locally	--Assess if local businesses have the capital and business plan to continue --Economic projections of what it might take for businesses to succeed --Set-aside hiring agreements

78 MacArthur BART Station West Side Pedestrian Enhancement Project. (2004) City of Oakland/CalTrans/BART.

			with contractors for local employment
Useful retail for community. **Specifically a grocery store.**	CPC (see Appendix A)[79], UCBHIG[80]	--38,000 square feet of retail --Recruitment for 50,000 sq ft grocery store unsuccessful. Current plan for15,000 ft grocery store. Trader Joe's is going in on Broadway (about 1.3 miles away) --Rejected proposal for a Target at MBTV site	--No retail recruitment plan -- Property contractor not named as yet --Asses if local businesses want to continue
Revitalize surrounding area (Telegraph Ave, MacArthur Blvd, MLK)	Oakland Redevelopment Authority Plan[81], CPC, Oakland General Plan	--Telegraph Streetscape Plan --___% of retail for MBTV on Telegraph --Non-MBTV Housing development on MLK moving forward	--Study revitalization improvements for MacArthur Blvd -- Encourage business development on MLK
Safety from crime	CPC, UCBHIG, West Side Ped Enhancement	--Will have security at Village --Lighting at Village --Design elements to encourage eyes on the street --Design elements for 40th street connector to encourage more light	
Community space	CPC, UCBHIG	--5,000 square feet of community space planned, most popular idea is child care	--Potential programming for youth (i.e., teens) and wider community
Neighborhood economic and racial integration	CPC, UCBHIG	--West side housing development projects --Architectural mitigations to integrate BMR housing and market rate real estate	--Construction contract set-asides
Parking	CPC, UCBHIG	--300 parking spaces retained at expense of City of Oakland --Resident permit parking planned for surrounding community to discourage	--Analysis of effect of decreased parking --Analysis of effect of unbundling parking cost to unit sales

79 Buss M. MBTV November 2004 MBTV CPC meeting minutes. Aegis Equity Partners. Accessed from the Community Economic Development Agency. See Appendix A.

80 Gilhuly K. Minutes from October 2006 CPC meeting.

81 Redevelopment Agency of the City of Oakland. (2000). Redevelopment Plan for the Broadway/MacArthur/San Pablo Redevelopment Project. City of Oakland. Community Economic and Development Association. Available at http://www.business2oakland.com/main/documents/B-M-SPredevelopmentplan.pdf. Accessed on November 20, 2006.

		transit commuters to park there	

*CPC – Citizen Planning Committee.[82],[83],[84]

**UCBHIG – University of California Berkeley Health Impact Group.[85]

The community has consistently raised the issue of crime and safety in the MBTV. The MBTV process will directly affect the economic integration of the east side of SR 24 and therefore may realize improvements in community violence particularly for low income residents of this area. In an evaluation of rental voucher assistance programs, low income families residing in public housing in poverty neighborhoods experimentally moved into non-poverty neighborhoods reported less crime and less risky youth behavior, among other outcomes.[86] Cumulatively, reduced risky youth behavior and more retail activity can increase perceived safety and reduce crime incidence. However, given the physical division of the east and west side of SR 24, we cannot expect these potential benefits to be realized for all area residents equally.

The experience of other transit villages provides additional evidence that the MBTV may improve safety. The Fruitvale Transit Village (FTV) has made the area much safer than before its construction, in part due to intensive security investments, estimated at approximately $250,000 a year.[87] Issues of safety discourage being out-of-doors, which will impact neighbors' ability to interact. MBTV plans, similar to the FTV, include hiring security and incorporating design elements to encourage more "eyes on the street", such as doors and stoops facing the streets.[88]

Based on resident and shopkeeper interviews conducted by UCBHIG students for this analysis, priority issues for area residents include safety, economic revitalization, and opportunity for youth, better retail and in particular a grocery store, upgrade of housing stock, parking concerns, and that the MBTV be family-friendly. Overall, needs of non-participants seem to mirror those of participants, with an extra emphasis on providing community space and opportunity for youth. Some residents raised the concern that the separation of affordable housing in a separate building would lead to a "mini-project", or a building where crime would flourish.[89] Overall, we find no evidence that this would be the case. The BMR (Below Market Rate) housing is private rental housing and not subsidized housing that typifies "projects", and thus is likely to attract higher-income tenants than the key informant is considering. In addition, the developer has incorporated architectural design elements that encourage cohesiveness of the BMR building with the market-rate buildings. Nonetheless, this comment underscores need for more outreach and education by the developer, City, and CPC to get "buy-in" on the part of the West side residents.

What are existing physical and social assets for social cohesion?

Informal social networks exist as casual contacts between neighbors and strangers in the public realm. Jane Jacobs, in her seminal book on urban planning and commentary on public life, stated that mixed

82 Walter Miles, chair of the Citizen Planning Committee for the MacArthur BART Transit Village, interview, October 30, 2006.

83 Zac Wald, Assistant to Oakland City Councilmember Jane Brunner, interview, November 2, 2006.

84 Kathy Kleinbaum, City of Oakland, Community Economic Development Agency. Interview, November 17, 2006.

85 Gilhuly K. Key informant interviews, MacArthur BART Transit Village Health Impact Assessment. Oct/Nov 2006

86 Anderson LM, St. Charles J, Fullilove MT, Scrimshaw SC, Fielding JE, Normand J, Task Force on Community Preventative Services. Providing affordable family housing and reducing residential segregation by income:A systematic review. Am J Prev Med 24(3);Suppl 1:47-67.

87 Pace, ibid.

88 Minutes: October 6, 2006 CPC Planning Meeting.

89 Gilhuly, ibid.

use, i.e., a mixture of residential, retail, and business use, provides neighbors with the opportunity for casual contact.[90]

A number of settings in the MBTV area are conducive to informal social contact (See Table Below).[91] Parks and other outdoor spaces are important to bring together diverse groups where they can encounter each other in an open and inviting atmosphere.[92] Mosswood Park is less than a half-mile away from the MBTV, and has programming for basketball, after-school activities, dance, and a child care center. The park is staffed, safe during the day, and well maintained. Groves Shafter Park I, II, III are listed as parks but really are no more than weedy areas in the interchange of on- and off-ramps. While there is a gazebo and basketball courts, the "park" has a dangerous feel, is home to the homeless, and is not conducive to social interaction of non-homeless residents.

Existing, Planned, and Potential Physical and Social Resources for Social Cohesion

Existing Resources	Planned MBTV resources	Potential Realizable MBTV Resources
Mosswood Park		Routine maintenance on sidewalks and pedestrian elements to encourage walking
	5,000 sq. ft. for childcare facility or other community space	
Churches	Public Plaza, outdoor gathering space	Programming for community space
Limited local retail	38,000 sq. ft. for retail	Locating any grocery store on the West side
Network of community groups on East side; unconnected community groups on West side		Connect the West side community groups through ongoing planning to the MBTV goals

Churches offer communities public use of meeting space and worship. In the immediate area there are approximately 28 churches, most notably the Beebe Memorial Church which has been hosting the CPC meetings.[93] Beside churches, there are no community gathering spaces in the MBTV area.

While Telegraph Ave and Martin Luther King, Jr. Way are mixed use, neither is a high-traffic retail destination. Telegraph Avenue has small specialty stores for hair braiding, several ethnic restaurants, an independent coffee shop, a national chain fast food store, day surgery center, a liquor store. MLK, on the

90 Jacobs, J. (1993) The Death and Life of American Cities. Modern Library Edition. NY: Random House.

91 Ewing R, Frank L, Kruetzer R. (May 2006). Understanding the relationship between public health and the built environment: A report prepared for the LEED-ND Core Committee. (find the website)

92 Low S, Tapin D., & Scheld S. (2005). Rethinking Urban Parks: Public Space and Cultural Diversity. Austin: University of Texas Press.

93 MacArthur BART Business Director Listing. Alameda County Public Health Department, Community Assessment, Planning and Evaluation (CAPE) Unit. November 2006.

West side of the project, has several auto parts and maintenance shops, an African-American bookstore, and a newly renovated café. Casual social contact, of the type that happens between residents of the same neighborhood who patronize the retail and service components of that neighborhood, can be strengthened by ensuring that new retail will be used by current and future residents.

Will the village contribute to new physical or social assets that contribute to social cohesion, including parks, public plazas, meeting spaces, and other community serving facilities?

Because TOD encourages people to get out of their cars, the MBTV is likely to encourage casual social contact among pedestrians. For example, research shows that those who live within a ½ mile of rail stations walk about half of all of their short trips (trips of up to one mile) compared with only about one quarter of such trips walked by residents outside this range.[94]

However, pedestrian behavior can be significantly affected by design, use, and social factors other than transit access. During a site assessment for pedestrian quality undertaken by UCBHIG, the assessment team found the pedestrian environment to be adequate but not inviting for casual social contact. [95] There were very few places for resting, i.e., public benches or plazas. West side main thoroughfare sidewalks were in some disrepair, there was little landscaping, limited welcoming retail, and a fair amount of abandoned buildings. Side streets, however, appeared more inviting, with some landscaped residences and wide sidewalks. Improving the quality of the pedestrian environment (walkability) can support or discourage walking, through which neighbors can casually interact and start to know one another.

38th Street running from Telegraph west currently dead-ends and offers no access to BART. The project plans to open it up to flow through the transit village and exit onto MacArthur. Likewise, the current vehicular entrance to BART will be made into Village Drive, which will continue through the project and exit onto Telegraph. These streets and their accompanying sidewalks will open up this formerly enclosed and isolated parking lot to the Telegraph/40th/MacArthur streets and could generate social interaction between the MBTV and the East side. The West side remains connected primarily via 40th street (see discussion below of West/East connectors).

The MBTV project will add a green space with trees directly across from the BART plaza. There will be trees and benches, and this space has potential for public use and to encourage social interaction. The City states that this will create a “sense of place for the neighborhood” and will have “outdoor gathering space”.[96] At this time there is no plan for programming for outdoor activity in the fairly small green areas.

The project will create a rectangular corridor planted with trees running from Village Drive to 38th in the middle of the Village. This will be a pedestrian corridor, raised above street level with wide stairs designed to encourage sitting and casual encounters. The small plaza is not envisioned for public events, but is designed to connect the buildings to one another and to BART, to encourage casual contact of residents, and also provide ease of entry to BART.

Throughout the planning process, the community has expressed the need for a community center of some sort, and 5,000 square feet of community space has been incorporated into the design of the MBTV. Through the course of the CPC meetings, input was solicited from residents about what type of use would best serve the community, and the community expressed a slight preference for a childcare center. While the developer and CEDA appear enthusiastic to provide the child care center, there are

94 MTC. Characteristics of Rail and Ferry Station Area Residents in the San Francisco Bay Area: Evidence from the 2000 Bay Area Travel Survey. Volume I, ibid.

95 UCBHIG. Pedestrian Environmental Quality Index. November 2006. Available at http://169.229.208.153/hiawiki/index.php/Main_Page.

96 Kleinbaum, ibid.

legal constraints they have to investigate further, such as a new law requiring that childcare centers be a certain distance from freeways and the mandated amount of outdoor play space required.[97],[98]

Will the development provide a means to support cohesion between the west and east sides of SR 24?

One of the stated goals of the development and planning process for the MBTV partnership (between the City of Oakland, BART, and the CPC) was to repair the divide created by the construction of the MacArthur BART station and Highway 24.[99] The West Side Pedestrian Enhancement Study involved the community in studying two ways to reconnect the East and West sides: improving 40th street between MLK and Telegraph, which is the main entrance to the BART and creating a tunnel under SR 24 to connect the West side and BART. A TLC community planning grant was awarded, and a series of 5 workshops with approximately 25 residents each guided the scoping of two connecting projects between the West side and East side.[100]

97 Kleinbaum, ibid.

98 CPC minutes, November 15, 2004. Available from K. Kleinbaum, CEDA, City of Oakland.

99 Bay Area Rapid Transit. Planning document: MacArthur BART Station. Available at http://www.bart.gov/about/planning/alameda.asp. Accessed on November 4, 2006.

100 MacArthur BART Station West Side Pedestrian Enhancement Project. (2004) City of Oakland/CalTrans/BART.

Reconnection Strategies considered in the Westside pedestrian enhancement project

	40th Street Corridor Improvements	Westside BART Tunnel Entrance
Goal	Safety; BART access from the Westside of SR 24	
Actions	Increased natural and artificial lighting; tree and median plantings, benches; artwork.	Tunnel feasibility studies in 1993 and 2004
Costs	Estimated cost: $3.5 million.[101]	Estimated cost in 2004: $10.6 million.
Status	Some 40th Street improvements are funded and will likely begin breaking ground in 2007.[22]	No further action planned.

As described in the report and summarized in the table above, improvements to the 40th street underpass are funded and scheduled for implementation. However, following the planning study, the Macarthur BART CPC voted to not support a Westside Pedestrian tunnel entrance for BART. Safety, cost, and structural feasibility were provided as the main reasons for this decision.[102,103,104] The engineering of the tunnel would require turns and corners, creating blind spots. In the absence of a full-time dedicated security staff at the BART plaza, safety concerns were high. The tunnel raised many structural feasibility issues as well. For example, one of the options would require that the BART escalators be moved, which would impact the nearby electrical equipment and the train platform. Difficulty in phasing might also necessitate the need for service interruption on BART and the freeway. The $10.6 million cost was considered by the CPC to be expensive. It is anticipated that future feasibility studies for a tunnel may still occur through BART's capacity analysis through its Comprehensive Station Area Plan (CSP) planning process. The CSP provides a solid context for examining complex engineering and operational issues of moving elements within BART stations and joint development efforts.[29,34]

While UCBHIG does not believe a Westside tunnel is essential to mend the physical division of this community, we do note that there exists precedents for generous spending on community projects that address externalities of transportation projects. $13 million was spent from state highway operation funds to transform the old Cypress corridor, where 880 was formerly located, into Mandela Parkway, a landscaped boulevard with trees, benches, fountains, walking trails, and a Welcome to Oakland arch.[105]

Improvements to West Macarthur Boulevard between MLK and Telegraph might also be a potential undervalued mechanism to reconnect the west and east sides of the community. MacArthur Blvd. presents opportunities for pedestrian, bicycle, and transit enhancements given its current six lane configuration. Such improvement would serve to connect West side residents to Mosswood Park and other East-side amenities. Several reasons were given by City staff for omission of such improvements in planning efforts. In general, improvements to 40th street gained higher priority due to the current location of the pedestrian and drop off entrance to BART and the perceived lack of safety of 40th Street. Staff also

101 MacArthur BART Station West Side Pedestrian Enhancement Project, ibid.

102 Kleinbaum, ibid.

103 Miles, ibid.

104 Jason Patton, Oakland Pedestrian Safety Project. Interview, November 17, 2006.

105 California Department of Transportation. Environmental Justice Case Study: Cypress Freeway Replacement Project. Available at http://www.fhwa.dot.gov/ENVIRonment/ejustice/case/case5.htm. Accessed on November 15, 2006.

cited the need to have land use plans for the MBTV inform decisions related to future planning of this street. Given that the tunnel originally desired by the community was determined to be infeasible, pedestrian oriented improvements Mac Arthur Blvd appear to be ripe for study as a connector between East and West.

The community and the City have been persistent in encouraging housing development on the West side of the MBTV. Historically, the MBTV sought to connect the West Side and East side via the MBTV, however this objective was abandoned many years ago when the development team changed. The CPC and CEDA have kept this goal active, and there are other developments on private and City-owned land on several housing development projects on the West side of the freeway.[106],[107],[108] According to CEDA, one development with 74 units of housing planned is scheduled to begin construction within a year and another with 60 units of affordable housing-to-own is also on deck. There are other projects that will be developed "as parcels become available."

Other strategies to increase the physical and social cohesion between the East and West side, might include locating a grocery store on the West side or developing an active community center with programming for youth at the Transit Village.

Will new housing at the transit village affect residential integration in the area by class or ethnicity?

As planned the project will bring about 500 new households to the area. Households able to purchase the market rate units will have incomes significantly higher of the area median income MBTV residents will be. The table below illustrates some demographic characteristics of the area relative to characteristics of households living near regional transit. If households similar to those traditionally living near transit stops move into the MBTV, the project will likely promote a very different racial and economic mix than currently exists in the area, particularly for the West side of SR 24. This will directly increase integration at the neighborhood level with regard to economic status.

	Region ½ mile of a transit stop[109]	West side of MBTV Area[110]	East side of MBTV Area
Median Income	$53,000	$39,987	$47,639
African-American	8%	70.5%	28.3%
White	46%	9.2%	43.2%
Hispanic	17%	9.6%	10.2%

106 Miles, ibid.

107 Wald, ibid.

108 Kleinbaum, ibid.

109 MTC. Characteristics of Rail and Ferry Station Area Residents in the San Francisco Bay Area: Evidence from the 2000 Bay Area Travel Survey. Volume I. Metropolitan Transportation Commission. Planning Section. September 2006.

110 US Census Bureau Block Group Data for MacArthur BART Transit Village Area. Alameda County Public Health Department. Community Assessment, Planning, and Evaluation Unit. November 2006.

Asian	23%	6.1%	12.1%
Other	6%	4.6%	6.2%

Typically, many households tend to relocate out of low income and racially segregated neighborhoods when their economic status permits. Increased economic integration and the new housing opportunities in these transit villages might be particularly appealing to upwardly mobile households and provide them an opportunity to remain in the neighborhood.

The 100+ BMR rental units may offer another housing choice for low- to moderate- income residents who are struggling to find affordable housing. The placement of BMR in a building separate from the market-rate housing raises a concern that the project will not create opportunities for interaction between classes. Such segregation of housing within a project is not necessary. In the Fruitvale Transit Village, affordable housing and market rate housing are within the same building, side by side and the annual household incomes of neighbors range from <$20,000 - >$200,000 (median income of FTV is $53,000).[111,112]

While potentially increasing the area's economic diversity, the project may not permit diversity with regard to household size. According to CEDA, the current average size for MBTV units will be about 900 sq. ft., most likely one or two bedroom units.[113] Community members interviewed by UCBHIG have raised concerns that people who purchase condominiums do not reflect the family nature of the neighborhood.[114] Most residences in the area at present are single-family homes with at least 3.1 rooms each – on average, they house 4.0 individuals each.[115] Dwellings that are all solely 1-2 bedrooms each may not be sufficient for families with children; on the other hand, the limited supply of larger homes available in the area may lead some families to accept the smaller size as a trade-off with location.

What are the likely secondary economic effects of the project?

As discussed above, the City of Oakland places several requirements on City sponsored or supported construction and development projects that provide a local economic benefit to residents. A description of the local social inclusion mandates applicable to the MBTV project are identified in the table below. Enumeration of the specific benefits (e.g., number and duration of local prevail wage jobs produced by the project) was not possible based upon current public project information.

Economic Opportunity Mandate	Applicability to MBTV	Project impacts on Oakland Residents
Prevailing Wage	**YES?**	**TBD**
Living Wage	**YES?**	**TBD**
Local & Small Local For Profit and	**YES?**	**TBD**

111 Jeff Pace, Vice President of Finance and Business Opportunity. The Unity Council. Interview, November 10, 2006.

112 Gilhuly K. Key informant interviews, MacArthur BART Transit Village Health Impact Assessment. Oct/Nov 2006.

113 Kleinbaum, ibid.

114 Gilhuly, ibid.

115 US Census Bureau Block Group Data for MacArthur BART Transit Village Area, ibid.

Not For Profit Business Enterprise Program		
Local Employment Program	**YES?**	**TBD**
Oakland Apprenticeship Workforce Development Partnership System	**YES?**	**TBD**

The MBTV will result in an increase in residents with higher incomes. Indirectly, this influx of new residents will also create new markets and thus will be likely to lead to increased retail diversity and density. Such changes along with the proximity to transit may make the area a more desirable place to live and cause property values in the entire area (beyond MBTV) to rise.

The Fruitvale Transit Village began with 45,000 square feet of retail, more than the MBTV's 38,000 square feet. At the FTV, they have more than 300 jobs on-site three years into the project, and an expectation of a total of about 400+ when fully occupied by 2008. Most of the retailers are small businesses, so the owners and their family members, who may or may not be local residents, work in the stores. The record of success with local entrepreneurs is mixed, and one lesson learned is the necessity of vetting out the financial acumen of interested retailers. [116] There is potential for collaboration with the City in developing the capacity of local businesses through a program for creating business plans.

Another opportunity for secondary economic effects of the MBTV to benefit the local community is for the City to require that the chosen construction contractors have "set-asides", or requirements for hiring a certain percentage of local workers, such as the project to rebuild the Cypress Freeway (880) did, as detailed in Section B above. While these jobs are technically temporary, they could serve to train residents in new skills and offer connections to future employment, while providing a livable wage for several years. The construction in the Cypress Freeway Project started in 1993 and was completed in 1998, totaling 5 years of jobs in the construction industry. The documentation of the Cypress Freeway Project did not include how many jobs were created, however, the total amount of money spent on construction was approximately $475.8 million, of which 43.9% went to Disadvantaged Business Enterprises and 19.5% went to Local Business Enterprises.[117]

Will the MBTV induce residential displacement indirectly or directly?

The project will not result in direct displacement of existing residents however, transit villages may raise the property value in the surrounding area and thus indirect involuntary displacement is a long term potential outcome of this project.[118] Indirect displacement can occur when rental prices increase or when rental units are sold or converted to ownership tenure. Overall, which the experience with redevelopment in other parts of the country provides evidence for the dynamic of such forms of indirect displacement, the timing and magnitude of such effects in a particular context are difficult to predict or quantify.

Currently, there is approximately 5% vacancy in the MBTV area which suggests that the long-term potential for displacement due to rental cost increases or a property conversion is real. On the West side,

116 Jeff Pace, ibid.

117 California Department of Transportation. Environmental Justice Case Study: Cypress Freeway Replacement Project, ibid.

118 Transportation for Livable Communities: Works in Progress…Building a Better Bay Area. (2004) Metropolitan Transportation Commission.

there is a 7% vacancy rate, and on the East side there is a 4% vacancy rate.[119] In other cities, a vacancy rate of 5% has been labeled a "housing emergency",[120] however, at the height of the housing shortage in the Bay Area, vacancy rates were at 1-2%[121]

Notably, the Fruitvale Transit Village has already had an effect on the property values. While all Bay Area property values have risen, the Unity Council (the community development agency that led the planning and implementation of the FTV) does attribute the attractiveness of the transit village with having an impact on property values.[122] Given their experience, it is likely that the property values in the MBTV area will also rise. One local landlord felt that his rental rates would not change, because his tenants cannot afford to live in the transit village.[123]

In qualitative research, most community members welcomed mixed income neighbors in the hope that it would improve the neighborhood, and did not appear overly concerned about displacement. One man noted that housing values have been increasing for many years whether or not the MBTV is implemented. Miles, the chair of the CPC, maintains that the MBTV will not displace anyone given that there is nothing in the project area now except for a "big hole in the ground", i.e., the parking lot. However, his comment appears to address only direct displacement and does not take into account potential indirect displacement in the neighborhood.

F. Recommendations for design and mitigations to promote social cohesion and prevent social exclusion

Based on our understanding of the community planning process and plans made to date, the following recommendations may help the Mac Arthur Bart project make a greater positive impact on social cohesion and social inclusion.

1. ***Implement additional strategies to include more west side residents in the design and planning for MBTV***. Specific strategies could include:

- Conduct outreach to households and businesses on the West side;
- Host CPC more planning meetings West side locations or in collaboration with Westside organizations such as churches'
- Solicit input for future design and development decision via surveys, focus groups and key informant interviews;
- Establish a "community window" on the planning process in a storefront on the West side (e.g. MLK Avenue).

o Involve churches in outreach

o Performing key informant interviews not unlike the ones performed by UCBHIG project members.

119 US Census Bureau Block Group Data for MacArthur BART Transit Village Area. Alameda County Public Health Department. Community Assessment, Planning, and Evaluation Unit. November 2006.

120 Schwartz A. New York City and subsidized housing: Impacts and lessons of the City's $5 billion capital budget housing plan. Housing Policy Debate 10(4):839-877.

121 Budd S. Independent realtor, private communication, November 21, 2006.

122 Pace, ibid.

123 Gilhuly, ibid.

2. ***Integrate Below Market Rate and Market Rate housing on the project site.*** Currently the design for the MBTV calls for separate buildings to house the rental (affordable) units and the market rate units. The project team could study how to blend funding streams to allow for integration of income levels.

3. ***Create common walking routes and meeting points that encourage interaction.*** If the housing types are not to be integrated, crossing points and common paths of access where residents from different project structures come in contact with one another would encourage interaction between the Bridge Housing (affordable) building and the market rate buildings. Design strategies might include a common courtyard with benches, plants, and fountains in order to create common spaces through which dwellers pass and mingle.

4. ***Facilitate economic development of MLK between 40th and MacArthur Blvd***. One reason of the many reasons given for not pursuing the tunnel design as a second entrance to the MacArthur BART transit village is that MLK is not a viable economic driver. The Redevelopment Agency should make funding and initiating programs that encourage investment by retail and business on the West side a priority. Locating the planned grocery store on the West side would have a huge impact on the connectivity and social integration of the East and West side.

5. ***Encourage locally-owned business development at the MBTV and on MLK.*** City programs that offer low-income loans to small businesses and technical assistance for business planning could help to integrate minority-owned business and revitalize the neighborhood in an equitable way. One of the lessons learned in the Fruitvale Transit Village is that businesses moving in often did not have an accurate vision for what would be needed in terms of capital and expectations for growing their businesses.

6. ***Solicit funding to hire a community program coordinator.*** This position could coordinate use, programming, and maintenance of the community center. The position could also coordinate larger community-wide events, such as the Fruitvale Transit Village's Dia de los Muertos, which drew over 100,000 people to the FTV this past October.

7. ***Study MacArthur Boulevard as another Connector Project.*** MacArthur Blvd has a history of being a lively street that served as a center of activity. The street is currently crime-ridden and foreboding. Mac Arthur presents opportunities for pedestrian, bicycle, and transit enhancements given it current six lane configuration. Such improvement would serve to connect Westside residents to Mosswood Park and other East side amenities.

8. ***Continue to study the feasibility of a Westside BART station entrance/tunnel with regards to safety, structural feasibility, and cost. .*** Given its potential value to health and equity, following through on plans to further study a tunnel connector between the West and East sides is to be encouraged, with a particular focus on:

- ways to mitigate safety concerns;
- technical and engineering concerns;
- creative funding sources;
- design of potential plaza space at the end of 39th Street and design of the tunnel entrance;
- establish the social value of the connection/social costs of not building the tunnel.

9. ***Develop programs to retain low-income residential tenants vulnerable to displacement.*** The potential for displacement in lower-income areas of the MBTV project is valid. The City should offer incentives or subsidies for landlords who currently own buildings to retain their tenants.

10. ***Step up routine City maintenance of current infrastructure.*** Increased commitment to routine maintenance of sidewalks, medians, parks, and other parts of the public realm can have a positive impact on residents' perception of the safety of their environment as well as the conclusion that the City has an interest in their neighborhood.

11. ***Establish a Community Benefits Agreement that sets aside agreed-upon percentages of local and minority filled job placements***. In addition, the CBA should create a monitoring body to ensure that its requirements are being met.