South Downtown Tacoma Subarea Plan Health Impact Assessment

By the University of Washington HIA Graduate Class
Editors: Kristina Blank, Eric Howard, Katie McCabe, and Lina Pinero Walkinshaw

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The University of Washington ENVH536 / URDBP536 Health Impact Assessment Class:

Claire Allen, Elizabeth Ambriz, Kristina Blank, Lara Bomfim, Halley Brunsteter, Erica Bush, Heather Carrie, Shayla Compton, Tara Corbridge, Leonardo Bocanera Ferreira, Kate Forand, Kristen Gelino, VeraEve Giampietro, Eric Howard, K. Olivia Lutz, Katie McCabe, Jonathan Nagata, Trevor Peckham, Rekha Ravindran, Sierra Rotakhina, Dillon Roth, Larissa Stassek, Linda Sharee Squires, Dale Terasaki, Christine Tran, Lina Pinero Walkinshaw, Stefanie Young

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Andrew L. Dannenberg, MD, MPH
Affiliate Professor, Department of Environmental and Occupational Health Sciences, School of Public Health, and Department of Urban Design and Planning, College of the Built Environments, University of Washington
Consultant and former Team Lead, Healthy Community Design Initiative, National Center for Environmental Health, Centers for Disease Control and Prevention

Fritz Wagner, PhD
Dean Emeritus, University of New Orleans College of Urban and Public Affairs
Research Professor, Department of Urban Design and Planning, UW College of the Built Environments
Managing Director, Northwest Center for Livable Communities

Barbara Wright
Formerly with Public Health Seattle & King County

Ian Munce
Planning Services Division, City of Tacoma

Cheri Gibbons
Urban Planner, Planning & Development Services, City of Tacoma

Cindan Gizzi
Community Assessment Manager for the Tacoma-Pierce County Health Department

Mike Fitzgerald
Assistant to the Chief for Budget and Finance for the Tacoma Fire Department

Danielle Larson
Tax and License Manager for the City of Tacoma's Finance Administration

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EXECUTIVE SUMMARY

INTRODUCTION

The way we design and build our communities has significant impacts on individual and population health, safety, and well-being. Planners and health professionals can work together to create living conditions and environments that allow people to adopt and maintain happy, healthy lifestyles.

This health impact assessment (HIA), conducted by a team of University of Washington (UW) graduate students, identifies potential health concerns and action items for the City of Tacoma's South Downtown Subarea Plan. HIAs are an emerging method for considering how policies, plans, and projects potentially affect human health both positively and negatively. The overall goal of an HIA is to present practical recommendations that lead to health-supportive actions by decision makers. An HIA of the South Downtown Subarea Plan was deemed appropriate after the Plan's authors were approached and they expressed interest in receiving it.

ABOUT THE SOUTH DOWNTOWN SUBAREA PLAN

The South Downtown Subarea Plan, from here on referred to as the SAP, is an innovative, area-wide, long-range plan to promote economic development in South Downtown Tacoma. With significant population growth projected in this area, the plan highlights planning and policy interventions that will provide a broad range of equitable social, environmental, and economic benefits at both local and regional scales.

Tacoma's South Downtown Subarea, from here on referred to as the Subarea, currently has relatively low population density, with only approximately 2,400 residents covering around 600 acres. The Subarea's residents are more racially diverse, younger, and less affluent than Tacoma residents as a whole. The Subarea extends across five distinct districts, including the Dome District, Brewery District, and University of Washington Tacoma/Museum District, as well as the southern portions of the Hillside Neighborhood and the Thea Foss Waterway. A multi-modal transit hub located in the southeastern portion of the Subarea provides some of the most comprehensive transit service in the state, including light rail, commuter rail service, and local and express bus service.

METHODS

The team of UW graduate students identified six health areas of focus, each of which composes a separate chapter in this HIA:

1. Mobility
2. Economic Security
3. Food Access
4. Mental Health and Social Capital
5. Affordable and Healthy Housing
6. Environmental Health

For the assessment of each of these areas, students used data from a variety of sources, including technical and academic literature, public reports, previous HIAs, field visits, and key informant interviews.

KEY FINDINGS AND RECOMMENDATIONS

Mobility

Findings

The SAP's mobility strategies are expected to promote physical activity, improve access to healthcare services and employment, and reduce risks of injury. However, future development in the Subarea, and corresponding increase in traffic, may have a detrimental impact on air and noise pollution.

Recommendations

The City of Tacoma should continue to promote physical activity and the safety of pedestrians and bicyclist within the South Downtown Subarea. Specifically, Tacoma should continue to support walking, bicycling, and transit orientated development by implementing the zoning code changes proposed in the SAP. Additionally, Tacoma should work with the Puget Sound Regional Commission and the Washington State Department of Transportation to expand the pedestrian and bicycle transportation networks within the Subarea.

Economic Security

Findings

If the SAP achieves its goal of improved economic vitality for the region, it will potentially lead to improvements in: work-life balance, job benefits, job security, and public funding. In turn, these outcomes are likely to have positive mental and physical health impacts on the community, including decreased rates of violence, cardiovascular disease, depression, and substance abuse.

Recommendation

The City of Tacoma should emphasize job training, collaboration, employment opportunities, and outreach to meet economic development goals.

Food Access

Findings

Within the SAP there is both support to expand the number of community gardens and a proposal for a future farmers market. While these projects are likely to have benefits in regard to food access, they will not meet planned future demand for a reliable, permanent, and economical source of food. Impaired food access can lead to substitution of healthful foods with cheap, processed, convenient foods. Regular consumption of these foods is associated with a host of diet-related health outcomes, including obesity, diabetes, and cardiovascular disease.

Recommendation

The City of Tacoma should outline specific infrastructure plans, design guidelines, and incentives for bringing a full service grocery store, supermarket, or supercenter into one or more key locations in the Subarea.

Mental Health and Social Capital

Findings

The SAP supports mental health and social capital by improving access to greenspaces, expanding community gardens, reducing train horn noise, and developing vacant, underutilized land throughout the Subarea.

Recommendation

The City of Tacoma should preserve all existing greenspaces in South Downtown and foster the development of new greenspaces in order to build a sense of community and provide opportunities for physical activity and social interactions.

Affordable and Healthy Housing

Findings

The SAP does a thorough job taking into account issues around affordable housing, housing quality, and displacement. While the overall intent of the SAP is to promote community development and ensure safe, healthy, affordable housing, the SAP could do more to assure healthy housing is affordable and accessible to those who need it.

Recommendation

While the SAP sets aside a sufficient quantity of affordable housing, it must define the income levels to which this housing is available. The SAP should also consider redefining affordable housing as affordable to individu-

als earning 50% AMI rather than the current 80% AMI. The City of Tacoma should also specify housing design guidelines prior to redevelopment, and encourage broad stakeholder participation in the housing planning process to help prevent displacement.

Environmental Health

Findings

The SAP has the potential to significantly reduce environmental exposures in the Subarea through the redevelopment of contaminated brownfields, reduction of particulate matter emissions by wood-burning stoves, and increased use of non-polluting, active forms of transportation.

Recommendation

As brownfields are a major component of the redevelopment plan, specific language should be included in the SAP to explicitly acknowledge that residents may experience contaminant exposure while redevelopment efforts are underway. The SAP should include mitigation measures to reduce the possibility of such exposures.

CHAPTER 1 - INTRODUCTION

This health impact assessment (HIA) identifies potential health concerns and action items for the City of Tacoma as it moves forward with the planning and implementation of its 2016 Comprehensive and Subarea Plans. Within the scope of the Comprehensive Plan, this HIA investigates solely the proposed redevelopment of the South Downtown Subarea. Tacoma's South Downtown is currently sparsely populated and experiencing significant economic struggles. The Subarea Plan (SAP) proposes a variety of actions to increase both the population and economic prosperity over the next twenty years.

This HIA represents the final product of a spring 2013 graduate course offered jointly by the University of Washington's Department of Urban Design and Planning, and the Department of Environmental and Occupational Health Sciences. The student authors represent several professional fields, including public health, public policy, urban planning and design, landscape architecture, nursing, medicine, law, and education.

Defining Health Impact Assessment

In recent years, HIAs have grown more common as planners, developers, and policy makers seek to understand the direct health impacts of proposed projects and legislation. HIAs are an emerging method for considering how policies, plans, and projects potentially affect human health both positively and negatively. The overall goal of the HIA is to present practical recommendations that lead to health-supportive actions by decision makers (UW, 2011). HIAs have no standardized formula or requirements and are almost always voluntary. The practice is relatively new in the United States but rapidly gaining in popularity. Locally, Public Health Seattle and King County conducted a state-mandated HIA for the State Road 520 Bridge replacement project in 2007-2008. In the case of this report, the HIA is voluntary, and we undertook the research over a period 3 months (UW, 2011).

CHARACTERISTICS OF TACOMA'S SOUTH DOWNTOWN SUBAREA

General Overview of the Subarea Plan

To create an appealing livable community, the SAP endorses a "smart growth" approach to redevelopment. This approach focuses on creating a compact, mixed-use, transit rich district that encourages greater activity in the community and less car dependence. To further promote mobility and social cohesion, the plan recommends complete streets with bicycle lanes and pedestrian walkways that support safety and accessibility for all users. For functional and aesthetic value, the plan recommends green streets that integrate more trees, shrubs, and plantings into the landscape. To support the currently diverse community members living within the Subarea, the plan proposes affordable housing, community garden space, and mixed land uses. For the environmental health of the city, the SAP lays out guidelines for brownfield cleanup and redevelopment of the waterways. Regionally, the SAP will have significant environmental and health impacts as it seeks to reduce regional commute times and reduce urban sprawl. Ultimately, to achieve its goals, the plan addresses the need for a rebranded South Downtown that emphasizes its assets and reflects its redevelopment potential (City of Tacoma, 2013a).

Demographics

Tacoma's South Downtown Subarea currently has relatively low population density. Housing just an approx-

imate 1,200 of Tacoma's 78,500 households, the South Downtown Subarea has only around 2,400 residents (City of Tacoma, 2013a). Of this Subarea population, 81% are of working age (18 to 65 years). Only 5% of residents are over 65 years old. The area has a lower education status, with 80% holding a high school degree or higher and 17% holding a Bachelor's degree or higher (City of Tacoma, 2013a). The population is 63% male, as well as 18% African American and 14% Hispanic. South Downtown median household income and per capita income are much lower than both that of the city of Tacoma and Washington State. Unemployment rates are notably higher (City of Tacoma, 2013a). It was estimated that between 4,440 and 5,550 persons experienced homelessness in Tacoma in 2009 (City of Tacoma, 2013a).

METHODS

The initial step of the HIA process, screening, is the identification of projects or policies for which an HIA would be useful. Screening was conducted through meeting with the City of Tacoma Planning Services Division to ascertain whether an HIA would contribute to the South Downtown Subarea Plan. The remaining steps of the HIA were conducted in this order: (1) Scoping to decide which health effects to consider; (2) Assessing to identify possible effects and populations affected; (3) Developing recommendations; and (4) Reporting the results to relevant stakeholders. The final step in a typical HIA process—monitoring and evaluating the HIA's effects on the given project—remains to be completed. This will likely be the responsibility of the City of Tacoma (UW, 2011).

To establish a clear understanding of the connection between the SAP and individual and community health, we conducted both desktop research and key informant interviews. We closely reviewed the SAP, public comments on the SAP, and current literature. We also extensively referenced the City of Tacoma Comprehensive Plan (City of Tacoma, 2012), the Environmental Impact Statement (City of Tacoma, 2013b), and local recommendations from the city and county councils (City of Tacoma, 2010). Additionally, we conducted key informant interviews with representatives from the City of Tacoma's Finance Administration, Tacoma-Pierce County Health Department, and the Tacoma Fire Department.

SCOPE OF HIA

Overview of the Health Topics Related to the Plan

Through extensive research comparing the current characteristics of the Subarea to the redevelopment plans highlighted in the SAP, we identified six health focus areas:

1. Mobility
2. Economic Security
3. Food Access
4. Mental Health and Social Capital
5. Affordable and Healthy Housing
6. Environmental Health

Mobility

An effective and connected mobility infrastructure directly impacts health outcomes by decreasing traffic related injuries, increasing physical access to health care, reducing financial stress, and reducing risk of obesity.

Economic Security

Economic security affects physical and mental health through the workplace environment, work-life balance, job benefits, income inequality, unemployment, and public funding. Complementarity, healthier residents make healthier employees and contribute to more productive businesses and increased economic vitality of the area as a whole.

Food Access

Availability of fresh produce, unprocessed foods, and low calorie, low salt, and low sugar foods has been demonstrated as a determining factor in diet-related health. Diet-related health problems are among the leading causes of death and morbidity in the United States, including heart disease, cancer, diabetes, and stroke (CDC, 2010).

Mental Health and Social Capital

Numerous features of the built environment contribute to mental health and social capital, including greenspaces, place attachment, transportation, aesthetics, noise, way-finding, and vacant land. This is primarily due to the fact that these features of the built environment can influence stress, anxiety, and depression, facilitate social

interactions, and promote recovery from mental fatigue (Sullivan & Chang, 2011).

Affordable and Healthy Housing

Gentrification, displacement, housing quality, and affordable housing have significant impacts on community health and individual health outcomes. Individuals living in poor quality housing or housing they cannot afford tend to have lower educational achievement and experience higher incidence of stress and heart disease, among other risks.

Environmental Health

Environmental exposures to air, water, and soil contaminants can adversely impact public health in diverse ways, depending on the toxicity of the specific contaminant, dose, route of exposure, and individual susceptibilities. Redevelopment activities can inadvertently increase concentrations of contaminants or increase the number of people who are exposed to the contaminants.

CHAPTER 2 - MOBILITY

INTRODUCTION TO MOBILITY

Mobility and transportation play an important role in most people's daily lives. Transportation networks link people to employment, education, shopping, and recreational opportunities. Additionally, these networks foster the exchange of goods, services, and information between people in different places. The transportation system's type and structure is shaped by land use patterns. Segregated land use patterns and the continued urbanization of the United States post World War II have made the automobile the dominant transportation mode throughout the nation (MacDonald, 2010). These development patterns and the dependency on automobiles promote limited opportunities for walking and biking, which detrimentally impacts health (Brown, 2009).

CONNECTION BETWEEN MOBILITY AND HEALTH

Physical Activity

The national increase in obesity rates over the last several decades prompted research to clarify how the built environment impacts obesity. One study found that those who spend less time doing physical activity often spend more time sitting in cars, which contributes to difficulties in maintaining a healthy weight (Rahman, 2011). Active forms of transportation such as walking and biking, are convenient methods for increasing levels of physical activity, and attenuate the health risks associated with sedentary lifestyles. Not only has regular physical activity been shown to reduce the risks of many adverse physical health outcomes (CDC, 2008), it is simultaneously associated with reducing many concurrent mental health issues (Sallis et al., 2011). For more information on mental health, refer to the Mental Health and Social Capital section of this document.

Federal guidelines in the United States suggest that adults should spend either 30 minutes per day, five or more days per week doing moderate-intensity activity, or three or more days per week doing vigorous-intensity activity such as brisk walking or biking (CDC, 2008; Greenberg, 2005). Adherence to moderate or vigorous physical activity regimens may elicit short-term benefits for weight loss and cardiovascular health. However, these regimens are often unsustainable for many Americans in the long term (Stokes, 2008). Less intense forms of physical activity, on the other hand, encourage greater permanence in individuals' daily routines (MacDonald, 2010), and if the built environment supports it, walking and biking for transportation can easily become a part of a person's routine and contribute to improved health.

Walking to and from public transit is another way to increase physical activity. In a study of New Jersey train commuters, 78% met the federal guidelines for physical activity by spending an additional 20 to 40 minutes round-trip walking between train stations and their destinations (Greenberg, 2005). Another study found that commuters who took light rail transit walked 30% more pedometer-measured steps per day than car commuters (Brown, 2009). Overall, light rail transit users experience an annual BMI decrease of 1.18 and are 81% less likely to become obese in the long-term when compared to non light rail transit users (MacDonald, 2010). Thus, promoting public transit is an essential element in reducing obesity rates. Increasing the number of bus routes and frequency of service, as well as ensuring affordable transit fares, are essential in these decisions (Greenberg, 2005).

Shifting communities' transportation systems away from personal automobiles to public transit offers a variety of indirect social and health benefits. For example, an

increase of walking by 8.3 minutes a day—the average time it takes to walk to/from public transit—can save up to $6,600 in health care costs, 80% of which are public savings (Edwards, 2008). Furthermore, when transportation increases access to preventative health care, the frequency of acute health problems and costly emergency room visits decrease (Weinick et al., 2010; Andrulis, 1998). High quality public transportation can positively impact community livability and can help to support social networks; for more information, please see the Mental Health chapter.

Safety

Responsible active transportation requires that safety issues related to walking and bicycling be addressed. The extent to which the built environment addresses safety concerns of pedestrians and cyclists, affects willingness to engage in these physical activities. In the United States, many students do not walk to school due to perceptions that the environment is unsafe for pedestrians (Staunton et al., 2003; CDC, 2005). A safe, walkable environment tends to increase the number of pedestrians in an area. Sidewalks, traffic-calming measures, and well-marked street crossings have all been associated with increases in physical activity (Boarnet et al., 2011). Studies have also found that an increased number of pedestrians is associated with a reduced number of auto-pedestrian collisions (Jacobsen, 2003), suggesting that drivers become more alert to pedestrians in or near the roadway when there are more of them in the area.

Bicycle-specific infrastructure has been shown to reduce the risk of injuries requiring hospitalization for cyclists. One study compared the risk of serious injuries while riding a bicycle on major streets with parked cars, to various types of cyclist routes. Major streets with a bike lane showed a 31% reduction in the risk of serious injury, local streets designated as bike routes with traffic calming measures showed a 34% reduction in risk, a separated bike path showed a 46% reduction in risk, and cycle tracks show an 89% reduction in risk (Teschke et al., 2012).

Economic Implications of Walkability and Bikeability

Cyclist- and walker-friendly infrastructure enhances opportunities for accessing employment, education, health care, and shopping. Relative to car ownership, bicycling and walking are inexpensive means of transportation with no need for fuel, no parking fees, and a low cost to purchase equipment. One study found that automobile dependent households spend 50% more time commuting and $8,500 more annually on transport (Litman, 2008). When consumers save on vehicle and fuel expenditures, they are able to invest in other aspects of the economy. Individuals can then put money toward food and other critical household costs, all while getting needed exercise. Reduced travel expenses benefit both individuals and society as a whole. Walkable environments have been linked to business success due to enhanced consumer accessibility (Litman, 2011). Furthermore, as investments in pedestrian and cyclist infrastructure are less expensive than those for car infrastructure (Van Hout Kurt, 2008), the monetary return on the investment can be quite large. Please see the Economic Security section of this document to learn how improved economic security impacts health.

Air Quality

Increases in traffic related air pollution stem from a reliance on single-occupancy vehicles. These increases can be mitigated through the promotion of active travel modes and public transit. Active transportation and public transit help reduce traffic congestion by removing vehicles from the roadways. This reduction in traffic allows for more efficient fuel usage by the vehicles still on the road, and decreases individual vehicle pollutant emissions (Meyers, 1999). For more information about how the SAP is expected to impact air quality, please see the Environmental Health chapter.

EXISTING TRANSPORTATION CONDITIONS

Current State of Tacoma's Physical Health

Heart disease is the second leading cause of death in Tacoma. Obesity, a direct cause of heart disease, is more common among Tacoma residents than it is nationwide. There is a clear connection between heart disease, obesity, and physical activity (CDC, 2012). According to the 2010 Behavioral Risk Factor Surveillance System (BRFSS), 19.6% of Tacoma respondents reported they did no physical activity (CDC, 2010), while 36.5% of residents reported body mass index (BMI) in the overweight category and 31.2% fell into the obese category (CDC, 2010).

Pedestrian

Currently, the Subarea has sidewalks of inconsistent quality; many of them are narrow and lack pedestrian amenities such as street trees and benches. Although there have been recent sidewalk improvements along

many streets in the Subarea, many roadways are still missing adequate pedestrian access. There are existing pedestrian connectors along the Foss Esplanade Waterway, the University of Washington-Tacoma Campus, and the Bridge of Glass; however, the closure of the at-grade railroad crossing between A Street and Dock Street poses a particular barrier for pedestrians, as there is no longer connectivity for pedestrians to the south end of the Foss Esplanade from the Brewery District. A major challenge to mobility in general is the topography of the region. Steep grades along the hilltop plateau can make walking and biking difficult for some.

Biking

Biking facilities are currently extremely limited, with on-street lanes only along East D Street. Some off-street paths exist along the Thea Foss Waterway, but these are shared with pedestrian traffic. Separate bicycle facilities, like cycling tracks and bicycling lanes, can significantly reduce the risk of serious injuries (requiring hospitalization) to cyclists (Teschke et al., 2012). In general, bicycle activity has not been considered in the existing layout. Figure 1 shows the current extent of bicycle facilities within the Subarea.

Public Transit

Tacoma boasts a strong public transit system that consists of bus hubs, LINK light rail systems, Sounder commuter rail, and Amtrak train service. It is a major transfer location that connects downtown Tacoma with southern parts of Pierce County and the Puget Sound. The Dome District in particular is a multi-modal hub of bus, light and commuter rail, and Amtrak traffic. Existing bus routes are primarily provided by Pierce, Sound, and Intercity Transit, connecting different points both north and south of Tacoma. The LINK light rail is a reliable and frequent free-service system connecting the Dome District and downtown via a 1.6 mile-long track. The Sounder commuter train is located at the Tacoma Dome Station and runs between Lakewood and Seattle. Amtrak provides additional heavy rail support and operates several blocks northeast of the Tacoma Dome Station on Puyallup Avenue and East J Street. Figures 2 and 3 show the extent of the bus and light rails facilities within the Subarea.

Roadways and Parking

Tacoma is situated along major interstate highways and state routes and is subject to significant traffic congestion. Congestion is of particular concern along entry/exit ramps for I-5, a major connector for areas north and south of Tacoma. Tacoma's irregular street network exacerbates existing congestion issues. Parking availability exceeds current demand, and much of it goes unused. Most local and arterial roadways have significant on-street parking available, which is metered Monday through Saturday. Off-street parking is also available in major lots, and the University of Washington-Tacoma campus provides extra parking intended for students and faculty members. While much general parking is unused, the Tacoma Dome Station (which boasts the largest off-street parking structure) is filled to 97% capacity on weekdays, on average (City of Tacoma, 2013a). Figure 4 shows the service area for the Tacoma Dome parking structure.

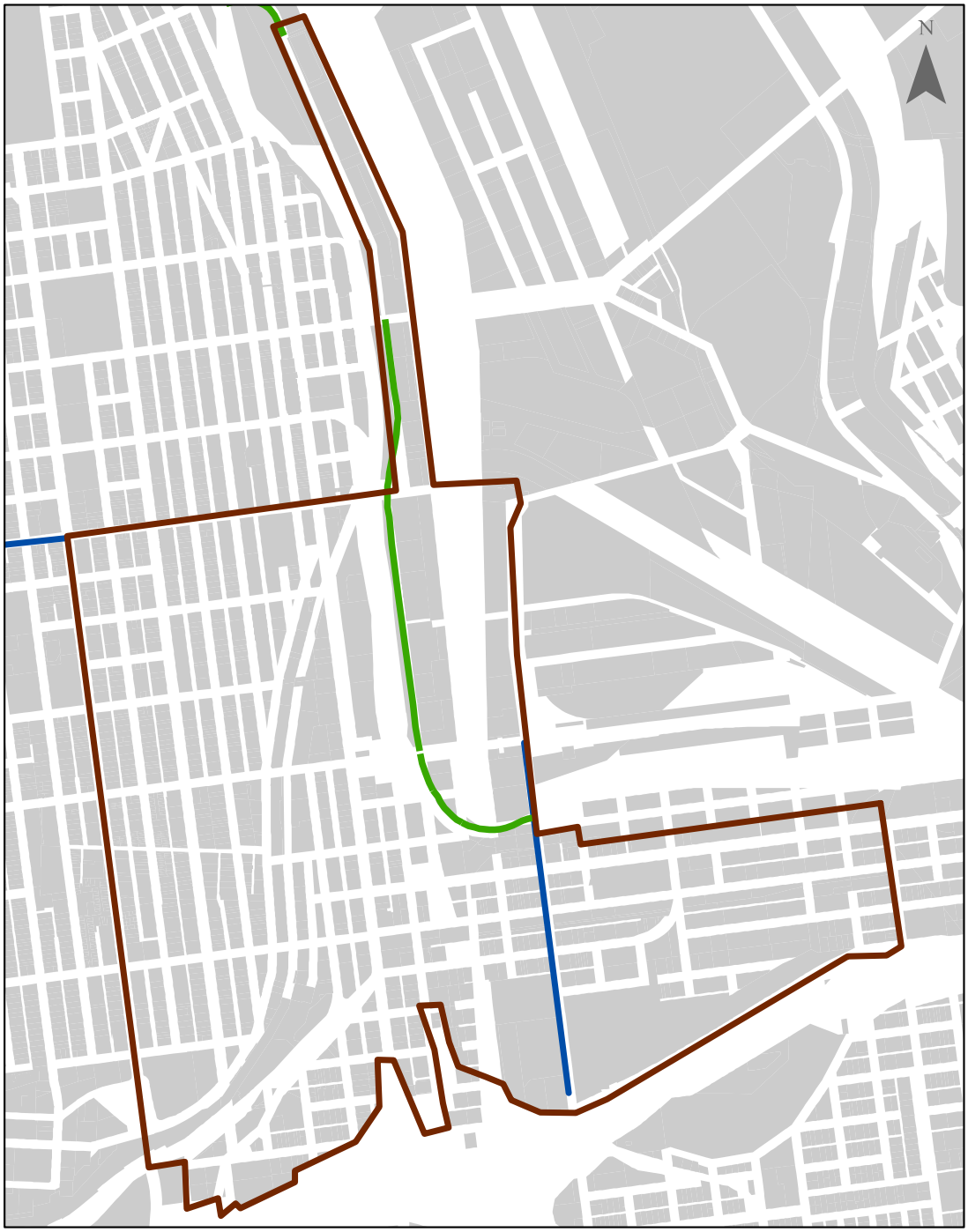
WHAT THE PLAN SAYS ABOUT MOBILITY

In order to address the growing population in the Puget Sound Region, the Vision 2040 and Transportation 2040 (T2040) plans were developed. The regional T2040 goals encourage transit-oriented development and are supportive of the use of alternative forms of transportation, including public transit, bicycling, walking, and vanpools (PSRC, 2010). As a local response to these regional plans, the Tacoma SAP was drafted to highlight transportation.

Biking and Pedestrian Facilities

A large network of biking lanes and pedestrian connectors has been proposed to complement what already exists today, offer more alternatives, and help the transportation system continue to work. The SAP highlights the City of Tacoma Mobility Masterplan, which has a series of specific recommendations and implementation guidelines regarding public transportation, biking and pedestrian facilities, and other mobility-related issues. The Masterplan has already been adopted in the City of Tacoma's Comprehensive Plan and some of its recommendations are already being implemented. The SAP also recommends that a list of needed improvements for existing sidewalks and crossings be created. "Complete Streets" is a design concept that strives to create an integrated multimodal network by improving sidewalks, bike lanes, signalization, lighting, and other elements of the streets. The SAP has suggested implementing the "Complete Streets" concept on various streets in the Subarea (Puyallup Avenue, Jefferson Avenue, and South C Street, by order of priority), as well as in the entire Brewery District (already in process) (City of Tacoma, 2012a).

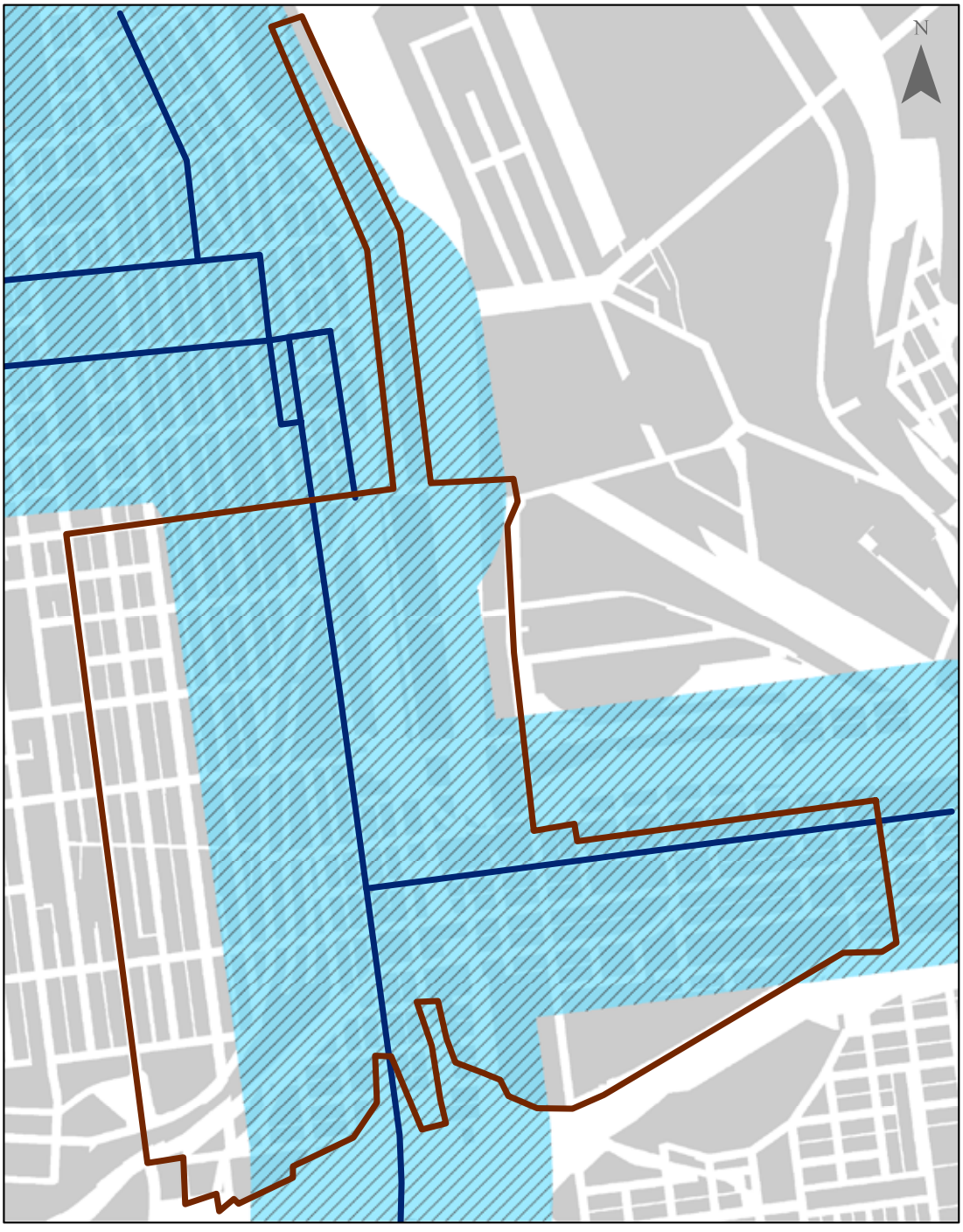
Figure 1: Bicycle facilities within the Subarea



The tax parcel data was provided courtesy of Pierce County, WA and the Washington State Geospatial Data Archive

The subarea boundary, shared use path, and existing bike lanes were digitized using map images in the City of Tacoma's South Downtown Subarea Plan which is available at http://www.cityoftacoma.org/Page.aspx?hid=15999

Figure 2: Bus corridors within the Subarea



The tax parcel data was provided courtesy of Pierce County, WA and the Washington State Geospatial Data Archive.
The subarea boundary and the bus corridor were both digitized using map images in the City of Tacoma's South Downtown Subarea Plan which is available at http://www.cityoftacoma.org/Page.aspx?hid=15999

Figure 3: Light rail service within the Subarea

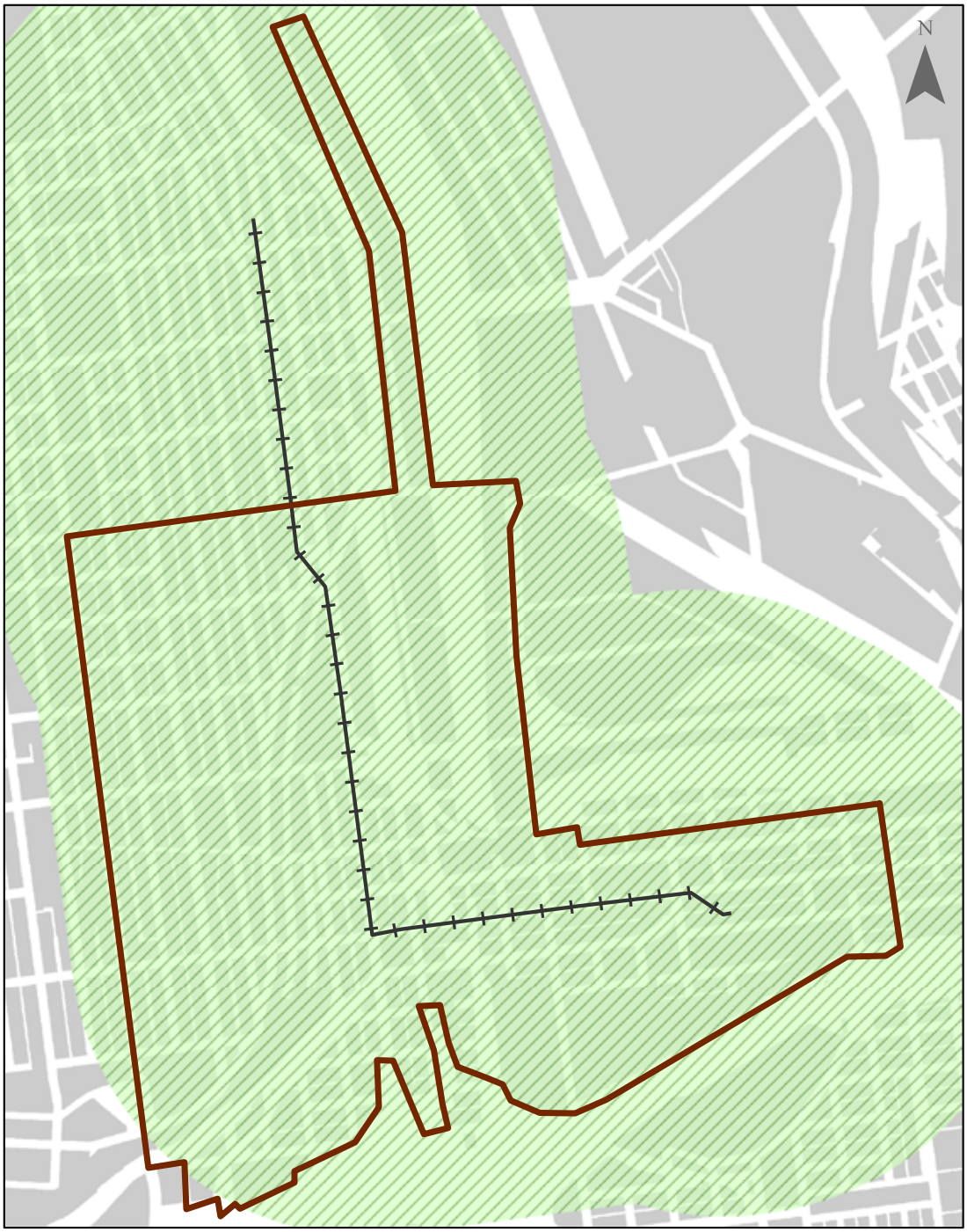


Figure 4: Pedestrain service area for the Tacoma Dome parking structure

Public Transit

The SAP focuses on developing and implementing a functional multi-modal transportation system, consisting of buses, the LINK light rail, and Amtrak trains. The SAP notes that developers must take the projected increase in transportation demand into account as the Subarea develops, in order to keep the transportation system running smoothly. More specifically, the SAP proposes a "developer impact fee" system as a way to fund transportation infrastructure improvements. The SAP identifies the Tacoma Dome Station as an important transportation hub and suggests improvements for its access. These improvements are encouraged because today, 80% of the people who go to the Dome Station do so by car, according to studies done by Sound Transit (City of Tacoma, 2013a). All of these changes will have impacts on the surrounding community. The SAP has recommended that Sound Transit engage the community in order to understand the impacts of expanding the transportation system by extending the LINK light rail and building the new Amtrak Station (City of Tacoma, 2012a).

Roadways and Parking

The SAP's recommendations concerning roadways focus mostly on de-prioritizing single occupancy vehicles and stimulating the use of other transportation methods. SAP recommendations include modifying traffic management techniques by adopting new engineering approaches, setting a lower Level of Service (an indicator that measures how vehicle flow is prioritized in a given area), implementing parking policies that maximize the use of on-street spots and reduce the area reserved for off-street parking lots, and adopting pricing policies that discourage the use of single occupancy vehicles and help fund street improvements (City of Tacoma, 2012a).

ANALYSIS AND IMPACT ASSESSMENT

Access to Health Care Services

With the projected population growth and reduced dependency on cars, it will be necessary to ensure that access to preventive health care and other necessary services is preserved or improved. Many of the residents in Tacoma currently depend on cars to access health care services. Limitations in access to health care services tend to decrease the likelihood that people will seek preventive care and regular doctor check-ups, thus increasing the risk of adverse health outcomes (Weinick et al., 2010; Andrulis, 1998). Reliable and affordable transit services to and from health care services must be available for all Tacoma residents.

Physical Activity

Currently, there are limited biking- and pedestrian-friendly facilities in the Subarea. By incorporating such facilities into the Subarea and promoting the use of active transportation over automobile commuting, the SAP may increase the likelihood that physical activity will become a habitual part of individuals' lives. Inevitably, this will positively affect health outcomes related to obesity, including type 2 diabetes, high blood pressure, high cholesterol levels, coronary heart disease, cancers (endometrial, breast, and colon), infertility, back pain, sleep apnea, osteoarthritis, ulcers, and gallstones (CDC, 2012).

Air Quality

The potential Subarea air quality impacts of the SAP transportation plan are not clear. Future development in the Subarea is likely to increase the demand for travel, which may or may not have a negative impact on air quality. If conventional automobile-focused development occurs, it could increase the amount of traffic congestion within the Subarea. Congestion would subsequently increase air pollution in and around the Subarea, which raises the risk for upper respiratory conditions and coronary heart disease (City of Tacoma, 2013a). However, if walking, bicycling, and public transit are promoted as transportation modes, the Subarea could see future growth with only a limited reduction in air quality. More detail on air quality issues within the Subarea can be found in the Environmental Health chapter of this document.

Injury

Safety is a concern for cyclists and pedestrians, whose risk of injury increases in the absence of proper infrastructure. Trips by bicycle face higher risks of fatality and injury per trip and distance traveled than trips by automobile. However these risks are minimal compared to the health benefits of physical activity. It appears that a sedentary lifestyle is more risky to health than the risk of traveling by bicycle instead of by car. Regardless, including safer pedestrian and bicycle paths in the plan improves the capacity of the city to protect individuals opting to travel by foot or bike.

Noise

By increasing Subarea population density and redeveloping the transportation network, the implementation of the

SAP may inadvertently increase exposures to traffic-related noise. Traffic noise contributes to sleep-loss and stress-related problems, such as elevated blood pressure and minor psychiatric illnesses. People living in urban areas can experience sleep disturbance when noise levels exceed 50dB (decibels). Exposure to continuous noise exceeding 85dB may lead to a progressive loss of hearing (Stansfeld et al., 2003). Please see the Mental Health section for a more explicit explanation of how health is related to noise exposure.

Equity

Equitable transportation access is imperative because it can provide inclusion, interconnectivity, and opportunities to disadvantaged populations who might otherwise be geographically restricted. An equitable transportation network is critical, particularly for enabling carless households to reach work, school, health care, and other necessary services. Existing conditions within the free-service LINK light rail system promote equity by providing equal access to downtown Tacoma. However, the proposed fee for LINK light rail will disproportionately impact low-income people, who could suffer if they are no longer able to affordably reach employment, education, and health care services.

Reassuringly, transport investments and service improvements laid out in the SAP favor lower-income areas and groups. For example, affordable housing will be placed in accessible, multi-modal locations (Litman, 2013). By improving street lighting, walkability, and bike lanes, the SAP is poised to enhance equitable access and improve safe, affordable connections between all people and places.

RECOMMENDATIONS

1) The City of Tacoma should continue to promote physical activity within the South Downtown Subarea.

This recommendation can be accomplished by implementing the zoning and land-use recommendations presented in the SAP. The proposed zoning change from Urban Center Mixed-Use (UCX-TD) to Downtown Mixed-Use (DMU) should be carried out only if some of the transit-oriented development elements of the UCX-TD can be maintained through other means.

To maintain pedestrian, bicycle, and transit focuses in the Subarea, we recommend that the SAP:

- Eliminate the floor-to-area ratio (FAR) bonus for new parking facilities in the DMU designation, as recommended in the SAP.
- Provide FAR bonuses for bicycle enhancements, like protected bicycle parking facilities or the creation of cycle tracks.
- Provide FAR bonuses for connections to the existing pedestrian and bicycle transportation networks.
- Provide FAR bonuses for shower and locker facilities.
- Expand the Reduced Parking Area, as recommended in the SAP.
- Designate more streets within the Subarea as Primary Pedestrian Streets, as recommend in the SAP.

These specific zoning and land use changes will help create a built environment that is supportive of active transportation, while still allowing the additional flexibility for developers that is suggested in the SAP.

Parking facilities for UWT and the Tacoma Dome should be easily accessible by the highway in order to reduce traffic congestion and noise, and promote walking, biking, and public transit in the surrounding areas. Ideally, direct on and off ramps should connect the facilities to the local highways and interstates. These connections are likely to increase the use of those parking facilities and help to reduce the traffic congestion issues on the local streets. People who park in these facilities are likely to walk, bike, or take transit when visiting other locations within the Subarea.

2) The City of Tacoma should prioritize safety for pedestrians and bikers.

The City of Tacoma, Puget Sound Regional Council, and the Washington State Department of Transportation should continue to invest in improving sidewalks, increasing bicycle parking, creating designated bicycle lanes, and improving access to transit stops within the public right of way. These strategies will improve the safety and attractiveness of the built environment as well as increase linkages between homes, businesses, and transit stops (MacDonald, 2010).

The SAP should include more protected pedestrian walkways, bicycle paths, and road crossings. Parking should be limited around pedestrian street crossings in order to improve pedestrian sightlines and safety. During construction of new developments, safe pedestrian and

bicycle ways should be maintained. In roadways where space is limited, we recommend on-street parking be removed to provide space and infrastructure for active transportation.

The SAP can improve equity by ensuring pedestrian walkways are accessible for people with mobility issues. The transit fee structure should remain as affordable as possible so that people of all economic backgrounds can reap the health benefits of the transportation system.

SUMMARY

The SAP positively supports health by promoting improved infrastructure that is supportive of safe, active modes of transportation. The SAP's mobility strategies are expected to promote physical activity, improve access to health care services, and reduce risks of injury. However, redevelopment may have a detrimental impact on air and noise pollution. Implementers of the SAP must remain cognizant of how decisions affect equity; vulnerable populations could benefit from the inclusion of affordable housing around transportation hubs, but may be rendered unable to utilize public transit if fees are made unaffordable. Our recommendations seek to maximize health outcomes by supporting further development of pedestrian- and biker-friendly infrastructure and active surveillance. We hope that with continual monitoring, the SAP is able to maintain its focus on promoting healthy forms of transportation.

CHAPTER 3 - ECONOMIC SECURITY

INTRODUCTION TO ECONOMIC SECURITY

A vibrant local economy is beneficial to cities in many ways: it increases local character and prosperity, improves community well-being, enhances local decision-making, allows capital to be kept in the local economy, provides employment to local residents, and is supportive of entrepreneurship, competition, and environmental sustainability (Mitchell, 2012). A healthy economy can help ensure employment security for communities, thus improving the physical and mental health of residents. Correspondingly, healthier residents lead to more productive businesses and improved community economic vitality.

CONNECTION BETWEEN ECONOMIC SECURITY AND HEALTH

A thriving economy that provides residents with living wage jobs, benefits, and a stable source of income enables individuals and families to obtain healthy foods, quality childcare, educational opportunities, and healthy homes and neighborhoods (Robert Wood Johnson Foundation, 2013). In fact, income is one of the strongest predictors of physical and mental health. However, employment alone does not guarantee positive health outcomes; mismanagement of the workplace system can actually be detrimental to health. Employment affects health through a variety of mechanisms including: 1) The workplace environment, 2) Work-life balance, and 3) Job benefits. A strong economy is associated with health through its impact on: 1) Unemployment, 2) Income inequality, and 3) Public funding.

Workplace Environment

The conditions under which we work contribute to our ability to lead a healthy life. Demanding jobs that offer low levels of control (i.e. the ability for workers to decide how they work or use their skills), little social support, and an imbalance between efforts and rewards can affect mental health and may increase the probability of depression (Kivimaki et al., 2005; Bonde, 2008). Having low control in the workplace is also related to physical health outcomes, including low back pain, cardiovascular disease, obesity, and an increased need to take sick days off work (Uehata, 1991; Bohle et al., 2004). Injuries in the workplace can harm individuals' abilities to maintain a stable income by necessitating time away from work, the transfer of jobs, or a restriction of job responsibilities (Robert Wood Johnson Foundation, 2013). Furthermore, some occupations carry inherent risks. A California study found that the jobs most likely to result in fatal injuries include specialty trade contractors, truck transportation drivers, building equipment contractors, and heavy civil engineering construction workers (Bureau of Labor Statistics, 2005).

Work-Life Balance

According to the Robert Wood Johnson Foundation, "American adults spend nearly half their waking hours at work" (2013). The balance between work and life outside of work impacts the amount of time that can be spent on activities that contribute to health. Imbalances between work and home life are associated with higher levels of stress, sleep disturbances, depressive symptoms, and fatigue (Schnall et al., 1998). Furthermore, working long hours has been linked to stress and heart disease, to less time spent on health-promoting activities, to poorer perceived health, and to increased injuries and illness and increased risk of death (Shields, 1999; Robert Wood Johnson Foundation, 2013). The style of work hours can also impact health. Shift work in particular is associated with sleep disturbances, digestive problems, cardiovascular disease, unhealthy behaviors, stress, and interference with social relationships due to work/family conflict (Plaisi-

er et al., 2007). The effect of workers' places of residence on commute time also impacts work-life balance. A recent study found that a long commute can lead to reductions in sleep time, physical activity, and food preparation time, which are activities that enable a healthy lifestyle (Christian, 2012).

Job Benefits

Employment opportunities that offer job benefits—such as health insurance and paid sick leave—can significantly contribute to positive health outcomes. Health insurance is associated with a usual source of health care, receipt of preventive services, and decreased emergency department use (Pulos, 2010). Individuals who lack health insurance coverage are less likely to receive timely care, are sicker, and are more likely to die prematurely than individuals with health insurance (Faulkner et al., 2002). The United States is one of very few countries that does not offer paid sick days universally (Robert Wood Johnson Foundation, 2013). Businesses that do not offer sick leave benefits have employees who come to work sick and are thus less productive, take longer time to recover, are more likely to spread infections to other employees, have children with worse health outcomes, and have higher health care costs in the future (Institute of Medicine, 2001).

Unemployment

As discussed above, various characteristics of an individual's employment can affect his or her health. It is important to note that employment in and of itself can also impact health. Research shows that job insecurity is not only burdensome financially, but also has a hazardous impact on health. Unemployment and underemployment are associated with cardiovascular disease, depression, lower life expectancy, and substance abuse (Yarnell et al., 2005; Khlat et al., 2002; Yen et al., 2002). Even perceived job insecurity can adversely impact mental and physical health (Gazzaniga & Heatherton, 2003). On the contrary, job security is associated with better health, food and housing security, community safety, and strengthened communities (Wang & Minor, 2010; Currie, 1985; Koc & Dahlberg, 1999).

Income Inequality

The unequal distribution of income within a geographic area is associated with increased risk of death, lower average life expectancy, poor self-reported health, depressive symptoms, stress, and increased violence (Lochner et al., 2001; Kahn et al., 2000). Even in wealthier areas, a large difference in income levels and a perceived disadvantage in social or economic standing in comparison to others are associated with worse health among the entire population (Carter et al., 2009). Explanations for these poorer health outcomes are thought to relate to the stress or discontent that is experienced when comparing one's situation to that of others, underinvestment in human capital, and decreased social cohesion within communities (Kawachi & Kennedy, 1997). For more on social cohesion, refer to the Mental Health section of this document.

Public Funding

Funded by the collection of taxes, cities are able to provide a variety of services that may impact health. Departments dedicated to improving community health and safety (i.e. fire, police, and health departments) receive some revenue through tax structures. Other public institutions such as school districts and public transportation receive revenue through taxes as well. These institutions have substantial impacts on health. For example, higher levels of education are positively associated with improved health (Veenstra, 2000), as is access to public transportation.

EXISTING ECONOMIC CONDITIONS

History and Economy

Tacoma was initially settled by the Nisqually and Puyallup tribes and later, with the establishment of the Northern Pacific Railroad, built its economy around the coal and lumber industries (Washington State History Museum, 2009). This thriving railroad hub supported a business community of industrial and warehousing endeavors until the mid-20th century movement away from the railroad urban center and toward suburban developments (City of Tacoma, 2013a). Despite the subsequent decline in the downtown area during the mid-20th century, the past 30 years have brought revitalization with investments at the city, county, and state levels (Angelou Economics, 2008). In the 1990s, investments established a new University of Washington campus, museums, the LINK light rail, residential development projects, the cleanup of the Foss Waterway, and new restaurants and retail establishments, which have all encouraged growth in the downtown Tacoma area (Angelou Economics, 2008). Currently, Tacoma is the second largest city in the Puget Sound Region and the most important business center in the South Sound Region (City of Tacoma, 2013a). However, despite these improvements, "Economic diversification and private commercial investment have lagged"

(Angelou Economics, 2008) and the Subarea continues to have a relatively low population density, high poverty rate, and general underutilization of its land (City of Tacoma, 2013a).

Employment

Currently, the largest employer in the Subarea is the University of Washington-Tacoma campus, with 714 employees, including faculty, classified staff, professional staff, temp/hourly employees, and student employees (City of Tacoma, 2013a). Other employers in the area include the Brown and Haley, museums, the Tacoma Convention and Trade Center, the U.S. District Court, and the Tacoma Dome and multimodal hub. Large employers nearby include the hospitals and the Port of Tacoma. The Subarea has fewer management, business, science and arts, sales, and office jobs and more production, transportation, and material-moving jobs than the rest of Tacoma and Washington State. The jobs: housing ratio is 3.6:1, indicating that those who are employed in the Subarea mostly commute from elsewhere (City of Tacoma, 2013a).

Impact of the Economic Recession

Compared to the rest of Tacoma, the Subarea was more heavily impacted by the recent economic recession. Median household income and per capita income are much lower than the rest of Tacoma and Washington State (See Table 1). The total covered jobs in the Subarea (i.e. jobs that qualify for the state's unemployment insurance program, which includes 85 to 90% of all jobs) decreased by 24%, from 6,827 jobs in 2000 to 5,220 jobs in 2011. This is striking considering that Tacoma as a whole lost only 5% of covered jobs during the same time period. Construction, manufacturing, and retail jobs were hit the hardest; for example, the manufacturing sector lost 64% of its jobs (741 jobs). During the recession, only jobs in the fields of education and fire increased (City of Tacoma, 2013a).

Jobs with Benefits

With the increases in the proportion of the population that is unemployed, not in the formal labor force, or earning a much lower per capita income, there are likely high rates of working-age adults (18 to 64 years) in the Subarea without benefits, including health insurance (Pulos, 2010). Only 35% of losses in employer-provided insurance are covered by public insurance such as Basic Health, which provides discounted health insurance to the poor regardless of parenthood status. Basic Health currently has a waiting list (Pulos, 2010).

Table 1: Employment and Economic Data in the South Downtown Tacoma Subarea (City of Tacoma, 2013)

Parameter	South Downtown	Tacoma	Pierce County	King County	WA State	U.S.
Economics						
Median household income ($)	23,405	47,862	57,869	66,174	57,244	50,046
Per capita income ($)	18,815	25,377	27,466	36,410	29733	26,059
Poverty rate (%)	n/a	16	12	12	13	15
Employment						
Unemployment rate (%)	16	13	12	9	11	11
Not in labor force (%)	44	37	34	30	35	36
Occupation						
Management, business, science, arts (%)	25	34	32	48	39	36
Service (%)	21	22	19	15	18	18
Sales and office (%)	19	25	26	22	23	25
Natural resources, construction, maintenance (%)	11	8	10	6	10	9
Production, transportation, material moving (%)	24	11	12	9	11	12

WHAT THE PLAN SAYS ABOUT ECONOMIC SECURITY

The SAP's fundamental goal of promoting economic development in the Subarea suggests that the authors recognize the importance of economic security. Creating a "thriving equitable urban center" would address both the needs of existing and future community members, as well as the needs of potential private investors. The SAP acknowledges that current residents and businesses are at risk of displacement during redevelopment and recommends actions "to encourage redevelopment that complements and reinforces the existing social fabric and economy." The SAP also recommends increasing employment opportunities through job training and collaboration with existing and prospective employers (City of Tacoma, 2013a).

To launch the redevelopment process, the City of Tacoma and the University of Washington-Tacoma prepared a non-project Environmental Impact Statement (EIS) for the SAP that addresses the issues pertinent to the State Environmental Policy Act and the Growth Management Act. An upfront EIS may help entice potential investors to the Subarea because it renders specific project EISs unnecessary, which can cause delays and unexpected mitigation measures that may deter investors (City of Tacoma, 2013b).

As market forces may influence economic development the most, the SAP focuses on creating an environment that will best attract private investment under any market conditions. To accomplish this goal, the SAP calls for promoting the elements of walkability, affordable housing, high-quality design, transit connections, managed parking, and synergistic mixed-use neighborhoods in order to provide a healthy lifestyle infrastructure for future growth (City of Tacoma, 2013a).

Buildout scenarios predicted in the SAP and in the EIS suggest that new jobs will be created in the Subarea. The Large-scale Buildout alternative is predicted to create 40,000 jobs by 2030, the Moderate Buildout is predicted to create 26,667 jobs, the Modest Buildout is predicted to create 13,333 jobs, and the No Action alternative is predicted to result in 8,352 jobs by virtue of natural population and employment growth patterns (City of Tacoma, 2013a; City of Tacoma, 2013b).

ANALYSIS AND IMPACT ASSESSMENT

Workplace Environment

The effect the SAP will have on the workplace environment is not yet clear and will depend on the types of businesses that are attracted to the Subarea. The workplace environment for employees of these new businesses will impact their occupational injuries, wages, and their sense of control, support, demands, and expectations, which all exert great impact on physical and mental health.

The magnitude of the impact of the workplace environment on employee health will be high as employment rates rise and more residents spend their time in the workplace. The direction of the impact on health could be either positive or negative, depending on the specific working conditions of each employee.

Work-Life Balance

Work-life balance affects everyone employed in the Subarea, as well as their families; thus the magnitude of any impact the SAP has on work-life balance will be substantial. The SAP is likely to positively impact certain aspects of work-life balance by decreasing commute time, which increases the amount of time available for health-related activities. Employees who live in the Subarea are more likely to be positively affected than those who commute into the area, as they will experience shorter commute times and the benefits of living in the newly developed area. By realizing its goal of creating a thriving community with mixed-use spaces and green and walkable neighborhoods, the SAP will help support a positive living experience outside the workplace. Improved work-life balance may contribute to increased job satisfaction, lower levels of stress, the promotion of social interaction, and improved physical health. It is unclear what impact the SAP may have on shift work and the length of the workday; these factors will depend on the types of businesses that are attracted to the Subarea.

Job Benefits

Although the types of businesses that will settle in the Subarea are uncertain, the SAP nonetheless aims to create an attractive business environment. Theoretically, this will entice businesses with good business practices, such as the provision of health insurance benefits and paid sick leave. The magnitude of the impact of job benefits on health will depend on the proportion of employees who receive benefits through their employer. Provision of benefits or lack thereof by future employers, will affect both employees and their family members, who may also benefit from health insurance or paid sick leave. Those who were previously uninsured and gain benefits through employment generated by the SAP may experience the greatest impacts, as their access to preventive

health care and their ability to take time off work to care for themselves or family members will be substantially improved.

Job Security

The magnitude of the potential impact of the SAP on employment and job security is high, as the Subarea is expected to gain 19,650 new residents and 25,680 new jobs by 2030 (City of Tacoma, 2013a). Additionally, the Subarea's current largest employer, the University of Washington-Tacoma, is planning to grow to support 10,000 to 15,000 full-time equivalent students and a workforce of over 2,000 in the coming decades (City of Tacoma, 2013a). If these new employment opportunities emerge, which is likely, and the Subarea thrives economically, we anticipate a positive impact on job security and employment rates. Improved employment and job security will positively impact everyone who works in, lives in, or visits the Subarea because lower unemployment rates are associated with decreased violence and strengthened communities. However, some groups, such as those who are currently unemployed or have low levels of education, may still have difficulties in obtaining employment despite an increase in opportunities.

Income Inequality

We are uncertain what impact the SAP will have on income inequality within the Subarea. While income inequality will always exist because of the inherent qualifications and responsibilities required for different jobs, the degree to which it exists and the ways in which income is redistributed to the community (in the form of public infrastructure and funding for social services) will have either a positive or negative impact on health. If economic development increases incomes relatively equally across the population, the adverse health effects associated with income inequality will be minimized. These same health effects are likely to increase if economic development instead increases the gap between the wealthy and the poor. As the Subarea is relatively small and will be densely populated, it is likely that mixed income levels will be living within close proximity to one another, and this may increase feelings of relative disadvantage and the health effects that accompany them. The effects of income inequality influence the health of entire populations: individuals with lower incomes experience poorer health outcomes than individuals with higher incomes, and in areas with high income inequality, the entire population experiences poorer health outcomes than areas with low income inequality. The SAP does include language about creating an "equitable" environment, which, if carried out, may help to reduce the gap between the wealthy and the poor and thus promote health.

Public Funding

If the Subarea does achieve improved economic security, there is potential for the city's tax base to increase. Improved city tax revenue will theoretically increase funding to the public service agencies that have a positive impact on community health and safety. This would have a high magnitude of impact, as the entire community would benefit. Tacoma may expect to see particular increases in Sales, Property, and Business, and Occupation taxes. According to Danielle Larson, Tax and License Manager for the City of Tacoma's Finance Administration, all three of these tax sources go into the General Fund, which is then allocated to support a number of services, including the Police and Fire Departments (Personal communication, May 15, 2013). Mike Fitzgerald, Assistant to the Chief for Budget and Finance for the Tacoma Fire Department, pointed out that, in addition to increased funding from a more robust General Fund (20-22 percent of which has historically been allocated to the Fire Department), the Fire Department will see additional benefits in the wake of the SAP through the property tax-funded Emergency Medical Services (EMS) levy (Personal communication, May 16, 2013).

The public school systems may also see an increase in revenue through property tax-funded school bond monies (D. Larson, Personal communication, May 15, 2013); Pierce Transit may see increased funding through sales tax. Such support is essential because both education and transportation opportunities are related to positive health outcomes. The Tacoma Pierce County Health Department is an independent governmental body, so they would not expect to experience immediate direct increases in funding from Tacoma. However, Cindan Gizzi, Community Assessment Manager for the Tacoma-Pierce County Health Department, expressed that the Health Department might see a financial benefit if the City of Tacoma's overall revenue increases, which could enable the City to increase their flexible funding for the Health Department. In addition, the Health Department would see indirect benefits from the improved public safety that should occur if the Police and Fire Departments see increased funding (Personal communication, May 6, 2012). Naturally, well-funded health, police, and fire departments have enhanced capacity to protect public health.

Vulnerable Populations

As economic vitality increases in the Subarea, it will be important to consider the ability of the existing population to secure jobs. The current resident population in the Subarea is comprised of a higher proportion of minorities and homeless individuals, and experiences a higher level of poverty, lower educational attainment, and higher unemployment than Tacoma as a whole. Therefore, these populations may not experience the same opportunities for employment as outsiders who move into the area. If these groups experience differential access to employment opportunities, the SAP has the potential to increase income inequality in the Subarea. Vulnerable populations will be disproportionately affected by the health impacts of income inequality, including lower average life expectancy, higher risk of death, and higher rates of violence (Lochner et al., 2001; Kahn et al, 2000).

RECOMMENDATIONS

1) Emphasize job training, collaboration, employment opportunities, and outreach to meet projected economic development needs.

We recommend adhering to the elements of the SAP that address job training and employment opportunity during all stages of redevelopment. Specifically, we recommend that:

- Workforce development agencies such as the Pierce County Workforce Investment Board continue to support current South Downtown residents.
- Attention be given to returning military and vulnerable populations to address the broader scope of social services needed to ensure successful employment, such as substance abuse treatment and mental health services.
- A continued collaboration with the University of Washington-Tacoma should be sought to provide job opportunities on campus for local residents.
- The University of Washington-Tacoma should create ongoing job training programs to strengthen the local workforce with the skills needed to support growth of the local business community.

2) The SAP already includes language that emphasizes the importance of economic vitality in the Subarea—we recommend that in future drafts of the SAP, the Growing Transit Communities Partnership (GTC) preserves and augments this language to emphasize the importance of attracting new businesses to the Subarea that will promote community health.

The augmented language should emphasize the importance of attracting businesses and industries that:

- Pay a living wage and provide health insurance and other benefits.
- Are well suited for the levels of skill and education of current and prospective residents.
- Utilize green business standards, as these practices can promote community and environmental health; they can also provide tax incentives for businesses, which may further encourage economic development of the Subarea (U.S. Small Business Administration, n.d.).
- The augmented language should encourage the Subarea to utilize business incubators, in order to support start-ups among populations that do not have access to traditional business development services.
- For example, Washington Community Alliance for Self-Help (CASH), a nonprofit in Seattle, helps low-income women and minority populations establish small start-ups (Washington CASH, n.d.).

3) Throughout the redevelopment of the Subarea, we recommend that the City of Tacoma continually leverage the Tacoma Economic Development Strategy report and the SAP in order to best support economic development of the region.

The Tacoma Economic Development Strategy outlines the types of industries most appropriate for downtown Tacoma and will help ensure smart development of the region.

We recommend that the City continually reference the SAP during project approvals in order to ensure that individual project plans in the Subarea are aligned with the SAP's vision of developing of the region into a thriving urban center, which will indirectly support good health.

SUMMARY

Evidence from the literature, as well as the opinions of budget and finance experts in Tacoma, indicate that if the SAP achieves its goal of improved economic vitality for the region, it will potentially lead to improvements in: work-life balance, job benefits, job security, and public funding. In turn, these outcomes are likely to have positive mental and physical health impacts on the community, including decreased rates of infectious disease

transmission, cardiovascular disease, depression, and substance abuse (Institute of Medicine, 2001;Yarnell et al., 2005; Khlat et al., 2002; Yen et al., 2002). It is unclear how the SAP will impact income inequality and the workplace environment, so we recommend that the City of Tacoma establish job training and support programs that will both ensure that currently unemployed residents have access to incoming jobs and attract companies with business practices that provide employee benefits and healthy work environments. Additionally, healthier employees are more productive in the workplace, thus contributing to the economic vitality of the Subarea as a whole and attracting more businesses to the region.

CHAPTER 4 - FOOD ACCESS

INTRODUCTION TO FOOD ACCESS

Food access refers to the ability to acquire appropriate foods to form a nutritious diet. Food access has recently been identified as a major determining factor in shaping the choices that people make about what to eat (Karpyn & Treuhaft 2010). This is important because food choices greatly impact individuals' health, and when aggregated, food availability can be a determinant of overall community health. Of the variety of food sources available, it is widely acknowledged that full service grocery stores selling fresh produce, whole grains, and minimally processed foods are the best sources for a healthful diet (Karpyn & Treuhaft 2010) (USDA Food Access Research Atlas, 2013). As evaluated by the United States Department of Agriculture (2010), food access is based on a combination of three fundamental factors:

1. The presence or absence of grocery stores, supermarkets, or other affordable sources of healthful foods;

2. Availability of household-level resources that determine access to full service grocery stores or supermarkets, such as vehicle access and income level; and

3. Neighborhood qualities, such as the availability of public transportation and neighborhood levels of income.

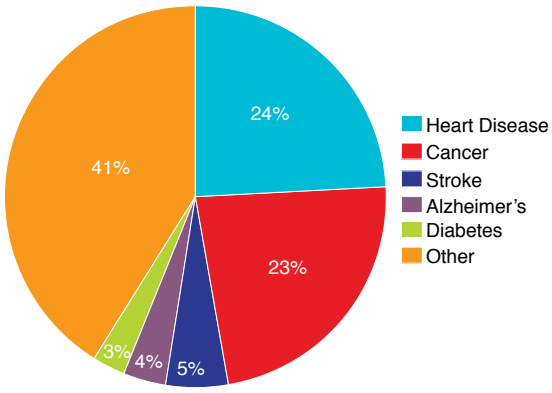
THE CONNECTION BETWEEN FOOD ACCESS AND HEALTH

Healthful food access plays a fundamental role in our nation's health and overall quality of life. Research shows that diet-related health problems are leading the United States in causes of morbidity and mortality (Figure 5).

In fact, more than half of the deaths in the United States in 2010 were the result of health conditions linked to or brought about by dietary choices (CDC, 2010). These health conditions include obesity, heart disease, and diabetes; recent trends of increasing rates of these conditions are troubling and have even been labeled epidemics (Brody, 2011).

Although these trends are catastrophic in terms of health impacts and costs to society, diet-related health problems are considered to be among the easiest to prevent (CDC, Adult Obesity, 2013). Recent studies show that increasing public awareness about the causes of heart disease, diabetes, and other food-related disorders, is a highly effective method for helping people consume more healthful dietary choices (USDA, 2010). However, public awareness can only be effective if the healthful foods themselves are readily accessible; healthful foods must be geographically and culturally available at affordable prices. If made feasible by the proper planning incentives, a grocery store can help improve health outcomes in its community.

Figure 5: Leading Causes of Mortality in the United States (CDC, 2010)



The term "food desert" has recently emerged to describe an area where residents lack access to sources of healthy foods and/or have limited means or mobility for getting to a grocery store (Economic Research Service, 2009). Food deserts are typically correlated with areas that are also "structurally and economically disadvantaged," and thus suffering other health burdens as well (K.A. Schafft, 2009). However, health and healthy food options seem to be correlated irrespective of economic status. A California study concluded that residents living near a preponderance of fast-food restaurants and convenience stores are more likely to suffer from obesity and diabetes than are people who live in an environment with more grocery stores, regardless of those residents' economic status (California Center for Public Health Advocacy, 2008).

Additionally, research suggests that the mere presence of a supermarket or full service grocery store in a neighborhood is likely to impact obesity rates (Lopez, 2007). The draft EIS recognizes this, and points to research that correlates residents living near a supermarket with a better diet and a decreased likelihood of obesity (City of Tacoma, 2013b).

Local farmers markets and community gardens can positively impact health outcomes not only by providing a source of fresh, healthful foods, but also by acting as drivers of community development and economic growth (Hagan & Rubin, 2013). For more information on how community development and economic growth impact health, see the Mental Health and Economic Security chapters.

EXISTING FOOD ACCESSIBILITY CONDITIONS

The Subarea is geographically small compared to Tacoma as a whole, and is not representative of Tacoma's overall condition of food accessibility. The geographic area delineated in the SAP currently has no grocery stores, supermarkets, or supercenters. The nearest grocery store is the IGA located on Pacific Avenue, two blocks north of the official border of the district. This grocery store can be accessed by a variety of modes of transportation, including the LINK light rail. Despite the store's relative proximity and public transit's adequacy in connecting the Subarea to the grocery store, some sections of the Subarea are nonetheless considered geographically isolated from a food source. When evaluating an urban environment, any distance greater than a mile from a grocery store is considered a significant barrier to accessing a food source; the southern and eastern sections of the Subarea are thus far enough from an affordable, healthful food source that residents of those areas lack sufficient access (Food Access Research Atlas, 2013).

Currently available food sources within or immediately adjacent to the Subarea, excluding restaurants, are limited to fast food restaurants, convenience stores, a food bank (one block north of the border), and two community gardens: Hilltop House and La Grande Garden. The two gardens are quite close to each other and are located in the northwest region of the Subarea.

WHAT THE PLAN SAYS ABOUT FOOD ACCESSIBILITY

The primary way in which the SAP addresses food accessibility issues is by recommending strategies that pave the way for community gardens and farmers markets. Such projects are in line with Tacoma-Pierce County Board of Health Resolution 2005-3698, which calls for community sectors, including community planners, to design environments conducive to active living and healthy eating (Tacoma-Pierce County Board of Health, 2005).

The demand for community gardens in the Subarea is expected to rise, "(as) neighborhood population and employment increase" (City of Tacoma, 2013a). Demand for new gardens may be expected in the Dome District and the southern portion of the Old Brewery District, as these areas are farthest from current gardens and appear to have the capacity to bear that growth, along with residential development. Community gardens are promoted in the SAP as one of the ideas for a community-driven project that could help build social capital and act as a point of interest to new residents in the Subarea (City of Tacoma, 2013a). New gardens in the Subarea are expected to support the livable communities strategy and provide a small-scale, seasonal source of healthy food for some residents.

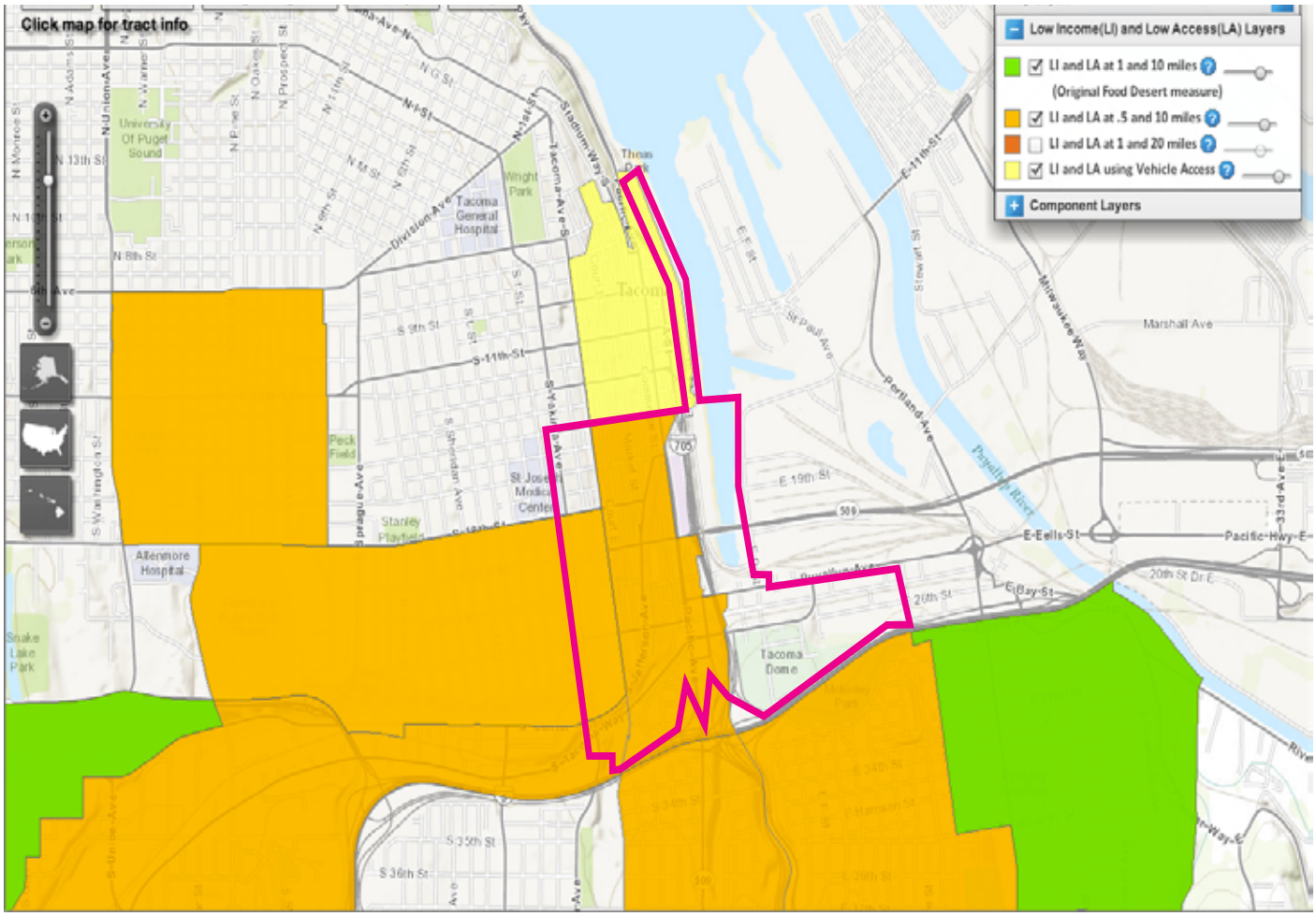
Farmers markets are also supported by the SAP, and are another way to bring healthful food to some members of the community. Farmers markets in the Pacific Northwest tend to offer locally grown and organic produce. The SAP describes farmers markets as a way to market a new image of the Subarea to developers. There is an open-space project proposal within the SAP to construct a farmers market on Holgate Street (City of Tacoma, 2013a). Building new community gardens and farmers markets are projects that can promote healthy food choices and provide meaningful community interaction.

While farmers markets, community gardens, and other local, sustainable food sources may enhance the quality

Figure 6: Grocery stores around the Subarea

Full Service Grocery Store, Supermarket, or Supercenter

Figure 7: Food desert status according to the USDA



Low Income & Low Access within 1 mile (Original Food Desert measure).

Low Income & Low Access within .5 miles.

Low Income & Low Access using Vehicle Access.

Tacoma South Downtown Subarea

and availability of fresh produce in the Subarea, they rarely serve as primary, affordable food sources. They are rarely able to provide the same volume of food, for as many hours of the day, at the competitive prices that grocery stores can (Heumann, 2013). Grocery stores, supercenters, and supermarkets are still considered the main sources of consistently accessible, affordably priced food (USDA Food Access Research Atlas, 2013). Unfortunately, the SAP does not directly address the need and provisions for grocery stores within the Subarea.

ANALYSIS AND IMPACT ASSESSMENT

The food access issues addressed by the SAP relate to farmers markets and community gardens. These proposed projects are likely to build social capital, promote regional farms' success, and increase overall healthy food options. The expected impact of such gardens is that small groups of residents will experience very positive social and health outcomes.

Food access issues that are not addressed in the SAP include the addition of a full service grocery store, supermarket, or supercenter. The absence of such a service within the Subarea could result in future access issues when the population density increases and there is inadequate development planning for a grocery store. Residents of the southern and eastern parts of the Subarea will be at the highest risk, as they are located farthest from the closest grocery store.

Neglecting food access in the redevelopment process may cause the SAP to work against its stated plans for residential and commercial investment, and economic vibrancy. Without explicitly designing adequate conditions for bringing a grocery store into this region, inherent uncertainty exists about whether or not one will be part of the total redevelopment plan. If the SAP fully addresses healthful food access, it would enforce its other objectives: "Increasing food access also creates positive benefits beyond the public's health, such as offering economic development opportunities for small business owners and creating more walkable and livable neighborhoods" (Ringstrom & Born 2011).

Overall, the SAP does not adequately address access to healthful food for residents of the area, leaving the proposed development vulnerable to the adverse consequences of an area with few affordable food options.

Equity

The most pronounced access disparities are between different socioeconomic groups. Much of the research on food deserts shows that they frequently occur in low-income areas (USDA Agricultural Marketing Service, 2013). However, income is only one of several crucial factors in determining healthful food access. Studies have shown that diet-related health improvements are possible irrespective of income, so long as affordable food options are located among low-income areas of residence, and public transportation is available to bring those residents to the grocery retailer (California Center for Public Health Advocacy, 2008). If not accounted for in the SAP, healthful food access for low-income residents may decrease as a result of overall changes to the built environment.

RECOMMENDATIONS

As population density increases in the Subarea, the demand for healthy food is also likely to increase. Recommendations made here are based on the assumption that current food sources will not meet future demand; anticipating and planning for this demand now is expected to enhance the prosperity of the Subarea community. Many of the recommendations in this chapter are aligned with specific goals and policies included in the Vision 2040 strategic guide for planners and city officials for the Central Puget Sound Region (2009).

1) Outline specific infrastructure plans, design guidelines, and incentives for bringing a full service grocery store, supermarket, or supercenter into one or more key locations in the Subarea.

- The SAP already includes ready-made development incentives for office, commercial, and residential construction. The SAP should add a provision specifically for food retailers within the Subarea.
- Conducting market analysis in advance of development—on behalf of would-be grocers in the area—would pave the way for grocery stores to move in at the same time as housing and office spaces.
- We suggest designating grocery stores or food retail as allowable activities in most (if not all) zones in the Subarea. In particular, ensure that small-scale healthy food retail is properly defined and given an appropriate zone.
- We suggest passing a resolution that would identify grocery retail as an economic development strategy (Ringstrom & Born, 2011).

- Planning for a full-service grocery store coincides with many specific policies addressed in Vision 2040 (MPP-DP-43 to MPP-DP-47). These policies address the enhancement of the Puget Sound region's food system (Puget Sound Regional Council, 2009).

2) Make healthful food at farmers markets available to low-income residents by recommending a program that facilitates federal food assistance program purchases.

- Alongside recommendations for farmers markets, the SAP should require that any new markets include systems that allow people receiving government benefits to purchase food from those markets, and should also pursue partnership programs that allow those consumers to maximize their purchases.

- The Senior Farmer' Market Nutrition Program and the WIC Farmers' Market Nutrition Program are specifically targeted at making the healthful produce at farmers markets available to low-income members of these populations (USDA WIC). With such a system in place, many farmers markets in the Pacific Northwest and elsewhere facilitate use of federal food assistance programs such as Electronic Benefit Transfer (EBT) at their sites, and in fact increase the amount of purchasing power available to such consumers.

- A common perception is that farmers markets sell expensive products. New markets should conduct outreach and incentive programs as necessary to attract low-income residents, making healthful farmers market food more available to them.

3) Promote food security and nutrition programs within the Subarea by partnering with existing healthful food coalitions, networks, and initiatives, and supporting the proliferation of their messages.

- Many food access-related coalitions, food security councils, task forces, and support measures exist within Pierce and surrounding counties, and throughout the Puget Sound region as a whole. Tacoma planners should draw on this wealth of expertise by explicitly stating that they plan to partner with any and all appropriate food access groups in the area.

4) Incorporate existing guidelines for food access and security into the SAP appendix, such as Ringstrom & Born's King County Food Access Policy and Planning Guide.

- Ringstrom & Born's guide is recognized by municipalities across the United States as the go-to guide for approaching food policy at a municipal level, by using specific planning tools for improving diet-related health outcomes.

- Drawing on this comprehensive resource would lend legitimacy to the SAP while incorporating a depth of research that may not be otherwise available to drafters of the SAP.

SUMMARY

The unambiguous link between healthful food access and positive health outcomes provides a clear directive to planners to include deliberate development incentives for an affordable, full service grocery store, supermarket, or supercenter within the SAP. Aside from recommending the cultivation of farmers markets and community gardens, the current SAP does not adequately address the impending need for broad-scale food access in the area. However, Tacoma planners are uniquely poised to design and incentivize specific land use patterns that would remedy the lack of access in the Subarea. The SAP should state outright the need for a full-service grocery store, substantiate that claim with evidence for how food access supports the health, vibrancy, and desirability of a neighborhood, and then write specific measures into its zoning and use codes whereby space for a grocery store is a natural and economical choice for developers. By promoting affordable and healthful food options within the Subarea, planners can both promote good nutrition and improve economic development prospects for the area as well.

CHAPTER 5 - MENTAL HEALTH AND SOCIAL CAPITAL

INTRODUCTION TO MENTAL HEALTH AND SOCIAL CAPITAL

Mental Health

According to the World Health Organization (WHO), mental health is an integral and essential component of overall health (WHO, 2013). The WHO's Constitution declares, "Health is a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity" (WHO, 2013). Mental health is defined as a state of wellbeing in which every individual realizes his or her own potential, can cope with the normal stress of life, can work productively and fruitfully, and is able to make a contribution to his or her community (WHO, 2013). The promotion of mental health involves the creation of living conditions and environments that will allow people to adopt and maintain happy, healthy lifestyles.

Social Capital

Social capital refers to the features of social organization that can improve the efficiency of society by facilitating coordinated actions (Bourdieu, 1986). The main features of social capital include interpersonal trust, norms of reciprocity, and social engagement that promotes community and social participation, thereby improving health outcomes (Carpiano, 2006).

Vulnerable Populations

Mental health and wellbeing is influenced not only by individual attributes, but also by the social circumstances in which people find themselves and by the environment in which they live. These determinants interact with each other dynamically, and may threaten or protect an individual's mental health state (WHO, 2012). Risks to mental health manifest themselves at all stages in life. Certain groups are more susceptible to experiencing mental health problems, including households living in poverty, people with chronic health conditions, minority groups, victims of domestic or child abuse, and persons exposed to and/or displaced by war or conflict (WHO, 2012).

CONNECTION BETWEEN MENTAL HEALTH, SOCIAL CAPITAL, AND THE BUILT ENVIRONMENT

Mental health and social capital are intimately tied to features of the built environment, which can influence stress, anxiety, and depression, facilitate social interactions, and promote recovery from mental fatigue (Sullivan & Chang, 2011). Consequently, communities can be designed in such a way as to promote the development of good individual and community mental health, as well as strong social capital. Social capital and mental health are tied to each other, with more socially engaged individuals living longer and healthier lives—in terms of physical and mental wellbeing—than those who are isolated (Kaplan, 1988; Kawachi, 1999; Kawachi & Berkman, 2001). While there are numerous features of the built environment that contribute to mental health and social capital, some of the most widely studied aspects include greenspaces, place attachment, transportation, aesthetics, noise, way-finding, and vacant land.

Greenspaces

A greenspace is a natural area in or around a development, intended to provide buffer, noise control, recreational use, and/or wildlife refuge, all in order to enhance the quality of life for residents within the community. Several studies have demonstrated that proximity to greenspace promotes healthy psychological development, a higher self-rated quality of life, increased satisfaction with one's neighborhood, and more positive interactions with one's neighbors (Day, 2008; Kaplan, 2001; Grahn

and Stigsdotter, 2003; White et al., 2013). Quality neighborhood parks in particular contribute to stronger social ties among residents, as parks provide residents with an opportunity to interact frequently, and establish trust and belonging (Kaźmierczak, 2013). This benefit applies to people of all ages, as studies have found that children, college students, and older adults all show signs of improved cognitive functioning, better perceived quality of life, and increased social ties (Mårtensson et al., 2009; McFarland et al., 2008; Kweon et al., 1998). Too much stimulation from traffic or noise leads to individuals being inattentive, withdrawn, irritable, distractible, impulsive, and accident-prone; however, this can be overcome through contact with nature. Greenspace helps to reduce levels of stress and promote good mental health, because simply viewing natural resources can facilitate attention restoration (Berman et al., 2008). These findings suggest that features such as streets and parks lined with grass, plants, and trees, and buildings with windows that allow residents to view these natural features, will go a long way toward promoting a vibrant, healthy community.

Place Attachment

Place attachment, or the positive emotional bond between a person and a place, is also predictive of a healthy community (Sullivan & Chang, 2011). As Altman and Low (1992) found, people who are emotionally attached to their neighborhood are more engaged in their community and are more likely to be long-term residents than those without such an attachment. Planners can increase the chances that people will form positive emotions toward their neighborhood by designing aesthetically pleasing environments where residents want to spend their time. Having public gathering spaces increases the opportunity for developing or fostering social ties. The more social gathering spaces (i.e. cafes, coffee shops, parks, community centers, etc.) there are within a community, the more opportunities there are for residents to hang out, develop new friendships, and de-stress, thereby strengthening social capital (Sullivan & Chang, 2011; Oldenberg, 1999). The more extensive an individual's social connections, the more likely and less costly he or she can access health-relevant information or seek informal care and assistance in case of illness (Rocco & Suhrcke, 2012).

Transportation, Aesthetics, Noise, and Way-finding

There are also features of the built environment that can impede the development of social capital and good mental health. As mentioned in the Mobility section, long commutes from home to work add stress to daily life and decrease involvement in community affairs (Heaton et al., 2010). Thus, it is essential to construct live-work communities where residents can quickly travel between destinations, freeing up time for friends, family, exercise, or other health-promoting activities. Additionally, communities with dilapidated buildings and overcrowding have been associated with increased rates of social withdrawal among the residents, who often feel unsafe and stressed (Evans, 2006). High levels of noise and traffic in a community can contribute to sleep disruptions and safety concerns that are associated with increased cardiovascular disease risk, aggression, anxiety, and decreased interactions with neighbors (Sullivan & Chang, 2011; Stansfeld, Haines, & Brown, 2000; Davies & Van Kamp, 2012). In addition, the lack of way-finding mechanisms that help orient a person within physical space can also contribute to increased stress, anxiety, and frustration, when one is lost. "Places with distinct landmarks and districts, clear edges and pathways, and appropriate signage increase legibility, help people stay oriented, and promote less stressful interactions with the built environment," which improves mental health (Sullivan & Chang, 2011: 114). Therefore, providing residents and visitors with way-finding tools to navigate their way through a community is critical.

Vacant Land

A study by Garvin et al., (2012) found that residents regard vacant land as a negative force that undermines health in neighborhoods. For example, illegal use of vacant land for dumping, prostitution, or drug sales contributes to a sense of helplessness and a lack of trust among neighbors. Coincidentally, communities lacking collaboration and respect for one another are more likely to have increased rates of violence. Residents found that vacancy promotes crime, making people feel less safe and often forcing them to stay inside, rather than interact with members of their community. The presence of vacant lots, often strewn with garbage and other hazards like broken glass, contributes to a sense of stress, anger, and depression among residents (Garvin et al., 2012).

EXISTING CONDITIONS

Limited Greenspaces

The Subarea currently has 12 parks and open spaces, two community gardens, and four habitat corridors. Given the existing population and employment conditions in the Subarea, as outlined in the Economic Security chapter, there is currently sufficient open space in or near the Subarea to serve the needs of residents, employees, and visitors. However, with new development in the area and

an expected increase in South Downtown residents, new greenspaces will need to be developed in the future.

Underutilization of Land

The Subarea has a relatively small resident population and a large amount of vacant land. There are numerous vacant or underutilized properties, especially along the west side of the Thea Foss Waterway, that have potential for redevelopment. As mentioned previously, vacant land contributes to stress, exposure to various hazards, and inhibited social capital.

Noise and Traffic

Train horn noise from the Sounder commuter rail is a serious detraction to livability in the Dome District, having a significant negative impact on the business environment and quality of life in the Subarea. As mentioned in the Mobility section, Tacoma is situated along many major interstates and state routes, and is subject to significant congestion. Traffic noise likely contributes to sleep-loss and stress-related problems, such as high blood pressure and mental fatigue.

Artwork

The Subarea provides opportunities for artistic enjoyment and education with the Museum of Glass and the Tacoma Art Museum. The Chihuly Bridge of Glass is a 500-foot-long pedestrian overpass that links the Museum of Glass to South Downtown and displays over 109 glass sculptures. Artwork contributes to aesthetically pleasing environments that directly and indirectly improve mental health outcomes (Ball et al., 2001).

Thea Foss Waterway

The Thea Foss Waterway Public Esplanade currently serves thousands of visitors annually on Tacoma's waterfront. It provides 2.5 acres of waterfront park space with walkways, benches, picnic areas, water access, small boat access, greenspace, and landscaping. Significant residential growth is expected in this area.

University of Washington-Tacoma

Since University of Washington-Tacoma (UWT) was established in 1990, its subsequent growth and new vitality has created a focal point in the Subarea. UWT plans to expand the campus in a way that builds upon and creates new connections with the broader community of residents. Having access to the services and economic vitality of a large university can be a community asset.

Local YMCA

Currently, UWT is working with the local YMCA to foster a stronger community connection. The YMCA has a program entitled "Life University" that holds classes on topics such as handling stress, child rearing, financial stability, and the connection of mind and body wellbeing. The YMCA also provides a healthy place to meet new people and share in life's challenges.

Old Brewery District

The Brewery District is situated between UWT and the Dome District, and has the potential to serve as an important connector between the various neighborhoods in the Subarea. There is currently very little housing in the Brewery District and a relatively high amount of vacant or underutilized property that presents numerous opportunities for redevelopment.

Overall, the Subarea has several challenges, but there are also many existing strengths that can be built upon to improve the overall wellbeing of area residents, students, and workers.

WHAT THE PLAN SAYS ABOUT MENTAL HEALTH AND SOCIAL CAPITAL

Although it does not overtly discuss mental health and social capital, the Plan nonetheless includes plans that promote mental and social wellbeing throughout the document.

Greenspaces

Strategy three of the Plan aims to enhance and connect the public realm by providing ample open space for projected future growth. The City of Tacoma plans for an equitable distribution of open space types, including pocket parks, recreation areas, and community gardens.

Place Attachment

The SAP intends to make the Subarea a thriving urban center that brings opportunities to local residents and businesses, thereby supporting the development of emotional bonds between residents and the Subarea. The SAP encourages the expansion of South Downtown's concentration of creative arts and design, urban recreation, and dynamic small-scale businesses.

Aesthetics, Noise, and Way-finding

The SAP addresses noise by promoting a "Quiet Zone"

that will limit train horn noise in the core of the Dome District. A public art strategy will prioritize artwork in prominent locations and encourage art projects in underutilized properties, to help improve the aesthetics of the region. The SAP proposes building a legible system of public walkways, trail corridors, and active street linkages that connect the Subarea's neighborhoods, waterfronts, and key destinations. Improvements in neighborhood navigability will improve way-finding to cultural attractions for motorists and public transit users.

Vacant Land

The City of Tacoma has adopted new land code language of "Live-Work" and "Work-Live", removing barriers for mixed-use communities and enabling a unique, economical solution for both housing and commercial space. New opportunities for mixed-use development, public and private investment, recreational opportunities, and public access are expected to reduce the current abundance of vacant lots throughout the Subarea. The SAP identifies currently vacant sites with potential for private sector investment.

ANALYSIS AND IMPACT ASSESSMENT

Mobility

The focus on public transit and other alternatives to motor vehicle commuting provides convenient, practical options for residents to spend more time outdoors and among members of the community, while enhancing social capital. As stated in the SAP, "A safe, comfortable, and engaging pedestrian experience is perhaps the most essential ingredient of a vibrant, mixed-use center." Providing efficient connections between various neighborhoods via public transit has the capacity to "knit together the Subarea and integrate it with the City."

Social Capital

As mentioned in the Existing Conditions section, the Brewery District has the potential to be a vibrant area for community residents. Creation of the Brewery District Holgate Market has the potential to "form the social heart of the Brewery District and would breathe new life in the neighborhood." Farmers markets provide an opportunity for neighbors to interact with one another in the Brewery District. Connecting with those around you can promote a sense of belonging, a feeling that you matter, and a healthy trust in your neighbors (Bjornstrom, 2011).

Community Gardens

Developing community gardens throughout the Subarea can provide residents with minimally-processed healthy foods, as well as a number of benefits that improve mental health, including:

- Building a sense of community and purpose among participants;
- Restoring blighted neighborhoods;
- Building skills among participants; and
- Encouraging physical activity (Wakefield et al, 2007).

Noise

As mentioned in the Mobility chapter, noise is a major concern in the Subarea. Train horn noise is a serious detraction to livability in the Dome District. As mentioned in the SAP, "Train horn noise has a significant negative impact on the business environment and quality of life in the Dome District." Too much noise stimulation may cause individuals to be inattentive, withdrawn, irritable, distractible, impulsive, and accident-prone (Sullivan & Chang, 2011). Noise is linked to aggression and violence and can be a source of frustration for residents.

Greenspaces

New access to open spaces and parks will improve the livability of the Subarea. The SAP states that, "(as) South Downtown gains population and employment, exemplary open space will be a critical ingredient for achieving the goal of a vibrant, walkable, mixed-use community." Greenspaces offer mental health benefits through stress reduction, both for park visitors and for people who live near parks (Orsega-Smith et al., 2004). Parks with certain features, such as greenery, good maintenance, recreational facilities, and restrooms, predict greater use and are important elements to consider in the SAP.

Public Artwork and Aesthetics

As mentioned in the SAP, "The quality of urban open space can be greatly enhanced with public art and well-designed amenities such as lighting and benches." The Tacoma Museum of Glass art displays have the potential to contribute immensely to psychological wellbeing. Art displays reduce stress, decrease heart rates, and improve moods for visitors and residents (Wichrowski et al., 2005). The City should proactively pursue the funding of public art and aesthetic improvements in both existing and planned open spaces throughout the Subarea.

RECOMMENDATIONS

1) *Greenspaces and Community Gardens* – Preserve all existing greenspaces in the SAP and foster the development of new greenspaces through the promotion of community gardens throughout the Subarea.

- Community gardens build a sense of community and provide local, healthy food sources, as well as opportunities for physical activity.
- Greenspaces help to reduce levels of stress and promote good mental health.
- The city can use spaces that are currently vacant for the development of new community gardens.
- The SAP should also explicitly include plans for proper lighting and bench placement within public spaces, to help make these places safer and more appealing to the community.

2) *Waterfront Area* – The SAP should continue to emphasize recreation and small business opportunities on the waterfront in order to increase the opportunity for residents to develop place attachment.

- The Thea Foss Waterway is one of the Subarea's strongest assets, providing opportunities for recreation, stress management, and the development of social ties.
- We recommend that the city encourage locally-owned cafes, bookstores, and other small shops that support community interaction and promote mental health.

3) *Old Brewery District* – Start a weekly farmers market in this district to encourage community engagement and to support local businesses.

- Farmers markets foster social capital by connecting community residents and promoting a sense of belonging, feelings of self-worth, and a healthy trust in your neighbors.
- The SAP should integrate a media and publicity campaign to emphasize the historical significance of this district to create interest in the area and make it an attractive living space.

4) *Urban Open Spaces* – Involve community residents in the design of the Subarea by holding a contest, allowing community members to submit public art project ideas; the top submissions should be funded.

- Public art makes urban areas more appealing, thereby enhancing mental health and fostering social connections.

5) *Noise* – Keep noise levels below 60 decibels (dB) from 10:00pm – 7:00am, when many residents will be trying to sleep.

- Noise levels above 60 dB have been associated with increased risk of cardiovascular disease (Davies and Van Kamp, 2012).
- Since noise is one of the greatest challenges for people living in this area, the SAP should more directly address this issue.
- The Pierce County Public Health Department should monitor noise levels and air quality near the highway and train tracks to help enforce noise and air pollution regulations.

6) *Alternative Transit and Way-finding*– Create an extensive way-finding system with colorful signage that highlights historical buildings, public art, and community services to improve walkability in the Subarea.

- The SAP and the City of Tacoma have already worked to emphasize public transit and to make it easier to develop mixed-use communities in the Subarea.
- The SAP should preserve these assets to create walkable communities where people want to live, work, and play.

SUMMARY

We found that the draft SAP offers many components that will foster improvements in mental health and social capital. Specifically, the plan emphasizes development of the historic Old Brewery District and the Thea Foss Waterway, and improves access to public transportation to create a more walkable and bikeable area. We recommend that the SAP preserve these assets. To improve mental health and foster social capital, the City of Tacoma should utilize vacant spaces to establish community gardens and recreational areas, restrict noise levels to below 60 decibels, and increase way-finding through colorful signage that highlights areas of historical significance and important community services.

CHAPTER 6 - AFFORDABLE AND HEALTHY HOUSING

INTRODUCTION TO AFFORDABLE HOUSING

Introduction

Housing is considered to be affordable when the cost of housing plus utilities equals no more than 30% of gross household income (Housing Advisory Group, 2010). The cost of affordable housing in Washington State is determined at the local level, based on countywide area median income (AMI). To be considered affordable, unit prices can range from 30% AMI, to 50 or 80% AMI.

Health Impacts of Affordable Housing

Housing affordability affects health through the infliction of stress on low-income families. Prioritizing rent over necessities such as food, transportation, medical care, and childcare places a significant burden on families. The on-going concern of maintaining stable housing impacts individual and family participation in their immediate communities, reducing levels of social capital. Social isolation due to lack of affordable housing has been linked to depression, anxiety, extended periods of unemployment, and increased homelessness. The importance of affordable housing to good health is increasingly prominent in public health policy and research (Anderson et al., 2002).

The lack of affordable housing can have a particular impact on children. Children whose families are waiting for housing assistance are exposed to many more health hazards than children whose families are already receiving housing assistance (Sharfstein et al., 2001). Stable, affordable housing was found to be the most important factor in explaining differences in rates of infant mortality among children born to extremely poor mothers (Culhane et al., 2001).

The severity of the impact related to affordable housing is often referred to as “rental burden.” A study conducted by the Joint Center for Housing Studies of Harvard University on rental burden found that in 2009, families with children in the bottom expenditure quartile spent less than $1,450 each month on housing and all other needs. On average, those with severe rent burdens devoted more than three times as much of their monthly budgets to housing than their counterparts in affordable units, and had only half ($571) the additional spending dollars as unburdened renters ($1,107). On average, these severely housing cost-burdened families spent 71% less on transportation, 52% less on clothes, 52% less on health care, and 37% less on food than those living in affordable housing. Households in the lower-middle expenditure quartile are also under significant pressure; families with children had roughly $2,550 per month to spend on housing and all other needs. Those with high housing outlays, however, had only $1,050 available for non-housing expenses—again, roughly half as much as those living in affordable housing. These housing cost-burdened families spent on average 63% less on transportation, 59% less on clothing, 74% less on health care, and 24% less on food than families with affordable housing (Joint Conference on Housing Studies of Harvard University, 2011).

Existing Conditions

Currently, the city of Tacoma is facing an affordable housing shortage; many residents are paying greater than 30% of gross household income towards rent. As of the 2000 census, 73% of Tacoma’s very low-income households and 77% of its extremely low-income households are paying more than 30% of their gross income for housing and utilities; 22% of its very low-income households and 61% of its extremely low-income households are paying more than 50% of an already low income. Housing officials in Tacoma estimate that they will need an additional 14,096 units of affordable housing to accommodate

its current population, and an additional 8,174 affordable housing units between now and 2030 to meet their expected growth in population in the coming years (City of Tacoma, 2013a).

Housing affordability in the Subarea is assessed in relation to the countywide AMI, which is $40,150/single person and $57,350/family of four. According to the SAP, there are currently 462 units of subsidized housing, accounting for 29% of available housing. These 462 units meet the definition of affordable housing, ranging between 30% AMI and 80% AMI. 325 of the 462 subsidized housing units are affordable to 30% AMI. There are also a number of market-rate rental units in the Subarea that some low-income residents may qualify for. Of the 518 market-rate units available in the Subarea location, 145 of the units are affordable at 51% to 80% AMI (City of Tacoma, 2013a). This currently exceeds the Pierce County and Washington State requirement that 25% of all available housing qualify as 'affordable housing' (City of Tacoma Affordable Housing Policy Group, 2010: 2-15).

Affordable Housing in the Subarea Plan

Through developer incentives, preservation of current affordable housing units, and implementation of minimum affordable housing standards, the SAP works to ensure housing will remain affordable over Tacoma's next 20 years of population and economic growth.

Many of the recommendations within the Subarea Affordable Housing Plan are adopted from both the City of Tacoma's proposed 2013 Affordable Housing Policy and Code Amendment, and the 2010 Policy Recommendations of Tacoma's Affordable Housing Group. The SAP focuses its recommendations into three categories: 1) Affordable Housing Goals, 2) City of Tacoma 2013 Affordable Housing Policy, and 3) Affordable Housing Strategies. In accordance with Washington State's Growth Management Act and the Pierce County Regional Council, the SAP proposes one overarching Affordable Housing Goal:

> *"Recommendation AH-1: Adopt a policy that twenty-five percent of the total housing units in South Downtown shall be affordable to households earning up to 80 percent of the countywide median income." (City of Tacoma, 2013a: 80).*

To ensure this outcome is met, the SAP recommends initiatives in five main areas:

1. South Downtown will adopt the City of Tacoma's affordable housing policies and proposed Affordable Housing Policy and Code Amendment (City of Tacoma, 2013a: 82).
2. The City will identify and adopt "the most promising mechanisms" from the 2010 Policy Recommendations of Tacoma's Affordable Housing Policy Advisory Group to support equitable growth (City of Tacoma, 2013a: 84).
3. The City will offer developers a variety of financial incentives to encourage inclusion of affordable units in new housing developments. Among these financial incentives is the Multifamily Property Tax Exemption, Affordable Housing Developer Loans, Development Bonuses for Incorporating Affordable Housing, City Assistance and Private Partnerships, Transfer of Development Rights, Value Capture, Surplus Land Disposition, and TOD Affordable Housing Fund (City of Tacoma, 2013a: 82-85).
4. The City will work with partners to collaborate on transit-oriented developments to ensure transit rich parcels are developed with affordable housing (City of Tacoma, 2013a: 85-86).
5. The City will develop a monitoring system to ensure affordable housing quotas are met, a back-up system of policies and regulations that take effect if affordable housing falls under the required twenty-five percent, and a marketing strategy will be implemented to encourage individuals to move into the new South Downtown housing (City of Tacoma, 2013a: 86-87).

Analysis and Impact Assessment

While the SAP establishes extensive proven strategies to ensure developers include affordable housing units, the recommended outcome that "twenty-five percent of the total housing units in South Downtown shall be affordable to households earning up to 80 percent of the countywide median income" (City of Tacoma, 2013a: 80) will potentially have a negative impact on health. While twenty-five percent affordable housing for residents earning less than 80% AMI is the required Pierce County minimum, this minimum will not facilitate positive health outcomes for the City of Tacoma.

In the 2010 City of Tacoma Affordable Housing Policy Advisory Group Recommendations, the group recommended that "the City's goals should be that at least 20% of downtown housing units, but not more than 20%, will be governed by subsidies that reserve those units for

households at or below 50% AMI and that make those units affordable to such households" (2010: 30). State law also directs that rental units be targeted to an income of 50% countywide AMI or less (RCW 36.70A.540(2)(b)). While the state law allows for rental units to be targeted at 80% AMI if local need has been assessed at that level, it is clear from demographic data and the presence of vulnerable populations that Tacoma residents require rental units available at 50% AMI. If twenty-five percent of affordable housing in Tacoma is only available to families at 80% AMI, the rental burden placed on lower income families could result in the negative health effects outlined above, including stress, social isolation, and diminished funds for food, health care, and other health-promoting factors.

It is also important to note Tacoma's "supply versus need misalignment" (Policy Advisory Group, 2010). HUD data from 2000 estimated that only one half of Tacoma's affordable housing was rented by families at or below the target AMI. "Of the units affordable to households at or below 30% AMI (extremely low income), only 61% were occupied by households with incomes in that range. The others were occupied by households with higher incomes" (Policy Advisory Group, 2010). This supply versus need misalignment is likely to continue if regulations are not established to ensure otherwise. If this misalignment does continue, an even larger number of lower income Tacoma residents will either experience displacement or be forced to pay greater than 30% of their income towards housing.

HOUSING QUALITY: SOCIAL EQUITY, DISPLACEMENT, AND GENTRIFICATION

Introduction

Housing quality refers to the structural building conditions of homes. Quality housing creates a standard of living that promotes a healthy lifestyle. The World Health Organization identifies 4 categories crucial to supporting healthy housing quality: 1) Ventilation, 2) Lighting, 3) Disease vectors, and 4) Overcrowding (WHO, 2002). Proper appliances, mechanical systems, and sanitary systems within the home are essential to maintain good health (Beatley, 2011).

Low-income populations have a higher risk of living in sub-standard housing. This housing inequity negatively impacts community health. Positive community development and growth of social capital cannot be achieved if social equity is ignored. Displacement can also result in another form of social inequity. Equitable development can be defined as "a range of approaches for creating healthy, vibrant, and sustainable communities where residents of all incomes, races, and ethnicities have access to the opportunities, services, and amenities they need to thrive" (McConville et al., 2013). The aim of equitable development is to ensure that the benefits of economic growth are felt by everyone in the region (McConville et al., 2013). Displacement, gentrification, and vulnerable populations must all be addressed in order to achieve equitable development.

Gentrification is the process of redeveloping deteriorated areas, accompanied by an influx of people of greater affluence than the current residents. Displacement can occur when housing prices in a predominantly low-income neighborhood increase at a faster rate than the income of residents (Levy et al., 2006). These residents face displacement from their homes and neighborhoods as a result of their inability to keep up with increasing rent or property taxes. Furthermore, when housing prices in a neighborhood are high, low-income individuals are prevented from relocating to that area. Gentrification can lead to more homogeneous neighborhoods, consisting of people of the same relative income levels, and often of the same race and ethnicity (Levy et al., 2006).

However, gentrification does not always lead to displacement of populations, and some argue that gentrification has a positive impact on communities (Levy et al., 2006). Affluent individuals moving into an area may bring new housing investments, cultural and retail services, and improvements in infrastructure (ICP 2009). Endemic populations may therefore benefit from the process of gentrification.

Gentrification, Housing Quality, and Health

The health concerns associated with low-quality housing are numerous. Cramped and crowded conditions can create breeding grounds for ticks, fleas, and other infectious bugs. Water contamination can lead to health risk and disease. Inadequate lighting can cause eyesight problems. Low-quality houses are more likely to expose their occupants to indoor air pollution, mold, mildew, asbestos, and lead. Indoor air pollution, mold, and mildew can cause allergic, cardiovascular, and respiratory complications, including asthma (Perez-Padilla et al., 2010). Asbestos inhalation can cause different forms of cancer (Perez-Padilla et al., 2010). Lead, which can still be found in many older buildings, can have neurodegenerative effects such as brain damage, impaired mental capacity, behavioral disorders, and even death (McConville et al., 2013). Furthermore, poor housing conditions can lead to

higher stress, which causes a host of negative mental and individual health outcomes (WHO, 2002).

Displaced individuals are forced to resettle in new neighborhoods, where they are more likely to live in sub-standard housing. Low-income and minority populations are "more likely to live in unhealthy housing with indoor air pollution, lead paint, asbestos, mold, and mildew" (McConville et al., 2013). A neighborhood undergoing gentrification can also cause individuals living on the brink of homelessness to be forced from their current housing situation and onto the streets (ICP 2009). Gentrification can affect those who are already homeless by further increasing housing costs or reducing homeless services. Homelessness in general is linked to "higher rates of mortality and increased morbidity due to respiratory infections and poor nutrition" (Krieger & Higgins 2002). The homeless also face higher rates of abuse and mental health problems (Cohen 2011).

Housing in mixed-use land areas fosters an environment that supports community development and discourages displacement. Access to grocery stores, transit, community areas, green spaces, offices, and other amenities, creates a functional network that promotes health and better living standards (Miller, 2011). Public safety is also addressed through developing mixed land use housing. Public safety promotes healthy lifestyles and communities through the 'eyes of the street' concept; people interacting in the physical space throughout the day and not just during non-business hours increasing safety through numbers. Mixed land use creates an around-the-clock street watch, and fosters a sense of community (Brown, 2008).

Existing Conditions

Currently, the Subarea is primarily an industrial area with vacant lots and brownfields. Few residential properties exist. Consequently, the area has relatively low population density; only 2,462 people currently live in the project area. Vulnerable populations living in the Subarea include racial/ethnic minorities, the homeless, elderly, and low-income residents. It was estimated that between 4,440 and 5,550 persons experienced homelessness in Tacoma in 2009 (City of Tacoma, 2013a: 36). Given current conditions, the Subarea is not conducive to healthy lifestyles.

Gentrification in the Subarea Plan

The SAP mentions displacement, equity, and vulnerable populations in a few limited sections. Early in the report, authors stress that current residents should not be displaced, and that the plan will "ensure that all people have equal access to a safe, clean, and healthy environment in which to live, work, and play" (City of Tacoma, 2013a: 9). A few pages later, however, the report seems to disregard concerns of displacement of households and businesses due to the relatively small resident population and large areas of vacant space (City of Tacoma, 2013a: 12). Further mentions of equity in the SAP are mostly made in the context of transportation.

The SAP includes goals for both high-quality design and mixed use neighborhoods:

- *Mixed Use:* Neighborhood health is supported through a balance of complementary uses, such as housing, retail, offices, entertainment, and light industry (City of Tacoma, 2013a: 9).
- *High-Quality Design:* Design guidelines and standards can help ensure a well-designed built environment (City of Tacoma, 2013a: 10).

Despite mentions in the SAP of high-quality design, there have yet to be specific design guidelines and standards that describe the quality and health impacts that housing design should have. Overall, the SAP considers health through the built environment in a positive light and incorporates it significantly throughout the plan.

Analysis and Impact Assessment

If executed well, the SAP will positively support health through equitable development, increased housing quality, and mixed land use. However, vulnerable populations may experience adverse health outcomes if project planners are not careful. Homeless populations and low-income individuals may experience negative health impacts if they become displaced due to rising costs of living in the Subarea. These individuals may be forced to live in the streets, or in low-quality housing in another neighborhood. To prevent the detrimental health effects of displacement and gentrification, it is important to ensure equitable growth and support community development

RECOMMENDATIONS

1) Develop appropriate measures to ensure affordable housing is available to vulnerable and lower-income populations.

- Within the 25% affordable housing allotment, create required bracket designations for families earning less than 30% AMI, 30% to 50% AMI, and 50% to 80% AMI.

- Within the Affordable Housing Monitoring Plan, develop a system that ensures affordable housing is utilized by residents within the targeted AMI bracket.
- Continue developer incentives to encourage inclusion of affordable housing units in conjunction with high transit areas.

2) Ensure design guidelines and building codes are defined prior to the redevelopment of the South Downtown Subarea.

- Ensure that hygiene, lighting, open space, crowding, and ventilation requirements are included in housing units.
- Ensure that new buildings are constructed with materials of minimal health risk.
- Ensure units are attractive and appealing to community through stakeholder input.
- Promote public safety by implementing housing within mixed-use spaces and inclusionary zoning.

3) Enable broad stakeholder participation in the housing planning process.

- Engage vulnerable populations and public housing organizations in the planning process to help prevent displacement and ensure that public housing units are safe and healthy.

SUMMARY

The issues of gentrification, displacement, social capital, housing quality, and affordable housing are thoroughly intertwined. Without an effective and inclusive affordable housing plan, Tacoma is at risk of experiencing negative health impacts from gentrification and displacement, with vulnerable populations disproportionately impacted. The development of social capital is essential for any community to grow and thrive. Healthy, affordable housing is what allows individuals to devote themselves to their community and experience together increased levels of social capital, and increased levels of overall health. Without safe and secure housing, individuals suffer significant financial, mental, social, and health burdens. Overall, the SAP takes these factors into consideration and addresses them. While the overall intent is clearly to promote community development and ensure safe, healthy, affordable housing, there are a few additional components we recommend the City of Tacoma take into account. Including vulnerable populations in the redevelopment discussions, ensuring housing is developed to high health standards, and making housing affordable to folks earning less than 50% countywide median income will help ensure Tacoma's Subarea develops into a healthy, vibrant place to live.

CHAPTER 7 - ENVIRONMENTAL HEALTH

INTRODUCTION TO ENVIRONMENTAL HEALTH

The World Health Organization defines environmental health as addressing "all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviors. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing disease and creating health-supportive environments" (WHO, 2013).

In this section we explore the environmental health impacts associated with the SAP. We address these impacts through various pathways of exposure, including soil, air, and water. Specifically, we examine the relationship between:

- Brownfields, exposures to toxins, and economic vitality;
- Air pollution, particulate matter and other criteria air pollutants, and proximity to industry and roads; and
- Water pollution in groundwater, surface runoff, and the Foss Waterway.

BROWNFIELDS

Definition and Relation to Health

Brownfields are defined as "abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination" (EPA, 2011). Contamination of these properties can result from the presence of industrial facilities, gas stations, dry cleaning facilities, and inappropriately stored chemicals, as well as many other common activities. Depending on site-specific geological factors and physical and chemical composition of contaminants, migration beyond the original source may occur via mobilization through soils, transfers to groundwater, surface water runoff, and/or volatilization to the atmosphere.

State and federal regulations require site cleanup prior to brownfield redevelopment. The extent and nature of this cleanup is often site- and contaminant-specific. Cleanup efforts are often complex and expensive, which can cause uncertainty in both project timing and costs for potential developers (Greenberg et al., 2001). As a result, brownfield properties commonly remain fallow for long periods until public outcry or market forces catalyze

Table 2: Categories of health impacts from brownfields (EPA, 2006)

Health Impact	Source
Exposure to Toxic Chemicals	Site contamination, groundwater impacts, surface runoff, or migration of contaminants to other sites.
Social/Economic Impacts	Increased crime and/or vagrancy, reduced social capital or community 'connectedness', reductions in the local tax revenue, reduced private and commercial property values, and the impediment of redevelopment/ revitalization.
Safety	Abandoned and dilapidated structures.

Vacant lots, such as the one pictured here, are potential brownfield sites, Photo Credit - Lara Costa Bomfim

redevelopment efforts. In the meantime, the presence of these sites may directly and indirectly impact the health of surrounding communities. Generalized health impacts are outlined in Table 2.

Although difficult to measure with epidemiologic tools, adverse health effects from residential proximity to contaminated brownfields are reported in current literature. For example, a thorough study of brownfield redevelopment in Charlotte, NC found that density of brownfields in a census block was related to a higher incidence of babies born with low birth weight. These researchers also attributed environmental cleanups to an economic benefit of $7.59 million in averted statistical cancer deaths (Chilton et al., 2009).

The existence of brownfields can also negatively impact local economies by decreasing property values and lowering tax revenues. Uncertain liability and high costs of remediation act as barriers for future economic development. These impacts affect health indirectly; loss of income can strain a municipality's resources, making it difficult to provide revenues for needed infrastructure and public services.

Existing Conditions

The presence of brownfields in the Subarea is a major consideration of and impetus for the SAP. There are many sites with known contaminants, leaking underground storage tanks, and abandoned commercial tanks (see Figure 8).

Many of these sites, however, have not yet undergone assessment. Assessments would provide needed information regarding the type and extent of contamination. It is likely that there is additional contamination from heating oil spills and gas stations that were not properly decommissioned. The Department of Ecology has determined that at least twenty-two such sites are known to be located within the Subarea, which is indicative that there are likely other contaminated sites within the Subarea as well (City of Tacoma, 2013a).

Additionally, the City became aware of seven plumes of five contaminants within the Subarea during construction associated with the University of Washington-Tacoma Campus. The plumes are composed of Trichloroethene (TCE), Benzene (B), Total Petroleum Hydrocarbons (TPH), Vinyl Chloride (VC), and Tetrachloroethene (PCE). See Table 3 below for potential health impacts related to these contaminants and refer to the SAP for plume locations. Seeing as how many needed assessments have not been completed for the Subarea, there may be additional underground plumes yet to be discovered.

Currently, the Subarea has a relatively low residential population coupled with a high percentage of land that is vacant or used as parking (City of Tacoma, 2013a). Future SAP land use is intended to promote a substantial increase in the number of residents and businesses within the Subarea. If not removed, this growth will increase the potential of human exposures to soil contaminants.

Subarea Plan and Environmental Impact Statement

The draft SAP and draft Environmental Impact Statement have considered the problems and opportunities brownfields present for the Subarea. An entire chapter of the SAP is devoted to the discussion of what is known and unknown about these sites and contaminants.

It is known that South Downtown Tacoma has significantly contaminated soils. The City recognizes that this contamination presents obstacles for development as envisioned by the SAP (City of Tacoma, 2013a). Because of this, the City has promoted an area-wide approach in its brownfields program and has been persistent in its efforts to secure funding to perform area-wide planning and site assessment. For instance, a 2012 EPA Brownfield Community-wide Assessment Grant Application is included as Appendix E of the SAP.

Specific recommendations in the SAP indicate the need for the continued pursuit of funding for assessment efforts (Recommendation BF-1, BF-8 and BF-10) (City of Tacoma, 2013a: 111-112). The document also proposes creation of an area-wide geographic information systems (GIS) brownfields inventory (Recommendation BF-3)

Figure 8: Areas of contaminated soils (image reproduced from the City of Tacoma Draft South of Downtown Subarea Plan, 2013)

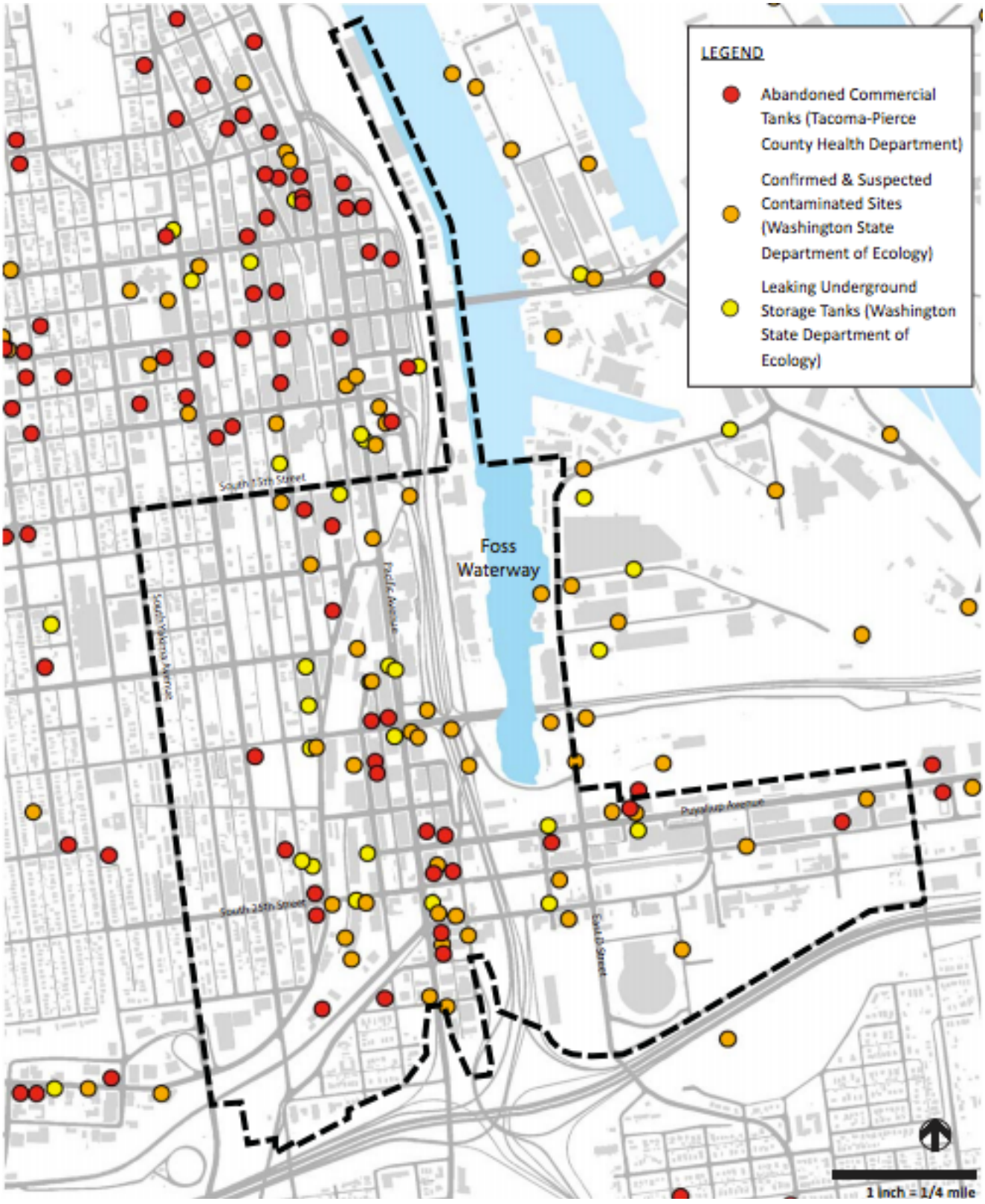


Table 3: Known plume contaminants and their potential health effects (CDC/NIOSH Pocket Guide to Chemical Hazards, 2007)	
Contaminant	**Potential Health Effects**
Benzene (B)	Cancer, bone marrow depression, decrease in red blood cells, anemia, immunological problems, irregular menstrual periods, irritation of eyes, skin, and lungs, dizziness, headache, and nausea.
Trichloroethene (TCE)	Cancer, nausea, liver damage, unconsciousness, impaired heart function, kidney damage, impaired immune system function, impaired fetal development in pregnant women, headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.
Tetrachloroethene (PCE)	Nervous system effects, menstrual problems, spontaneous abortions, liver and kidney damage, dizziness, headache, sleepiness, confusion, nausea, and difficulty in speaking and walking.
Vinyl Chloride (VC)	Cancer, liver damage, neurological and immunological damage, dizziness, numbness, redness, and blisters.
Total Petroleum Hydrocarbons (TPH)	Cancer, damage to the blood, nervous system, immune system, kidneys, liver, lungs, skin, and eyes, headaches, and dizziness.

(City of Tacoma, 2013a: 111). Currently, it is challenging to locate spatial and contaminant information for specific sites.

The remediation of brownfield sites currently owned by the City of Tacoma is proposed as a proactive strategy to reduce uncertainty and show a strong commitment to potential developers (Recommendation BF-6 to BF-8) (City of Tacoma, 2013a: 112). The City also hopes to offer assistance to private sector entities in the navigation of brownfield assessment, remediation, and development requirements and regulations (Recommendation BF-11, BF-12) (City of Tacoma, 2013a: 113).

The Environmental Policy Element of the City of Tacoma Comprehensive Plan includes mitigation measures for dealing with contaminated sites. The mitigation measures, including source control and best management strategies, aim to avoid recontamination of wetlands, streams, shorelines, groundwater, and other aquatic areas (City of Tacoma, 2013b: section 3.5.5). Washington State regulations, under the Model Toxics Control Act (MTCA), set strict and pertinent environmental cleanup standards. These standards include protection of human health (i.e. for site workers) and the environment; however, this is not mentioned in the SAP.

Analysis and Impact Assessment

Remediation and redevelopment of brownfield sites is expected to mitigate associated environmental health risks, including direct health impacts from chemical exposures. These cleanup efforts will also greatly reduce the chances of migration of contaminants into groundwater and indoor air environments. Over the course of remediation, construction, and development, disturbance of contaminated soils may lead to an increased risk of exposure to site workers and others residents living and working near the site. The potential exposures associated with these activities are likely temporary, site specific, and more likely to affect residents and workers not following protocol or wearing protective equipment. Additional and long-lasting health impacts may occur if sites are developed for uses inconsistent with residual contamination levels (i.e. housing), or if capped sites are not monitored and applicable deed restrictions are not enforced (Greenberg et al., 2001).

While the Subarea is currently sparsely populated, more residents are expected to move into the area as the vision of the SAP is realized. This potential influx in population will likely occur before all site remediation within the Subarea is complete. While the area-wide planning approach allows for upfront assessment of many potential environmental- and health-related impacts, the SAP neglects discussion of mechanisms for controlling exposures for populations that move into the Subarea while remediation efforts are ongoing. Additional environmental impact assessments will not be required for new subarea projects. The extended horizon of this plan forecloses avenues for public participation compared to a more iterative development process. Frequent and meaningful community engagement is often cited as a critical com-

ponent of successful redevelopment projects (Bartsch, 2003; EPA, 2012b).

The redevelopment of these sites is likely to improve economic conditions in the Subarea as unproductive land is repurposed. Improved economic conditions may positively influence community health through job creation, a deeper tax base, and increased property values (De Sousa et al., 2009).

Equity

Vulnerable populations are likely at higher risk of negative impacts associated with brownfields. Census blocks containing brownfields tend to have higher rates of poverty, larger minority populations, vacant residencies, and lower per capita income than census blocks without brownfields (Office of Brownfields and Land Revitalization, 2009). The SAP includes many proposed activities aimed at the elimination of brownfield sites.

WATER AND HEALTH

Definition and Relation to Health

Water serves a vital role in human lives. Water fulfills basic consumption needs, is utilized in sanitation systems and hygiene practices, and serves aesthetic and recreational purposes. However, water can facilitate negative health outcomes through numerous direct and indirect pathways. The most relevant public health concerns associated with water include:

- Ingestion of chemicals or pathogens by consuming contaminated water or seafood;
- Dermal exposure to chemicals or pathogens via contact with contaminated water;
- Morbidity and mortality caused by accidents associated with water-related activities.

Existing Conditions

Groundwater: While most of Tacoma's drinking water is provided by the Green River, peak demands are supplemented by 13 groundwater wells in South Tacoma. The most important source of groundwater is the South Tacoma Channel, which provides 10% of the 80 million gallon per day average demand for Tacoma Water (City of Tacoma, 2013b). The Channel's geology is characterized by highly porous sands and gravels; these geologic factors make this aquifer not only highly productive, but also highly susceptible to contamination.

Stormwater Runoff: Rainwater in the Subarea is collected through a system of catch basins and a network of piped storm sewers. The Subarea drains into the Puyallup River and the Thea Foss Waterway, which connect to Commencement Bay and Puget Sound. Runoff from roadways, driveways, and parking lots can transport pollutants such as gas, oil, animal waste, pesticides, fertilizers, and other chemicals into these surface waters. This "non-point" source pollution accumulates as water runs over impervious surfaces toward the receiving body of water. The City of Tacoma has programs in place for stormwater discharge monitoring, as evidenced by the 2012 Stormwater Management Manual (City of Tacoma, 2012b).

Thea Foss Waterway: The Commencement Bay Nearshore/Tideflats Superfund site, which includes the Foss Waterway, was added to the National Priority List in 1983. Planning for the cleanup project began in 1994, and took place from 2002 through 2006. Remediation involved a combination of natural recovery, dredging, and capping in place. Some contaminants of concern (COCs) are still prevalent in sediments; they are deposited via stormwater, marinas, and groundwater seepage (City of Tacoma, 2013b). Two COCs with the greatest potential to affect sediment quality include polycyclic aromatic hydrocarbons (PAHs) and phthalates. In recent years, Tacoma has made significant efforts to control pollution sources and avoid recontamination of the Foss Waterway.

Subarea Plan

The SAP includes strategies, policies, and proposed actions that directly address stormwater management and water-related development. Regarding stormwater runoff, the SAP proposes to "apply natural drainage strategies to enhance the livability and sustainability of open spaces, while reducing capacity demand on the City's stormwater system" (City of Tacoma, 2013a: 55). Other stormwater management tactics include implementation of strategies to "collect water from streets and roofs, store and filter the water through the landscape, and reuse [it]" (City of Tacoma, 2013a: 57).

The SAP also proposes policies that would increase mixed-use development along the Foss Waterway. This includes supporting the Foss Waterway Development Authority "in its ongoing efforts to realize the community's established vision for the Waterway" (City of Tacoma, 2013a: 58), and "leveraging the Waterway's potential as an urban amenity that catalyzes economic development in South Downtown" (City of Tacoma, 2013a: 59).

While the SAP does not directly address groundwater

pollution as a result of soil contamination, proposed strategies and policies to remediate brownfields relate to water quality issues.

Analysis and Impact Assessment

Groundwater: Implementing the SAP has potential to improve groundwater quality. Because groundwater is directly affected by soil contaminants, efforts to remediate brownfields are likely to reduce the risks of groundwater pollution from contaminated soils. Preemptive pollution control is important because pumped groundwater only undergoes chlorine disinfection for microorganisms. Consequently, the SAP may positively affect health outcomes. As contaminated soils are remediated, pollutants will be reduced, and water will become safer for consumption.

Stormwater runoff: The SAP's impact on water quality as a result of stormwater runoff is uncertain. While higher population density may increase street pollutants, the SAP calls for policies and actions that would improve stormwater management (City of Tacoma, 2013a). Through source identification and correction programs during superfund clean-up, Tacoma significantly reduced contaminants in stormwater discharges (City of Tacoma, 2012a). If these improvements continue, surface water pollution may remain constant or improve over time. While the health effects of stormwater runoff are uncertain, contaminants entering the Thea Foss Waterway will directly impact health.

Thea Foss Waterway: SAP development surrounding the Foss Waterway may negatively impact health outcomes. Even though the Commencement Bay Nearshore/Tideflats Superfund site underwent substantial clean-up, contaminants still remain in the sediments (EPA, 2009). Part of the Site was covered-in-place with a protective sediment cap; if this layer is disturbed, pollutants could be re-suspended in the water. Additionally, stormwater runoff, if untreated, could pollute the Waterway with chemicals and/or microorganisms.

As cited in the SAP, the Foss Waterway Development Authority aims to "encourage the reuse and redevelopment of the area for mixed-use pedestrian-oriented development, [including] cultural facilities, marinas and related facilities, water-oriented commercial uses, maritime activities, water-oriented public parks and public facilities, residential development, and waterborne transportation" (City of Tacoma, 2013a: 20). If these goals are realized, increased recreational use of the Waterway would increase the likelihood of human contact with water. This could result in exposure to hazardous chemicals or pathogenic microbes, leading to acute health problems like rashes or infections.

While possible, these negative health outcomes are unlikely. The South Downtown Subarea Environmental Impact Statement identified PAHs and phthalates as the chemicals most likely to affect sediment quality in the

New development along the Foss Waterway, Photo Credit - Halley Brunsteter

Foss Waterway. Due to their chemical properties, PAHs and phthalates are not readily absorbed by the body through dermal contact or ingestion of contaminated water; thus, their potential impact on human health is unlikely. However, due to biomagnification, seafood grown in contaminated areas is a significant source of exposure if consumed. Site use restrictions are in effect to limit human exposure to contaminated seafood, making this too an unlikely source of exposure to these chemicals.

Increased recreational activities around the Foss Waterway could also lead to an increase in water-related injuries (i.e. drowning). Compared to the potential health impacts of microbial infections or chemically-induced skin irritation incidents, water-related accidents are more likely and more severe.

Increased economic activity in the Subarea could provide tax revenue that could indirectly benefit health by funding infrastructure improvements and water quality monitoring programs.

Equity

In other cities, vulnerable populations have been shown to utilize local waterways more than the general population for recreational and fishing purposes. For example, in the Duwamish River of Seattle, consumption of fish

by low socioeconomic populations as a means of supplementing their diet is a major environmental justice concern (EPA, 2013). While signage warns against the consumption of seafood from the Foss Waterway, vulnerable populations may be at increased risk of exposure if individuals cannot read the signs, or feel compelled to consume caught seafood for cultural reasons or because few alternative food sources exist.

AIR AND HEALTH

Definition and Relation to Health

The quality of air within regions, cities, neighborhoods, and buildings is important to the environment, tourism, and public health. This section discusses the mechanisms by which air pollution could affect health outcomes in the Subarea, and assess how the SAP may or may not influence these effects.

Criteria Air Pollutants

Air quality impacts health primarily through direct inhalation of harmful compounds. The EPA sets standards for limiting air pollution by focusing on six 'criteria' pollutants: ozone (O_3), carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO), sulfur dioxide (SO_2), and lead (Pb). As mentioned in the Environmental Impact Statement, a region that includes Tacoma and much of Pierce County has historically failed to meet PM standards (City of Tacoma, 2013b). Pierce County has also failed to meet standards for O_3 and CO in the past, but they are now in attainment. We will therefore focus mostly on PM—the pollutant of greatest current concern—and briefly discuss O_3 and CO as well.

Particulate matter

PM is emitted by motor vehicles, brake pad/tire wear, wood burning, industrial facilities, and ground-disturbing activities, such as construction. PM may elicit respiratory symptoms, a decline in lung function, and exacerbation of respiratory and cardiovascular disease in those who inhale it. PM affects health in a uniquely harmful way; the small particle size allows for deep penetration into the gas-exchange regions of the lungs, which leads to cardiopulmonary problems. Both short and long-term exposure to PM are linked to higher all-cause mortality rates (Krewski et al., 2001; Pope III et al., 2006).

Ozone

Ozone is formed from a reaction between sunlight and other pollutant molecules (i.e. nitrous oxides) that are commonly emitted by motorized vehicles. Acute exposure to ozone that is close to the ground (versus atmospheric) can reduce lung function and aggravate diseases such as asthma and emphysema. The health effects are largely reversible, but are more severe when ozone is inhaled during outdoor exercise in hot weather due to deeper breathing and higher ambient ozone levels. Chronic exposures in animal studies have shown that ozone induces morphologic changes to lung tissue, but (unlike acute exposures) does not appear to decrease lung function. Epidemiologic studies have been inconclusive, likely due to the difficulty in accurately measuring exposure (EPA, 2012a). Overall, it appears that acute ground-level ozone exposure poses the greatest risk to human health.

Carbon Monoxide

Carbon monoxide (CO) is formed from incomplete combustion of fuel, with common sources including motor vehicles in poorly ventilated areas, residential space heaters, and industrial sites. It is mainly a concern in indoor settings (ATSDR, 2012), but can be harmful outdoors as well. CO affects health by impairing oxygen delivery to organs, such as the heart and brain. High levels can be fatal (Clardy et al., 2012). According to the draft EIS, levels around the Puget Sound have been well below limits over the last 15 years due to improved vehicle standards (City of Tacoma, 2013b).

Proximity to industry and roads

Factories and other industrial facilities are likely to emit high levels of pollutants, including PM, and use vehicles that run diesel engines. Diesel exhaust is not yet explicitly included as an EPA criteria pollutant, but there are concerns that diesel exhaust may be associated with respiratory and cardiovascular health problems. A health impact assessment in California cites seven studies that demonstrate poorer health outcomes among those living close

Busy roadways in subarea, Photo Credit - Lara Costa Bomfim

(<300 meters) to busy roadways (Bhatia et al., 2006). In a prominent case-control study, children hospitalized for asthma in Erie County, NY were almost twice as likely to live within 200 meters of a heavily trafficked road compared to children hospitalized for other reasons (Lin et al., 2002).

Existing Conditions

In 2009, after the EPA's 2006 tightening of its standards for fine particle air pollution, an area that includes much of Tacoma and Pierce County was designated a 'non-attainment' area for 24-hour average PM2.5 concentrations. The area was in violation of federal limits during the months of November, December, January, and February. Fine particle pollution comes from many sources, but the most significant contributor in Tacoma is the combustion of solid fuels for heating (53%), particularly on clear winter days with atmospheric 'inversion' effects. Nearly half of the solid fuel pollution comes from woodstoves that are 'uncertified,' which are less efficient and more polluting. Other sources include motor vehicle emissions (25%), industrial activities (10%), and ships (4%) (Tacoma-Pierce County Clean Air Task Force, 2011).

In the wake of nonattainment, the Puget Sound Clean Air Agency was tasked with submitting recommendations to WA State Department of Ecology, who then submitted an implementation plan to the EPA. The target date for reducing fine particle pollution is 2014, with a final deadline of 2019 (Tacoma-Pierce County Clean Air Task Force, 2011). The task force recommended three main strategies to address the problem: 1) Enhanced enforcement of burn bans, 2) Establishment of a certain date for removal of uncertified wood stoves and inserts, and 3) Implementation of a range of strategies to reduce fine particle pollution for gasoline vehicles, diesel vehicles, industries and ships.

Subarea Plan and Environmental Impact Statement

The SAP references "air quality" in three places: in the Pierce County planning policies regarding protection of the environment, in promoting the live-work/work-live code, and in the Brewery District complete streets improvement project. Curiously, the Mobility chapter of the SAP did not explicitly mention air quality, despite the fact that each of the three sections refers to improving air quality by reducing vehicle miles traveled.

The draft EIS addresses each criteria pollutant, and discusses the PM2.5 nonattainment area in which the Subarea is located. The authors then provide an overview of mitigation measures. They note the Task Force recommendations, plus additional policies and efforts aimed at reducing PM, such as having the Department of Ecology review pollution control mechanisms of the top six industrial sources of PM—accounting for 90% of industrial PM generation (City of Tacoma, 2013b).

Transportation projects in non-attainment areas are subject to strict standards as codified by state law (WAC 173-420-100), yet the temporary emissions during construction are not used for determining conformity. However, Tacoma requires contractors implement air quality control plans. These plans include best management practices to control dust and emissions from diesel equipment. Some typical mitigation measures include using water sprays on unpaved roadways, covering soil piles when practical, and using ultra-low sulfur diesel fuel (City of Tacoma, 2013b).

Overall, recommendations included in the SAP associated with the assessment and remediation of brownfield sites are well considered and likely to have positive health impacts for the local community; we fully endorse these into our assessment.

Analysis and Impact Assessment

Urban land use development can influence air quality in many ways, and the consequences of these changes are difficult to predict. Although mobile sources of emissions may be reduced by increasing availability of public transit options, increasing density can increase the number of people exposed to what emissions do exist (Schweitzer & Zhou, 2010).We judge that three main mechanisms are most relevant to the SAP:

First, the increase in residential, business, and industrial activity may lead to increased air pollutants (including PM, ozone, and CO) due to additional motorized vehicles. Air quality changes would not be immediate as expected growth spans multiple decades. The draft EIS states that the SAP would not result in significant air quality impacts or create conditions that would jeopardize regulatory compliance (City of Tacoma, 2013b: 3.2-8). The mixed land uses and transportation infrastructure envisioned by the SAP will hopefully attenuate per-person motor vehicle use. While the increased population and activity encouraged by the SAP may increase pollutant emissions—and subsequently higher risks of cardiopulmonary disease—, the effects will be gradual and minimal.

Second, absorption of population growth in newer, multi-unit buildings may replace growth in smaller, single-family

homes that are more likely to utilize wood-burning heat. Given this transition away from wood-burning stoves, the implementation of the SAP is expected to reduce PM2.5, and could potentially aid in achieving attainment status. Reaching attainment status will decrease risk of short- and long-term cardiopulmonary disease.

Third, adopting the SAP will result in significant amounts of construction activity, which may temporarily increase PM. The authors of the draft EIS note that earthwork and other construction activities would increase particulate levels and, similarly, diesel-powered trucks and equipment would contribute to air pollutant emissions (City of Tacoma, 2013b: 3.2.2). While construction-related impacts would likely be temporary and localized, reduced air quality can contribute to adverse health effects to nearby populations. As noted previously, even short-term exposures to PM increase the risk of all-cause mortality (Pope III & Dockery, 2006).

Equity

Asthma and cardiovascular disease are conditions for which all persons carry some degree of risk; however, they afflict some groups disproportionately due to various genetic and environmental factors. Children, females, and African Americans are all at higher risk for asthma (CDC, 2011). Furthermore, African Americans are 2-3 times more likely to die from asthma than any other racial or ethnic group (CDC, 2012). African Americans and males have elevated risk of cardiovascular disease. There is a high proportion of African Americans in the Subarea (City of Tacoma, 2013a); this group can be reasonably anticipated to carry a disproportionate amount of the burden of asthma should exposures to PM2.5 increase with redevelopment. If more females and children move into the Subarea with redevelopment, incidence of asthma events will likely increase. Vulnerable populations commonly have less access to health care, less ability to afford inhalers and other treatments, and may even lack access to a phone to call emergency services in case of a severe cardiovascular event or asthma attack. Today, one in four African American adults cannot afford their asthma medications (CDC, 2012). The unique risks to these populations should be given the attention they warrant as the SAP develops.

RECOMMENDATIONS

1) Add specific language regarding the consideration of public health during brownfield remediation and redevelopment.

- Simple, straightforward language specifically addressing public health concerns related to brownfield sites would help reinforce the existing commitment to protecting local populations during implementation of area revitalization.
- A sentence or two can be added regarding the strict cleanup oversight regulations that will be followed during remediation/redevelopment and result in protection of workers and nearby residents (i.e. Model Toxic Control Act).
- Language should be included to explicitly acknowledge that residents may experience contaminant exposure while redevelopment efforts are underway. The plan should include mitigation measures to reduce the possibility of such exposures.

2) Engage in multi-agency collaboration to address safety and health issues associated with development plans around the Foss Waterway, and develop a public notice system around the Foss Waterway in the event of high contamination events.

- Development of the Foss Waterway should involve the numerous organizations that currently oversee different elements of Foss Waterway management (i.e. Tacoma Police Department Marine Unit, the Tacoma-Pierce County Health Department, Foss Waterway Development Authority, etc.).
- As development projects proceed, an increase in recreational activities will increase the probability of water-related accidents and injuries. Safety plans and mitigation strategies that address these potential hazards should be incorporated into development plans.
- In the instance of high microbial or chemical water contamination (i.e. following a large rain event), public notification could mitigate negative public health impacts by reducing human contact with polluted water. Notices could take the form of visible signage, or restricted access to facilities where human-water contact is likely.
- The contamination notification system should include materials that specifically target vulnerable populations to communicate the health risks of recreational waterways use.

3) Assess the feasibility of implementing alternative remediation strategies at existing brownfields, such as bioremediation.

- Phytoremediation strategies, for instance, offer a potential cost-effective, natural, passive, and aesthetic method of decontamination, while providing important psychological and social benefits to the community (Westphal & Isebrands, 2001).
- Appropriate site- and contaminant-specific implementation of these strategies may require research and testing; therefore feasibility of such strategies should be evaluated subsequent to site assessments.
- These strategies may be particularly useful for sites that are not likely to be redeveloped in the short term.

4) Encourage contractors to tailor their city-required air pollution plans to minimize health effects by incorporating source-resident separation, best practices, and modern technology.

- Risk of adverse health effects from exposure to harmful emissions associated with construction activities can be minimized by providing space between the emitting source (i.e. trucks, equipment) and residents or workers. Truck routes and staging areas should avoid residential areas as much as possible, especially areas with schools, daycare centers, hospitals, or nursing homes.
- Encourage contractors to use the best practices mentioned in the draft EIS, such as using water sprays on unpaved roadways, especially during the winter and late fall months. This will likely decrease risk of local PM-related health effects during construction.
- Encourage contractors' use of newer, cleaner diesel engines and other pollution control technologies.

5) Pursue partnerships that can potentially benefit brownfield assessment and remediation goals, including academic-community partnerships and involvement of the Tacoma-Pierce County Health Department.

- Community interactions with academic institutions frequently originate from problems that impact a community (Bringle & Hatcher, 2002). Several societal benefits were noted during the transformation of an urban brownfield site into a community civic, recreational, and learning resource in North Carolina (Levine et al.,, 2011).
- Support from academic institutions can take many forms, including faculty, staff, and student project oversight, active participation in field activities, laboratory analytic resources, and access to equipment for field implementation. Partnerships may also provide additional access to funding opportunities.
- The role of the Tacoma-Pierce County Health Department as it pertains to brownfield redevelopment should be clarified explicitly, and, if needed, collaboration should be fostered.
- There is value in local health officials working with planners, developers, and communities to ensure thorough cleanup activities, adequate consideration of public health hazards, sustainability of redevelopment projects, and appropriate long-term stewardship of affected sites.

6) Continue to support Foss Waterway and stormwater quality monitoring programs, and prioritize Subarea Plan policies and actions that address stormwater management.

- Disruption of the protective sediment cap in the Foss Waterway could resuspend hazardous chemicals in recreational waters, increasing the likelihood of human exposure. As suggested by the 2009 Five-year Review Report, the City of Tacoma should continue monitoring water and sediment quality in the Foss Waterway, and take actions to protect the sediment cap during development projects (EPA, 2009).
- Tacoma has a strong system in place for stormwater management, and stormwater discharge quality has improved dramatically since the completion of the Superfund cleanup (City of Tacoma, 2012a). Continued support for monitoring and control programs will help mitigate negative public health outcomes associated with stormwater contaminants.
- Because of the potential negative human health effects, the City of Tacoma should focus resources on sustainable development projects that control stormwater quality and mitigate recontamination of the Foss Waterway.

7) Develop and implement long-term strategies for reducing air pollution--and ultimately cardiopulmonary disease--at the local and regional levels.

- Restrict wood-burning fireplaces and stoves in new buildings in the Subarea, as wood-burning is the predominant contributor to PM in the region during months of non-attainment.
- Support the recommendations put forth by the Taco-

ma-Pierce County Clean Air Task Force as well as the efforts by the Department of Ecology to review the top industrial sources of PM.

- Implement the recommendations given in the Transportation chapter of this HIA that fully maximize a mode shift away from single occupancy vehicles to active forms of transportation, such as walking.

- Support routing strategies that direct bulk truck traffic away from schools, thus protecting the vulnerable respiratory health of children. Also, support congestion-minimizing design plans, as congestion increases emissions.

SUMMARY

In this chapter we examined the potential health impacts of the SAP from an environmental health perspective. Specifically, we looked at the current or potential future presence of contaminants in brownfield properties, surface water (including the Foss Waterway), groundwater, and air, and then considered the resulting effects on health. For each of these exposure pathways we also highlighted social equity considerations. We have determined that the SAP has the potential to significantly reduce environmental exposures in the Subarea. This may occur through the redevelopment of contaminated brownfields, reduction of PM emissions by wood-burning stoves, and increased use of non-polluting, active forms of transportation. However, care must be exerted to ensure that exposures don't occur inadvertently, as a result of poor brownfield redevelopment strategies, recontamination of the Foss Waterway, or increased emissions as a result of increased population density and construction.

CHAPTER 8 - CONCLUSIONS

The South Downtown Subarea Plan offers the unique and exciting opportunity to create living conditions and environments that allow people to adopt and maintain happy, healthy lifestyles. With careful planning, the City of Tacoma can promote economic development and improve the health and well-being of residents and visitors.

VULNERABLE POPULATIONS

In order to promote equitable economic development in South Downtown, the City of Tacoma must pay particular attention to vulnerable populations in the area. Many vulnerable populations reside in and move through the Subarea. Examples of vulnerable populations include individuals who are mentally ill, homeless, low-income, a racial or ethnic minority, children, elderly and/or disabled. Planning decisions play a pivotal role in the ability of these groups to move through and live within neighborhoods safely and with dignity. Designing a more walkable, accessible, cohesive, and affordable community helps ensure this.

LIMITATIONS OF HIA

Although successful in identifying and recommending many important health considerations, this HIA was limited in its efforts by a number of factors. The team of graduate students faced a short project timeline, as the University of Washington operates on a 10-week quarter system. Under this timeline, opportunities for public engagement, data collection, quantitative analysis, evaluation, and monitoring were minimal.

In addition to student time constraints, the timeline for public review and comment of the SAP did not align with the 10-week quarter schedule. The Draft South Downtown Subarea Plan and Draft Environmental Impact Statement were released on March 26, 2013 for public review and comment. However, written comments were accepted only through May 3, 2013, one month before the rapid HIA could be finalized. Nonetheless, planners associated with the SAP agreed to review the HIA and take its recommendations into consideration.

NEXT STEPS

The last phases of the HIA process involve evaluation and monitoring. The objective of monitoring is to track the impacts of the HIA on the decision making process and the actions taken by decision makers. The following questions reflect the nature of monitoring:

- To what extent did this HIA raise awareness about the health impacts of the Subarea Plan among decision makers, media, and community residents?
- Were recommendations adopted, considered, or ignored?
- Did any of the adopted recommendations create unintended and potentially harmful consequences?

Where monitoring aims to assess the impact of the HIA on subsequent decision making, the evaluation phase considers the process of conducting the HIA itself. The following questions serve as examples for potential evaluation themes:

- Who was involved in the screening and scoping phases of the HIA?
- Were any key health issues overlooked?
- Did the evidence collected support the recommendations?

As the City of Tacoma moves forward with the South Downtown Subarea Plan, the recommendations and findings of this rapid HIA can support and guide its ongoing work.

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